SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Countywide Program Annual Report

FY 2012-13

September 15, 2013

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.
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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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September 16, 2013

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 2012/13 ANNUAL REPORT

Dear Mr. Wolfe:

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) is pleased to submit the enclosed Fiscal Year 2012/13 Annual Report. This report describes Municipal Regional Permit (MRP) compliance activities conducted at the regional and countywide levels on behalf of all of SMCWPPP'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 SMCWPPP FY 2012/13 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.

SMCWPPP 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
Program Coordinator

Enclosure: SMCWPPP FY 2012/13 Annual Report

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- Regional Pollutants of Concern Report for FY 2012-2013

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

EXECUTIVE SUMMARY

INTRODUCTION

The FY 2012-13 Countywide Program Annual Report was developed in compliance with the National Pollutant Discharge Elimination System (NPDES) stormwater Municipal Regional Permit (MRP) adopted in October 2009. It summarizes stormwater management activities implemented by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) in FY 2012-13. SMCWPPP's activities benefit all 22 of its member agencies: 20 cities/towns, the County of San Mateo, and the San Mateo County Flood Control District. Each member agency also separately submits an individual Annual Report to the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) focusing on that agency's stormwater management activities during FY 2012-13.

The City/County Association of Governments (C/CAG) of San Mateo County 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 and is comprised of a local elected city council representative from each member agency, a member of the County Board of Supervisors, and representatives from the transit district and transportation authority. 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. C/CAG activities, as well as those of its various stormwater management-related committees and workgroups are described below.

C/CAG Board

Throughout FY 2012/13, the C/CAG Board received presentations, updates, and took actions on various stormwater-related issues, as detailed below:

- August 2012: Funding Initiative Request for Proposals, Unfunded Mandates
- September 2012: Bransten Green Street Funding Agreement, Vehicle License Fund Expenditure Programs
- November 2012: Convening Stormwater Committee
- December 2012: Countywide Funding Initiative Consultant Funding Agreement
- February 2013: Stormwater Committee Appointments, Unfunded Mandates
- March 2013: Countywide Funding Initiative Update, Consultant Procurement Issues
- May 2013: Countywide Funding Initiative Update, Draft C/CAG Budget
- June 2013: Final C/CAG Budget, Technical Consultant Funding Agreement

City Managers Association

In September 2012, C/CAG staff and Bruce Wolfe, Executive Officer of the Regional Water Board, provided a presentation to the City/County Managers Association of San Mateo County regarding MRP issues/concerns.

Stormwater Committee

C/CAG's stormwater management-related decisions are assisted by the NPDES Stormwater Committee. At its November 2012 meeting, the C/CAG Board authorized reconvening this committee to include director-level appointees with decision-making authority for implementing stormwater management programs within the member agencies in compliance with requirements of the MRP. The Stormwater Committee first reconvened in February 2013 and met a total of three times during FY 2012-13 to assist with planning and organizing SMCWPPP's stormwater management activities including MRP compliance actions.

Technical Advisory Committee and Subcommittees

The Stormwater Committee provides direction to and receives feedback and recommendations from the Technical Advisory Committee (TAC). During FY 2012-13 the TAC transferred its former policy-related functions to the Stormwater Committee and transitioned to a quarterly workshop format. The new format allowed more detailed discussion of particular MRP compliance topics, including check-ins on what jurisdiction should be focused on in the coming quarter and what should have been accomplished and documented in the preceding quarter. The TAC met five times during FY 2012-13. In addition, in July 2012 SMCWPPP held a workshop to help train municipal staff on completing the member agency Annual Reports. SMCWPP has also established various subcommittees and work groups to the TAC that met periodically throughout FY 2012/13 to help implement the different aspects of the MRP, as summarized below.

SUMMARY OF ACCOMPLISHMENTS

The FY 2012-13 Annual Report is structured around the following major provisions of the MRP:

- C.2. Municipal Operations
- C.3. New Development and Redevelopment
- C.4. Industrial and Commercial Site Controls
- C.5. Illicit Discharge Detection and Elimination
- C.6. Construction Site Control
- C.7. Public Information and Outreach
- C.8. Water Quality Monitoring
- C.9. Pesticides Toxicity Control
- C.10. Trash Load Reduction
- C.11. Mercury Controls
- C.12. PCBs Controls
- C.13. Copper Controls
- C.14. Polybrominated Diphenyl Ethers (PBDE), Legacy Pesticides and Selenium
- C.15. Exempted and Conditionally Exempted Discharges

The following sections briefly summarize how SMCWPPP provided assistance in FY 2012-13 in

implementing the MRP for each of these provisions.

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. Most MRP-required Provision C.2 Municipal Operations tasks are implemented individually by each SMCWPPP member agency. SMCWPPP helps agency staff to understand MRP requirements and develops various tools that assist agency staff to effectively plan, implement, and report on compliance activities. SMCWPPP's assistance and the implementation of Municipal Operations tasks are coordinated through the SMCWPPP Public Works Municipal Maintenance Subcommittee.

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of Provision C.2, with input and assistance provided by the Public Works Municipal Maintenance Subcommittee. Accomplishments included the following:

- Held four Public Works Municipal Maintenance Subcommittee meetings.
- Facilitated dialogue between the San Francisco Estuary Project (SFEP) and member agencies with failed West Coast Storm Inc. trash capture devices.
- Attended February and March 2013 BASMAA Municipal Operations Committee meetings related to Provision C.2 and C.7.a Annual Report form revisions.
- Made a presentation to the SMCWPPP TAC on Municipal Maintenance MRP compliance.
- Held a Municipal Maintenance Workshop in May 2013. The workshop was attended by 52 people and included presentations on MRP requirements, BMPs for municipal field activities, trash capture device maintenance, and full trash capture devices. A main focus of the workshop was for agencies to share experiences with installation and maintenance of trash capture devices. In addition, the attendees received a refresher on MRP requirements and a brief presentation on BMPs for maintenance field activities, and a new technology vendor provided a demonstration for graffiti removal and structure cleaning with no/low water runoff.

C.3 New Development and Redevelopment

The reporting year FY 2012-13 was the first full year in which all projects regulated by Provision C.3 had to meet stormwater treatment requirements using low impact development (LID) measures, including infiltration, evapotranspiration, rainwater harvesting and use, and biotreatment. During FY 2012-13 SMCWPPP continued to provide compliance assistance with MRP Provision C.3 (and MRP Provision C.6 Construction Site Controls) through the New Development Subcommittee. The subcommittee met bimonthly and enjoyed good participation.

SMCWPPP's accomplishments during FY 2012-13 include the following major tasks to assist member agencies with implementation of Provision C.3:

- Participated in a workshop on "Protecting Coastal Watersheds with Focus on Residential Low Impact Development" conducted by the San Francisco Estuary Institute (SFEI) in Moss Beach on August 25, 2012.

- Prepared and updated various implementation and outreach products, including flyers, checklists, and the Program's C.3 Technical Guidance Manual (available on SMCWPPP's website at http://www.flowstobay.org/bs_new_development.php), to assist member agencies in complying with new requirements of Provision C.3.
- Held the 2013 New Development Workshop on May 22, 2013. The full-day workshop was attended by 45 people and started with "basic training" providing an overview of stormwater post-construction controls, and then focused on new requirements that took effect during the fiscal year. The workshop included group exercises to review example small projects and regulated projects, using the checklists prepared by SMCWPPP. The workshop also included presentations on a LID treatment case study (the Bransten Road project in San Carlos), operation and maintenance requirements, and review of the hydraulic sizing criteria and sizing worksheets.
- Contributed to the update of the Bay Area Hydrology Model (hydromodification control sizing tool).
- Participated in development of regional projects and MRP-required submittals through the BASMAA Development Committee.

C.4 Industrial and Commercial Site Controls

A primary goal of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component is to assist member agencies to control the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable. SMCWPPP member agencies are responsible for complying with various business inspection requirements under MRP Provision C.4. SMCWPPP's CII component assists member agency staff with understanding these MRP requirements and develops various related tools, templates, reporting forms, and other MRP compliance support materials. SMCWPPP's assistance with MRP Provision C.4 is coordinated through the CII Subcommittee.

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of MRP Provision C.4, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- Held four CII Subcommittee meetings to share information about commercial/industrial inspection related MRP requirements and methods for achieving compliance. The meetings provided a forum to share experiences with implementing MRP Provisions related to the CII component, including Provision C.4. In addition, the meetings allow a forum for the San Mateo Health Services Agency, Environmental Health Services Division (County Environmental Health or CEH) representative to discuss the status of CEH inspections and hear member agency feedback on the process, since many of the member agencies have an agreement with CEH to conduct stormwater inspections of businesses.
- Made a presentation to the SMCWPPP TAC on CII related MRP compliance, including implementation of MRP Provision C.4.

C.5 Illicit Discharge Detection and Elimination

Another primary goal of SMCWPPP's CII component is to assist member agencies effectively

prohibit the discharge of illicit, non-stormwater discharges to the municipal storm drain system. SMCWPPP member agencies are responsible for controlling non-stormwater discharges prohibited by MRP Provision C.5. SMCWPPP's CII component assists member agency staff with understanding these MRP requirements and develops various related tools, templates, reporting forms, and other MRP compliance support materials. SMCWPPP's assistance with MRP Provision C.5 is coordinated through the CII Subcommittee (described above under C.4. Industrial and Commercial Site Controls). The CII Subcommittee also has a Training Work Group that assists with the planning of trainings, developing educational outreach materials, and coordinating with the Public Information and Participation (PIP) Subcommittee on materials that affect businesses.

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of MRP Provision C.5, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- SMCWPPP held four CII Training Work Group meetings during FY 2012-13. The meetings focused on organizing an Illicit Discharge Inspector Training Workshop.
- Conducted an Illicit Discharge Inspector Training Workshop on April 24, 2013 that was attended by 61 people. The workshop included presentations on MRP illicit discharge control requirements and mobile garage cleaning businesses, and a table top group exercise. The focus of the training was on the table top group exercise. Five illicit discharge scenarios were presented and inspectors were given the opportunity to discuss among themselves how they would approach the investigation, education, enforcement and cleanup of the scenario. The approaches were discussed with the larger group and actual agency responses were shared. The emphasis on the exercise was for inspectors to share information and learn from other agencies' experiences. The group exercise also offered the opportunity to work towards consistency within and among SMCWPPP member agencies.
- Updated Illicit Discharge Coordinator contact list to include after-hours contact information.
- Updated the Illicit Discharge Inspection Form template and the Illicit Discharge Tracking Table template.
- Adapted the Santa Clara Valley Urban Runoff Pollution Prevention Program's Mobile Businesses BMP brochure for use by SMCWPPP agencies.

C.6 Construction Site Control

During FY 2012-13 SMCWPPP continued to provide compliance assistance with MRP Provision C.6 (and MRP Provision C.3) through the New Development Subcommittee (described above under C.3. New Development and Redevelopment).

SMCWPPP's accomplishments during FY 2012-13 include the following major tasks to assist member agencies with implementation of Provision C.6:

- Conducted a construction site controls training for the California Building Inspectors Group (CALBIG) on October 10, 2012. SMCWPPP staff gave presentations on current stormwater requirements for construction sites, proper installation of construction BMPs, and tips for keeping construction inspection programs in compliance.

Approximately 55 people attended the training, including agency inspectors, local stormwater program staff, and contractors.

- Updated the Construction Site Inspection Report and Inspection Tracking Table. The updated Inspection Report form is available on SMCWPPP's website at the following address: http://www.flowstobay.org/bs_construction.php.
- Planned and conducted the April 11, 2013 Construction Site Inspector Workshop. The half-day workshop was attended by 95 people and covered the following topics: requirements of MRP Provision C.6; differences between Provision C.6 and the Construction General Permit; Caltrans experience with construction BMPs and inspections; an exercise using the Program's Construction Site Inspection Report; MRP requirements for O&M verification inspection of treatment measures; and common issues in inspections of newly installed systems.

C.7 Public Information and Outreach

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 adverse effects on the water quality in 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 many pollutants originate from preventable, everyday residential activities. Pollutants in stormwater may be reduced by motivating and educating residents about the benefits of preventing stormwater 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 2012-13 to oversee the development of educational materials and to guide the implementation of the PIP component of the program. SMCWPPP accomplished the following major PIP tasks during FY 2012-13:

- Raised awareness of San Mateo County's Reusable Bag Ordinance, which took effect in most cities on April 22, 2013.
- Maintained 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.
- Launched additional Spanish- and Chinese- language web pages focused on providing residents with information on proper household toxics disposal.
- Grew the existing car wash discount campaign to include 15 commercial car washes located throughout the county, in order to encourage residents to wash cars at commercial car washing facilities. Revised and distributed approximately 5,000 discount car wash tip cards with attached coupons through municipal channels and outreach events. Maintained a web page that 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.

- Coordinated the California Coastal Cleanup Day for San Mateo County diverting 26,936 gallons of trash and 6,620 gallons of recyclables from waterways. An estimated 4,490 residents volunteered in the September 2012 event, an increase from September 2011 event. Raised awareness of the event and litter issues through local media coverage and use of social media.
- 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.
- Supported collaborative watershed stewardship efforts by updating the online guide to local groups, promoting cleanup activities through continuing the "Spring Cleaning SMC" promotional campaign, and creating the new Team Effort campaign to engage citizens and civic groups not traditionally allied with water protection efforts.
- Sponsored an educational assembly program for elementary-age students entitled "We All Live Downstream," performed by the Banana Slug String Band. The program emphasizes the importance of not littering or dumping substances into the storm drain to protect the marine environment.
- Developed a high school educational program entitled "Water Pollution Prevention: Problems and Solutions." The program emphasizes educating students on basic problems and solutions of storm water pollution, and encourages them to become involved by educating others.
- Participated 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. Created a web page identifying operators that are IPM-trained as a resource for the public.

C.8 Watershed Quality Monitoring

On behalf of it member agencies, SMCWPPP performs water quality monitoring activities in compliance with MRP Provision C.8. Much of this work is accomplished through participation in BASMAA regional projects. Per Provision C.8, water quality monitoring activities conducted from the beginning of the permit term through September 30, 2013 will be documented, summarized, and evaluated in the comprehensive Integrated Monitoring Report (IMR), which is due March 15, 2014.

C.9 Pesticides Toxicity Control

The primary objective of MRP Provision C.9 is to prevent the impairment of urban streams by pesticide-related toxicity, and thereby implements requirements of the *TMDL for Diazinon and*

Pesticide-related Toxicity for Urban Creeks in the region. Permittees are required 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 stormwater conveyance system. Most MRP-required Provision C.9 tasks are implemented individually by each SMCWPPP member agency. SMCWPPP helps agency staff to understand MRP requirements and develops various tools that assist agency staff to effectively plan, implement, and report on compliance activities. SMCWPPP's assistance with MRP Provision C.9 Pesticides Toxicity Control is mainly coordinated through the Parks Maintenance and Integrated Pest Management (IPM) Work Group.

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of Provision C.9, with input and assistance provided by the Parks Maintenance and IPM Work Group. Accomplishments included the following:

- Held three meetings of the Parks Maintenance and IPM Work Group.
- Conducted the SMCWPPP annual Landscape IPM Training Workshop in February 2013. Eighty-two people attended and the following topics were covered: 1) Gopher and Squirrel Control, 2) Adapting and Applying the Central Tenets of IPM to Urban Ecosystems, 3) Efficient Turfgrass Irrigation in an IPM Program, 4) No Mow/Low Mow Turf Options, and 5) Respirator Regulatory Refresher and Online Pesticide Use.
- Prepared a report evaluating implementation of source control actions relating to pesticides per MRP Provision C.9.g .
- Participated in relevant BASMAA and CASQA committees.

C.10 Trash Load Reduction

MRP Provision C.10 Trash Load Reduction tasks are implemented by each SMCWPPP member agency. SMCWPPP helps agency staff to understand trash load reduction requirements and develops various tools needed to effectively plan, implement, and report on compliance with trash management activities. Provision C.10 requires Permittees (as applicable) to:

- Submit a Short-Term Trash Reduction Plan to the Water Board by February 1, 2012 that is designed to attain a 40% reduction from its MS4 by July 1, 2014.
- Determine its baseline load of trash from its stormwater system and document the method used to demonstrate progress towards load reduction levels (e.g., 40% reduction).
- 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 land area.
- Submit a Long-Term Trash Reduction Plan to the Regional Water Board by February 1, 2014 that specifies actions designed to attain a 70% reduction from its MS4 by July 1, 2017, and a 100% reduction (i.e., "No Visual Impact") by July 1, 2022.

During FY 2012-13, SMCWPPP completed the following tasks in support of member agency trash management activities conducted in compliance with the above requirements:

- SMCWPPP staff coordinated five Trash Committee meetings. Committee members discussed and provided input on a range of topics/projects including developing the FY 2012-13 Annual Report format for Provision C.10, developing a response letter to Regional Water Board staff with the approach and time schedule for responding to Regional Water Board staff comments on Permittee Short-Term Plans, ABAG/SFEP full trash capture demonstration project, developing the Long-Term Trash Load Reduction Framework and Plans, verifying and mapping trash generation rates for SMCWPPP member agency jurisdictional areas, conducting and reporting on creek and shoreline trash hot spot cleanups and assessments, and developing a preliminary scope for identifying optimal locations for large full capture devices in member agency jurisdictional areas.
- SMCWPPP staff assisted Permittees to continue refining baseline trash loads from their MS4s. The trash generation rates technical memorandum submitted on February 1, 2012 to the Regional Water Board is currently being revised to include results from the January and April 2012 characterization events, and incorporate findings from similar efforts conducted in Los Angeles County in the early 2000's. The final technical report will also include an analysis of factors other than land use that may further differentiate trash generation rates. The results of all analyses will be fully documented in the technical report entitled Final Baseline Trash Generation Rates for San Francisco Bay Area MS4s, which will be finalized in late 2013.
- SMCWPPP assisted Permittees to develop and begin implementing a framework for developing Long-Term Trash Reduction Plans. A work group of MRP Permittee, SMCWPPP and other Bay Area countywide stormwater program staff, and Regional Water Board staff met between October 2012 and March 2013 to better define the process for developing the plans, methods for assessing progress toward reduction goals, and tracking and reporting requirements. The first step of the framework is the identification of very high, high, moderate, and low trash generating areas within each Permittee jurisdictional area. As part of this process, SMCWPPP staff developed guidance to assist Permittees in refining land uses classifications, and conducting assessments to confirm/refine trash generation levels depicted on draft trash generation maps, which will be the focal point of the Long-Term Plans. Final draft trash generation maps and preliminary management area maps are included in each Permittee's FY 2012-13 Annual Report.
- Permittees are required to clean up trash hot spots to a level of "no visual impact" at least one time per year for the term of the permit. To assist Permittees in meeting this requirement, SMCWPPP staff developed the necessary tools (i.e., guidance memorandum, Trash Hot Spot Cleanup Data Collection Form and Trash Hot Spot Activity Reports) used to report trash hot spot assessment and cleanup activities conducted during the reporting period. Trash Hot Spot Activity Reports for individual Permittees are included in Permittee Annual Reports. During FY 2012-13, Permittees continued conducting annual cleanups and assessments required by the MRP. Results from this year's annual cleanups indicated that a total of 37 cleanups and assessments were conducted at 32 different sites within SMCWPPP member agency jurisdictions. Approximately 45.8 cubic yards of trash was removed from these sites during FY 2012-13.
- In an effort to increase coordination between solid waste and recycling programs and

SMCWPPP member agency MS4 trash reduction activities, SMCWPPP program staff began attending Countywide Recycling Committee meetings in FY 2012-13. Program staff provided presentations at two meetings regarding the MRP trash reduction requirements, short-term trash reduction plans, and the BASMAA Regional Trash Generation Rates Project.

C.11 Mercury Controls

Provision C.11 Mercury Controls implements stormwater runoff-related actions required by the San Francisco Bay mercury Total Maximum Daily Load (TMDL) water quality restoration program. On behalf of it member agencies, SMCWPPP performs a variety of activities to address mercury in stormwater runoff in compliance with MRP Provision C.11. Much of this work is accomplished through participation in BASMAA regional projects. The BASMAA *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details about these projects and their status through FY 2012/13. In addition, per Provision C.11, all mercury-related activities conducted by SMCWPPP and BASMAA over the permit term will be documented, summarized, and evaluated in the comprehensive Integrated Monitoring Report (IMR), which is due March 15, 2014.

Provision C.11.a requires that Permittees report an estimate of the mass of mercury collected via mercury collection and recycling efforts. Using a spreadsheet calculator developed in collaboration with BASMAA, SMCWPPP staff calculated the mass of mercury collected during FY 2012-13 by the San Mateo County Household Hazardous Waste Program. The estimated mass of mercury collected is calculated based on the total amount of mercury-containing devices and equipment collected and the best available information from manufacturers and trade organizations regarding the amount of mercury contained in the devices and equipment.

In addition, Provision C.11.i requires development of a risk reduction program implemented throughout the region. This has been accomplished through the San Francisco Bay Fish Project, a two-year regional project to improve communication to the public about how to reduce their exposure to PCBs and mercury from consuming San Francisco Bay fish. During FY 2012/13 the San Mateo County Environmental Health Department (SMCEHD) began distributing education materials created by the Fish Project, including posting signs along the Bay's shore in most cities in San Mateo County. SMCEHD has also begun a program to provide educational materials (e.g., a Fish Project brochure entitled "Guide to Eating Fish and Shellfish from San Francisco Bay") to at-risk populations (e.g., subsistence fisherman) by working with private marinas, public parks, and nurses with the San Mateo County Health System who serve appropriate communities.

C.12 PCBs Controls

Provision C.12 PCBs Controls implements stormwater runoff-related actions required by the San Francisco Bay PCB Total Maximum Daily Load (TMDL) water quality restoration program. On behalf of it member agencies, SMCWPPP performs a variety of activities to address PCBs in stormwater runoff in compliance with MRP Provision C.12. Much of this work is accomplished through participation in BASMAA regional projects. The BASMAA *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details about these projects and their status through FY 2012/13. In addition, per Provision C.12, all PCB-related activities conducted by SMCWPPP and BASMAA over the permit term will be documented, summarized, and

evaluated in the comprehensive Integrated Monitoring Report (IMR), which is due March 15, 2014.

C.13 Copper Controls

Provision C.13 of the MRP addresses copper control measures identified in the San Francisco Bay Basin Water Quality Control Plan (commonly referred to as the Basin Plan) that the Regional Water Board has deemed necessary to support copper site-specific objectives in San Francisco Bay. SMCWPPP's accomplishments during FY 2012-13 include the following tasks to assist member agencies with implementation of Provision C.13:

- Provision C.13.a requires Permittees to manage waste from cleaning and treating copper architectural features, including copper roofs, during construction and post-construction. SMCWPPP's main focus in FY 2012-13 was education and outreach to municipal inspectors about the MRP requirements and BMPs for architectural copper installation, cleaning, and treating. The education and outreach utilized a previously developed fact sheet entitled *Requirements for Architectural Copper: Protect water quality during installation, cleaning, treating, and washing!* Construction site inspectors received the information during the April 11, 2013 SMCWPPP Construction Site Inspection Workshop; building inspectors received the information from a SMCWPPP staff presentation at the California Building Inspectors Group (CALBIG) meeting on October 10, 2012; and illicit discharge inspectors received the information at the April 24, 2013 SMCWPPP Illicit Discharge Inspector Training Workshop.
- Provision C.13.b requires Permittees to manage discharges from pools, spas and fountains that contain copper-based chemicals by adopting local ordinances. Guidance on these requirements for illicit discharge inspectors is provided through SMCWPPP's CII Subcommittee and public outreach on related BMPs is provided through SMCWPPP's PIP Subcommittee.
- 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 2012-13, BASMAA regional projects continued to address these provisions; the BASMAA *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details.
- Provision C.13.d requires Permittees to ensure through routine industrial facility inspections that proper BMPs are in place at industrial facilities likely to use copper or have sources of copper. SMCWPPP's CII Subcommittee assists member agency staff with understanding this MRP requirement and program staff develops MRP compliance support materials as necessary. Pollutants of concern commercial/industrial inspector training materials and a guidance manual that address industrial sources of copper are available on SMCWPPP's website (www.flowstobay.org).

C.14 PBDEs, Legacy Pesticides and Selenium

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 2012-13, SMCWPPP staff worked with BASMAA on regional projects that address this provision. The BASMAA *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details about the projects and their status.

C.15 Exempted and Conditionally Exempted Discharges

The objective of MRP Provision C.15, Exempted and Conditionally Exempted Discharges, is to exempt unpolluted non-stormwater discharges from the MRP's general non-stormwater discharge prohibition (Provision A.1) and to conditionally exempt unpolluted non-stormwater discharges that are potential sources of pollutants. SMCWPPP assists municipal staff to understand the C.15 requirements and makes available for their use various MRP compliance support materials. The SMCWPPP CII Subcommittee facilitates and coordinates providing this assistance to the member agencies for a variety of different types of non-stormwater discharges that may be conditionally exempted.

The most extensive tracking, monitoring, and reporting requirements in Provision C.15 are for planned and unplanned potable water discharges by water purveyors. These requirements include documenting, monitoring, notifying, and reporting on various types of planned (e.g., fire hydrant flushing) and unplanned (e.g., water line breaks) potable water discharges. There are eleven SMCWPPP agencies that have identified themselves as water utilities in their Annual Reports. In April 2012 a Water Utility Work Group was temporarily formed to specifically address the Provision C.15.b.iii requirements related to conditionally exempt planned and unplanned potable water discharges.

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of Provision C.15, with input and assistance provided by the CII Subcommittee and Water Utility Work Group. Accomplishments included the following:

- Held a Water Utility Work Group meeting in September 2012.
- Developed four fact sheets related to Provision C.15.b.iii requirements and posted on SMCWPPP's web site (flowstobay.org).
- Held a Water Utility Training Workshop in November 2012. The workshop was attended by 34 people and included presentations on MRP requirements and BMPs for planned and unplanned potable water discharges, and new flushing equipment with no discharge. The primary objective of the training was to provide an orientation to municipal staff that are responsible for performing routine operation and maintenance on water utility systems and responding to unplanned discharges. Attendees received a presentation from CalWater staff on the BMPs and record keeping procedures used by this water agency. In addition, Town of Hillsborough staff provided information on their new NO-DES flushing system. This innovative new system filters and re-circulates water back into the water distribution system. Hillsborough is the first water agency to purchase and use this system. The Town performed rigorous water testing with oversight from the California Department of Public Health during a pilot phase that began in February 2011. After the presentations attendees visited vendor equipment displays (e.g., monitoring and municipal water utility BMP equipment) and had the opportunity to discuss the equipment with vendor representatives.

SECTION 1
INTRODUCTION

BACKGROUND

This FY 2012-13 Countywide Program Annual Report was developed in compliance with the National Pollutant Discharge Elimination System (NPDES) stormwater Municipal Regional Permit (MRP) adopted in October 2009. It summarizes stormwater management activities implemented by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) in FY 2012-13. SMCWPPP's activities benefit all of its member agencies. Each member agency also separately submits an individual Annual Report to the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) focusing on that agency's stormwater management activities during FY 2012-13.

The organizational structure of SMCWPPP is shown on Figure 1-1. The City/County Association of Governments (C/CAG) of San Mateo County 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 and is comprised of a local elected city council representative from each member agency, a member of the County Board of Supervisors, and representatives from the transit district and transportation authority. 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. C/CAG's various NPDES stormwater committees and workgroups are described below.

STORMWATER COMMITTEE

C/CAG's stormwater management-related decisions are assisted by the NPDES Stormwater Committee. At its November 2012 meeting, the C/CAG Board authorized reconvening this committee to include director-level appointees with decision-making authority for implementing stormwater management programs within the member agencies in compliance with requirements in the MRP. The Committee meets on an approximate bimonthly basis (depending on need) on the third Thursday of the month at the San Mateo County Transit District Office in San Carlos. Public notices for Committee meetings are posted in accordance with Brown Act requirements on the ground floor of the same location. The Stormwater Committee reconvened in February 2013 and met three times during FY 2012-13 to assist with planning and organizing SMCWPPP's stormwater management activities including MRP compliance actions. Appendix 1 includes a table summarizing attendance at the Stormwater Committee meetings held during FY 2012-13.

The below sections describe the Stormwater Committee's mission statement, membership criteria, and roles and responsibilities.

Mission Statement

The Stormwater Committee provides policy and technical advice and recommendations to the C/CAG Board of Directors and direction to technical committees (described below) on all matters relating to stormwater management and compliance with associated regulatory mandates from the State Water Resources Control Board and Regional Water Board.

Membership

The Stormwater Committee is comprised of one director-level representative from each of the 21 member agencies, recommended by City/Town/County Managers, with decision-making authority and primary responsibility for implementing stormwater management programs within their jurisdictions and one non-voting executive management representative from the Regional Water Board staff, all appointed by the C/CAG Board. There are no term limits and members may be removed and replaced as needed.

Roles & Responsibilities

The role of the Stormwater Committee is to provide policy and technical advice and recommendations to the C/CAG Board and direction to stormwater technical committees on matters related to stormwater management and associated regulatory requirements. While the Stormwater Committee may consider any item reasonably related to stormwater and associated regulatory requirements, the following issues are the primary focus of the Stormwater Committee:

- Review and provide recommendations for SMCWPPP's annual budget as part of the overall C/CAG budget approval process.
- Authorize submittal of countywide and regional compliance documents on behalf of their respective agencies for activities performed via C/CAG through SMCWPPP or the Bay Area Stormwater Management Agencies Association (BASMAA).
- Convey relevant program and compliance information and direction to appropriate staff and departments within their jurisdictions.
- Form ad-hoc work groups to address particular stormwater-related issues on an as-needed basis.
- Discuss and provide policy recommendations on stormwater issues, such as:
    - funding stormwater compliance activities at the local and countywide level;
    - unfunded mandate test claims;
    - permit appeals and litigation;
    - reissuance of the Municipal Regional Permit;
    - permit requirements, especially those related to new and redevelopment, monitoring, and pollutants of concern, including trash, mercury, PCBs, and pesticides;

- training and technical support needs for municipal staffs; and
- legislation and statewide policy issues impacting member agencies.

TECHNICAL ADVISORY COMMITTEE AND SUBCOMMITTEES

The Stormwater Committee provides direction to and receives feedback and recommendations from the Technical Advisory Committee (TAC). During FY 2012-13 the TAC transferred its former policy-related functions to the Stormwater Committee and transitioned to a quarterly workshop format. The new format allowed more detailed discussion of particular MRP compliance topics, including check-ins on what jurisdictions should be focused on in the coming quarter and what should have been accomplished and documented in the preceding quarter. The TAC met five times during FY 2012-13. Appendix 1 includes a table summarizing attendance at the TAC meetings held during FY 2012-13. In addition, in July 2012 SMCWPPP held a workshop to help train municipal staff on completing the member agency Annual Reports.

SMCWPP has also established various subcommittees and work groups to the TAC to help implement the different aspects of the MRP, as shown on Figure 1-1. The subcommittees and work groups are discussed further in the remaining sections of this report.

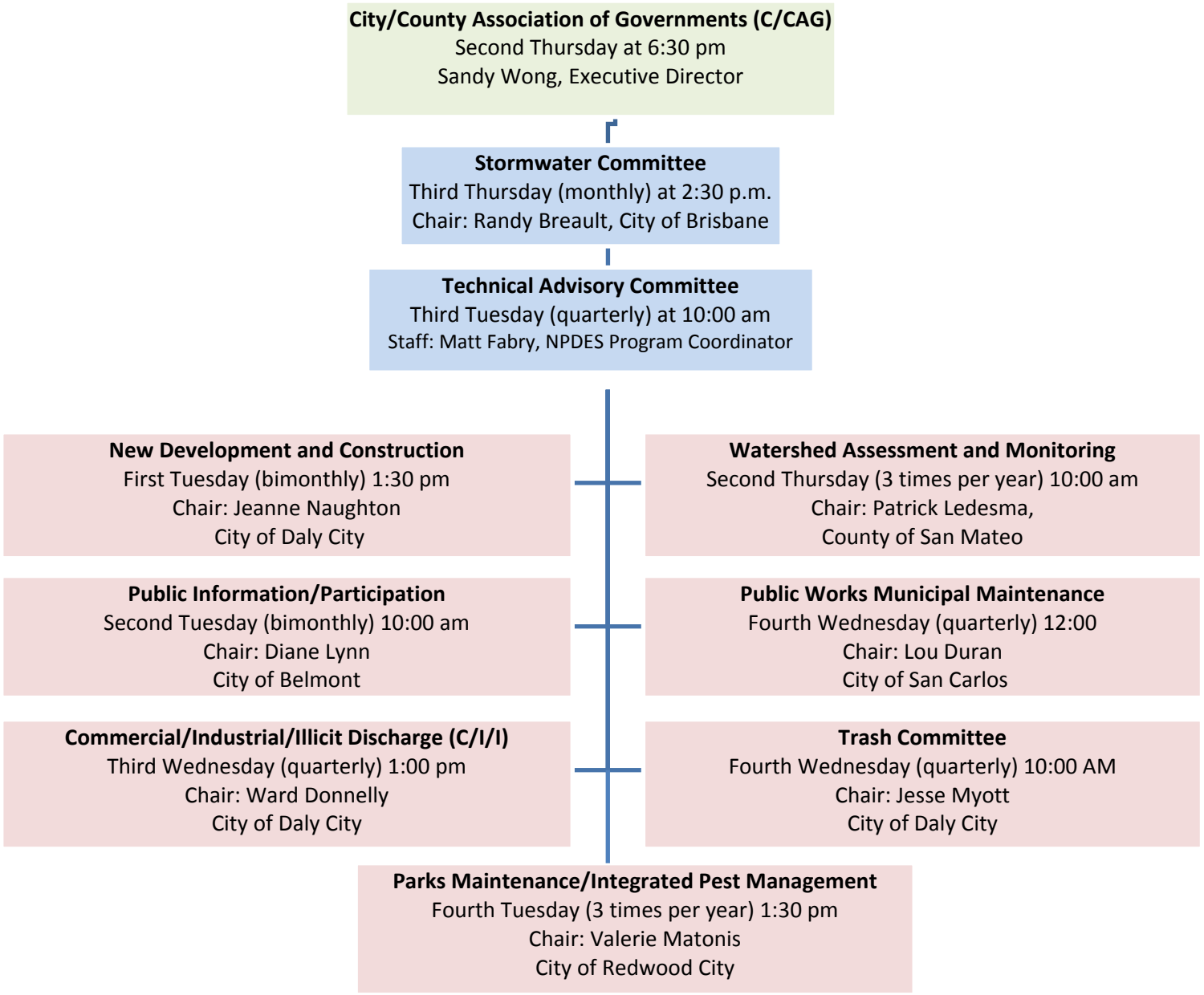
ORGANIZATION OF REPORT

The FY 2012-13 Annual Report is structured around the following major provisions of the MRP:

- C.2. Municipal Operations
- C.3. New Development and Redevelopment
- C.4. Industrial and Commercial Site Controls
- C.5. Illicit Discharge Detection and Elimination
- C.6. Construction Site Control
- C.7. Public Information and Outreach
- C.8. Water Quality Monitoring
- C.9. Pesticides Toxicity Control
- C.10. Trash Load Reduction
- C.11. Mercury Controls
- C.12. PCBs Controls
- C.13. Copper Controls
- C.14. Polybrominated Diphenyl Ethers (PBDE), Legacy Pesticides and Selenium
- C.15. Exempted and Conditionally Exempted Discharges

The following sections of this report summarize how SMCWPPP provided assistance in FY 2012-13 in implementing the MRP for each of the above provisions. Most of the following individual sections include three sub-sections: 1) Introduction, 2) Implementation of MRP Actions, and 3) Future Actions.

Figure 1-1. Organizational Structure and Meeting Schedule



SECTION 2
C.2 MUNICIPAL OPERATIONS

INTRODUCTION

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.

Most MRP-required Provision C.2 Municipal Operations tasks are implemented individually by each SMCWPPP member agency. SMCWPPP helps agency staff to understand MRP requirements and develops various tools that assist agency staff to effectively plan, implement, and report on compliance activities. SMCWPPP's assistance and the implementation of Municipal Operations tasks are coordinated through the SMCWPPP Public Works Municipal Maintenance Subcommittee.

IMPLEMENTATION OF MRP PROVISIONS

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of Provision C.2, with input and assistance provided by the Public Works Municipal Maintenance Subcommittee. Accomplishments included the following:

- Held four Public Works Municipal Maintenance Subcommittee meetings;
- Facilitated dialogue between the San Francisco Estuary Project (SFEP) and member agencies with failed West Coast Storm Inc. trash capture devices;
- Attended February and March 2013 BASMAA Municipal Operations Committee meetings related to Provision C.2 and C.7.a Annual Report form revisions;
- Made a presentation to the SMCWPPP TAC on Municipal Maintenance MRP compliance; and
- Held a Municipal Maintenance Workshop in May 2013.

More information on each of these accomplishments is provided below.

Public Works Municipal Maintenance Subcommittee

The Public Works Municipal Maintenance Subcommittee met four times during FY 2012-13 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.

Louis Gotelli from the Town of Colma chaired the subcommittee up until December 2012. Lou Duran from the City of San Carlos has chaired the subcommittee since January 2013. A FY 2012-13 subcommittee attendance summary table is included in Appendix 2. A majority of the subcommittee's four meetings were attended by staff from the Cities of Belmont, Burlingame, Colma, Foster City, Half Moon Bay, Hillsborough, Millbrae, Pacifica, Redwood City and San Carlos.

During FY 2012-13 the Program conducted a survey requested by the subcommittee to identify trash capture device failures. Program staff facilitated communication with SFEP and the agencies with West Coast Storm Inc. trash capture device failures to investigate recourse. Also the subcommittee reviewed and provided comments on the Annual Report form revisions to section C.2 and C.7 proposed by the BASMAA Municipal Operations Committee.

In addition, the SMCWPPP program staff facilitating the subcommittee made a presentation at the April 2013 TAC meeting on Municipal Maintenance MRP compliance.

Municipal Maintenance Workshop

The Municipal Maintenance Subcommittee sponsored a workshop which was held May 23, 2013 at the Belmont Sports Complex Conference Center. The workshop was attended by 52 people and included presentations on MRP requirements, BMPs for municipal field activities, trash capture device maintenance, and full trash capture devices. The workshop agenda, final attendance list and evaluation summary are included in Appendix 2.

The primary objective of the training was to provide an orientation to new municipal maintenance agency staff and a refresher to existing staff. The main focus of the workshop was for agencies to share experiences with installation and maintenance of trash capture devices. The panel discussion of five agencies provided several perspectives and initiated a productive discussion among all workshop participants. In addition to discussions of trash capture devices, the attendees had a refresher in the MRP requirements and brief presentation on BMPs for maintenance field activities. Also, a new technology vendor provided a demonstration for graffiti removal and structure cleaning with no/low water runoff.

Based on the evaluation forms submitted following the workshop, attendees were satisfied with the training. Approximately 78 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.

Program Materials

Since the MRP was adopted, SMCWPPP staff has developed a number of materials to assist municipal maintenance agency staff with implementing Provision C.2. 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.

FUTURE ACTIONS

FY 2013-14 activities planned by SMCWPPP to assist member agencies comply with MRP requirements in Provision C.2 include the following:

- Hold up to four Public Works Municipal Maintenance Subcommittee meetings.
- Organize and hold a Rural Roads Municipal Maintenance Workshop.

SECTION 3
C.3 NEW DEVELOPMENT AND REDEVELOPMENT

INTRODUCTION

This section describes SMCWPPP's activities to assist member agencies in complying with MRP Provision C.3 (New Development and Redevelopment). The reporting year FY 2012-13 was the first full year in which all projects regulated by Provision C.3 had to meet stormwater treatment requirements using low impact development (LID) measures, including infiltration, evapotranspiration, rainwater harvesting and use, and biotreatment.

SMCWPPP continued to provide compliance assistance with MRP Provision C.3 (and MRP Provision C.6 Construction Site Controls – see Section 6) through the New Development Subcommittee, which was chaired by Jeannie Naughton, the Daly City representative. SMCWPPP program staff also obtained input and direction from agency representatives through the subcommittee. The subcommittee met bimonthly and enjoyed good participation, as shown by the FY 2012-13 attendance list, which is included in Appendix 3.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP's accomplishments during FY 2012-13 include the following major tasks to assist member agencies with implementation of Provision C.3:

- Participated in a workshop on "Protecting Coastal Watersheds with Focus on Residential Low Impact Development" conducted by the San Francisco Estuary Institute (SFEI) in Moss Beach on August 25, 2012;
- Prepared and updated various implementation and outreach products, including flyers, checklists, and the Program's C.3 Technical Guidance Manual, to assist member agencies in complying with new requirements of Provision C.3;
- Held the 2013 New Development Workshop on May 22, 2013;
- Contributed to the update of the Bay Area Hydrology Model (hydromodification control sizing tool); and
- Participated in development of regional projects and MRP-required submittals through the BASMAA Development Committee.

More information on each of these accomplishments is provided below.

"Protecting Coastal Watersheds" Workshop

As part of the James V. Fitzgerald Area of Special Biological Significance (ASBS) Pollution Reduction Program, funded in part by a Proposition 84 grant from the State Water Resources Control Board, the County of San Mateo (County) is implementing best management practices (BMPs) and LID practices to improve water quality in stormwater draining into the Fitzgerald Marine Reserve and ASBS in Moss Beach and Montara. As part of this grant, SFEI hosted a workshop titled "Protecting Coastal Watersheds with Focus on Residential Low Impact Development" on Saturday, August 25, 2012 at Cypress Meadows in Moss Beach. The workshop was intended to inform local builders, contractors, and residents about potential LID options that can be integrated in smaller scale projects to improve water quality downstream. The workshop covered residential LID techniques including bioswales and rain gardens, pervious pavement, reduced irrigation and pesticide use, and rainwater harvesting and gray water reuse. A SMCWPPP representative made a presentation on LID features and MRP requirements for small projects. Appendix 3 includes a copy of the workshop flyer, agenda, and summary.

Implementation and Outreach Products

With the assistance of the New Development Subcommittee, SMCWPPP program staff developed and/or updated the following technical and outreach products:

- C.3.i Small Project Requirements - Notice to Project Applicants – SMCWPPP prepared a flyer to inform project applicants about the new Provision C.3.i site design requirements for small projects, which went 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. These projects need to incorporate at least one of six site design measures in the project plan. The flyer was provided to SMCWPPP municipalities for distribution to project applicants.
- Stormwater Checklist for Small Projects – To help municipalities implement the new Provision C.3.i site design requirements for small projects (described above), SMCWPPP created a checklist for small projects that allows municipalities to document the site design measures and source control measures that will be incorporated into the project, and what construction phase BMPs will be implemented.
- C.3 Regulated Projects Checklist and Flow Chart – In past fiscal years, SMCWPPP had developed several forms, including the C.3/C.6 Data Collection Form, Stormwater Requirements Checklist, and Project Closeout Form, to assist municipalities determine the requirements for regulated projects and document information for annual reporting. In FY 2012-13, at the request of the New Development Subcommittee, SMCWPPP program staff combined the existing checklists into one comprehensive "C.3 Regulated Projects Checklist". SMCWPPP also created a flow chart as a visual representation of the stormwater review process.
- Template for Operation and Maintenance (O&M) Verification Inspection Plan – In response to Regional Water Board comments on SMCWPPP municipalities' O&M Verification Inspection programs based on data provided in the FY 2011-12 Annual Report, SMCWPPP updated the O&M Verification Inspection Plan Template to provide guidance for determining how many stormwater treatment facilities to inspect each year.
- Model Conditions of Approval – SMCWPPP staff developed a model list of conditions of approval as a tool for municipalities to use in applying post-construction stormwater requirements to both regulated and non-regulated development projects. The conditions incorporate a

comprehensive set of site design, source control, treatment and hydromodification management measures and operation and maintenance requirements that may apply to a project. The list was developed based on the City of San Bruno's C.3 Conditions of Approval and updated for consistency with the LID requirements (Provision C.3.c) that took effect December 1, 2011.

- Updates to C.3 Technical Guidance Manual – The C.3 Technical Guidance was updated twice during FY 2012-13. The first update (Version 3.2, completed January 4, 2013) consisted of the addition of Appendix L, Site Design Requirements for Small Projects, describing the requirements of Provision C.3.i which took effect on December 1, 2012. In spring of 2013, SMCWPPP produced a draft Version 4.0 of its C.3 Technical Guidance, which incorporated the following additional revisions:
    - Chapter 2 – provided updates and clarifications to the definition of and requirements for regulated projects, and added site design requirements for small projects;
    - Chapter 3 – updated to be consistent with the new C.3 Regulated Projects Checklist;
    - Chapter 4 – added site design requirements for small projects;
    - Chapter 5 – updated description of methodologies for hydraulic sizing of treatment measures;
    - Chapter 6 – added technical guidance on subsurface infiltration systems, deleted guidance on vegetated buffer strips, and updated guidance for all other treatment measures;
    - Chapter 7 – added a section on hydromodification control measure design process and a hydromodification control plan checklist;
    - Appendix B – added new hydraulic sizing examples and sizing worksheets;
    - Appendix I – updated the description of the feasibility analysis for infiltration and rainwater harvesting and use, and included the new Stormwater Review Process flow chart; and
    - Appendix J – updated the description of Special Projects and added a section describing how to calculate and apply the LID treatment reduction credits for a project.

  The C.3 Technical Guidance Version 4.0 will be finalized and posted on SMCWPPP's website in September 2013.
- C.3 Outreach Flyer – In late spring 2013, SMCWPPP revised its general C.3 outreach brochure for builders and developers to include the site design requirements for small projects and make the format consistent with other SMCWPPP documents. The revised flyer will be finalized in September 2013.

The above described information and outreach products are available on SMCWPPP's website at http://www.flowstobay.org/bs_new_development.php.

2013 New Development Workshop

The 2013 New Development Workshop was held on May 22, 2013 at the Belmont Sports Complex in Belmont and attended by 45 people. The full-day workshop started with "basic training" providing an overview of stormwater post-construction controls, and then focused on new requirements that took effect during the fiscal year. The workshop included group exercises to review example small projects

and regulated projects, using the checklists prepared by SMCWPPP. The workshop also included presentations on a LID treatment case study (the Bransten Road project in San Carlos), operation and maintenance requirements, and review of the hydraulic sizing criteria and sizing worksheets. Copies of the workshop flyer, agenda, sign-in sheet, and evaluation summary are provided in Appendix 3.

Bay Area Hydrology Model Update

In 2006, SMCWPPP collaborated with the Santa Clara and Alameda countywide stormwater programs to fund the development of the Bay Area Hydrology Model (BAHM), a tool for simulating pre- and post-project runoff conditions and sizing hydromodification control measures to meet MRP requirements. The BAHM included simplified methods to simulate the effect of LID treatment measures on runoff hydrology but did not explicitly model the movement of runoff through these measures. During FY 2012-13, the three countywide programs contracted with the BAHM developer, Clear Creek Solutions, to update the BAHM to a Windows 7 platform and to explicitly model LID treatment measures including bioretention, planter boxes, pervious pavement, infiltration basins and trenches, and dry wells. In addition, enhancements were made to the data management, plotting, and reporting features of the BAHM. The updated model and draft User Manual have been provided to the programs for review and will likely be available for use in September 2013. Trainings on the updated model are planned in the fall of 2013.

Regional Collaboration

SMCWPPP program staff 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.

LID Feasibility/Infeasibility Status Report

SMCWPPP program staff provided in-kind services to assist with the preparation of a regional "Status Report on Application of Feasibility and Infeasibility Criteria" for the LID treatment techniques of infiltration and rainwater harvesting and use, which is due to the Water Board on December 1, 2013. The outline for the report was submitted with the FY 2011-12 Annual Report (in the BASMAA FY 2011-12 Regional Supplement for New Development and Redevelopment). Work performed during FY 2012-13 included: compilation and analysis of data on the types of LID treatment measures reported for regulated projects in MRP Permittee FY 2011-12 Annual Reports; documentation of case studies of projects in which rainwater harvesting and infiltration measures were used; and presentation of information to the BASMAA Development Committee. The report development is still in progress and will be completed this fall prior to the submittal deadline.

Green Street Pilot Projects Summary Report

MRP Provision C.3.b.iii requires Permittees to cumulatively complete ten green street pilot projects that incorporate LID site design and treatment techniques during the permit term. A minimum of two projects must be completed in each county. The Cities of Burlingame and San Carlos are the member agencies in San Mateo County that are implementing green street pilot projects. Burlingame's Donnelly Avenue green street project (a SMCWPPP Sustainable Green Streets and Parking Lots Demonstration Project) was completed in January 2011. The project consists of a 0.06-acre bioretention area retrofit in a City parking lot and a 0.01-acre curb extension (planter box). The City of San Carlos' Bransten Road green street project is being constructed in an industrial area and also serves as a pilot treatment project for removal of PCBs. The proposed treatment measures are nine bioretention areas that will be constructed as curb extensions of various lengths. The project construction bid package was advertised in July 2013 and construction is anticipated to be completed before the 2013/14 rainy season.

The MRP requires that a Green Street Pilot Projects Summary Report describing the ten pilot projects be prepared and submitted by September 15, 2013. The report must also describe the results of the water quality monitoring or modeling performed for each project to determine the estimated reduction in pollutant loading achieved by the project. The report was funded by SMCWPPP and other BAY Area stormwater programs through BASMAA as a regional submittal and prepared by BASMAA's contractor, Geosyntec Consultants. SMCWPPP staff reviewed and commented on the pilot project reporting forms and data collection procedures, submitted information on green street projects (with assistance from Burlingame and San Carlos staff), and reviewed the draft and final draft reports. The final report is included in Appendix 16.

FUTURE ACTIONS

In FY 2013-14, SMCWPPP staff plans to work with the New Development Subcommittee to conduct the following activities to assist member agencies comply with MRP Provision C.3:

- Continue to exchange information with member agencies through quarterly New Development Subcommittee meetings and at the annual New Development Workshop.
- Update checklists, outreach flyers, and the C.3 Technical Guidance Manual as needed to respond to member agency issues, concerns and suggestions for improvement.
- Collaborate with the Santa Clara Valley stormwater program to develop a list of biotreatment soil vendors to post on the SMCWPPP's website as a resource.
- Plan and conduct an Operation and Maintenance (O&M) Training for inspectors who conduct O&M verification inspections of installed treatment and hydromodification control measures (Fall 2013).
- Plan and conduct a New Development Workshop for municipal staff, to build on the training conducted in 2013 and provide municipal staff opportunities to conduct practice reviews of development projects (Spring 2014).
- Continue working with BASMAA on regional projects, particularly the 2013 Feasibility/Infeasibility Status Report, and on preparation for MRP reissuance.

SECTION 4
C.4 INDUSTRIAL AND COMMERCIAL SITE CONTROLS

INTRODUCTION

One of the goals of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component is to assist member agencies control the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable. SMCWPPP member agencies are responsible for complying with various business inspection requirements under MRP Provision C.4. SMCWPPP's CII component assists member agency staff with understanding these MRP requirements and develops various related tools, templates, reporting forms, and other MRP compliance support materials. There are additional MRP provisions that are implemented through SMCWPPP's CII component that are discussed in other sections of this report (Section 5, 12, 13 and 15).

SMCWPPP's assistance with MRP Provision C.4 is coordinated through the CII Subcommittee. The CII Subcommittee also has a Training Work Group that assists with the planning of trainings, developing educational outreach materials, and coordinating with the Public Information and Participation (PIP) Subcommittee on materials that affect businesses.

IMPLEMENTATION OF MRP PROVISIONS

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of MRP Provision C.4, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- Held four CII Subcommittee meetings and four CII Training Work Group meetings.
- Made a presentation to the SMCWPPP TAC on CII related MRP compliance, including implementation of MRP Provision C.4.

More information on each of these accomplishments is provided below.

The CII Subcommittee met four times during FY 2012-13 to share information about commercial/industrial inspection related MRP requirements and methods for achieving compliance. The meetings provided a forum to share experiences with implementing MRP Provisions related to the CII component, including Provision C.4. In addition, the meetings allow a forum for the San Mateo Health Services Agency, Environmental Health Services Division (County Environmental Health or CEH) representative to discuss the status of CEH inspections and hear member agency feedback on the process, since many of the member agencies have an agreement with CEH to conduct stormwater inspections of businesses.

Ward Donnelly from the City of Daly City continued to chair the CII Subcommittee during FY 2012-13. Dermot Casey from CEH represented San Mateo County and some of the cities that have an agreement with CEH to conduct stormwater inspections of businesses. Patrick Ledesma replaced Dermot Casey as the CEH stormwater lead in April 2013. The SMCWPPP program staff who facilitates the CII Subcommittee, the previous CEH representative and the new CEH representative met in May 2013 to discuss opportunities for improving assistance to agencies in meeting MRP requirements.

A FY 2012-13 subcommittee attendance summary table is included in Appendix 4. A majority of the subcommittee's four meetings were attended by staff from the Cities of Belmont, Burlingame, Daly City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, San Mateo, and South San Francisco and San Mateo County. The Cities of Brisbane, Colma, East Palo Alto, Redwood City and San Carlos and South Bayside System Authority had representatives attend one to two meetings.

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. The Training Work Group includes representatives from the Cities of Brisbane, Millbrae and Half Moon Bay and the County of San Mateo, and met four times during FY 2012-13.

In addition, the SMCWPPP Program staff facilitating the CII Subcommittee made a presentation at the April 2013 TAC meeting on CII related MRP compliance, including implementation of MRP Provision C.4.

FUTURE ACTIONS

FY 2013-14 activities planned by SMCWPPP to assist member agencies comply with MRP requirements in Provision C.4 include the following:

- Hold quarterly CII Subcommittee meetings.
- Work with the Training Work Group to provide a workshop for commercial and industrial facility inspectors.
- Assist member agencies with the implementation of commercial and industrial stormwater inspection tasks, including continuing to assist with business inspection plans and priorities, data management and enforcement response plans.

SECTION 5
C.5 ILLICIT DISCHARGE DETECTION AND ELIMINATION

INTRODUCTION

One of the goals of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component is to assist member agencies effectively prohibit the discharge of illicit, non-stormwater discharges to the municipal storm drain system. SMCWPPP member agencies are responsible for controlling non-stormwater discharges prohibited by MRP Provision C.5. SMCWPPP's CII component assists member agency staff with understanding these MRP requirements and develops various related tools, templates, reporting forms, and other MRP compliance support materials. There are additional MRP provisions that are implemented through SMCWPPP's CII component that are discussed in other sections of this report (Section 4, 12, 13 and 15).

SMCWPPP's assistance with the MRP provisions listed above was coordinated through the CII Subcommittee. Further details about the CII Subcommittee are provided in Section 4 of this report. The CII Subcommittee also has a Training Work Group that was discussed in Section 4. During FY 2012-13 the Training Work Group's focus was on organizing an Illicit Discharge Inspector Training Workshop.

IMPLEMENTATION OF MRP PROVISIONS

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of MRP Provision C.5, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- Conducted an Illicit Discharge Inspector Training Workshop on April 24, 2013. The workshop included presentations on MRP illicit discharge control requirements and mobile garage cleaning businesses, and a table top group exercise.
- Updated Illicit Discharge Coordinator contact list to include after-hours contact information.
- Updated the Illicit Discharge Inspection Form template and the Illicit Discharge Tracking Table template.
- Adapted the Santa Clara Valley Urban Runoff Pollution Prevention Program's Mobile Businesses BMP brochure for use by SMCWPPP agencies.

More information on each of these accomplishments is provided below.

Illicit Discharge Inspector Training Workshop

The Training Work Group took the lead in planning the Illicit Discharge Inspector Training Workshop held on April 24, 2013 at the Belmont Sports Complex Conference Center. The workshop was attended by 61 people and included presentations on MRP illicit discharge control requirements and mobile garage cleaning businesses, and a table top group exercise. The workshop agenda, final attendance list and evaluation summary are included in Appendix 5.

The workshop training was approved by the California Water Environment Association (CWEA) as providing three 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 addressing illicit discharges and conducting related enforcement to achieve compliance with local stormwater ordinances. The focus of the training was on the table top group exercise. Five illicit discharge scenarios were presented and inspectors were given the opportunity to discuss among themselves how they would approach the investigation, education, enforcement and cleanup of the scenario. The approaches were discussed with the larger group and actual agency responses were shared. The emphasis on the exercise was for inspectors to share information and learn from other agencies' experiences. The group exercise also offered the opportunity to work towards consistency within and among SMCWPPP member agencies.

Based on the evaluation forms submitted following the workshop, attendees were satisfied with the training. Workshop attendees found the regulatory overview presentation to be helpful. This presentation put the inspectors work in the context of the MRP requirements. Attendees also found the presentation on mobile business garage cleaners to be helpful. One hundred percent of the attendees who completed the workshop evaluation form indicated that the workshop met their expectations. The respondents comprised 61% of all workshop attendees.

Updates of Contact List and Templates

During FY 2012-13, 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. In addition, the following templates were updated with input and assistance from the CII Subcommittee:

- Updated Illicit Discharge Coordinator contact list available on the SMCWPPP website (www.flowstobay.org) to include after-hours contact information.
- Updated Illicit Discharge Inspection Form template and Illicit Discharge Tracking Table template available on the SMCWPPP website (both updated templates are included in Appendix 5).

Control of Mobile Businesses

The CII Subcommittee adapted a Mobile Business BMP brochure developed by the Santa Clara Valley Urban Runoff Pollution Prevention Program for use in San Mateo County. The brochure is available on the SMCWPPP website (www.flowstobay.org) and a copy is included in Appendix 5.

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 2012-13, 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 program. 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. A SMCWPPP program staff participated in the March 2013 BASMAA Municipal Operations Committee where the revised scope of work for the BASMAA mobile cleaner project was reviewed.

FUTURE ACTIONS

FY 2013-14 activities planned by SMCWPPP to assist member agencies comply with MRP requirements in Provision C.5 include the following:

- Hold quarterly CII Subcommittee meetings.
- Work with the Training Work Group to provide focused training for commercial and industrial facility and illicit discharge inspectors.
- Assist member agencies with the implementation of illicit discharge detection and elimination tasks, including continuing to assist with data management, enforcement response plans, complaint tracking and follow-up, and collection system screening programs.
- 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.

SECTION 6
C.6 CONSTRUCTION SITE CONTROL

INTRODUCTION

This component of SMCWPPP assists member agencies in complying with MRP Provision C.6 (Construction Site Control). This assistance continued to be provided through the New Development Subcommittee (see Section 3 for more details about the subcommittee). SMCWPPP program staff also obtained input and direction from agency representatives through the subcommittee.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP's accomplishments during FY 2012-13 include the following major tasks to assist member agencies with implementation of Provision C.6:

- Conducted a construction site controls training for the California Building Inspectors Group (CALBIG) on October 10, 2012;
- Updated the Construction Site Inspection Report and Inspection Tracking Table; and
- Planned and conducted the April 11, 2013 Construction Site Inspector Workshop.

CALBIG Training Meeting

In FY 2012-13, SMCWPPP continued its partnership with CALBIG, a group in which many building inspectors from SMCWPPP member agencies participate, and conducted a construction site controls training at the group's October 10, 2012 meeting. SMCWPPP staff gave presentations on current stormwater requirements for construction sites, proper installation of construction BMPs, and tips for keeping construction inspection programs in compliance. Approximately 55 people attended the train, including agency inspectors, local stormwater program staff, and contractors. The meeting announcement, agenda, presentation outline, and sign-in sheet are provided in Appendix 6.

Construction Site Inspection Report and Inspection Tracking Table

SMCWPPP program staff made minor revisions to the Construction Site Inspection Report form to address comments from member agencies based on their inspectors' experience with the form. Revisions were also made to the model Construction Site Inspection Tracking Table, which is used by member agencies to manage inspection data. SMCWPPP provided copies in triplicate of the approved Inspection Report form to each member agency for use during construction site inspections. The updated Inspection Report form is available on SMCWPPP's website at the following address: http://www.flowstobay.org/bs_construction.php.

2013 Construction Site Inspector Workshop

The 2013 Construction Site Inspector Workshop was held on April 11, 2013 at the City of Millbrae's Chetcuti Room and attended by 95 people. The half-day workshop covered the following topics: requirements of MRP Provision C.6; differences between Provision C.6 and the Construction General Permit; Caltrans experience with construction BMPs and inspections; an exercise using the Program's Construction Site Inspection Report; MRP requirements for O&M verification inspection of treatment measures; and common issues in inspections of newly installed systems. Appendix 6 includes a copy of the workshop flyer, agenda, sign-in sheet, and evaluation summary.

FUTURE ACTIONS

In FY 2013-14, SMCWPPP program staff plans to work with the New Development Subcommittee to conduct the following activities to assist member agencies comply with MRP Provisions C.6:

- Continue to exchange information with member agencies through quarterly New Development Subcommittee meetings and at the annual Construction Site Inspection Workshop.
- Update existing flyers on construction BMPs, in coordination with BASMAA.
- Update the Enforcement Response Plan Template as needed to address recent Regional Water Board staff comments and changes in annual reporting.
- Plan and conduct a Construction Site Stormwater Control Workshop and a field visit to a construction site.
- Continue to coordinate with partner organizations, such as the California Building Inspectors Group (CALBIG), to provide additional training on construction-related issues.

SECTION 7
C.7 PUBLIC INFORMATION AND OUTREACH

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 adverse effects on the water quality in 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 many pollutants originate from preventable, everyday residential activities. Pollutants in stormwater may be reduced by motivating and educating residents about the benefits of preventing stormwater 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 2012-13. Diane Lynn of the City of Belmont served as the chairperson this year for the SMCWPPP PIP subcommittee.

SUMMARY OF ACCOMPLISHMENTS

The SMCWPPP PIP Subcommittee met six times in FY 2012-13 to oversee the development of educational materials and to guide the implementation of the PIP component of the program (see Appendix 7). SMCWPPP accomplished the following major public information and participation tasks during FY 2012-13:

- Raised awareness of San Mateo County's Reusable Bag Ordinance, which took effect in most cities on April 22, 2013.
- Maintained 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.

- Launched additional Spanish- and Chinese- language web pages focused on providing residents with information on proper household toxics disposal (see Appendix 7).
- Grew the existing car wash discount campaign to include 15 commercial car washes located throughout the county, in order to encourage residents to wash cars at commercial car washing facilities. Revised and distributed approximately 5,000 discount car wash tip cards with attached coupons through municipal channels and outreach events. Maintained a web page that 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.
- Coordinated the California Coastal Cleanup Day for San Mateo County diverting 26,936 gallons of trash and 6,620 gallons of recyclables from waterways. An estimated 4,490 residents volunteered in the September 2012 event, an increase from September 2011 event. Raised awareness of the event and litter issues through local media coverage and use of social media.
- 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.
- Supported collaborative watershed stewardship efforts by updating the online guide to local groups, promoting cleanup activities through continuing the "Spring Cleaning SMC" promotional campaign, and creating the new Team Effort campaign to engage citizens and civic groups not traditionally allied with water protection efforts (see Appendix 7).
- Sponsored an educational assembly program for elementary-age students entitled "We All Live Downstream," performed by the Banana Slug String Band. The program emphasizes the importance of not littering or dumping substances into the storm drain to protect the marine environment.
- Developed a high school educational program entitled "Water Pollution Prevention: Problems and Solutions." The program emphasizes educating students on basic problems and solutions of storm water pollution, and encourages them to become involved by educating others.
- Participated 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. Created a web page identifying operators that are IPM-trained as a resource for the public (see Appendix 7).

IMPLEMENTATION OF MRP PROVISIONS – C.7

C.7.b.ii.(1) ADVERTISING CAMPAIGN

SMCWPPP, as a member of BASMAA, participates directly with the BASMAA PIP subcommittee by acting as chair of the committee and facilitating meetings, reviewing documents, and providing comments and feedback on campaigns and materials. During FY 2012-13, SMCWPPP took BASMAA-generated outreach materials pertaining to the Regional Youth Litter Campaign and developed them for local use. SMCWPPP developed a new model for implementing the campaign at the local level, which led to an increase in youth participants at local events. The BASMAA Youth Litter Campaign Report, developed and submitted by BASMAA, summarizes the activities and surveys of the Regional Youth Litter Campaign conducted in FY 2012-13 (see Appendix 16).

SMCWPPP is also actively involved in the following regional advertising campaigns:

- San Francisco Bay Protection and Behavior Change Campaign: a regional effort to create a brand for use on outreach materials and events that represents all stormwater and waste water public messages for the entire San Francisco Bay area. SMCWPPP 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.
- Got Ants? Pesticide Campaign: During the 2012-13 fiscal year, the San Francisco Estuary Partnership secured a grant from the California Department of Pesticide Regulation for the *Got Ants?* outreach campaign. This project addresses water quality impacts from current use patterns of pyrethroids, fipronil, and other broadcast or perimeter spray pesticides used in outdoor structural pest control to control ants in urban residential areas. The campaign provides easy-to-use information on ant control methods that do not harm water quality and shift users' behavior to integrated pest management, or IPM. This project uses a social marketing approach to enlist the public who hire pest control operators and/or practice pest control at home, to change their pesticide use practices. SMCWPPP has participated in providing feedback for materials development and implementation of the campaign. SMCWPPP has provided links on the flowstobay website, referenced the campaign on Facebook, and has used local channels to distribute outreach materials.

C.7.b.iii.(1) PRE-CAMPAIGN SURVEY

As SMCWPPP is a participant of the BASMAA Youth Litter Campaign. The BASMAA Youth Litter Campaign Report, developed and submitted by BASMAA, summarizes any pre-campaign survey conducted in FY 2012-13 (see Appendix 16).

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 and Facebook.

Regional Media Relations

SMCWPPP, as a member of BASMAA, participates directly with the BASMAA PIP subcommittee's media relations program by attending all meetings, reviewing articles and press releases, and providing comments and feedback. During FY 2012-13, SMCWPPP took two BASMAA-generated press releases and developed them for local use:

- October 22, 2012: "Choosing Less-Toxic Home and Garden Products Just Got Easier" (see Appendix 7)
- December 4, 2012: "Give the Gift of Clean Water and Air This Holiday Season" (see Appendix 7)

The "BASMAA Media Relations Final Report FY 12-13," developed by BASMAA, summarizes the regional media relations efforts conducted during FY 2012-13, and includes a full description of the above-mentioned press releases (see Appendix 16).

County-wide Media Relations

One press release was sent out to local reporters, newspapers, newsletters, TV, and radio, with resulting articles in local newspapers.

California Coastal Cleanup Day Organizers Prepare for Tsunami Debris

Content: Details about the event, how to participate, and where to obtain more information. **Medium:** Print and digital. **Date of publication:** Released August 20, 2012. As a result, five local print newspapers ran stories or added the event to their calendars to promote it, as did six online papers and several non-profit partners' newsletters. In addition, two local television stations provided coverage on the day of the event (see Appendix 7).

In addition, Facebook and Twitter accounts were used to share news stories related to local water quality, including Coastal Cleanup Day, plastic bags, marine debris, pharmaceutical disposal, and more. Media outlets shared our article links with their readers, bringing them to the attention of a wider audience.

C.7.d STORMWATER POINT OF CONTACT

The Countywide Program website (www.flowstobay.org) and phone number (650-372-6200) are publicized on outreach materials and maintained by SMCWPPP. Permittees' points of contact are also publicized on the website, and are referred to when receiving calls from the public on the Countywide Program phone number. 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 for the 2012-13 fiscal year was 49,772. 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 7-1. 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:

- A page devoted to San Mateo County Pest Control Operators who are IPM-trained
- Spanish-Language pages outlining proper household toxics disposal
- A Chinese-Language page outlining proper household toxics disposal
- Redesigned Litter Reduction and Coastal Cleanup Day pages (see Appendix 7)

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 7-1 shows subscriptions in 2013 and a comparison from the previous year.

Table 7-1 Gov Delivery Subscribers

Web Page with Gov Delivery Option	Subscriber Numbers June 30, 2013	Subscribers Numbers June 30, 2012
Community Events	317	293
New Information	322	230
Resources for Teachers and Schools	301	211
Community Action Grant	317	227
Litter Reduction & Coastal Cleanup Day	484	324
Newsletter: Pollution Prevention Post	1052	941
Less Toxic Pest Control	293	206
Press Room/ In the News	335	240
Green Streets and Parking Lots	121	124

Top 4 Web Pages Viewed in 2012-13, spanning all months in the year:

1. 14,910 views: Calendar of Events
2. 14,832 views: Sustainable Streets
3. 10,238 views: Less Toxic Pest Control
4. 6,896 views: Litter Prevention

Top 4 Document downloads in 2012-13, spanning all months in the year:

1. 940: Sustainable Streets Book Layout, Municipalities Section
2. 766: Sustainable Streets Regular Guide, Municipalities Section
3. 459: C.3 Technical Guidance, Municipalities Section
4. 305: C.3 Regulated Projects Checklist, Municipalities Section.

Social Media

In addition to the web page, there are also established Facebook, 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.

C.7.e PUBLIC OUTREACH EVENTS

Coordination of California Coastal Cleanup Day in San Mateo County

See section C.7.g, as this event fulfills the requirement of both C.7.e and C.7.g.

San Mateo County Fair, June 8-16, 2013

SMCWPPP conducted a county-wide outreach event at the San Mateo County Fair, June 8 - 16, 2013. 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 96 hours during the 9 days. Staff from 7 jurisdictions and County Environmental Health worked at the booth at select times each day for a total of 33 hours of staffed time for the week. The booth was unstaffed for the remaining 63 hours, including night time hours when most of the public were at concerts. 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 25 people per hour were spoken to during the hours that volunteers were present. Using this average, it's estimated roughly 850 people were directly contacted during the 33 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, all of which are listed below.

On Saturday June 8 and Wednesday, June 12, the public was introduced to the new Spinning Wheel question and prize game and the Be the Street litter campaign photo booth. Both days and times had a significantly higher than average turnout in people engaged in the booth.

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 (not including 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
- 4 children's activity books: Pest or Pal (OWOW), Watershed Protection, Stormwater, and Don't Be a Litterbug.
- Children's promotional materials with SMCWPPP logo/messages: fish sponge, bookmark, pencils, fish eraser, crayons

- SMCWPPP promotional paper bag
- Flowstobay.org business card
- Flowstobay reusable nylon shopping bag
- OWOW business cards
- OWOW magnets
- OWOW pocket guides
- OWOW Pest Bugging You booklet of fact sheets
- New outreach materials listed below

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:

- Comprehensive toxics disposal and pollution prevention guide "Too Toxic To Trash"
- 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
- Used Oil "Check Your Number" keychain
- Less Toxic Cleaning Alternatives recipes, in English and Spanish
- Newsletter: Pollution Prevention Post (see below)

New Outreach Materials Developed This Year

SMCWPPP developed and/or purchased the following new outreach materials:

- Team Effort campaign promotional flyer (see Section C.7.f for a description)
- Clean 15/Dirty Dozen pocket guide to pesticides and produce
- Revised car wash tip card with updated discount card attached (see Appendix 7)
- Got Ants? promotional campaign flyer

For the High School Outreach program (described in Section C.7.h), SMCWPPP purchased promotional giveaways related to re-use and recycling:

- SMCWPPP water bottle
- SMCWPPP mug
- Be The Street lunch bag
- Be The Street mini recycling toter (pen holder)

- SMCWPPP keychain

Newsletter

Issues of the "P3: Pollution Prevention Post" newsletter were published in September and April (see Appendix 7) to coincide with Earth Day and Coastal Cleanup Day, respectively. Newsletter topics included: Coastal Cleanup Day, Be The Street You Want to See, translated web pages, new too toxic guide, reusable bag ordinance, used oil and filter curbside pickup, used oil collection program, car wash discount coupons, antifreeze recycling, Check Your Number oil campaign, and spring outreach events. A total of 4,500 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:

- 2,901 for Fall 2012 issue
- 2,864 for Spring 2013 issue

Currently there are 450 residents who receive the newsletter by mail and 1052 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 discussions of the topic with the public. In FY 2011-12, the informational tip card was redesigned to incorporate a new discount card, and that was done again during FY 2012-13, when the partnerships with existing commercial car washes were maintained and four more joined the program for a total of 15 car wash partners. Advertisements were also placed in local newspapers promoting car wash best practices and the discount program.

C.7.f WATERSHED STEWARDSHIP COLLABORATIVE EFFORTS

Environmental Resource Guide of Groups and Organizations in San Mateo County with Watershed Stewardship Efforts

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. One group was added to the guide, bringing the new total to 42. 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. As part of the work with watershed groups, SMCWPPP staff attended the Silicon Valley Watershed Summit on September 22, 2012, the Watershed Cleanup Forum for Santa Clara and San Mateo Counties hosted by Acterra on March 19, 2013, and the Peninsula Watershed Forum on June 13, 2013.

Spring Cleanup Promotional Program

SMCWPPP promoted "Spring Cleaning SMC," launched in FY 2011-12, an annual campaign designed to provide an outlet for watershed stewardship groups and jurisdictions to promote small local spring

cleanup events. It is promoted as a cleanup "season," from March 21 to June 21, including all Earth Day events that take place in late April. SMCWPPP revised a web page on flowstobay.org dedicated to posting cleanup events during this time period. Newspaper advertisements were developed and placed in newspapers throughout the county, directing the public to the web page. A total of 23 spring cleanup events in 13 cities were posted during the spring season, an increase of 5 over last year. The page had 244 visits in March, 240 visits in April, 145 visits in May, and 50 visits in June, for a total of 679 visits.

Team Effort Campaign

A new campaign was launched to reach civic-minded County residents and organizations who may not historically have considered themselves to be watershed stewards. To reach new partners, SMCWPPP staffed a booth at the Skyline College Volunteer Fair on March 28, 2013 and the San Carlos Green Volunteer Fair on April 13, 2013, designed a web page to engage new partners, created the first of several new collateral pieces (Team Effort: Litter), and used the social media accounts to interact with new organizations and residents.

C.7.g CITIZEN INVOLVEMENT EVENTS

Coordination of California Coastal Cleanup Day, September 15, 2012

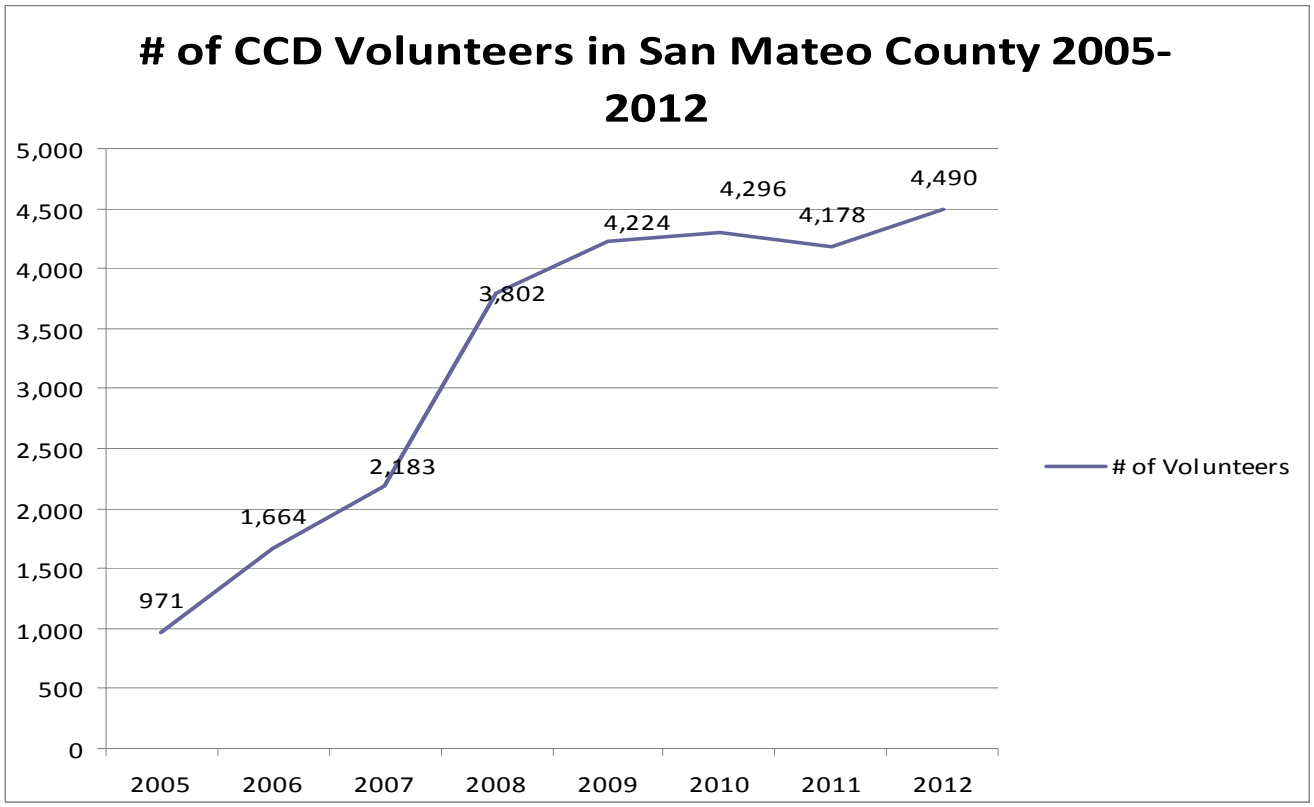
California Coastal Cleanup Day, held each year on the third Saturday in September, is the largest volunteer event in the state. The California Coastal Commission sponsors the event with the support of County and Regional Coordinators. SMCWPPP coordinated the event for the seventh year for San Mateo County, 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:

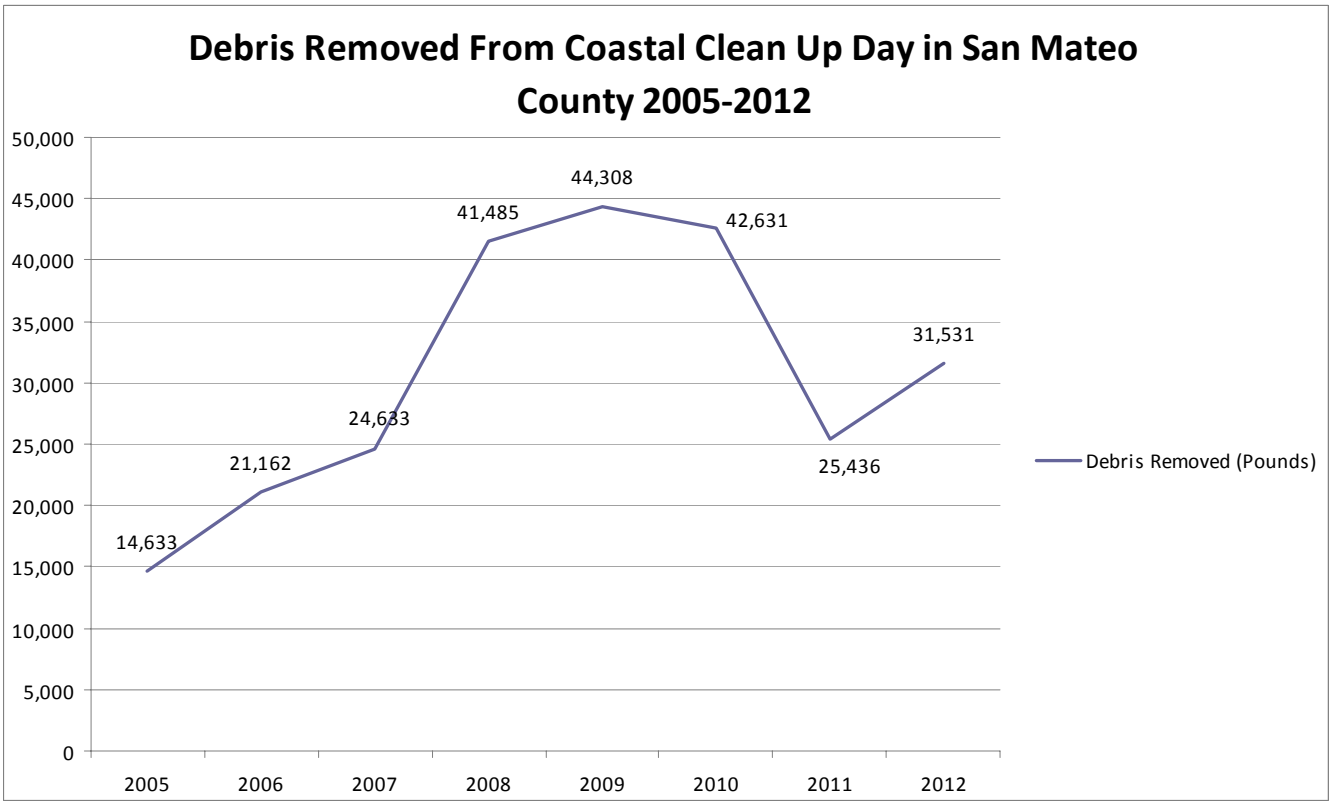
- Outreach materials such as posters and postcards provided by the Coastal Commission were disseminated to public schools, libraries, community centers, non-profit organizations, churches, youth groups, site captains, and all jurisdictions in the County. These materials were also handed out at outreach events.
- An article was written in the San Mateo County Environmental Health newsletter, "Pollution Prevention Post" (Fall 2012) which informed residents about the event and where to find a location list of cleanup sites in San Mateo County. A total of 2,901 copies were distributed throughout the County to libraries, residents, and local businesses.
- A press release was developed and sent out on August 20, 2012 describing the event and encouraging readers to go to flowstobay 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): Pacifica Tribune, San Mateo Daily Journal, Half Moon Bay Review and Coastsider, Latino Post, plus six local Patches (online news outlets by Patch.com, with a focus on a single city). ABC 7 News did a television broadcast news story on the cleanup effort at Thornton Beach in Daly City, and FOX 2 News did a television broadcast story on the cleanup effort at Ryder Park in San Mateo.
- The event was posted on the flowstobay web site home page, as well as in the online calendar. A special section of the website dedicated to litter prevention, located in the Community Section of the website, also contained pages devoted to Coastal Cleanup Day

that provided residents with logistical information for the event, including a new Google map of sites. Several environmental groups included the event their on web calendars.

- SMCWPPP used Twitter and Facebook to draw attention to the event as the date approached. In all, 49 Twitter feeds and 17 Facebook postings were issued to promote the event.
- All public schools were sent a memo which contained information about two ways that schools could support CCD: by displaying posters on campus on the first day of school where staff, students, and parents would see them; and to participate in a school or classroom cleanup activity on Friday, September 15- 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. In an effort to move toward a change in reporting methods, captains were also trained in how to report their findings using volume measurements and gallons. Both weight and volume numbers were requested in the final reporting.
- There were four new sites established: Half Moon Bay Yacht Club at Pillar Point Harbor, Maverick's Beach at Pillar Point Harbor, Cooley Landing in East Palo Alto, and Redwood Creek in Redwood City.

Figure 7-1 Historical Data for SMCWPPP Coordination of Coastal Cleanup Day





On the actual day of the event, 30 site captains managed 68 sites throughout the county. There were 51 sites located on the coastal portion of the county (including 39 large and small sites in the City of Pacifica), and 17 sites were located bayside. A total of 4,490 volunteers were reported to have participated. A total of 26,641 pounds (26,936 gallons) of trash and 4,890 pounds (6,620 gallons) of recyclables were gathered in the 3 hour period of the event. A total of 106.5 miles of shoreline was cleaned.

Since SMCWPPP began coordinating the event for San Mateo County in 2005, the increase in volunteers who have turned out for Coastal Cleanup Day has grown by roughly 450%. The amount of debris removed from waterways has more than doubled (Figure 5.1). An estimated total of nearly 245,000 pounds of debris has been removed since 2005.

Spring Cleaning SMC

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

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) in 2010 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. The show uses songs and activities to engage students on the topic. In 2012-13, The Banana Slug String Band performed 37 assemblies at 26 elementary schools across the county, reaching nearly 7,920 students. Surveys of the performance and its effectiveness were sent to 16 schools, and 13 schools responded with 1139 student responses. The results indicated the following:

- 86% understood that stormwater flows directly into the bay or ocean.
- 94% answered correctly on questions related to the type of pollution often impacting storm drains.
- 95% understand that pollution in the storm drain sickens or kills marine life.
- 81% chose not littering as a way to prevent pollution.
- 86% liked the presentation.

Table 7-2: Banana Slug String Band School Assembly Performances 2012-13

School	City	Date	# shows	# students
San Mateo Park	San Mateo	9/18/12	2	550
San Carlos Charter Learning Ctr	San Carlos	9/26/12	1	210
Bayshore Elementary	Daly City	10/3/12	1	215
Taylor Middle School	Millbrae	10/3/12	1	900
La Honda Elementary	Unincorporated SMC	10/18/12	1	80
Martin Elementary	South SF	11/2/12	2	300
El Crystal Elementary	San Bruno	11/2/12	1	200
Roosevelt Elementary	Redwood City	11/16/12	2	500
Oceanshore Elementary	Pacifica	11/27/12	2	450
Brisbane Elementary	Brisbane	12/13/12	1	250
Panorama Elementary	Daly City	12/13/12	1	125
Garden Village Elementary	Colma	1/10/13	2	340
Seacrest Elementary	Half Moon Bay	1/11/13	1	185
Willow Oaks Elementary	East Palo Alto	1/17/13	1	300
Woodside Elementary	Woodside	1/24/13	1	200
Crocker Middle	Hillsborough	1/24/13	2	150
Brewer Island Elementary	Foster City	2/5/13	2	400
Cipriani Elementary	Belmont	2/7/13	2	280
Pescadero Elementary	Unincorporated SMC	3/12/13	1	150
Trinity School	Menlo Park	3/15/13	1	290
Heather Elementary	San Carlos	3/20/13	2	450
Ormondale Elementary	Portola Valley	3/27/13	1	310
Laurel Elementary	Atherton	4/13/13	2	500
German American School	Menlo Park	4/24/13	1	190
Farrolone View	Unincorporated SMC	5/9/13	2	370
Burlingame Intermediate	Burlingame	5/29/13	1	25

SMCWPPP High School Outreach

During FY 2012-13, SMCWPPP developed its own High School Outreach program to replace a program previously conducted by a contractor. SMCWPPP developed the program, conducted pilot presentations, made revisions, and finalized the content before beginning to implement the program in schools across the County. Content was focused on water pollution prevention problems and solutions, with an emphasis on litter prevention and student involvement. The presentation was conducted at 6 schools located throughout the county, reaching a total of 535 students. Grades 9-12 received the presentations in science, environmental science, and small engine repair classes. Surveys of 225 students were conducted in 9 classrooms. Students were asked to give scaled responses to statements related to pollution prevention, with 1 meaning strongly disagree and 5 meaning strongly agree. The results indicate the following:

- 95% agreed or strongly agreed with the statement "I learned something new about watersheds, storm drains, and water pollution in the bay and ocean.

- 88% agreed or strongly agreed with the statement "I learned new ways to protect the San Mateo County watersheds.
- 93% agreed or strongly agreed with the statement "I would recommend this presentation to my friends."

In addition to rating these statements, students were given opportunities to write specific narrative comments to each statement, and wrote narrative responses to the question: "How will you a apply the lessons that you learned in the presentation, specifically about actions you plan to take to prevent water pollution." Narrative responses varied greatly, but showed students had an engaged interest in becoming active.

Table 7-3: SMCWPPP High School Presentations 2012-13

School	City	Date	Number of classes	Type	Grade	Number ofStudents
Jefferson High School	Daly City	2/6/13	2	Chemistry	11	45
Jefferson High School	Daly City	2/7/13	3	Earth Science	9	85
El Camino High School	South SF	2/12/13	2	Engine Lab	9	53
Woodside High	Woodside	2/20/13	1	Env. Science	11,12	16
Aragon High School	San Mateo	2/26/13	2	AP Env. Sci.	10,11,12	47
Terra Nova	Pacifica	3/8/13	2	Biology	10	59
Terra Nova	Pacifica	3/13/13	2	Biology	10	58
Woodside High	Woodside	4/10/13	1	H20 Resources	11	37
Mills High School	Millbrae	5/7/13	3	Chemistry	10	76
Mills High School	Millbrae	5/8/13	2	Chemistry	10	59

Science Fair

On February 26, 2013 SMCWPPP representatives served as judges in the special awards category, reviewing more than 20 exhibits/projects in the category of Environmental Preservation.

An eighth grade student was selected to receive SMCWPPP's Water Quality Award for his project entitled, "Pampas Grass Grows Wild". SMCWPPP awarded the student with a framed certificate and a bag of program promotional children's giveaway items.

Safe Routes to School

SMCWPPP partnered with the San Mateo County Office of Education (SMCOE) to promote an event entitled "Be Seen Keepin' It Clean" in which elementary–aged school children were coordinated in an effort to pick up trash on the way to school as part of SMCOE's Safe Routes to School program. This event took place on April 19, 2013.

C.7.i OUTREACH TO MUNICIPAL OFFICIALS

C/CAG Board

The C/CAG Board consists of one elected official from each of the 20 city/town councils and one member of the County Board of Supervisors. Throughout FY 2012/13, the C/CAG Board received presentations, updates, and took actions on various stormwater-related issues, as detailed below:

- August 2012: Funding Initiative Request for Proposals, Unfunded Mandates
- September 2012: Bransten Green Street Funding Agreement, Vehicle License Fund Expenditure Programs
- November 2012: Convening Stormwater Committee
- December 2012: Countywide Funding Initiative Consultant Funding Agreement
- February 2013: Stormwater Committee Appointments, Unfunded Mandates
- March 2013: Countywide Funding Initiative Update, Consultant Procurement Issues
- May 2013: Countywide Funding Initiative Update, Draft C/CAG Budget
- June 2013: Final C/CAG Budget, Technical Consultant Funding Agreement

City Managers Association

In September 2012, C/CAG staff and Bruce Wolfe, Executive Officer of the Regional Water Board, provided a presentation to the City/County Managers Association of San Mateo County regarding MRP issues/concerns.

IMPLEMENTATION OF MRP PROVISION C.9.h

The below sections describe implementation of MRP Provision C.9.h by SMCWPPP and its member agencies. Appendix 16 contains additional information about related efforts conducted at the regional level.

PUBLIC OUTREACH: POINT OF PURCHASE

Our Water, Our World Program

Since 1999, SMCWPPP has participated in the regional effort for the *Our Water Our World* (OWOW) program by attending all IPM partnership meetings with BASMAA and participating jurisdictions to coordinate the program in San Mateo County. There were 15 stores participating when the program began, and there are now 19 stores, including all Orchard Supply Hardware and Home Depot stores located within the county. Regional program leaders report an overall increase in sales of less toxic products as a result of the program's implementation.

Table 7-4 San Mateo County "Our Water, Our World" Partnership Stores 2012-13

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

Early in 2013, an IPM advocate was hired to devote her time to the program in San Mateo County, bringing with her specialized training and knowledge of the stores and the products in the program. In a combined staff effort, each store was visited a minimum of twice during this year, once in the fall and again in the spring. Several larger stores, such as all Home Depots, 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. Trainings have been offered to all store managers in order to better equip their employees with the knowledge needed to help the public. Tabling events have also been conducted to draw public attention to the resources that the program offers (See table 7-5).

To promote the OWOW program, SMCWPPP conducted the following outreach during FY 2012-13:

- Partnered with County RecycleWorks to use and distribute fact sheets. Additional materials were given out at events that RecycleWorks staffed throughout the year.
- Participated in the Greener Pesticides for Cleaner Waterways grant from the Environmental Protection Agency that placed the IPM advocate in two local stores, Home Depot in San Carlos and Orchard Supply Hardware in Foster City. The advocate maintained working relationships with those store managers and enhanced the established program. Requirements of the grant included a minimum of two tabling events, one training, and no less than one monthly visit per store. The advocate also provided support to store management in dealing with pest problems presented by customers, including consulting and research. In conjunction with this program, suppliers such as Bayer and Kellogg partnered with OWOW in FY 2012-13 to develop an end cap display that features the less toxic products. They are showcased and framed by the OWOW banner and shelf talkers. These products now reportedly move so quickly that it is difficult to keep the inventory

stocked. Further details regarding the IPM advocate program can be found in the report entitled "IPM Advocates for Retail Stores, May 8, 2013 submitted by BASMAA on behalf of member Permittees (see Appendix 16).

- Constructed less toxic seasonal "end cap" displays detailed above in other Home Depot stores and Orchard Supply Hardware stores throughout the County. Worked with product suppliers to create the displays, and established working relationships with them in the process.
- Conducted outreach tabling events (see table 7-5) promoting OWOW to customers at Home Depot and Orchard Supply Hardware. Staff answered questions, educated, and mentored customers at point of purchase for home and garden pest problems, and offered tips and solutions. Staff provided non-toxic and less-toxic options for problem solving through discussion and distribution of printed OWOW materials and resources, as well as other printed materials with stormwater pollution prevention messages.
- Conducted trainings of store employees (see table 7-5) at partner stores. During the fiscal year, a total of 41 store employees were trained in IPM strategies and product identification in order to help the public when making purchases of garden and pest products. The trainings resulted in team building and empowerment of employees to feel comfortable answering questions and helping the customer solve pest problems. Post-training surveys conducted of employees indicated that they found the training valuable and informative.

TABLE 7-5: OWOW Tabling and Training Events

Tabling Events		
Date	**Store**	**Notes**
January 12, 2013	Foster City OSH	GPCW grant
March 9, 2013	Foster City OSH	GPCW grant
March 10, 2013	South SF OSH	
April 20, 2013	Millbrae OSH	
April 21, 2013	Foster City OSH	GPCW grant
April 26, 2013	San Carlos Home Depot	GPCW grant
May 12, 2013	San Carlos Home Depot	GPCW grant
May 19, 2013	Redwood City OSH	
May 25, 2013	Millbrae OSH	
May 26, 2013	South SF OSH	
Employee Trainings		
Date	**Store**	**Notes**
October 26, 2012	San Carlos Home Depot	13 trainees
February 9, 2013	Foster City OSH	11 trainees
February 23, 2013	Millbrae OSH	6 trainees
March 29, 2013	South SF OSH	7 trainees
June 21, 2013	Redwood City OSH	4 trainees

- Posted bus ad cards in English and Spanish promoting the program inside buses in San Mateo County from July 1 to September 30, 2012.
- Provided materials and information at the other (non-IPM) 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.
- Attended a Municipal Maintenance/ Parks-IPM work group meeting on April 23, 2013 to introduce the IPM advocate to municipalities for consideration as a resource in municipal efforts to implement IPM.
- Attended a vendor event at Home Depot on February 27, 2013. Staff met product vendors and floor teams to establish and maintain working relationships.

PUBLIC AND SMALL BUSINESS OUTREACH: HHW AND VSQG PROGRAMS

SMCWPPP's member agencies have ensured that adequate pesticide disposal services are available to all residents and small businesses in San Mateo County by participating in the in San Mateo County Health Department's Household Hazardous Waste (HHW) Program and Very Small Quantity Generator (VSQG) Business Collection Program. The HHW Program offers residents the opportunity to dispose of HHW at designated drop-off points or drop-off events free of charge. The VSQG

Program provides an inexpensive hazardous waste disposal option to eligible small businesses (and government agencies and non-profits) that generate less than 100 kilograms of waste per month.

HHW Collections are held every Friday and Saturday at the San Mateo County facility (except major holiday weekends). Additional collections are held in several other locations throughout the county. Residents in Belmont, East Palo Alto, Foster City, Hillsborough, Menlo Park, San Carlos, San Mateo and the West Bay Sanitary District can contact Curbside Inc., for a door-to-door HHW collection option.

SMCWPPP's public outreach program is designed to raise awareness of water quality issues and promote behavior change that will reduce water quality impacts on receiving waters. Efforts that raise awareness and promote behavior change relative to using the HHW and VSQG Programs include:

- Many member agencies promote the availability of the HHW Program and VSQG Program on their websites.
- SMCWPPP distributes a HHW brochure at community outreach events. Information is also posted on SMCWPPP's website (www.flowstobay.org).
- The HHW Program serviced approximately 19,729 residents in FY 10-11 and 14,971 residents in FY 2011-12. This indicates that San Mateo residents are aware of the HHW Program and using it to dispose of unwanted pesticides.

The HHW and VSQG Programs are effective at reducing the amount of pesticides available as a potential source to urban runoff. For example:

- In FY 2010-11, the HHW Program managed 61,932 pounds of poisons,[1] including pesticides.
- In FY 2011-12, the HHW Program managed 63,572 pounds of poisons.

PUBLIC OUTREACH: PEST CONTROL OPERATORS

SMCWPPP contacted the San Mateo County Agricultural Commissioner to obtain an updated list of Pest Control Operators in San Mateo County. Using this list, two mailings were sent out during FY 2012-13. The first mailing went out on September 5, 2012 and contained information on registration for a Green Gardener training class on September 12 and 13 in San Jose. The second mailing consisted of a packet, sent out on September 26, 2012, with a cover letter explaining basic IPM and encouraging the operators to become IPM certified. Flyers and information were included in the packet for the following opportunities:

- A Pesticide Applicators Professional Association seminar for landscape pest control operators on October 30, 2012 in San Mateo.
- Online training and certification program offered by EcoWise, designed for structural pest control operators.
- Online Green Pro training and certification program offered by the National Pest Management Association.

[1] Poisons as a waste stream includes anything categorized by DOT shipping requirements as a poison including pesticides, herbicides, rodenticides, some fertilizers and many other types of products.

- Online Green Shield training and certification program offered by the IPM Institute of America

The cover letter also encouraged PCO's to contact SMCWPPP to be part of a new web page dedicated to helping the public find IPM certified contractors on flowstobay.org. One contractor responded to this mailing. SMCWPPP followed up over the next few months by calling each of the contractors on the list, confirming they are IPM trained, and inviting them to join the new web page. As a result, 6 contractors agreed to be posted on the new page on flowstobay.org. The public will be directed to it during outreach events beginning in FY 2013-14. The page also contains links to the OWOW program, the Got Ants campaign, and other pest-control resources.

FUTURE ACTIONS

The following PIP activities are planned for FY 2013-14:

- 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 SF Bay Partnership and Behavior Change Campaign to develop a region-wide brand and collaborate on related outreach activities.
- Support and participate in the Got Ants? campaign.
- Support and participate in the Greener Pesticides for Cleaner Waterways grant.
- Conduct a minimum of two local media relations pitches
- Maintain the www.flowstobay.org website, utilizing a new content management system
- Increase subscribers to specified web pages using a constituent management system.
- Maintain and grow social media outlet accounts with Twitter and Facebook.
- Create an Instagram account and tie to other social media accounts already in place.
- Staff local public outreach events, including one Countywide event
- Maintain stock of outreach materials and provide to jurisdictions and public on request
- Maintain the outreach campaign partnering with commercial car wash businesses
- Maintain and update the online Environmental Resource Guide, and engage new partners through Team Effort
- Establish a new Constituent Relationship Management Data Base to improve the ability to conduct targeted outreach and establish partnerships with specific groups, including new groups outside the sphere of pollution prevention.
- 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

- Expand 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, and promote IPM-trained operators to the pubic via web promotions, social media, and tabling events.

SECTION 8
C.8 WATER QUALITY MONITORING

On behalf of it member agencies, SMCWPPP performs water quality monitoring activities in compliance with MRP Provision C.8. Much of this work is accomplished through participation in BASMAA regional projects. Per Provision C.8, water quality monitoring activities conducted from the beginning of the permit term through September 30, 2013 will be documented, summarized, and evaluated in the comprehensive Integrated Monitoring Report (IMR), which is due March 15, 2014.

SECTION 9
C.9 PESTICIDE TOXICITY CONTROLS

INTRODUCTION

The primary objective of MRP Provision C.9 is to prevent the impairment of urban streams by pesticide-related toxicity, and thereby implements requirements of the *TMDL for Diazinon and Pesticide-related Toxicity for Urban Creeks* in the region. Permittees are required 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 stormwater conveyance system.

Most MRP-required Provision C.9 tasks are implemented individually by each SMCWPPP member agency. SMCWPPP helps agency staff to understand MRP requirements and develops various tools that assist agency staff to effectively plan, implement, and report on compliance activities. SMCWPPP's assistance with MRP Provision C.9 Pesticides Toxicity Control is coordinated through the Parks Maintenance and Integrated Pest Management (IPM) Work Group (except Provision C.9.h, the public outreach portion of Provision C.9, which is implemented through the SMCWPPP Public Information and Participation component - see Section 7 of this report).

IMPLEMENTATION OF MRP PROVISIONS

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of Provision C.9, with input and assistance provided by the Parks Maintenance and IPM Work Group. Accomplishments included the following:

- Held three meetings of the Parks Maintenance and IPM Work Group;
- Conducted the SMCWPPP annual Landscape IPM Training Workshop in February 2013;
- Prepared a report evaluating implementation of source control actions relating to pesticides per MRP Provision C.9.g ; and
- Participated in relevant BASMAA and CASQA committees.

More information on each of these accomplishments is provided below.

Parks Maintenance and IPM Work Group

The Parks Maintenance and IPM Work Group met three times during FY 2012-13 to share information about MRP requirements and methods for achieving compliance. Valerie Matonis from the City of Redwood City continued to chair the IPM Work Group during FY 2012-13. A FY 2012-13 subcommittee attendance summary table is included in Appendix 9. A majority of the work group's three meetings were attended by staff from the Cities of Brisbane, Colma, Daly City,

East Palo Alto, Menlo Park, Redwood City, San Mateo, and South San Francisco. Other cities that attended at least one meeting were Foster City, Half Moon Bay, Hillsborough, Pacifica, and San Bruno. 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.

Twelfth Annual Landscape Integrated Pest Management Workshop

The SMCWPPP annual Landscape IPM workshop was held on February 27, 2013 at the City of Foster City's Library Community Center. Eighty-two people attended and the following topics were covered:

- Gopher and Squirrel Control
- Adapting and Applying the Central Tenets of IPM to Urban Ecosystems
- Efficient Turfgrass Irrigation in an IPM Program
- No Mow/Low Mow Turf Options
- Respirator Regulatory Refresher and Online Pesticide Use

SMCWPPP worked closely with San Mateo County Agriculture/Weights and Measures staff to provide Department of Pesticide Regulations Continuing Education Credits for participants. Evaluation forms completed by the workshop's attendees included many positive comments and indicated that overall the workshop met their expectations. Appendix 9 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.

Pesticide Source Control Evaluation

MRP Provision C.9.g requires Permittees to "evaluate the effectiveness of the control measures implemented, evaluate attainment of pesticide concentration and toxicity targets for water and sediment from monitoring data (Provision C.8.), and identify improvements to existing control measures and/or additional control measures, if needed, to attain targets with an implementation time schedule." In accordance with C.9.g, during FY 2012/13 SMCWPPP prepared a report that describes the source control actions implemented by SMCWPPP and its member agencies. The report also assesses the effectiveness of the actions using effectiveness evaluation outcomes described in the CASQA Program Effectiveness Assessment Guidance Manual. The report also describes the results from the creek monitoring studies conducted by SMCWPPP, assesses whether TMDL targets for pesticides are being met, and provides related recommendations. The report is provided in Appendix 9.

Participation in BASMAA and CASQA

During FY 2011-12 SMCWPPP representatives continued to participate in the BASMAA Municipal Operations Committee meetings. In addition, SMCWPPP staff stayed current with pesticide regulatory work by participating in selected CASQA Pesticide Committee meetings.

Provision C.9.e requires Permittees to track and participate in regulatory processes relevant to pesticide toxicity control. During FY 2012-13, SMCWPPP accomplished this task by working with

BASMAA and CASQA. For additional information, see the *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16).

FUTURE ACTIONS

SMCWPPP activities that are planned for FY 2013-14 to assist member agencies comply with MRP requirements in Provision C.9 include the following:

- Conduct three Parks Maintenance and IPM Work Group meetings;
- Continue to assist member agencies with implementation of Provision C.9 including implementation of IPM programs and policies, with input and assistance provided by the Parks Maintenance and IPM Work Group.
- Conduct a structural IPM workshop in the fall of 2013;
- Conduct a landscape IPM workshop in the spring of 2014;
- Continue to track relevant regulatory processes and interface with County Agriculture/Weights & Measures staff to help implement MRP C.9 Pesticide Toxicity Control requirements.

SECTION 10
C.10 TRASH LOAD REDUCTION

INTRODUCTION

Provision C.10 Trash Load Reduction tasks are implemented by each SMCWPPP member agency. SMCWPPP helps agency staff to understand trash load reduction requirements and develops various tools needed to effectively plan, implement, and report on compliance with trash management activities.

More detailed information about SMCWPPP's assistance in helping member agencies comply with MRP requirements in Provision C.10 are included in the following sections. Details on tasks completed by member agencies can be found in each member agency's Annual Report.

IMPLEMENTATION OF MRP PROVISIONS

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

- Submit a Short-Term Trash Reduction Plan to the Water Board by February 1, 2012 that is designed to attain a 40% reduction from its MS4 by July 1, 2014.
- Determine its baseline load of trash from its stormwater system and document the method used to demonstrate progress towards load reduction levels (e.g., 40% reduction).
- 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 land area.
- Submit a Long-Term Trash Reduction Plan to the Regional Water Board by February 1, 2014 that specifies actions designed to attain a 70% reduction from its MS4 by July 1, 2017, and a 100% reduction by July 1, 2022.

During FY 2012-13, SMCWPPP completed the tasks described below in support of member agency trash management activities conducted in compliance with the above requirements.

Participation and Coordination of the Trash Committee

SMCWPPP's Trash Committee assists member agencies with the implementation of new or enhanced trash control measures and actions required by the MRP. The Trash Committee generally meets quarterly. Additional meetings are scheduled as necessary to address high priority issues. During FY 2012-13, SMCWPPP staff coordinated five Trash Committee meetings, which were chaired by Jesse Myott from the City of Daly City. Jesse became the new chairperson

in fall 2012 and replaced Shelli St. Clair from the City of San Mateo. The FY 2012-13 Trash Committee attendance list is included in Appendix 10. Staff from the following member agencies attended a majority of the committee's meetings during FY 2012-13: County of San Mateo and Cities/Towns of Belmont, Brisbane, Burlingame, Colma, Daly City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, San Carlos, San Mateo, South San Francisco and Woodside.

During the Trash Committee meetings in FY 2012-13, Committee members discussed and provided input on the following topics/projects:

- Developing the FY 2012-13 Annual Report format for Provision C.10.
- Developing a response letter to Regional Water Board staff with the approach and time schedule for responding to Regional Water Board staff comments on Permittee Short-Term Plans and two regional trash technical memoranda submitted by BASMAA on behalf of all MRP Permittees.
- 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.
- Developing the Long-Term Trash Load Reduction Framework and Plans (see below).
- Verifying and mapping trash generation rates for SMCWPPP member agency jurisdictional areas.
- Conducting and reporting on creek and shoreline trash hot spot cleanups and assessments.
- Developing a preliminary scope for identifying optimal locations for large full capture devices in member agency jurisdictional areas.

Final Regional 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 MS4s by February 1, 2012. To accomplish this task, in December 2010 the BASMAA Board of Directors approved the Preliminary Baseline Trash Generation Rates Project for developing regional trash generation rates used to develop preliminary baseline trash load estimates. 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. The 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 is currently being revised to include results from the January and April 2012 characterization events, and incorporate findings from similar efforts conducted in Los Angeles County in the early 2000's. The final technical report will also include an analysis of factors other than land use that may further differentiate trash generation rates. The results of all analyses will be fully

documented in the technical report entitled *Final Baseline Trash Generation Rates for San Francisco Bay Area MS4s*, which will be finalized in late 2013.

Long-Term Trash Loading Reduction Plan Framework and Guidance

Provision C.10.c of the MRP requires each Permittee to submit a *Long-Term Trash Load Reduction Plan* (Long-Term Plan) by February 1, 2014. The Long-Term Plans must describe control measures that are currently being implemented, including the level of implementation, and additional control measures that will be implemented and/or increased level of implementation designed to attain a 70% trash load reduction by July 1, 2017, and 100% (i.e., "No Visual Impact") by July 1, 2022.

A work group of MRP Permittee, SMCWPPP and other Bay Area countywide stormwater program staff, and Regional Water Board staff met between October 2012 and March 2013 to better define the process for developing Long-Term Trash Reduction Plans, methods for assessing progress toward reduction goals, and tracking and reporting requirements. Through these discussions, a framework for developing Long-Term Plans was developed. The first step of the framework is the identification of very high, high, moderate, and low trash generating areas within each Permittees jurisdictional areas. Trash generation rates developed through the BASMAA regional study were used as a starting point for differentiating and delineating land areas with varying levels of trash generation. Permittees then used local knowledge and field and/or desktop assessments to confirm/refine the level of trash generation for specific areas (Figure 10-1). As part of this process, SMCWPPP staff developed guidance to assist Permittees in refining land uses classifications, and conducting assessments to confirm/refine trash generation levels depicted on draft trash generation maps, which will be the focal point of the Long-Term Plans. The framework and map development process is further described in the *BASMAA Regional Supplement for Pollutants of Concern* included as Appendix 16.

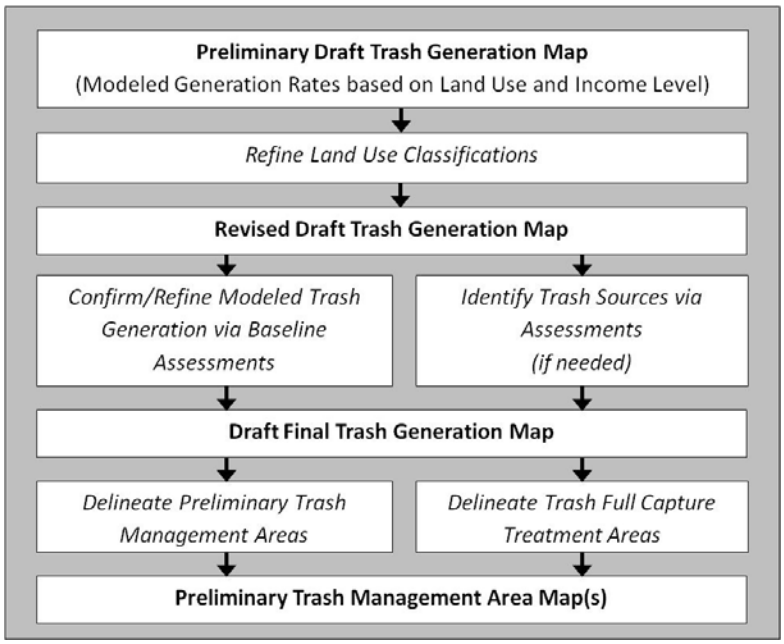


Figure 10-1. Trash generation and management area mapping process implemented by Permittees in FY 2012-13.

Final draft trash generation maps and preliminary management area maps are included in each Permittee's FY 2012-13 Annual Report. High resolution trash generation and management area maps can also be found at www.flowstobay.com. Delineations of land areas treated by full trash capture devices conducted to-date and locations of all devices installed/constructed to-date are also included in the trash generation maps.

Trash Hot Spot Cleanup and Assessment Guidance

Provision C.10.b(ii) of the MRP requires Permittees to clean up trash hot spots to a level of "no visual impact" at least one time per year for the term of the permit (December 1, 2009 through November 30, 2014). To assist Permittees in meeting this requirement, SMCWPPP staff developed the necessary tools (i.e., guidance memorandum, Trash Hot Spot Cleanup Data Collection Form and Trash Hot Spot Activity Reports) used to report trash hot spot assessment and cleanup activities conducted during the reporting period. Trash Hot Spot Activity Reports for individual Permittees are included in Permittee Annual Reports.

During FY 2012-13, Permittees continued conducting annual cleanups and assessments required by the MRP. Results from this year's annual cleanups indicated that a total of 37 cleanups and assessments were conducted at 32 different sites within SMCWPPP member agency jurisdictions. Approximately 45.8 cubic yards of trash was removed from these sites during FY 2012-13. The timing of annual assessments and cleanups vary between hot spots due to the location of the hot spot, potential for natural resource impacts, crew availability and other site-specific factors.

Locations of all Permittee creek/shoreline trash hot spots are also illustrated in the trash generation and management area maps included in Permittee Annual Reports.

Coordination with San Mateo Countywide Recycling Committee

In an effort to increase coordination between solid waste and recycling programs and SMCWPPP member agency MS4 trash reduction activities, SMCWPPP program staff began attending Countywide Recycling Committee meetings in FY 2012-13. Program staff provided presentations at two meetings regarding the MRP trash reduction requirements, short-term trash reduction plans, and the BASMAA Regional Trash Generation Rates Project. SMCWPPP intends to continue coordinating with the Recycling Committee in FY 2013-14, specifically targeting outreach and coordination with municipal solid waste/recyclable haulers in San Mateo County to reduce trash impacts associated with inadequate waste container management and dispersal from waste transfer vehicles.

FUTURE ACTIONS

FY 2013-14 activities that are planned by SMCWPPP to assist member agencies comply with MRP requirements in Provision C.10 include the following:

- Coordination of SMCWPPP Trash Committee meetings.
- Develop and implement a trash load reduction assessment strategy designed to demonstrate progress towards MRP trash load reduction goals.
- Develop a trash full capture operation and maintenance verification program, in

coordination with other participating BASMAA member agencies.

- Calculate and report on the amount and types of trash removed via creek and/or shoreline cleanups required by the MRP.
- Provide guidance and assist with the development of Permittee Long-Term Plans to address 70% and "No Visual Impact" (i.e., 100%) trash load reduction goals.
- Complete a project to identify optimal locations where large full capture devices could be installed by SMCWPPP member agencies in the future.
- Develop a web-based tool that provides a visual display of the location and types of trash management actions implemented or planned by SMCWPPP Permittees.
- Coordinate and plan up to two workshops with municipal solid waste/recyclable haulers, in coordination with the San Mateo Countywide Recycling Committee.
- Actively participate in the implementation of a Proposition 84 grant-funded project entitled "Tracking California's Trash", which includes the pilot testing of tools to monitor progress in trash load reductions and reducing trash impacts.

SECTION 11
C.11 MERCURY CONTROLS

Provision C.11 Mercury Controls implements stormwater runoff-related actions required by the San Francisco Bay mercury Total Maximum Daily Load (TMDL) water quality restoration program. On behalf of it member agencies, SMCWPPP performs a variety of activities to address mercury in stormwater runoff in compliance with MRP Provision C.11. Much of this work is accomplished through participation in BASMAA regional projects. The *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details about these projects and their status through FY 2012/13. In addition, per Provision C.11, all mercury-related activities conducted by SMCWPPP and BASMAA over the permit term will be documented, summarized, and evaluated in the comprehensive Integrated Monitoring Report (IMR), which is due March 15, 2014.

Provision C.11.a 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 meet this requirement, member agencies continued to participate in San Mateo County Health Department's Household Hazardous Waste (HHW) Program and Very Small Quantity Generator Business Collection (VSQG) Program during FY 2012-13. 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. County programs assisted approximately 13,703 households and 269 businesses in disposing of their unwanted HHW. Descriptions of any member agency efforts to promote, facilitate and/or participate in collection and recycling of mercury-containing devices and equipment during FY 2012-13 are provided in individual Permittee Annual Reports.

C.11.a also requires that Permittees report an estimate of the mass of mercury collected via mercury collection and recycling efforts. During FY 2012-13, the HHW Program collected 75,698 linear feet of fluorescent lamps (tubes, u-shapes, etc.) and 7,646 compact fluorescent lamps. In addition, the HHW Program also collected the following mercury-containing devices and equipment:

- 14 thermostats;
- 238 thermometers; and
- 32 pounds of switches.

To assist with calculating the mass of mercury collected during FY 2012-13 by the HHW Program, SMCWPPP staff worked with BASMAA to develop a spreadsheet calculator. The estimated mass

of mercury collected is calculated based on the total amount of mercury-containing devices and equipment collected and the best available information from manufacturers and trade organizations regarding the amount of mercury contained in the devices and equipment. The estimated mass of mercury collected by the HHW Program during FY 2012-13 is provided in Table 11-1.

Table 11-1. Estimated mercury mass collected by the San Mateo County HHW Program in FY 2012-13.

Mercury Containing Device/Equipment	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)
Fluorescent Lamps (linear feet)[1]	75,698	0.16
CFLs (each)[2]	7,646	0.03
Thermostats (each)[3]	14	0.06
Thermometers (each)[4]	238	0.15
Switches (each)[5]	Unavailable	Unavailable
Total Estimated Mass of Mercury Collected During FY 2012-13:		**0.4**

In addition, Provision C.11.i requires development of a risk reduction program implemented throughout the region. This has been accomplished through the San Francisco Bay Fish Project, a two-year regional project to improve communication to the public about how to reduce their exposure to PCBs and mercury from consuming San Francisco Bay fish. During FY 2012/13 the San Mateo County Environmental Health Department (SMCEHD) began distributing education materials created by the Fish Project, including posting signs along the Bay's shore in most cities in San Mateo County. SMCEHD has also begun a program to provide educational materials (e.g., a Fish Project brochure entitled "Guide to Eating Fish and Shellfish from San Francisco Bay") to at-risk populations (e.g., subsistence fisherman) by working with private marinas, public parks, and nurses with the San Mateo County Health System who serve appropriate communities.

[1] 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.

[2] 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.

[3] 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.

[4] USEPA reports that glass mercury fever thermometers contain about 0.61 g (0.00061 kg) of mercury. Source: USEPA 2012. Thermometers. Available at http://www.epa.gov/mercury/thermometer-main.html. Accessed April 11, 2012.

[5] The San Mateo County HHW Program collected switches during FY 2012-2013 but tracked the total amount collected as pounds of unknown container types that contained the switches. Thus it was not possible to estimate the amount of mercury associated with the switches collected.

SECTION 12
C.12 PCB CONTROLS

Provision C.12 PCBs Controls implements stormwater runoff-related actions required by the San Francisco Bay PCB Total Maximum Daily Load (TMDL) water quality restoration program. On behalf of it member agencies, SMCWPPP performs a variety of activities to address PCBs in stormwater runoff in compliance with MRP Provision C.12. Much of this work is accomplished through participation in BASMAA regional projects. The *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details about these projects and their status through FY 2012/13. In addition, per Provision C.12, all PCB-related activities conducted by SMCWPPP and BASMAA over the permit term will be documented, summarized, and evaluated in the comprehensive Integrated Monitoring Report (IMR), which is due March 15, 2014.

SECTION 13
C.13 COPPER CONTROLS

INTRODUCTION

Provision C.13 of the MRP addresses copper control measures identified in the San Francisco Bay Basin Water Quality Control Plan (commonly referred to as the Basin Plan) that the Regional Water Board has deemed necessary to support copper site-specific objectives in San Francisco Bay. C.13 includes the following sub-provisions:

- C.13.a. Manage waste generated from cleaning and treating copper architectural features, including copper roofs, during construction and post-construction;
- C.13.b. Manage discharges from pools, spas and fountains that contain copper-based chemicals;
- C.13.c. Vehicle Brake Pads;
- C.13.d. Industrial Sources; and,
- C.13.e. Studies to Reduce Copper Pollutant Impact Uncertainties.

In FY 2012-13, activities associated with Provision C.13 were conducted at the Permittee, SMCWPPP and regional levels. Local actions are documented in each Permittee's individual Annual Report. This section summarizes copper control activities conducted at the SMCWPPP and regional levels.

IMPLEMENTATION OF MRP PROVISIONS

Provision C.13.a Copper Architectural Features

Provision C.13.a requires Permittees to manage waste from cleaning and treating copper architectural features, including copper roofs, during construction and post-construction. In FY 2011-12, SMCWPPP developed a Fact Sheet entitled *Requirements for Architectural Copper: Protect water quality during installation, cleaning, treating, and washing!* The main focus in FY 2012-13 was education and outreach to municipal inspectors about the MRP requirements and BMPs for architectural copper installation, cleaning, and treating. Construction site inspectors received the information during the April 11, 2013 SMCWPPP Construction Site Inspection Workshop (see Section 6); building inspectors received the information from a SMCWPPP staff presentation at the California Building Inspectors Group (CALBIG) meeting on October 10, 2012 (see Section 6); and illicit discharge inspectors received the information at the April 24, 2013 SMCWPPP Illicit Discharge Inspector Training Workshop (see Section 5).

Provision C.13.b Manage Discharges from Pools, Spas and Fountains That Contain Copper-Based Chemicals

Provision C.13.b requires Permittees to manage discharges from pools, spas and fountains that contain copper-based chemicals by adopting local ordinances. These requirements are implemented by individual Permittees and were reported on in the FY 2010-11 and FY 2011-12 Permittee Annual Reports, but were not included in the FY 2012-13 Annual Report template. Guidance on these requirements for illicit discharge inspectors is provided through SMCWPPP's CII Subcommittee and public outreach on related BMPs is provided through SMCWPPP's PIP Subcommittee.

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 2012-13, BASMAA regional projects continued to address these provisions. The *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details.

Provision C.13.d Industrial Sources

Provision C.13.d requires Permittees to ensure through routine industrial facility inspections that proper BMPs are in place at industrial facilities likely to use copper or have sources of copper. SMCWPPP's CII Subcommittee assists member agency staff with understanding this MRP requirement and program staff develops MRP compliance support materials as necessary. In addition, in June 2010 BASMAA developed pollutants of concern commercial/industrial inspector training materials and a guidance manual that address industrial sources of copper. These materials are available on SMCWPPP's website (www.flowstobay.org).

FUTURE ACTIONS

FY 2013-14 activities planned by SMCWPPP to assist member agencies comply with MRP requirements in Provision C.13 include the following:

- Provide information on MRP requirements regarding industrial sources of copper at the FY 2013-14 CII Subcommittee-sponsored Commercial/Industrial Inspector Workshop.
- Continue to provide information on MRP requirements regarding architectural sources of copper to construction site and building inspectors at SMCWPPP's Construction Site Inspection Workshop and at presentations to CALBIG or other partner organizations.
- Conduct outreach to local vendors of copper roofing materials and local contractors that install copper roofs, including mailing or emailing them copies of the SMCWPPP's fact sheet on architectural copper BMPs.

SECTION 14
C.14 PBDEs, LEGACY PESTICIDES AND SELENIUM

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 2012-13, SMCWPPP staff worked with BASMAA on regional projects that address this provision. The *Regional Pollutants of Concern Report for FY 2012-2013* (Appendix 16) provides further details about the projects and their status.

SECTION 15
C.15 EXEMPTED AND CONDITIONALLY EXEMPTED DISCHARGES

INTRODUCTION

The objective of MRP Provision C.15, Exempted and Conditionally Exempted Discharges, is to exempt unpolluted non-stormwater discharges from the MRP's general non-stormwater discharge prohibition (Provision A.1) and to conditionally exempt unpolluted non-stormwater discharges that are potential sources of pollutants. This section of the report describes the countywide activities conducted to help SMCWPPP member agencies to implement this provision. SMCWPPP's role is to help municipal staff to understand the MRP's requirements and to make available for their use various MRP compliance support materials. The SMCWPPP CII Subcommittee, discussed in Section 4, facilitates and coordinates providing this assistance to the member agencies for a variety of different types of non-stormwater discharges that may be conditionally exempted.

The most extensive tracking, monitoring, and reporting requirements in Provision C.15 are for planned and unplanned potable water discharges by water purveyors. There are eleven SMCWPPP agencies that have identified themselves as water utilities in their Annual Reports. In April 2012 a Water Utility Work Group was temporarily formed to specifically address the Provision C.15.b.iii requirements related to conditionally exempt planned and unplanned potable water discharges.

SMCWPPP and regional activities that address outreach requirements for C.15.b.iv (Individual Residential Car Washing Discharge), C.15.b.iv (Swimming Pool, Hot Tub, Spa, and Fountain Water Discharges), and C.15.b.vi.a (Irrigation Water, Landscape Irrigation, and Lawn or Garden Watering) are discussed in Section 7 (Public Information and Outreach) of this report.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP member agencies are responsible for complying with managing certain non-stormwater discharges exempted or conditionally exempted by the 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.

During FY 2012-13, SMCWPPP performed a number of tasks to assist member agencies with implementation of Provision C.15, with input and assistance provided by the CII Subcommittee and Water Utility Work Group. Accomplishments included the following:

- Held a Water Utility Work Group meeting in September 2012;
- Developed four fact sheets related to Provision C.15.b.iii requirements; and
- Held a Water Utility Training Workshop in November 2012.

More information on each of these accomplishments is provided below.

Water Utility Work Group and Fact Sheets

MRP Provision C.15.b.iii Planned and Unplanned Potable Water 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 (e.g., fire hydrant flushing) and unplanned (e.g., water line breaks) 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 their Annual Report were invited to participate in the Work Group. The Work Group first met in April 2012. Subsequent meetings were held in May, June and September 2012. A summary table of Work Group attendees for FY 2012-13 is included in Appendix 15. Guidance materials were developed and finalized in FY 2012-13 prior to the training workshop described below. Four Fact Sheets were posted on the SMCWPPP website and are included in Appendix 15.

SMCWPPP program staff is also following the progress of the Bay Area Water Agency Task Force (WATF), comprised of eight water agencies that are funding a Regional Water Board staff position to facilitate development of a regional general permit for water utility potable water discharges.

Water Utility Training Workshop

SMCWPPP program staff worked with the Water Utility Work Group to plan the Water Utility Training Workshop held on November 13, 2012 at the Mission Blue Center in Brisbane. The workshop was attended by 34 people and included presentations on MRP planned and unplanned potable water discharge requirements, BMPs for planned and unplanned potable water discharges, and new flushing equipment with no discharge. The workshop agenda, final attendance list and evaluation summary are included in Appendix 15.

The primary objective of the training was to provide an orientation to municipal staff that are responsible for performing routine operation and maintenance on water utility systems and responding to unplanned discharges. Workshop attendees found the regulatory overview presentation to be very helpful. This presentation put the inspectors work in the context of the

MRP requirements. Attendees also received a presentation from CalWater staff on the BMPs and record keeping procedures used by this water agency. In addition, Town of Hillsborough staff provided information on their new NO-DES flushing system. This innovative new system filters and re-circulates water back into the water distribution system. Hillsborough is the first water agency to purchase and use this system. The Town performed rigorous water testing with oversight from the California Department of Public Health during a pilot phase that began in February 2011. More information can be found at http://www.hillsborough.net/depts/pw/water/conservation/town.asp. After the presentations attendees visited vendor equipment displays (e.g., monitoring and municipal water utility BMP equipment) and had the opportunity to discuss the equipment with vendor representatives.

This was the first training workshop held specifically for municipal staff responsible for operation and maintenance of potable water systems. Based on the evaluation forms submitted following the workshop, attendees were satisfied with the training. Approximately 93 percent of the attendees who completed the workshop evaluation form indicated that the workshop met their expectations. The other respondent did not answer this question.

FUTURE ACTIONS

FY 2013-14 activities planned by SMCWPPP to assist member agencies comply with MRP requirements in Provision C.15 include the following:

- Hold quarterly CII Subcommittee meetings; and
- Review member agencies' FY2012-13 Annual Report Section C.15.b.iii submittals and provide recommendations for monitoring and record keeping, as needed.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 1

- Stormwater Committee – Attendance List – FY 2012-13
- Technical Advisory Committee – Attendance List – 2012 and 2013

2013 Stormwater Committee Roster and Attendance Record								
Agency	**Representative**	**Position**	**Feb**	**Apr**	**May**	**Aug**	**Oct**	**Nov**
Atherton	Gordon Siebert	Public Works Director	X					
Belmont	Afshin Oskoui	Public Works Director	X	X	X	X		
Brisbane	Randy Breault	Public Works Director/City Engineer	X	X	X	X		
Burlingame	Syed Murtuza	Public Works Director	X	X	X	X		
Colma	Brad Donohue	Director of Public Works and Planning	X	X	X	X		
Daly City	Patrick Sweetland	Director of Water & Wastewater		O	X	X		
East Palo Alto	Kamal Fallaha	City Engineer	X	X				
Foster City	Brad Underwood	Director of Public Works	X	X	X			
Half Moon Bay	Mo Sharma	City Engineer		X	X	X		
Hillsborough	Paul Willis	Public Works Director	X	X	X	X		
Menlo Park	Charles Taylor	Public Works Director	X	X	X			
Millbrae	Khee Lim	City Engineer	X	X	X			
Pacifica	Van Ocampo	Public Works Director/City Engineer	X	X	X	X		
Portola Valley	Howard Young	Public Works Director	X	X		X		
Redwood City	Shobuz Ikbal	City Engineer/Engineering Manager	X	X	X	X		
San Bruno	Klara A. Fabry	Public Services Director		X	X	X		
San Carlos	Jay Walter	Public Works Director	X	X	X	X		
San Mateo	Larry Patterson	Public Works Director	X	X	X			
South San Francisco	Terry White	Public Works Director	O	X	O	O		
Woodside	Paul Nagengast	Deputy Town Manager/Town Engineer	O	X	X			
San Mateo County	Jim Porter	Public Works Director		X		X		
Regional Water Quality Control Board	Tom Mumley	Assistant Executive Officer		X				

"X" - Committee Member Attended

"O" - Other Jurisdictional Representative Attended

2012 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	Telephone #	Email Address	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SMCWPPP/ CCAG														
Matt Fabry	599-1419	mfabry@co.sanmateo.ca.us	X	X	X	X	X	X		X	X		X	
Richard Napier	599-1420	rnapier@co.sanmateo.ca.us		X		X	X				X			
Sandy Wong	599-1409	slwong@co.sanmateo.ca.us								X				
EOA, Inc.														
Jon Konnan	510 832-2852 x111	jkonnan@eoainc.com	X	X	X	X	X	X		X	X		X	
Adam Olivieri	510-832-2852x115	awo@eoainc.com												
Regional Board														
Sue Ma	510-622-2386	sma@waterboards.ca.gov												
Selina Louie	510-622-2383	slouie@waterboards.ca.gov												
Atherton														
Steve Tyler	752-0570	styler@ci.atherton.ca.us					X	X		X				
Belmont														
Gilbert Yau	595-7425	gyau@belmont.gov											X	
Leticia Alvarez	595-7469	lalvarez@belmont.gov	X		X		X			X	X			
Dalia Corpus	595-7468	dcorpus@belmont.gov												
Brisbane														
Randy Breault	415-508-2130	rbreault@ci.brisbane.ca.us	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														
Victor Voong	558-7230	vvoong@burlingame.org	X	X	X	X	X	X		X	X		X	
Eva Justimbaste		eva.justimbaste@veoliawaterna.com					X	X						
Steve Daldrup		stephen.daldrup@veoliawaterna.com			X	X	X	X		X			X	
Colma														
Muneer Ahmed	757-8888	muneer.ahmed@colma.ca.gov	X		X		X			X			X	
Brad Donohue				X		X		X			X		X	
Saied Mostafavi							X							
Daly City														
Cynthia Royer	991-8203	croyer@dalycity.org	X				X	X		X	X			
Jesse Myott	991-8054	jmyott@dalycity.org		X	X						X		X	
East Palo Alto														
Michelle Daher	853-3165	mdaher@cityofepa.org	X	X	X	X	X	X					X	
Foster City														
Norm Dorais	286-3279	ndorais@fostercity.org		X	X		X	X		X	X		X	
Mike McElligott	286-8140	mmcelligott@fostercity.org												
Half Moon Bay														
Muneer Ahmed		muneer@csgengr.com	X		X		X			X			X	
Brad Donohue				X		X								
Laura Snideman								X			X			
Hillsborough														
Dave Bishop	375-7588	dbishop@hillsborough.net	X											
Jen Chen	375-7488	jchen@hillsborough.net									X			
Catherine Chan		cchan@hillsborough.net	X		X		X	X		X	X		X	
Menlo Park														
Rebecca Fotu	330-6765	rlfotu@menlopark.org	X	X	X	X	X	X		X	X		X	
Fernando Bravo	330-6742	fgbravo@menlopark.org											X	

* January meeting held via conference call

2012 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	Telephone #	Email Address	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Millbrae														
Khee Lim	259-2347	klim@ci.millbrae.ca.us	X					X		X	X			
Anthony Riddell	259-2337	ariddell@ci.millbrae.ca.us												
Kelly O'Dea	259-2448	kodea@ci.millbrae.ca.us			X	X								
Pacifica														
Raymund Donguines	738-3768	donguinesr@ci.pacifica.ca.us	X	X	X	X	X	X		X	X		X	
Elizabeth Claycomb	738-7361	claycombe@ci.pacifica.ca.us												
Portola Valley														
Howard Young	851-1700x214	hyoung@portolavalley.net		X						X				
Redwood City														
Marilyn Harang	780-7477	mharang@redwoodcity.org	X	X		X								
Peter Vorametsanti				X		X								
Harry Kwong	650-780-7473					X								
Terence Kyaw	780-7466	tkyaw@redwoodcity.org								X	X		X	
Charlie Drechsler		cdrechsler@redwoodcity.org											X	
San Bruno														
Gino Quinn	616-7169	gquinn@sanbruno.ca.gov						X		X	X			
Joseph Cervantes	616-7068	jcervantes@sanbruno.ca.gov								X	X			
Klara Fabry										X			X	
San Carlos														
Ray Chan		rchan@cityofsancarlos.org												
Jay Walter		jwalter@cityofsancarlos.org												
San Mateo, City														
Shelli St. Clair	522-7342	sstclair@cityofsanmateo.org	X	X	X		X	X		X				
Debra Bickel	522-7343	dbickel@cityofsanmateo.org								X	X			
Sandy Mathew	510-625-1580	sandym@lwa.com											X	
San Mateo, County														
Dermot Casey	372-6257	djcasey@co.sanmateo.ca.us		X	X	X	X	X		X			X	
Julie Casagrande	599-1457	jcasagrande@co.sanmateo.ca.us	X	X		X	X	X		X	X		X	
Mary Bell Austin	372-6259	maustin@co.sanmateo.ca.us												
Tim Swillinger	372-6245	tswillinger@co.sanmateo.ca.us												
Carole Foster		cfoster@smcgov.org			X									
So. San Francisco														
Cassie Prudhel	829-3840	cassie.prudhel@ssf.net	X	X				X		X	X		X	
Rob Lecel	829-3882	rob.lecel@ssf.net			X	X	X							
Woodside														
Gratien Etchebehere	851-6790	getchebehere@woodsidetown.org					X							
Dong Nguyen	851-6790	dnguyen@woodsidetown.org			X	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		geoff@brosseau.us									X			
Elise Sbarbori, TEC Accutite	650-616-1214	esbarbori@tecaccutite.com									X		X	
Attendance			18	19	19	19	25	22	0	25	25	0	25	0

* January meeting held via conference call

2013 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	Telephone #	Email Address	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SMCWPPP/ CCAG														
Matt Fabry	599-1419	mfabry@co.sanmateo.ca.us	X			X								
Sandy Wong	599-1409	slwong@co.sanmateo.ca.us												
EOA, Inc.														
Jon Konnan	510 832-2852 x111	jkonnan@eoainc.com	X			X								
Adam Olivieri	510-832-2852x115	awo@eoainc.com							C					
Regional Board									A					
Sue Ma	510-622-2386	sma@waterboards.ca.gov							N					
Selina Louie	510-622-2383	slouie@waterboards.ca.gov							C					
Atherton									E					
Steve Tyler	752-0570	styler@ci.atherton.ca.us	X						L					
Belmont									E					
Gilbert Yau	595-7425	gyau@belmont.gov							D					
Leticia Alvarez	595-7469	lalvarez@belmont.gov	X											
Dalia Corpus	595-7468	dcorpus@belmont.gov												
Brisbane														
Randy Breault	415-508-2130	rbreault@ci.brisbane.ca.us	X											
Karen Kinser	415-508-2133	kkinser@ci.brisbane.ca.us				X								
Shelley Romriell	415-508-2128	sromriell@ci.brisbane.ca.us												
Burlingame														
Victor Voong	558-7230	vvoong@burlingame.org	X			X								
Eva Justimbaste		eva.justimbaste@veoliawaterna.com												
Steve Daldrup		stephen.daldrup@veoliawaterna.com	X			X								
Colma														
Muneer Ahmed	757-8888	muneer.ahmed@colma.ca.gov	X			X								
Brad Donohue														
Saied Mostafavi														
Daly City														
Cynthia Royer	991-8203	croyer@dalycity.org	X			X								
Jesse Myott	991-8054	jmyott@dalycity.org	X											
East Palo Alto														
Michelle Daher	853-3165	mdaher@cityofepa.org	X			X								
Foster City														
Norm Dorais	286-3279	ndorais@fostercity.org				X								
Mike McElligott	286-8140	mmcelligott@fostercity.org	X											
Half Moon Bay														
Muneer Ahmed		muneer@csgengr.com	X			X								
Brad Donohue														
Laura Snideman														
Hillsborough														
Dave Bishop	375-7588	dbishop@hillsborough.net												
Jen Chen	375-7488	jchen@hillsborough.net												
Catherine Chan		cchan@hillsborough.net	X			X								
Menlo Park														
Rebecca Fotu	330-6765	rlfotu@menlopark.org												
Fernando Bravo	330-6742	fgbravo@menlopark.org				X								

2013 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	Telephone #	Email Address	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Millbrae														
Khee Lim	259-2347	klim@ci.millbrae.ca.us	X											
Anthony Riddell	259-2337	ariddell@ci.millbrae.ca.us												
Kelly O'Dea	259-2448	kodea@ci.millbrae.ca.us												
Pacifica														
Raymund Donguines	738-3768	donguinesr@ci.pacifica.ca.us	X			X			C					
Elizabeth Claycomb	738-7361	claycombe@ci.pacifica.ca.us							A					
Portola Valley									N					
Howard Young	851-1700x214	hyoung@portolavalley.net							C					
Redwood City									E					
Peter Vorametsanti									L					
Harry Kwong	650-780-7473								E					
Terence Kyaw	780-7466	tkyaw@redwoodcity.org				X			D					
Charlie Drechsler		cdrechsler@redwoodcity.org	X			X								
San Bruno														
Gino Quinn	616-7169	gquinn@sanbruno.ca.gov												
Joseph Cervantes	616-7068	jcervantes@sanbruno.ca.gov	X			X								
Klara Fabry														
San Carlos														
Jay Walter		jwalter@cityofsancarlos.org												
San Mateo, City														
Debra Bickel	522-7343	dbickel@cityofsanmateo.org	X											
Sandy Mathews	510-625-1580	sandym@lwa.com												
San Mateo, County														
Dermot Casey	372-6257	djcasey@co.sanmateo.ca.us	X											
Julie Casagrande	599-1457	jcasagrande@co.sanmateo.ca.us				X								
Mary Bell Austin	372-6259	maustin@co.sanmateo.ca.us												
Tim Swillinger	372-6245	tswillinger@co.sanmateo.ca.us												
Carole Foster		cfoster@smcgov.org												
So. San Francisco														
Rob Lecel	829-3882	rob.lecel@ssf.net				X								
Andrew Wemmer	829-3883	andrew.wemmer@ssf.net	X											
Woodside														
Dong Nguyen	851-6790	dnguyen@woodsidetown.org												
Eunejune Kim		ekim@woodsidetown.org	X											
Caltrans														
Karen Mai		kmai@caltrans.ca.gov												
Guests/Public														
Elise Sbarbori, TEC Env.	650-616-1200		X											
Attendance			23	0	0	18	0	0	0	0	0	0	0	0

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 2

- Municipal Maintenance Subcommittee – Attendance List– FY 2012-13
- Municipal Maintenance Workshop – March 23, 2013
  - Agenda
  - Attendance List
  - Summary of workshop evaluations

Municipal Maintenance Subcommittee Meetings - FY 2012/13

NAME	MUNICIPALITY	Aug. 22	Oct. 24	Jan. 23	Mar. 27
Gordon Siebert	Atherton			✓	
Steve Tyler	Atherton			✓	
Randy Ferrando	Belmont	✓	✓	✓	
Tim Murray	Belmont	✓	✓	✓	✓
Arno Jacodi	Belmont				✓
Keegan Black	Brisbane	✓			
Eva Justimbaste	Burlingame				
John Baack	Burlingame	✓			
Peter Gaines	Burlingame				✓
Steve Daldrup	Burlingame	✓		✓	✓
Vince Falzon	Burlingame	✓			✓
Louis Gotelli	Colma	✓	✓	✓	✓
Muneer Ahmed	Colma				
Phil Scramaglia	Colma				
Jeff Fornesi	Daly City			✓	
Jesse Myott	Daly City				
Jay Farr	East Palo Alto				
Michelle Daher	East Palo Alto			✓	✓
Allan Shu	Foster City				
Mike McElligott	Foster City	✓	✓		
Frank Schoering	Foster City			✓	
Norm Dorais	Foster City				
Larry Carnahan	Half Moon Bay	✓	✓	✓	
Gary Francis	Hillsborough			✓	✓
Dave Bishop	Hillsborough		✓		
Irv Meachum	Menlo Park			✓	✓
Craig Centis	Millbrae				
Heather Henwood	Millbrae	✓		✓	✓
Michael Killigrew	Millbrae	✓	✓	✓	✓
Russ Clark	Millbrae		✓		
Bernie Mau	Pacifica	✓		✓	
Ron Fascenda	Pacifica	✓		✓	✓
Howard Young	Portola Valley				
Tony Macias	Portola Valley				
Albert Munguis	Redwood City	✓	✓	✓	✓
Eddy Lopez	Redwood City	✓	✓	✓	✓
Ray Bartolo	Redwood City				✓
Rich Del Ben	Redwood City				✓
Terrance Kwan	Redwood City				
Victor Castaneda	Redwood City	✓			
Harry Kwong	Redwood City		✓	✓	
Bob Fowler	San Bruno				

Municipal Maintenance Subcommittee Meetings - FY 2012/13

NAME	MUNICIPALITY	Aug. 22	Oct. 24	Jan. 23	Mar. 27
Gino Quinn	San Bruno	✓			
Frank Amoroso	San Carlos			✓	✓
Lou Duran	San Carlos	✓		✓	✓
Paul Baker	San Carlos	✓	✓	✓	✓
Ron Mareno	San Carlos			✓	
Chris Zanoni	San Carlos			✓	✓
Ted Rutledge	San Carlos				✓
Bob Correa	San Mateo County				
Dermot Casey	San Mateo County				
Diana She	San Mateo County				
Ed Vigil	San Mateo County				
Julie Casagrande	San Mateo County				
Matt Fabry	San Mateo County				
Stephen Fischer	San Mateo County			✓	✓
Tim Stanfield	San Mateo County				
Timothy Swillinger	San Mateo County				
Debra Bickel	City of San Mateo			✓	✓
Ray Jackson	City of San Mateo				✓
Cassie Prudhel	South San Francisco				
James Hardie	South San Francisco		✓		
Marissa Garren	South San Francisco				
Eunejune Kim	Woodside				
Brian Weber	San Mateo County				
	Mosquito & Vector				
Jon Konnan	EOA, Inc.				
Kristin Kerr	EOA, Inc.	✓	✓	✓	✓
Sue Ma	Regional Board				
Matt Fabry	SMCWPPP Coordinator				

Municipal Maintenance Stormwater Workshop

Thursday, May 23, 2013
Belmont Sports Complex Conference Center
550 Island Parkway
Belmont, CA

AGENDA

9:30	Registration	
10:00	Welcome and Introductions	Kristin Kerr, EOA, Inc.
10:05	Stormwater Regulatory Review	Kristin Kerr, EOA, Inc.
10:30	Maintenance of Trash Capture Devices - Overview • Catch Basin Insert (CPS) Cleaning *Rick Orta, City of San Leandro* • Trash Capture Device Installation *Kevin McGillicuddy*	John Fusco, EOA, Inc.
11:20	Lunch	
12:15	Operation & Maintenance of Catch Basin Inserts- the San Mateo Experience • *Randy Ferrando, City of Belmont* • *Vince Falzon, City of Burlingame* • *Heather Henwood, City of Millbrae* • *Lou Duran, City of San Carlos* • *Eddie Lopez, Redwood City*	Roundtable
1:15	Graffiti Removal Demonstration	Alex Boufidis, *Eco_2Clean Dry Ice Blasting*
1:50	Summary Remarks, Adjourn	Kristin Kerr, EOA, Inc.

SMCWPPP Maintenance Workshop May 23rd
Attendance

Last Name	***First Name***	***Municipality***
Ferrando	Randy	City of Belmont
Jacobi	Arno	City of Belmont
Jit	Pravnesh	City of Belmont
Locke	Rick	City of Belmont
Murray	Tim	City of Belmont
Tyler	Brandon	City of Belmont
Daldrup	Steve	City of Burlingame
Falzon	Vince	City of Burlingame
Justimbaste	Eva	City of Burlingame
Fornesi	Jeff	City of Daly City
Daher	Michelle	City of East Palo Alto
McCarthy	James	City of East Palo Alto
Schmeekle	Jon	City of Foster City
Schoening	Frank	City of Foster City
Gutierrez	Nelson	City of Menlo Park
Meachum	Irv	City of Menlo Park
Ortiz	Gabriel	City of Menlo Park
Torres	Hugo	City of Menlo Park
Henwood	Heather	City of Millbrae
Killigrew	Michael	City of Millbrae
Ma	Bernie	City of Pacifica
Bartolo	Ray	City of Redwood City
Castaneda	Victor	City of Redwood City
Chaffey	Rich	City of Redwood City
DelBen	Richard	City of Redwood City
Lopez	Eddie	City of Redwood City

SMCWPPP Maintenance Workshop May 23rd
Attendance

Last Name	***First Name***	***Municipality***
Munguia	Albert	City of Redwood City
Chapman	Ted	City of San Bruno
Baker	Paul	City of San Carlos
Duran	Lou	City of San Carlos
Estrada	Luis	City of San Carlos
Howell	Dan	City of San Carlos
Moreno	Ron	City of San Carlos
Rutledge	Ted	City of San Carlos
Viles	Rick	City of San Carlos
Zanoni	Chris	City of San Carlos
Orta	Rick	City of San Leandro
Bickel	Debra	City of San Mateo
Camilleri	Steve	City of San Mateo
Correa	Bob	City of San Mateo
Jackson	Ray	City of San Mateo
Fusco	John	EOA, Inc/ Speaker
Kerr	Kristin	EOA, Inc/ Speaker
McGillicuddy	Kevin	Roscoe Moss Company
Gonzalez	Vicente	Town of Colma
Gotelli	Louis	Town of Colma
Clay	Daniel	Town of Hillsborough
Francis	Gary	Town of Hillsborough
Henwood	Frank	Town of Hillsborough
Paulino	John	Town of Hillsborough
Wiber	Scott	Town of Portola Valley

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

Evaluation Form
51 Attendees
32 Evaluations
63% Responded

Municipal Maintenance Workshop
Wednesday, May 23, 2013

What Did You Think of the Following Presentations and Activities?

1. **Stormwater Regulatory Review** - *Kristin Kerr, EOA, Inc*.

very helpful **25** somewhat helpful **7** not helpful

Comments:

Great presentation and explanation of MRP.

Kristin, you're the best!

2. **Maintenance of Trash Capture Devices – Overview** – *John Fusco, EOA, Inc.*

very helpful **23** somewhat helpful **9** not helpful

Comments:

Great review.

Could speak a little louder

3. **Catch Basin Insert (CPS) Cleaning** – *Rick Orta, City of San Leandro.*

very helpful **22** somewhat helpful **9** not helpful **1**

Comments:

Wonderful to hear of the PM other cities and their program.

Bigger slide, especially those with pictures

4. **Trash Capture Device Installation** – *Kevin McGillicuddy, Roscoe Moss Company*

very helpful **23** somewhat helpful **7** not helpful **1**

Comments:

Nice to hear of other options.

Shall review the product offered for creek-culvert.

Great visual aids

5. **O&M of Catch Basin Inserts – the San Mateo Experience** - *Roundtable*

very helpful **26** somewhat helpful **6** not helpful

Comments:

Great to hear on how everyone is doing their program and O&M.

Panel description is thorough.

This is a good idea/format to get representative information on a specific topic

6. **Graffiti Removal Demonstration**

very helpful **16** somewhat helpful **7** not helpful

Comments:

Not sure yet!

N/A Could not stay for this last section

Did this workshop meet your expectations? Yes **25** No

- Better!
- Actually got more out of it than anticipated.
- All of the workshop

What parts of the workshop were most useful to you?

- Hearing all the different cleaning issues.
- All
- All of them.
- All of it!
- Round table presentations and slide shows.
- Roundtable discussion
- Large capture was very interesting!
- Very good to have Rick from East Bay and Manufacturer's Rep.
- TCD awareness of cleaning process and maintenance issues.
- Full capture device maintenance
- Large trash capture devices
- Graffiti removal
- How to fill in the TCD Maintenance Report better and faster

What would have made this workshop more useful?

- None
- N/A
- Did a great job!
- Workshop very informative
- More demo's of device cleaning
- Bigger screen and microphone for all the panelists

What topics would you recommend for a future workshop?

- Pump station inspections
- C4, C9, C6

- More bio products
- Reporting
- How or when will the private industries and residential areas be compliant as well as Public entities.
- Storm mainline cleaning
- Wet well testing/cleaning
- More panel/roundtable discussion or trash topics

General Comments:

- Overall great workshop.
- Love all the meetings, workshops, collaboration, networking, It’s always so helpful to hear what others do.
- Excellent. Good times.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

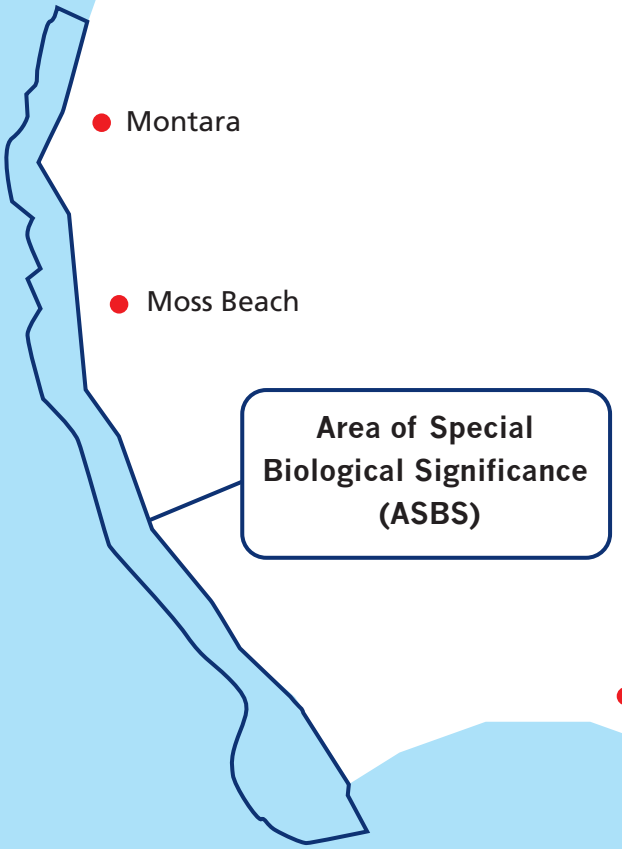
Appendix 3

- New Development Subcommittee – Attendance List– FY 2012-13
- LID Training Workshop – August 25, 2012
  - Announcement flyer
  - Agenda
  - Summary of workshop evaluations
- New Development Workshop – May 22, 2013
  - Announcement flyer
  - Agenda
  - Attendance list
  - Summary of workshop evaluations

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

New Development Subcommittee
FY 2012/13 Meeting Attendance

Representing	Name	Phone Number	Meetings Attended					
			Aug	Oct	Dec	Feb	Apr	Jun
Atherton	David Huynh	650/752-0555				✓	✓	
	Andrea Mardesich							✓
Belmont	Gilbert Yau	650/595-7467	✓	✓	✓			
	Philip Esquboa							
	Dalia Manaois	650/595-7468				✓		
Brisbane	Ken Johnson	415/508-2120	✓		✓	✓	✓	✓
Burlingame	Eva Justimbaste	650/342-3727	✓	✓		✓	✓	
	Stephen Daldrup	650/342-3727	✓		✓	✓	✓	✓
Colma	Michael Laughlin	650/757-8896	✓					
	Turhan Sonmez				✓	✓		✓
	Muneer Ahmed	650/757-8894	✓	✓	✓	✓	✓	
Daly City	Jeanne Naughton	650/991-8035	✓	✓	✓	✓	✓	✓
East Palo Alto	Michelle Daher	650/853-3197		✓	✓		✓	✓
	Bret Swain	650/853-3159		✓				
EOA	Jill Bicknell	408/720-8811 x 1						✓
	Laura Prickett	510/832-2852 x 123	✓	✓	✓	✓	✓	
Foster City	Julie Moloney	650/286-3242	✓	✓		✓		
	Norm Dorais					✓		
Half Moon Bay	Mark Lander	925/785-4518		✓	✓	✓	✓	
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	650/259-2339		✓				
	Doug Rider			✓		✓		
Pacifica	Elizabeth Claycomb	650/738-7361		✓		✓		
	Christina Horrisberger	650/738-7444				✓	✓	✓
Portola Valley	Chey Anne Brown	650/851-1700	✓	✓	✓		✓	✓
Redwood City	Kevin Fehr	650/780-5923						✓
	Jimmy Tan	650/780-7397						
	Patti Schrotenboer	650/780-7368		✓	✓	✓	✓	
	Grace Le	650/780-7258	✓					
San Bruno	Laura Russell	650/616-7038	✓		✓	✓	✓	✓
San Carlos	Gavin Moynahan	650/802-4267	✓	✓	✓	✓	✓	✓
San Mateo	Ken Pacini	650/522-7333	✓		✓		✓	✓
	Debra Bickel					✓		
County of San Mateo	Camille Leung	650/363-1826	✓	✓	✓	✓	✓	✓
Countywide Program	Matt Fabry	650/599-1419				✓		✓
South S.F.	Andrew Wemmer	650/829-3883		✓				
	Rob Lecel	650/829-3882	✓			✓		✓
	Cassie Prudhel			✓	✓		✓	
Woodside	Dong Nguyen	650/851-6790						
	Doug Rider					✓		
Water Board	Sue Ma	510/622-2386						



Protected species:
Octopus rubescens &
Anthropleura
xanthogrammica

PROTECTING COASTAL WATERSHEDS

With Focus on Residential Low-Impact Development

Date: Aug 25, 2012
Time: 10am - 1pm

Cypress Meadows
343 Cypress Ave.
Moss Beach, CA 94038

RSVP:
www.sfei.org/coastalwatershed-reg

Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board. The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Topics for the Presentations

- Rain Gardens and Bioswales
- Pervious Pavements
- Irrigation and Pesticide Use
- Rainwater Harvesting and Graywater Reuse
- Permits and Requirements

Information for residents, contractors, and builders available through presentations, vendor tables, and informational displays

Protecting Coastal Watersheds

With Focus on Residential Low-Impact Development

Saturday, August 25, 2012 10am – 1pm

10:00 Nicole David (San Francisco Estuary Institute): Welcome and Introductions

10:10 Julie Casagrande (San Mateo County): Overview of LID and BMP Efforts on the San Mateo County Coast with Preliminary Results from Pilot Phase Monitoring (Nicole David)

10:30 Chuck Kozak (Go Native): Bioswales and Raingardens; Soils and Plants for Good Infiltration

10:50 Ryan Marlinghaus (Cal EarthCare Landscaping, Inc.): Pervious Pavements and Permeable Pavers

11:10 Gretchen Schubeck (Bay-friendly Coalition): Irrigation and Pesticide Use

11:30 TBD: Rainwater Harvesting and Gray Water Reuse

11:50 Kristin Kerr (EOA): LID Features for Small Projects and MRP Requirements

Potential Booth Participation (Starting at 12:15)

1. RCD
2. The Urban Farmer Store
3. Earth Energy (Landscaping and Premier Ponds)
4. Blue Sky Design
5. Coastal Range Landscaping
6. Recycle Works (SMC)
7. SMCWPPP
8. Yerba Buena Nursery
9. Common Ground Palo Alto
10. Sustainable Landscape Design

LID Workshop Summary

As part of the James V. Fitzgerald Area of Special Biological Significance (ASBS) Pollution Reduction Program, funded in part by a Proposition 84 grant from the State Water Resources Control Board, the County of San Mateo (County) is implementing Best Management Practices (BMPs) and Low Impact Development (LID) practices to improve water quality in stormwater draining into the Fitzgerald Marine Reserve and ASBS in Moss Beach and Montara. The County contracted with the San Francisco Estuary Institute (SFEI) for monitoring pollutants in the inflow and outflow the County's storm drain BMPs to evaluate the effectiveness of various management practices.

As part of the same grant, SFEI is also hosting a workshop with the title:

Protecting Coastal Watersheds
With Focus on Residential Low-Impact Development

This workshop is intended to reach out to an audience of local builders, contractors, and residents and inform them about potential LID options that can be integrated in smaller scale projects to improve water quality downstream. The workshop will be held on Saturday, August 25, 2012 at Cypress Meadows in Moss Beach, CA.

The workshop will have five focus areas.
1. Bioswales and Rain Gardens (Soils and plants for good infiltration to make LIDs work properly and add great aesthetic value with low maintenance to your garden on the San Mateo coast.)
2. Pervious Pavements and Permeable Pavers
3. Irrigation and Pesticide Use (Conserving Water and Protecting the Downstream Watershed)
4. Rainwater Harvesting and Gray Water Reuse
5. LID Features for Small Projects and MRP Requirements

After the presentations (10am – noon), there will be another hour available when local agencies and businesses display their work and products for participants to learn face-to-face about LID options, environmental benefits, and other detailed advantages for certain projects.

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

Register now for the 2013 New Development Workshop!

Improving the Development Review Process:

New Tools for Stormwater Control Reviews

This workshop is for:

- ✓ Municipal Planners
- ✓ Municipal Engineers
- ✓ Architects and Landscape Architects[1]
- ✓ Developers & Consultants[1]

Belmont Sports Complex Conference Room
550 Island Parkway, Belmont

Wednesday, May 22, 2013
8:00 am* – 3:00 pm

**8:00 a.m. start time for "Basic Training"*
9:00 a.m. start time for main workshop

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

Landscaped area in a small project designed to receive runoff from the roof. (Photo credit: Stephanie Morris, landscape architect)

Workshop Highlights:

- **New stormwater requirements for small projects** *(projects that create and/or replace 2,500 to 10,000 square feet of impervious surface, and individual single family home projects that create or replace 2,500 square feet or more of impervious surface).*
- **Hands-on practice with example projects** to:
  - o Review a completed Stormwater Checklist for Small Projects.
  - o Review a completed C.3 Regulated Projects Checklist (including feasibility analysis for infiltration and rainwater harvesting).
- **Updates on operation and maintenance compliance** for stormwater treatment measures.
- **Overview of new hydraulic sizing spreadsheets**.
- **"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 May 13, 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, melissa@eoainc.com) with any questions.

[1] *Developers, builders and consultants working within the county may register beginning May 13th, if space is available.*

San Mateo Countywide Water Pollution Prevention Program
2013 New Development Workshop:

Registration Form

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 May 13, 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 ***Wednesday, May 15, 2013***. For additional information, contact Melissa at (510) 832-2852 ext. 101. We look forward to seeing you at the workshop!

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.

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.

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

2013 New Development Workshop

Improving the Development Review Process:

New Tools for Stormwater Control Reviews

Belmont Sports Complex
550 Island Parkway, Belmont
May 22, 2013

Agenda

Early Registration for Basic Training (and Refreshments)	8:00 – 8:15
Basic Overview of Stormwater Post-Construction Controls *Learn (or refresh your memory) about long-standing stormwater requirements and key concepts* Jill Bicknell, *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
What's New in Stormwater Requirements for Development Projects Jill Bicknell, *EOA, Inc.*	9:30 – 10:00
Exercise 1: Stormwater Review of Small Example Project Kristin Kerr, *EOA, Inc.*	10:00 – 10:50
Break	**10:50 – 11:00**
Exercise 2: Stormwater Review of Example Regulated Project Jill Bicknell, *EOA, Inc.*	11:00 – 12:00
LUNCH - provided on site	**12:00 – 12:45**

LID Treatment Case Study (Bransten Road) Analette Ochoa, WRECO	12:45 – 1:30
Operation and Maintenance Requirements: Tips for Keeping Your Agency in Compliance Kristin Kerr, *EOA, Inc*.	1:30 – 2:00
Hydraulic Sizing Criteria: Overview of New Tools and When to Use Them Jill Bicknell, *EOA, Inc.*	2:00 – 2:50
Closing Remarks	2:50 – 3:00

SMCWPPP 2013 New Development Workshop
Attendance

Last Name	***First Name***	***Municipality***
Leda	Dale	BKF Engineers
Smith	Craig	BKF Engineers
Yau	Gilbert	City of Belmont
Breault	Randy	City of Brisbane
Cannon	Diane	City of Brisbane
Johnson	Ken	City of Brisbane
Daldrup	Stephen	City of Burlingame
Gomery	Jane	City of Burlingame
Justimbaste	Eva	City of Burlingame
Voong	Victor	City of Burlingame
Daher	Michelle	City of East Palo Alto
Galli	Laura	City of Foster City
Mao	Shaun	City of Menlo Park
Storz	Roger	City of Menlo Park
Lim	Khee	City of Millbrae
O'Dea	Kelly	City of Millbrae
Diaz	Lee	City of Pacifica
Donguines	Raymond	City of Pacifica
Farbstein	Kathryn	City of Pacifica
Zahori	Sayed	City of Redwood City
Cervantes	Joseph	City of San Bruno
Neuebaumer	Matt	City of San Bruno
Russell	Laura	City of San Bruno
Bickel	Debra	City of San Mateo
Chuck	Dennis	City of South San Francisco
Lecel	Rob	City of South San Francisco
Tan	Andy	City of South San Francisco

SMCWPPP 2013 New Development Workshop
Attendance

Last Name	***First Name***	***Municipality***
Aguirrre	Dennis	County of San Mateo Planning & Building
Brennan	John	County of San Mateo Planning & Building
Leung	Camille	County of San Mateo Planning & Building
Rosen	Steve	County of San Mateo Planning & Building
Bicknell	Jill	EOA, Inc./Speaker
Kerr	Kristin	EOA, Inc./Speaker
Shu	Diana	San Mateo County
Fabry	Matt	SMCWPPP Program Coordinator
Huynh	David	Town of Atherton
Mardesich	Andrea	Town of Atherton
Ahmed	Muneer	Town of Colma
Laughlin	Michael	Town of Colma
Sonmez	Turhan	Town of Colma
Truong	Sophie	Town of Colma
Nevarez	Serena	Town of Hillsborough
Yniguez	Ray	Town of Hillsborough
Leung	Sonia	WRECO
Ochoa	Analette	WRECO/Speaker

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

Evaluation Form Summary
46 Attendees
22 Evaluations
48% Responded

New Development Workshop
Wednesday, May 22, 2013

What Did You Think of the Following Presentations and Activities?

1. **Basic Overview of Stormwater Post-Construction Controls**

very helpful **13** somewhat helpful **2** not helpful N/A did not attend **7**

Comments:

Could be a bit longer for those who have NO experience.

Good summary of current state of regulations and practices.

Already familiar; good review.

A very good refresher.

Great, concise overview.

Extremely helpful. This is a great class! You should keep providing it. It is a great introduction to those of us that have limited experience in this subject.

2. What's New in Stormwater Requirements for Development Projects

very helpful **17** somewhat helpful **5** not helpful

Comments:

Good to hear what's on the horizon.

Already familiar; good review.

These updates are very helpful.

Good basic information provided by Jill. Very comprehensive.

I didn't know the old, but this was very helpful.

3. Exercise 1: Stormwater Review of Small Example Project

very helpful **17** somewhat helpful **4** not helpful

Comments:

Need better example that has a more straight forward plan.

Good examples to show usage of forms.

Addressed a recent interpretation issue we had in our office.

The exercise was helpful but the form is very complicated and confusing. Form needs revising.

Very practical application. It is one thing to hear the information. It is another to apply it to your work. Through going through the exercise, many questions came up & relevant discussions were initiated that might not have otherwise been asked or talked about without going through the checklist.

Need better graphics. Would be good to have handouts to take and study later.

4. Exercise 2: Stormwater Review of Example Regulated Project

very helpful **20** somewhat helpful **1** not helpful

Comments:

This one was better, easier to follow.

A good demonstration.

See above comment.

Also, ditto. We made some suggested revisions to the checklist, based on going through the exercise

5. LID Treatment Case Study (Bransten Road)

very helpful **13** somewhat helpful **7** not helpful

Comments:

Kind of vague on project – not sure what expected removal rate will be.

Very interesting projects.

Interesting but not pertinent to project types in our community.

Less lecture, more real life samples.

We had the best Q&A by talking to someone who had gone through the process.

The project is awesome. I am happy to hear about the details of it.

6. Operation and Maintenance Requirements: Tips for Keeping Your Agency in Compliance

very helpful **16** somewhat helpful **3** not helpful

Comments:

Real world examples of how agencies are tracking and inspecting would help.

Already familiar; good review.

Good overview.

Thanks.

7. Hydraulic Sizing Criteria: Overview of New Tools and When to Use Them

very helpful **14** somewhat helpful **1** not helpful **1**

Comments:

Cleared up a lot, much better understanding now.

Technical, well done.

Good overview and was good to get a review of calcs.

Did not attend.

Did this workshop meet your expectations? Yes **19** No

Well beyond my expectations. I know so much more now than when I walked in.

Liked the location. Food timing was good. Exceeded! Liked pace – less on agenda and slides – allows for discussion and absorption by audience! Presenters were all good and went at a good pace.

What parts of the workshop were most useful to you?

- Overview
- Real examples, questions posed by attendees.
- Discussions, the practical application and the direction to the website where brochures and forms are available to use and borrow.
- Talking to other agencies.
- Basic overview and LID treatment case study and hydraulic sizing criteria.
- Basic training and Activities #1 (Stormwater Review of Small Example Project) and #2 (Stormwater Review of Example Regulated Project).
- Basic overview and two exercises.
- Calculation
- Sample calculations
- Hydraulic sizing requirements
- # 7 (Hydraulic Sizing Criteria; Overview of New Tools and When to Use Them).
- Hydraulic sizing and O&M treatment.
- Overview of O&M
- All good.
- Sample projects, spreadsheets.
- New information and updates for new MRP.
- LID Treatment. Good sample project presented.
- Provide more general information regarding C.3 and C.6 before addressing new requirements (would help to have an overview to refresh).

What would have made this workshop more useful?

- More explanation of site design vs. required measures
- More examples.
- More information regarding hydromodification.
- Having more municipal staff present to learn!
- Move the difficult (calculation) to (AM) morning from the end.
- I liked it all.
- Good examples.
- Attendees have different level of understanding of MRP therefore a lot of time wasted answering basic questions. Also, more sample projects would be helpful.
- More practice inspections and what to look for!
- Just ways to get more information that is already out there.
- How to update our websites so we can be helpful to our applicants and they can get all the forms they need easily.
- Great workshop.
- Overview with ideas of how to fill out annual permit form submittals. Lots of descriptive answers needed etc.

What topics would you recommend for a future workshop?

- Water harvesting when new plumbing code is adopted.
- I hope this material is emailed or available online.
- Public regulated projects.
- I think the workshop agenda is comprehensive. Maybe more on MRP renewal next year.
- Hydromodification
- On site assessment of existing treatment facilities that are 1 year, 5 years, 10 years old.
- What really works and what does not and where.
- Cost for various types of treatment vs. effectiveness.

General Comments:

- Very good workshop.
- Food: No Styrofoam @ breakfast. Mayo on sandwiches : (
- Thank you for good information and good breakfast & lunch.
- Sandwiches are too soggy, chairs are not too comfortable, room too cold, no more than 4 slides should be printed on one sheet.
- Excellent class. Would recommend to everyone. Very useful information.
- The room was not comfortable. It was too cold. It was hard to hear the speaker. I asked staff to turn the volume up. But it was up to the max. The graphics were hard to read.
- Than you for hosting the workshop and for providing food and drink.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 4

- CII Subcommittee – Attendance List– FY 2012-13

SMCWPPP Commercial/Industrial/Illicit Discharge (CII) Subcommittee Attendance
FY 2012/13

Name	Agency	E-Mail	Oct. 17th	Dec. 19th	March 20th	June 19th
Steve Tyler	City of Atherton	styler@ci.atherton.ca.us				
Bozhena Palatnik	City of Belmont	Bpalatnik@Belmont.gov	✓	✓	✓	
Randy Breoult	City of Brisbane	rbreault@ci.brisbane.ca.us		✓		
Kiley Kinnon	City of Burlingame	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	Louis.Gotelli@colma.ca.us	✓		✓	
Ward Donnelly	City of Daly City	wdonnelly@dalycity.org	✓	✓	✓	✓
Cynthia Royer	City of Daly City	croyer@dalycity.org				
Michele Daher	City of East Palo Alto	mdaher@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	ndorais@fostercity.org				
Allan Shu	City of Foster City	ashu@fostercity.org				
Larry Carnahan	City of Half Moon Bay	larryc@hmbcity.com	✓	✓		✓
Mo Sharma	City of Half Moon Bay	mosharma@hmbcity.com				
Mark Lander	City of Half Moon Bay	markl@csgengr.com				
Jen Chen	Town of Hillsborough	JChen@hillsborough.net				
Dave Bishop	Town of Hillsborough	dbishop@hillsborough.net				
Catherine Chan	Town of Hillsborough	cchan@hillsborough.net				
Virginia Parks	City of Menlo Park	vkfparks@menlopark.org	✓		✓	✓
Charles Taylor	City of Menlo Park	cwtaylor@menlopark.org				
Catherine Allin	City of Millbrae	callin@ci.millbrae.ca.us	✓		✓	
Kevin Cesar	City of Millbrae	kcesar@ci.millbrae.ca.us				✓
Lizzy Claycomb	City of Pacifica	claycombe@ci.pacifica.ca.us				
Raymund Donguines	City of Pacifica	donguinesr@ci.pacifica.ca.us	✓		✓	✓
Christina Horrisberger	City of Pacifica	horrisbergerc@ci.pacifica.ca.us				✓
Howard Young	Town of Portola Valley	hyoung@portolavalley.net				
Terence Kyaw	City of Redwood City	TKyaw@redwoodcity.org				✓
Peter Vorametsanti	City of Redwood City	PVorametsanti@redwoodcity.org				
Gary Lepori	City San Bruno	glepori@SanBruno.ca.gov				
Mike Dillon	City San Carlos	mdillon@cityofsancarlos.org				
Chris Valley	City San Carlos	cvalley@cityofsancarlos.org				
Denny Phan	City San Carlos	DPhan@cityofsancarlos.org				✓
Debra Bickel	City of San Mateo	dbickel@cityofsanmateo.org	✓	✓	✓	✓
Rob Lecel	City of South San Francisco	rob.lecel@ssf.net				
Andy Wemmer	City of South San Francisco	Andrew.wemmer@ssf.net		✓	✓	✓
Kristen Font	City of South San Francisco			✓		
Eunejune Kim	Town of Woodside	ekim@woodsidetown.org				
Dermot Casey	County of San Mateo	djcasey@co.sanmateo.ca.us		✓	✓	
Pat Ledesma	County of San Mateo	PLedesma@smcgov.org				✓

Name	Agency	E-Mail	Oct. 17th	Dec. 19th	March 20th	June 19th
Tim Swillinger	County of San Mateo	tswillinger@co.sanmateo.ca.us				
Mark Chow	County of San Mateo	mchow@co.sanmateo.ca.us				
Julie Casagrande	County of San Mateo	jcasagrande@smcgov.org				
Matt Fabry	SMCWPPP Coordinator	mfabry@smcgov.org				
Susan Hiestand	SBSA	shiestand@sbsa.com	✓			✓
Francis Rooney	SBSA	frooney@sbsa.com				
Norman Domingo	SBSA	ndomingo@sbsa.org				
Cecil Felix	Water Board	CFelix@waterboards.ca.gov				
Kristin Kerr	EOA, Inc.	kakerr@eoainc.com	✓	✓	✓	✓

SAN MATEO COUNTYWIDE
Water Pollution
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Appendix 5

- Illicit Discharge Inspection Workshop – April 24, 2013
  - Agenda
  - Attendance list
  - Summary of workshop evaluations
- Illicit Discharge: Source Identification Form
- Complaint/Spill/Discharge Tracking Spreadsheet
- Best Management Practices for Mobile Businesses Pamphlet

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

AGENDA

Illicit Discharge Inspection Workshop

SMCWPPP CII Subcommittee
Belmont Sports Complex Conference Room
550 Island Parkway
Belmont, CA 94002
Wednesday, April 24, 2013
11:30 a.m. – 2:45 p.m.

Lunch *Registration*	11:30 – noon
Welcoming Remarks Ward Donnelly, *City of Daly City, Commercial, Industrial, and Illicit Discharge Control Subcommittee Chair*	12:00 – 12:05
Regulatory Refresher Kristin Kerr, *EOA, Inc.*	12:05 – 12:25
Mobile Cleaning of Parking Garages Jim Gamble, *Crystal Cleaning*	12:25 – 1:10
Group Table Top Exercise: Discussing Illicit Discharge Scenarios Facilitator	1:10 – 2:40
Closing Remarks Ward Donnelly, *CII Chair*	2:40 – 2:45

SMCWPPP Commercial/Industrial/Illicit Discharge (CII) Subcommittee

Illicit Discharge Inspector Training Workshop

April 24, 2013

Last Name	***First Name***	***Municipality***
Palatnik	Bozhena	City of Belmont
Tallitsch	John	City of Belmont
Breault	Randy	City of Brisbane
Morris	Greg	City of Brisbane
Daldrup	Stephen	City of Burlingame
Donnelly	Ward	City of Daly City
Daher	Michelle	City of East Palo Alto
Johnston	Jon	City of East Palo Alto
McCarthy	James	City of East Palo Alto
Castaneda	Victor	City of Redwood City
Claire	Jason	City of Redwood City
DelBen Sr.	Rich	City of Redwood City
Fenech	Ben	City of Redwood City
Lopez	Eddie	City of Redwood City
Munguia	Albert	City of Redwood City
Rees	Shawn	City of Redwood City
Maharaj	Umesh	City of San Bruno
Padilla	Tino	City of San Bruno
Bickel	Debra	City of San Mateo
Potter	Lucy	City of San Mateo
Font	Kristen	City of South San Francisco
Fulford	Daniel	City of South San Francisco
Wemmer	Andrew	City of South San Francisco
Ledesma	Patrick	County Environmental Health
Balestieri	Steve	County of San Mateo

Last Name	*First Name*	*Municipality*
Cullen	Darrell	County of San Mateo
Ernest	Frobie	County of San Mateo
Fischer	Stephen	County of San Mateo
Gomes	Richard	County of San Mateo
Grech	Jeff	County of San Mateo
Pacheco	Alan	County of San Mateo
Pacini	Jeff	County of San Mateo
Stanfield	Tim	County of San Mateo
Gamble	Jim	Crystal Cleaning/Speaker
Mazon	Edward	Menlo Park Police Department
Sepulveda	Gonee	Menlo Park Police Department
Guier	Brent	San Mateo County
Hum	Cristina	San Mateo County
Khine	Christine	San Mateo County
Lew	Sheldon	San Mateo County
Mantz	Annie	San Mateo County
Mejia-Barbaran	Liliana	San Mateo County
Tong	Edmond	San Mateo County
Villareal	Elizabeth	San Mateo County
Rompf	Dan	San Mateo County
Terrell	Marjorie	San Mateo County
Jarin	Joanne	San Mateo County Environmental Health
Lent	William	San Mateo County Environmental Health
Liy	Herbert	San Mateo County Environmental Health
Lowe	Steve	San Mateo County Environmental Health
Wong	Ngai	San Mateo County Environmental Health
DeMasi	Amy	San Mateo County Health Department

Last Name	***First Name***	***Municipality***
Hiestand	Susan	SBSA
Kerr	Kristin	SMCWPPP Program Staff
Siu	Courtney	SMCWPPP Program Staff
Rooney	Francis	South Bayside System Authority
Zanni	Stuart	South Bayside System Authority
Gotelli	Louis	Town of Colma
Chan	Catherine	Town of Hillsborough
Racanelli	Will	Town of Hillsborough

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

Evaluation Form Summary
61 in attendance
37 Evaluations
61% responded

Illicit Discharge Inspection Workshop
SMCWPPP CII Subcommittee
Wednesday, April 24, 2013
11:30 a.m. – 2:45 p.m.

What Did You Think of the Following Presentations and Activities?

1. **Regulatory Refresher** –*Kristin Kerr, EOA*

   23 very helpful **14** somewhat helpful **0** not helpful

Good job, very concise & efficient, but helpful building blocks.

Very Fast – Think I need Stormwater 101.

Wish the handouts were larger (hard to read).

2. **Mobile Cleaning of Parking Garages**- – *Jim Gamble, Crystal Cleaning*

26 very helpful **5** somewhat helpful **6** not helpful

Sales job.

Contractor should know what they can and cannot do. Where is the trust, he is saying a contractor cannot be trusted.

Was completely eye opening – hadn't any idea, what he described, was taking place.

Don't do any pressure washing

3. **Group Exercise: Illicit Discharge Scenarios**

28 very helpful **9** somewhat helpful **0** not helpful

Some were related to my job duties and some were not, but all were enlightening to me.

Did this workshop meet your expectations? **37** Yes **0** No

Suggestions for future workshop topics:

- Catch Basin issues
- Define how to fill out Illicit forms properly. What is Illicit Discharge?
- The written format (progression) of the scenarios wasn't very clear.
- Outdoor exercises.
- Inspection procedures.
- None.
- On site inspections training/hand on.
- Field visits and scenario exercises are helpful.
- Don't rush through 1st part of material, otherwise it's a waste of time.
- Cover other portions of the MRP and have Field workshop.
- Inspecting Restaurants
- More illicit discharge pictures and scenarios.
- More group exercise about illicit discharge.

General Comments:

- Very Good Scenarios
- More real time situations.
- Raffle
- Good.
- Patrick did great job!
- Most of our group maintains rural roads or suburban streets. Do storm drain maintenance street sweeping, construction, paving, etc.
- Thanks!
- Great Program!
- Great Job!
- Very Informative. Good speakers.
- I learned a lot.
- Very well done. Speakers were engaging.
- Helpful training. Too much emphasis on residential violations rather than commercial/industrial violations. Increase training on industrial operations compliance.
- Everything else was good. Group activities were good and enlightening.
- Pat Ledesma is awesome.
- Good real-world examples of illicit discharges.
- Made me aware of different agencies and what they have done to remedy different situations.
- Yay!

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

Retain copies of these completed forms at your municipality's office

Illicit Discharge: Source Identification Form

Inspection Date: _____ Time: _____

Municipality: _____

Inspector(s): _____ Department: _____

I. Source of Discharge

1. Describe reason for conducting the investigation.
   - ☐ Conducting regularly scheduled field screening.
   - ☐ Responding to report from the public, staff, another agency, etc. Date Reported: _____ Time: _____
2. Describe location of source of discharge (address, cross streets, physical features, etc.) _____
   _____
   _____
   ☐ Business ☐ Resident ☐ Other _____
3. Reporting Contact: _____ Field Contact: _____
4. Phone: _____ Phone: _____

II. Discharge Summary

1. Illegal Dumping
   - ☐ Illicit Connection
   - ☐ Poor Management Practices
   - ☐ Describe cause of discharge further, if appropriate. _____
     _____
     _____
2. Describe frequency of discharge.
   - ☐ Continuous Discharge
   - ☐ Intermittent Discharge
   - ☐ One time incident
3. Volume, if quantifiable: _____
4. Field Test Results: _____
5. Describe material discharged (Check box and circle subcategory type if needed.).
   - ☐ Construction Materials (debris, concrete, concrete cutting slurry/washwaters)
   - ☐ Food Wastes
   - ☐ Industrial Wastes (solvents, metals, corrosive, cooling tower blowdown, etc.)
   - ☐ Litter and/or Debris
   - ☐ Paint
   - ☐ Sediment and/or Silt
   - ☐ Sewage
   - ☐ Vehicle Fluids (antifreeze, fuel, oil)
   - ☐ Washwaters (vehicle, building, sidewalk cleaning)
   - ☐ Yard Wastes
   - ☐ Other: _____
6. Actual/Potential Discharge.
   - ☐ Discharge entered storm drain and/or receiving water
   - ☐ Evidence of discharge but did not reach storm drain and/or receiving water
   - ☐ Nothing found to abate

III. Follow-up Activities

1. Describe action to be taken by discharger.
   - ☐ Discharge has been stopped.
   - ☐ Discharge cannot be stopped immediately. Describe corrective actions that will be taken by the discharger.
     _____
     _____

   Date Discharge Abated: _____
2. Describe informational, educational, or BMP information distributed. _____
   _____
   _____
3. Describe enforcement action.
   - ☐ None
   - ☐ Level 1: Informal Violation (including verbal notice)
   - ☐ Level 2: Written Warning/NOV
   - ☐ Level 3: Notice to Comply
   - ☐ Level 4: Legal Action
4. Comments/Follow-up:

Complaint/Spill/Discharge Tracking Spreadsheet

[Enter Agency Name]

MRP Requirements *The MRP's Provision C.5.f requires the following: "All incidents or discharges reported to the complaint/spill system that might pose a threat to water quality shall be logged to track follow-up and response through problem resolution. The data collected shall be sufficient to demonstrate escalating responses for repeat problems, and inter/intra-agency coordination, where appropriate."*

Purpose: *The purpose of this spreadsheet is to provide an example "water quality spill and discharge complaint and follow up" tracking method for the San Mateo Countywide Clean Water Program's agencies to use.*

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	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Complaint Information																			**Investigation Information**																**Follow Up Information**								
Date and Time of Complaint Receipt		**Source of Complaint** Enter "1" for source of complaint			**Location**	**Problem Status**		**Type of Pollutant(s)** Enter "1" for each type reported													**Type of Pollutant(s)** Enter "1" for each type found												**Enter "1" if Discharge Entered Storm Drain and/or receiving water**	**Evidence of discharge but did not reach storm drain and/or Receiving Water**	**Nothing Found to Abate** Enter "1" if there is nothing needing abatement	**Type of Enforcement** Enter "1" for each type issued					**Response Times** Enter number of days			**Enter "1" if Resolved in Timely Manner**
Date of Complaint	**Time of Complaint**	**Public**	**Another Public Agency**	**Own Agency Staff**	**Address of Spill/Discharge or Physical Description of Incident's Location**	**Enter "1" if reported as actual discharge**	**Enter "1" if reported as potential discharge**	**Construction Materials**	**Food Wastes**	**Industrial Wastes**	**Litter and/or Debris**	**Paint**	**Sediment and/or Silt**	**Sewage**	**Vehicle Fluids**	**Washwaters**	**Yard Wastes**	**Other**	**Date Investigation Started**	**Time Investigation Started**	**Construction Materials (debris, concrete, slurry)**	**Food Wastes**	**Industrial Wastes**	**Litter and/or Debris**	**Paint**	**Sediment and/or Silt**	**Sewage**	**Vehicle Fluids (antifreeze, fuel, oil)**	**Washwaters (vehicle, building, sidewalk cleaning)**	**Yard Wastes**	**Other**				**None**	**Level 1: Verbal Notice/Verbal Warning**	**Level 2: Written Warning/ Notice of Violation**	**Level 3: Notice to Comply**	**Level 4: Legal Action**	**Call to Investigate**	**Investigate to Abate**	**Call to Abate**	

Summary Discharge Information	
Number of discharges reported	0
Number of discharges reaching storm drains and/or receiving waters	0
Number of discharges resolved in a timely manner	0
Percentage of discharges resolved in a timely manner	###

Summary of Types of Pollutants Discharged

	Const. Mat.	Food Wastes	Ind. Wastes	Litter/Debris	Paint	Sed./Silt	Sewage	Vehicle Fluids	Washwaters	Yard Wastes	Other	Total
Number	0	0	0	0	0	0	0	0	0	0	0	0
Percentage	######	###	###	###	###	###	###	#####	######	###	###	

Summary of Sources of Complaints

	Public	Another Public Agency	Own Public Agency	Total
Number	0	0	0	0
Percentage	###	#####	#####	

Three Steps to Remember Before You Clean

1. **Be a BASMAA Recognized Mobile Cleaner** Take the online "mobile surface cleaning" training from BASMAA (Bay Area Stormwater Management Agencies Association). This program will train you on how to clean different surfaces in an environmentally acceptable way and publish your name as a trained cleaner. Visit *www.basmaa.org.*

2. **Ask Your Local Inspector**
   Contact your local City stormwater inspector to determine specific discharge requirements. Obtain permission to discharge to the property owner's sanitary sewer plumbing or landscaping before starting the job.

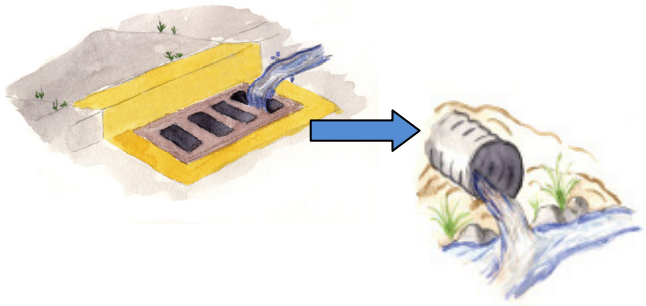
3. **Divert and Collect Wash Water**
   Cover the storm drains to prevent wash water from entering and divert wash water to the sanitary sewer system if permitted to do so. Small amounts may be diverted to landscaped areas, if appropriate.

Local Pollution Control Agencies

Burlingame Waste Water Treatment Facility	(650) 342-3727
Millbrae Water Pollution Control Plant	(650) 259-2388
North San Mateo County Sanitation District Wastewater Treatment Plant	(650) 991-8200
Pacifica's Calera Creek Water Recycling Plant	(650) 738-4660
San Mateo Waste Water Treatment Plant	(650) 522-7300
Sewer Authority Mid Coastside Wastewater Treatment Facility	(650) 726-0124
South Bayside System Authority	(650) 594-8411 ext. 140
South San Francisco/San Bruno Water Quality Control Plant	(650) 877-8555
Palo Alto Regional Water Quality Control Plant	(650) 329-2598
San Francisco's Southeast Treatment Plant	(415) 648-6882

Protect the Bay, the Ocean, and Yourself!

When wash water flows into storm drains it goes straight to local creeks and the Bay or Ocean without any cleaning or filtering.



If you discharge wash water generated by mobile cleaning activities to the storm drain, **you are violating municipal stormwater ordinances and may be subject to a fine.**

For More Information About Stormwater Pollution Prevention

Insert Contact Information and logo

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Water Pollution Prevention Program
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The San Mateo Countywide Water Pollution Prevention Program acknowledges the Santa Clara Valley Urban Runoff Pollution Prevention Program for developing and sharing the content and artwork of this brochure.

October 2012

Best Management Practices for

MOBILE BUSINESSES

Carpet Cleaners
Vehicle Washers or Detailers
Power Washers
Pet Care Services
Steam Cleaners

Information about using Best Management Practices (BMPs) to prevent wash and rinse waters from entering storm drain systems and polluting local waterways, our Bay, and our Ocean.

Why should we be concerned with wash water disposal?

Wash water from mobile cleaning is NOT just dirt and water. It also may contain soaps, toxic chemicals, heavy metals, oil, and/or grease that are harmful to our creeks and waterways.

Pollutants draining from mobile cleaning activities are washed into the street and into the storm drain system which then flows to our creeks, Bay, and Ocean without any cleaning or filtering.

Federal, State, and local regulations **prohibit discharge of anything but rain water in the storm drain**.

Implementing the proper Best Management Practices (BMPs) is easy and is required for compliance with stormwater pollution prevention regulations.

What about biodegradable and non-toxic cleaning products?

Cleaning products labeled "non-toxic" and "biodegradable" can still harm wildlife if they enter a storm drain system. Fish, for example, are affected by both regular and biodegradable soap! However, if disposed of in the sanitary sewer system, wastewater treatment plants prefer biodegradable products over toxic cleaners.

Plan Ahead

- ❑ Determine where you will discharge wastewater before starting a new job.
- ❑ Be sure to have equipment on hand (i.e. long hoses, sump pump, etc.) for directing discharge to sanitary sewer access points. Ensure hoses are long enough to reach access points that are far from your holding tank.

Contact your local hardware or construction material stores for available tools and materials for mobile businesses including wet/dry vacuums and sump pumps, mats, sand or gravel bags, wattles, etc.

Options for Disposal

Never drain wash or rinse water into streets, gutters, parking lots, or storm drains.

- ❑ Wash and rinse waters can usually be discharged to the sanitary sewer through a drain at the property owner's home or business, such as a utility sink, floor drain, mop sink, cleanout or toilet. Take precautions to prevent debris, hazardous materials or anything that can clog from entering sinks, toilets or sanitary drains.
- ❑ Direct water to landscaping or gravel surfaces. Wash water must completely soak into vegetation before you leave the site.

Doing the Job Right Checklist of BMPs

- ❑ Walk the area to identify storm drains.
- ❑ Sweep the wash area to remove debris.

- ❑ If feasible, wash on a vegetated or gravel surface where wash water can infiltrate into the ground without runoff.
- ❑ Contain wash area so that water does not drain down streets and gutters– use sand bags, plugs, containment mats or berms.
- ❑ Block or seal off any storm drain inlets and sloping areas that release water to the gutter to prevent wash water from entering the storm drain.
- ❑ Put storm drain protection in place before starting the washing process and remove before you leave the site.
- ❑ Vacuum or shake floor mats into a trash can.
- ❑ Minimize water use; use nozzles on hoses.
- ❑ Use less-toxic cleaning products (or wash without soaps and solvents, if possible)
- ❑ Use a "wet-vac" to vacuum up the contained wash water for proper disposal.
- ❑ Remove all debris or sediment accumulated during washing activities and put in the trash, or if it is hazardous, dispose of it properly.

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Water Pollution
Prevention Program

Appendix 6

- CalBig Meeting: Construction Site Stormwater Compliance – October 10, 2012
  - Announcement Flyer
  - Agenda
  - Attendance list
- Stormwater Training for Construction Site Inspectors – April 11, 2013
  - Announcement Flyer
  - Agenda
  - Attendance list
  - Summary of workshop evaluations

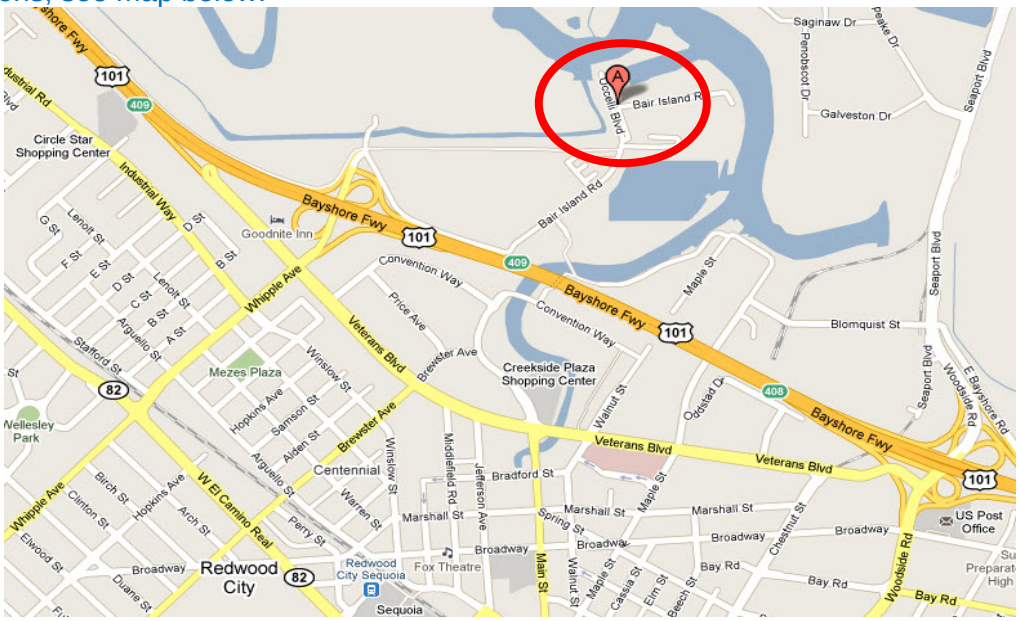
CALBIG MEETING ANNOUNCEMENT

Construction Site
Stormwater Compliance

(See Below)

This month's CALBIG meeting will be on Wednesday, October 10, 2012 from 11:30am to 1pm at The Waterfront Café at Pete's Harbor in Redwood City. 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.

Luncheon Buffet

Spring mix salad
Potato salad or pasta salad
Fresh fruit
Veggie platter
Assorted sandwiches (tuna, ham & cheese, vegetarian, turkey)
Coffee, ice tea and soft drinks.

Speakers: Matt Fabry, Program Coordinator
San Mateo Countywide Water Pollution Prevention Program

Laura Prickett, Senior Planner
EOA, Inc.

Topic: Update on new stormwater requirements for construction sites, overview of proper installation of construction BMPs, and tips for keeping your stormwater program in compliance.

The Waterfront Restaurant @ Pete's Harbor
One Uccelli Blvd, Redwood City, CA
October 10, 2012

Agenda

Registration/Seating	**11:30 - 11:45**
Michael Dillon, President - Welcome and Pledge of Allegiance	**11:45 - 11:46**
Old Business - Approval of Minutes	**11:46 - 11:52**
New Business	**11:52 - 12:00**
Featured Speakers – Matt Fabry, SMCWPPP	**12:00 - 12:10**
Laura Prickett, EOA, Inc.	**12:10- 1:00**
Michael Dillon, President - Closing	**1:00**

Please RSVP to Gary Lepori (glepori@sanbruno.ca.gov) by Monday, October 8. Out of consideration for the speakers and restaurant, we need an accurate head count.

Thank you !

CalBIG October 10, 2012, meeting
"Construction Site Stormwater Compliance"

Proposed Outline

12:00 – 12:10 p.m.: Matt Fabry

- What is the Countywide Program?
- Recent Notices of Violation and Notices of Deficiency re: construction site compliance
    - Failure to show that all sites that disturb 1 acre or more and high priority sites were inspected monthly during the wet season.
    - Failure to continue monthly wet-season inspection of sites that disturb 1 acre or more and high priority sites until the site is fully stabilized.
    - Failure to verify corrective actions for violations within 10 business day.
    - Failure to escalate enforcement for repeat offenders.
    - Numbers of violations and enforcement actions recorded in tracking tables not matching the numbers reported in Annual Reports.

12:10 - 1:00 p.m. Laura Prickett

- Existing Municipal Regional Stormwater Permit requirements for inspections (10 min.)
    - Monthly wet season inspections for sites that disturb 1 acre or more of land and high priority sites
    - What are high priority sites?
    - Inspection checklist, data tracking and reporting
    - Remember: This is the NOT the Statewide Construction General Permit; these are the basics for your local stormwater program
- New requirements (10 min.)
    - Architectural copper BMPs
    - Starting December 1, 2012, certain small projects will be required to install a permanent "site design measure"
        - Slides and handouts showing site design measures
        - Inspecting site design measure installation
- Proper Installation of common BMPs (20 min.)
    - Erosion control
    - Run-on and Run-off control
    - Sediment control
    - Good site management
    - Non-stormwater management
- Tips for Keeping your Stormwater Program in Compliance (5 min.)
- Questions (5 min.)

CalBIG Attendance
Oct 10, 2012

NAME	ORGANIZATION	EMAIL
David Graham	City of East Palo Alto	DGraham@cityofEPA.org
Brad Swain	City of East Palo Alto	BSwain@CityofEPA.org
CHAI LOR	CSG/MILLBRAE/PACIFICA/HMB	CHAIL@CSGENER
Tim McMillan	CSG	Timm@CSGENER.com
John Arellano	City of Daly City	jarellano@dalycity.org
Joseph Costa	County of San Mateo P.W.	JCosta SMCO.ORG.
CORKY COGGINS	COUNTY OF SAN MATEO P.W.	CCOGGINS SMCO.ORG.
Grace Le	City of Redwood City	gle@redwoodcity.org
Kevin Fehr	Redwood City	kfehr@redwoodcity.org
Angelo VENTURELLI	City DALY City	aventurelli@dalycity.org
Thomas Silipin	RW City	tsilipin@Redwoodcity.org
Randy Breault	Brisbane	rbreaultte ci.brisbane.ca.us
Daniel Fulford	City of SSF	Daniel.fulfordeSSF.net
Andrew Wemmer	City of SSF	Andrew.Wemmer@SSF.net
RICHARD LEE	San Mateo County	rlee@co.sanmateo.ca.us
MARK MARELICH	"	mmarelich@ " "
Gilbert Yau	city Belmont	gyau@belmont.gov
John Tallitsch	"	JTallitsch@belmont.gov
Byron Palakiko	"	bpalakiko@belmont.gov
Delia Lopez	"	dlopez@belmont.gov
Michelle Kenyon	City of San Mateo	MKenyon@CityofSanMateo.org
VIJY VANN	"	VVANN@City of San Mateo
MARK HATHAWAY	" "	MHATHAWAY@cityofsanmateo.org
TONY DIVI	California Electric	tdivi@caleelectric
LEIGH SIMPSON	BAY ALLEN ELECTRIC	LACASAME@AOL.COM
GREG MORRIS	CITY OF BRISBANE	gmorris@ci.brisbane.ca.us
Shelley Romriell	city of Brisbane	sromriell@ci.brisbane.ca.us
GARY FITZER	PORTOLA VALLEY	GFITZER@PORTOLAVALLEY.NET
HOWARD YOUNG	Town of Portola Valley	HYoung@PortolaValley.net
JAY RAJ	City of San Mateo	raj@cityofsanmateo.org
Anthony Vergara	City of San Mateo	AVergara@cityofsanmateo.org
CATHERINE CHAN	TOWN OF HILLSBOROUGH	cchan@hillsborough.net
Carlos Castro	Town of Hillsborough	ccastro@hillsborough.net
Cary Dahl	"	cdahl@hillsborough.net

Name	Organization	Email
Luca Miranda	SAN BRUNO	
Jesse Bonner	CSG	
EVA JUSTIMBASTE	BURLINGAME	eva.justimbaste@
DOUG RIDER	CSG	
TANYA Benedik	Millbrae	
DINO FRANCESCONI	BELMONT	
Leah Edwards	Foster City	
Armand Lobao	Foster City	
MICHAEL DILLON	SAN CARLOS	
Camille Leung	County of San Mateo	
PHILIP KLIN	city of Redwood City	
Diana Shu	COUNTY OF SAN MATEO.	
JEFF FINSHEL	EA Q/. Ono Services Cle	
FARRIS HIX	Redwood City	
Gary Francis	Hillsborough	
Michelle Daher	EPA	
CHAN WR	CSG	
Tim	CSG	
Will Racanelli	Hillsborough.	
Christina Lucchini	Redwood city	
Elizabeth Rider	CSG	elizabeth@csgengr.com

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Water Pollution Prevention Program
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Register Now!

Stormwater Training for Construction Site Inspectors

Inspecting Construction Sites and Permanent Stormwater Controls

Thursday, April 11, 2013
8:00 am – 12:00 pm

City of Millbrae Chetcuti Room
450 Poplar Avenue, Millbrae

Who Should Attend:

- Construction site inspectors
- Building inspectors
- Development review staff
- Stormwater program managers
- Other staff involved in construction site compliance and/or O&M verification of permanent stormwater controls

Workshop Highlights:

This half-day training workshop is for municipal staff who inspect construction sites and/or permanent stormwater controls for compliance with the Municipal Regional Stormwater Permit (MRP). The workshop will address:

- Requirements for construction site inspections in Provision C.6 of the MRP,
- Key differences between Provision C.6 and the statewide Construction General Permit,
- Presentation by Caltrans staff on Caltrans construction stormwater inspection procedures,
- Practice identifying proper BMP installation and using the construction site stormwater inspection checklist,
- Ongoing operation and maintenance (O&M) inspections of permanent stormwater controls.

This is a free workshop. Continental breakfast will be served.

To register, please complete and email or fax this form to Melissa at EOA, Inc. (email: melissa@eoainc.com, fax: 510.832.2856) by ***Thursday, April 4***. For more information, contact Melissa at 510.832.2852 x 101.

Municipality/Affiliation:_____

Name/Title:_____

Address:_____

Phone:_____ **Email:**_____

You will be sent a confirmation, including an agenda, one week prior to 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.

SAN MATEO COUNTYWIDE Water Pollution Prevention Program
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Stormwater Training for Construction Site Inspectors

Inspecting Construction BMPs and Permanent Stormwater Controls

Thursday, April 11, 2013
City of Millbrae Chetcuti Room, 450 Poplar Avenue, Millbrae
Agenda

8:00 a.m.	Registration and Breakfast
8:30 a.m.	Introductory Remarks *Elizabeth Claycomb, City of Pacifica, Representing the Workshop Work Group*
	Construction BMPs Module
8:40 a.m.	Municipal Regional Stormwater Permit (MRP) Requirements for Inspection of Construction Sites (Provision C.6) *Kristin Kerr, EOA, Inc.*
9:05 a.m.	Top Ten Differences between Provision C.6 and the Construction General Permit *Kristin Kerr, EOA, Inc.*
9:25 a.m.	Caltrans District 4 Experience with Construction BMPs and Inspections *Dragomir Bogdanic, Caltrans District 4*
10:15 a.m.	Review of the Countywide Program's Construction Site Inspection Checklist and Construction BMPs *Laura Prickett, EOA, Inc.*
10:40 a.m.	**Break**
10:50 a.m.	Exercise: Using the Construction Site Inspection Checklist for an Example Inspection *Laura Prickett, EOA, Inc.*
	Permanent Stormwater Controls Module
11:30 a.m.	MRP Requirements for Operation and Maintenance (O&M) Verification Inspections of Treatment Measures (Provision C.3.h) *Laura Prickett, EOA, Inc.*
11:40 a.m.	Common Issues in Inspections of Newly Installed Systems *Laura Prickett, EOA, Inc.*
12:00 p.m.	Adjourn

A-La

SMCWPPP Stormwater Training for Construction Site Inspectors
April 11, 2013

Last Name	First Name	Sign In	Municipality
Ahmed	Muneer		Town of Colma
Anderson	Tim		Town of Hillsborough
Arellano	John		City of Daly City Public Works
Ariasp	Homayoun		City of San Mateo
Azzari	Zack		County of San Mateo Public Works
Baumgartner	**Lori**		**EOA, Inc.**
Benedik	Tanya		City of Millbrae
Bernardo	Ramon		City of Half Moon Bay
Bickel	Debra		City of San Mateo
Bogdanic	**Dragomir**		**Caltrans District 4**
Breault	Randy		City of Brisbane
Carlos	Armando		County of San Mateo Public Works
Carlos	Hector		County of San Mateo
Casagrande	Julie		San Mateo County Public Works
Cervantes	Joseph		City of San Bruno
Chan	Catherine		Town of Hillsborough
Chen	Eric		County of San Mateo
Chen	Jen		Town of Hillsborough
Choi	Carter		County of San Mateo
Claycombe	Elizabeth		City of Pacifica
Cosentino	Gaetano		City of Vallejo
Daher	Michelle		City of East Palo Alto
Daldrup	Stephen		City of Burlingame
Davenport	Tom		County of San Mateo
Dickinson	Rebecca		County of San Mateo
Donguines	Raymund		City of Pacifica
Donnelly	Ward		City of Daly City
Dreesman	Eric		City of Foster City
Eastman	Robert		City of Half Moon Bay
Edwards	Leah		City of Foster City
Eva	Ninette		County of San Mateo
Fehr	Kevin		City of Redwood City
Font	Kristen		City of South San Francisco
Foster	Carole		San Mateo County Public Works
Galli	Laura		City of Foster City
Gomery	Jane		City of Burlingame
Gorman	Mike		County of San Mateo
Harris	Dean		City of Half Moon Bay
Heap	Gary		City of San Mateo
Hill	Matt		County of San Mateo Public Works
Hinkley	Eric		City of Menlo Park
Huynh	David		Town of Atherton
Jackson	Emmett		County of San Mateo Public Works
Justimbaste	Eva		City of Burlingame
Kenney	Dave		County of San Mateo
Kenyon	Michelle		City of San Mateo
Kerr	**Kristin**		**EOA, Inc.**
Kim	Philip		City of Redwood City
Lander	Mark		City of Half Moon Bay
Latu	John		City of East Palo Alto

Le-Z

Hello

SMCWPPP Stormwater Training for Construction Site Inspectors
April 11, 2013

Last Name	First Name	Sign In	Municipality
Lee	Richard		County of San Mateo
Lim	Khee		City of Millbrae
Lisaj	Krzysztof		County of San Mateo
Mack	Lamonte		Half Moon Bay
Manuel	Noel		County of San Mateo Public Works
Mardesich	Andrea		Town of Atherton
Marelich	Mark		County of San Mateo
Miranda	Luca		City of San Bruno
Moloney	Julie		City of Foster City
Morales	Rene		City of Menlo Park
Morris	Greg		City of Brisbane
Mortazavi	Farhad		City of Millbrae
Mostafavi	Saeid		City of Colma
Murphy	John		City of San Bruno
Ng	Wency		County of San Mateo
O'Connell	Mike		County of San Mateo
Pipkin	John		City of Morgan Hill
Prickett	**Laura**		**EOA, Inc.**
Quan	Martin		City of San Mateo
Racanelli	Will		Town of Hillsborough
Ramriell	Shelley		City of Brisbane
Remmel	Adam		San Mateo County Public Works
Riddell	Anthony		City of San Carlos
Rider	Doug		City of Millbrae
Rosen	Steve		County of San Mateo
Schrotenboer	Patti		City of Redwood City
Seto	Anthony		County of San Mateo
Shu	Diana		County of San Mateo
Siu	**Courtney**		**EOA, Inc.**
Truong	Sophie		City of Half Moon Bay
Venturelli	Angelo		City of Daly City Public Works
Ward	Tonya		City of Half Moon Bay
Wemmer	Andrew		City of South San Francisco
Yniguez	Ray		Town of Hillsborough
Zahori	Sayed		City of Redwood City
LOR	CHAI		CITY OF PACIFICA/MICOBRAC
Foote	Will		
Schabarum	John		County of SM
Mann	Jessica		Redwood City
Pacini	Kenneth		City of San Mateo
Voone	Victor		City of Burlingame
Heide	Kevin		City of Burlingame
Catherine	Allin		Millbrae
Michael Ramirez			Co. San Mateo
Pascual	Jeff		City of Daly City

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Stormwater Training for Construction Site Inspectors

April 11, 2013
Workshop Evaluations Summary

Number of attendees: 89
Number of evaluations: 52 (58%)

1. Was the material presented relevant to your job?

	No				Yes
	1	2	3	4	5
responses	0	2	4	14	30

comments:

- The MRP requirements and O&M Inspection

2. Were the presentations clear and easy to follow?

	No				Yes
	1	2	3	4	5
responses	0	2	4	18	26

3. ***Was the pace of the presentations appropriate?***

	No				Yes
	1-1	2	3	4	5
responses	1	2	8	14	25

comments:

- I would have liked more time on last one O & M
- Too fast.
- Needed more time for questions and discussions. Presenters racing the clock.

4. ***Were the presenters knowledgeable about the material?***

	No				Yes
	1	2	3	4	5
responses	0	0	0	8	43

5. Were the presenters well-prepared?

	No				Yes
	1	2	3	4	5
responses	0	0	1	10	39

comments:

- Time management.

6. Did the presenters invite questions and participation?

	No				Yes
	1	2	3	4	5
responses	0	0	5	6	39

comments:

- As much as time allowed.

7. Were the handouts informative and useful?

	No				Yes
	1	2	3	4	5
responses	0	1	4	12	33

8. Overall, how useful was this workshop?

	Not useful				Very useful
	1	2	3	4	5
responses	0	1	4	19	26

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

- Caltrans presentation very helpful for inspecting road projects.
- Liked Caltrans presentation, interactive session, O&M
- Caltrans presentation.
- Caltrans presentation.
- Differences between MPP & Statewide permit.
- Differences between general construction permit & MRP.
- Clarification between GCP and MRP reporting requirements.
- Contrast black/white statewide general permit v. MRP
- Discussions regarding General Permit vs. MRP
- Right amount of background and detailed information pertaining to current permit requirements, plus nice speakers referred to current and past deficiencies relating to this workshop.
- Finding out training can be in house.
- Refreshing old information.
- Q & A
- BMP=No minimums?
- Presentation on the differences between the MRP & State Construction Permit.
- Laura's presentation, informative.
- Exercise.
- BMP examples and inspection form exercise.
- Review of construction site BMPs.
- BMP review.
- Sediment and erosion control pics.

- Example pictures of good and bad sites.
- Photo examples.
- Great photos and examples of site control.
- Seeing slides of good BMPs.
- Photos of examples.
- Visual presentations. Use of pictures.
- Examples and requirements.
- Building Inspector training.
- O&M inspections.
- O&M checklist.
- Requirements of municipal inspections.
- Learning in general.
- Controlled training.
- The process of inspection.
- Refresher of C.3 and C.6
- Updates to the requirements for site inspections.
- Awareness of various conditions/concerns.
- Focusing attention on issues.
- Decent intro

10. What was least valuable about today's training?

- Permanent facility inspections are not something I am responsible for.
- Post Construction requirements.
- O&M inspections (does not apply to me currently).
- Many staff still do not understand difference between CGP and MRP.
- Need to provide a summary/introduction of MRP and CGP for folks that don't know and are now to the subject.
- State requirements.
- Top ten differences.
- Caltrans not relevant.
- Caltrans.
- Caltrans process.
- Examples of BMPs.
- Would be helpful to have some ideas what local agencies are doing and their ordinances.
- Not inspector specific.
- It was all good.
- As a first timer – overwhelmed by the details – especially at the beginning
- None.
- None
- It was all good info.
- N/A
- Too crowded/seating.
- Inadequate room size, speaker's volume, and rushing on.
- Too large as a classroom, too small as an assembly hall.

11. Please offer suggestions for what could be improved.

- Need to spend more time on BMPs.
- Provide commonly used Acronym-attendees may not always know.
- Key dates for reporting.
- Define wet season date.
- Provide sample MRP Annual Report website of SMCWPPP, Waterboards, Caltrans, etc.
- More frequent/larger trainings.
- Review of specific sections of C.3, C.4, C.5, etc.
- Mandated funding on a state municipal level to cover costs of these statewide/regional-wide requirements=USE TAX!!!
- Pictures were great! Maybe ones that are more dramatic.
- Video footage may help as well.
- Continue to offer training in proper reporting of SWCPPP.
- Need a remedial training/more time less topics.
- More time/training on basics of different permits and who is required to do what inspection where, and when.
- Differentiate C.3, C.6 as part of MRP & the GCP & areas that may overlap. Within those discussions go thru examples.
- More examples of construction projects (i.e. paving projects, linear pipeline projects, buildings) and how GCP and MRP would be applied to each.
- Site visit as in the past to see properly installed erosion control and sediment controls.
- More time.
- A microphone P.A. system.
- Be more clear and take more time explaining the roles of municipalities inspectors.
- More emphasis on municipality responsibilities vs. state/regional board responsibilities with respect to the permits.
- Tailor a class related to civil projects for public agencies, e.g. roadway, trails, retaining wall inspection.
- Provide a flow chart of the permit process for local agencies to follow i.e. to obtain CGP.
- Who performs inspections of construction projects? Make this topic clearer.
- Site visits would be great.
- Hand outs on products available for erosion control, maybe water detention systems and dispersion. How they should be constructed. We are seeing them often in the field.
- A well prepared checklist for inspection.
- The comparison between state permit and MRP confusing.
- Map of area of meeting.
- Appropriate room size and speaker system.
- Better visibility of on screen presentation.
- Color choices of written material not always visible.
- Breakout into groups/tailor training to experience level.

12. Please offer suggestions for future training topics.

- Provide reference materials for future use for attendees.
- Use a microphone.
- Discussion of Design Requirements.
- Topic on how agencies are to comply with limited staff and budget.
- What authority is available to use to enforce and fully fund the permit requirements.
- Basics. Design of treatment facilities or plan reading.
- More information on permits (MPP & statewide).
- I suggest going through examples/projects & go thru requirements per MRP/CGP first. It seems the audience gets confused too early during the training. Possibly talk more of NOVs and how it was corrected.
- More photo examples.
- Suggesting BMP/making requirements of contractors. Resolving conflicts, demonstrating importance of S.W. Regs
- Maybe a focus on recent state/regional board audits in the area and findings.
- Certification preparation.
- Stormwater treatment procedures, materials for permanent installations.
- Full trash capture material list.
- Permanent stormwater treatment controls presentation with manufacturers.
- For inclusion during plan review process.
- More BMP techniques for construction sites, love the pictures!

General Comments?

- Judging the questions, some more basic permit information.
- Good presentation. But: Needed more time allotted.
- Nice pace, information. Liked Caltrans presentation, Kristin and Laura were great!
- Provide excerpt MRP permit relative to the workshop.
- Also, may want to review attendee list to see if workshop materials provided are information enough, i.e. acronym list etc.
- Overall a good workshop.
- Please provide more than one training per calendar year for Building Inspectors.
- Shutting down inspections for an entire department is a problem. Also, staff may not be available on the training day, i.e. on vacation.
- Thanks.
- Forgot to have everyone introduce themselves. Would like to know if consultants were on hand and representation of municipal agencies.
- Keep same format. Don’t change it.
- There still seems to be a lot of general confusion about all the types of permits, inspection requirements, and reporting requirements. They are not user friendly.
- Good class, interesting choice of when you chose to give the review class at the end of the rainy season.
- None.
- Unfunded mandates? How nice.
- Great presentation. Great speakers.
- Please enlarge font on slide pictures for later reference.
- Overall, well done. Presenters are knowledgeable on topic. Easy to understand.
- Enjoyable training; thanks.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 7

- Public Information and Participation Subcommittee – Attendance List– FY 2012-13
- Proper Household Toxics Disposal Web Page – Spanish
- Proper Household Toxics Disposal Web Page – Chinese
- "Spring Cleaning SMC" Promotional Campaign Web Page
- IPM Pest Control Operators Web Page
- BASMAA Generated Press Release - "Choosing Less-Toxic Home and Garden Products Just Got Easier"
- BASMAA Generated Press Release - "Give the Gift of Clean Water and Air This Holiday Season"
- BASMAA Generated Press Release – "California Coastal Cleanup Day Organizers Prepare for Tsunami Debris"
- Redesigned Coastal Cleanup Day Web Page
- Revised Car Wash Tip Card and Updated Discount Card
- Pollution Prevention Post Newsletter – Fall 2012
- Pollution Prevention Post Newsletter – Spring 2013

Public Information and Participation Subcommittee				FY 2012-2013					
AGENCY	NAME	ALTERNATE	PHONE	Jul-12	Sep-12	Nov-12	Jan-13	Mar-13	May-13
Prog. Coordinator	Matthew Fabry		415-599-1419	1				1	
Atherton	Andrea Mardesich		752-0544		1			1	
Belmont	Diane Lynn		595-7425	1	1	1	1	1	1
Brisbane	Shelley Romriell		415-508-2128						
Burlingame	Stephen Daldrup	Eva Justimbaste	342-3727	1	1		1	1	1
Colma	Muneer Ahmed	Jason Chen	757-8888	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				1	1
Foster City	Mike McElligot		286-3546	1					1
Half Moon Bay	Muneer Ahmed	Mo Sharma		{1}	{1}	{1}	{1}		{1}
Hillsborough	Rachelle Ungaretti		375-7444	1			1	1	
Menlo Park	Rebecca Fotu	Vanessa Marcadejas	330-6765	1	1	1	1	1	1
Millbrae	Shelly Reider		259-2444		1	1	1	1	1
Pacifica	Lizzy Claycomb	Ray Donquinez	738-7361	1		1	1		1
Portola Valley	Brandi de Garmeaux	Howard Young	851-1700 x 14				1	1	
Redwood City	Terence Kyaw		780-7466					1	
San Bruno	Joseph Cervantes		616-7068		1	1	1	1	
San Carlos	Jill Lewis		802-4361	1	1	1	1	1	1
San Mateo City	Debra Bickel		522-7343	1			1	1	1
San Mateo County	Carole Foster		599-1448			1		1	
S. San Francisco	Daniel Fulford	Andrew Wemmer	829-3840	1	1	1		1	
Woodside	Dong Nguyen		851-6790						
			TOTAL CO-PERMITTEES IN ATTENDANCE	13	10	9	12	16	11
PIP Consultants:									
Environ. Health	Waymond Wong		372-6248		1				
Environ. Health	Timothy Swillinger		372-6245	1	1	1	1	1	1
Environ. Health	Mary Bell Austin		372-6259	1					
Environ. Health	Ana Clayton		372-6214				1		
Environ. Health	Julia Au		372-6250	1	1	1		1	1
Environ. Health	Suzanne Bontempo		372-6252					1	
Environ. Health	Allison Milch		372-6252					1	
Resident/Guest					1				
			Total Attendance	15	14	11	14	20	13

1 - Attendance **{1} - Duel Coverage**

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Residents
Schools & Teachers
Kids
Stormwater 101
Watershed Map
Watershed Groups Guide
Videos
Calendar of Events
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Community Outreach
Too Toxic To Trash
Yard, Garden, and Landscape
Pest Control
Litter Prevention
Automotive Care
Green Streets & Parking Lots
Used Oil Recycling

Muy Tóxico Para La Basura

Los desperdicios domésticos peligrosos (HHW, por sus siglas en inglés) o cualquier sobra de ellos son productos químicos utilizados en la cocina, baño, garaje, automóvil, o el jardín. Estos desperdicios peligrosos pasan a través de los sistemas de tratamiento o drenajes pluviales y terminan en los arroyos, la bahía, o el océano Pacífico. Por razones de seguridad y medioambientales, es ilegal desechar HHW en la basura, alcantarillas o drenajes pluviales.

Problemas de la eliminación inadecuada de los desperdicios peligrosos

- Contaminan nuestras vías publicas y el agua potable.
- Lesionan físicamente a los trabajadores de obras publicas.
- Contaminan los tanques sépticos o sistemas de tratamientos de aguas residuales si se vierten en los drenajes o inodoros.
- Presentan riesgos para los niños y mascotas que estan en la casa.
- Afectan la vida salvaje y el medio ambiente.

Cómo deshacerse de HHW
Haga un clic a continuación para conocer las ubicaciones de recolección de HHW en el Condado de San Mateo


Bombillas fluorescentes


Baterías Domésticas


Pinte


Medicamentos viejos


Agujas hipodérmicas y Lancetas


Electrónicos


Cuidado del Automóvil

Tienes aceite de cocina?? No lo tire a la basura! Reciclar es!

Eventos de recolección
El Departamento de Salud Ambiental del Condado de San Mateo patrocina un programa gratuito en todo el condado para recoger, reciclar y desechar adecuadamente de los desperdicios domésticos peligrosos. Las recolecciones de HHW se realizan prácticamente todos los jueves, viernes, y sábados (excepto los fines de semana y feriados) en el centro permanente de San Mateo. Recolecciones adicionales se llevan a cabo en varios otros lugares en todo el condado. Haga una cita por Internet o llame al Departamento de Salud Ambiental al 650 -363-4718 y seleccione la Opción 3.

Nota: Para los residentes en Burlingame, East Palo Alto, Foster City, Hillsborough, Menlo Park, San Carlos, San Mateo, y las área no incorporadas de San Mateo* pueden comunicarse con At Your Door Special Collection (antes conocido como Curbside Inc.) al 800-HHW-PKUP (800-449-7587) para que recojan los desperdicios en la puerta de su casa.

**Los vecindarios de las áreas no incorporadas del condado* de San Mateo incluidos en programa son: Burlingame Hills, San Mateo Highlands and Baywood Park (area de Crystal Springs), Harbor Industrial, Devonshire Canyon, Palomar Park, Oak Knoll, Kensington Square, Emerald Lake Hills, Sequoia Tract y Trailer Ranchero y North Fair Oaks (area de CSA-8).*

Materiales que se aceptan

- Pinturas a base de aceite, barnices y tintes

- Disolventes
- Limpiadores para el hogar
- Latas de aerosol
- Lustradores de muebles y metal
- Pesticidas y químicos de jardinería
- Químicos para piscinas y productos para spa
- Productos químicos para fotografías
- Suministros para arte y pasatiempos
- Productos para automóviles**
- Baterías (para el hogar y automóviles) **
- Suministros para pasatiempos
- Combustibles
- Tanques de gas propano para barbacoas
- Artículos que contengan mercurio (bombillas de luz fluorescente*, termómetros viejos, etc.)

Materiales que no se aceptan

- Municiones
- Asbesto
- Materiales biológicos
- Materiales desechados por empresas
- Electrodomésticos
- Explosivos
- Materiales radioactivos
- Cilindros de gas comprimido

****No es necesario una cita si lleva los siguientes materiales a los centros locales de recolección:**

- Baterías de uso doméstico
- Medicamentos viejos
- Pintura
- Bombillas fluorescentes
- Baterías de automóvil
- Aceite de motor usado
- Filtros de aceite
- Anticongelantes

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

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Used Oil Recycling

有毒，請勿棄置

家庭危險廢物 (HHW) 是指在廚房、浴室、車庫、汽車、院子裏所用化工品的殘留物或未使用的化工品。家庭危險廢物可透過廢物處理、下水道途徑排入小溪、海灣或太平洋。出於安全和環境方面的考量，透過垃圾處理、污水管道或下水道處理家庭危險廢物是非法的。

家庭危險廢物處理不當導致的後果

- 污染水源及飲用水
- 造成環衛工人的人身傷害
- 如果直接倒入排水溝或廁所，會污染化糞池或污水處理系統
- 如果棄於房子周邊，會危害到兒童和寵物
- 傷害野生動物、破壞環境

家庭危險廢物的正確處理方法

點擊下面，瞭解聖馬特奧縣 (San Mateo County) 的回收點

螢光燈泡

家用電池

油漆

老藥物

使用過針頭和小刀等

電子用品

汽車維護

你有油用於烹飪？不要扔在垃圾桶裡！回收吧!

廢物收集事宜

聖馬特奧縣環境衛生署發起一項全縣免費收集、回收、妥善處置家庭危險廢物的計劃。一般於每週四、週五、週六 (週末及節假日除外) 在聖馬特奧縣的永久機構收集家庭危險廢物。其他廢物的收集工作在全縣其他各個地方開展。在綫預約或致電至環境衛生署，電話 650-363-4718，選擇 3 號鍵。

注： 貝爾蒙特、伯林格姆、東帕洛阿爾托、福斯特城、希爾斯堡、門洛派克、聖卡洛斯、聖馬特奧市的居民有均可聯絡特別上門收集計劃 (At Your Door Special Collection) (該公司前身為 Curbside Inc.)，撥打家庭危險廢物收集 800 熱線 800-449-7587，選擇上門收集家庭危險廢物。

可接受材料

- 油性塗料、清漆和染色劑
- 塗料稀釋劑
- 家用清潔劑
- 氣溶膠噴霧罐
- 傢俱和金屬拋光劑
- 農藥及園林化工品
- 游泳池和水療池水處理藥劑
- 攝影化學品
- 藝術類及其他愛好所用化學品
- 汽車配件**
- 廢舊電池 (家用及車用)**
- 其他化學品
- 燃料
- 燒烤用丙烷儲罐
- 含汞物品(熒光燈燈泡*，舊溫度計等)

不接受的材料

- 彈藥
- 石棉
- 生物材料
- 工業產生的廢物
- 電子垃圾
- 炸藥
- 放射性材料
- 壓縮氣體鋼瓶

****無需預約即可將以下廢物送至當地回收機構：**

- **家用電池**
- **老藥物**
- **油漆**
- **螢光燈泡**
- **汽車電瓶**
- **用過的機油**
- **廢機油濾油器**
- **防凍液**

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Spring Cleaning SMC

Sign up to receive e-mail updates for this page

Litter Central | Litter-free Living | Coastal Cleanup Day | Spring Cleaning SMC

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.

Find a Spring Cleaning SMC event below and get out and help keep San Mateo County clean!

City	Event
Belmont	**Event:** Belmont Earth Day Cleanup **Organizer:** City of Belmont Public Works **Date:** Saturday, April 20, 2013 **Times:** 9:00am - Noon **Contact:** Diane Lynn, dlynn@belmont.gov, 650-595-7425 **Website:** www.belmont.gov **Details:** Creek and On-Land Trash Cleanup. Meet at City Hall. Volunteers are encouraged to bring their own reusable bucket and gloves. **Event:** Document Shredding **Organizer:** City of Belmont Public Works **Date:** Saturday, April 20, 2013 **Times:** 9:00am - 1:00pm **Contact:** Diane VanZant, dvanzant@belmont.gov, (650) 595-7460 **Website:** www.belmont.gov **Details:** Document shredding will be held in the front parking lot of City Hall- One Twin Pines Lane. **Event:** E-waste Recycling **Organizer:** City of Belmont Public Works **Date:** Saturday, April 20, 2013 **Times:** 9:00am - 1:00pm **Contact:** Diane VanZant, dvanzant@belmont.gov, (650) 595-7460 **Website:** www.belmont.gov **Details:** An E-Waste station will be set up in the front parking lot of City Hall-One Twin Pines Lane. **Event:** Booth Staffing Volunteers Needed **Organizer:** City of Belmont Public Works **Date:** Saturday, April 20, 2013 **Times:** 8:30am - 1:30pm **Contact:** Diane Lynn, dlynn@belmont.gov, 650-595-7425 **Website:** www.belmont.gov **Details:** Staff volunteers will help set up and staff the booths, sign in participants and hand out materials. **Event:** Free Compost - Bring Your Own Bucket **Organizer:** City of Belmont Public Works

	Date: Saturday, April 20 & Sunday, April 21, 2013 **Times:** 8:00am - 5:00pm **Contact:** Diane VanZant, dvanzant@belmont.gov, (650) 595-7460 **Website:** www.belmont.gov **Details:** Compost will be available for pickup at the rear of Belmont City Hall parking lot.
Brisbane	**Event:** Habitat Restoration Work Day at San Bruno Mountain State and County Park **Organizer:** San Bruno Mountain Watch and San Mateo County Parks **Date:** Saturday, April 20 **Times:** 10 a.m. – 12:30 p.m. **Contact:** Ken McIntire at (415) 467-6631 **Website:** www.mountainwatch.org or www.SMCoParks.org **Details:** Call (415) 467-6631 for specific meeting location. Bring water, wear sturdy, closed-toe shoes and layered clothing.
Burlingame	**Event:** Keep Burlingame Beautiful **Organizer**: Nancy Locke **Date:** Ongoing **Times:** 8am to 10am, typically on Sat. or Sun. **Contact:** nancy.locke@sbcglobal.net or 650-340-9647 **Website:** http://www.burlingame.org/index.aspx?page=938 **Details:** Adult volunteers needed to help pick up trash, pull weeds, and/or transplant cuttings of existing groundcover. Before joining an Adopt-a-Highway event, volunteers MUST undergo safety orientation -- which simply means viewing Caltrans' "AHA Safety" CD and obtain the Caltrans-issued protective gear. Call Nancy Locke at 650-340-9647. Volunteers may bring their gardening tools and gloves. Meet at the parking lot at 1210 Rollins Road at Nerli Lane.
Daly City	**Event:** Earth Day Drop Off Event **Organizer:** City of Daly City and Allied Waste **Date:** April 20, 2013 **Times:** 9:00 am to 2:00 pm **Contact:** (650) 756-1130 **Details:** Daly City Residents only. Located at Mussel Rock Transfer Station, 120 Westline, Daly City. DC residents may drop off recyclables, appliances, scrap metal, mattresses, electronics, small kitchen appliances, batteries, bulbs, used motor oil and filters. NO Household Hazardous Waste accepted. Call for limits on the above-listed items. **Event:** Earth Day Cleanup **Organizer:** David Sondergeld **Date:** April 20, 2013 **Times:** 10:00 am to 11:00 am **Contact:** (415) 602-7847 **Details:** Meet at north side of horse stables off Olympic Way in Daly City. Some bags and gloves are available, but best to bring your own bucket and gloves. Please confirm attendance beforehand.
Half Moon Bay	**Event:** Wavecrest Clean Up Day **Organizer:** Coastside Land Trust **Date:** June 8, 2013 **Times:** 10am - Noon **Contact:** Eric Rutledge (eric@coastsidelandtrust.org) (650-726-5056) **Website:** www.coastsidelandtrust.org **Details (including meeting location):** Meet at Smith Field Little League Park at the end of Wavecrest Road in Half Moon Bay. Sign in at 9:45. Wear layers, sturdy shoes, and sun protection. Light refreshments.
East Palo Alto	**Event:** Be Seen Keeping it Clean! **Organizer:** City of East Palo Alto **Date:** Friday, April 19, 2013 **Times:** 7:00am - 8:30am **Contact:** Michelle Daher, mdaher@cityofepa.org, 650-853-3197 **Website:** http://www.ci.east-palo-alto.ca.us/ **Details:** SPUbcli and private schools in the community. See the above website for details. **Event:** National Rivers Cleanup Day **Organizer:** City of East Palo Alto **Date:** Saturday, May 18, 2013 **Times:** 9:00am - Noon **Contact:** Michelle Daher, mdaher@cityofepa.org, 650-853-3197 **Website:** http://www.ci.east-palo-alto.ca.us/ **Details:** San Francisquito Creek cleanup. Meet at corner of Woodland Avenue and Manhattan Avenue. Parking nearby. Poison oak protection: wear long pants and shirt sleeves along with close-toed shoes. Bring your own bucket and gloves, or disposables wilol be provided.
Millbrae	**Event:** Arbor and Earth Day **Organizer:** City of Millbrae **Date:** Saturday, April 27,2013 **Time:** 10:00am to noon **Contact:** Shelly Reider, sreider@ci.millbrae.ca.us, (650) 259-2444 **Website:** www.ci.millbrae.ca.us/sustainablemillbrae **Details:** Meet at Central Park on Palm Avenue. Activities include cleaning up litter, planting trees and flowers, and helping with park improvements.
Pacifica	**Event:** Earth Day of Action/Festival **Organizer:** Pacifica Beach Coalition **Date:** Saturday, April 20, 2013 **Times:** 9am - 11:30am **Contact:** TBD **Website:** http://www.pacificabeachcoalition.org/ **Details:** Beach, street, parking lot cleanups, gardening, and restoration events, over 50 sites, 9-11:30am. Earth Day Celebration 11:30am to 3pm in the Linda Mar Beach south parking lot.

	Event: Habitat Restoration Work Day at San Pedro Valley Park **Organizer:** Friends of San Pedro Valley Park and San Mateo County Parks **Date:** Saturday, April 20 **Times:** 9 a.m. - Noon **Contact:** Park at (650) 355-8289 **Website:** www.SMCoParks.org **Details:** Meet in front of the Park Visitor Center at 9 a.m. Bring work gloves, hats, water and sunscreen.
Portola Valley	**Event:** Neighborhood Clean-Up Day **Organizer:** Town of Portola Valley, GreenWaste and Goodwill **Date:** Saturday, May 4, 2013 **Times:** 8am - 11am **Contact:** Brandi De Garmeaux, bdegarmeaux@portolavalley.net, 650.851.1700 ext. 222 **Website:** Portola Valley Neighborhood Clean-Up Day **Details:** Town of Portola Valley residents only. Portola Valley residents may drop off large appliances, scrap metal, mattresses, electronics, construction & demolition debris, wood waste. NO Household Hazardous Waste accepted. The Town of Portola Valley and GreenWaste have also partnered with Goodwill to incorporate a "Give 'n Go" station. Check website above for specifics. A Sheriff's Office Deputy will also be at the event to collect prescription drugs.
Redwood City	**Event:** Spring Cleanup **Organizer:** City of Redwood City Pride and Beautification Committee **Date:** Saturday, April 20, 2013 **Times:** 8:30am - Noon **Contact:** Crystal Tuifua **Website:** TBD **Details:** Meet at Public Works: 1400 Broadway Street, RWC. Breakfast at 8:30am and BBQ at Noon to be served to all volunteers. More details here. **Event:** Habitat Restoration Work Day at Edgewood Park and Natural Preserve **Organizer:** California Native Plant Society and San Mateo County Parks **Date:** Saturday, April 20 **Times:** 9 a.m. - Noon **Contact:** Drew Shell at shell@corp.webtv.net or Paul Heiple at pheiple@gmail.com **Website:** http://edgewood.thinkersrus.net or www.SMCoParks.org **Details**: Meet in front of the Bill and Jean Lane Visitor Center at 9 a.m. Bring work gloves, water and sunscreen.
San Bruno	**Event:** San Bruno Cleansweep **Organizer:** City of San Bruno Beautification Task Force **Date:** Saturday, May 4, 2013 **Times:** 9:00am - Noon **Contact:** Irene O'Connell at IOConnell@ci.sanbruno.ca.us **Website:** http://www.sanbruno.ca.gov/committee_OCSreg.asp **Details:** Check-in begins at 9:00 a.m. at San Bruno City Park near the Rotary Pavilion (Gazebo).
San Mateo	**Event:** Downtown Spring Clean UP **Organizer:** Downtown San Mateo Association and City of San Mateo **Date:** Saturday, April 20, 2013 **Times:** 8am – 12pm **Contact:** Jessica Evans **Website:** http://dsma.org/ **Details:** Volunteers will meet at Central Park at 8am and split into teams to accomplish projects in various locations around the Downtown. All supplies will be provided. A BBQ to thank our volunteers will take place in Central Park following the event. **Event:** Coyote Point Earth Day Bay Side Beach Clean Up **Organizer:** San Mateo County Parks and CuriOdyssey **Date:** Sunday, April 21 **Times:** 10 a.m. - Noon **Contact:** Carla Schoof at: www.cschoof@smcgov.org **Website:** www.SMCoParks.org **Details:** Meet in front of CuriOdyssey Museum in Coyote Point Recreation Area at 10 a.m. Bring your own bucket to use to collect trash. Sunscreen, hats and water are advised. **Event:** Earth Day Recycling Event for City of San Mateo Residents **Organizer:** City of San Mateo **Date:** Sunday, April 28, 2013 **Times:** 9am - 1pm **Contact:** Ron Kasper, rkasper@cityofsanmateo.org, (650) 522-7329 **Website:** www.cityofsanmateo.org **Details:** Earth Day Recycling Event at the Beresford Park parking lot located at 2770 Alameda de las Pulgas. City of San Mateo residents can recycle ewaste (computers, monitors, TV's etc), bring up to three banker boxes of documents for confidential shredding, additionally Goodwill will be on hand to take a large variety items such as clothes, shoes, books, microwaves, small kitchen appliances, and wall art. For further information please see our website.
South San Francisco	**Event:** Colma Creek National River Day Cleanup **Organizer:** County of San Mateo **Date:** May 18, 2013 **Times:** 9:00 am to 12 noon **Meeting Location:** Meet at the end of Belle Aire Road next to Costco in South San Francisco, CA 94080. Park in small parking lot at end of Belle Aire Road or along street. Follow signs to the creek and walk over the pedestrian bridge to the meeting area. **Contact:** Carole Foster, cfoster@smcgov.org, 650-599-1448 **Website:** http://patch.com/N-gzD7 **Brief Description:** Volunteers needed to help pick up trash from Colma Creek at this trash "hot spot".

Want to do more?

Volunteers are needed in every community to start new litter cleanup groups. You don't have to live near a beach or a creek to make a difference. Trash that ends up in those places comes from neighborhood streets, so keeping your neighborhood clean is beneficial. We can provide you with tips for organizing a cleanup and assist with arranging for trash pickup for what you gather. We can also supply bags and gloves for your group. Contact us at pollutionprevention@smcgov.org or (650) 372-6245 for more information. We will post your cleanup event on this page in the spring.

Also, volunteers like yourself help make these cleanup events successful. Join our Pollution Solution Team and get email updates of spring cleanup events taking place around the county. Here's how:

1) Look at the top of this page where there is a red envelope icon and the words "sign up to receive email updates for this page." Select this link.

2) Follow the prompts and enter your email address. This is a free subscription service and you can unsubscribe at any time. Please note: **your information is not shared with any other program, agency, etc, and is strictly confidential.**

3) When this page is updated, you will receive an email with a link to this page so you can see the latest cleanup events happening around the County. Emails begin going out in early March and continue into May.

4) By subscribing to this page, you will also receive email updates for Coastal Cleanup Day in the fall.

If you don't want to sign up, you can always email us at pollutionprevention@smcgov.org for more information.

Municipalities
Member Agencies
New Development
Green Streets & Parking Lots
Trainings and Workshops
Resources
Presentations
Brochures
Pocket Ashtray Pilot Study
Password Protected
Annual Report Guidance
Unfunded Mandates Info
PIP
WAM
ND
TAC
CII
Municipal Maintenance
Trash Work Group
Archive

IPM Pest Control Operators

Integrated pest management, or IPM, is a process you can use to solve pest problems while minimizing risks to people and the environment. IPM can be used to manage all kinds of pests anywhere—in urban, agricultural, and wildland or natural areas. With IPM, you take actions to keep pests from becoming a problem, such as by growing a healthy crop that can withstand pest attacks, using disease-resistant plants, or caulking cracks to keep insects or rodents from entering a building.

Rather than simply eliminating the pests you see right now, using IPM means you'll look at environmental factors that affect the pest and its ability to thrive. Armed with this information, you can create conditions that are unfavorable for the pest.

Some pest control companies also use IPM strategies in their services. There are several that service San Mateo County listed below.

Applied Pest Management Inc / Paratex Termite Landscape and Structural Pest Control (800) 244-1176 email: apm@appliedpestgtmgt.com Offers IPM services, LEED services, general pest control, termite and bird control. Termite treament and repairs	**Performance Pest Management** Structural and Landscape Pest Control (925) 484-3400 Katie@performancepest.com Provides full service pest control, but no termite service.
Dewey Pest Control Structural Pest Control (415) 468-6660 Provides services to eradicate rodents, bed bugs, ants, and roaches	**Power Pest Control** Structural and Landscape Pest Control (650) 349-8323 powerpestcontrol@rocketmail.com Provides full service pest control, but no termite service.
Janet Moyer Landscaping Landscape Pest Control (415) 821-3760 info@Jmoyerlandscaping.com Provides landscape design, installation, and maintenance gardening	**Western Exterminator** Structural Pest Control (650) 579-6565 Jshiloh@West-ex.com Provides full service pest control, including animal trapping

Other Resources to Locate a Pest Management Professional

EcoWise Certified Prevention-based pest control practices. They use their knowledge of how pests live, feed, reproduce and move to effectively solve pest problems.

Green Shield Certified is an award-winning, independent, non-profit certification program that promotes practitioners of effective, prevention-based pest control while minimizing the use of pesticides.

Green Pro Certified offered by the National Pest Management Association (NPMA)

The Bay Area Green Gardener Program educates and certifies residential landscapers in resource efficient and pollution prevention landscape practices. Certified Green Gardeners utilize practical, sustainable landscaping skills to reduce water use, to select the most appropriate plants including California natives, to build nutrient-rich soils by promoting plant's natural cycles, and to prune selectively and properly to compliment the natural form and needs of the plant. They are also trained in integrated pest management and the use of alternatives to pesticides and herbicides.

More Information on Finding a Pest Control Company that Can Prevent Pest Problems

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

555 County Center, 5th Floor
Redwood City, CA 94063
P 650.599.1406 F 650.361.8227 www.flowstobay.org

FOR IMMEDIATE RELEASE
October 22, 2012

Contact:
Matt Fabry
SMCWPPP Coordinator
650-599-1419
mfabry@smcgov.org

ATTENTION SHOPPERS:
CHOOSING LESS-TOXIC HOME & GARDEN PRODUCTS JUST GOT EASIER

Pest management experts now training store employees in San Mateo County

San Mateo County – Making green decisions about home and garden pest management products at the store is now a snap.

Starting this month, San Mateo County shoppers will have a new resource at 4 stores: employees trained by a group of professionals who have gone through a rigorous year volunteering in retail nurseries, hardware stores, and garden centers in order to educate and train store employees about less toxic pest management products and methods.

These professionals, called Integrated Pest Management (IPM) Advocates, have taken courses taught by top experts from the University of California Statewide Integrated Pest Management Program and professionals in the nursery industry. The advocates then spent nearly one year with store managers, buyers, and retail associates training and guiding them towards effective pest management products and techniques with the least impact on the environment. The program was funded by a Pest Management Alliance grant from the California Department of Pesticide Regulation, and the program is getting a boost from new funding from the U.S EPA's San Francisco Bay Water Quality Improvement Fund. "We have a big opportunity here to have our neighborhoods reduce their use of toxic pesticides," said Jared Blumenfeld, EPA's Regional Administrator for the Pacific Southwest.

"This program is really about helping the consumer in San Mateo County. It can be overwhelming to make choices at the store because of the breadth of products available," explains Matt Fabry, of the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), which funds the local implementation of the program. "Home and garden pests can be managed with less-toxic methods. With trained managers and employees, San Mateo County consumers can now get more support in finding less-toxic products. These products effectively manage pests with the least impact on the environment."

- more -

Stores involved in this effort are:

- Home Depot, Colma
- Home Depot, San Carlos
- Orchard Supply Hardware, South San Francisco
- Orchard Supply Hardware, Foster City

All of these stores currently participate in the "Our Water Our World" program that partners with the Bay Area Stormwater Management Agencies Association (BASMAA). This program identifies less toxic garden products on the shelves by using a shelf tag and is accompanied by informative fact sheets for particular pest problems. There are 19 stores in the OWOW program in San Mateo County, and SMCWPPP is working on expanding the training program to all 19 stores.

For more information on less toxic gardening products and water pollution prevention tips, visit BayWise.org. For a list of stores participating in the Our Water Our World program around the Bay Area, please visit ourwaterourworld.org. For a list of stores with the OWOW program in San Mateo County, please go to flowstobay.org.

# # # #

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

County Government Center
555 County Center
Redwood City, CA 94063

P 650.599.1406
F 650.361.8227
flowstobay.org

For Immediate Release
December 4, 2012

Contact: Matt Fabry (650) 599-1419
San Mateo Countywide Water
Pollution Prevention Program

Give the Gift of Clean Water and Air This Holiday Season

San Mateo County, Calif. - Holidays can be a time of excess, but there are simple ways to reduce air and water pollution without reducing the fun. This year, you can have a greener holiday season by following these easy tips from the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP).

When it comes to tree trimming, bring out the heirloom ornaments but forgo flocking the tree with fake snow or tossing on tinsel. Once trees are put out for recycling, these products can be carried by the wind and rain into our neighborhoods and storm drains, negatively impacting our local water ways, air quality and wildlife.

It is important to remember that holiday packaging material such as gift boxes, wrapping paper, and ribbons ultimately end up as waste, which must be disposed of or recycled. But these things can have other negative impacts on our local environment as well. "While holiday gift wrap may not readily come to mind as a water pollutant, it can create serious environmental impacts when burned," says SMCWPPP Coordinator Matt Fabry. "When wrapping paper is burned, soot and other harmful pollutants are emitted. These toxins collect in clouds, roadways, and other surfaces. Rain then flushes them into local creeks, causing stormwater pollution, so we're asking residents to not burn gift wrap. We're also encouraging consumers to avoid buying foil gift wrap. Foil-based wrapping paper is among the worst to burn and isn't recyclable."

Burning wood in fireplaces, woodstoves, chimneys and outdoor fire pits is prohibited during Winter Spare the Air Alerts in the Bay Area. "Burning wrapping paper, boxes and other wrapping materials is illegal anytime, not just when the Air District calls a Winter Spare the Air Alert," said Jack Broadbent, executive officer of the Air District. "Wrapping paper and boxes are often coated with toxic materials that are hazardous when burned. Burning these items causes additional smoke polluting our homes and our communities."

RecycleWorks of San Mateo County encourages residents to go green this holiday season by using creative gift giving or gift wrap alternatives such as decorated boxes, scarves, or recyclable bags. They're creative and fun, and good for the environment. Giving the gift of an experience, such as tickets to a movie, a sporting event, or gift cards to your favorite restaurant is a great way to reduce your waste this holiday season—no gift wrap is required!

Visit www.RecycleWorks.org for other great green gift ideas. If you do chose to use wrapping paper, make sure you can recycle it!

- MORE -

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

County Government Center
555 County Center
Redwood City, CA 94063

P 650.599.1406
F 650.361.8227
flowstobay.org

Tips for a green holiday season:

- *Use reusable ornaments or natural items to decorate your Holiday Trees.* A few ideas are popcorn and pinecones. Try to avoid flock and tinsel.

- *If purchasing a live tree*, find a great place to plant it in your yard or keep it in a planter so you can use it year after year.

- *Get creative with gift wrap alternatives.* Place a gift with in a gift, or in a reusable shopping or tote bag instead of paper. Or, go old school and use newspaper comics to make gifts more fun and the wrapping recyclable.

- *If you must use gift wrap,* avoid foil-based papers. Make sure to recycle used gift wrap—don't burn it!

- *Check before you burn wood!* Call 1-877-4-NO-BURN to find out if a Spare the Alert is in effect.

For more tips on greening your holidays, visit www.RecycleWorks.org
For more tips about preventing water pollution, visit www.flowstobay.org .

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

2000 Alameda de las Pulgas, Suite 100
San Mateo, CA 94403
P 650.372-6245 F 650.627-8244 www.flowstobay.org

FOR IMMEDIATE RELEASE
August 20, 2012

Contact:
Matt Fabry
SMCWPPP Coordinator
650-599-1419
mfabry@smcgov.org

California Coastal Cleanup Day Organizers Prepare for Tsunami Debris

San Mateo County – The 28th Annual California Coastal Cleanup Day, the state's largest volunteer event, will take place on Saturday, September 15th, 2012. Local volunteers will have dozens of sites to choose from, including inland creeks, bayside parks, and coastal beaches. This year's event will also provide one of the first opportunities for Cleanup organizers to measure a baseline of debris on our shores that may have washed up as a result of last year's devastating tsunami in Japan.

After the massive earthquake and tsunami struck Japan in March, 2011, the Japanese Government estimated that as much as 1.5 million tons of debris may have washed out to sea. The West Coast has already begun to feel the impacts of that debris, as items as small as a soccer ball and as large as a 100-ton pier have washed ashore north of the California border. With over 57 miles of coastline, San Mateo County expects to see its share of unusual items.

"Volunteers always record the items they least expected to find while cleaning the beaches and creeks. They pull an amazing array of things from the sand and the mud, from office furniture to a phone booth. But most of the litter comes from everyday upstream sources – homes and businesses, parking lots and uncovered truck loads – rather than from a tragic event thousands of miles across the ocean," notes Matt Fabry, coordinator of the San Mateo County Water Pollution Prevention Program (SMCWPPP).

The challenges posed by everyday litter – cigarette butts, plastic bags, food wrappers - are daunting enough. Watershed groups and other environmentally-minded organizations hold cleanups around the County throughout the year, working to keep litter from reaching the Bay and ocean. Local cities work diligently as well, picking up parks and cleaning out storm drains, attempting to meet Federal water quality permit requirements. Coastal Cleanup adds a unique element, bringing the most County residents out on one day and collecting a data 'snapshot' of the problem.

Last year, over four thousand volunteers collected more than 25,000 pounds of trash and recyclables at over 30 sites around the County in the event's short time window of **9 AM to Noon.** To find all of this year's sites, along with tips for safe and waste-free participation, visit www.flowstobay.org/ccd

# # # #

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

Coastal Cleanup Day

Sign up to receive e-mail updates for this page

Community
Residents
Schools & Teachers
Kids
Stormwater 101
Watershed Map
Watershed Groups Guide
Videos
Calendar of Events
Community Action Grant
Program Materials
Newsletter
Community Outreach
Too Toxic To Trash
Yard, Garden, and Landscape
Pest Control
Litter Prevention
Automotive Care
Green Streets & Parking Lots
Used Oil Recycling

About Coastal Cleanup Day

Coastal Cleanup Day (CCD) is an annual beach and waterway clean up held on the third Saturday of September. It is California's largest volunteer event and brings community awareness to cleaning up and protecting our marine environment.

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) coordinates CCD in San Mateo County in conjunction with the California Coastal Commission, Ocean Conservancy, and many local partners.

Cleanups are held all over San Mateo County beaches, creeks, rivers, waterways and neighborhoods. *Click here to find information about last years results*.

See photos from 2012 and past events and read about our **2012 results!**

Schools and Classrooms

Schools and classrooms can get involved too! A perfect way to teach young people about the problem of litter in their local environment. SMCWPPP encourages teachers to conduct a school area cleanup during the month of September and will be a registered site with CCD. We will provide all the supplies you need and count your students among the thousands that participate in this cleanup worldwide. If your school or classroom is interested in participating in a cleanup, please contact pollutionprevention@smcgov.org or 650-372-6245 for more information.

How Do I Volunteer?

- **Coastal Cleanup Day**
  Third Saturday of September
- **Where**
  Over 30+ sites in San Mateo County. Site listings available in August before Coastal Cleanup Day.
- **Prepare for the event**
  - *Sign the waiver form.* Although there will be waiver forms at each cleanup location, you can print and sign the waiver form now (your check in will be faster). All volunteers under the age of 18 must have the waiver form signed by a parent or legal guardian before participating in a cleanup.
  - Wear comfortable closed-toe shoes and sunscreen, and be ready to work and have fun!
  - *Bring Your Own* (BYO) buckets, gloves and reusable water bottle. Help reduce your footprint at the event.

Keep Car Wash Pollution Out of the Storm Drain

The car is clean but what about the ocean?

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.

CLIP AND SAVE!

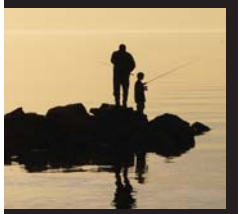
CAR WASH DISCOUNT COUPON

ENJOY A ONE-TIME-USE DISCOUNT AT CAR WASHES LISTED ON THE BACK!

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

EXPIRATION DATE: DECEMBER 31, 2014

Practice Good Car Care



The best option. Taking your car to a commercial car wash or spray booth is the best option as all of the dirty water is sent to a wastewater treatment plant. Not only do you reduce pollution, you will save water. A commercial car wash uses less water than you would at home. Even better is to choose a commercial car wash that is ***"waterless."*** They use products that are non-toxic and generate no wasted water. Avoid fundraiser car washes if you observe wash water flowing into the street or storm drain.

The attached coupon will provide you will a discount at ***15*** local commercial car washes located in San Mateo County.

At home, wash your vehicle on the grass or gravel. If you wash your car or truck at home, wash it where the wash water can soak into grass, gravel, or be diverted to nearby landscaping, away from the street and storm drains. Use rags to wipe brake dust off of wheels before washing.

Minimize cleaners. Reduce the amount of soap used. Wash your car with plain water, and use a hose nozzle with a trigger to save water. Use soaps, cleaners and detergents that are labeled phosphate free or biodegradable. Remember, any soap, even biodegradable, is not allowed to go into the storm drain because it takes longer to break down in water and harms aquatic life in the process. Pour your bucket of soapy water down the sink when you are done. Even better is to try a ***"waterless"*** approach. There are new products on the market that use no more than a cup of water to wash your entire car!

Find out more at: www.flowstobay.org/autocare

BURLINGAME
Auto Pride Car Wash $2 off any wash
1095 Carolan Drive 650-342-0743
Eagle Car Wash $1 off car wash w\purchase of 8 gal. fuel
177 California Drive. 650-344-6284

DALY CITY
Westlake Touchless $5 off Super Wash
247 87th Street 650-992-5344

FOSTER CITY
Foster City Touchless $5 off Super Wash
390 Foster City Boulevard. 650-638-9274

HALF MOON BAY
Half Moon Bay Shell $3 off full service wash
201 San Mateo Road 650-726-4457

MENLO PARK
Ducky's $5 off Supreme/Deluxe/Super Wash (#120)
1436 El Camino Real. 650-838-9000

MILLBRAE
Millbrae Express $5 off Plus Exterior Wash ($8 value)
310 Adrian Road 650-692-2345

REDWOOD CITY
Redwood City Car Wash 50% off any Car Wash Package
20% off any Auto Detail Service
215 El Camino Real. 650-365-6690
Eco Green Auto Clean FREE Car Wash w/membership sign up
2801 El Camino Real. 650-216-6600
Auto Pride Car Wash $2 off any wash
909 Woodside Road 650-306-1072

SAN CARLOS
Ducky's $5 off Supreme/Deluxe/Super Wash (#120)
1301 Old County Road 650-637-1301
Auto Pride Car Wash $2 off any wash
195 El Camino Real 650-591-4638

SAN MATEO
San Mateo Car Wash 50% off any Car Wash Package
20% off any Auto Detail Service
221 E. Hillsdale Boulevard 650-350-1122
Ducky's $5 off Supreme/Deluxe/Super Wash (#120)
716 N. San Mateo Drive 650-375-8100

SOUTH SAN FRANCISCO
South City Car Wash $5 off any car wash service
988 El Camino Real. 650-589-1214

Fall 2012

P3 POLLUTION PREVENTION POST

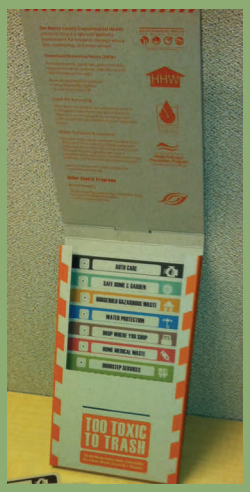
YOUR NEWS AND INFORMATION SOURCE ABOUT: RECYCLING, POLLUTION PREVENTION, LESS TOXIC PRODUCTS

What's New?

Flowstobay.org has information available in Spanish and Chinese now! Our Community and Business pages have been condensed and translated so everyone can get information about preventing pollution, keeping your yard and garden clean and other information. There is also a quick stop to report illegal dumping. Check it out!

Door-to-door pick-up of household hazardous waste (HHW) is here for unincorporated areas of San Mateo County. If you live in the following County franchised areas, you now have a free HHW pick-up program available to you. The service areas include: Burlingame Hills, San Mateo Highlands and Baywood Park (Crystal Springs area), Harbor Industrial, Devonshire Canyon, Palomar Park, Oak Knoll, Kensington Square, Emerald Lake Hills, Sequoia Tract, Trailer Ranchero and North Fair Oaks. Information on what is accepted can be found at: www.rethinkwaste.org

Too Toxic Too Trash guide gets a face-lift! San Mateo County has a new guide available for residents looking for information on how to dispose of your household hazardous waste, used oil and filters recycling, stormwater pollution prevention, and safe home and garden techniques. For your own copy, contact us at: (650) 372-6200 or pollutionprevention@smcgov.org.



Come Join Us For Coastal Clean Up Day

Saturday, September 15
9am to noon

Join San Mateo County on the 28th anniversary of California's largest volunteer event by helping us clean up our beaches, waterways, lakes and marinas. These locations have historically been collection spots for trash and debris and if not removed, can be harmful to marine wildlife and human health.

Last year in San Mateo County, 4,178 volunteers picked up 25,436 pounds of trash and recyclables from our beaches, inland waterways, parks and neighborhoods. We continue to look for amazing volunteers to help make this event a success year after year.

Coastal Cleanup Day is a great way for families, students, service groups, and neighbors to join together to take care of our fragile marine environment, while showing community support for our shared natural resources. *Continued on page 4*

Be The Street You Want To See

"Be the Street" is a Bay Area campaign committed to keeping our community clean because nobody likes litter and pollution on our streets. It's about the benefits of owning and enjoying your community. Be the Street is about coming together with other people who not only care about a beautiful Bay Area but are doing things about it. So what can *you* do?

- Check out the website at *www.bethestreet.org* and the Facebook page at *www.facebook.com/bethest*
- Sign up for the quarterly e-Newsletter (under the "News" tab on their website) for information on what's going on with the program, upcoming opportunities to engage with other participants and general community updates. *Continued on page 4*

BE the street

CONTENTS

BYOB: Bring Your Own Bag

On Coastal Cleanup Day, you can BYOB – Bring Your Own Bucket. There's also Bring Your Own Bottle of water - to that event and many others. And there's even Bring Your Own Beverage mug to the coffee shop. So why not add Bring Your Own Bag to the list?

Choosing to carry a reusable item is a small step that makes a big difference over time. When fewer single-use water bottles, coffee cups, and plastic bags are needed, the decrease saves energy in manufacturing and transportation. And that's before we even get to the step of worrying about making sure they get safely into the garbage can or recycling bin.

By making sure that fewer plastic bags enter our community, we eliminate several serious hazards they create.

- Getting stuck in garbage and recycling machinery, causing costly work stoppages.
- Clogging storm drains and littering our streets, parks, creeks, and beaches.
- Blowing or drifting out to the Bay or ocean, and harming wildlife.

As it considers whether to ban single-use plastic bags at local stores, San Mateo County is sizing up just how much our plastic bag use affects our quality of life here. The Draft Environmental Impact Report (DEIR) can be found at www.smchealth.org/bagban

You don't have to wait for government to act, though. Start bringing your own bag with you whenever you shop, and you'll make a difference each time!

Visit our website for tips on living plastic bag free and preventing all types of litter. www.flowstobay.com/litter

Join Us On Our Social Media Sites!

Have you found flowstobay on social media? Get up-to-date news and information, links to videos and photos from the pollution prevention team.
And feel free to ask us questions!

Follow us on Twitter: @flowstobay
Like us on Facebook! www.facebook.com/flowstobay
See us on YouTube! www.youtube.com/flowstobay

We look forward to interacting with you!

Bag Facts

- Disposable plastic bags used every 5 minutes in America : **60,000**
- Disposable plastic bags used by Bay Area residents each year: **3.8 billion**
- Expected local reduction due to the proposed BYOB ordinance: **95%**
- Countries with laws restricting the use of free plastic bags by retailers: **at least 29** (including 7 in Africa, 7 in Asia, Australia, 12 in Europe, and 2 in South America)

- California cities or counties with bans: **19** (including our neighbors San Francisco and San Jose)
- Cities considering using the County's proposed BYOB ordinance language for a regional approach:**18** in San Mateo County, 6 in Santa Clara County
- How many bags get recycled? Nationally, **1%**. For California, **<5%**

Used Oil and Filter Recycling is Recyclicious!

RECYCLE USED OIL

Do you change your own oil? Know what to do with your used oil and filters when you're done?

If you change your own oil or know someone that does, always remember that the oil and filter are recyclable.

San Mateo County has over 60 locations, including many service stations, quick lubes and auto shops that accept used oil and filters for free from residents. Some even take back antifreeze and car batteries, too, All of which, including oil and filters, are not allowed in the garbage.

To get the word out, the County contracted with One World Communication to create videos in English and Spanish that educate residents on the importance of used oil and filter recycling, where to recycle, and what happens to recycled used oil and filters.

Find recycling locations and the videos on our website: www.flowstobay.com/usedoil

Do You Know Your Used Oil and Filter Curbside Options?

Did you know that most of San Mateo County's waste haulers offer single family residents a curbside recycling program for used motor oil and filters? Well, they do.

Check the chart on the right and see if your local hauler offers this free program.

Be sure to check with your hauler for limitations and how used oil and filters are to be accepted.

And always remember to NOT mix oil with any other substances such as water, antifreeze, paint, gasoline, or other solvents. Your used oil must be free of contaminants in order to be recycled.

Contaminated oil is only accepted at the Household Hazardous Waste facility. To make an appointment, call (650) 363-4718 or visit www.smchealth.org/hhw.

Company	Phone Number	Area Serviced
Allied Waste of Daly City (MOTOR OIL ONLY) www.alliedwastedalycity.com/	(650) 756-1130	Daly City, Colma
Allied Waste of Half Moon Bay (MOTOR OIL ONLY) www.alliedwastehalfmoonbay.com	(650) 592-2411	City of Half Moon Bay
GreenWaste www.greenwaste.com/	(650) 568-9900	Towns of Portola Valley and Woodside
Recology of San Mateo www.recologysanmateocounty.com	(650) 595-3900	Atherton, Belmont, Burlingame, East Palo Alto, Foster City, Hillsborough, Menlo Park, Redwood City, San Carlos, San Mateo, and Unincorporated San Mateo
South San Francisco Scavenger www.ssfscavenger.com	(650) 589-4020	Brisbane, Millbrae and South San Francisco

Coastal Clean Up Day (con't)

Participants learn about the impacts of marine debris and how we can prevent them.

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) is in its seventh year coordinating Coastal Cleanup Day in San Mateo County and we make it super easy.

All you have to do is pick a local cleanup location – find locations on our website (www.flowstobay.org/ccd), show up and clean up! What a better way to spend a Saturday than helping your community!

SMCWPPP will also continue to focus on reducing waste at this year's cleanup by asking volunteers to "Bring Your Own (BYO)" buckets, gloves and reusable water bottle to help reduce our overall footprint for the event.

We hope to see you September 15!

Spotlight – Used Oil Collection Program

On the intersection of 17th Ave. and Palm in San Mateo you will find one of the over 60 locations in the County that collects used motor oil from residents. But did you know they've been doing it for almost 20 years?

Reeds Auto Service has been on this corner for almost 40 years and continues to be a great partner with San Mateo County's Used Oil Program, which they see as a good ecological deed for residents.

Bob Reed worked in gas stations most his life when opportunity came to start his own shop at the corner of 4th Ave. and Delaware when he was 23. With little money and a big loan, Reed started the business there and moved eight years later to its current location. Over 45 years later, Reed is still there, working on cars with his son Jimmy, now the manager, while wife Randi pitches in behind the scenes.

About forty years ago Bob bought a hydraulic press (picture on left) for the shop and at the time he also decided it would make a great filter crusher. When filters are crushed, up to 700 of them can fit into a 55 gallon drum – uncrushed only nets 250. That's what we call maximizing the use of resources. Even the next generation get involved, helping crush the many filters they generate and collect from the public.

Reed's was recently featured as one of the locations in our recent oil and filter recycling educational videos (more information on page 3).

Thanks Reeds Auto Service for helping the public by taking back used oil, filters and car batteries for recycling for free!

Be the Street (con't)

issues from designs to general interest. The YRC helps guide Be the Street!

- For 16-24 year olds: Be part of the youth video contest! There are tons of prizes (cash and otherwise). Find more information on the website. Also, for youth who are very interested in an ongoing role, apply to become part of the Youth Resource Council (YRC.) The YRC answers questions regarding all manner of

- Be sure to properly dispose of waste where it belongs! Our community belongs to us – own it! And talk with your friends about keeping the community clean.

Be the Street is all about community, ownership, and action!

Check out all the latest information at www.bethestreet.org.

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Spring 2013

P3 POLLUTION PREVENTION POST

YOUR NEWS AND INFORMATION SOURCE ABOUT: RECYCLING, POLLUTION PREVENTION, LESS TOXIC PRODUCTS

What's New?

Don't Forget to Recycle Your Filters

After an oil change, you recycle your oil. But did you remember to recycle that filter, too?

Filters contain small amounts of oil; and the steel in the filters can be recycled.

San Mateo County is giving out an oil filter recycling container to County residents who change their own oil. For your own container, email us at pollutionprevention@smcgov.org.

Over 60 locations in San Mateo County collect used oil filters from the public and some cities collect them curbside as well. Find out how to recycle oil and filters at our website: www.flowstobay.org/usedoil

Also check our website for **Filter Exchange events** this spring!

New Car Wash Discount Coupons are Now Available

There are 15 San Mateo County car washes participating in the program, with a variety of discounts available.

The coupons are valid for two years. By using them you will prevent car wash pollution from entering the storm drains near your home.

Send an email with your name and address to pollutionprevention@smcgov.org and we will mail one to you!

What's The Bag Deal?

Starting April 22, single-use shopping bags will be a thing of the past in most of San Mateo County. The Reusable Bag Ordinance goes into effect April 22 and applies to all retailers in County unincorporated areas and cities that have adopted the County's ordinance.

The ordinance requires retailers to stop giving out single-use plastic bags and instead only offer recycled-content paper or reusable bags for a charge of 10 cents per bag.

To avoid the charge, residents can bring their own reusable bag when out shopping. Help conserve resources, reduce litter, protect marine wildlife, and prevent waste!

Find more information about the ordinance and educational materials at our website: www.smchealth.org/bagban.

Bring Your Own Bag Tips:

- Keep reusable bags in the car, your purse, backpack, at work or in other areas where you will remember to take them to the store.
- Don't use reusable grocery bags for other purposes, such as carrying books, laundry or gym clothes.
- Regularly clean your bags. Most fabric/cloth bags can be washed in the washing machine. Wipe other bags with a sponge and mild soap and line dry to keep clean.

Help Keep San Mateo County Clean!

Do you want to help clean up your community in just a few hours? Not sure how to find out what cleanups are planned? Go to Spring Cleaning SMC on flowstobay.org!

The Spring Cleaning SMC web page lists the many spring cleanups taking place all over San Mateo County between March 21 and June 21.

These cleanups are important because wind and rain from winter storms can blow or flush trash into curbside gutters and landscaping. This trash can be captured during a spring cleanup before it ends up entering the storm drain. In some cases, trash that has ended up in ditches and creeks can be captured before it ends up in the bay or ocean.

Spring cleanups also remind neighbors to not litter as they are out and about throughout the summer.

The cleanups are a nice complement to Coastal Cleanup Day, which happens on the third Saturday in September. *Continued on page 2*

I Recycle My Oil and Filter. What About My Antifreeze?

Do-It-Yourselfers already know the right thing to do after an oil change is to recycle used oil and filters at a collection center or on the curb (if pick up service is available). But did you know that antifreeze from your car is also recyclable?

Waste antifreeze contains heavy metals such as lead, cadmium, and chromium in high enough levels to make it a hazardous waste and not allowed in regular trash.

Recycling antifreeze is cost effective and saves resources. Ethylene glycol, a primary ingredient of antifreeze, is produced from natural gas, a non-renewable resource.

To recycle antifreeze, contaminants such as heavy metals are removed. Then the liquid is reconditioned and restored with additives that contain critical antifreeze properties. The process costs less than producing virgin antifreeze.

For a list of antifreeze recycling locations, go to www.flowstobay.org/antifreeze.

If you accidentally mix your antifreeze with your used oil, the oil's now contaminated and must be dropped off only at the County's Household Hazardous Waste Facility. To make an appointment, call (650) 363-4718 or visit www.smchealth.org/hhw.

Check Your Car's Number!

The old standard of changing your oil every 3,000 miles is no longer the norm. Today's new technologies allow many newer cars to go longer between oil changes. Some vehicles can go 5,000, 7,000 or even 10,000 miles between oil changes under normal driving conditions.

"Checking your number" and changing your motor oil according to manufacturer recommendations can help lower the nation's motor-oil demand and thus save resources. In addition, it will save you money.

To see when your car needs a regular oil change, go to CalRecycle's Check Your Number website. www.checkyournumber.org.

Spring Cleaning SMC (con't)

By participating in both a spring cleanup and Coastal Cleanup Day, you are helping address the issue of trash twice a year, which makes a significant impact on the health of the creeks, rivers, bay, and ocean. It helps keep city streets clean, too!

Volunteers like you make a huge difference.

For a list of events coming up this spring, visit: www.flowstobay.org/springcleaningsmc.

Come Find Us This Spring

Spring brings many outreach events. Come find us at any of them - a few are listed below. We'll have information about safe gardening techniques, activities for children and much more. We look forward to meeting you!

Find all events at: www.flowstobay.org/calendar.

April 20
Pacifica Earth Day
Linda Mar Beach Parking Lot
1:30am-3:30pm

May 18
National River Cleanup
Colma Creek, South San Francisco
9:00am-Noon

June 8-16
San Mateo County Fair
Sustainable Living Hall

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SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 9

- Parks Maintenance & IPM Work Group Attendance List FY 2012-13
- Integrated Pest Management Workshop – February 27, 2013
  - Agenda
  - Attendance list
  - Summary of workshop evaluations
- Pesticide Source Control Action Effectiveness Evaluation

San Mateo Countywide Water Pollution Prevention Program
Parks Maintenance & IPM Work Group Attendance List FY 2012/13

MUNICIPALITY	REPRESENTATIVE	Contact Information		Attendance		
		Email	Phone	8/28/2012	1/9/2013	4/23/2013
Atherton	Mike Anderson	manderson@ci.atherton.ca.us	650/752-0541			
	Steve Tyler	styler@ci.atherton.ca.us				
Belmont	Daniel Ourtiague	dourtiague@belmont.gov	650/595-7441			
	Jonathan Gervais	Jgervais@belmont.gov				
Brisbane	Don McClymond	dmcclymond@ci.brisbane.ca.us	415/716-0105	✓		
	Joe Friars	jfriars@ci.brisbane.ca.us	650-786-4353		✓	
Burlingame	Greg Foell	gfoell@burlingame.org				
	Bob Disco	bdisco@burlingame.org				
Colma	Phil Scramaglia	phil@csgengr.com				
	Louis Gotelli	Louis.Gotelli@colma.ca.gov	650/333-0295	✓	✓	✓
	Paul Vershull	paul@lorallandscaping.com				
	Brian Dossey	brian.dossey@colma.ca.gov				
Daly City	Paul Thompson	pthompson@dalycity.org	650/991-8006	✓	✓	
	Dennis Bray	dbray@dalycity.org				
	Jesse Myott	jmyott@dalycity.org				
East Palo Alto	Jay Farr	jfarr@cityofepa.org	650/853-3105	✓	✓	
	Michelle Daher	mdaher@cityofepa.org			✓	
Foster City	Dorte Drastrup	ddrastrup@fostercity.org	650/286-3553	✓		
Half Moon Bay	Larry Carnahan	larryC@hmbcity.com	650/726-7177	✓		
	Mark Lander	markl@csgengr.com				
Hillsborough	Gary Francis	gfrancis@hillsca.org	650/375-7506		✓	
	Dave Bishop	dbishop@hillsborough.net				
	Ed Cooney	ecooney@hillsborough.net				
Menlo Park	David Mooney	damooney@menlopark.org	650/330-6794	✓		✓
Millbrae	Ken Crosetti	kcrosetti@ci.millbrae.ca.us				
	John Gianoli	jgianoli@ci.millbrae.ca.us				
Pacifica	Ron Fascenda	fascendar@ci.pacifica.ca.us	650-738-3760			
	A. Clark	clarka@ci.pacifica.ca.us				
	James McNally	mcnallyj@ci.pacifica.ca.us				
	Eric Steele	steelee@ci.pacifica.ca.us				
	Jean Elissetche					✓
	Raymond Donguines	donguinesr@ci.pacifica.ca.us				
Portola Valley	Howard Young	hyoung@portolavalley.net	650/851-1700 x214			
	Tony Macias	tmacias@portolavalley.net				
Redwood City	Valerie Matonis	vmatonis@redwoodcity.org	650/780-7280	✓	✓	✓
	Terence Kyaw	TKyaw@redwoodcity.org				
	Francisco Espinoza	fespinoza@redwoodcity.org	650-280-5094		✓	✓

San Mateo Countywide Water Pollution Prevention Program
Parks Maintenance & IPM Work Group Attendance List FY 2012/13

MUNICIPALITY	REPRESENTATIVE	Contact Information		Attendance		
		Email	Phone	8/28/2012	1/9/2013	4/23/2013
San Bruno	Rene Walsh	rwalsh@ci.sanbruno.ca.us	650/616-7193	✓		
	Jeff Madonich	jmadonich@sanbruno.ca.gov	650/616-7194	✓		
	Danielle Brewer	DBrewer@sanbruno.ca.gov				
San Carlos	Guy Wallace	gwallace@cityofsancarlos.org	650/802-4144			
San Mateo	Debra Bickel	dbickel@cityofsanmateo.org		✓		✓
	Mike Blondino	mblondino@cityofsanmateo.org				
	Bruce Reed	breed@cityofsanmateo.org				
	Dennis Pawl	dpawl@cityofsanmateo.org				
San Mateo Co. Parks	Pamela Noyer	pnoyer@co.sanmateo.ca.us				
	Maria Mastrangelo	mmastrangelo@co.sanmateo.ca.us				
	Sam Herzberg	SHerzberg@co.sanmateo.ca.us				
	Julie Casagrande	jcasagrande@co.sanmateo.ca.us				
SMC Public Wks	Jeff Pacini	JPacini@co.sanmateo.ca.us				
Agriculture Weights and Measures	Jeremy Eide	jeide@co.sanmateo.ca.us	650/363-4700	✓	✓	✓
	Ricard Garcia	rgarcia@smc.gov.org or rgarcia@co.sanmateo.ca.us				
	Joseph Hennen					✓
	Koren Widdel	kwiddel@smc.gov.org				
	Fred Crowder	fcrowder@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			
	Brian Brunelli	brian.brunelli@ssf.net	650/829-3837	✓	✓	
	David Venturini	david.venturini@ssf.net				
	Andrew Arzaga	andrew.arzaga@ssf.net				
Woodside	Eunejune Kim	EKim@woodsidetown.org	650/851-6790			
Regional Bd	Janet O'Hara	JOhara@rb2.swrcb.ca.gov	510/622-5681			
SFEP	Athena Honore					
UCCE/UC IPM	Andrew Sutherland	amsutherland@ucanr.edu	510/499-2930	✓		
EOA	Kristin Kerr	kakerr@eoainc.com	510/832-2852 x122	✓	✓	✓
	Jon Konnan	jkonnan@eoainc.com	510/832-2852 x111			✓
	Vishakha Atre	vatre@eoainc.com	408/720-8811		✓	
SMCWPPP	Matt Fabry	mfabry@smcgov.org	415/508-2134			
	Tim Swillinger	tswillinger@smcgov.org				✓
	Suzanne Bontempo	sbontempo@smcgov.org				✓

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

AGENDA
Integrated Pest Management Workshop
SMCWPPP Parks Maintenance and IPM
Wind Room, Library Community Center
1000 E. Hillsdale Blvd.
Foster City, CA 94404
Wednesday, February 27, 2013
11:00 a.m. – 3:00 p.m.

Lunch *Registration*	11:00 – 11:30
Welcoming Remarks	11:30 – 11:35
Gopher and Squirrel Control Steven Hebert, *Swat Pest Control*	11:35 – 12:05
Adapting and Applying the Central Tenets of IPM to Urban Ecosystems Andrew Sutherland, *UC Cooperative Extension*	12:05 – 12:50
Efficient Turfgrass Irrigation in an IPM Program Ali Harivandi, *UC Cooperative Extension*	12:50 – 1:20
Break	1:20 – 1:30
No Mow/Low Mow Turf Options Ali Harivandi, *UC Cooperative Extension*	1:30 – 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 Work Group Landscape IPM Workshop February 27, 2013			
Attendance List			
	Last Name	**First Name**	**Municpality**
1	Acker	Alan	City of Menlo Park
2	Aizawa	Brian	City of Redwood City
3	Atre	Vishakha	EOA. Inc./ Program Staff
4	Avtonomoff	Bradley	City of Pacifica
5	Braas	Kelley	City of Daly City
6	Cardenas	Jorge	Loral Landscaping
7	Cerini	Larry	City of San Bruno
8	Chavez	Jose	Town of Hillsborough
9	Cipres	Hector	City of Menlo Park
10	Clark	Aren	City of Pacifica
11	Daher	Michelle	City of East Palo Alto
12	Dahl	Clay	Town of Hillsborough
13	Daldrup	Stephen	Veolia Water NA
14	Del Carlo	Matthew	County of San Mateo Parks
15	Dela Cruz	Jesse	City of Daly City
16	DeOliveira	Joao	City of San Bruno
17	Drastrup	Dorte	City of Foster City
18	Duran	Lou	City of San Carlos
19	Eide	Jeremy	SMC Agricultural Weights & Measures/ Speaker
20	Ellisetche	Jean Pierre	City of Pacifica
21	Escoto	Greg	San Mateo County Parks
22	Espinoza	Francisco	City of Redwood City
23	Fa	Matiu	City of Foster City
24	Falzon	Vince	City of Burlingame
25	Fascenda	Ron	City of Pacifica
26	Florez	Joe	County of San Mateo
27	Francis	Gary	Town of Hillsborough
28	Fukudome	Glenn	City of Redwood City
29	Gomba	William	City of Foster City
30	Gostisha	Sheila	County of San Mateo Parks
31	Gotelli	Louis	Town of Colma
32	Gotthardt	Garrett	City of Foster City
33	Grunwald	Kingsley	City of San Mateo Parks
34	Haena	Todd	City of Foster City
35	Hanson	Donald	City of Foster City
36	Harivandi	Ali	UC Cooperative Extension/ Speaker
37	Harmison	Richard	City of Foster City
38	Harmison	Robin	City of Foster City
39	Hebert	Steven	Swat Pest Control/ Speaker

	Last Name	First Name	Municpality
40	Herbert	Dominique	City of Redwood City
41	Hernandez	Manny	City of Foster City
42	Hollis	Mike	City of Redwood City
43	Hummel	Gordon	City of Menlo Park
44	Hurtado	Oswaldo	City of Menlo Park
45	Jimenez	Oswald	City of Foster City
46	Kerr	Kristin	EOA. Inc./ Program Staff
47	Kieffer	Ed	City of Menlo Park
48	Kraemer	Stephen	County of San Mateo Parks
49	Matonis	Valerie	City of Redwood City
50	Matthews	Lindsey	Loral Landscaping
51	Melger	Juan	City of Daly City
52	Mooney	David	City of Menlo Park
53	Moore	David	Neudorff North America
54	Moreno	Leonardo	City of Redwood City
55	Munoz	Genaro	City of Foster City
56	Murphy	Robert	City of Foster City
57	Nicholls	Ed	City of San Bruno
58	Niehuser	Paul	City of San Bruno
59	Ortiz	Andres	City of San Mateo Parks
60	Palmini	Mari	City of San Bruno
61	Paolino	John	Town of Hillsborough
62	Perez	Juan	City of Menlo Park
63	Perez	Leno	City of Menlo Park
64	Pimentel	Scott	County of San Mateo
65	Purido	Mario	City of East Palo Alto
66	Rodricks	Kenneth	Town of Hillsborough
67	Ryan	Matthew	City of Foster City
68	Schroeder	Nazmeen	City of Foster City
69	Soulard	Mark	City of San Mateo Parks
70	St. Martin	Jean	San Carlos
71	Stipp	Randy	City of Daly City
72	Sutherland	Andrew	UC Cooperative Extension/ Speaker
73	Templin	Jeff	City of Daly City
74	Thompson	Paul	City of Daly City
75	Trewin	John	County of San Mateo - Public Works
76	Valencia	Miguel	City of East Palo Alto
77	Valenicia	Alex	City of East Palo Alto
78	Vaplon	Richard	City of Burlingame
79	Vetter	Steve	City of San Bruno
80	Weber	Daniel	City of Foster City

	Last Name	First Name	Municpality
81	Wheeler	Howard	Loral Landscaping
82	Zumba	Tony	City of San Mateo Parks

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

Evaluation Form

Integrated Pest Management Workshop

SMCWPPP Parks Maintenance and IPM
Wednesday, February 27 2012
11:00 a.m. – 3:00 p.m.

79 Attendees
45 Evaluations submitted (57% Evaluation Participation)

What Did You Think of the Following Presentations and Activities?

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

   41 very helpful 4 somewhat helpful □ not helpful

2. **Adapting and Applying the Central Tenets of IPM to Urban Ecosystems** - *Andrew Sutherland, UC Cooperative Extension*

   31 very helpful 12 somewhat helpful □ not helpful

3. **Efficient Turfgrass Irrigation in an IPM Program -** *Ali Harivandi, UC Cooperative Extension*

   39 very helpful 6 somewhat helpful □ not helpful

4. **No Mow/Low Mow Turf Options -** *Ali Harivandi, UC Cooperative Extension*

   38 very helpful 6 somewhat helpful □ not helpful

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

   30 very helpful 10 somewhat helpful □ not helpful

Did this workshop meet your expectations? 43 Yes 1 No

Do you have any structural pest control responsibilities? 12 Yes 31 No

Is <u>structural</u> pest control a responsibility of: (Check all that apply)

Your department: 9

Another department: 9
PW
Building Maintenance
Recreation Department
Building

Please submit at the end of the workshop. ***Thank You for Your Comments!***

Structural pest control services are contracted out: 10
Pest Control
Teminix

Suggestions for future workshop topics:

- Sports Fields diseases and irrigation
- Syberian Wood Rat Control
- None. Already great!
- A bigger facility.
- Alternative ways to reduce chemical use.
- More of the "public" is becoming sensitive to pesticides and even gopher baiting/trapping. Would like to see/learn about drought tolerant type of landscaping. Save on water and water bill keeps going up.
- Everything was good on the topics.
- None.
- Very good.
- More time so speakers aren't rushed.
- Gopher more and bring back Jeremy Eide – Fun and not a sleeper.
- Fertilizing weed control.

General Comments:

- Very good!
- Good job Val and EOA. Thank you! Great lunch.
- Speakers from suppliers like "Target" on New Products?
- Great class and info.
- Location was great.
- Have it earlier in the day.
- Bottled water instead of soft drinks.
- Thank you for CE credits.
- Shorten up the length of time per #2 but very informative. Great Food!
- Will return.
- Very good class. Change seating set up.
- Lunch was great, thanks! Excellent speakers. Better (brighter) projector for the PowerPoints.
- Water Flea, Nematodes, Tiphiid Wasps.
- Steven Hebert always good. Al Harivandi was good as well.
- Need a better sound system. Good food and drinks.
- Steven was great.
- Excellent.
- Excellent presenters.
- Best workshop I've attended in at least five years. Practical speakers and information.
- Great class on gophers and no-mow lawn and regulations = FUN
- I enjoyed the class and I learned something new today.

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

Pesticide Source Control Actions Effectiveness Evaluation

Submitted on behalf of all SMCWPPP Member Agencies in Compliance with Provision C.9.g of the Municipal Regional Permit (Order R2-2009-0074)

September 16, 2013

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List of Abbreviations

303(d) List	List of impaired waters under Section 303(d) of the federal Clean Water Act
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
BOMA	Building Owners and Managers Association
CASQA	California Stormwater Quality Association
CEP	Clean Estuary Partnership
DPR	California Department of Pesticide Regulation
HHW	Household Hazardous Waste
IFMA	International Facility Management Association
LC_{50}	Lethal Concentration 50% - i.e., the dose required to kill half the members of a tested population after a specified test duration
MRP	Stormwater NPDES Municipal Regional Permit (Order R2-2009-0074)
NPDES	National Pollutant Discharge Elimination System
OSH	Orchard Supply Hardware
O&M	Operation and Maintenance
OWOW	Our Water Our World
PCO	Pest Control Operator
PRISM	Pesticide Research and Investigation of Source and Mitigation (Grant Program)
RMC	BASMAA Regional Monitoring Coalition
SFEI	San Francisco Estuary Institute
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SOP	Standard Operating Procedure
SPoT	Stream Pollutant Trend Monitoring Project (Statewide SWAMP)
SWAMP	California Surface Water Ambient Monitoring Program
SWRCB	State Water Resource Control Board
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
WQAS	Water Quality Attainment Strategy
WQO	Water Quality Objective

PESTICIDES SOURCE CONTROL ACTIONS EFFECTIVENESS EVALUATION

1.0 INTRODUCTION

This *Pesticide Source Control Actions Effectiveness Evaluation* addresses the requirements of Provision C.9.g of the Municipal Regional Permit (MRP) (SFBRWQCB 2009) - Evaluate Implementation of Source Control Actions Relating to Pesticides. This provision requires Permittees to:

- Evaluate the effectiveness of the control measures implemented;
- Evaluate the attainment of pesticide concentration and toxicity targets for water and sediment from monitoring data generated via Provision C.8.; and,
- Identify improvements to existing control measures and/or additional control measures, if needed, to attain targets with an implementation time schedule.

The MRP includes requirements associated with pesticides because regulatory agencies have previously identified pesticides as causing water and/or sediment toxicity and impairing beneficial uses of San Francisco Bay Area (Bay Area) creeks and determined that urban stormwater is a likely cause or contributor to the impairment (SFRBWQCB 2009). This report describes the source control measures implemented by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) and its 22 member agencies[1] and provides an evaluation of the effectiveness of the control measures using effectiveness assessment outcomes developed by the California Stormwater Quality Association (CASQA) (CASQA 2007). The effectiveness of pesticide control measure is assessed using both implementation and water quality outcomes, including a comparison to receiving water quality targets. This evaluation also identifies source control measures that SMCWPPP and its member agencies should continue to implement and potential enhancements to assist in achieving targets for pesticide concentrations and pesticide-related toxicity in San Mateo County urban creeks.

2.0 BACKGROUND

2.1. Water Quality Impairment and Bay Area Urban Creeks TMDL

During the early 1990s, organophosphate pesticides were identified as causing water column toxicity in Bay Area urban creeks (SWRCB et al. 1997). The toxicity was observed via bioassays using *Ceriodaphnia dubia*, an indicator organism used in laboratory tests to assess surface water toxicity and evaluate biological community responses. The concentration of diazinon in water samples from urban creeks throughout the Bay Area was often high enough to account for the observed water column toxicity and diazinon was identified as the primary cause of the toxicity.

In May 1999, the U.S. Environmental Protection Agency (USEPA) listed San Francisco Bay and 35 Bay Area urban creeks as impaired by diazinon under Section 303(d) of the federal Clean Water Act (USEPA

[1]SMCWPPP's 22 member agencies are 20 cities/towns, the County of San Mateo, and the San Mateo County Flood Control District.

1998). In 2000, because of growing concerns about the effects organophosphate chemicals have on human health, the USEPA announced an agreement with pesticide manufacturers to remove most products containing diazinon and chlorpyrifos from retail store shelves and end most residential and professional uses by the end of 2004. As a result, urban uses of diazinon and chlorpyrifos declined substantially. These pesticides have generally not been detected in San Mateo County creeks since 2005 (Hladik and Orlando 2008, SFBRWQCB 2008, SMCWPPP 2005a, 2005b, 2006, 2007). The phase-out of diazinon, however, resulted in increased use of alternative pesticides and new pesticides entering the market place. Replacements for organophosphate pesticides included pyrethroids, carbamates and fipronil.

In 2005, the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) adopted the Total Maximum Daily Load (TMDL) and Water Quality Attainment Strategy (WQAS) for diazinon and pesticide-related toxicity in San Francisco Bay area urban creeks (SFRBWQCB 2005). Because it was anticipated that the phase-out of diazinon could lead to the use of other pesticides that could potentially cause toxicity, the TMDL/WQAS targeted diazinon specifically, while concurrently addressing the potential for other pesticide-related toxicity in urban creeks. The following water and toxicity targets were established through the TMDL/WQAS:

- **Toxicity Targets** - no pesticide-related acute or chronic toxicity in urban creeks in excess of 1.0 TU_a or 1.0 TU_c:

  where:

  TU_a = 100 / No Observable Adverse Effects Concentration (NOAEC)

  TU_c = 100 / No Observable Effects Concentration (NOEC)

  NOAEC = statistically significant differences between acute endpoints in sample and control

  NOEC = statistically significant differences between chronic endpoints in sample and control

  NOAEC and NOEC are both expressed as the percentage of a sample in a test container (e.g., an undiluted sample has a concentration of 100%). In both cases, an observable effect must be statistically significant. An undiluted ambient water or sediment sample that does not exhibit an acute or chronic toxic effect that is significantly different from control samples on a statistical basis shall be assumed to meet the relevant target.

- **Diazinon Target** - The one-hour average concentration of diazinon in freshwater shall not exceed 100 ng/l.

As described in the TMDL/WQAS, the goal of the implementation strategy is to eliminate and prevent pesticide-related toxicity in Bay Area urban creeks. The overarching strategy to reach this goal is to encourage pest management alternatives that do not threaten water quality and to discourage the use of pesticides that run off and threaten water quality, which can best be accomplished through the application of Integrated Pest Management (IPM) techniques and the use of less toxic pest control methods (SFBRWQCB 2005). The TMDL includes proposed actions that focus on effective IPM implementation, proactive regulation, education and outreach, and research and monitoring. Requirements included in Provision C.9 of the MRP are consistent with the actions outlined in TMDL/WQAS.

2.2. Pesticide Regulation and Oversight

Several agencies and organizations oversee pesticide use and pesticide discharges. Those with the broadest authorities include the USEPA and the California Department of Pesticide Regulation (DPR). Gaps in pesticide regulatory program implementation allow pesticides to be used in ways that result in discharges that impair beneficial uses in San Francisco Bay Area urban creeks. The role of the Regional Water Board in reducing pesticide-related toxicity in urban creeks is to encourage, monitor, and enforce implementation actions, and to lead by example (SFBRWQCB 2005). Local governments in the Bay Area are responsible for managing urban runoff discharges through Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) permits, but California law generally prohibits these agencies from regulating the registration, sale, transportation, or use of pesticides. SMCWPPP's member agencies are therefore limited in their ability to reduce the concentrations and impacts of pesticides in discharges from stormwater conveyances. Pesticide control measures implemented by member agencies are focused primary on practicing and encouraging IPM and participating in regulatory processes to ensure water quality impacts are considered during the pesticide re-registration and approval process. These control measures are described later in this document.

2.3. Current Use Urban Pesticides of Concern

Currently, pyrethroids, carbamate and fiprinol are the pesticides of primary concern to water quality in Bay Area urban creeks. Depending on their use, pyrethroids can be divided into the following two groups (TDC 2010):

- The "urban high-use pyrethroids" are the pyrethroids most heavily used in urban areas, including: bifenthrin, cyfluthrin (including beta-cyfluthrin), cypermethrin, deltamethrin, esfenvalerate, gamma-cyhalothrin, lambda-cyhalothrin, permethrin, and tralomethrin. These photo-stable pyrethroids are commonly applied outdoors around buildings or on landscaping via broadcast treatments. They may also be used indoors.
- The "other urban pyrethroids" are insecticides commonly used as pet flea treatments, human body treatments, impregnated in fabric, aerosol sprays, foggers, and manhole treatments, including: cyphenothrin, etofenprox, resmethrin, sumithrin, and tetramethrin. These pyrethroids occur primarily in low-concentration formulations like aerosols and foggers and in products designed for indoor use, probably because most (all except the relatively new ether pyrethroid, etofenprox) do not persist when exposed to sunlight.

Additionally, carbarmates and fipronil also pose concerns to water quality, due to increased market share and toxicity to aquatic species (Cary et al. 2004, Chandler et al. 2004).

2.4. MRP Requirements

Provision C.9 of the MRP requires Permittees to implement pesticide toxicity control programs within their jurisdictions to address the use of pesticides that pose a threat to water quality and have a potential to enter their MS4.

Consistent with the requirements of Provision C.9, SMCWPPP's and its member agency's approach to pesticide management focuses on the use of source control and pollution prevention actions that can potentially reduce the use of the "urban high-use pyrethroids." These actions include robust outreach efforts to residents and businesses, and training to municipal staff to provide education and achieve

behavior changes relative to uses of pesticides and less-toxic pest control methods. Local training and regional outreach efforts have been supplemented by monitoring studies to define the problem and track trends, participation in regional efforts to address pesticide regulations (e.g., related to registration) and other issues, and development of local municipal IPM plans.

2.4.1. Source Control Measures

SMCWPPP and its member agencies have implemented source control measures to control pesticide pollution for over 10 years. Source control measures were enhanced, as needed, to meet MRP requirements to reduce pesticide-related toxicity in urban creeks. Currently, source control measures include the following:

- Adopting IPM policies/ordinances and establishing Standard Operating Procedures;
- Training municipal staff on IPM techniques;
- Requiring contractors to implement IPM;
- Participating in regulatory processes to ensure water quality impacts are considered in the pesticide re-registration and approval process;
- Providing free disposal of unused pesticides locally or through the County's Household Hazardous Waste (HHW) Collection Program;
- Conducting public outreach to promote IPM; and,
- Minimizing pesticide use at new and redevelopment sites.

These source control measures are described in detail later in this report.

2.4.2. Monitoring Program

SMCWPPP began implementing a creek water quality monitoring program before the adoption of the MRP. Monitoring consisted of collecting grab samples from selected urban creeks and analyzing for organophosphate pesticides and water column toxicity. The results of this monitoring were summarized in several technical reports submitted to the Regional Water Board (SMCWPPP 2005a, 2005b, 2006, 2007).

With the adoption of the MRP, SMCWPPP began implementing new monitoring requirements as a participant in the Bay Area Stormwater Management Agencies Association (BASMAA) Regional Monitoring Coalition (RMC). Per MRP Provision C.8.c, SMCWPPP performs annual dry season testing of streambed sediments for pesticides and tests the water column and streambed sediments for toxicity during a storm event and dry weather at two creek sites per year, designated through a probabilistic monitoring design (BASMAA 2011a) using standard protocols (BASMAA 2012). The suite of parameters monitored for includes pyrethroid pesticides, carbaryl and fipronil in sediment. Water column toxicity is assessed using three test organisms, *Pimephales promelas* (fathead minnow), *Ceriodaphnia dubia* (a crustacean), and *Selenastrum capricornutum* (a green algae), and sediment toxicity is assessed using *Hyalella azteca* (an amphipod). Water column toxicity and sediment chemistry and toxicity data are analyzed to evaluate potential stressors (including pesticides) that may impact water quality. The monitoring results are compared to WQOs and monitoring trigger thresholds specified in the MRP. Results that exceed WQOs or monitoring trigger thresholds may lead to additional monitoring to confirm or identify stressors and/or sources of impacts and their spatial extents, and/or the implementation of management actions to minimize the impacts associated with urban runoff.

3.0 EFFECTIVENESS EVALUATION

This report evaluates the effectiveness of source control measures implemented by SMCWPPP and its member agencies. The evaluation uses "Outcome Levels" described by CASQA (2007) in the *Program Effectiveness Assessment Guidance Manual* (Guidance Manual). Information on the level of implementation and associated data (e.g., local implementation of IPM Policy, trends in use of pesticides impacting water quality, and number of staff trained in IPM) used to assess the effectiveness of pesticide source controls were obtained from SMCWPPP and member agency Annual Reports. Water quality monitoring data collected by SMCWPPP and other agencies (e.g., Regional Water Board) were also compiled and summarized to assess progress towards the TMDL/WQAS targets described in section 2.1.

3.1. Evaluation Methodology

According to the CASQA Guidance Manual, "outcomes" are the results of implementing a stormwater control measure, program activity or element, or overall program. Each control measure or activity can lead to one or more "Outcome Levels." The six Outcome Levels described in the Guidance Manual are summarized below:

1. **Outcome Level 1: Documenting Activities** – Many specific activities are either prescribed by or established under municipal stormwater permits. The most basic means of assessing effectiveness is to determine compliance with activity-based permit requirements. Level 1 Outcomes may take the form of a simple yes/no answer.
2. **Outcome Level 2: Raising Awareness** – A goal of most stormwater management programs is to increase the level of knowledge and awareness among target audiences. Measuring Level 2 Outcomes is a useful way of gauging whether educational efforts are progressing toward these changes. Various methods and tools, both quantitative and qualitative, are currently utilized to measure changes in knowledge and awareness. These methods generally take the form of surveys and quizzes.
3. **Outcome Level 3: Changing Behavior** – Building on increases in knowledge and awareness, a key focus of stormwater management programs is to effect changes in behavior. Level 3 Outcomes measure the effectiveness of programs in motivating target audiences to change their behaviors and implement appropriate control measures. Methods used to measure behavioral changes include those described above for Level 2 Outcomes and direct observation via site visits and reporting by dischargers or third parties.
4. **Outcome Level 4: Reducing Loads from Sources** – Many activities implemented through stormwater management programs are intended to reduce the loading of pollutants from targeted sources. Load reductions should in turn result in improvements to discharge and receiving water quality. Load reductions quantify changes in the amounts of pollutants associated with specific sources before and after one or more control measures are employed.
5. **Outcome Level 5: Improving Runoff Quality** – A primary focus of stormwater management programs is to reduce pollutants in stormwater and non-stormwater discharges to the maximum extent practicable, and to ensure that these discharges do not cause or contribute to violations of WQOs in receiving waters. Level 5 Outcomes may be measured as reductions in one or more specific pollutants, and may reflect effectiveness at a variety of scales ranging from site-specific to programmatic.

6. **Outcome Level 6: Protecting Receiving Water Quality** – The ultimate objective of stormwater management programs is the protection of water bodies receiving discharges from MS4s. Changes to receiving water and environmental quality may be expressed through a variety of outcomes such as achievement of WQOs and TMDL targets, protection of biological integrity, and beneficial use attainment.

Once the desired outcomes of program implementation have been defined, specific assessment measures are used to determine whether or how successfully a programmatic or water quality outcome has been achieved. They may be qualitative (e.g., yes/no) or quantitative (e.g., % of targeted audience reached, % reduction in a constituent level). All priority outcomes have at least one assessment measure associated with them, but some may have multiple measures.

On a broader scale, there are two general categories of effectiveness assessments: 1) Implementation Assessments; and 2) Water Quality Assessments. These categories of assessments are differentiated by whether the type of outcome is implementation–based or water quality–based. Implementation assessments include those evaluations conducted at levels 1 - 4, and water quality assessments are those conducted at levels 5 and 6. The following sections (3.2 and 3.3) discuss the results of both implementation and water quality assessments conducted to evaluate the effectiveness of pesticide source control measures implemented by SMCWPPP and its member agencies.

3.2. Implementation Assessment Results (Levels 1 - 4)

3.2.1. Adopting and Implementing IPM Policies/Ordinances and Establishing SOPs

The goal of this control measure is to establish structural and landscape pest control guidelines for municipal staff and pest control contractors. Adopting an IPM policy/ordinance demonstrates a local agency's commitment to reducing pesticide use. The effectiveness of this source control measure is assessed at Outcome Levels 1, 2, 3 and 4.

Level 1 - Documentation of Activities

All SMCWPPP member agencies have adopted IPM policies/ordinances and established pesticide application Standard Operating Procedures (SOPs). Many member agencies adopted IPM Policies in 2003. After the MRP was adopted, SMCWPPP developed the San Mateo Countywide Water Pollution Prevention Program Model IPM Policy and a template of pesticide application SOPs. Both of these were used by member agencies to update their local IPM Policies and SOPs. The timeline for adoption of IPM Policies by SMCWPPP member agencies is below:

- Atherton – 2003
- Belmont, Brisbane, Daly City, Portola Valley – 2010
- Burlingame, Colma, Foster City, Hillsborough, Redwood City, San Bruno, Half Moon Bay, San Carlos, San Mateo – adopted 2003, revised and adopted in 2011
- East Palo Alto – 2012
- Menlo Park – 1998
- Millbrae - 2004
- Pacifica - 2011

- San Mateo County –2010, revised and adopted in 2012
- San Mateo – adopted 2003
- South San Francisco – adopted 2010, revised and adopted 2011
- Flood Control District – adopted 2010, revised and adopted in 2012
- Woodside – adopted 2004, updated 2011

Level 2 - Raising Awareness

Staff trainings are used to raise the awareness of and update municipal staff on IPM policies/ordinances and the agency's commitment to using less-toxic pest management techniques. All contractors are made aware of and required to apply pesticides in a manner consistent with IPM policies/ordinances. Additionally, pesticide application SOPs describe the pest control procedures that municipal staff and contractors must follow.

Level 3 - Behavior Change and Level 4 - Source Reduction

One indicator of behavior change and source reduction associated with municipal use of pesticides of concern is the amount of pesticides applied annually by SMCWPPP's member agencies. Member agencies have tracked and reported municipal use of pesticides of concern via their Annual Reports to the Regional Water Board. Available use data were reviewed and a preliminary evaluation conducted to better understand whether pest control practices have changed. The results of the evaluation indicated a reduction in the use of pesticides of concern. For example:

- Seventeen member agencies reported that they have not used any pesticides of concern from FY 2009-10 to FY 2011-12.
- The member agencies that reported using pesticides of concern did so only as a last resort and provided a reason for the use. In most cases, the pesticides of concern were applied in small quantities and the agency indicated that staff was working with the pesticide applicators to reduce or eliminate the use.

3.2.2. Staff Training

The intent of trainings for municipal staff is to: 1) raise awareness of all municipal employees about IPM, and 2) train employees who apply pesticides about the municipality's IPM Policy and/or IPM techniques as appropriate. The effectiveness of this source control measure is assessed at Outcome Levels 1 and 2.

Level 1 - Documentation of Activities

All SMCWPPP member agencies ensure that staff responsible for applying pesticides is familiar with their agency's IPM Policy, SOPs and new and current IPM techniques. Staff attends trainings held by individual member agencies and/or the annual IPM trainings conducted by SMCWPPP, including the following recent trainings:

- Sixty-three municipal staff attended SMCWPPP's Annual Landscape Maintenance IPM Training Workshop held on February 28, 2012 and 79 municipal staff attended SMCWPPP's Annual Landscape Maintenance IPM Training Workshop on February 27, 2013.

- Fifty-four municipal staff attended SMCWPPP's Structural IPM Training Workshop held on November 9, 2011.

Some member agencies also sent staff to trainings held by other organizations (e.g., Pesticide Applicators Professional Association IPM Trainings).

Level 2 - Raising Awareness

The IPM trainings help increase the awareness on IPM techniques. Generally, training content includes topics such as overview of IPM techniques, using IPM for managing pest problems, plant selection to avoid pest problems, and available less-toxic pest control products. By attending IPM and other trainings, municipal staff's awareness of IPM and the use of less toxic pesticides were raised.

The IPM trainings cover a wide range of topics that help increase attendees' awareness of IPM techniques. After each workshop attendees are requested to complete an evaluation form. The positive feedback provided indicated that attendees found the workshops helpful, supporting the notion that the workshops increase awareness among municipal staff. For example:

- SMCWPPP 2013 Annual Landscape Maintenance IPM Training Workshop - 95% of the respondents to the evaluation form said that the workshop met their expectations, 91% of the respondents said that they found the presentation on "Gopher and Squirrel Control using IPM Methods" very helpful, and 87% of respondents said that they found the presentation on "Efficient Turfgrass Irrigation in an IPM Program" very helpful.
- SMCWPPP 2011 Structural IPM Training Workshop - 81% of respondents to the evaluation form said that the workshop met their expectations, 71% said that they found the presentation on "Principles and Practices of Structural IPM" very helpful, and 71% of respondents said that they found the panel presentation on "Roads to Successful IPM Programs" very helpful.

3.2.3. Requiring Contractors to Implement IPM

The goal of this control measure is to ensure that all pest control contractors retained by SMCWPPP member agencies are familiar with the agency's IPM policy and are able to address pest problems using IPM techniques. The effectiveness of this source control measure is assessed at Outcome Levels 1, 2, 3 and 4.

Level 1 - Documentation of Activities and Level 2 - Raising Awareness

All member agencies that use contractors to apply pesticides have either 1) hired contractors that are IPM-certified (e.g., Eco-wise, Green Pro and Green Shield) and/or have taken the Bay-Friendly Landscaper Training or 2) have contract specifications in place that require contractors to follow the IPM Policy and implement IPM.

Level 3 - Behavior Change and Level 4 - Source Reduction

As discussed earlier, a preliminary analysis of the reported pesticide use data indicates that pest control practices have changed leading to a reduction in the use of pesticides of concern by member agency staff and contractors through implementation of IPM practices.

3.2.4. Participation in Regulatory Processes

The goal of this source control measure is to actively participate in regulatory processes to increase the level of consideration given to water quality by regulatory agencies during the pesticide approval and registration process. Improvements to the registration process with regard to water quality will reduce the impact that registered pesticides have on Bay Area water bodies. Active participation by SMCWPPP and its member agencies includes working with regional and state stormwater management organizations (BASMAA and CASQA) to communicate with the USEPA Office of Pesticide Programs and DPR the need to improve the pesticide registration process. The effectiveness of this source control measure is assessed at Outcome Levels 1, 2, 3 and 4.

Level 1 - Documentation of Activities

SMCWPPP program staff participates in the CASQA Pesticide Subcommittee and thereby provides input on regulatory efforts related to pesticides. Additionally, since the early-2000s SMCWPPP has provided funding (via BASMAA) to a CASQA project to track and participate in pesticide-related regulatory processes. This project included the efforts of the CASQA Pesticide Subcommittee (which includes BASMAA representatives) to track regulatory efforts and comment on pesticide re-registrations and maintain other relevant communications with USEPA and DPR through meetings and letters. In 2012 alone CASQA submitted 13 letters to DPR and USEPA on pesticide toxicity issues and pesticide re-registrations.

Level 2 - Raising Awareness and Level 3 - Behavior Change

CASQA efforts, which have been supported and partly funded by SMCWPPP and BASMAA, have raised awareness about water quality-related pesticide issues and led to improvements in the pesticide approval and registration processes at USEPA and DPR. Recent achievements include:

- DPR adopted new California regulations for "Surface Water Protection in Outdoor Nonagricultural Settings" that 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 such as irrigation overflow runs across treated surfaces.
- DPR has agreed that additional reductions in outdoor bifenthrin (a pyrethroid) use, beyond what is required in the above surface water regulations, are warranted because of bifenthrin's significant contribution to water column toxicity in the aquatic environment. 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.
- 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 relevant information will be routed to DPR's Surface Water Program for review and comment.
- 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 include 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 and esfenvalerate), the changes are voluntary until registration reviews are completed.

- In response to comment letters from CASQA and other agencies, USEPA modified its Registration Review Work Plans for fipronil, permethrin, spinosad and imiprothrin. The modified work plans will consider water quality risk associated with urban uses of these pesticides.

Level 4 - Reducing Loads from Sources

DPR's recently adopted California regulations for "Surface Water Protection in Outdoor Nonagricultural Settings" will 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 such as irrigation overflow runs across treated surfaces. Jorgenson (2011) estimated that DPR's new regulations, in combination with new product labeling being implemented at DPR's request, will reduce the amount of pyrethroids insecticides in urban stormwater runoff by 80-90%.

3.2.5. Household and Small Business Hazardous Waste Collection

The goal of this control measure is to prevent illegal dumping and inappropriate disposal of pesticides by providing free and convenient disposal locations to residents and small businesses and conducting related outreach to inform residents and small businesses about the proper disposal of unused pesticides. The effectiveness of this source control measure is assessed at Outcome Levels 1, 2, 3 and 4.

Level 1 - Documentation of Activities

SMCWPPP's member agencies have ensured that adequate pesticide disposal services are available to all residents and small businesses in San Mateo County by participating in the in San Mateo County Health Department's Household Hazardous Waste (HHW) Program and Very Small Quantity Generator (VSQG) Business Collection Program. The HHW Program offers residents the opportunity to dispose of HHW at designated drop-off points or drop-off events free of charge. The VSQG Program provides an inexpensive hazardous waste disposal option to eligible small businesses (and government agencies and non-profits) that generate less than 100 kilograms of waste per month.

HHW Collections are held every Friday and Saturday at the San Mateo County facility (except major holiday weekends). Additional collections are held in several other locations throughout the county. Residents in Belmont, East Palo Alto, Foster City, Hillsborough, Menlo Park, San Carlos, San Mateo and the West Bay Sanitary District can contact Curbside Inc., for a door-to-door HHW collection option.

Level 2 - Raising Awareness and Level 3 - Behavior Change

SMCWPPP's public outreach program is designed to raise awareness of water quality issues and promote behavior change that will reduce water quality impacts on receiving waters. Efforts that raise awareness and promote behavior change relative to using the HHW and VSQG Programs include:

- Many member agencies promote the availability of the HHW Program and VSQG Program on their websites.
- SMCWPPP distributes a HHW brochure at community outreach events. Information is also posted on SMCWPPP's website (www.flowstobay.org).

- The HHW Program serviced approximately 19,729 residents in FY 10-11 and 14,971 residents in FY 2011-12. This indicates that San Mateo residents are aware of the HHW Program and using it to dispose of unwanted pesticides.

Level 4 - Source Reduction

The HHW and VSQG Programs are effective at reducing the amount of pesticides available as a potential source to urban runoff. For example:

- In FY 2010-11, the HHW Program managed 61,932 pounds of poisons,[2] including pesticides.
- In FY 2011-12, the HHW Program managed 63,572 pounds of poisons.

3.2.6. Public Outreach

SMCWPPP's Public Information and Participation (PIP) component has several elements related to pesticides including: 1) informing the general public about stormwater pollution due to pesticides, 2) educating the public on using IPM techniques for pest control and, and 3) helping the public choose the least-toxic pesticides. The PIP component promotes watershed stewardship by educating the public about watersheds, urban runoff issues and pollution prevention. Outreach is conducted through media advertising, outreach events, school presentations, the SMCWPPP website, social networking sites, and partnerships with local businesses and community organizations.

SMCWPPP's pesticide outreach efforts can be broadly divided into the following three categories:

1. **Point-of-Purchase Outreach** – SMCWPPP implements the BASMAA IPM Store Partnership Program (also known as the *Our Water Our World* Program or the OWOW Program) in local retail stores and nurseries. The aim of the OWOW Program is to partner with retail stores and nurseries to provide less-toxic pest control information to residents at the point of purchase. This involves visiting participating stores regularly (at least three times per year) to stock literature racks with "Less-Toxic Pest Management" fact sheets and update "shelf-talkers." Shelf-talkers are product identification tags that are placed on store shelves to help customers identify less-toxic products. In addition, the Program contracts with an IPM consultant to conduct store employee training. These trainings educate store employees on IPM and selling less-toxic products.
2. **Outreach to Residents** – SMCWPPP utilizes media advertising, website postings and distribution of outreach materials at events to educate residents about IPM.
3. **Outreach to Pest Control Operators (PCO) and Landscapers** – SMCWPPP has conducted training classes for landscape maintenance professionals on sustainable landscaping techniques. SMCWPPP has also conducted targeted outreach to structural PCOs on IPM.

The effectiveness of the SMCWPPP public outreach program and its components is assessed at Outcome Levels 1, 2 and 3. Results of the effectiveness assessment are grouped below by the above three pesticide outreach categories.

[2] Poisons as a waste stream includes anything categorized by DOT shipping requirements as a poison including pesticides, herbicides, rodenticides, some fertilizers and many other types of products.

Point-of-Purchase Outreach

Level 1 - Documentation of Activities

Since 1999, SMCWPPP has participated in the regional effort for the OWOW Program by attending all IPM partnership meetings with BASMAA and participating jurisdictions to coordinate the program in San Mateo County. There were 15 stores participating when the program began and there are now 19 stores, including a few smaller hardware stores and nurseries and all Orchard Supply Hardware and Home Depot stores located within the county. From FY 2009-10 through FY 2012-13, SMCWPPP sponsored 18 store employee trainings and trained 130 employees.

Level 2 - Raising Awareness

The employee trainings educate employees on IPM, stormwater pollution problems and how to direct customers toward buying less-toxic products. SMCWPPP is planning to include a survey component in future trainings to obtain employee feedback on the trainings. SMCWPPP also conducted outreach tabling events promoting the OWOW Program to customers at Home Depot and Orchard Supply Hardware. Staff answered questions, educated, and mentored customers at point of purchase for home and garden pest problems, and offered tips and solutions. Staff also provided non-toxic and less-toxic options for problem solving through discussion and distribution of printed OWOW materials and resources, as well as other printed materials with stormwater pollution prevention messages.

Level 3 - Behavior Change

The increase in the number of participating stores and the willingness of store managers to participate in the OWOW Program and send employees to trainings reflects the changing attitude of pesticide sellers toward IPM and the use of less-toxic pest control methods. Regional OWOW Program leaders report an overall increase in sales of less toxic products as a result of the OWOW Program's implementation.

Outreach to Residents

Level 1 - Documentation of Activities

SMCWPPP utilizes media advertising and distribution of outreach materials at events to educate residents about IPM. In addition, information on less-toxic pest control is posted on SMCWPPP's website (www.flowstobay.org). SMCWPPP's web site also has a new web page dedicated to helping the public find IPM certified contractors. To-date, six IPM certified contractors have agreed to be listed on the new web page. The web page also contains links to the OWOW Program, the regional "Got Ants" campaign, and other pest-control resources.

Level 2 - Raising Awareness and Level 3 - Changing Behavior

SMCWPPP's various efforts to educate residents about pesticides and IPM, including media advertising, website postings and distribution of outreach materials at events, raise awareness among residences and lead to increased use of IPM and decreased use of toxic pesticides. In the future SMCWPPP plans to continue promoting IPM-trained operators to the pubic via web promotions, social media, and tabling events.

Outreach to Pest Control Operators (PCOs) and Landscapers

Level 1 - Documentation of Activities

In FY 2009-10 and FY 2010-11, SMCWPPP was a sponsor of the Peninsula Green Gardener Training Program initiated and coordinated by the Redwood City Water Resource Management Program, with the support of the Bay Area Gardeners Association and Bay Area Water Supply and Conservation Agency (BAWSCA). The target audience included landscape maintenance professionals who work within San Mateo County. Three pilot training sessions were held in FY 2009-10, two in Spanish and one in English, and 84 students completed the training. In FY 2010-11, two training sessions were held, both in Spanish. One was a beginning class with 20 students completing 11 sessions of two hours each. The second was an intermediate class with 15 students completing five sessions of three hours each.

In FY 2011-12, the Program obtained a list of PCOs in San Mateo County from the local Agricultural Commissioner. A packet was sent to the PCOs 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 PCOs 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 PCOs. A flyer for this program was also included in the packet.

The packet was sent on January 2012 along with a cover letter that encouraged PCOs to become IPM-certified and to contact SMCWPPP to be part of the new web page (described above) dedicated to helping the public find IPM-certified contractors.

Level 2 - Raising Awareness

The Green Gardener training educates landscape maintenance professionals on soils, IPM, right plant right place, fertilizers and grass cycling, irrigation, IPM, pruning, mulch and compost, and air quality. In addition, attendees are required to take a final test to receive the certificate of completion. This ensures that they understood the curriculum and will be able to implement the practices at their client locations.

Additionally, SMCWPPP will continue providing outreach and education to PCOs in FY 2013-14.

3.2.7. Minimizing Pesticide Use at New and Redevelopment Sites

The goal of this source control measure is to reduce pesticide use by encouraging pest-resistant landscaping and design features in the design, landscaping, and environmental reviews of proposed development projects. The effectiveness of this type of source control is assessed at Outcome Levels 1, 2, and 3.

Level 1 - Documentation of Activities

The SMCWPPP Source Control Measures Guidance and Model List, which is used by member agencies to review development project applications, describes measures that projects can implement to reduce pesticide pollution. Member agencies have incorporated these types of measures into their project review and approval processes. In addition, the SMCWPPP C.3 Data Collection Form lists the following sustainable landscaping techniques:

- Retain existing vegetation as practicable.
- Select diverse species appropriate to the site. Include plants that are pest and/or 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.

The SMCWPPP C.3 Stormwater Technical Guidance includes templates for Operation and Maintenance (O&M) of stormwater treatment measures. These templates include guidance on using IPM to maintain these O&M treatment measures. The templates are posted on the SMCWPPP website and member agencies use them as exhibits to their stormwater treatment measure maintenance agreement. The C.3 Stormwater Technical Guidance includes a list of plants that can be used for stormwater treatment measures, and guidance on planting and maintaining these plants. The recommended plants are non-invasive, California natives that require less water and minimum use of pesticides. The C.3 Stormwater Technical Guidance and the plant list are available on the SMCWPPP website.

In 2009, SMCWPPP developed the "San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook" which describes how streets and parking lots can be designed to manage stormwater using landscape-based treatment measures.

Level 2 - Raising Awareness

SMCWPPP conducts an annual workshop to educate municipal staff about the MRP requirements for new and redevelopment projects. Information on Low Impact Development (LID), green streets, landscaping with native plants, and selecting plants for stormwater treatment measures is typically included in these workshops.

In addition, SMCWPPP conducted a workshop on May 28, 2009 to train municipal staff on using the San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook. Approximately 49 municipal staff attended this workshop. The training video is posted on the SMCWPPP website.

Level 3 - Behavior Change

An analysis of data submitted in SMCWPPP member agency Annual Reports from FY 2009-10 to FY 2011-12 indicates that an increasing number of MRP regulated projects are including sustainable landscaping techniques (e.g., including plants that are pest and/or disease resistant, drought tolerant and or attract beneficial insects, minimizing use of pesticides and quick-release fertilizers, and incorporating Bay Friendly Landscaping design). In FY 2009-10 and FY 2010-11, approximately 12% of the regulated projects included sustainable landscaping techniques as a source control measure. This increased to 31% in FY 2011-12.

4.0 WATER QUALITY ASSESSMENT (LEVEL 6)

Water quality assessments are conducted using monitoring and assessment data that characterize the quality of discharges from stormwater conveyance systems (Level 5) or the chemical, physical or biological condition of receiving waters (Level 6). The available applicable water quality monitoring data in San Mateo County is generally from receiving waters (i.e., pesticide concentrations and toxicity in water and sediment collected from urban creeks). Collecting useful data from stormwater conveyances

is problematic for a number of reasons and as a result these types of data are generally not available. Thus the effectiveness of source control measures is assessed at Outcome Level 6 (Protecting Receiving Water Quality). The origins of the data used in the Level 6 water quality assessment are described below.

4.1. Monitoring Programs with Samples from San Mateo County Urban Creeks

Over the course of the last decade a number of monitoring programs have tested for pesticides and toxicity in water and sediment from San Mateo County urban creeks. SMCWPPP has monitored urban creeks since the early 2000s, consistent with NPDES stormwater permit requirements. This includes measuring the concentrations of pesticides in water and sediment from urban creeks and assessing the degree of toxicity to test organisms exposed to water and sediment.

In addition, California's Surface Water Ambient Monitoring Program (SWAMP) has collected pesticide and toxicity data at a number of sites in San Mateo County urban creeks since 2002. These data have been collected through a number of projects implemented at the regional and statewide scales, including the Regional Water Board's regional SWAMP program, the SWRCB's Statewide Stream Pollutant Trend (SPoT) program and a project conducted by the San Francisco Estuary Institute (SFEI) funded through a California Proposition 13 Pesticide Research and Investigation of Source and Mitigation (PRISM) grant (Lowe et al. 2007). In addition, the concentration of pesticides and extent of toxicity in Bay Area urban creeks were monitored by the Clean Estuary Partnership (CEP) in 2005, including one site in San Mateo County (CEP 2005).

4.2. Pesticides of Concern in San Mateo County Urban Creek Water and Sediment

Each program described above has measured various parameters in water and/or sediment collected from San Mateo County urban creeks. Decisions regarding parameters and sample matrices are informed by project/program objectives, the chemical characteristics of the pesticides of interest, and available resources. For example, water soluble organophosphate pesticides such as diazinon are monitored for in water samples from urban creeks. Concentrations of pyrethroid pesticides, carbaryl and fipronil, however, are generally measured in bedded sediment sampled from urban creeks since these types of pesticides have a higher affinity to adsorb to particles.

4.2.1. Concentrations in Water

Table 1 summarizes the numbers of water samples collected in San Mateo County urban creeks and analyzed for pesticides from 2002 to 2012. These data were generated from the programs described in the previous section. During this timeframe, a total of 56 water samples collected from various sites in urban creeks were analyzed for diazinon. Samples were collected during both storm events and dry weather conditions.

Table 1. Number of water samples collected from San Mateo County urban creeks and analyzed for pesticides from 2002 to 2012.

Monitoring Program	Data Points Collected in San Mateo Urban Creeks per Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SMCWPPP Monitoring Program											
Pre-MRP Monitoring	-	6	7	3	6	-	-	-	-	-	-
BASMAA RMC Monitoring (MRP)	-	-	-	-	-	-	-	-	-	-	-
POC Loads Monitoring	-	-	-	-	-	-	-	-	-	-	-
Surface Water Ambient Monitoring Program (SWAMP)											
Region 2 (SF Bay Region) Monitoring	10	17	-	-	-	-	-	-	-	-	-
Statewide Stream Pollution Trends (SPoT) Program	-	-	-	-	-	-	-	-	-	-	-
PRISM Grant Program	-	-	1	1	-	-	-	-	-	-	-
Clean Estuary Partnership (CEP)											
Urban Pesticide Monitoring Project	-	-	-	1	-	-	-	-	-	-	-
Totals	**10**	**23**	**8**	**5**	**6**	**0**	**0**	**0**	**0**	**0**	**0**

Figure 1 compares concentrations of diazinon in these San Mateo County urban creek water samples to the diazinon concentration target described in the TMDL/WQAS for diazinon and pesticide-related toxicity in San Francisco Bay area urban creeks (SFRBWQCB 2005). The data indicate that diazinon concentrations measured were well below the TMDL/WQAS target. As described previously, in 2000 USEPA announced an agreement with pesticide manufacturers to remove most products containing diazinon and chlorpyrifos from retail store shelves and end most residential and professional uses by the end of 2004.

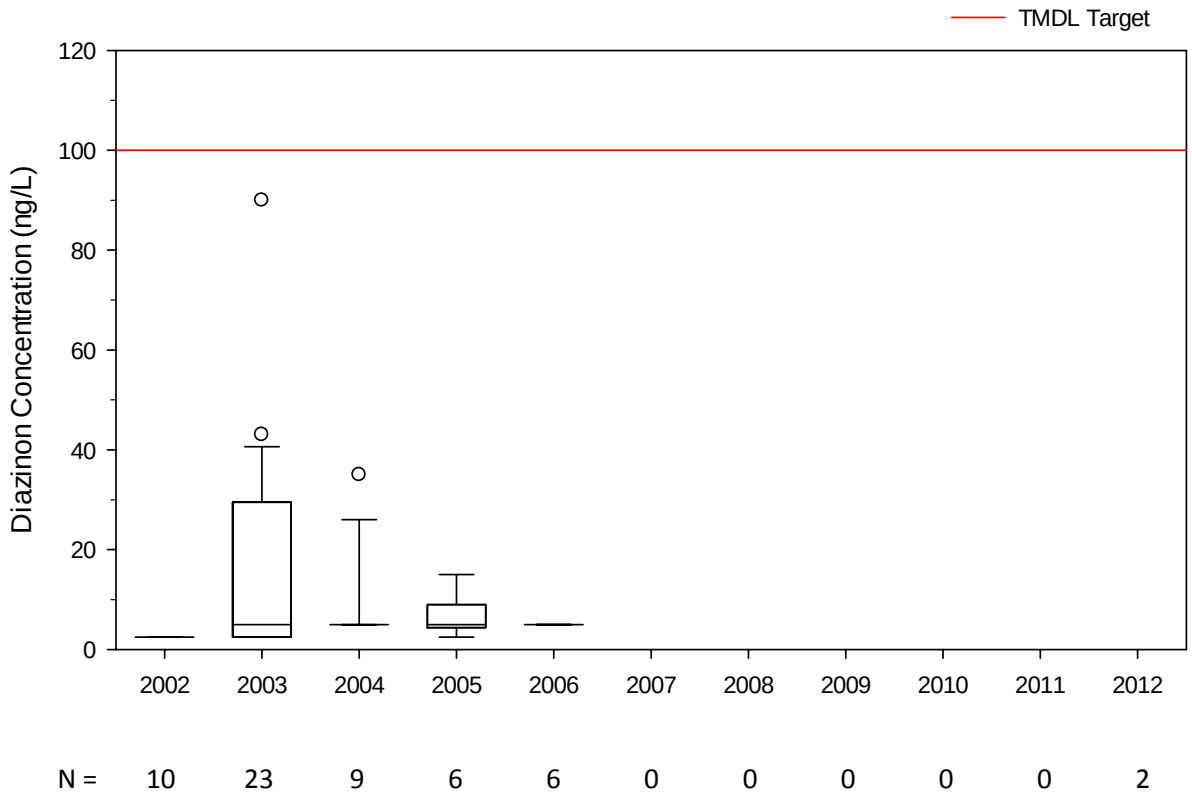

Figure 1. Diazinon concentrations in water samples collected from San Mateo County urban creeks from 2002 to 2012. Redline is the TMDL target for diazinon (SFRBWQCB 2005). Note: ND = ½ MDL or RL (2-15 ng/L).

4.2.2. Concentrations in Sediment

Table 2 summarizes the numbers of bedded sediment samples collected in San Mateo County urban creeks and analyzed for pesticides from 2002 to 2012. These data were generated by the programs described in section 4.1. During this timeframe, a total of 11 sediment samples collected from various sites in urban creeks were analyzed for concentrations of pyrethroids and other types of emerging pesticides. All bedded sediment samples were collected during dry weather conditions.

Table 2. Number of bedded sediment samples collected from San Mateo County urban creeks and analyzed for pesticides from 2002 to 2012.

Monitoring Program	Data Points Collected in San Mateo Urban Creeks per Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SMCWPPP Monitoring Program											
Pre-MRP Monitoring	-	-	-	-	-	-	-	-	-	-	-
BASMAA RMC Monitoring (MRP)	-	-	-	-	-	-	-	-	-	-	2
POC Loads Monitoring	-	-	-	-	-	-	-	-	-	-	-
Surface Water Ambient Monitoring Program (SWAMP)											
Region 2 (SF Bay Region) Monitoring	3	1	-	-	-	-	-	-	-	-	-
Statewide Stream Pollution Trends (SPoT) Program	-	-	-	-	-	-	1	1	1	-	-
PRISM Grant	-	-	1	1	-	-	-	-	-	-	-
Clean Estuary Partnership (CEP)											
Urban Pesticide Monitoring Project	-	-	-	-	-	-	-	-	-	-	-
Totals	**3**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**0**	**2**

Figures 2 through 5 compare pyrethroid pesticide concentrations in these San Mateo County urban creek sediment samples to adverse effects LC_{50} thresholds[3] identified in the literature (Amweg et al. 2005, Maund et al. 2002). Only those data with values measured above method detection limits are presented in the figures. Data presented are normalized to total organic carbon (TOC) since pyrethroids are found primarily in the organic carbon fraction of sediments.

[3]Lethal Concentration 50% - the dose required to kill half the members of a tested population after a specified test duration.

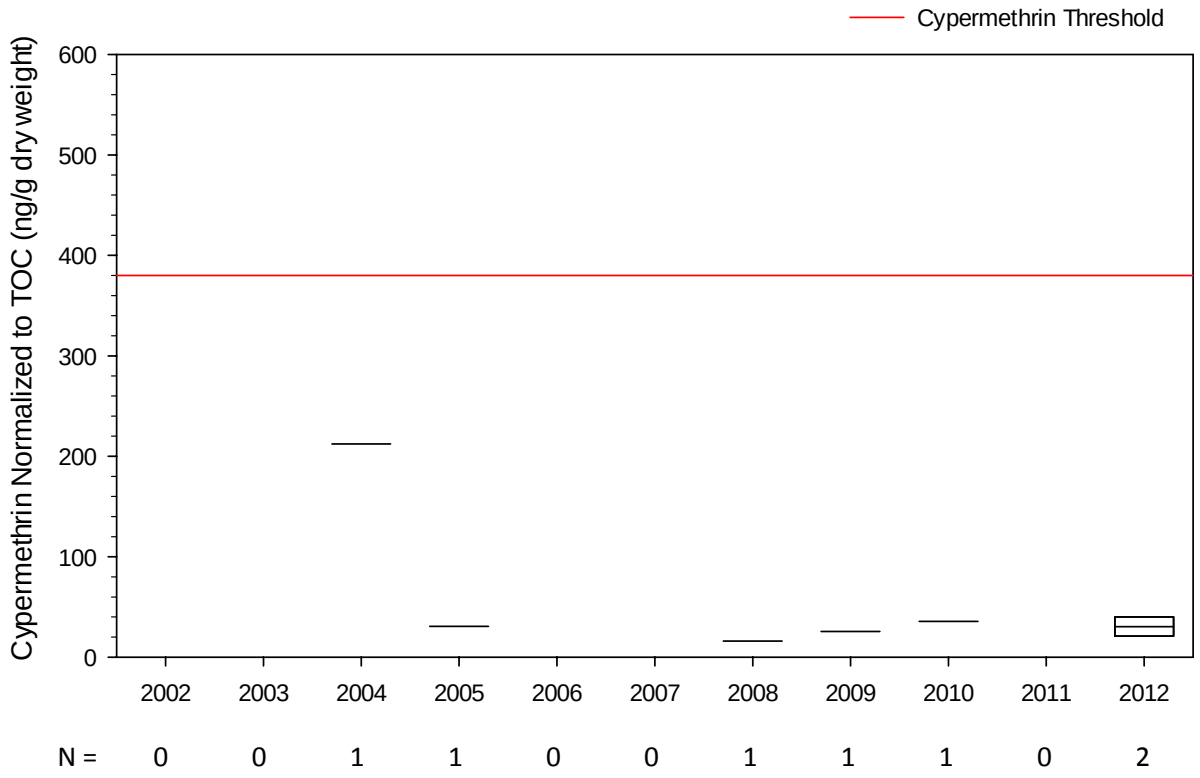

Figure 2. Cypermethrin concentrations in bedded sediment collected from San Mateo County urban creeks from 2002 to 2012. Redline is the adverse effects concentration (i.e., LC_{50}) for *Hyalella azteca* (Maund et al. 2002). Note: ND = ½ MDL (0.06-1 ng/g).

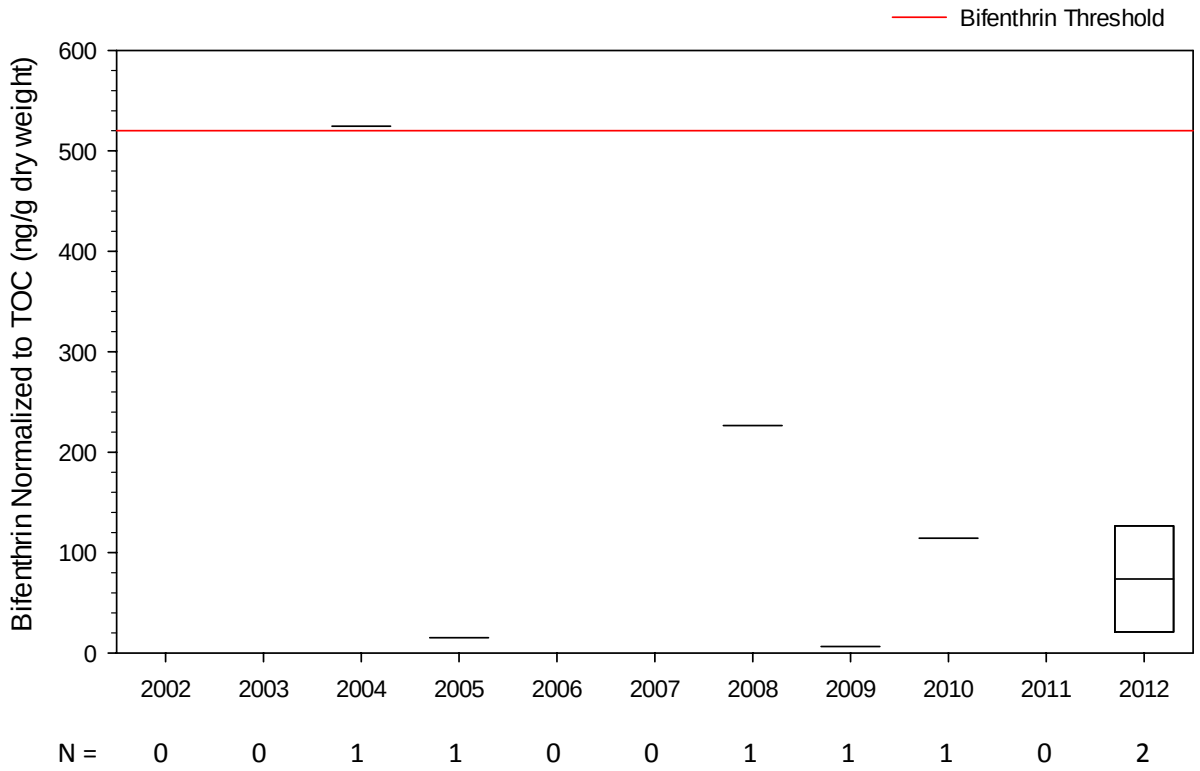

Figure 3. Bifenthrin concentrations in bedded sediment collected from San Mateo County urban creeks from 2002 to 2012. Redline is the adverse effects concentration (i.e., LC_{50}) for *Hyalella azteca* (Amweg et al. 2005). Note: ND = ½ MDL (0.25-5 ng/g).

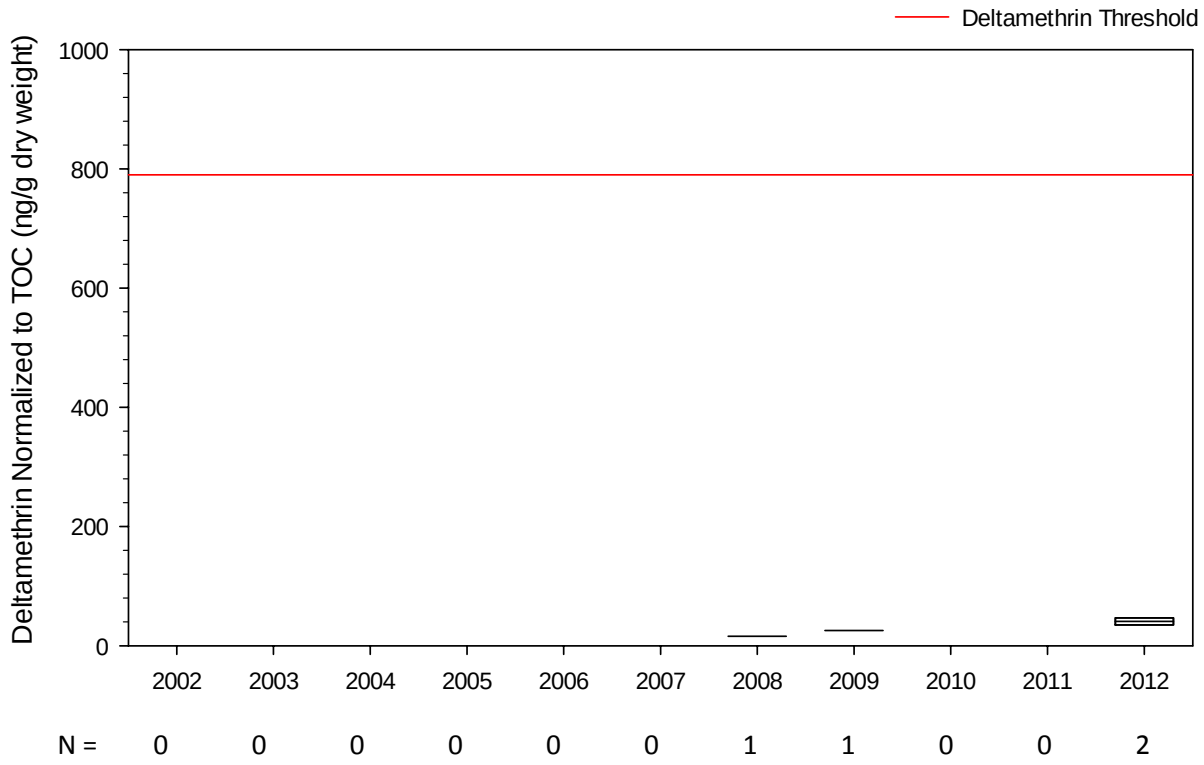

Figure 4. Deltamethrin concentrations in bedded sediment collected from San Mateo County urban creeks from 2002 to 2012. Redline is the adverse effects concentration (i.e., LC_{50}) for *Hyalella azteca* (Amweg et al. 2005). Note: ND = ½ MDL (0.07 – 1 ng/g).

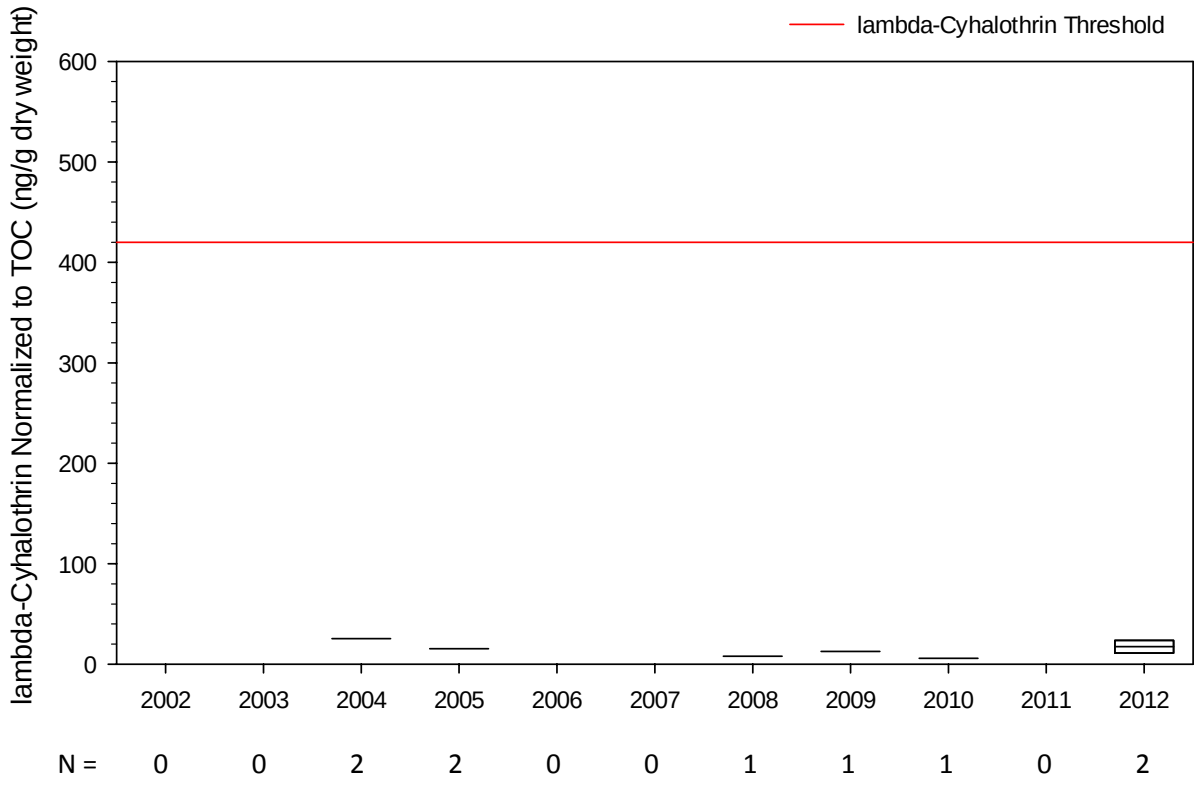

Figure 5. lambda-Cyhalothrin concentrations in bedded sediment collected from San Mateo County urban creeks from 2002 to 2012. Redline is the adverse effects concentration (i.e., LC_{50}) for *Hyalella azteca* (Amweg et al. 2005). Note: ND = ½ MDL (0.0355 – 0.5 ng/g).

Based on the sediment data compiled, pesticide concentrations in sediment samples did not exceed adverse effects thresholds, with the exception of one pesticide analyte in one sediment sample. The concentration of bifenthrin slightly exceeded its LC_{50} in one sample collected in 2004 (Figure 3).

4.3. Toxicity in San Mateo County Urban Creek Water and Sediments

The types of test organisms used in toxicity testing differ between water and sediment and responses vary with exposure to different pesticides. Test organisms *Pimephales promelas* (fathead minnow), *Ceriodaphnia dubia* (a crustacean), and *Selenastrum capricornutum* (a green algae) are typically utilized for testing for acute and chronic toxicity in the water column. *C. dubia* is highly sensitive to diazinon. *Hyalella azteca* (an amphipod) is typically the only organism used to evaluate toxicity in sediments from fresh water creeks and is highly sensitive to pyrethroid pesticides.

4.3.1. Toxicity in Water

Table 3 summarizes the numbers of water samples collected in San Mateo County urban creeks and tested for toxicity to laboratory test organisms between 2002 and 2012. These data were generated by the programs described in Section 4.1.

Table 3. Number of water samples collected from San Mateo County urban creeks and analyzed for toxicity to *Ceriodaphnia dubia* from 2002 to 2012.

Monitoring Program	Data Points Collected in San Mateo Urban Creeks per Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SMCWPPP Monitoring and Assessment Program											
Pre-MRP Monitoring	-	6	7	3	6	-	-	-	-	-	-
BASMAA RMC Monitoring (MRP)	-	-	-	-	-	-	-	-	-	-	4
POC Loads Monitoring	-	-	-	-	-	-	-	-	-	-	-
Surface Water Ambient Monitoring Program (SWAMP)											
Region 2 (SF Bay Region) Monitoring	4	11	-	-	-	-	-	-	-	-	-
Statewide Stream Pollution Trends (SPoT) Program	-	-	-	-	-	-	-	-	-	-	-
PRISM Grant	-	-	-	-	-	-	-	-	-	-	-
Clean Estuary Partnership (CEP)											
Urban Pesticide Monitoring Project	-	-	-	1	-	-	-	-	-	-	-
Totals	**4**	**17**	**7**	**4**	**6**	**0**	**0**	**0**	**0**	**0**	**4**

Figure 6 shows that toxicity to *Ceriodaphnia dubia* (i.e., Toxicity Units > 1.0) was not observed in water samples collected from San Mateo County urban creeks from 2002 to 2012. These results correspond to the timeframe when diazinon was phased out of use in urban areas and further support the hypothesis that *C. dubia* toxicity exhibited in the 1990s was attributable to this organophosphate pesticide.

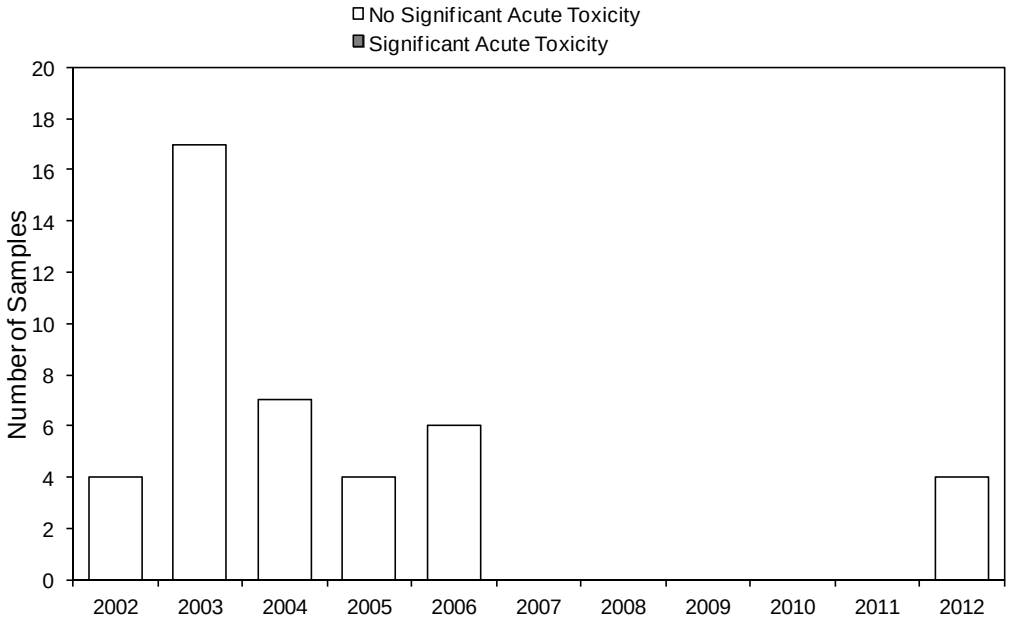

Figure 6. Numbers of water samples collected from San Mateo County urban creeks from 2002 to 2012 that exhibited significant acute toxicity to *Ceriodaphnia dubia*.

4.3.2. Toxicity in Sediment

Table 9 summarizes the numbers of water samples collected in San Mateo County urban creeks and tested for toxicity to laboratory test organisms from 2002 to 2012. These data were generated by the programs described in Section 4.1.

Table 4. Number of sediment samples collected from San Mateo County urban creeks and analyzed for toxicity to *Hyalella azteca* from 2002 to 2012.

Monitoring Program	Data Points Collected in San Mateo Urban Creeks per Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SMCWPPP Monitoring and Assessment Program											
Pre-MRP Monitoring	-	-	-	-	-	-	-	-	-	-	-
BASMAA RMC Monitoring (MRP)	-	-	-	-	-	-	-	-	-	-	2
POC Loads Monitoring	-	-	-	-	-	-	-	-	-	-	-
Surface Water Ambient Monitoring Program (SWAMP)											
Region 2 (SF Bay Region) Monitoring	1	1	-	-	-	-	-	-	-	-	-
Statewide Stream Pollution Trends (SPoT) Program	-	-	-	-	-	-	1	1	1	-	-
PRISM Grant	-	-	1	1	-	-	-	-	-	-	-
Clean Estuary Partnership (CEP)											
Urban Pesticide Monitoring Project	-	-	-		-	-	-	-	-	-	-
Totals	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**0**	**2**

Figure 7 illustrates the number of bedded sediment samples collected from San Mateo County urban creeks from 2002 to 2012 that were significantly toxic (i.e., Toxicity Units > 1.0) to the test organism *Hyalella azteca*. Sediment toxicity was observed in 56% (5 of 9) of samples, which were collected during the timeframe when pyrethroid pesticides gained market share with the phase out of diazinon.

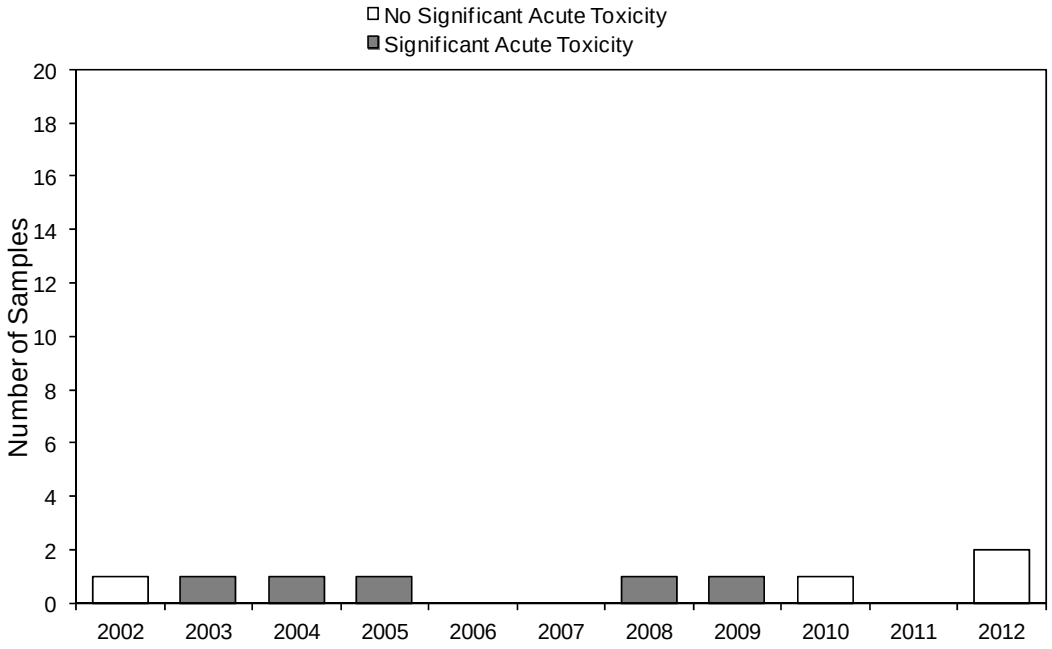

Figure 7. Sediment samples collected from San Mateo County urban creeks from 2002 to 2012 that exhibited significant acute toxic to *Hyalella azteca*.

4.4. Statewide Review of Pesticide and Toxicity Monitoring Data

A recent statewide review compiles and summarizes chemistry data from monitoring performed in urban areas of California (including the San Francisco Bay area) for pyrethroid and fipronil pesticides and related toxicity testing results, covering the ten year period from 2003 to 2012 (Ruby 2013). Over 9,200 pyrethroid sample analysis results and 3,200 fipronil results were evaluated and summarized along with a large amount of toxicity testing data. The author concluded that evidence of the presence and effects of pyrethroids and fipronil, and associated toxic effects in urban watercourses, is widely distributed geographically throughout urbanized areas of California. Furthermore, the author found that pyrethroid-related toxicity has been documented in nearly every major urban watershed in the state.

5.0 CONCLUSIONS

Through the development of this pesticide source control effectiveness evaluation report, SMCWPPP member agencies have complied with the requirements in MRP Provision C.9.g by:

- Evaluating the effectiveness of pesticide source control measures implemented; and,
- Evaluating the attainment of TMDL/WQAS pesticide concentration and toxicity targets for water and sediment.

This section summarizes the conclusions of the evaluation, including source control measures that SMCWPPP and its member agencies should continue to implement and potential enhancements to assist in achieving targets for pesticide concentrations and pesticide-related toxicity in San Mateo County urban creeks.

5.1. Summary of Implementation Assessment Outcomes (Levels 1 - 4)

SMCWPPP member agencies have successfully implemented a number of source control measures consistent with Provision C.9 of the MRP and the TMDL/WQAS implementation plan (see Section 3.2). For example, the following Level 1 through 4 outcomes have been achieved as a result of control measure implementation:

- All SMCWPPP member agencies have adopted IPM policies/ordinances and established pesticide application SOPs. In addition, all member agencies that use contractors to apply pesticides have either 1) hired contractors that are IPM-certified and/or have taken the Bay-Friendly Landscaper Training or 2) have contract specifications in place that require contractors to follow the IPM Policy and implement IPM. These measures, in combination with staff trainings, have led to an increase in awareness about pesticide impacts and a change in behavior by municipal employees and contractors and a corresponding decrease in the use of pesticides of concern on municipal properties.
- Through a collaborative effort with CASQA, formal procedures are now in place 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. As a result of this new process and improvements to product labeling, one estimate is that the amount of pyrethroids in urban stormwater runoff will decrease by 80-90%.
- SMCWPPP's member agencies have ensured that adequate pesticide disposal services are available to all residents and small businesses in San Mateo County by participating in the in San Mateo County Health Department's HHW Program and VSQG Business Collection Program. The HHW and VSQG Programs are effective at reducing the amount of pesticides available as a potential source to urban runoff. For example, in both FY 2010-11 and FY 2011-12, the HHW Program managed more than 60,000 pounds of poisons per year, including pesticides.
- SMCWPPP implements the OWOW Program in local retail stores and nurseries to provide less-toxic pest control information to residents at the point of purchase. There were 15 stores participating when the program began and there are now 19 stores, including a few smaller hardware stores and nurseries and all Orchard Supply Hardware and Home Depot stores located within the county. From FY 2009-10 through FY 2012-13, SMCWPPP sponsored 18 store employee trainings and trained 130 employees. The increase in the number of participating stores and the willingness of store managers to participate in the OWOW Program and send employees to trainings reflects the changing attitude of pesticide sellers toward IPM and the use of less-toxic pest control methods. Regional OWOW Program leaders report an overall increase in sales of less toxic products as a result of the OWOW Program's implementation.
- SMCWPPP's other various efforts to educate residents about pesticides and IPM, including media advertising, website postings and distribution of outreach materials at events, raise awareness among residences and lead to increased use of IPM and decreased use of toxic pesticides. Information on less-toxic pest control is posted on SMCWPPP's website (www.flowstobay.org) and there is a new web page dedicated to helping the public find IPM certified contractors. To-date, six IPM certified contractors have agreed to be listed on the new web page. SMCWPPP has also conducted targeted outreach to structural PCOs on IPM.
- SMCWPPP has conducted training classes for landscape maintenance professionals on sustainable landscaping techniques. SMCWPPP was a sponsor of the Peninsula Green Gardener Training

Program, which educates landscape maintenance professionals on soils, IPM, right plant right place, fertilizers and grass cycling, irrigation, IPM, pruning, mulch and compost, and air quality.

- An analysis of data submitted in SMCWPPP member agency Annual Reports from FY 2009-10 to FY 2011-12 indicates that an increasing number of MRP regulated projects are including sustainable landscaping techniques (e.g., including plants that are pest and/or disease resistant, drought tolerant and or attract beneficial insects, minimizing use of pesticides and quick-release fertilizers, and incorporating Bay Friendly Landscaping design). In FY 2009-10 and FY 2010-11, approximately 12% of the regulated projects included sustainable landscaping techniques as a source control measure. This increased to 31% in FY 2011-12. These data suggest that SMCWPPP and member agency efforts are reducing the potential for water quality impacts attributable to pesticide usage at new and redevelopment projects.

5.2. Summary of Water Quality Assessment Outcomes (Level 6)

Over the course of the last decade a number of monitoring programs have tested for pesticides and toxicity in water and sediment from San Mateo County urban creeks. SMCWPPP has monitored urban creeks since the early 2000s, consistent with NPDES stormwater permit requirements, and other programs have collected additional data, as described in Section 4.1. Based on evaluation of these data, the following Level 6 outcomes were observed:

- The available monitoring data suggest that diazinon is no longer a concern in San Mateo County urban creeks. From 2002 to 2012, diazinon concentrations have been well below the TMDL/WQAS target (i.e., 100 ng/L). In addition, toxicity to *Ceriodaphnia dubia* (i.e., Toxicity Units > 1.0) was not observed in water samples collected from San Mateo County urban creeks from 2002 to 2012. These results correspond to the timeframe when diazinon was phased out of use in urban areas and further support the hypothesis that *C. dubia* toxicity exhibited in the 1990s was attributable to this organophosphate pesticide.
- Pesticides that have gained market share during the past decade (e.g., pyrethroids and fipronil) are a potential concern in San Mateo County urban creeks at this time. Based on the limited sediment chemistry data compiled, pesticide concentrations in sediment samples did not exceed adverse effects thresholds for pyrethroids, with the exception of one pesticide analyte (bifenthrin) in one sediment sample. However, 56% (5 of 9) of bedded sediment samples collected from San Mateo County urban creeks from 2002 to 2012 were significantly toxic (i.e., Toxicity Units > 1.0) to the test organism *Hyalella azteca*. The cause of this toxicity is not known, but this organism is sensitive to pyrethroids and the samples were collected during the timeframe when pyrethroid and other alternative pesticides gained market share with the phase out of diazinon. In addition, a recent statewide review compiled and summarizes chemistry data from monitoring performed in urban areas of California (including the San Francisco Bay area) for pyrethroid and fipronil pesticides and related toxicity testing results, covering the ten year period from 2003 to 2012 (Ruby 2013). The author concluded that evidence of the presence and effects of pyrethroids and fipronil, and associated toxic effects in urban watercourses, is widely distributed geographically throughout urbanized areas of California and pyrethroid-related toxicity has been documented in nearly every major urban watershed in the state.

6.0 RECOMMENDATIONS

Considering the results of this pesticide source control effectiveness evaluation, SMCWPPP and its member agencies should consider implementing the following recommendations beginning in FY 2013/14 to help reduce the impacts of pyrethroids and other pesticides on San Mateo County creeks and the San Francisco Bay estuary:

- **Continue Implementing Local IPM Programs**. SMCWPPP member agencies should continue implementing and as appropriate improving their local IPM Programs to potentially further reduce the use of pesticides of concern.
- **Continue Active Participation in the Regulatory Process**. Since municipal agencies do not have the authority to bans or place significant restrictions on pesticide sales or use within their jurisdiction, it is essential that the SMCWPPPP and member agency representatives continue to collaborate with CASQA to participate in the pesticide approval and registration process.
- **Outreach to Structural Pest Control Operators**. An analysis of pesticide sales and use data available through 2008 from DPR concluded that professional applications of pyrethroids to control pests in and around structures comprise more than 95% of professional urban use of these pesticides. Furthermore, reported professional use remains the vast majority (nearly 90%) of all estimated urban use of "urban high-use pyrethroids" (TDC 2010). Therefore, to reduce pyrethroid use, SMCWPPP and its member agencies should continue conducting and consider enhancing targeted outreach to structural PCOs to encourage them to use IPM techniques and obtain IPM certification.
- **Outreach to Residents**. To bring about a change in the manner that PCOs apply pesticides, it is important that residents who hire PCOs are aware of the water quality impacts of specific types of pesticides and are motivated to hire PCOs that effectively practice IPM, thereby creating a demand for PCOs that provide IPM services. SMCWPPP and its member agencies should continue conducting and consider enhancing outreach to residents regarding the importance of hiring PCOs that provide IPM services.
- **Outreach to Commercial Establishments**. SMCWPPP and its member agencies should consider conducting targeted outreach to commercial establishments to promote the hiring of PCOs that provide IPM services. Targeted outreach materials could be distributed during industrial and commercial facility inspections and though organizations such as the Building Owners and Managers Association (BOMA) and the International Facility Management Association (IFMA).

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SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 10

– Trash Work Group Attendance List– FY 2012-13

Trash Work Group Meeting Attendance – FY 2012/13

Name	Agency	PHONE	E-Mail	Aug 22	Nov 28	Feb 27	Apr 9	May 7
Steve Tyler	City of Atherton		styler@ci.atherton.ca.us					
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
Leticia Alvarez	City of Belmont		lalvarez@belmont.gov					
Alberto d'Jovza	City of Belmont							
Matt Fabry	SMCWPPP Program Coordinator	(650) 599-1410	mfabry@co.sanmateo.ca.us				X	
Shelley Romriell	City of Brisbane	(415) 508-2128	sromriell@ci.brisbane.ca.us	X	X			
Keegan Black	City of Brisbane		kblack@ci.brisbane.ca.us	X			X	X
Karen Kinser	City of Brisbane	(415) 508-2133	kkinser@ci.brisbane.ca.us	X				
Randy Breault	City of Brisbane		rbreault@ci.brisbane.ca.us				X	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					
Stephen Daldrup	City of Burlingame	(650) 342- 3727	Stephen.dalrup@ veoliawaterna.com	X	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	Town of Colma	(650) 333-0295	louis.gotelli@colma.ca.gov	X	X		X	X
Phil Scramaglia	Town of Colma		phil@csgengr.com					
Muneer Ahmed	Town of Colma		Muneer.ahmed@colma.ca.gov				X	
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					
Michelle Daher	City of East Palo Alto	(650) 853-3197	mdaher@cityofepa.org				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		X	X	
Larry Carnahan	City of Half Moon Bay	(650) 636-3753	larryc@hmbcity.com	X	X	X		X
Mo Sharma	City of Half Moon Bay		mosharma@hmbcity.com					
Mark Lander	City of Half Moon Bay		markl@csgengr.com				X	X
Gary Francis	Town of Hillsborough		gfrancis@hillsborough.net				X	
Catherine Chan	Town of Hillsborough	(650) 579-3353	cchan@hillsborough.net	X	X	X	X	X
Rebecca Fotu	City of Menlo Park	(650) 330-6740	rfotu@menlopark.org	X	X	X		
Vanessa Marcadejas	City of Menlo Park	(650) 330-6768	VAMarcadejas@menlopark.org				X	X
Craig Centis	City of Millbrae	(650) 259-2369	ccentis@ci.millbrae.ca.us					
Mike Killigrew	City of Millbrae		mkilligrew@ci.millbrae.ca.us	X		X	X	X
Heather Henwood	City of Millbrae	(650) 259-2374	hhenwood@ci.millbrae.ca.us			X	X	X
Raymund Donguines	City of Pacifica	(650) 738-3767	donguinesr@ci.pacifica.ca.us					
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	(650) 738-3775	Maub@ci.pacifica.ca.us	X			X	X
Howard Young	Town of Portola Valley		hyoung@portolavalley.net					
Ray Bartolo	City of Redwood City		rbartolo@redwoodcity.org					

Name	Agency	PHONE	E-Mail	Aug 22	Nov 28	Feb 27	Apr 9	May 7
Terrance Kwan	City of Redwood City	(650) 780-7466	TKyaw@redwoodcity.org				X	
Gino Quinn	City of San Bruno	(650) 616-7160	gquinn@sanbruno.ca.gov	X	X			
Robert Wood	City of San Bruno		rwood@sanbruno.ca.gov				X	
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					
Lou Duran	City of San Carlos	(650) 863-6782	lduran@cityofsancarlos.org	X				
Debra Bickel	City of San Mateo	(650) 522-7343	dbickel@cityofsanmateo.org	X	X		X	
Shelli St. Clair	City of San Mateo	(650) 522-7342	sstclair@cityofsanmateo.org	X				
Larry Patterson	City of San Mateo		lpatterson@cityofsanmateo.org				X	
Rob Lecel	City of So. San Francisco	(650) 829-3882	rob.lecel@ssf.net					X
Cassie Prudhel	City of So. San Francisco	(650) 829-3840	cassie.prudhel@ssf.net					
Shoshana Wolff	City of So. San Francisco	(650) 829-3880	shoshana.wolff@ssf.net					
Andrew Wemmer	City of So. San Francisco	(650) 829-3883	andrew.wemmer@ssf.net	X			X	
Gratien Etchebehere	Town of Woodside	(650) 851-6790	getchebehere@woodsidetown.org	X				
Stephen Fischer	County of San Mateo - DPW	(650) 599-7281	SFischer@co.sanmateo.ca.us					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					
Steve Balestieri	County of San Mateo					X		
Tim Swillinger	County of San Mateo-Environmental Health	(650) 372-6245	tswillinger@co.sanmateo.ca.us					
James Counts	SMC Mosquito and Vector Control District	(650) 642-4846	james@smcmad.org					
Chindi Peavey	SMC Mosquito and Vector Control District	(650) 344-8592	cpeavey@smcmad.org					
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	
John Fusco	EOA, Inc.	(510) 832-2852 X 130	jrfusco@eoainc.com	X	X		X	
Kristin Kerr	EOA, Inc.	(510) 832-2852 X 122	kakerr@eoainc.com				X	
Kristine Corneillie	LWA/City of San Mateo	(408) 261-3996	KrisC@lwa.com					X
Brad Donohue	Town of Colma	(650) 757-8888	Brad.donohue@colma.ca.gov					
Diane Cannon	City of Brisbane	(415) 508-2130	dcannon@ci.brisbane.ca.us					X
Rich Chaffey	City of Redwood City		rchaffey@redwoodcity.org					
No. Attending				**27**	**19**	**15**	**31**	**21**

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Water Pollution
Prevention Program

Appendix 15

- Water Utility Training Work Group Attendance – FY 12-13
- Planned Potable Water Discharge Fact Sheet
- Planned Potable Water Discharge to Storm Drain Fact Sheet
- Unplanned Potable Water Discharge to Storm Drain Fact Sheet
- Planned, Unplanned and Emergency Discharge Fact Sheet
- C.15.b. Water Utility Workshop: "Field Implementation of Stormwater Requirements for Water Utility O&M Discharges" – Novemeber 13, 2012
  - Agenda
  - Attendance list
  - Summary of workshop evaluations

Water Utility Training Work Group Attendance – FY2012/13

Agency	Name	Phone	Email	9/5/12
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	Russell Narahara	650.780.7475	rnarahara@redwoodcity.org	✓
	Terence Kyaw		tkyaw@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	✓

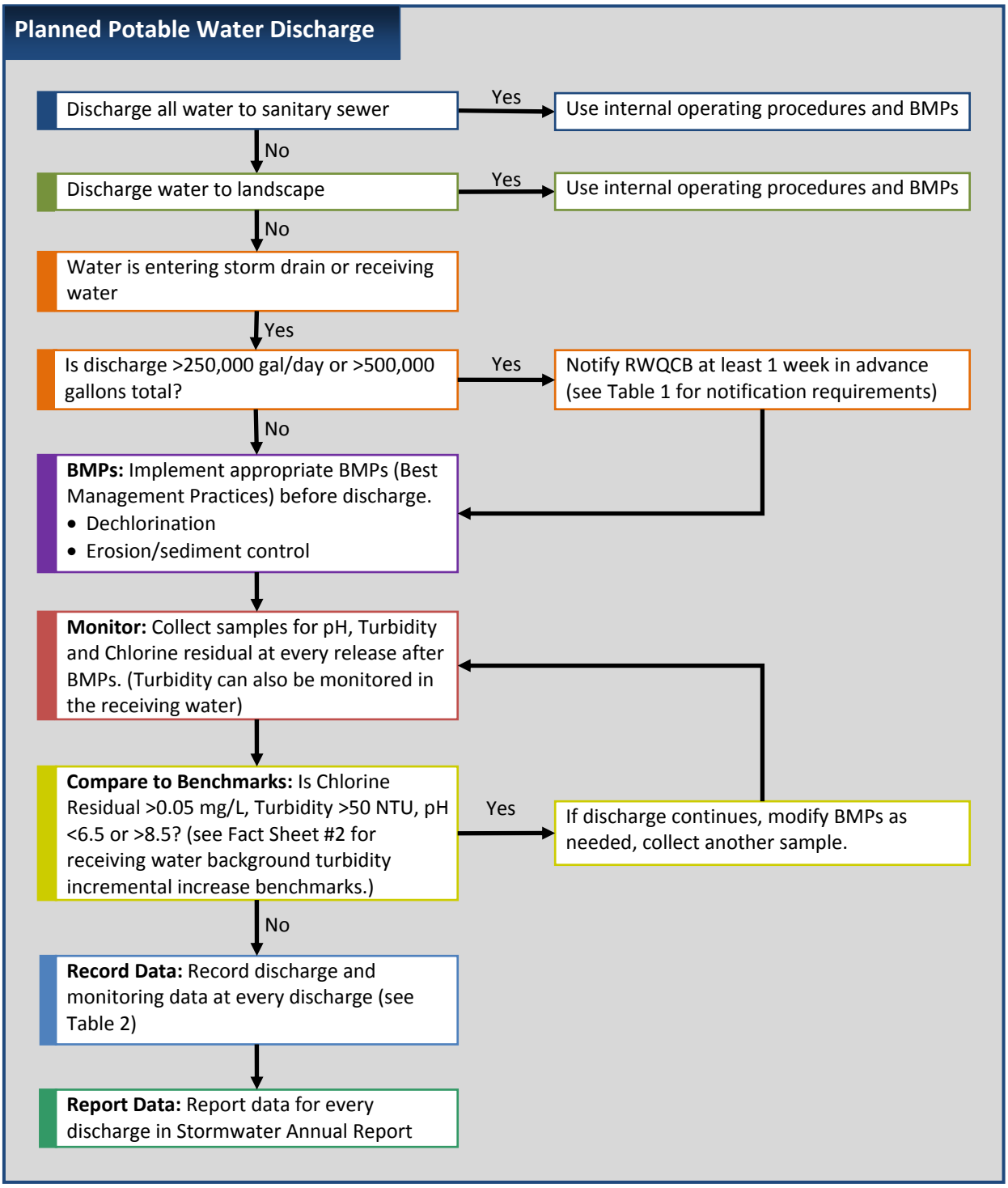
Planned Potable Water Discharge

San Francisco Bay Municipal Regional Stormwater NPDES Permit (MRP)
Provision C.15.b.iii. (1)

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

Types of O&M activities:

- **Blowoff/hydrant flushing**
- **Unidirectional hydrant flushing**
- **Storage tank discharges (maintenance or cleaning operations)**
- **Valve replacement**
- **New service line installation**



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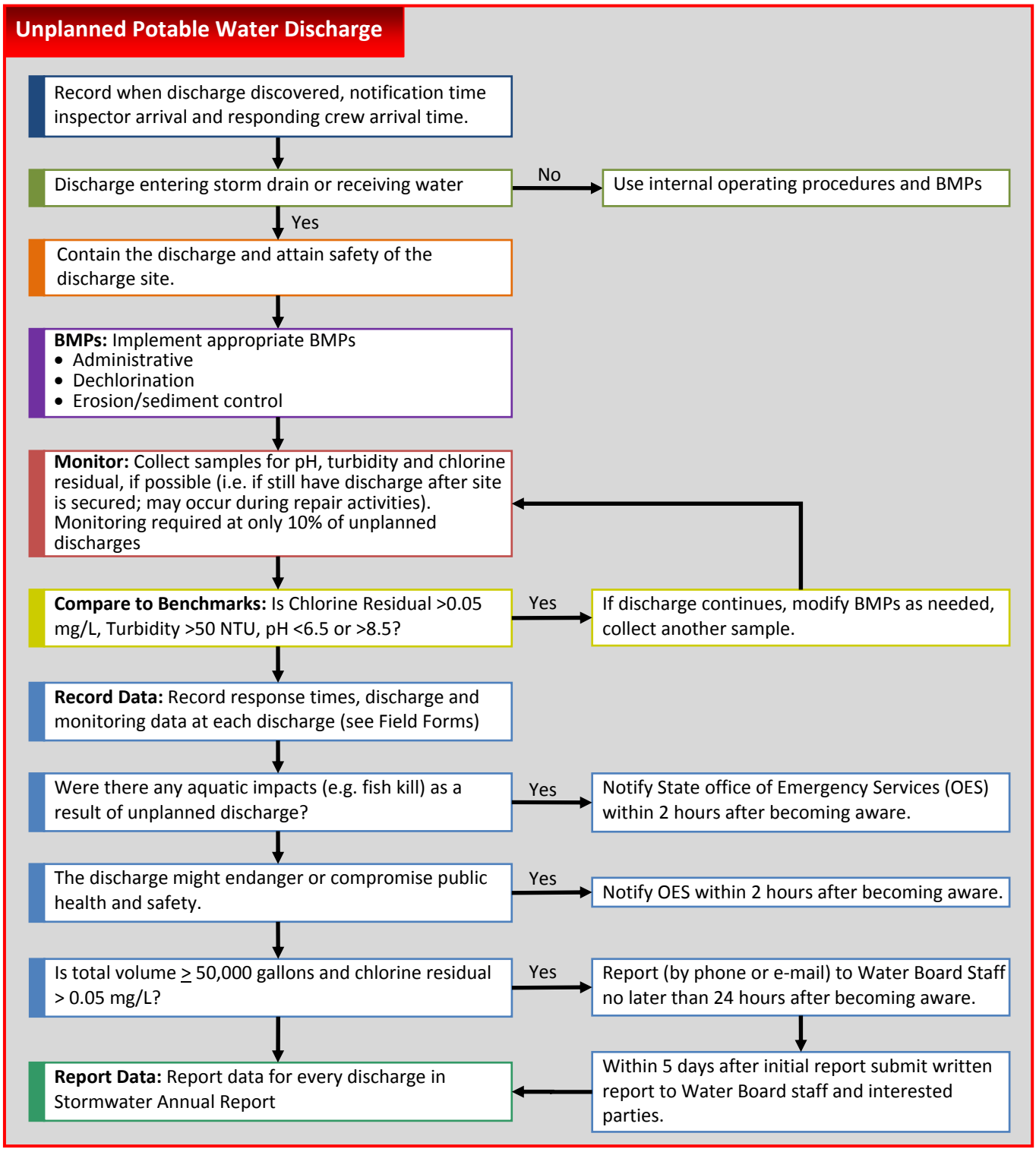
Unplanned Potable Water Discharge

San Francisco Bay Municipal Regional Stormwater NPDES Permit (MRP)
Provision C.15.b.iii. (2)

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

Unplanned discharges are non-routine activities such as:

- **Water line breaks**
- **Leaks**
- **Overflows**
- **Fire hydrant shearing**
- **Emergency Flushing**



Water Utility O&M Activities
Planned Potable Water Discharge to Storm Drain Best Management Practices (BMPs)

San Francisco Bay Municipal Regional Stormwater NPDES Permit (MRP) Provision C.15.b.iii. (1)

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

General Best Management Practices (BMPs)

1. **Pre-activity:** If planned discharge is ≥ 250,000 gpd or ≥ 500,000 gallons total notify Regional Water Board Staff one week in advance.
2. **Evaluate release volume and character. Compare with release point and conveyance to determine appropriate BMP use.**
3. **Clear/cleanup the flow path.**

Regional Water Board Notification
Sue Ma (510) 622-2386
sma@waterboards.ca.gov
Include: project name, type of discharge, receiving waterbody(ies), date of discharge, time of discharge, estimated volume (gallons), estimated flow rate (gpd), and monitoring plan.

Filter bag w/dechlor tablets in gutter (Palo Alto WUDPPP)

4. **Place erosion and sediment control devices in flow path if needed.** Erosion and sediment control:
   - Slows the flow of water, preventing erosion and/or allowing some portion of the sediment to settle out and/or;
   - Protects bare earth surfaces to preclude the detachment of soil particles from the flow of water;
   - Bypasses sediment using piping to move flow around potential pollutants;
   - Prevents the flow of water from reaching or picking up sediment by using berms or dikes.

Example erosion and sediment controls: filter bag over sump pump hose discharge, storm drain inlet protection, flow path check filters, vegetation filtration, flow diversion (surface protection), armoring (surface protection), diffuser.

Diffuser (Palo Alto WUDPPP August 2011)

5. **Dechlorinate potable water.** Example types of dechlorination equipment available:
   - Dechlor mat (3' x 4') used with tablets
   - Dechlor strip (6" x 36") used with tablets
   - Diffuser used with tablets
   - Drip system used with liquid

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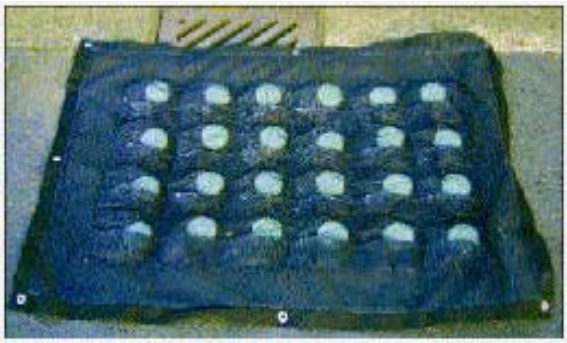
6. **Monitor release after BMPs and before discharge to storm drain for chlorine residual, turbidity* and pH.** (*Turbidity can also be monitored in the receiving water.)
7. **Compare monitoring results to the benchmark values. If discharge continues, adjust the BMPs if results are above benchmark values and collect another sample.**
8. **Record results** (see Field Form).
9. **Close operation.**
   - Inspect the flow path for erosion damage or sediment deposition
   - Cleanup and dispose of control materials appropriately



dechlor mat from Pollardwater.com

Benchmarks
Chlorine residual: **<0.05 mg/L**
Turbidity*: **<50 NTU**
pH: **>6.5** or **<8.5**

Benchmarks
*If turbidity is monitored in the receiving water (RW), limit the increase above background levels as follows:

RW Background	Incremental Increase
Dry Creek	50 NTU
<50 NTU	5 NTU
50-100 NTU	10 NTU
>100 NTU	10% of background

Resources:

Guidelines for the Development of Your Best Management Practices (BMP) Manual for Drinking Water System Releases, CA-NV American Water Works Association, 2005. http://ca-nv-awwa.org/iMISpublic/AM/Template.cfm?Section=Resource_Center34&Template=/CM/ContentDisplay.cfm&ContentID=7742

SCVURPPP Water Utility Operation and Maintenance Discharge Model Pollution Prevention Plan approved January 20, 2011. http://www.scvurppp-w2k.com/pdfs/1011/WUDPPP_01_20_11.pdf

City of Palo Alto Water Utility Operation and Maintenance Discharge Model Pollution Prevention Plan (EOA August 22, 2011)

Municipal Regional Permit. State Water Resources Control Board. October 14, 2009. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/mrp.shtml

Water Utility O&M Activities
Unplanned Potable Water Discharge to Storm Drain Best Management Practices (BMPs)

San Francisco Bay Municipal Regional Stormwater NPDES Permit (MRP) Provision C.15.b.iii. (2)

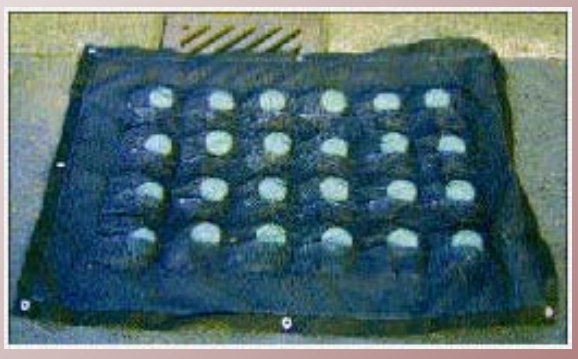
SAN MATEO COUNTYWIDE Water Pollution Prevention Program

General Best Management Practices (BMPs)

Filter bag w/dechlor tablets in gutter (Palo Alto WUDPPP)

1. **Unplanned discharges** are non-routine activities such as water line breaks, leaks, overflows, fire hydrant shearing and emergency flushing.
2. **Record response times.** (see Field Forms)
3. **Contain the discharge and attain safety of the discharge site.**
4. **Dechlorinate potable water.** Example types of dechlorination equipment available:
   - Dechlor mat (3' x 4') used with tablets
   - Dechlor strip (6" x 36") used with tablets
   - Diffuser used with tablets (can be used during repair operations)
   - Drip system used with liquid
   - Dechlor tablets in flowpath (e.g. in gutter or before stormdrain)
5. **Place erosion and sediment control devices in flow path if needed.** Erosion and sediment control:
   - Slows the flow of water, preventing erosion and/or allowing some portion of the sediment to settle out and/or;
   - Protects bare earth surfaces to preclude the detachment of soil particles from the flow of water;
   - Bypasses sediment using piping to move flow around potential pollutants;
   - Prevents the flow of water from reaching or picking up sediment by using berms or dikes.

> ***Example erosion and sediment controls***: filter bag over sump pump hose discharge, storm drain inlet protection, flow path check filters, vegetation filtration, flow diversion (surface protection), armoring (surface protection), diffuser.



dechlor mat from Pollardwater.com

6. **Monitor release after BMPs and before discharge to storm drain for chlorine residual, turbidity and pH, if possible.**

> **Benchmarks**
> Chlorine residual: **<0.05 mg/L**
> pH: **>6.5** or **<8.5**
> Turbidity: **Low**

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7. **Record results.** (see Field Form)
8. **Close operation.**
   - Inspect the flow path for erosion damage or sediment deposition
   - Cleanup and dispose of control materials appropriately
9. **Notify Regional Water Board staff within 24 hours by phone/e-mail if discharge ≥ 50,000 gallons and chlorine residual > 0.05 mgl/L.**
10. **Notify state Office of Emergency Services within 2 hours of becoming aware of:**
    1) aquatic impacts (e.g. fish kill)
    2) when discharge might endanger or compromise public health and safety

Sue Ma
(510) 622-2386
sma@waterboards.ca.gov

San Mateo County OES
400 County Center
Redwood City, CA 94063
(650) 363-4790
(650) 363-1868 fax
After hours: (650) 363-4915

Resources:

Guidelines for the Development of Your Best Management Practices (BMP) Manual for Drinking Water System Releases, CA-NV American Water Works Association, 2005. http://ca-nv-awwa.org/iMISpublic/AM/Template.cfm?Section=Resource_Center34&Template=/CM/ContentDisplay.cfm&ContentID=7742

SCVURPPP Water Utility Operation and Maintenance Discharge Model Pollution Prevention Plan approved January 20, 2011. http://www.scvurppp-w2k.com/pdfs/1011/WUDPPP_01_20_11.pdf

City of Palo Alto Water Utility Operation and Maintenance Discharge Model Pollution Prevention Plan (EOA August 22, 2011)

Water Utility O&M Potable Water Discharges to Storm Drain/Receiving Water

San Francisco Bay Municipal Regional Stormwater NPDES Permit (MRP)
Provision C.15.b.iii.

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

MRP Requirements: Apply to **ALL** potable water discharges to the storm drain and/or receiving water from water utility O&M activities

Planned Discharges: routine operation and maintenance activities that can be scheduled in advance, and such as disinifecting water mains, testing fire hydrants, storage tank maintenance, cleaning and lining pipe sections, routine distribution system flushing, reservoir dewatering, and water main dewatering activities

Category	Requirement
BMPs	Implement BMPs for dechlorination and erosion/sediment control
Notification	Discharge ≥ 250,000 gpd or ≥ 500,000 gallons total notify Regional Water Board staff 1 week in advance and other interested parties who may be impacted by discharge. Notification must include: • Project name • Type of discharge • Receiving water body(ies) • Date of discharge • Time of discharge • Estimated volume (gallons) • Estimated flow rate (gpd) • Monitoring plan
Monitoring	Monitor each discharge for: • pH • chlorine residual • turbidity
BMP Effectiveness Evaluation	Compare monitoring results to the following benchmark values: • Chlorine Residual: Post de-chlorination chlorine residual < 0.05 mg/L • pH: Between 6.5 – 8.5 • Turbidity: < 50 NTU[1]
Reporting	Submit in Stormwater Annual Report due to the Regional Water Board by September 15th each year the following: • project name • type of discharge • receiving water body(ies) • date of discharge • duration of discharge • estimated volume (gallons) • estimated flow rate (gpd) • chlorine residual (mg/L) • pH • turbidity (NTU) • description of BMPs & corrective actions

[1] There is also an option to limit an increase in turbidity above background levels in the Receiving Water. This requires receiving water monitoring upstream and downstream of the discharge. See MRP Provision C.15.b.iii.(1)(c)(ii) for the allowable incremental increase.

Unplanned Discharges: non-routine activities such as water line breaks, leaks, overflow, fire hydrant shearing, and emergency flushing.

Category	Requirement
BMPs	Implement BMPs for dechlorination, erosion/sediment control and administrative upon containing the discharge and attaining safety of site
Notification	Discharge ≥ 50,000 gallons total and chlorine residual > 0.05 mg/L notify Regional Water Board staff within 24 hours by phone/email of becoming aware of discharge. Within 5 working days after the phone/email notification submit a report documenting the discharge and corrective actions. Discharge results in any aquatic impacts (e.g. fish kill) or might endanger or compromise public health and safety report to the State Office of Emergency Services within 2 hours after becoming aware of issue.
Monitoring	Monitor 10% of discharges for: • pH • chlorine residual • visual turbidity
BMP Effectiveness Evaluation	Compare monitoring results to the following benchmark values: • Chlorine Residual: Post de-chlorination chlorine residual < 0.05 mg/L • pH: Between 6.5 – 8.5 • Turbidity: low
Reporting	Submit in Stormwater Annual Report due to the Regional Water Board by September 15th each year the following: • project name • type of discharge • receiving water body(ies) • date of discharge • duration of discharge • estimated volume (gallons) • estimated flow rate (gpd) • chlorine residual (mg/L) • pH • turbidity (low, medium and high) • description of BMPs & corrective actions • time of discharge discovery • notification time • inspector arrival time • responding crew arrival time

Emergency Discharges: result of firefighting, unauthorized hydrant openings, natural or man-made disasters (e.g., earthquakes, floods, wildfires, accidents, terrorist actions).

Category	Requirement
BMPs	Implement BMPs if they do not interfere with immediate emergency response operations or impact public health and safety. Priority efforts shall be directed toward life, property and the environment (in descending order).
Reporting	Determined by Regional Water Board staff on a case-by-case basis.

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

C.15.b. WATER UTILITY WORKSHOP:

"Field Implementation of Stormwater Requirements for Water Utility O&M Discharges"

Tuesday, November 13, 2012
Mission Blue Center
475 Mission Blue Drive, Brisbane

WORKSHOP AGENDA

9:30 AM	Registration and Refreshments	
10:00 AM	Welcome and Introduction	*SMCWPPP Program Staff*
10:05 AM	What's New in Stormwater Regulations? *MRP requirements for potable water discharges and available guidance material*	*Kristin Kerr, SMCWPPP Program Staff*
10:25 AM	BMPs for Planned and Unplanned Potable Water Discharges	*Dale Gonzalas, Cal Water*
11:10 AM	NO-DES Presentation and Demonstration	*Ed Cooney, Town of Hillsborough*
11:45 AM	Equipment and Vendor Displays *Workshop participants can view equipment on display outside*	
12:30 PM	Lunch	
1:00PM	Adjourn	

SMCWPPP Water Utility Workshop Registration

November 13, 2012

Last Name	First Name	Municipality	Signature
Alvarez	P	San Mateo County Public Works and Parks	
Arce	Lorenzo	American Water, East Palo Alto	LORENZO ARCE
Black	Keegan	City of Brisbane	
Campos	Robert	Bracewell Engineering	
Casey	Dermot	San Mateo County	
Cattaneo	Cory	City of Redwood City	
Chan	Catherine	Town of Hillsborough	
Chapel	Justin	City of Redwood City	
Cohn	Dustin	City of Brisbane	
Costella	Jon	City of Redwood City	
Diaz	Jack	City of Millbrae	
Donald	Burrinton	City of Redwood City	
Donnelly	Ward	City of Daly City	
Ebert	Josh	Bracewell Engineering	
Flanagan	Jerry	City of Brisbane	
DANISH ~~Guerra~~	ZAHEED ~~Roy~~	City of Foster City	
Harrington	Jim	City of Millbrae	
Hauge	Christopher	Bracewell Engineering	
Heathcote	Michael	City of Burlingame	
Ibarra	Ramiro	City of Brisbane	
Justimbaste	Eva	City of Burlingame	
Kerr	**Kristin**	**EOA, Inc**	
Kerrisk	Pat	City of Burlingame	
Kim	Philip	City of Redwood City	
Kwong	Harry	City of Redwood City	

SMCWPPP Water Utility Workshop Registration

November 13, 2012

Last Name	First Name	Municipality	Signature
Lu	Quan	EOA, Inc.	
McAuliffe	Tim	City of Burlingame	
Mercado	Xavier	City of Redwood City	
Moli	Lesi	American Water, East Palo Alto	
Nickle	Donald	City of Redwood City	
Pettegrew	Lori	EOA, Inc.	
Gonzalas	**Dale**	**Cal Water**	
Ricketts	Ruben	City of Redwood City	
Romriell	Shelley	City of Brisbane	
Garcia ~~Sanchez~~	Edelzar ~~America~~	San Mateo County	
Smith	Allen	City of Foster City	
Soberanes	Martin	City of Redwood City	
Taimanio	Kitione	City of Redwood City	
Tan	Jimmy	City of Redwood City	
Vendor			
Vendor			
Villa	Mike	City of Redwood City	
Webb	Gary	County of San Mateo	
Cooney	**Ed**	**Town of Hillsborough**	
Mezgiova	Steve	CDWS	
Daher	Michelle	EOA	
Bloom	Mark	Cal Water	
Race	Paul	Town of Hillsborough	

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

Evaluation Form

C.15.b Water Utility Workshop

SMCWPPP
Tuesday, November 13, 2012
9:30 a.m. – 1:30 p.m.

34 Attendees
15 Evaluations submitted (44% Evaluation Participation)

What Did You Think of the Following Presentations and Activities?

1. **Regulatory Review** –*Kristin Kerr, EOA*

   14 very helpful **1** somewhat helpful **0** not helpful

2. **BMPs for Planned and Unplanned Potable Water Discharges**- – *Dale Gonzales, Cal Water*

   9 very helpful **6** somewhat helpful **0** not helpful

3. **NO-DES Presentation and Demonstration** – *Ed Cooney, Town of Hillsborough*

   11 very helpful **3** somewhat helpful **0** not helpful

4. **Equipment and Vendor Displays**

   8 very helpful **4** somewhat helpful **0** not helpful

Did this workshop meet your expectations? **14** Yes **0** No

Suggestions for future workshop topics:

- A better way to capture information
- Links for presentations without handouts.

General Comments:

- I liked the presentation on the NO-DES. This might help our city.
- Very informative. Good ideas and review of requirements. Will definitely be able to integrate some of ideas into our current procedures
- Dale- bring pass-outs, couldn't read screen.
- If we can continue to manage the water boards involvement and approval of our training that will be ideal. Of course if we can have them come and present, that will provide more confidence to San Mateo Co-permittees.
- Very well done. Very informative

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix 16

- Green Street Pilot Projects Summary Report
- MRP Regional Supplement for Training and Outreach: Annual Reporting for FY 2012-2013
- Regional Pollutants of Concern Report for FY 2012-2013

Prepared for

Bay Area Stormwater Management Agencies Association (BASMAA)
P.O. Box 2385
Menlo Park, CA 94026

FINAL

Green Street Pilot Projects

Summary Report

Municipal Regional Permit Provision C.3.b.iii. and C.3.b.v.(2)(c).

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1111 Broadway, 6th Floor
Oakland, California 94607

WW1436

7 August 2013

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1. EXECUTIVE SUMMARY

Municipal Regional Permit[1] (MRP) Provision C.3.b.iii requires that Permittees cumulatively complete ten green street pilot retrofit projects (Projects) that incorporate low impact development (LID) techniques for site design and treatment in accordance with Provision C.3.c and provide stormwater treatment sized in accordance with Provision C.3.d. At least two projects must be located in each of the following counties: Alameda, Contra Costa, San Mateo, and Santa Clara. Additionally, MRP Provision C.3.b.iii. (5) requires that the Permittees conduct appropriate monitoring of these projects to document the water quality benefits achieved. Appropriate monitoring may include modeling using design specifications and specific site conditions. The 2013 Annual Report, due to the Regional Water Board on September 15, 2013, must contain a summary of all green street pilot projects completed by January 1, 2013.

In fulfillment of MRP Provision C.3.b.v.(2)(c), this report, which is to be included with the 2013 Annual Report, provides project descriptions that include the locations of the ten selected green street pilot projects, the proposed treatment measures, drainage catchment information, project designs, construction activities, cost estimates, funding sources, and identification of parties responsible for operation and maintenance. The ten selected projects are in various stages of design and construction and will be completed within a few months of the report filing date. More than ten additional green street projects are in the planning and/or design phases throughout the San Francisco Bay Area, which are beyond the requirements of the MRP. In Appendix A, Tables A1 and A2 provide Project status tables that summarize key project information for the ten selected green street pilot projects. Table A3 provides available data on all of the reported twenty green street projects throughout the San Francisco Bay. The data indicate that most projects were at least partially funded by grants, and many received funding from multiple sources. (One project was funded solely by the local municipality, two projects were associated with private development projects, and one project was partially funded by private entities.)

For the selected projects with complete designs (i.e., the Codornices Creek Restoration Project and the Park and Hollis Stormwater Curb Extension Project), project design

[1] Municipal Regional Stormwater NPDES (National Pollutant Discharge Elimination System) Permit, Order R2-2009-0074, NPDES Permit No. CAS612008, issued by the California Regional Water Quality Control Board, San Francisco Bay Region.

drawings are provided in Appendix C. For the selected projects in the design stage (i.e., the Bransten Road Green Streets Project and the City of Richmond's San Pablo Avenue Green Spine Project), treatment measure conceptual plans are provided.

In fulfillment of MRP Provision C.3.b.iii.(5), a simple spreadsheet model was developed for the ten selected green street pilot projects using design specifications and site-specific considerations, including tributary area and land uses, rainfall, best management practices (BMP[2]) categorization, and runoff and effluent water quality. The list of potential pollutants of concerns (POCs) that were modeled included copper, zinc, total suspended solids (TSS), total mercury, and polychlorinated biphenyls (PCBs). Additionally, monitoring information is reported for those Projects where monitoring was conducted or is planned. Of the ten selected green street projects, one has been monitored and four others will be monitored following completion. Overall, more than half of the 20 reported green street projects have or will be monitored.

The ten green street pilot projects provide valuable lessons for the planning, design and construction of future green street projects. In general, constructing green street projects within an existing transportation corridor present major challenges. Right-of-ways generally contain electrical utilities, gas lines, water lines, and other infrastructure. Treatment facilities need adequate space within the right-of-way to operate effectively but cannot conflict with existing utilities and transportation needs, and must be located at a lower elevation than the tributary impervious surface for which treatment is desired. These factors require a comprehensive evaluation of the existing site and its functionality with accurate mapping and information prior to construction. In addition to technical considerations, factors such as availability of funding, opportunity for integration into other planned projects, and community support are key for the success of a green street project.

2. INTRODUCTION

MRP Provision C.3.b.iii. requires Permittees to cumulatively complete ten green street pilot projects (Projects) that incorporate LID techniques for site design and treatment in accordance with Provision C.3.c., and provide stormwater treatment sized in accordance

[2] The term "BMP" used throughout this report refers to a post-construction stormwater treatment measure.

with Provision C.3.d. At least projects must be located in each of the following counties: Alameda, Contra Costa, San Mateo, and Santa Clara.

The ten selected projects are representative of various types of streets, including arterial, collector, and local, as well as parking lots. As a whole, the Projects contain the following key elements as specified in Provision C.3.b.iii:

(i) Stormwater storage for landscape reuse or stormwater treatment and/or infiltration for groundwater replenishment through the use of natural feature systems;
(ii) Creation of attractive streetscapes that enhance neighborhood livability by enhancing the pedestrian environment and introducing park-like elements into neighborhoods;
(iii) Service as an urban greenway segment that connects neighborhoods, parks, recreation facilities, schools, main streets, and wildlife habitats;
(iv) Parking management that includes maximum parking space requirements as opposed to minimum parking space requirements, parking requirement credits for subsidized transit or shuttle service, parking structures, shared parking, car sharing, or on-street diagonal parking;
(v) Meets broader community goals by providing pedestrian, and where appropriate, bicycle access; and
(vi) Located in a Priority Development Area as designated under the Association of Bay Area Governments and Metropolitan Transportation Commission's FOCUS program.

This report fulfills the MRP requirements to provide the status of the ten green street pilot projects, as specified in Provision C.3.b.v. (2). This report contains a summary of all the projects completed by January 1, 2013, as well as those projects in the design phase that will be constructed by or near the end of the permit term. For each completed project, the summary includes the following information:

(i) The location of the project;
(ii) The size of the project, including the total impervious surface treated;
(iii) Map(s) of the project showing areas where stormwater runoff will be treated by LID measures;
(iv) Specific type(s) of LID treatment measures included;
(v) Total and specific costs of project;

(vi) Specific funding sources for project and breakdown of percentage paid by each funding source;
(vii) Lessons learned, including recommendations to facilitate finding and building of future projects; and
(viii) Identification of responsible party and funding source for operation and maintenance.

This report also documents the modeling methodology that was used to evaluate the potential water quality benefits achieved or proposed to be achieved by each of the ten green street pilot projects, as required in Provision C.3.b.iii.(5). The water quality benefits, in terms of potential removal of pollutants of concern (POCs), were estimated using a spreadsheet model and are described in Section 4 of this report. In general, the spreadsheet model errs on the side of conservatism in terms of inputs and assumptions and is not intended to evaluate actual BMP performance. The modeling results will be supplemented by more site-specific monitoring data for some projects (monitoring is planned for more than half of the twenty projects being implemented).

3. PROJECT DESCRIPTIONS

The project descriptions include available information on the locations of the green street pilot projects, the proposed treatment measures, drainage catchment information, project designs, construction activities, cost estimates, funding sources, and identification of parties responsible for operations and maintenance.

The ten selected projects are in various stages of design. For those projects with complete designs (i.e., the Codornices Creek Restoration Project and the Park and Hollis Stormwater Curb Extension Project), project design drawings are provided in Appendix C. For projects in the design stage (i.e., the Bransten Road Green Streets Project and the City of Richmond's San Pablo Avenue Green Spine Project), treatment measure conceptual plans are provided in Appendix C. In some cases, such as Bransten Road and Stanley Boulevard, the design plans are quite extensive, so a sample of bioretention cross-sections and plans showing treatment measure locations are provided, rather than including the entire design package. Figure 1 shows the locations of the ten selected green streets pilot projects and Appendix A provides Project status tables that summarize key Project information.

3.1 Park and Hollis Stormwater Curb Extension

The Park and Hollis Stormwater Curb Extension Project is located in the City of Emeryville (Alameda County), at the northeast corner of Park Avenue and Hollis Street. The project is classified as a landscaped curb extension along a collector street. The project was required by the City of Emeryville as part of an expansion project by Pixar Animation Studios. The project was completed in 2010 and is currently rated as a Bay-Friendly landscape (no score provided).

Project Catchment

The total drainage area to the Project is 0.19 acres. The Project is located in a commercially developed area and is entirely in the public right-of-way. Prior to construction, the tributary area was 100% impervious; following the installation of the curb extension, the tributary area became 93% impervious.

Treatment Measure Concept

The curb extension (bioretention facility) is 650 square feet in area and consists of an on-street planted rain garden with an underdrain. The underlying native soil is clay, so infiltration as the sole means of treatment was determined to be infeasible. Biofiltration media was added above the clay layer and an underdrain was installed to convey treated runoff to the public storm drain. The Alameda Countywide Clean Water Program's C.3 Stormwater Technical Guidance[3], which was used to size the treatment measure requires treatment measures to be a minimum of 4% of the tributary area.

Project Design and Construction Schedule

The Park and Hollis Stormwater Curb Extension Project was completed in 2010. Operation and maintenance activities are ongoing.

Project Funding and Costs

This project was entirely funded by Pixar Animation Studios as part of their expansion project. A request was submitted for detailed expense information for the green street portion of the project, but this data was not available at the time of reporting. The property on which the green street project is located is owned by the City of Emeryville.

[3] The ACCWP C3 Technical Guidance Manual can be found at http://www.cleanwaterprogram.org/c3-guidance-table.html?view=item

Project Outcomes and Lessons Learned

The Park and Hollis Stormwater Curb Extension Project was considered a success as a green street pilot project due to a reduction in localized flooding and the addition of vegetation that aesthetically enhanced the plaza area. A notable lesson learned from this project is that choosing streets with standard crowns, rather than those with steeper cross slopes, allows for more effective green streets due to the reduced cross slope and they allows for greater available treatment area. The project team recommended that green streets components should be a condition of approval for projects in Emeryville whenever possible.

Operation and Maintenance

Pixar Animation Studios is responsible for the project's operation and maintenance, and has signed a standard stormwater O&M agreement with the City of Emeryville.

3.2 Codornices Creek Restoration Project

The Codornices Creek Restoration Project is located in the City of Albany (Alameda County), and is a joint project between the City of Berkeley, City of Albany, and the University of California; the primary purpose of the project is to restore lower Codornices Creek between the Union Pacific Railroad Tracks to the west and San Pablo Avenue to the east. As part of the overall restoration project, a series of rain gardens (bioretention facilities) were installed to treat stormwater runoff prior to entering Codornices Creek, which are described below.

Project Catchment

The total drainage area tributary to the project is 1.93 acres of impervious area (developed on top of clay soils). The area, which will remain 100% impervious following the restoration, is commercial and residential in land use with 60% of the area in the public right-of-way.

Treatment Measure Concept

The four rain gardens (bioretention facilities) have surface areas of 180 ft^2, 260 ft^2, 224 ft^2, and 425 ft^2. The facilities have an underdrain placed near the top of a 1-foot gravel drainage layer, which may allow for some incidental infiltration through the system. There are two treatment areas located on each side of the 6th Street, which are separated by a sidewalk providing access to the street. Facility sizing was based on the Alameda

Countywide Clean Water Program's C3 Stormwater Technical Guidance, but two of the four basins were restricted in size by site conditions, including driveway access requirements for semi-truck trailers, an existing shallow culvert crossing, and design parameters for improved pedestrian crossing.

Project Design and Construction Schedule

The planning phase for the Project took approximately 1 year, the design phase was approximately 6 months, and the actual construction took approximately 1 year, with the rain garden portion taking approximately 3 months to construct.

Project Funding and Costs

The Codornices Creek Restoration Project was funded entirely by a Proposition 50 River Parkways Grant that was awarded to the City of Albany. The $2.2 million dollar grant was intended for the restoration of the Creek between 6th Street and 8th Street. The cost of the four rain gardens was included within this grant and was estimated to be approximately $175,000 in total. The design phase cost approximately $35,000, and the construction cost approximately $140,000. The project required permitting from the Department of Fish and Game and the San Francisco Bay Regional Water Quality Control Board, but this did not add any additional costs.

Table 1. Costs for Codornices Creek Restoration Project

Project Phase	Description	Cost ($)	Notes
Design	Labor	35,000	Rain garden cost estimated as a part of the overall grant for the Creek Restoration Project.
Construction	Materials	140,000	
Total Cost	**Total**	**175,000**	

Project Outcomes and Lessons Learned

The Codornices Creek Restoration Project incorporated rain gardens in curb extensions that provided the added benefit of traffic calming in the creek crossing area. Overall, the comments received from the public have been very positive. However, the dense growth of planting on the southern rain garden cells caused water to back-up on the outer wall of the cells, which caused ponding in the gutter during larger storms. Outside of the undersized southwestern rain garden, the ponding extended into the driveway area of an adjacent business. To address this problem, the original plantings in the southwestern

rain garden were removed and replaced with other species. Additionally, a duct was placed beneath the sidewalk on the western side of Sixth Street, allowing for a connection between southwestern and northwestern rain gardens. Finally, and unfortunately, the overflow of the northwestern rain garden was lowered, substantially reducing the effective area and effective reservoir volume of the two western rain gardens. (Dan Cloak, Personal Communication, 2013)

Operation and Maintenance

The maintenance of the improvements related to the Codornices Creek Restoration Project is shared among the City of Albany, the City of Berkeley, and UC Berkeley through a Memorandum of Understanding (MOU). The bioretention areas were included in the MOU prior to construction, with the costs split among the agencies. The first year of maintenance for the four rain gardens was estimated to cost approximately $2,000; the total annual cost per year to maintain the restoration area is approximately $20,000 per year. The project includes a mandatory 5-year landscape-monitoring plan.

3.3 Stanley Boulevard Safety and Streetscape Improvement

The Stanley Boulevard Safety and Streetscape Improvement Project is located in Unincorporated Alameda County along a 3-mile stretch of Stanley Boulevard between the city limits of Pleasanton and Livermore. The Alameda County Public Works Agency is converting a 4-lane, high volume arterial street, which is currently a primarily industrial corridor, to a rural parkway setting. The overall project uses a variety of sustainable design concepts and improves the safety and aesthetics along Stanley Boulevard. The project is rated as a Bay-Friendly landscape with a score of 98. The project is currently under construction.

Project Catchment

The total drainage area to the project is approximately 33 acres, 90% of which is in the public right-of-way. The pre- and post-project tributary area imperviousness values are 80% and 78%, respectively. Exploratory borings identified the underlying soils as being generally alluvium consisting of silty sand with gravel and clayey sand with gravel.

Treatment Measure Concept

Two treatment measures will be constructed along Stanley Boulevard: (1) an infiltration trench and (2) a bioswale (bioretention facility). The infiltration trench is located on the northern side of Stanley Boulevard and is approximately 13,895 feet long and 4 feet

wide, with a 1-foot depth of backfilled gravel. The infiltration trench is designed to infiltrate all runoff from the water quality design storm. The bioswale is located on the south side of Stanley Boulevard and is approximately 13,895 linear feet long and 3 feet wide. The bioswale has a maximum of 18 inches of sandy loam media and a raised overflow structure that is 4 inches above grade. The Caltrans standards and Alameda Countywide Clean Water Program's C.3 Stormwater Technical Guidance were used to size the treatment measures.

Project Design and Construction Schedule

The duration of the Stanley Boulevard Safety and Streetscape Improvement Project was projected to be from September 2008 to September 2012. The project is currently in the construction phase and the construction of the two treatment measures has not yet started.

Project Funding and Costs

The total cost of the project is estimated to be $14,500,000 and was funded by a variety of sources. State Prop 1B and local funds are contributing 64.3% of the project costs, CEMEX and Vulcan Materials Companies are contributing 34.5%, the Bay Area Air Quality Management District Transportation for Clean Air Grant Funds are contributing 0.008%, and the StopWaste.org Bay Friendly Grant Funds are contributing 0.002%. A breakdown of the design and construction costs for the stormwater treatment measures was not available at the time of reporting.

Project Outcomes and Lessons Learned

The construction of the Stanley Boulevard and Streetscape Improvement Project is still in progress, so it is not yet possible to assess treatment performance and project execution. However, the anticipated ancillary benefits of the project include improved drainage and stormwater treatment; the conservation of energy and water associated with stormwater runoff; the introduction of native plant species and diversification of wildlife habitats; and the improvement of public safety for motorists, bicyclists, and pedestrians (including compliance with the Americans with Disabilities Act (ADA) requirements). Interpretive signage will be located throughout the project site to promote and educate the public about sustainability concepts.

An important lesson learned through the project planning phase and design phase is that roadway projects that incorporate treatment features should be located on relatively flat

terrain and have ample public right-of-way. Where there is limited right-of-way within a developed or urban area, treatment options become limited in type and size, resulting in reduced treatment effectiveness and higher project costs.

Operation and Maintenance

The Alameda County Public Works Maintenance & Operations Division will be responsible for the operation and maintenance of the project site.

3.4 El Cerrito Green Streets Project

The El Cerrito Green Streets Project is located in the City of El Cerrito (Contra Costa County). The project includes facilities at two locations along the major arterial of San Pablo Avenue: (1) the Eureka Rain Gardens at 10200 San Pablo Avenue and (2) the Madison Rain Gardens at 11048 San Pablo Avenue. This project was conceived as part of the larger San Pablo Avenue Streetscape Project, which adds low impact development (LID) elements to the pedestrian, bicycle, transit, and beautification improvements. The project is located inside the El Cerrito San Pablo Priority Development Area, as designated by the ABAG/MTC FOCUS program. The project was completed in 2010.

Project Catchment

The drainage area to the project is 1.33 acres, only including the area within the public right-of-way. The tributary area to the Madison Rain Garden is 0.39 acres and the tributary area to the Eureka Rain Gardens is 0.94 acres. There may be some additional runoff from adjacent properties, but this area was not included in the analysis. The tributary area is classified as 100% commercial, with approximately 99% imperviousness in the pre-project and post-project scenarios.

Treatment Measure Concept

The Eureka Rain Garden consists of a series of 12 individual rain gardens and the Madison Rain Gardens consists of a series of seven individual rain gardens. The individual rain gardens (bioretention facilities) are separated from each other to provide access between curbside parking and the sidewalk. The gardens collect street runoff through a series of depressed troughs that run from the street gutters into the gardens and convey water through a series of curb cuts. There are two curb cuts for each of the individual rain gardens, which are composed of a gutter depression of 0.10 feet and a

flow-through trough set at 90 degrees to the gutter that falls 0.10 feet along a 2.5-foot rain garden length.

Water that enters the gardens is stored in a shallow depression and may leave the structure through one of three pathways. The first pathway is via percolation through approximately 18 inches of sandy loam filter media to the underdrain connected to the public storm drain system. The second pathway is to exit the storage area through one of the curb cuts located at the down gradient end of the rain garden and flow into the adjacent rain garden structure. The third pathway occurs when stormwater in the rain garden storage area exceeds the elevation of the overflow outlets and is conveyed directly to the storm drain. The water that enters the overflow catch basin or exits a downstream curb cut without being treated in a subsequent rain garden is considered untreated bypass flow.

The Madison Rain Garden was designed to capture 0.38 acres of the overall tributary area (0.39 acres). The Eureka Rain Garden was sized to treat 0.64 acres of the overall tributary area (0.94 acres).

Project Design and Construction Schedule

The design phase occurred from 2008 through the end of 2009 and was a portion of the larger San Pablo Avenue Streetscape Project. The construction of the El Cerrito Green Streets Project was completed in August of 2010.

Project Funding and Costs

Approximately 78% of this project was funded by a federal American Recovery and Reinvestment Act (ARRA) grant administered through the State Water Resources Control Board that amounted to $392,000. Funds from the ARRA grant were split between the design/construction phase and the monitoring phase. The design/ construction phase of the grant totaled $215,295 and was provided to the City of El Cerrito as a sub-grantee. The monitoring funds were managed by the San Francisco Estuary Institute (SFEI) and results from that monitoring were reported by SFEI (2012).[4] Additional funding for the project was provided by the El Cerrito Redevelopment Agency and amounted to $108,832, which is 22% of the overall funding.

[4] Monitoring and Results for El Cerrito Rain Gardens, Gilbreath, Pearce, and McKee (2012).

The total design costs specific to the green streets portion of the project are unknown because the design was completed in conjunction with the larger San Pablo Avenue Streetscape Project. An estimate for the total construction cost is $324,127, which includes estimated construction management costs of $26,300, but does not include an estimated annual operation and maintenance (O&M) cost of $5,000. The total monitoring costs are estimated at $176,705.

Table 2. Costs for El Cerrito Green Streets Project

Project Phase	Description	Individual Cost ($)	Total Cost ($)	Notes
Design	Total	Unknown	Unknown	Completed as part of larger San Pablo Ave Streetscape Project.
Construction	Management	26,300	324,127	
	Other	297,827		
O&M	Annual	5,000	5,000	
Monitoring	Total	176,705	176,705	Through SFEI
Total Cost	**Total**	**500,832**	**500,832**	The total estimated cost does not include the annual O&M costs.

Project Outcomes and Lessons Learned

The El Cerrito Green Streets Project has been considered an overall success and has been well received by the local community, particularly the businesses that are adjacent to the project. Many members of the community appreciate the aesthetic component of the rain gardens; some have noted that they appreciate the scale of the treatment facilities and their impact on stormwater management.

One design issue that arose during the monitoring analysis was that some of the curb cuts did not convey water into the rain gardens very well. This is attributed, in part, to the location of the plantings in the rain garden with respect to the placement of the curb cuts. Following construction, additional soil mix was placed in a portion of each of the rain gardens. This raised the top of soil above the design elevation so that the functional area and reservoir volume of each rain garden were reduced by between one-third to one-half (Dan Cloak, Personal Communication, 2013). This, in addition to other factors, could have led to significant bypass, which, although not measured, was observed (A. Gilbreath, SFEI, Personal Communication, 2012).

Overall, the project design and construction was completed with few major issues or setbacks due to the thorough planning process and cooperation of the community at large. One major change order was needed after a 16-inch water line was discovered within the rain garden area due to a mapping error. This was resolved quickly with East Bay Municipal Utility District (EBMUD), with a cost of implementing protective measures of $16,000. The only other additional change that was not in the original scope was the incorporation of a concrete pad for mounting a water quality sampler that cost $5,600.

Operation and Maintenance

The City of El Cerrito is responsible for the operations and maintenance of the project and the estimated additional cost per year is approximately $5,000. The entire maintenance staff received training on the filter media and the Bay Friendly planting scheme.

3.5 San Pablo Avenue Green Spine – Richmond

The portion of the San Pablo Avenue Green Spine Project within the City of Richmond (Contra Costa County) is located along the major arterial of San Pablo Avenue, between McBryde Avenue and Andrade Avenue. The project is currently at 30% design and the City is committed to incorporating Bay-Friendly landscape into the design. The project is located inside a Priority Development Area, as designated by the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) FOCUS program.

Project Catchment

The total drainage area is approximately 2.22 acres. Additional Project catchment information is unknown at this time.

Treatment Measure Concept

The proposed treatment measures consist of six bioretention areas consisting of three rain gardens and three curb extensions. The six bioretention areas have a total surface area of 4,625 ft^2. All six of the facilities will be located on the western side of San Pablo Avenue. Three facilities are located on the northwestern side of the intersection of McBryde Ave and San Pablo Ave. One facility is located on the southern side of Andrade Ave where it meets San Pablo Ave, and two facilities are located on the

northern side of the intersection. Further specifications for the treatment measures are not yet available because the project is currently in the 30% design phase.

Project Design and Construction Schedule

The San Pablo Avenue Green Spine Project is currently in the 30% design phase. The designs are anticipated to be completed by late summer 2013 and construction to begin in late summer/fall 2013. The design and construction cost estimates are not available at this time.

Project Funding and Costs

The Project is being funded entirely through a water quality grant administered by the San Francisco Estuary Partnership (SFEP). The construction portion of the funding is provided by the California Department of Transportation (Caltrans) (42.6%). The Project is supported by grants from USEPA's San Francisco Bay Water Quality Improvement Fund (7.2%) and the State of California's Integrated Regional Water Management Program (50.2%). The exact amount and breakdown of costs by phase have not been determined yet.

Project Outcomes and Lessons Learned

The Project is still in the design phase and has not reached a stage to evaluate outcomes or lessons learned at this time.

Operation and Maintenance

The City of Richmond will ultimately be responsible for the operation and maintenance of the project.

3.6 Sustainable Streets and Parking Lot Demonstration Project

The Sustainable Green Streets and Parking Lots Demonstration Project is in the City of Burlingame (San Mateo County) on Donnelly Ave between Primrose Road and Bellevue Avenue. The project incorporated stormwater treatment into the Public Parking Lot C Project by the City of Burlingame. This project was also intended to improve traffic circulation and add disabled accessible stalls, while maintaining the number of parking stalls. The project was completed in January 2011.

Project Catchment

The total drainage area to the project is 1.32 acres and consists of an existing parking lot, adjacent roadway, and building roofs. The pre-project imperviousness was 95%. The runoff from this area is routed into a rain garden, which adds 0.06 acres of landscaped area and results in a post-project imperviousness of 90%. The soil underlying the project is a mix of clayey loam, sandy loam, fine sand, and gravel.

Treatment Measure Concept

The proposed treatment measures consist of a 0.06 acre rain garden and a 0.01 acre planter box (curb extension, both of which function as bioretention facilities). Because the project location is not served by a storm drain system, the bioretention areas were constructed without an underdrain. A trench was included underneath the bioretention areas to detain runoff to increase the volume that infiltrates into the underlying soils.

The facilities were sized based on flow-based criteria to capture 0.2 inches per hour of rainfall intensity and to have a surface area of at least 4% of the tributary impervious area. The rain garden and curb extension are sized to handle a 0.2 in/hr rainfall intensity through the two facilities. The infiltration rate of the bioretention media is estimated to be 10 inches per hour.

Project Design and Construction Schedule

The Sustainable Streets and Parking Lots Demonstration Project was completed in January 2011. The planning and design phase for the project took approximately 9 months, which was followed by 4 to 5 months of construction.

Project Funding and Costs

The San Mateo Countywide Water Pollution Prevention Program, which is administered by the San Mateo County/City Association of Governments, provided $250,000 of funding for the project. The City of Burlingame also contributed to the Capital Improvement Project through the General Fund. The total cost of the project was approximately $270,000, which included $55,000 for project design and $215,000 for construction costs. It is estimated that roughly $6,500 per year will be needed for routine operations and maintenance costs.

Table 3. Costs for Sustainable Streets and Parking Lot Demonstration Project

Project Phase	Description	Cost ($)	Notes
Design	Total	55,000	The total estimated cost does not include the annual O&M costs.
Construction	Total	215,000	
O&M	Annual	6,500	
Total Cost	**Total**	**270,000**	

Project Outcomes and Lessons Learned

The Sustainable Streets and Parking Lots Demonstration Project achieved stormwater treatment and improved the drainage problems that had previously been an issue in the parking lot. The project also resulted in enhanced pedestrian and vehicle safety, and can be considered a successful integration of green street features into an existing development. There were some initial concerns by property owners about the project, but since its completion, the responses have been solely positive, including those from the City Council. The project will continue to engage the public through educational signage in the visible downtown location.

Some important lessons learned through the project design and construction phase are the following:

1. A 1-foot rock strip is beneficial to deter erosion along the rain garden;
2. A maintenance period following construction should be incorporated into the schedule;
3. Simple irrigation systems should be provided for vegetated treatment measures, where needed;
4. Facilities should be sited where storm drain systems currently exist or where underdrains can be extended to connect to the current system. If this is not feasible, incorporate overflow mechanisms, such as storm drain overflow piping where possible;
5. Prior to construction, the availability of the planned landscaped plantings should be verified;
6. Contractor qualifications should always be included in the specifications.

7. Project proponents should attempt to acquire sufficient funding for storm drain overflow piping and monitoring as part of the project.

Operation and Maintenance

The City of Burlingame is responsible for operation and maintenance of the project, which will be funded through the General Fund at a cost of approximately $6,500 per year.

3.7 Bransten Road Green Street

The Bransten Road Green Street Project is located in the City of San Carlos (San Mateo County) along Bransten Road, between Old Country Road and Industrial Road. The project is along a local street, in a location where elevated levels of PCBs have been identified through sediment monitoring. To the extent feasible, the proposed treatment measures will be sited at locations where the elevated concentrations were identified. The final design of the project was completed in February 2013 and construction is anticipated to begin in the summer of 2013.

Project Catchment

The drainage area to the Project is 0.54 acres (only including the impervious roadway surface areas draining to the bioretention facilities). Unidentified tributary areas may include drainage from other impervious sources, such as private properties, adjacent sidewalks, rooftops, or parking lots; these may contribute additional runoff to the facilities but are not incorporated into the calculation of facility size. The surrounding area is primarily industrial in land use and the imperviousness in the area prior to construction is approximately 95%. The project is underlain by a combination of fill and Holocene-age alluvial fan deposits. The soil type is hydrologic soil group (HSG) D, which is characterized by low infiltration rates and high runoff potential.

Treatment Measure Concept

The proposed treatment measures are nine bioretention areas that will be constructed in newly created curb extensions of various lengths. The San Mateo Countywide Water

Pollution Prevention Program (SMCWPPP) guidelines[5] were used, where feasible, for designing the bioretention areas.

Certain aspects of some of the bioretention facilities' designs deviate from the SMCWPPP guidelines due to utility conflicts and site restrictions. The SMCWPPP guidelines state that there should be an underdrain system in place where HSG D soils are present for bioretention areas. However, five of the bioretention areas are designed without underdrains either due to their location along a stretch of Bransten Road with no existing storm drain system (and no feasible addition or extension of the storm drain) or due to the depth of the existing storm drain system being too shallow to connect to the underdrain invert. These five bioretention areas also have soil depths of 12 inches, which deviate from the SMCWPPP guidance (minimum soil layer depth of 18 inches) due to utility conflicts. These areas without underdrains are designed to infiltrate through the biotreatment soil media and into the underlying soils.

The four remaining bioretention areas have underdrains with elevated orifices to allow for infiltration of the water that collects in the bottom of the rock layer. It should be noted that the design of Bioretention Area 7 includes an underdrain system that is routed around the existing drainage inlet and through Bioretention Areas 8 and 9, so that it can discharge to a storm drain with an invert that is low enough to connect to the underdrain. This was incorporated because Bioretention Area 7 is identified with elevated levels of PCBs, so additional efforts were necessary to attain a typical bioretention design in order to address the pollution reduction goal of the Project.

The "Simplified Sizing Method" from the SMCWPPP was used to determine whether the bioretention areas satisfy C.3 guidelines. This method requires that a bioretention area is at least 4% of the impervious surface area draining to that facility. All of the proposed facilities satisfy this criterion, and some have added capacity to handle additional runoff (where sources in addition to the roadway areas were identified).

Project Design and Construction Schedule

The Bransten Road Green Street Project completed its final design in March of 2013. Construction is anticipated to be completed by the MRP Provision C.3.b.iii due date of December 1, 2014.

[5] The SMCWPPP C.3 Technical Guidance Manual can be found at: http://www.flowstobay.org/bs_new_development.php#c3

Project Funding and Costs

Funding for the project comes from three sources: (1) 59% from grant funding through USEPA's San Francisco Bay Water Quality Improvement Fund; (2) 40% from grant funding through the San Mateo Countywide Water Pollution Prevention Program's Sustainable Green Streets and Parking Lots Program; and (3) 1% from a match from the Countywide Program. The 100% design cost estimate provides for a total project cost of approximately $535,600, with the design cost estimated at $156,000 and the construction costs estimated at $379,600. The design cost were high due to potholing to verify utility locations, redesign due to utility conflicts and challenges with PCB levels.

Table 4. Costs for Bransten Road Green Street Project

Project Phase	Description	Cost ($)	Notes
Design	Total	156,000	Anticipated O&M costs are unknown at this time.
Construction	Total	379,600	
Total Cost	**Total**	**535,600**	

Project Outcomes and Lessons Learned

The project is at the 100% design phase, but has not reached a stage to evaluate outcomes or lessons learned at this time.

Operation and Maintenance

The City of San Carlos will be responsible for the operation and maintenance of the project following completion. The costs of these activities are not yet determined.

3.8 Packard Foundation Green Street

The David and Lucile Packard Foundation Green Street is located in the City of Los Altos (Santa Clara County) on Second Street between Lyell Street and Whitney Street. The green street features were constructed in 2012 as part of the Packard Foundation's development of its new office building at 343 Second Street. (The runoff from the building and associated hardscape and parking lots is captured and treated by other stormwater treatment measures.) The green street portion of the project incorporates curbside flow-through rain gardens and corner bulb-outs to capture, treat and infiltrate runoff from adjacent impervious surfaces.

Project Catchment

The total drainage area to the rain gardens is 0.59 acres of impervious road and sidewalk areas. The project reduced the area of imperviousness from 100% to approximately 89%. The underlying soil type of the tributary area is sandy lean clay to clayey sand.

Treatment Measure Concept

The treatment measures consist of 20 rain gardens (bioretention facilities) along the north and south sides of Second Street and at the corners of Whitney Street and Second Street. The rain gardens along Second Street fit within the park strip between the sidewalk and the street, and range in size from 3.5 to 6.5 feet wide and 8 to 27.5 feet long, separated by street trees and sidewalk or driveway entrances. Their surface areas range from 30 to 164 square feet. They receive sidewalk runoff via sheet flow and street runoff through curb cuts. The two rain gardens at the corners of Whitney Street are shaped like bulb-outs from the curb and have a surface area of 110 square feet. The total surface area of the 20 rain gardens is 1834 square feet.

The rain gardens were designed based on the Santa Clara County Urban Runoff Pollution Prevention Program (SCVURPPP) C.3 Stormwater Handbook, using a design infiltration rate of 2 inches/hour. However, rain garden sizes were primarily determined by the available space within the public right of way.

Project Design and Construction Schedule

The project was constructed in 2012.

Project Funding and Costs

The funding and cost breakdown of the project is not known at this time.

Project Outcomes and Lessons Learned

The project was constructed in 2012, but the outcomes or lessons learned are not known at this time.

Operation and Maintenance

The Packard Foundation is responsible for operation and maintenance of the project.

3.9 Hacienda Avenue Green Streets

The Hacienda Avenue Green Street Project is located in the City of Campbell (Santa Clara County) on a segment of Hacienda Avenue that connects the San Tomas Area Neighborhood to Winchester Boulevard. The City is redeveloping Hacienda Avenue as a green street with proposed improvements including the installation of a new sidewalk, bike lanes, street trees; and bioinfiltration areas; narrowing the existing development area; and encouraging infiltration in open areas. The project will incorporate Bay-Friendly Landscape Design guidelines. The project is currently in the final design phase, with final design anticipated in September 2013.

Project Catchment

The total drainage area to the project is 22.7 acres and has an imperviousness of 74% prior to the green street improvements. The reduction of the width of the roadway by the project will reduce the imperviousness to 71%. The land use of the catchment is primarily residential. The underlying soils are fine sandy silt, silty sand, and gravely sand.

Treatment Measure Concept

The treatment measures to be implemented along Hacienda Avenue include the installation of approximately 80 bioinfiltration areas (bioretention with no underdrain) along both sides of the street, which will be landscaped with drought tolerant, native plants. They range in width from 5 to 20 feet, with an average length of 60 feet. The total surface area of the bioinfiltration areas is roughly 26,000 square feet. The infiltration rate of the underlying soil (3 feet below existing grade) is approximately 4 inches per hour. The treatment measures were designed using the combination flow and volume method as described in the SCVURPPP C.3 Stormwater Handbook.

Project Design and Construction Schedule

The project is currently in the final design phase (anticipated final design in September 2013), with construction set to begin in the summer of 2014.

Project Funding and Costs

The project received $2,000,000 in funding from the Bay Area Integrated Regional Water Management Plan (IRWMP), and $500,000 in funding from Caltrans (in the form of a Federal Grant under Community Development Transportation Program, with funds

originating from Federal Transportation Enhancement Fund). The total budget for the project is approximately $4,635,000. The City of Campbell is providing the remaining funds for this project.

Project Outcomes and Lessons Learned

The project is still in the design phase and has not reached a stage to evaluate outcomes or lessons learned at this time.

Operation and Maintenance

The City of Campbell will be responsible for the operation and maintenance of the project following completion. The costs of these activities are not yet determined.

3.10 Southgate Neighborhood Green Streets

The Southgate Neighborhood Green Streets Project is located within the Southgate neighborhood in the City of Palo Alto (Santa Clara County). This is a residential neighborhood consisting of single-family homes. The subdivision was developed in the 1920s with storm water runoff directed via surface gutter flow to a single drainage inlet connected to a piped storm drain system. Due to problems with street ponding in the neighborhood that arose over time as a result of the deterioration of gutter grades, the City of Palo Alto decided to retrofit the neighborhood to improve surface drainage and incorporate green street elements to improve water quality.

Project Catchment

The total area for the site is approximately 41.4 acres. Catchment delineation to each treatment measure is still being refined as part of final design.

Treatment Measure Concept

The proposed treatment measures include bioretention and biofiltration planters, porous pavement crosswalks, and a porous pavement “paseo” (pedestrian walkway connecting two streets). The bioretention planters will be incorporated into the street right-of-way and existing parkway strips (vegetated areas between the sidewalks and the streets). The project includes installation of 19 bioretention areas. The bioretention areas will be sited in locations that optimize the amount of tributary area draining to each system. The size and configuration of each bioretention area vary based on various constraints in the neighborhood, including physical conflicts with mature street trees, driveways, and

utility infrastructure. Bioretention facility surface areas will range from 5 to 9 feet in width and from 6 to 45 feet in length. The total surface areas of the bioretention areas is 3,524 square feet.

Porous pavers will be incorporated into crosswalks at four intersections in the neighborhood. The pavers will connect each adjacent corner with a 10-foot-wide crosswalk, creating nearly 8,712 square feet of pervious walkway as a part of the project.

Project Design and Construction Schedule

The project is currently in the final design phase, with construction set to begin in the fall of 2013.

Project Funding and Costs

The project is being funded entirely by the City of Palo Alto. The preliminary cost estimate for the design and construction of the project, including the bioretention planters, pervious paseo, pervious crosswalks, and approximately 475 linear feet of new storm drain, is $1.1 million (approximately $300,000 for design and $800,000 for construction). The actual costs are not available at this time.

Project Outcomes and Lessons Learned

The project is currently in the design phase and therefore has not yet reached a stage to conduct a post-implementation evaluation of outcomes or lessons learned at this time. However, some of the lessons learned in the design phase include: (1) soils and utilities should be researched early in the project schedule in order to understand site constraints; and (2) the project team should coordinate with residents in the neighborhood not only for their approval, but also to educate them, understand their concerns, and obtain feedback.

Operation and Maintenance

The City of Palo Alto will be responsible for the operation and maintenance of the project following completion. The cost of these activities is not yet determined.

3.11 Additional Green Street Projects

In addition to the ten selected green streets pilot projects described above, there are currently more than ten additional green streets projects in the planning or design

phases in the MRP Permittee area throughout the San Francisco Bay. These additional green street projects are beyond the requirements of the MRP and are being constructed based on the initiative of the municipality or funding agency. These additional projects are summarized in Table 5 below and Table A3 in Appendix A provides the available data on all of the reported twenty green street projects throughout the San Francisco Bay.

Table 5. Additional Ten Green Street Projects

Project Name	Project Location
1. Martha Gardens – Green Alleys Pilot Project	Alley between 2nd & 3rd St; Virginia & Martha St, San Jose, 95110
2. Nevin Avenue Improvements Green Streets	Nevin Avenue from 19th St to 27th St, Richmond CA 94804
3. Park Avenue – Green Avenue Pilot Project	Park Ave between Meridian Ave & Sunol St, San Jose, 95126
4. PG&E Substation	South 1st Street & Cutting Blvd, Richmond 94804
5. San Pablo Avenue Green Spine – Albany	San Pablo Ave & Monroe St, Albany 94706
6. San Pablo Avenue Green Spine – Berkeley	San Pablo Ave & Codornices Creek, Berkeley 94706
7. San Pablo Avenue Green Spine – El Cerrito (2 Project locations)	San Pablo Ave & Stockton Ave, El Cerrito 94530 San Pablo Ave & Moeser Ave, El Cerrito 94530
8. San Pablo Avenue Green Spine – Emeryville	San Pablo Ave & W MacArthur Blvd, Emeryville 94608
9. San Pablo Avenue Green Spine – Oakland	San Pablo Ave & 17th Street, Oakland, 94612
10. San Pablo Avenue Green Spine – San Pablo	13613 San Pablo Ave, San Pablo 94806

4. WATER QUALITY MODELING

MRP Provision C.3.b.iii requires that the Permittees conduct appropriate monitoring of the green street pilot projects to document the water quality benefits achieved.

Appropriate monitoring may include modeling using the design specifications and specific site conditions of the projects. The water quality modeling approach described below was selected to meet this requirement. The list of potential pollutants of concern to be modeled consisted of: copper, zinc, total suspended solids (TSS), total mercury and polychlorinated biphenyls (PCBs). In general, the spreadsheet model airs on the side of conservatism in terms of inputs and assumptions and is not intended to evaluate actual BMP performance. The modeling results are meant as placeholders until more site-specific monitoring data is collected.

Monitoring has been conducted at one green street project, the El Cerrito Green Street Project and is described in Section 5. Monitoring is planned as part of four other selected green street projects (additional projects will be added in the future), as part of grant requirements.

4.1 Facility Sizing Methodology

The treatment measures were sized using a simplified flow-based methodology in which the surface area of the BMP is sized to be 4% of the tributary impervious area. This sizing factor (0.04) is based on the ratio of the design rainfall intensity (0.2 inches per hour) to the design percolation rate of the biotreatment soil media (5 inches per hour, as required by Provision C.3.c.i.(2)(b)(iv)).

The planned BMP surface area and actual sizing factor (BMP surface area divided by tributary impervious drainage area to BMP) are presented in Table 6. The sizing factor for a few of the green street pilot projects was less than 0.04, because the projects are retrofit projects and had to work with space available for the BMPs.. However, due to the conservatism of treatment facility design built into the 4% sizing method (i.e. the method does not account for surface ponding, actual treatment soil infiltration rates, etc.), project facilities with a sizing factor of less than 0.04 may nonetheless capture and treat the C.3.d amount of runoff. Existing site constraints such as land availability and utility conflicts are examples of confining parameters, which affect the size and placement of water quality treatment measures.

Table 6. Planned BMP Size and Sizing Factor

Project Name	Planned BMP Surface Area (acre)	Sizing Factor[1,2] --
San Pablo Avenue Green Spine - Richmond	0.106	0.049
El Cerrito Green Streets	0.025	0.019
Codornices Creek Restoration	0.025	0.013
Park and Hollis Stormwater Curb Extension	0.015	0.084
Stanley Boulevard Safety and Streetscape Improvement	2.23	0.087
Sustainable & Parking Lots Demonstration	0.072	0.056
Bransten Road Green Street	0.104	0.203
Southgate Neighborhood Green Streets	0.010	0.002[3]
Packard Foundation	0.042	0.071
Hacienda Avenue Green Streets	0.596	0.026

Notes:
1 The sizing factor is the planned BMP surface area divided by the total tributary impervious area.
2 Available project tributary area delineations may not include all surfaces draining to the BMP, such as the adjacent paved surfaces or roofs; the sizing factors were based on the reported project information.
3 Tributary area information available for Southgate Neighborhood Green Streets includes all areas within the neighborhood, not just those delineated to drain onto green streets.

4.2 Modeling Methodology for TSS and Metals

The reductions in pollutant loads of total suspended solids (TSS) and metals that may be achieved by green street pilot projects stormwater treatment facilities, were modeled using a simple spreadsheet-based model.

The reduction in pollutant loads in a BMP is based on a combination of two factors: (1) the amount of water that is treated by the BMP and (2) the level of treatment received. The amount of water that is treated is commonly referred to as "captured" and the percent of mean annual flow that is treated is commonly referred to as "percent captured". When the capacity of the BMP to accept inflow is met, water will flow around the unit and is said to be "bypassed".

The amount captured by a bioretention facility depends on a number of factors including the catchment area and tributary imperviousness, the surface area of the infiltration bed, surface ponding volume, the media infiltration rate, void space in the underdrain layer, native soils infiltration rates, and evapotranspiration rates. The percent capture also depends on the precipitation patterns and runoff rates, and the time that is

required for the BMP to drain (or draw down) and regain capacity to capture runoff in anticipation of the next event. All other factors being equal, BMPs located in areas receiving more intense rainfall and rainfall with short inter-event separation times will achieve lower percent capture.

One of the primary factors affecting percent capture is the surface area of the bioretention unit. As indicated in Table 6, the unit sizes for the green street pilot projects vary substantially in terms of sizing factor, including three units that have sizing factors below 0.04 (the nominal sizing factor used in the Bay Area for new development projects). These smaller units will achieve a lower percent capture than those units with sizing factors over 0.04 will. In general, bioretention facilities that are properly designed and sized using the 0.04 sizing factor, should achieve percent capture in excess of 80%. However, given the substantially lower sizing factors for some of the facilities due to their design as retrofit projects, it was conservatively assumed that all of the facilities would achieve a 70% percent capture rate. It should be noted that the facilities might be sized in accordance to C.3.d. with the 70% capture rate due to the overall conservative nature of the treatment facility design in the guidance documents.

The influent pollutant load estimates were based on land use specific concentrations from the San Francisco Bay Area Stormwater Runoff Monitoring Data Analysis 1988-1995 (BASMAA, 1996). The industrial land use concentrations were an average of the available "Light Industrial" and "Heavy Industrial" land use categories, and the transportation concentrations were used for projects with tributary areas designated as within the public right-of-way.

The concentration used for total copper for "Residential" land uses was assumed to be a weighted estimate based on 25% of the area producing runoff concentrations similar to "Urban" land use and 75% of the area producing runoff concentrations similar to "Open Space" land use, as those were the only two categories with concentrations provided for total copper. A summary of the assumed land use specific concentrations is presented in Table 7.

Table 7. Land Use Specific Influent Concentrations

Land Use	Total Cu (µg/L)	Total Zn (µg/L)	Total TSS (mg/L)
Residential	19.5	188	85.9
Commercial	45	397	97.5
Industrial	45	365	135
Transportation	45	279	192

Each of the analyses assumed that the facilities would achieve 70% capture of the runoff volume, and scaled the removal of pollutants accordingly. Within the facilities, a range was used to estimate the pollutant reductions due to incidental infiltration and/or evapotranspiration of the captured volume (25%, 50%, and 75%) to account for variability in design and infiltration rates beneath the facilities. Similar assumptions were made in the LID Feasibility/Infeasibility Report prepared for BASMAA in 2011 (Geosyntec, 2011b), which noted that incidental infiltration in biotreatment measures was analyzed in a publication by Strecker, Quigley, Urbonas, and Jones (Strecker et. al., 2004). That study observed as much as 40 percent volume reduction through incidental infiltration. The Sustainable Green Streets and Parking Lot Demonstration Project (City of Burlingame) was also modeled to have 80% and 100% infiltration of the captured volume due to the specification in the project description that the BMP was designed to infiltrate. For all projects, the remaining pollutant loads associated with the volume that was not modeled as being infiltrated, were used as the influent loads being treated within the BMPs.

The 2012 International Stormwater BMP Database Summaries were used to evaluate the effluent event mean concentrations (EMCs) of TSS and total metals (copper and zinc) for bioretention facilities and bioswales (See Table 8). The bioretention facilities in the database are mostly characterized as bioretention cells that are not associated with flood conveyance, and all but 8 of the facilities have underdrains. Bioswales in the database are typically dry grassy swales (wetland swales are analyzed in the wetland channel BMP category).

The Database is generally quite robust in terms of the number and quality of data. For example, fourteen studies consisting of a total of 193 measurements of effluent TSS EMCs from bioretention facilities were considered when estimating the mean effluent

concentration. Similarly, a total of 354 individual measurements from 23 studies were analyzed to estimate the mean for bioswales.

The information from the Database was not filtered by location or climate of the facilities (i.e., in order to isolate facilities in semi-arid climates). Monitoring data for bioretention facilities includes facilities located in Delaware, Massachusetts, North Carolina, New Hampshire, Oregon, Pennsylvania, Virginia, Washington and Wisconsin; monitored bioswales were located in California, Florida, North Carolina, New Hampshire, Oregon, Texas, Virginia, Washington, and Wisconsin. In order to evaluate the representativeness of this data for application in California, a comparison of the effluent TSS EMCs with local monitoring data from the El Cerrito Project was conducted, and the comparison was quite good. Therefore, the application of the Database for bioretention BMPs in semi-arid climates, such as California, was deemed appropriate until data that is more representative becomes available.

Table 8. Estimated Mean Effluent Concentrations in Bioretention and Bioswales

Constituent	BMP Type	Effluent Concentration
TSS (mg/L)	Bioretention	17.70
	Bioswale	27.00
Total Cu (µg/L)	Bioretention	9.72
	Bioswale	10.10
Total Zn (µg/L)	Bioretention	27.70
	Bioswale	36.20

With the exception of the Stanley Boulevard Safety and Streetscape Improvement Project, the pollutant reductions due to treatment were calculated for the overall tributary area and design BMP volume for bioretention facilities. The Stanley Boulevard Safety and Streetscape Improvement Project specifies that 43% of the BMP area is a bioswale, so the effluent concentrations were estimated as partially attributed to bioretention and partially attributed to bioswales.

The total estimated removal from incidental infiltration and treatment is summarized for each of the projects in Appendix B.

4.3 Model Methodology for PCBs and Mercury

The approximate removal of PCBs and mercury could not be estimated using the same methodology as TSS and total metals because the International Stormwater BMP Database does not contain sufficient information on removal efficiencies for bioswales and bioretention facilities for those contaminants. In lieu of that information, a correlation was used between influent and effluent TSS concentrations to represent the treatment and removal of PCBs and mercury. This correlation is based upon a study conducted by the San Francisco Estuary Institute (SFEI) that looked at the contaminants and loadings of trace contaminants in an urbanized tributary in Hayward, California called Zone 4 Line A (Z4LA) (McKee et. al., 2011).

The water quality concentrations of the influent to the BMPs were estimated using land use particle-based event mean concentrations (EMCs), which were developed as part of a calibration and verification effort of the Regional Watershed Spreadsheet Model (RSWM) that was conducted by SFEI (SFEI, 2012). The approach uses pollutant of concern (POC) loads monitoring data that was collected from 21 mass emission stations in the Bay Area and uses statistical analyses and reverse optimization to estimate the concentrations of PCBs and total mercury (HgT) that originate within the different land uses in the upstream watersheds (McKee et. al., 2011).

The land use categories used for HgT include 1) old urban areas, 2) newer urban areas, and 3) undeveloped land (agriculture and open space). Urban areas are broken into two categories based on age of development because legacy pollutants, such as PCBs, depend on age of land use as well as land use type. For PCBs, two different land use category breakdowns were used to identify if a statistically significant relationship exists between PCBs and land use for the watersheds analyzed. The land uses common to both breakdowns include: 1) old (pre-1954) industrial areas, 2) old urban areas, 3) newer urban areas, and 4) undeveloped land (agriculture/open space). The land use categorizations were based upon available GIS layers and a previous study conducted by Greenfield et. al. that demonstrated a positive correlation between old industrual (before 1954) areas and PCBs and HgT (Greenfield et. al., 2010). Railroads were also analyzed for one set of model iterations as a specialized PCBs-associated land use. However, the inclusion of the railroad land use category did not generally improve the fit of the esimated concentrations and was inconsistent across watersheds, so the mean concentrations for the scenario without railroads is used. One watershed (Santa Fe Channel) was removed from the PCB concentration analysis after a skew towards high concentrations was observed. The optimization particle ratios for HgT and PCBs are presented in Table 9.

Table 9. Optimized Mean Particle Ratios for PCBs and HgT

Land Use Type	PCBs (µg/kg)[1]	HgT (mg/kg)[2]
Old Urban	150	0.63
New Urban	0.87	0.16
Old Industrial	2800	N/A
Agriculture/Open Space	20	0.14

Notes:

1. For PCBs, the four land use categories used from the RWSM EMC analysis include: 1) old (pre-1954) industrial areas, 2) old urban areas, 3) newer urban areas, and 4) undeveloped land (agriculture/open space).
2. For HgT, the three land use categories used from the RWSM EMC analysis include: 1) old urban areas, 2) newer urban areas, and 3) undeveloped land (agriculture/open space).

Limitations of Methodology

The particle ratios indicated in Table 9 were applied to convert influent solids concentrations to PCB concentrations. Since each project catchment contained a mix of land uses, a "catchment land use weighted" estimate of the particle ratio was applied to the effluent TSS to predict the effluent PCB concentration. It was assumed then that the effluent particle ratio was equal to the composite influent particle ratio, based on the reasoning that most of removals of PCBs would be in proportion to the removal of solids. Loading reduction estimates contained in this report reflect this assumption.

However, particle ratio data collected by SFEI at the El Cerrito Rain Gardens (Gilbreath et al, 2012) indicate that the mean effluent particle ratio at the inlet was 1.16 mg/kg, and only 0.13 mg/kg at the outlet. This suggests that PCBs are treated more effectively than solids (perhaps because of adsorption) or that the source of solids in the effluent may reflect mobilizing of solids from the media. Data from the Daly City Library Monitoring Study show a similar pattern; namely the post-installation PCB – SSC correlation is lower than that for the pre-installation data (David et al, 2011).

The implication for this report is that estimates of load reductions based on equality of particle ratios may result in lower estimates of load reduction (by as much as 10%), especially in those catchments where much of the land use is categorized by older industrial.

4.4 Summary of Modeling Results

The total estimated removal from incidental infiltration and treatment is summarized for each of the projects in Appendix B. Table B1 presents the results for the scenario with 25% incidental infiltration of the captured runoff volume, which was intended to be representative of systems designed with an underdrain and/or located on soils with poor infiltration capacity. The percent of the influent loads that is removed is between 55-62% for TSS, 55-64% for PCBs, 55-62% for HgT, and 18% for both copper and zinc. Table B2 presents the modeling results for the median case of 50% incidental infiltration. The percent of the influent loads that are removed is between 60-65% for TSS, 60-66% for PCBs, 60-65% for HgT, and is 35% for both copper and zinc. Table B3 presents the results for the scenario with 75% incidental infiltration of the captured runoff volume, which was intended to be representative of systems designed without an underdrain and located on soils with high infiltration rates. The percent of the influent loads that are removed for 75% incidental infiltration is between 65-67% for TSS, 65-68% for PCBs, 65-67% for HgT, and 53% for both copper and zinc. The modeling indicates that a higher degree of infiltration increases the removal of influent metal loads significantly, while only marginally increasing the removal of TSS, PCBs and HgT.

5. MONITORING

At the time of this report, monitoring had only occurred at the El Cerrito Green Streets Project. Qualitative observational monitoring was conducted during water years (WY) 2010 and 2011 to observe the construction of the project and the performance in the first year following implementation. Water Quality monitoring data collected by SFEI during WY 2012 were limited to 4 storm events and indicated that the percent reduction in concentrations (or treatment effectiveness) achieved varied depending on constituent, but was approximately 79% for suspended sediment concentration (SSC), 87% for polychlorinated biphenyls (PCBs), and 69% for total copper. Reductions in mercury were less consistent and the reduction for total Hg was indicated as -17%. This estimate was heavily driven by one sample, without which, the effectiveness would have been 32%. A summary table of the estimated load reductions is presented in Table 10.

Table 10. El Cerrito Green Streets - Estimated Load Reductions

	Average Change in Concentration (Inlet-Outlet)	Load Reduction if Volume Reduced by:		
		25%	50%	75%
SSC (n=4)	79%	84%	90%	95%
HgT (n=4) [1]	-17%	12%	42%	71%
HgT (excluding Storm 2; n=3) [1]	32%	49%	66%	83%
Total Copper (n=4)	69%	77%	85%	92%
PCBs (n=4)	87%	90%	94%	97%

Notes:
1. HgT is presented, both including all the data, as well as excluding the anomalous Storm 2 data point.

Monitoring is planned for the Codornices Creek Restoration Project, the San Pablo Avenue Green Spine Project, the Bransten Road Green Street Project, and the Hacienda Avenue Green Streets Project. A monitoring plan has been developed for the City of Richmond's San Pablo Avenue Green Spine Project and the Hacienda Avenue Green Streets Project as part of the Green Infrastructure Capacity Building Project, managed by the San Francisco Estuary Partnership (SFEP). The San Francisco Estuary Institute (SFEI) will conduct pollutant and flow monitoring to determine the effectiveness of the stormwater treatment measures to meet the green infrastructure implementation goals.

The San Pablo Avenue Green Spine project includes seven locations, one of which is the selected green streets pilot project located in the City of Richmond. The seven planned project locations will be assessed to determine the three locations most appropriate for monitoring with respect to site logistics, land use characteristics, and green infrastructure type. Baseline conditions will be established using land use characteristics in the drainage areas for each delineated project site and inlet monitoring prior to the stormwater reaching the treatment mechanisms for three storm events. The outlet of the facilities will also be monitored to provide an estimate of the level of treatment achieved. The preliminary analyte list includes PCBs, PAHs, mercury (total and dissolved), copper (total and dissolved), nutrients, and SSC.

The Hacienda Avenue Project will be monitored to evaluate its water budget by measuring the rainfall, stormwater bypass, and the water level within the treatment facility. This will allow for an estimation of infiltration to determine whether the facility is functioning as designed.

Finally, the Bransten Road Green Street Project will be monitored as part of Clean Watersheds for a Clean Bay (CW4CB) Task 5 grant in two phases: a screening phase to support monitoring design (2012-13 wet season) and a BMP assessment phase (2013-14 wet season). A maximum of 19 stormwater samples will be collected. A lesser number may be collected depending on the number of storms that are monitored during the 2012-2013 wet season. Grab samples will be collected for the following pollutants of concern: PCBs, dissolved PCBs, total mercury, particle size distribution, volatile suspended solids (VSS), suspended sediment concentration (SSC), turbidity, and settleable solids.

6. SUMMARY OF LESSONS LEARNED

The ten green street pilot projects provide valuable lessons for the design and construction of future green street projects. In general, constructing green street projects within an existing transportation corridor present major challenges. Right-of-ways generally contain electrical utilities, gas lines, water lines, and other infrastructure. Treatment facilities need adequate space within the right-of-way to operate effectively but cannot conflict with existing utilities and transportation needs, and must be located at a lower elevation than the tributary impervious surface for which treatment is desired. These factors require a comprehensive evaluation of the existing site and its functionality with accurate mapping and information prior to construction.

Additionally, runoff from areas outside of the delineated tributary area, such as adjacent properties, rooftops, sidewalks, and parking lots, may drain to green street project treatment measures even though they are not sized to treat the additional flows. Unanticipated treatment benefits from treating the additional runoff will be achieved even if the areas outside of the right-of-way are not designed to be tributary to the treatment measures.

Additional design and construction lessons learned include: (1) special attention should be made to design the curb cuts so that significant bypass does not occur; (2) Standard crown slopes allow for more effective implementation of green streets due to the reduced cross slope and greater available treatment area; (3) Monitoring of the facility should be considered during the design phase so that the appropriate infrastructure can be built; (4) the project team should coordinate with residents in the neighborhood not only for their approval, but also to educate them, understand their concerns, and obtain

feedback; and (5) A maintenance period following construction should be incorporated into the schedule.

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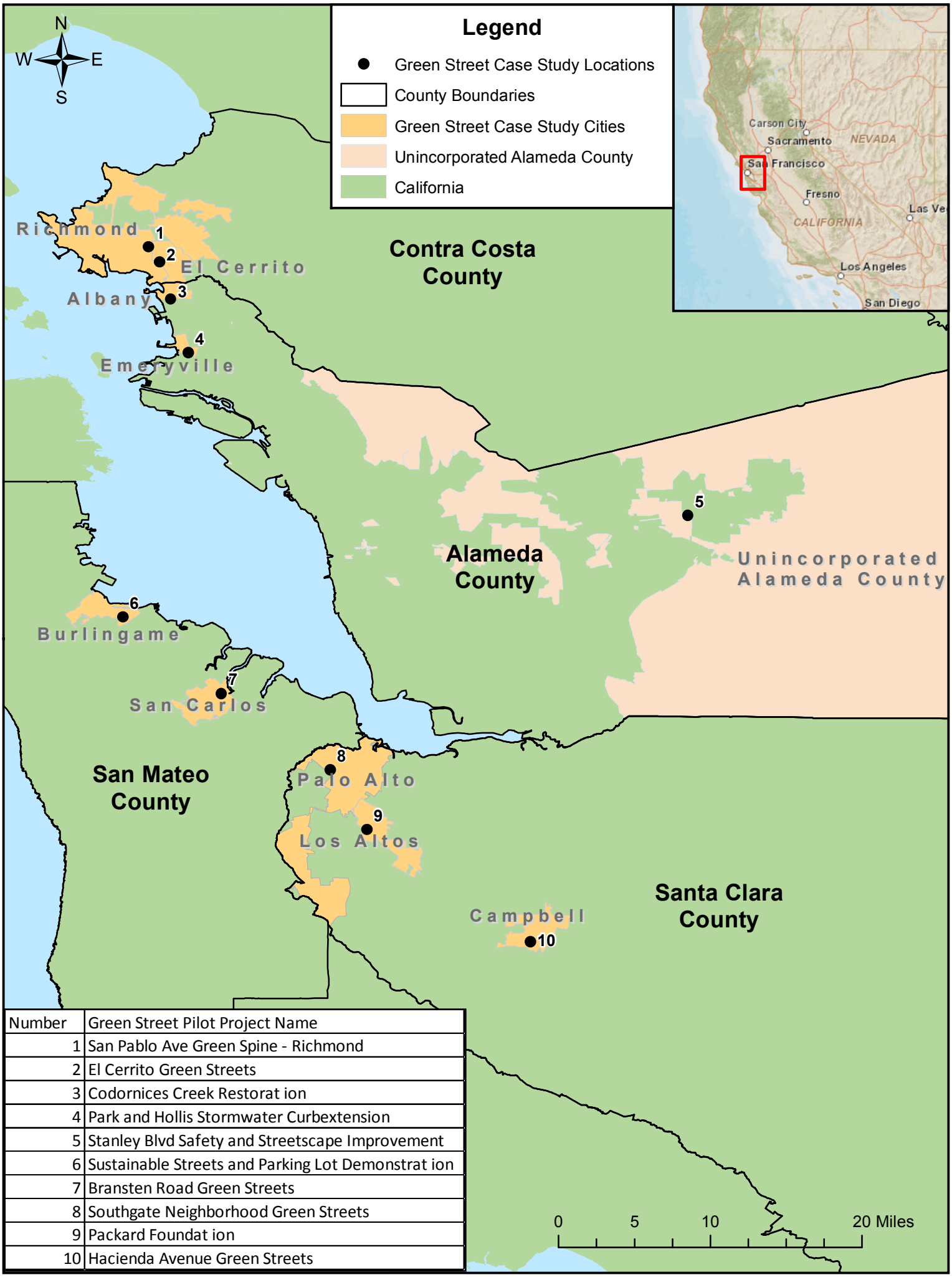
FIGURES



Number	Green Street Pilot Project Name
1	San Pablo Ave Green Spine - Richmond
2	El Cerrito Green Streets
3	Codornices Creek Restorat ion
4	Park and Hollis Stormwater Curbextension
5	Stanley Blvd Safety and Streetscape Improvement
6	Sustainable Streets and Parking Lot Demonstrat ion
7	Bransten Road Green Streets
8	Southgate Neighborhood Green Streets
9	Packard Foundat ion
10	Hacienda Avenue Green Streets

APPENDIX A

Green Street Pilot Projects Status Tables

Table A1. Project Information for 10 Selected Green Street Pilot Projects

Program	County	No.	Project Name	Owner/ Municipality	Project Location	Project Type (check all that apply)					Project Description	Project Attributes (check all that apply)									Project Status	Project Contact	Estimated Date of Comple-tion	Monitor-ing	Modeling	Project Status
						Arterial	Collector	Local	Parking Lot	Other (*specify*)		Bay-Friendly Landscaping	Stormwater Storage/Use	Stormwater Infiltration	Stormwater Treatment	Enhance Pedestrian and /or bicycle environment	Park-like elements	Connect residential, recreation, schools,	Parking Management	ABAG/MTC- designated Priority Development						
ACCWP	Alameda	1	Park and Hollis Stormwater Curb Extension	Emeryville	Northeast Corner of Park Ave and Hollis Street		X				Planted stormwater curbextension constructed in 2010 as part of new corner plaza area.	X	X			X	X			X	Constructed	Peter Schultze-Allen (Emeryville)	2010	None planned	Yes	Project completed. Pixar Animation Studios responsible, cost information not broken down or available.
		2	Codornices Creek Restoration Project	Berkeley, Albany, University of California	San Pablo Avenue at 6th Street			X			4 Rain Gardens/Bioretention areas with underdrains with discharge to Codornices Creek	X		X	X	X	X	X			Constructed	Jim Scanlin (ACPWA)	2011	Yes 5-Year Plan	Yes	Maintenance of all the improvements made on Codornices Creek is divided among the three agencies (Albany, Berkeley, and UC Berkeley) through a Memorandum of Understanding (MOU). The bioretention facilities were included in this MOU by an amendment before acceptance of construction.The Creek Project requires 5 years of monitoring.
		3	Stanley Boulevard Safety and Streetscape Improvement Project	Unincor-porated Alameda County	Stanley Boulevard Safety and Streetscape Improvement Project	X					Improving 3 miles of roadway, incorporating LID to convert industrial corridor to more rural parkway setting.	98		X	X	X	X	X			Contruction Phase	Justin Laurence (ACCWP)	September 2012	None planned	Yes	Construction is currently in progress. The BMPs have not yet begun construction.
CCCWP	Contra Costa	4	El Cerrito Green Streets	El Cerrito	10200 block of San Pablo Avenue (east side) and 11048 San Pablo Avenue	X					2 Rain Gardens (bioretention with underdrains)	X			X	X	X			X	Constructed	Stephen Pree (El Cerrito)	August 2010	Yes Conducted	Yes	The project was completed in August 2010 and completed water quality monitoring through WY 2012.
		5	San Pablo Avenue Greenspine Project	Richmond	12900 block of San Pablo Ave (west side) between McBryde Ave & Andrade Ave	X					5 Bioretention facilities, including infiltration			X		X	X	X			Preliminary Design Phase	Josh Brandt (SFEP)	Fall 2013	Planned	No	The project is currently in the 30% design phase. Design anticipated to be completed by late summer 2013 and construction to begin in late summer/fall 2013.
SMCWPPP	San Mateo	6	Sustainable Streets and Parking Lots Demonstration Project	Burlingame	1227 Donnelly Avenue, between Primose Road and Bellevue Avenue, Assessor Parcel Number 029-152-300			X	X		Rain Garden (bioretention without underdrain) and curb extention	X		X	X						Constructed	Jane Gomery (Burlingame)	January 2011	No	Yes	The project was completed in January 2011.
		7	Bransten Road Green Street	San Carlos	Bransten Road between Old County Road and Industrial Road			X			Bioretention areas in newly constructed curb extensions				X	X	X		X		100% Design Phase	Ray Chan (San Carlos)	December2014	CW4CB Task 5 Planned	Yes	The project is currently at the 100% design phase phase; construction is anticipated to be completed by the MRP Provision C.3.b.iii due date of December 1, 2014.
SCVURPPP	Santa Clara	8	Packard Foundation Project	Los Altos	343 Second Street, between Whitney and Lyell			X			Flow-through rain gardens in park strip along street and at an intersection; conversion of impervious to pervious area			X	X	X					Constructed	Jill Bicknell (SCVURPPP)	July 2012	None planned	Yes	Construction completed July 2012.
		9	Hacienda Avenue Green Street	Campbell	Hacienda Avenue, between South San Tomas Aquino Rd & Winchester Blvd	X					Improving 1 mile of roadway. Adding bike lanes, sidewalk infill, narrowing roadway width to install bioretention swales and bulbouts	X		X		X	X	X	X		Final Design Phase	Fred Ho (Campbell)	Late 2014/early 2015	Yes (water balance only)	Yes	Conceptual designs approved by City Council. Construction to begin in summer 2014.
		10	Southgate Neighborhood Green Street	Palo Alto	Various streets centered around Miramonte and Castilleja Avenues			X			Adding bioretention and biofiltration planters and pervious pavement throughout a residential neighborhood	X		X	X	X	X	X			Final Design Phase	Jill Bicknell (SCVURPPP)	Early 2014	None planned	Yes	Design received approval from city architectural review design staff. Construction to begin in fall 2013.

Table A2. Project Cost Information for 10 Selected Green Street Pilot Projects

Program	County	No.	Project Name	Owner/ Municipality	Project Location	Project Cost Estimate				Project Status	Project Contact	Funding (include Percentages)
						Construction Costs	Design Costs	Annual O&M Costs	Total Estimated Costs without Annual O&M			
ACCWP	Alameda	1	Park and Hollis Stormwater Curbextension	Emeryville	Northeast Corner of Park Ave and Hollis Street	Not Available	Not Available	Not Available	Not Available	Constructed	Peter Schultze-Allen (Emeryville)	Pixar Animation Studios
		2	Codornices Creek Restoration Project	Berkeley, Albany, University of California	San Pablo Avenue at 6th Street	$140,000	$35,000	$3,000	$175,000	Constructed	Jim Scanlin (ACPWA)	100% Funded by Prop 50 River Parkways Grant that was awarded to the City of Albany.
		3	Stanley Boulevard Safety and Streetscape Improvement Project	Unincorporated Alameda County	Stanley Boulevard Safety and Streetscape Improvement Project	Not Available	Not Available	Alameda County Public Works Maintenance & Operations Local Funds	$14,500,000	Contruction Phase	Justin Laurence (ACCWP)	State Prop 1B & Local funds (64.3%), CEMEX and Vulcan Materials Companies (34.5%), Bay Area Air Quality Management District – Transportation for Clean Air Grant Funds (0.008%), StopWaste.org Bay Friendly Grant Funds (0.002%)
CCCWP	Contra Costa	4	El Cerrito Green Streets Project	El Cerrito	10200 block of San Pablo Avenue (east side) and 11048 San Pablo Avenue	$324,127	Unknown	$5,000	$324,127	Constructed	Stephen Pree (El Cerrito)	This project was funded in large part through a federal ARRA grant through the State Water Resources Control Board ($392,000). This grant was split between the design/construction phase and the monitoring phase. The construction portion of that grant ($215,295) went to the City of El Cerrito as subgrantees. Other funding was from the El Cerrito Redevelopment Agency ($108,832).
		5	San Pablo Avenue Greenspine Project	Richmond	12900 block of San Pablo Ave (west side) between McBryde Ave & Andrade Ave	Not Available	Not Available	City of Richmond responsible	Not Available	Preliminary Design Phase	Josh Brandt (SFEP)	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
SMCWPPP	San Mateo	6	Sustainable Streets and Parking Lots Demonstration Project	Burlingame	1227 Donnelly Avenue, between Primose Road and Bellevue Avenue, Assessor Parcel Number 029-152-300	$215,000	$55,000	$65,000	$270,000	Constructed	Jane Gomery (Burlingame)	The San Mateo Countywide Water Pollution Prevention Program provided $250,000 of the funding. The City of Burlingame also contributed to the Capital Improvement Project from its General Fund.
		7	Bransten Road Green Street	San Carlos	Bransten Road between Old County Road and Industrial Road	$379,600	$156,000	Not Available	$535,600	100% Design Phase	Ray Chan (San Carlos)	EPA's San Francisco Bay Water Quality Improvement Fund (59%), San Mateo Countywide Water Pollution Prevention Program's Sustainable Creen Streets and Parking Lots Program (40%), Match from San Mateo Countywide Water Pollution Prevention Program (1%).
SCVURPPP	Santa Clara	8	Packard Foundation Project	Los Altos	343 Second Street, between Whitney and Lyell	Not Available - part of larger project	Not Available - part of larger project	Not Available	Not Available	Constructed	Jill Bicknell (SCVURPPP)	Funding was provided entirely by the David & Lucile Packard Foundation as part of construction of its headquarters office building. The Packard Foundation is responsible for operation and maintenance of the project.
		9	Hacienda Avenue Green Street	Campbell	Hacienda Avenue, between South San Tomas Aquino Rd & Winchester Blvd	Not Available	Not Available	Not Available	$4,635,000	Final Design Phase	Fred Ho (Campbell)	Received $2 million grant from State's IRWM program (43%) and $0.5 million in Federal funding via Caltrans (11%). City is providing the remainder of the funding (46%)."
		10	Southgate Neighborhood Green Street	Palo Alto	Various streets centered around Miramonte and Castilleja Avenues	$800,000 (estimate)	$300,000	Not Available	$1,100,000	Final Design Phase	Jill Bicknell (SCVURPPP)	The project is being funded entirely by the City of Palo Alto. The preliminary cost includes about 475 linear feet of new storm drain.

Table A3. Project Information for All Reported Bay Area Green Street Projects

Pro-gram	County	No.	Project Name	Owner/ Municipality	Project Location	Project Type (check all that apply)					Project Description	Project Attributes (check all that apply)									Project Status	Project Contact	Estimated Date of Comple-tion	WQ Monitor-ing	Modelling	Project Schedule, Funding, and Other Information
						Arterial	Collector	Local	Parking Lot	Other (*specify*)		Bay-Friendly Landscaping	Stormwater Storage/Use	Stormwater Infiltration	Stormwater Treatment	Enhance Pedestrian and /or bicycle environment	Park-like elements	Connect residential, recreation, schools,	Parking Management	ABAG/MTC- designated Priority Development						
ACCWP	Alameda	A1	Park and Hollis Stormwater Curb Extension	Emeryville	Northeast Corner of Park Ave and Hollis Street		X				Planted stormwater curbextension constructed in 2010 as part of new corner plaza area.	X	X			X	X			X	Constructed	Peter Schultze-Allen (Emeryville)	2010	None planned	Yes	Project completed. Pixar Animation Studios responsible, cost information not broken down or available.
		A2	Codornices Creek Restoration Project	Berkeley, Albany, University of California	San Pablo Avenue at 6th Street			X			4 Rain Gardens/Bioretention areas with underdrains with discharge to Codornices Creek	X		X	X	X	X	X			Constructed	Jim Scanlin (ACPWA)	2011	Yes 5-Year Plan	Yes	Maintenance is divided among 3 agencies (Albany, Berkeley, and UC Berkeley) through a Memorandum of Understanding (MOU) for entire project. The Creek Project requires 5 years of monitoring.
		A3	Stanley Boulevard Safety and Streetscape Improvement Project	Unincor-porated Alameda County	Stanley Boulevard Safety and Streetscape Improvement Project	X					Improving 3 miles of roadway, incorporating LID to convert industrial corridor to more rural parkway setting.	98		X	X	X	X	X			Contruction Phase	Justin Laurence (ACCWP)	September 2012	None planned	Yes	Construction is currently in progress. The BMPs have not yet begun construction. State Prop 1B & Local funds (64.3%), CEMEX and Vulcan Materials Companies (34.5%), Bay Area Air Quality Management District – Transportation for Clean Air Grant Funds (0.008%), StopWaste.org Bay Friendly Grant Funds (0.002%)
		A4	San Pablo Avenue Greenspine Project	Albany	San Pablo Ave & Monroe St, Albany 94706	X					3 Stormwater Curb Extensions and Sidewalk Planters	X			X		X				60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
		A5	San Pablo Avenue Greenspine Project	Berkeley	San Pablo Ave & Cordornices Creek, Berkeley 94708	X					5 Stormwater Curb Extensions	X			X		X				60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
		A6	San Pablo Avenue Greenspine Project	Emeryville	San Pablo Ave & W MacArthur Blvd, Emeryville 94608	X					3 Rain Gardens	X			X	X	X				60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
		A7	San Pablo Avenue Greenspine Project	Oakland	San Pablo Ave & 17th Street, Oakland, 94612	X					Stormwater Planters and Street Trees	X		X	X		X		X		60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
CCCWP	Contra Costa	CC1	El Cerrito Green Streets	El Cerrito	10200 block of San Pablo Avenue (east side) and 11048 San Pablo Avenue	X					2 Rain Gardens (bioretention with underdrains)	X			X	X	X			X	Constructed	Stephen Pree (El Cerrito)	August 2010	Yes Conducted	Yes	Funded through a federal ARRA Grant and by the El Cerrito Redevelopment Agency and administered through the State Water Resources Control Board via SFEP.
		CC2	San Pablo Avenue Greenspine Project	El Cerrito	San Pablo Ave & Stockton Ave; San Pablo Ave & Moeser Ave, El Cerrito 94530; El Cerrito 94530	X					Stormwater Curb Extensions, Rain Gardens, and Sidewalk Planters	X		X	X		X				60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
		CC3	San Pablo Avenue Greenspine Project	Richmond	12900 block of San Pablo Ave (west side) between McBryde Ave & Andrade Ave	X					5 Bioretention Facilities, including Infiltration	X		X		X	X	X			60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
		CC4	San Pablo Avenue Greenspine Project	San Pablo	13613 San Pablo Ave, San Pablo 94806	X					Stormwater Planters	X					X				60% Design Phase	Josh Brandt (SFEP)	Fall 2014	Planned	No	Project is funded from USEPA SF Bay Water Quality Improvement Fund and the State's IRWM program. Construction funded by Caltrans. SFEP administers grants.
		CC5	Nevine Avenue Improvements Green Streets	Richmond	Nevin Avenue from 19th St to 27th St			X			Rain gardens (bioretention w/underdrain) curb extensions, permeable pavement			X	X	X	X				100% Design Phase	Lynn Scarpa (Richmond)	March 2014	Planned as part of CW4CB Task 5	No	The project is currently at the 100% design phase phase; construction is anticipated to be completed by the MRP Provision C.3.b.iii due date of December 1, 2014.

Table A3. Project Information for All Reported Bay Area Green Streets Projects

Pro-gram	County	No.	Project Name	Owner/ Municipality	Project Location	Project Type (check all that apply)					Project Description	Project Attributes (check all that apply)									Project Status	Project Contact	Estimated Date of Comple-tion	WQ Monitor-ing	Modelling	Project Status
						Arterial	Collector	Local	Parking Lot	Other (*specify*)		Bay-Friendly Landscaping	Stormwater Storage/Use	Stormwater Infiltration	Stormwater Treatment	Enhance Pedestrian and /or bicycle environment	Park-like elements	Connect residential, recreation, schools, streets,	Parking Management	ABAG/MTC- designated Priority Development Area					
		CC6	**PG&E Substation at 1st & Cutting**	**Richmond**	South 1st Street & Cutting Blvd, Richmond 94804		X				4 Bioretention areas (2 w/underdrains; 2 w/o underdrains)			X	X						100% Design Phase	Lynn Scarpa (Richmond)	October 2013	Planned as part of CW4CB Task 5	No	The project is currently at the 100% design phase phase; construction is anticipated to be completed by the MRP Provision C.3.b.iii due date of December 1, 2014.
SMCW PPP	**San Mateo**	**SM1**	**Sustainable Streets and Parking Lots Demonstration Project**	**Burlingame**	1227 Donnelly Avenue, between Primose Road and Bellevue Avenue, Assessor Parcel Number 029-152-300			X	X		Rain Garden (bioretention without underdrain) and curb extention	X		X	X						Constructed	Jane Gomery (Burlingame)	January 2011	No		Funding for the projects come from a countywide vehicle registration fee under Assembly Bill (AB) 1546, which went into effect on July 1, 2005, and was subsequently extended to 2012 through Senate Bill (SB) 348.
		SM2	**Bransten Road Green Street**	**San Carlos**	Bransten Road between Old County Road and Industrial Road			X			Bioretention areas in newly constructed curb extensions				X	X	X		X		100% Design Phase	Ray Chan (San Carlos)	December2014	Planned as part of CW4CB Task 5	Yes	The project is currently at the 100% design phase phase; construction is anticipated to be completed by the MRP Provision C.3.b.iii due date of December 1, 2014.
SCVUR PPP	**Santa Clara**	**SC1**	**Packard Foundation Project**	**Los Altos**	343 Second Street, between Whitney and Lyell			X			Flow-through rain gardens in park strip along street and at an intersection; conversion of impervious to pervious area			X	X	X					Constructed	Jill Bicknell (SCVURPPP)	July 2012	None planned	Yes	Construction completed July 2012. Funding was provided entirely by the David & Lucile Packard Foundation as part of construction of its headquarters office building.
		SC2	**Hacienda Avenue Green Street**	**Campbell**	Hacienda Avenue, between South San Tomas Aquino Rd & Winchester Blvd	X					Improving 1 mile of roadway. Adding bike lanes, sidewalk infill, narrowing roadway width to install bioretention swales and bulbouts	X		X		X	X	X	X		Final Design Phase	Fred Ho (Campbell)	Late 2014/early 2015	Yes (Water balance only)	Yes	Conceptual designs approved by City Council. Construction to begin in summer 2014. Funding assistance provided by $2 million grant from State's IRWM program (43%) and $0.5 million in Federal funding via Caltrans (11%). City is providing the remainder of the funding (46%).
		SC3	**Southgate Neighborhood Green Street**	**Palo Alto**	Various streets centered around Castilleja &Miramonte Aveunes			X			Adding bioretention and biofiltration planters and pervious pavement throughout a residential neighborhood	X		X	X	X	X	X			Final Design Phase	Jill Bicknell (SCVURPPP)	Early 2014	None planned	Yes	Design received approval from city architectural review design staff. Construction to begin in fall 2013. The project is being funded entirely by the City of Palo Alto.
		SC4	**Martha Gardens Green Alleys Pilot Project**	**San Jose**	Alley between Second and Third Street; Virginia and Martha Strret					x	"Green" concrete sloped to permeable pavers draining to below-grade infiltration galleries.			x	x	x					Project Design Phase	Jill Bicknell (SCVURPPP)	Late 2013	Pre and post-project sediment analysis	No	Project was selected for Prop 84 Stormwater Implementation Grant funding.
		SC5	**Park Avenue: Green Avenue Pilot Project**	**San Jose**	Park Avenue between Meridian Ave. and Sunol St.		x				Bioretention areas constructed at existing curb and at new curb extensions, and permeable paver median.			x	x	x					Preliminary Design Phase	Jill Bicknell (SCVURPPP)	Late 2014	Pre and post project pollutant analysis, flow reduction.	No	Project was selected for Prop 84 Stormwater Implementation Grant funding.

Table A4. Modeling Information for 10 Selected Green Street Pilot Projects

GREEN STREET PILOT PROJECTS										
	Park and Hollis Stormwater Curb Extension	**Codornices Creek Restoration**	**Stanley Boulevard Safety and Streetscape Improvement**	**El Cerrito Green Streets**	**San Pablo Avenue Green Spine - Richmond**	**Sustainable Green Streets and Parking Lots Demonstration**	**Bransten Road Green Streets**	**Southgate Neighborhood Green Streets Project**	**Packard Foundation Green Streets**	**Hacienda Avenue**
General Info										
County	Alameda	Alameda	Alameda	Contra Costa	Contra Costa	San Mateo	San Mateo	Santa Clara	Santa Clara	Santa Clara
City	Emeryville	Albany	Unincorporated Alameda County	El Cerrito	Richmond	Burlingame	San Carlos	Palo Alto	Los Altos	Campbell
Location	Northeast Corner of Park Ave and Hollis Street	San Pablo Avenue at 6th Street	3 mile stretch of Stanley Blvd between City Limits of Pleasanton and Livermore in Unincorporated Alameda County	Two Locations: 10200 block of San Pablo Avenue (east side) and 11048 San Pablo Avenue	12900 block of San Pablo Ave (west side) between McBryde Ave & Andrade Ave	1227 Donnelly Avenue, between Primose Road and Bellevue Avenue, Assessor Parcel Number 029-152-300	Bransten Road between Old County Road and Industrial Road	Various streets centered around Castilleja Avenue and Miramonte Avenue	Second Street from Lyell Street to Whitney Street	Hacienda Avenue between S. Winchester Boulevard and Burrows Road/San Tomas Aquino Road
Design Complete	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No. Expected completion September 2013.
Constructed	Yes	Yes	In Progress	Yes	No	Yes	No	No	Yes	No
Map/Plans	GIS	CADD (PDF)	CADD (PDF)	CADD (PDF)	CADD (PDF)	CADD (PDF)	CADD (PDF)	PDF	CADD (PDF)	Available
Drainage Area Size/Characteristics										
Drainage area (acre)	0.19 (8,470 sq-ft)	1.93	33	1.33	2.22	1.32	0.54	41.4	0.59	22.7
Ability to measure area	GIS	CADD (PDF)	CADD	CADD	GIS	CADD	CADD	AutoCAD	Building Plans	GIS
Pre-Construction % Imp	100	100	80	99	Not Known At This Time	95	95	67	100	74
Post-Construction % Imp	93	100	78	99	Not Known At This Time	90	95	66	89	71
Underlying Soil Type	Clay	Clay	Alluvium with silty sand (SM) with gravel and clayey sand (SC) with gravel	D	Not Known At This Time	Clayey Loam	Fill and Holocene-age alluvial fan deposits; HSG D	Lean clay with sand; clayey sand with gravel at 5-10 feet below grade	Sandy lean clay to clayey sand	Fine sandy silt, silty sand, gravelly sand
Infiltration Rate	Infeasible	Low impermeability	In-situ Percolation testing and site sampling PDF available	Low impermeability	Not Known At This Time	Yes, rate (0.1 in/hr, 0.17 in/hr)	Low impermeability	0.15-0.5 in/hr (at 5-10 feet below grade)	2 inches/hour	4 in/hr
Land Use	Commerical	Commercial, Residential, 60% in ROW	90% Public ROW, 10% Private	Commerical	Commercial	Commerical	Industrial	Residential	Commercial	Residential
LID Features										
BMP Type	Planted stormwater curb extension or on-street rain garden.	Rain garden/bioretention areas with underdrains	Linear treatment measure(bioswales on plans), infiltration trench (filter strips on plans)	Bioretention with underdrain	Bioretention with underdrain	Bioretention area and curb extension	Bioretention swales in curb extensions-Detailed plans available, some infiltrate	Bioretention and biofiltration planters, and pervious pavers	Curbside rain gardens and bulb-outs	Bioinfiltration
Number of BMPS	1	4	2	2	6	2	9	21	20	~80
Infiltration	Bioretention facilities lined with impermeable liner and has underdrains; No infiltration.	Bioretention facilities not lined; incidental infiltration from ponding beneath underdrain which drains to Creek.	Bioswale and filter strip not lined; Both have overflows and are connected to public storm drain; Incidental infiltration due to ponding.	Bioretention facilities not lined; incidental infiltration from ponding beneath underdrain	Not Known At This Time	Bioretention facilities not lined; No underdrain and not connected to public storm drains; designed to infiltrate onsite	Bioretention facilities not lined; incidental infiltration from ponding beneath underdrain and in bioretential facilities without underdrains	Bioretention facilities are not lined and most have no underdrains	Bioretention facilities are not lined and have no underdrains	Bioinfiltration units not lined, will not have underdrain but will have overflow outlet/drain
BMP Sizing	650 sq-ft	Facilities sized with surface areas of 180 sq-ft, 260 sq-ft, 224 sq-ft, and 425 sq-ft	Trench (13,895' long, 4' wide), LTM (13,895' long, 3' wide)	Madison Rain Gardens (7 individual gardens) sized to treat 0.38 ac w/tributary area 0.39 ac. Eureka Rain Gardens (12 individual gardens) sized to treat 0.64 ac w/tributary area 0.94 ac.	4,625 sq ft of proposed treatment area, primarily through central rain garden and 5 curb extension planters.	0.06 acre bioretention (rain garden-infiltrates), 0.01 acre planter box (curb extension)	0.10 acres (from WRECO Memo, Feb 2013)	Bioretention with underdrains = 906 sq. ft.; bioretention without underdrains = 2,618 sq. ft.; pervious pavers = 8,712 sq. ft.	1834 sq. ft. (0.042 acres) total surface area	~26,000 sq. ft. (0.6 acres) total surface area
Stormwater Design Criteria	Volume Hydraulic Design Basis, 4% of catchment area method	Alameda County Sizing Criteria	Volume Hydraulic Design Basis. Stormwater Quality Handbook recommends a bioswale area that is 4% the size of the impervious area. 4% will adequately be able to capture and treat 0.2 in/hr of rainfall. The storm drain pipes are sized to handle a 2.0 in/hr storm.	Volume Hydraulic Design Basis	At this stage of planning, still using Contra Costa Countywide Clean Water Program c.3 sizing criteria of 4% of tributary area.	Flow Hydraulic Design Basis, 0.2" per hour of rainfall intensity	Volume Hydraulic Design Basis, 4% of catchment area method	Volume-based (85th percentile storm event)	Volume basis; actual size based on space available	Not Known At This Time
Design Specifications/Resources	Countywide Program C3 Design Manual	C3 Guidelines used as basis	Alameda County Design Guidelines, (State) Caltrans Standard Plans and Specifications, AASHTO and the Roadside Design Guide Policies, Cities of Livermore and Pleasanton design standards/requirements, Bay Friendly Guidelines, Various Utilities (PG&E, AT&T, Comcast), Railroad (UPRR), and (EBRPD) Park District requirements, and C3 Stormwater Technical Guidance.	C3 Guidelines	Not Known At This Time	San Mateo Countywide Program, C3 Stormwater Technical Guidance	San Mateo Countywide Program, C3 Stormwater Technical Guidance	Santa Clara County Drainage Manual and Los Angeles County Hydrology Manual	SCVURPPP C.3 Stormwater Handbook	SCVURPPP C.3 Stormwater Handbook

Table A4. Modeling Information for 10 Selected Green Street Pilot Projects

GREEN STREET PILOT PROJECTS										
	Park and Hollis Stormwater Curb Extension	**Codornices Creek Restoration**	**Stanley Boulevard Safety and Streetscape Improvement**	**El Cerrito Green Streets**	**San Pablo Avenue Green Spine - Richmond**	**Sustainable Green Streets and Parking Lots Demonstration**	**Bransten Road Green Streets**	**Southgate Neighborhood Green Streets Project**	**Packard Foundation Green Streets**	**Hacienda Avenue**
Water Quality Data										
Pre-Construction WQ Data	None Available	None Available	None Available	None Available	Not Known At This Time	None Available	None Available	None Available	None Available	None Available
Mean Annual Precip	Pull from rainfall record	20	Pull from rainfall record	Pull from rainfall record	Pull from rainfall record	18.77 inches of rainfall.	Pull from rainfall record	18 inches	18 inches	19 inches
WQ Monitoring	None planned	None planned	None planned	Conducted 2011-2012	Planned (SFEI)	None planned	CW4CB Task 5 planned	Not Known At This Time	None planned	None planned

Geosyntec consultants

APPENDIX B

Spreadsheet Model Results

Table B1. Modeling Results for Green Street Pilot Projects with 25% Incidental Infiltration

Project Name	Average Annual Runoff (cu-ft)	Total Effluent Volume[1] (cu-ft)	Average Annual Influent Loads					Average Annual Load Reduction				
			TSS (g)	Cu (mg)	Zn (mg)	PCBs (mg)	HgT (mg)	TSS (g)	Cu (mg)	Zn (mg)	PCBs (mg)	HgT (mg)
Bransten Road Green Street Project	24134	19911	77679	24944	216295	103	39	48025	4365	37852	66	24
Codornices Creek Restoration Project	113904	93971	366620	117727	1020838	488	184	226662	20602	178647	312	115
El Cerrito Green Streets Project	78935	65122	254068	81585	707441	338	128	157077	14277	123802	216	80
Packard Foundation Project	24703	20380	64355	22559	204609	5	16	38549	3948	35806	3	15
Park and Hollis Stormwater Curbextension	10593	8739	34096	10949	94938	45	17	21080	1916	16614	29	11
Stanley Blvd Safety and Streetscape Improvement Project	771549	636528	2009999	704592	6390485	152	794	1203978	123304	1118335	91	476
Sustainable Streets and Parking Lots Demonstration Project	60547	49951	157733	55292	501488	12	62	94481	9676	87760	7	37
San Pablo Avenue Green Spine Project (City of Richmond segment)	71813	59246	187084	65581	594807	14	74	112063	11477	104091	8	44
Hacienda Avenue Green Streets	758221	625532	1975276	692420	6280090	149	780	1183180	121174	1099016	89	467
Southgate Neighborhood Green Streets Project	1285452	1060498	3348790	11738790	10646968	253	1323	2005907	205432	1863219	151	792

Notes:
[1] Total Effluent Volume refers to the sum of the effluent volume from the BMPs and the bypassed volume.

Table B2. Modeling Results for Green Streets Pilot Projects with 50% Incidental Infiltration

Project Name	Average Annual Runoff (cu-ft)	Total Effluent Volume[1] (cu-ft)	Average Annual Influent Loads					Average Annual Load Reduction				
			TSS (g)	Cu (mg)	Zn (mg)	PCBs (mg)	HgT (mg)	TSS (g)	Cu (mg)	Zn (mg)	PCBs (mg)	HgT (mg)
Bransten Road Green Street Project	24134	15687	77679	24944	216295	103	39	50142	8730	75703	68	25
Codornices Creek Restoration Project	113904	74038	366620	117727	1020838	488	184	236653	41204	357293	322	120
El Cerrito Green Streets Project	78935	51308	254068	81585	707441	338	128	164000	28555	247604	223	83
Packard Foundation Project	24703	16057	64355	22559	204609	5	25	40715	7896	71613	3	16
Park and Hollis Stormwater Curbextension	10593	6885	34096	10949	94938	45	17	22009	3832	33228	30	11
Stanley Blvd Safety and Streetscape Improvement Project	771549	501507	2009999	704592	6390485	152	794	1271652	246607	2236670	96	502
Sustainable Streets and Parking Lots Demonstration Project	60547	39355	157733	55292	501488	12	62	99792	19352	175521	8	39
San Pablo Avenue Green Spine Project (City of Richmond segment)	71813	46679	187084	65581	594807	14	74	118361	22953	208182	9	47
Hacienda Avenue Green Streets	758221	492844	1975276	692420	6280090	149	780	1249684	242347	2198032	94	494
Southgate Neighborhood Green Streets Project	1285452	835544	3348790	1173896	10646968	253	1323	2118656	410864	3726439	160	837

Notes:

[1] Total Effluent Volume refers to the sum of the effluent volume from the BMPs and the bypassed volume.

Table B3. Modeling Results for Green Streets Pilot Projects with 75% Incidental Infiltration

Project Name	Average Annual Runoff (cu-ft)	Total Effluent Volume[1] (cu-ft)	Average Annual Influent Loads					Average Annual Load Reduction				
			TSS (g)	Cu (mg)	Zn (mg)	PCBs (mg)	HgT (mg)	TSS (g)	Cu (mg)	Zn (mg)	PCBs (mg)	HgT (mg)
Bransten Road Green Street Project	24134	11464	77679	24944	216295	103	39	52259	13096	113555	70	26
Codornices Creek Restoration Project	113904	54104	366620	117727	1020838	488	184	246643	61807	535940	331	124
El Cerrito Green Streets Project	78935	37494	254068	81585	707441	338	128	170924	42832	371406	230	86
Packard Foundation Project	24703	11734	64355	22559	204609	5	25	42882	11844	107419	3	17
Park and Hollis Stormwater Curbextension	10593	5032	34096	10949	94938	45	17	22938	5748	49842	31	12
Stanley Blvd Safety and Streetscape Improvement Project	771549	366486	2009999	704592	6390485	152	794	1339325	369911	3355004	101	529
Sustainable Streets and Parking Lots Demonstration Project	60547	28760	157733	55292	501488	12	62	105102	29028	263281	8	42
San Pablo Avenue Green Spine Project (City of Richmond segment)	71813	34111	187084	65581	594807	14	74	124660	34430	312273	9	49
Hacienda Avenue Green Streets	758221	360155	1975276	692420	6280090	149	780	1316189	363521	3297047	99	520
Southgate Neighborhood Green Streets Project	1285452	610590	3348790	1173896	10646968	253	1323	2231404	616296	5589658	168	881

Notes:

[1] Total Effluent Volume refers to the sum of the effluent volume from the BMPs and the bypassed volume.

Geosyntec consultants

APPENDIX C

Green Street Pilot Projects Design Plans

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

INDEX OF SHEETS:

Sheet No.	Description	
1	Title Sheet	
2–5	Demolition Plan	DM–1/4
6–9	Layout	L–1/4
10–13	Grading Plan	GR–1/4
14–17	Utility & Storm Drain Plan	U–1/4
18–19	Construction Details	C–1/2
20	Notes and Legend	HP1.1
21	Planting Notes and Legend	HP1.2
22–25	Landscape Layout Plan	HP2.1/2.4
26–29	Planting Plan	HP3.1/3.4
30–33	Irrigation Plan	HP4.1/4.4
34	Irrigation Notes and Legend	HP4.5
35–37	Irrigation Details	HP4.6/4.8
38–39	Landscape Details	HP5.1/5.2

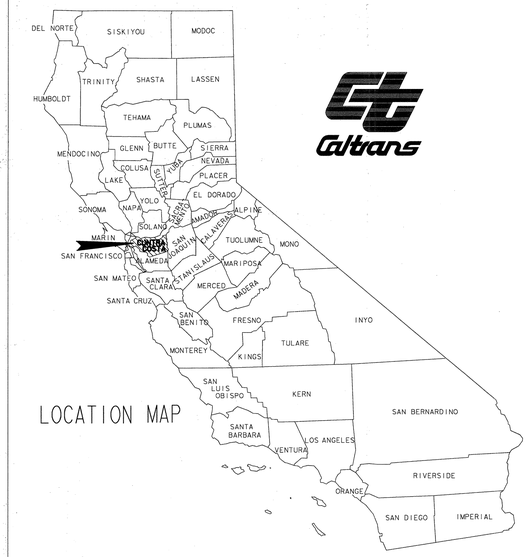
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN CONTRA COSTA COUNTY
IN EL CERRITO
AT SAN PABLO AVENUE (SR 123)

To be supplemented by Standard Plans dated May 2006

San Pablo Avenue Rain Garden Project

DST	COUNTY	ROUTE	MILES POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	CC	123	0.0/2.1	1	39



The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

To get to the Caltrans web site, go to: http://www.dot.ca.gov

Registered Civil Engineer — Date 11-19-09

REGISTERED PROFESSIONAL ENGINEER — ROBERT E. BROESTL — No. 41828 — Exp. 3/31/10 — CIVIL — STATE OF CALIFORNIA

Plans Approval Date

BID SET

November 19, 2009

CITY OF EL CERRITO
10940 SAN PABLO AVENUE
EL CERRITO, CA 94530

GATES AND ASSOCIATES
2671 CROW CANYON ROAD
SAN RAMON, CA 94583

BELLECCI & ASSOCIATES, INC.
2290 DIAMOND BOULEVARD, SUITE #100
CONCORD, CA 94520

City Contract No. C4016

LAST REVISION 00-00-00
DATE PLOTED=>
TIME PLOTED=>

APPROVED AS TO IMPACT ON STATE FACILITIES AND CONFORMANCE WITH APPLICABLE STATE STANDARDS AND PRACTICES AND THAT TECHNICAL OVERSIGHT WAS PERFORMED.

CONSULTANT DESIGN ENGINEER	CALTRANS DESIGN OVERSIGHT APPROVAL	REGISTRATION NO.	LICENSE EXP. DATE	DATE SIGNED

Approved as to impact on State facilities and conformance with applicable State standards and practices and that technical oversight was performed as described in the California Department of Transportation A & E Consultant Service Manual.

The Contractor shall possess the Class (or Classes) of license as specified in the "Notice to Contractors".

FOR REDUCED PLANS ORIGINAL SCALE IN INCHES 0 100 200 300 400 500

CITY CONTRACT NO.: C4016
DGN FILE=> DG TITLE_PHASE 2

CU 04275

EA 4A5604

NOTE:
MINOR GRADING REVISIONS TO BASE BID PLAN SET INCLUDED HERE FOR OTHER WORK, SEE BASE BID.

SEE BASE BID FOR WORK IN THIS AREA.

ENSURE POSITIVE DRAINAGE TO CREEK AROUND HEADWALL. TYPICAL AT ALL HEADWALLS. PROVIDE SWALE SIGNATURE TO CREEK, PER O.R. DIRECTION IN THE FIELD.

3 R-2 PIPE CONNECTION TO (E) CULVERT
INV = 14.85

BRING FINISH GRADE TO 1" OF PAVING, U.O.N., TYP.

SEE BASE BID FOR WORK IN THIS AREA.

SEE BID SET FOR SEATWALL.

CONFORM TO (E) CONDITIONS MM AT SIDEWALK, CURB, GUTTER AND PLANTING AREAS TYPICAL AT ALL PROJECT LIMITS.

PRESERVE AND PROTECT DRIVE AND SIDEWALK. DEMO (E) GUTTER PAN AND INSTALL NEW GUTTER PAN AT DRIVEWAY ENTRANCE. ENSURE POSITIVE DRAINAGE TO BIORETENTION AREA.

TOP OF CURB AT SIDEWALK AND END OF BIORETENTION CURB CUT TO MATCH. CONFORM TO (E) WATER VAULT ELEVATION.

PROVIDE (2) CU FT OF ROUND ROCK AT INITIAL CURB CUT (2'X2'X6"). SET FINISH GRADE OF ROCK 6" BELOW GUTTER FLOWLINE.

CATCH BASIN, RIM 18.27
6" INV = 15.68
8" INV = 15.01

OUTLET PIPE, CONNECT TO (E) CULVERT 3/R-2
INV 15.43
(8" DIA. - 2-FT @ 1.0%)

SEE BID SET/L-3 FOR WORK IN THIS AREA.

FG FLUSH WITH FS

CLEAN OUT AND SWEEP BEND
INV = 16.12

1 R-2 BIORETENTION

SAWCUT AC PAVEMENT PERPENDICULAR TO CURB AT SOUTHERN END OF DRIVE

PRESERVE AND PROTECT WATER LINE

CONFORM TO (E) ROAD SURFACE, TYP.

UNDER DRAIN, SEE SUBDRAINAGE NOTES.

CLEAN OUT AND SWEEP BEND
INV = 15.68

6" RAISED CURB, TYP.

15' DOUBLE RADIUS FACE OF CURB BULB OUT, TYP. BOTH SIDES.

CURB CUT, TYP. ENSURE CURB CUT IS PLACED AT LOW POINT OF ROAD. NOTE SPOT ELEVATIONS DO NOT INCLUDE ADDITION 3/4" DEPRESSION AT CURB CUT.

MODIFIED BIORETENTION CROSS SECTION OVER CULVERT. NO DRAINAGE LAYER OR DRAIN PIPE, TYP.

CATCH BASIN, RIM 18.62
6" INV = 16.12
8" INV = 15.45

SEE BIORETENTION DETAIL 1/R-2 FOR GRAVEL LAYER EL., TYP.

6" RAISED CURB, TYP.

UNDER DRAIN, SHOWN SCHEMATICALLY, SEE SUBDRAINAGE NOTES.

SEE BID SET/L-2 FOR MUTCD SIGNAGE.

(2) 4" PVC WEEPS THROUGH CONCRETE FOOTING, PER O.R. DIRECTION IN THE FIELD.

MM GUTTER AND CURB AT (E) ANGLE, BOTH EAST AND WEST.

PROVIDE (2) CU FT OF ROUND ROCK AT INITIAL CURB CUT (2'X2'X6"). SET FINISH GRADE OF ROCK 6" BELOW GUTTER FLOWLINE.

STD. CURB AND GUTTER

32'-0" S.W. BIORETENTION DTL. 1/R-2

62'-2" N.W. BIORETENTION DTL. 1/R-2

ENSURE POSITIVE DRAINAGE ACROSS GUTTER AT BULB OUTS, BOTH SIDES, TYP.

CASE 5 RAMP, BOTH SIDES, SEE BASE BID/ L-11. NOTE VERTICAL CURBS ON SIDES. PROVIDE GROOVES AT TOP OF RAMP.

DEMO CURB AND GRATE. PATCH (E) CULVERT HOLE, DOWEL AND EPOXY CONCRETE PATCH, BOTH SIDES OF 6TH ST.

CLEAN OUT AND SWEEP BEND
INV = 15.80

SEE BID SET/L-2 FOR MUTCD SIGNAGE.

PROVIDE (2) CU FT OF ROUND ROCK AT INITIAL CURB CUT (2'X2'X6"). SET FINISH GRADE OF ROCK 6" BELOW GUTTER FLOWLINE.

CATCH BASIN, RIM 18.44
6" INV = 15.80
8" INV = 15.64

UNDER DRAIN, SEE SUBDRAINAGE NOTES.

TRUNCATED DOMES, 36" WIDTH, ALIGN WITH FACE OF CURB, BOTH SIDES.

OUTLET PIPE, CONNECT TO (E) CULVERT 3/R-2
INV 15.41 (8" DIA. - 23-FT @ 1.0%)

OUTLET PIPE, CONNECT TO (E) CULVERT 3/R-2
INV 15.53
(8" DIA. - 2-FT @ 1.0%)

CATCH BASIN, RIM 18.62
6" INV = 16.22
8" INV = 15.55

CLEAN OUT AND SWEEP BEND
INV = 16.22

4 R-2 CURB CUT

CONFORM TO (E) ROAD SURFACE. TIE IN ELEVATIONS ARE BASED ON (E) SURVEY. VERIFY ELEVATIONS AND ALERT O.R. IF GRADES VARY FROM WHAT IS SHOWN.

DEMO CURB, AC PAVING, SIDEWALK TO THE LIMITS OF NEW INSTALLATION.

(2) 4" PVC WEEPS THROUGH CONCRETE FOOTING, PER O.R. DIRECTION IN THE FIELD.

DEMO SIDEWALK TO LIMITS SHOWN. SEE BID SET/L-3 PLAN NOTE 8 FOR LAYOUT AND GRADING.

MODIFY BIORETENTION CURB AT HYDRANT, SEE DETAIL 1/R-2

ADJUST VALVE EL. TO MM FG.

ENSURE POSITIVE DRAINAGE INTO BIORETENTION OVER CURB. PROVIDE (5) 2" PVC WEEP HOLES THROUGH 6" CURB, ELEV BY O.R.

PLANTING AREA

PRESERVE AND PROTECT (E) CURB, SIDEWALK, VEGETATION OUTSIDE AREA OF WORK, TYP.

HIDDEN CONCRETE EDGE, 6"X4" CONTINUOUS 4'-0" O.R. TO DIRECT IN THE FIELD.

PROVIDE MINOR SWALE TO PROVIDE POSITIVE DRAINAGE FROM BACK OF SIDEWALK TO CREEK, PER O.R. DIRECTION IN THE FIELD.

CONTRACTOR TO VERIFY LOCATION OF WATER MAIN LINE AND ALERT O.R. TO CONFLICTS WITH DESIGN. CONTRACTOR TO MODIFY FOOTING DETAIL PER O.R. DIRECTION ONCE CONFLICTS HAVE BEEN IDENTIFIED.

SEE BID SET/L-3 FOR CONCRETE WORK DETAILS.

DEMO CONCRETE, PRESERVE AND PROTECT LIGHT

DETAIL 2/R-2 CONCRETE PAVERS, SET ON 2.85" NO. 8 (3/8") AGG. AND 6" BASE COURSE, CUT PAVERS AS REQUIRED TO MM CONCRETE, PER O.R. DIRECTION IN THE FIELD.

SEE DETAIL 4/R-2 FOR PAVERS AND CURB OVER HEADWALL. DEMO (E) BURIED CURB AS NECESSARY TO INSTALL PAVING AS DETAILED. SEE BID SET/L-3 FOR GUARDRAILS.

INTERPRETIVE MARKER, INSTALL MARKER BASE 20" CLR. OF FACE OF GUARDRAIL. ALIGN CENTER OF MARKER 1'-6" FROM EDGE OF PAVING AS SHOWN.

STRIPING, PER MUTCD STANDARDS, 4" WHITE THERMOPLASTIC, TAPER TO CURB ALONG 125'-0" OR EXISTING CURB CUT, PER O.R. DIRECTION IN THE FIELD. CROSS STRIPING 6-FT O.C., 45° FROM CENTER LINE OF STREET. INSTALL (3) WHITE REFLECTORS 3'-0" O.C. ON THE FACE OF CURB AT BULB OUT. INSTALL (1) BLUE REFLECTOR AT FIRE HYDRANT. PAINT CURBS AT STREET EDGE RED, TYP.

SEE BID SET/L-3 FOR PAVING, LOG ROUNDS, STEPPING STONES, BOULDERS AND BOLLARD DETAILS.

THICKENED EDGE

SUBDRAINAGE NOTES:

1. CATCH BASIN: PROVIDE (4) CATCH BASINS WITH ATRIUM GRATES WITH 1/4 MAX OPENING. CHRISTY CONCRETE U-21 GR 24KORS, WITH CUSTOM KNOCK OUT TO MEET SPECIFIED PIPE DIAMETER, OR APPROVED EQUAL. CHRISTY CONCRETE, FREMONT, CA 800.486.7070.
2. OUTLET PIPE: SDR 35 SOLID PIPE, 8" DIA. CONNECT BETWEEN CATCH BASINS AND (E) CULVERT. SEE PIPE CONNECTION TO (E) CULVERT DETAIL 3/R-2 FOR TAPPING INTO CULVERT. 1% MIN. SLOPE. (3 R-2)
3. UNDER DRAIN: SEE BIORETENTION DETAIL FOR TYPE. ENSURE POSITIVE DRAINAGE TO CATCH BASIN. ALIGNMENT ON PLAN SHOWN SCHEMATICALLY. SET IN DRAINAGE LAYER AT LOW POINT OF CROSS SECTION, SEE BIORETENTION DETAIL 1/R-2, TYP. 0.0% SLOPE. (1 R-2)
4. CLEAN OUTS SHALL BE SET 2" HIGHER THAN CATCH BASIN.

NOTES:
REVISIONS TO 6TH STREET IMPROVEMENTS INCLUDE MODIFICATIONS TO THE 6TH STREET PAVING, CURB TREATMENTS AND EXTENT OF SIDEWALK REPLACEMENT. SEE BID SET REGARDING UNCHANGED WORK AT THE PLAZA'S, GUARDRAILS, BOULDERS, AND STONE PAVING. NOTE ADDITIONAL SIDEWALK, CURB, AC PAVING AND CONCRETE PLAZA INSTALLATION.

CASE 5 RAMP IN BASE BID MODIFIED TO PROVIDE VERTICAL CURB ON SIDES. MUTCD SIGNAGE AND CROSSWALK STRIPING REMAINS. SEE BASE BID/L-2, L-3 FOR STRIPING AND SIGNAGE.

GRADING ON THIS DRAWING REVISES THE BID SET GRADING. DIMENSIONS SHOWN ON THIS DRAWING REVISE THE BID SET LAYOUT.

ROUND ROCK SHALL BE 1-1/2" X 3/4" RIVER COBBLE. SIMILAR TO APPROVED FOR STEP POOL COBBLE.

PROVIDE BIDDER DESIGN PERMANENT IRRIGATION SYSTEM FOR BIORETENTION AREAS. POINT OF CONNECTION SHALL BE (E) UC BERKELEY SYSTEM. CONTRACTOR SHALL PROVIDE CONNECTION AND ALL NECESSARY VALVES AND CONTROLLER TO ENSURE PROPER FUNCTION PER REQUIREMENTS OF THE SPECIFICATIONS.

CONTRACTOR WILL BE PROVIDED A PLANT LIST AND PLANTING PLAN FOR BIORETENTION AREAS. CONTRACTOR WILL PURCHASE AND INSTALL PLANTS. FOR BIDDING PURPOSES THE CONTRACTOR SHALL ASSUME THE INSTALLATION OF (200) D-16, (100) D-40, (50) 1-GALLON, (10) 5-GALLON PLANTS. THIS DRAWING DOES NOT ALTER THE PLANTING OF BASE BID. SEE BID SET FOR SPECIFICATIONS PERTAINING TO PLANTING.

CONCRETE PAVERS SHALL BE 8X8 BASALITE SF-RIMA PAVERS, NATURAL COLOR, SET WITH 1/2" SPACING.

ABBREVIATIONS:
BC = BOTTOM OF CURB (GUTTER FLOWLINE OR SIDEWALK)
TC = TOP OF CURB
BR = BOTTOM OF RAMP
TR = TOP OF RAMP
FS = FINISH SURFACE
FG = FINISH GRADE
LP = LOW POINT
G = GUTTER FLOWLINE
TSL = TOP OF SOIL LAYER FINISH GRADE

-4 0 4 8

DATE	NO.	REVISIONS
10.22.10	1	CONCRETE PAVERS / DIMENSIONING
11.24.10	2	REMOVED SPEED TABLE / GRADING / BULB OUT
11.30.10	3	RESOLVE WATER LINE / DRAIN PIPE CONFLICTS

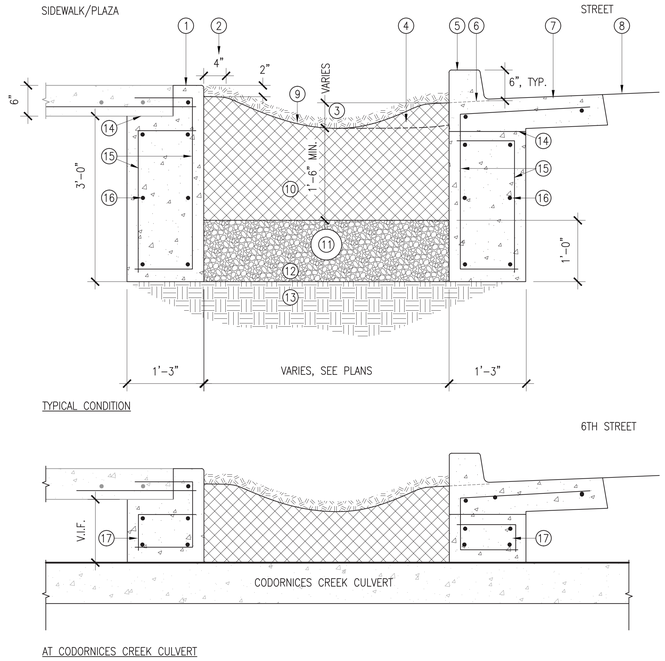
RDG
Restoration Design Group, LLC
2612b Eighth Street
Berkeley, CA 94710
T 510.644.2798 F 510.644.2799
www.restorationdesigngroup.com

LOWER CODORNICES CREEK - PHASE III
CREEK RESTORATION & SITE IMPROVEMENTS PLAN
CITY OF ALBANY / CITY OF BERKELEY / UNIVERSITY OF CALIFORNIA BERKELEY

CONSTRUCTION SET
NOVEMBER 30, 2010

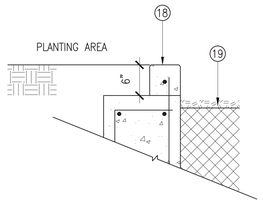
REVISED 6TH STREET PLAN

SHEET
R-1

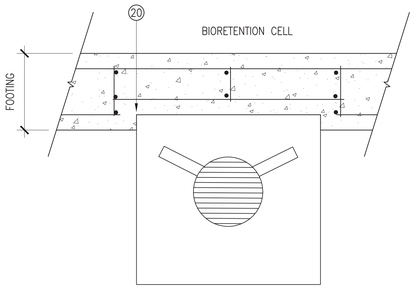


TYPICAL CONDITION

AT CODORNICES CREEK CULVERT



BIORETENTION CONCRETE CURB AND FOOTING WHEN ADJACENT TO PLANTING AREAS

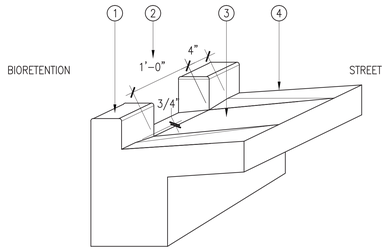


BIORETENTION CURB AND FOOTING MODIFICATIONS AT FIRE HYDRANT: PLAN VIEW

1. SIDEWALK/PLAZA SEE BASE BID AND REVISED 6TH STREET PLAN. SEE R-1 FOR ELEVATIONS. NO THICKENED EDGE AT BIORETENTION. POUR 6" CURB MONOLITHIC WITH FOOTING.
2. MOUND TOP OF SOIL (TSL) TO WITHIN 2" OF SIDEWALK/PLAZA PER O.R. DIRECTION IN THE FIELD. HOLD BOTH SIDES LEVEL 4" AT EQUAL ELEVATION.
3. TSL AT BIORETENTION LOW POINT. ELEVATIONS NOTED ON PLANS INDICATE BIORETENTION LOW POINT.
4. INLET DEPRESSION, DEPRESS FINISH GRADE OF SOIL AT CURB CUTS 4"–6" BELOW GUTTER FLOWLINE, PER O.R. DIRECTION. SEE NOTES ON PLAN FOR (3) LOCATIONS TO RECEIVE COBBLE AT INLET DEPRESSION.
5. CONCRETE CURB, SEE BERKELEY STD. DETAILS. ENSURE POSITIVE DRAINAGE OVER CURB. SEE R-1 FOR ELEVATIONS.
6. CURB CUT, SEE DETAIL 2/R-2.
7. GUTTER PAN, SEE BERKELEY STANDARD DETAIL.
8. AC PAVING, SEE BASE BID.
9. MULCH, 2" DEPTH ABOVE TSL. SEE BID SET SPECS.
10. SOIL LAYER, SEE CONTRA COSTA CLEAN WATER PROGRAM STORMWATER C.3 GUIDEBOOK APPENDIX B FOR SPEC.
11. UNDER DRAIN, 6" DIA. PVC SDR 35 OR EQUIVALENT, PERFORATED WITH HOLES FACING DOWN. BED NEAR TOP OF GRAVEL LAYER. SEE PLANS FOR EXTENT. PROVIDE SWEEP BEND AND CLEANOUT AT END. CLEANOUT ELEVATION 2" ABOVE OVERFLOW ELEV.
12. DRAINAGE LAYER, CLASS II PERMEABLE. OMIT WHERE DIRECTLY ABOVE 6TH STREET CULVERT.
13. SUBGRADE
14. COLD JOINT, CLEAN AND ROUGH
15. #4 REBAR @12" O.C. HOOK TOP AND BOTTOM AS SHOWN, 3" CLR TYP.
16. CONCRETE FOOTING WITH (6) #4 REBAR AS SHOWN.
17. TRUNCATE BOTTOM OF CONCRETE FOOTING AT CULVERT. MODIFY REBAR AS REQUIRED TO ENSURE 3" CLR. VERIFY IN FIELD BY O.R.
18. CURB, 6" WIDTH, INSTALL (1) #4 REBAR CONTINOUS.
19. HOLD TSL LEVEL TO BIORETENTION CURB AT THE S.E. BIORETENTION AREA ONLY, WHEN ADJACENT TO PLANTING AREA, AS SHOWN,
20. MODIFY CONCRET FOOTING THICKNESS TO ACCOMMODATE FIRE HYDRANT. MODIFY REBAR TO ENSURE 3" CLR AS SHOWN.

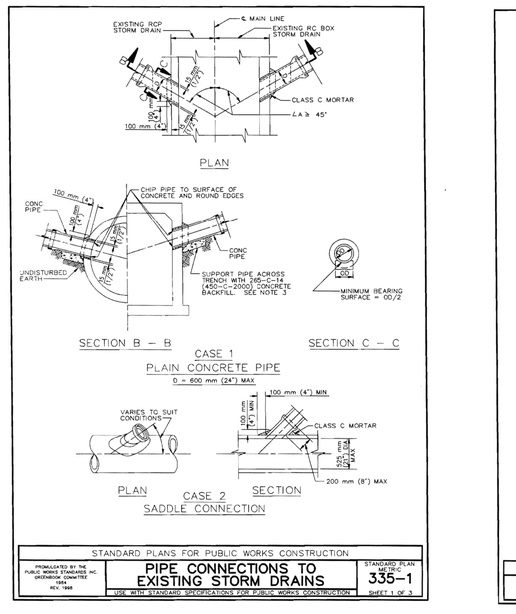
NOTE:
- CONTINUE TRUNCATED FOOTING AND SOIL PROFILE ON SOUTHERN SIDE OF CULVERT @ THE NW BIORETENTION CELL.

1 BIORETENTION
SCALE: NTS



1. CURB, SEE PLANS AND BIORETENTION DETAIL 1/R-1.
2. CURB CUT, 1'-0" WIDE, CONTINUE GUTTER PAN SLOPE DOWN CURB CUT INTO BIORETENTION AREA. ENSURE POSITIVE DRAINAGE INTO BIORETENTION AREA
3. CURB CUT DEPRESSION. DEPRESS GUTTER PAN 3/4" ACROSS 4" ON BOTH SIDES OF CURB CUT AS SHOWN.
4. GUTTER PAN, SEE BERKELEY STD. DETAILS.

2 CURB CUT
SCALE: NTS



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1994 R/V 1998

PIPE CONNECTIONS TO EXISTING STORM DRAINS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN METRIC 335–1 SHEET 1 OF 3

NOTES

CASE 1 AND CASE 3

1. OUTSIDE DIAMETER OF THE CONNECTOR PIPE SHALL NOT BE GREATER THAN 1/2 THE INSIDE DIAMETER OF THE RCP MAIN LINE.
2. INSIDE DIAMETER D OF THE CONNECTOR PIPE SHALL NOT BE GREATER THAN 600 mm (24").
3. THE MINIMUM OPENING INTO THE EXISTING STORM DRAIN SHALL BE THE OUTSIDE DIAMETER OF THE CONNECTING PIPE PLUS 30 mm (1"). THE CONCRETE BACKFILL SUPPORTING THE CONNECTING PIPE MAY BE OMITTED IF THE PIPE IS LAID ON UNDISTURBED EARTH TO STORM DRAIN WALL.
4. ALL CSP AND FITTINGS SHALL BE GALVANIZED. BAND CONNECTORS MAY BE 2 GAGES LIGHTER THAN THE PIPE, BUT WITH A MINIMUM GAGE OF 16. THEY SHALL BE CONNECTED AT THE ENDS BY ANGLES HAVING MINIMUM DIMENSIONS OF 50 mm x 50 mm x 5 mm (2"x2"x3/16") AND 140 mm (5 1/2") BOLTS.
5. WHEN JOINING A RCP CONNECTOR PIPE TO A CSP CONNECTOR PIPE, THE INSIDE DIAMETER D OF THE CSP SHALL BE AT LEAST EQUAL TO BUT NOT MORE THAN 75 mm (3") GREATER THAN THAT OF THE RCP.
6. CONNECTOR PIPES SHALL BE NOT MORE THAN 1.5 m (5') ABOVE THE INVERT.
7. CONNECTOR PIPES SHALL ENTER MAIN LINE RCP RADIALLY.
8. WHEN CONNECTING TO A RCB, SPPWC 333 SHALL BE USED IF THE TOP OF THE CONNECTOR PIPE IS LESS THAN 300 mm (12") BELOW THE SOFFIT OF THE RCB OR THE FLOW LINE OF THE PIPE IS LESS THAN 330 mm (13") ABOVE THE FLOOR OF THE RCB AT THE INSIDE FACE.

CASE 2

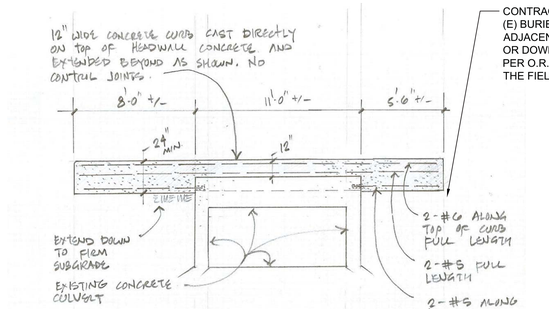
9. SADDLE CONNECTIONS SHALL BE USED WHEN CONNECTING TO PIPES 525 mm (21") OR LESS IN DIAMETER WITHOUT THE USE OF JUNCTION STRUCTURES OR PRECAST Y BRANCHES.
10. TRIM OR CUT SADDLE TO FIT SNUGLY OVER THE OUTSIDE OF THE MAIN PIPE SO ITS AXIS WILL BE ON THE LINE AND GRADE OF THE CONNECTING PIPE.
11. THE OPENING INTO THE PIPE SHALL BE CUT AND TRIMMED TO FIT THE SADDLE SO THAT NO PART WILL PROJECT WITHIN THE BORE OF THE SADDLE PIPE.
12. THE CONNECTOR PIPE SHALL BE SUPPORTED AS SHOWN IN CASE 1 AND CASE 3.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PIPE CONNECTIONS TO EXISTING STORM DRAINS

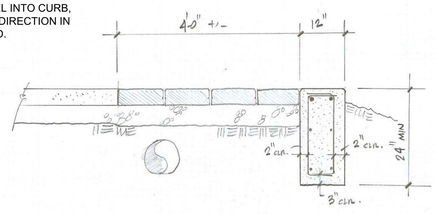
STANDARD PLAN METRIC 335–1 SHEET 2 OF 3

3 PIPE CONNECTION TO (E) CULVERT
SCALE: NTS



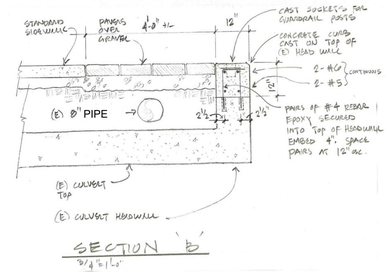
VIEW 'A' – LOOKING DOWNSTREAM AT 6TH ST. CULVERT

1/4" = 1'-0"



SECTION 'C'

3/4" = 1'-0"



SECTION 'B'

3/4" = 1'-0"

4 PAVERS AT SIXTH STREET EAST HEADWALL
SCALE: NTS

DATE	NO.	REVISIONS
10.22.10	1	CONCRETE PAVERS / DIMENSIONING
11.24.10	2	REMOVED SPEED TABLE / GRADING / BULB OUT
11.30.10	3	RESOLVE WATER LINE / DRAIN PIPE CONFLICTS

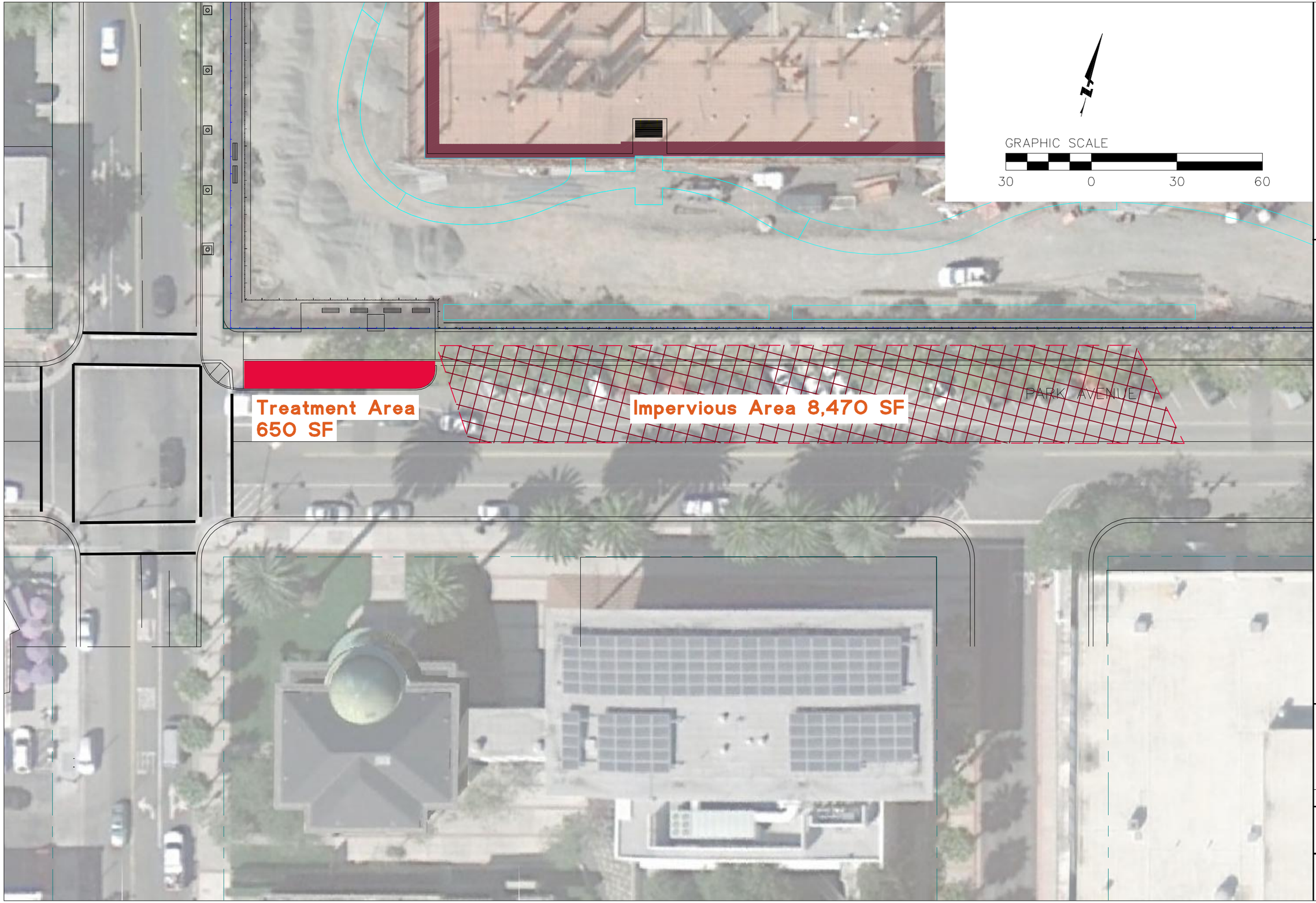
Restoration Design Group, LLC
2612b Eighth Street
Berkeley, CA 94710
T 510.644.2798 F 510.644.2799
www.restorationdesigngroup.com

LOWER CODORNICES CREEK - PHASE III
CREEK RESTORATION & SITE IMPROVEMENTS PLAN
CITY OF ALBANY / CITY OF BERKELEY / UNIVERSITY OF CALIFORNIA BERKELEY

CONSTRUCTION SET
NOVEMBER 30, 2010

REVISED 6TH STREET DETAILS

SHEET
R-2



GRAPHIC SCALE

30 0 30 60

BKF
ENGINEERS/SURVEYORS/PLANNERS
255 SHORELINE DRIVE, STE 200
REDWOOD CITY, CA 94065
650/482-6300
650/482-6399 (FAX)

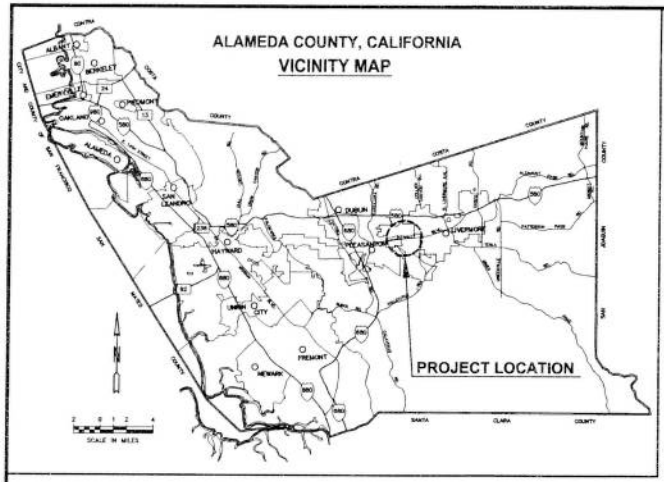
PIXAR PHASE II
STORMWATER QUALITY EXHIBIT
PARK AND HOLLIS STORMWATER CURB EXTENSION
EMERYVILLE ALAMEDA COUNTY CALIFORNIA

No.	Revisions

Date
Scale
Design
Drawn
Approved
Job No

Sheet Number:
1 OF 1

DRAWING NAME: K:\Eng07\070128\DWG\SWPPP\Treatment Areas\Park and Hollis Exhibit.dwg
PLOT DATE: 09-01-11
PLOTTED BY: som



ALAMEDA COUNTY
PUBLIC WORKS AGENCY

MAY 2010

STANLEY BOULEVARD

SAFETY & STREETSCAPE IMPROVEMENT PROJECT

BETWEEN THE CITY LIMITS OF PLEASANTON & LIVERMORE

MURRAY TOWNSHIP

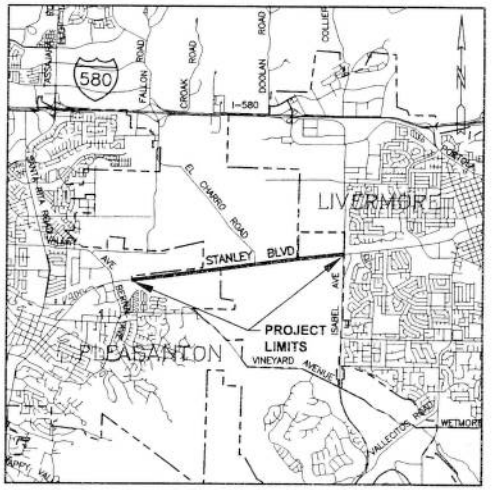
ALAMEDA COUNTY, CALIFORNIA

INDEX OF SHEETS

CONVENTIONAL SYMBOLS

PROPERTY, RIGHT OF WAY AND EASEMENT LINES OTHER THAN THOSE FOR PROJECT
PROJECT RIGHT OF WAY AND EASEMENT LINES
CONSTRUCTION CENTER LINE 10 11
TRAVERSE OR SURVEY LINE AND MONUMENT
CENTER LINE
CENTER LINE OF CHANNEL, CREEK, OR DITCH
TOE OF FILL OR SLOPE
TOP OF CUT OR BANK
CONCRETE CHANNEL
ROAD
EDGE OF PAVEMENT EP
PCC EXTRUDED CURB OR AC BERM
PCC SIDEWALK, CURB GUTTER & DRIVEWAY
GUARD RAIL OR BARRICADE
FENCE (SPECIFY TYPE) X X
CHAIN-LINK FENCE o o
RAILROAD
BUILDING
SHRUBBERY
MAIL BOX
TREE
TREE TO BE REMOVED
CHANNEL SLOPE

EXISTING UTILITIES:
WATER W
GAS G
SANITARY SEWER SS
OIL O
GASOLINE GS
STORM DRAIN SD
ELECTRICAL E
ELECTRICAL UNDERGROUND E
TELEPHONE T
TELEPHONE UNDERGROUND T
FIBER OPTIC UNDERGROUND F/O
CABLE TV CTV
CABLE TV UNDERGROUND CTV
TRANSMISSION LINE AND TOWER
DROP INLET DI
ELECTROLIER
FIRE HYDRANT
MANHOLE MH
MONUMENT EXISTING PROPOSED
UTILITY POLES: JOINT POLE JP, POWER POLE PP, TELEPHONE POLE TP, GUY POLE GP
RIGHT OF WAY MARKER
ROADWAY SIGN
STREET NAME SIGN
WATER METER WM
WATER VALVE WV



LOCATION MAP
NO SCALE

- THE CONTRACTOR SHALL POSSESS A CLASS A LICENSE AT THE TIME THIS CONTRACT IS AWARDED.

CONSTRUCTION AREA SIGNS

TYPE	QUANTITY	DESCRIPTION	DIMENSION (in)
G20-2	2	END ROAD WORK	60 x 24
W20-1	2	ROAD WORK	48 x 48
C30 (CA)	2 (MIN.)	LANE CLOSED	36 x 36

DANIEL WOLDESENBET, Ph.D., P.E.
COUNTY ENGINEER
CIVIL ENGINEER CERTIFICATE NO. 60306
EXPIRATION JUNE 30, 2010

6/2/10
PLAN APPROVAL DATE

REVISIONS

NO.	DESCRIPTION	BY	DATE	APP'D
1				
2				
3				
4				

COUNTY OF ALAMEDA ☆ PUBLIC WORKS AGENCY

TITLE SHEET

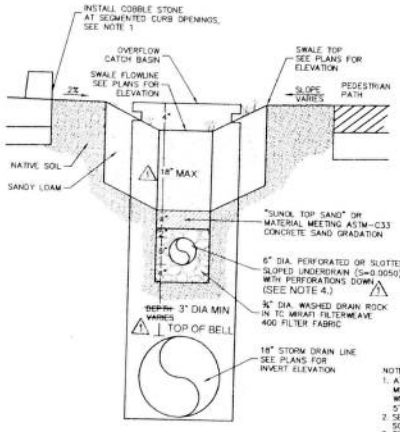
SCALE	AS SHOWN
DATE	MAY 2010
WORK ORDER NO.	R32064
SPECIFICATION NO.	2125
SHEET NO.	1.01 OF 194
FILE NO.	U-324-12

	REVIEWED BY:	DATE:
CONSTRUCTION		
MAINTENANCE		
REAL ESTATE		

	REVIEWED BY:	DATE:
SURVEY		
TRAFFIC		
ENVIRONMENTAL		

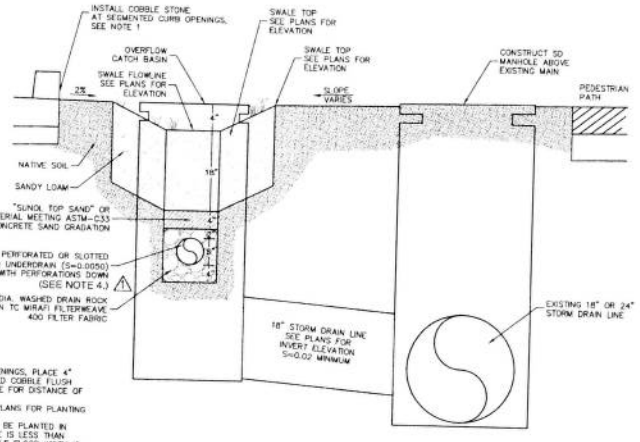
FOR REDUCED ENGLISH PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

N:\C30\ROAD\R32064-Stanley Safety\Dwgs\Sheet 1 Title Sheet.dwg 6-02-10 02:15:16 PM jsand

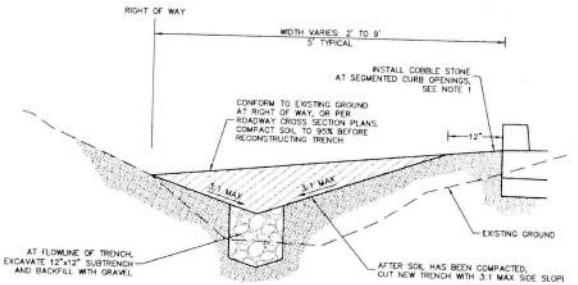


1 BIO RETENTION SECTION
SOUTHSIDE – ABOVE MAINLINE
NTS

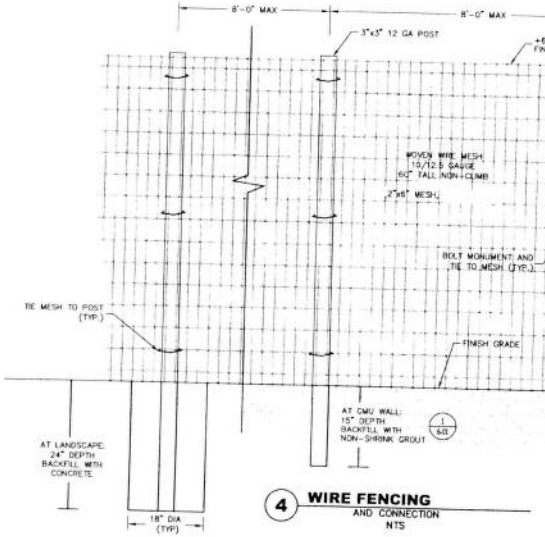
NOTES:
1. AT ALL CURB OPENINGS, PLACE 4" MIN DIA. APPROVED COBBLE FLUSH WITH FINISH GRADE FOR DISTANCE OF 5' DOWNSTREAM.
2. SEE LANDSCAPE PLANS FOR PLANTING SCHEDULE.
3. TREES SHALL NOT BE PLANTED IN FLOWLINE IF SLOPE IS LESS THAN 0.0020 OR IF SWALE FLOOR WIDTH IS LESS THAN 4'.
4. PERFORATED PIPE SHALL BE ALIGNED CENTERED WITH SWALE.



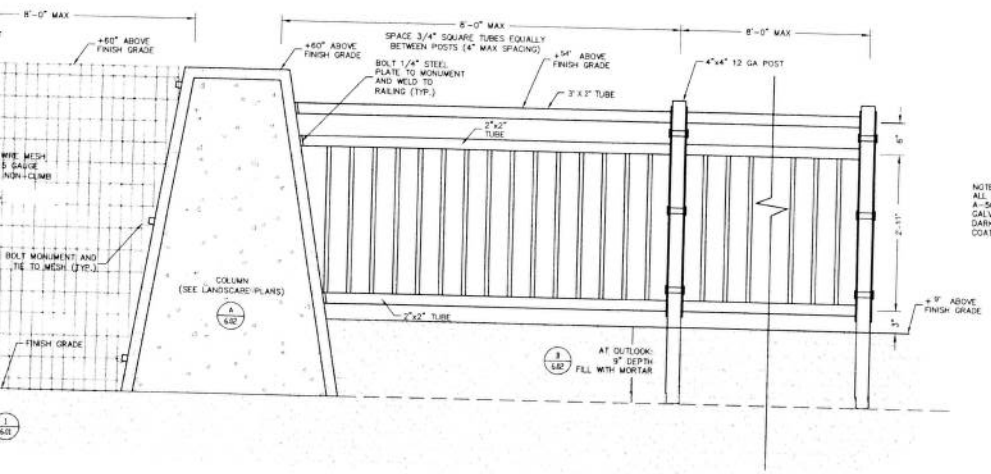
2 BIO RETENTION SECTION
SOUTHSIDE – OFFSET MAINLINE
NTS



3 TRENCH SECTION
NORTHSIDE
NTS



4 WIRE FENCING
AND CONNECTION
NTS



5 METAL RAILING
AND CONNECTION – AT OVERLOOK
NTS

FOR REDUCED ENGLISH PLANS ORIGINAL SCALE IN INCHES 0 1 2 3

CONSTRUCTION	REVIEWED BY:	DATE:
MAINTENANCE		
REAL ESTATE		

	REVIEWED BY:	DATE:
	SURVEY	
	TRAFFIC	
	ENVIRONMENTAL	

K:\Dvg04\065116-14\DWG\SHEETS\SBSR.dwg 6-03-10 03:49:46 PM mlr

REVISIONS

NO.	DESCRIPTION	BY	DATE
1	REVISION TO BIO RETENTION SECTION 1	BN	8/22/11

APPROVED

PROFESSIONAL ENGINEER — No. C 060660 — EXP. 6-30-12 — STATE OF CALIFORNIA

APPROVED

BKF — 4760 Willow Road, Suite 250, Pleasanton, California 94588 — (925) 396-7790 Fax (925) 396-7799

DESIGNED: ROBERT C. STEVENS
DRAWN: CHECKED: APPROVED:
SPECIAL PROVISIONS PREPARED: APPROVED:

COUNTY OF ALAMEDA PUBLIC WORKS AGENCY
STANLEY BOULEVARD
SAFETY & STREETSCAPE IMPROVEMENT PROJECT
BETWEEN THE CITY LIMITS OF PLEASANTON & LIVERMORE
DRAINAGE AND GRADING PLAN AND DETAILS

WORK ORDER NO. R32064
SPECIFICATION NO. 2125
SHEET NO. 7.27 OF 194
FILE NO. U-324-12

DONNELLY AVENUE
(50' RIGHT-OF-WAY)

INSTALL Conc. TRENCH DRAIN WITH NON-SLIP GRATE LOAD CLASS A ADA COMPLIANT "HEEL SAFE WITH OPENINGS LESS THAN 0.25" (TOTAL 3) SEE DETAIL 2/11

CURB AND GUTTER SEE DETAIL 6/14 MATCH Exist

PARKING METERS POST METER HEADS TO BE FURNISHED AND INSTALLED BY THE CITY, (TOTAL 2 ON-STREET)

CURB EXTENSION SEE SHEET 8

PROTECT Exist Conc. SIDEWALK

2'X2' REINFORCED CONCRETE BASE AROUND EXIST WATER VALVE SEE CITY TYPICAL W-1809

BOARDWALK WITH SIDEGUARDS, STRUCTURES, FOOTINGS, AND CONNECTIONS, TO BE DESIGNED AND INSTALLED BY DESIGN BUILD CONTRACTOR, SEE DETAIL 6/13 FOR VISUAL EXAMPLE (TOTAL 2)

PROTECT Exist DRIVEWAY

Exist PM TO REMAIN

SAWCUT LINE

INSTALL 6"x16" VERTICAL CURB

PROTECT Exist SIDEWALK

LOCATE AND VERIFY DEPTH OF JOINT TRENCH

Exist PM TO REMAIN

BACK OF SIDEWALK

ADJUST Exist WM

4"-8" ROUNDED RIVER ROCK, TYP.

ADJUST Exist WM

INSTALL RPB SEE DETAIL X.X/X

LOCATE AND VERIFY DEPTH OF GAS LINE

Exist WM TO REMAIN

LOCATE AND VERIFY DEPTH OF GAS LINE

INSTALL 6"x16" VERTICAL CURB SEE DETAIL 1/14

INSTALL 6"x16" VERTICAL CURB SEE DETAIL 1/X

Exist PM TO REMAIN

RELOCATED 4.0' WHEEL STOP (TOTAL 11)

Exist PM TO REMAIN TYP.

BEGIN FLUSHED 6"X14"CONCRETE CURB

SIGN POST, TYP. (BY OTHERS)

SAWCUT LINE

FLUSHED 6"X14" CONCRETE CURB SEE DETAIL 2/X

6.0' WHEEL STOP SEE DETAIL 4/12 (TOTAL 17)

END FLUSHED CONCRETE CURB

ELECTRICAL CONDUIT BOX SEE ELECTRICAL PLANS

ELECTRICAL CONDUIT BOX SEE ELECTRICAL PLANS

Exist SIGN TO REMAIN

Exist LP TO REMAIN

INSTALL NEW STREET LIGHT (TO BE PROVIDED BY THE CITY). SEE ELECTRICAL PLANS.

RELOCATE STREET LIGHT SEE ELECTRICAL PLANS

RELOCATE STREET LIGHT. SEE ELECTRICAL PLANS.

INSTALL NEW PM POST, TYP.

Exist SIGN TO REMAIN

RELOCATE STREET LIGHT SEE ELECTRICAL PLANS

INSTALL PARKING METERS POST METER HEADS TO BE FURNISHED AND INSTALLED BY THE CITY, (TOTAL 39 IN PARKING LOT)

ABANDON Exist ELECTRICAL LINE. SEE ELECTRICAL PLANS.

NOTE:

1. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET 2.
2. ALL ANGLES ARE 45 DEGREE, 90 DEGREE, OR 135 DEGREE UNLESS OTHERWISE NOTED.
3. ALL CURVES AND ALL TRANSITIONS BETWEEN CURVES AND STRAIGHT EDGES SHALL BE SMOOTH.
4. EXPANSION JOINTS FOR PLANTER CURBS SHALL LINE UP WITH PAVEMENT PATTERN.
5. FOR ADDITIONAL LIGHTING INFORMATION, SEE ELECTRICAL PLANS.

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 INCH = 10 FT

CITY OF BURLINGAME
PUBLIC WORKS
501 PRIMROSE ROAD
BURLINGAME, CA 94010
650.558.7230
650.685.9310 (FAX)

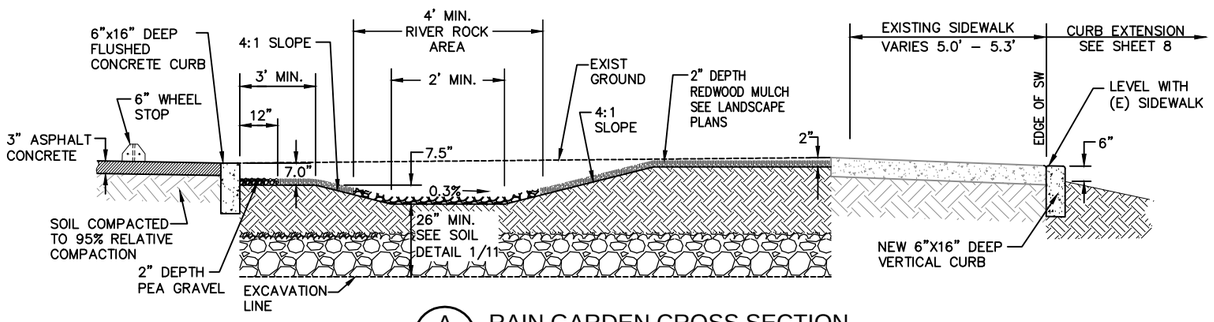
DONNELLY AVENUE – PARKING LOT C
STORMWATER GARDEN
BURLINGAME SAN MATEO COUNTY CALIFORNIA

Revisions
No.

Date: 11/17/09
Scale: 1"=10'
Design By:
Drawn By: LM
Checked By: JG
Project No.: 82340

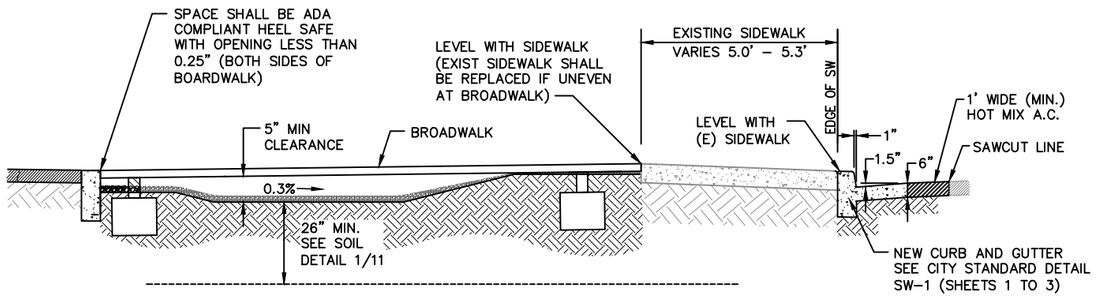
DRAWING TITLE: LAYOUT

Drawing Number:
5 OF 16



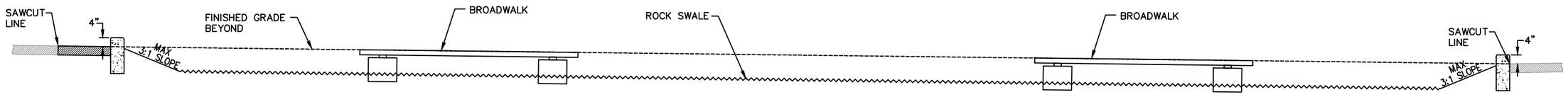
A/11 RAIN GARDEN CROSS SECTION

NOT TO SCALE



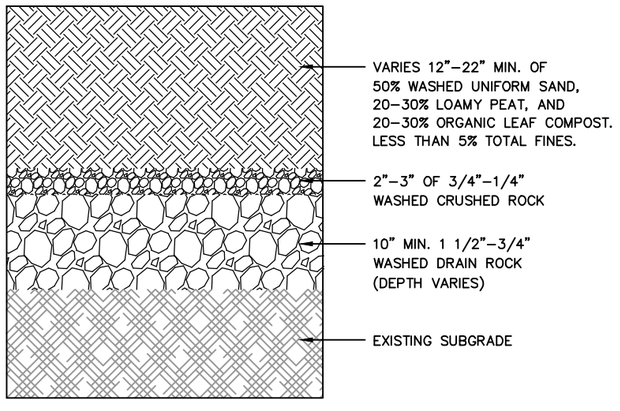
B/11 RAIN GARDEN CROSS SECTION

NOT TO SCALE



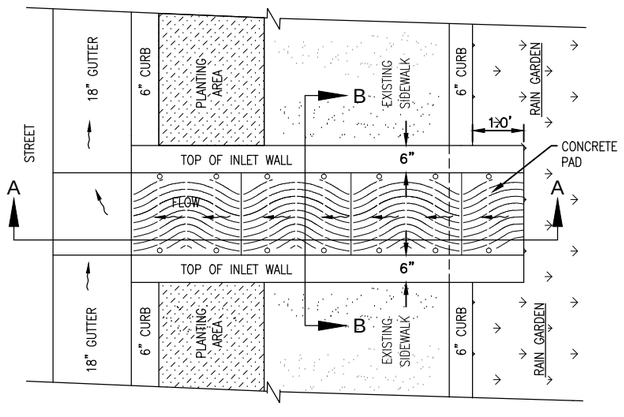
C/10 RAIN GARDEN CROSS SECTION

NOT TO SCALE

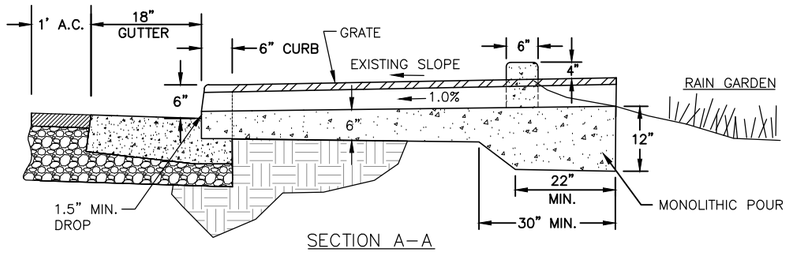


1/10 SOIL PROFILE

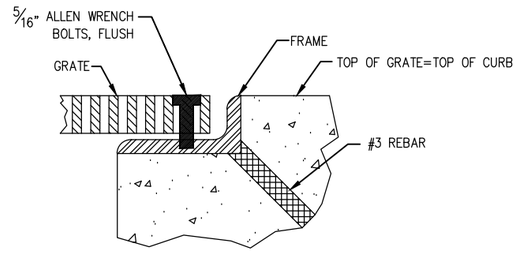
NOT TO SCALE



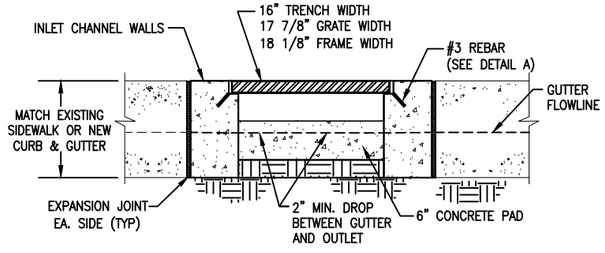
PLAN VIEW



SECTION A–A



DETAIL A



NOTE: MAXIMUM GRATE HOLE WIDTH (OPEN) 1/4 INCH. GRATE SIZE 18"X24". CAST IRON URBAN ACCESSORIES TRENCH GRATE AND FRAME. TITLE WAVE MODEL OR APPROVED EQUAL.

SECTION B–B

2/10 CONCRETE OUTLET

NOT TO SCALE

CITY OF BURLINGAME
PUBLIC WORKS
501 PRIMROSE ROAD
BURLINGAME, CA 94010
650.558.7230
650.685.9310 (FAX)

DONNELLY AVENUE – PARKING LOT C

STORMWATER GARDEN

BURLINGAME SAN MATEO COUNTY CALIFORNIA

Revisions

No.

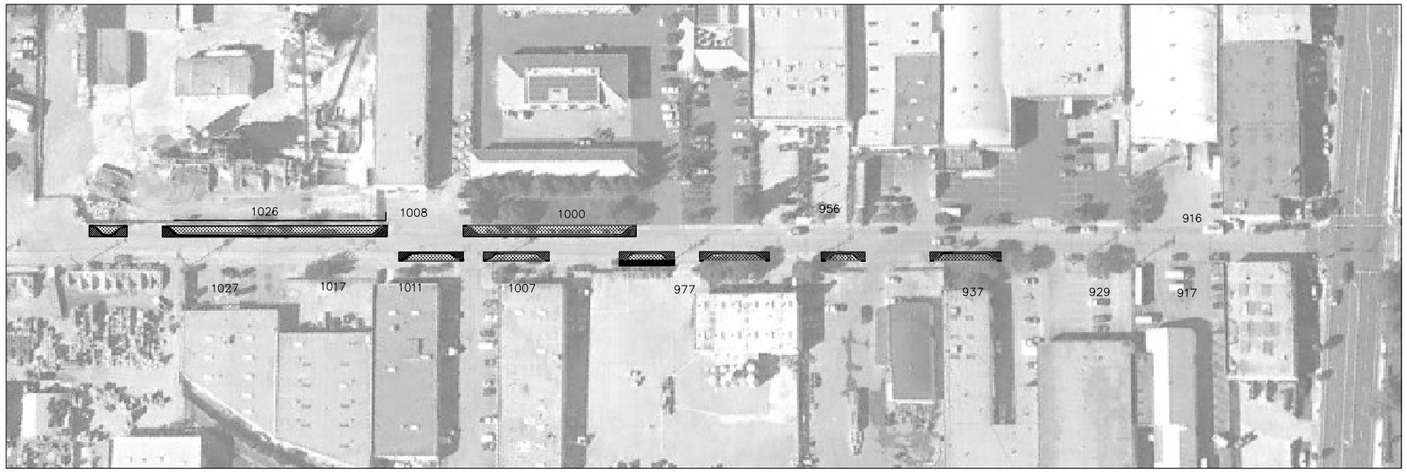
Date:	11/19/09
Scale:	AS SHOWNS
Design By:	
Drawn By:	
Checked By:	
Project No.:	82340

DRAWING TITLE: DETAILS

Drawing Number: 11 OF 16

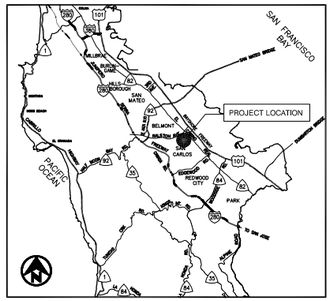
PROJECT TITLE

BRANSTEN ROAD
CURB EXTENSION AND STORWATER TREATMENT
SAN CARLOS, CA



LOCATION MAP
NOT TO SCALE

LIMITS OF WORK



VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

SHEET NO.	SHEET ID	PLAN & TITLE
1	T	TITLE SHEET, LOCATION MAP AND GENERAL NOTES
2	X	TYPICAL SECTIONS
3 - 6	L	LAYOUT PLAN
7 - 10	D	DRAINAGE PLAN
11 - 19	C	CONSTRUCTION DETAILS
20 - 22	I	IRRIGATION PLAN, NOTES AND DETAILS
23 - 25	P	IPLANTING PLAN, NOTES AND DETAILS

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SAN CARLOS STANDARD SPECIFICATIONS 2008 EDITION.
2. THE CONTRACTOR IS RESPONSIBLE FOR THE INTENT OF THESE PLANS AND SHALL REPORT ANY DISCREPANCIES FOUND IN THEM TO THE ENGINEER PRIOR TO CONSTRUCTION.
3. IT IS CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES WITH THE APPROPRIATE UTILITY AGENCIES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. CONTRACTOR SHALL NOTIFY ALL PUBLIC AND PRIVATE UTILITY OWNERS 48 HOURS PRIOR TO COMMENCEMENT OF WORK ADJACENT TO THE UTILITY. CONTACT SERVICE ALERT (USA) AT 800-642-2444.

SURVEY CONTROL:

BENCHMARK IS THE CENTER OF THE FIRE HYDRANT AT THE SOUTHEAST CORNER OF BRANSTEN ROAD AND INDUSTRIAL ROAD STATION 19.703' RT "BRN"
LINE 14+42.00 LATITUDE 37°30'26.53"
LONGTITUDE -122°15'06.75" TOP OF HYDRANT
ELEVATION + 9.82; CITY OF SAN CARLOS DATUM.

ADDITIONAL REFERENCE POINT:

EXISTING DRAINAGE INLET AT 18.033' LT "BRN" LINE 7+27.74, GRATE ELEVATION +7.68.

LINE 14+42.00 LATITUDE 37°30'26.53"
LONGTITUDE -122°15'06.75" TOP OF HYDRANT
ELEVATION + 9.82; CITY OF SAN CARLOS DATUM.

JAY WALTER, P.E.
PUBLIC WORKS DIRECTOR/CITY ENGINEER
PUBLIC WORKS DEPARTMENT

AUTHORIZED FOR CONSTRUCTION: _____

CITY OF SAN CARLOS
PUBLIC WORKS DEPARTMENT
600 ELM STREET
SAN CARLOS, CA 94070
(650) 802-4204

No.	DATE	BY	REFERENCE
1	08/22/12	AC/AO	65%
2	10/19/12	AC/AO	95%
3	03/04/13	AC/AO	100%

WRECO
1243 ALPINE ROAD, SUITE 108
WALNUT CREEK, CA 94596
PH (925) 941-0017 FX (925) 941-0018

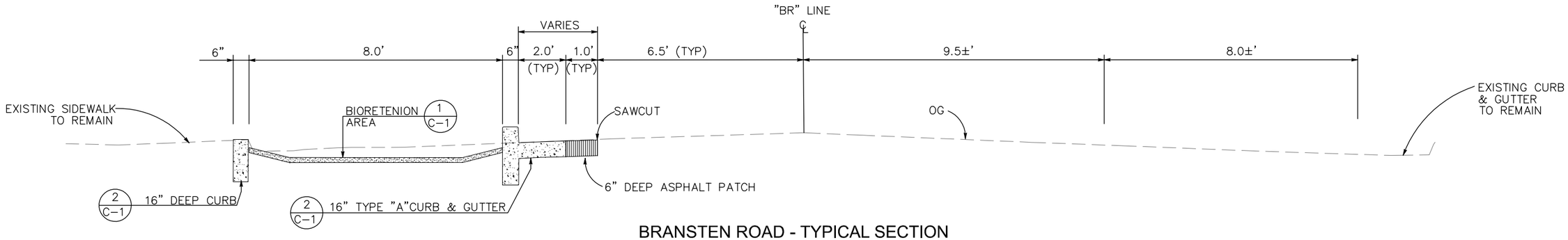
FOR: BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

CHECKED BY	AO
DESIGNED BY	AC
DRAWN BY	VP

REGISTERED PROFESSIONAL ENGINEER
ANALETTE A. OCHOA
No. 55279
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DATE: 03/04/2013

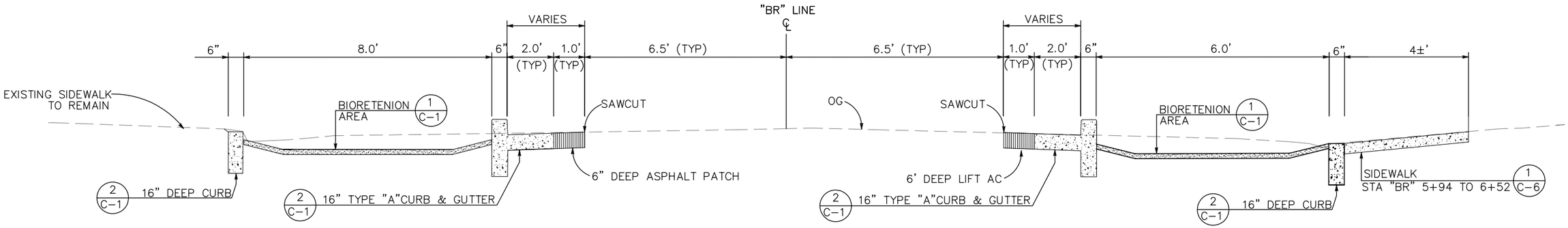
BRANSTEN ROAD CURB EXTENSION AND STORMWATER TREATMENT
SAN CARLOS, SAN MATEO COUNTY, CA
TITLE SHEET, LOCATION MAP, AND GENERAL NOTES

T-1
SHEET NO.
1 OF 25



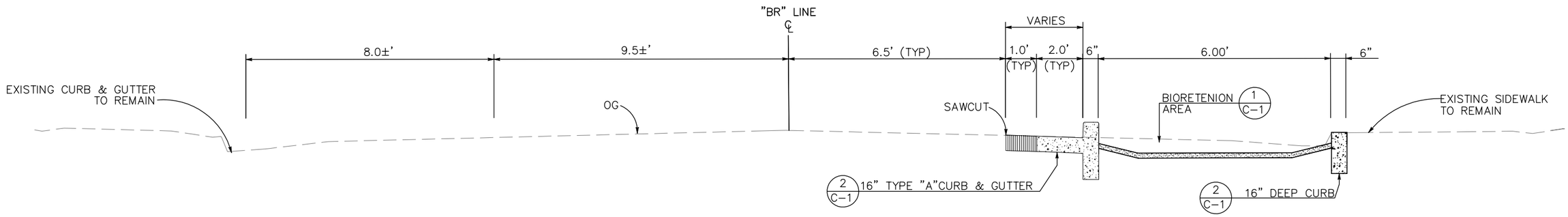
BRANSTEN ROAD - TYPICAL SECTION

STA "BR" 0+40 TO 3+60



BRANSTEN ROAD - TYPICAL SECTION

STA "BR" 3+60 TO 6+55



BRANSTEN ROAD - TYPICAL SECTION

STA "BR" 6+55 TO 10+00

CITY OF SAN CARLOS
PUBLIC WORKS DEPARTMENT
600 ELM STREET
SAN CARLOS, CA 94070
(650) 802-4204

No.	DATE	BY	REFERENCE
1	08/22/12	AC/AO	65%
2	10/19/12	AC/AO	95%
3	03/04/13	AC/AO	100%

WRECO
1243 ALPINE ROAD, SUITE 108
WALNUT CREEK, CA 94596
PH (925) 941-0017 FX (925) 941-0018

FOR: BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

CHECKED BY	AO
DESIGNED BY	AC
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REGISTERED PROFESSIONAL ENGINEER
ANNALETTE A. OCHOA
No. 55279
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DATE: 03/04/2013

PROJECT TITLE

BRANSTEN ROAD CURB EXTENSION AND STORMWATER TREATMENT
SAN CARLOS, SAN MATEO COUNTY, CA

TYPICAL SECTIONS

X-1

SHEET NO. 2 OF 25

NOTES:

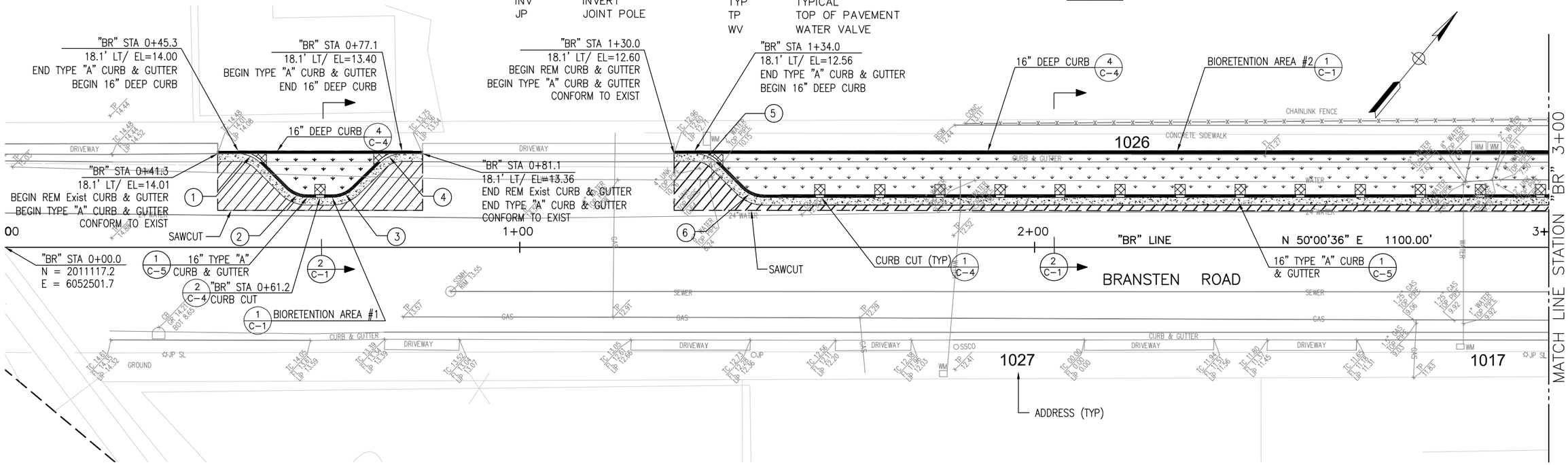
1. ELEVATIONS ON THE PLANS ARE FLOWLINES AT THE FACE OF CURBS.
2. CONTRACTOR TO COORDINATE WITH CITY ENGINEER FOR ALLOWABLE STAGING LOCATIONS.
3. CONSTRUCT ONE SIDE OF BRANSTEN ROAD AT A TIME TO ALLOW FOR ONE-WAY TRAFFIC CONTROL.
4. CONTRACTOR TO ALLOW DRIVEWAY ACCESS AT ALL TIMES DURING CONSTRUCTION.
5. CURVE DATA IS MEASURED FROM OUTSIDE FACE OF CURB.

ABBREVIATIONS:

AB	AGGREGATE BASE	LF	LINEAR FEET
AC	ASPHALT CONCRETE	MAX	MAXIMUM
BC	BEGIN CURVE	MIN	MINIMUM
BFP	BACKFLOW PREVENTION	MOD	MODIFIED
BOT	BOTTOM	OG	ORIGINAL GRADE
BSW	BACK OF SIDEWALK	PCC	PORTLAND CEMENT CONCRETE
CL	CLASS	REM	REMOVE
CONC	CONCRETE	SW	SIDEWALK
EC	END CURVE	SD	STORM DRAIN
ELEV	ELEVATION	SL	STREET LIGHT
FG	FINISHED GRADE	STA	STATION
FL	FLOWLINE ELEVATION	STD	CITY OF SAN CARLOS STANDARD
GR	GRATE	TC	TOP OF CURB
INV	INVERT	TYP	TYPICAL
JP	JOINT POLE	TP	TOP OF PAVEMENT
		WV	WATER VALVE

LEGEND:

- SAWCUT LINE
- TYPE "A" CURB OR 16" DEEP CURB
- CURB CUT
- TYPE "A" CURB GUTTER
- NEW ROADWAY PAVEMENT 6" AC (TYPE B), 12" CL 2 AB
- CONCRETE FOREBAY
- BIORETENTION AREA
- SIDEWALK



PLAN
SCALE: 1" = 10'

CURVE DATA

No.	BC STA	EC STA	RADIUS	DELTA	LENGTH	T
1	0+45.3	0+49.6	6.0'	45°00'00"	4.7'	2.5'
2	0+54.5	0+58.8	6.0'	45°00'00"	4.7'	2.5'
3	0+63.6	0+67.7	6.0'	45°00'00"	4.7'	2.5'
4	0+72.9	0+77.1	6.0'	45°00'00"	4.7'	2.5'
5	1+34.0	1+38.2	6.0'	45°00'00"	4.7'	2.5'
6	1+43.2	1+47.4	6.0'	45°00'00"	4.7'	2.5'

CITY OF SAN CARLOS
PUBLIC WORKS DEPARTMENT
600 ELM STREET
SAN CARLOS, CA 94070
(650) 802-4204

No.	DATE	BY	REFERENCE

WRECO
1243 ALPINE ROAD, SUITE 108
WALNUT CREEK, CA 94596
PH (925) 941-0017 FX (925) 941-0018

FOR: BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

CHECKED BY	AO
DESIGNED BY	AC
DRAWN BY	VP

REGISTERED PROFESSIONAL ENGINEER
ANNALETTE A. OCHOA
No. 55279
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DATE: 03/01/2013

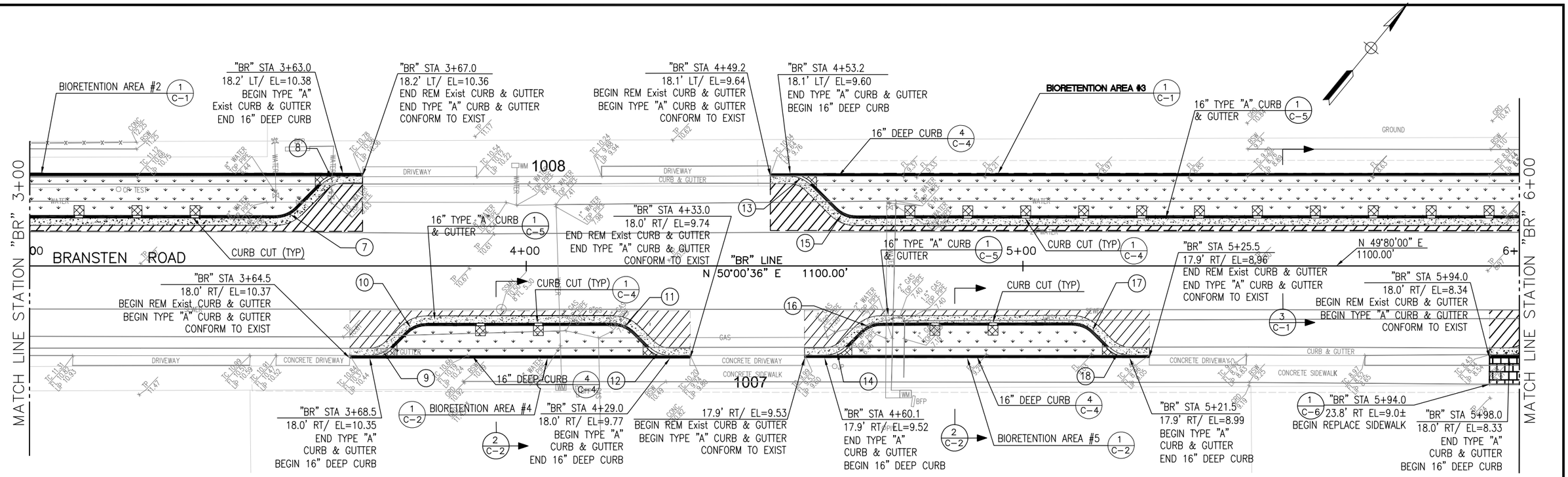
BRANSTEN ROAD CURB EXTENSION AND STORMWATER TREATMENT SAN CARLOS, SAN MATEO COUNTY, CA

LAYOUT PLAN

L-1

SHEET NO. 3 OF 25

PROJECT TITLE



CURVE DATA						
No.	BC STA	EC STA	RADIUS	DELTA	LENGTH	T
7	3+49.5	3+53.8	6.0'	45°00'00"	4.7'	2.5'
8	3+58.8	3+63.0	6.0'	45°00'00"	4.7'	2.5'
9	3+68.5	3+72.7	6.0'	45°00'00"	4.7'	2.5'
10	3+75.7	3+79.9	6.0'	45°00'00"	4.7'	2.5'
11	4+13.4	4+21.4	6.0'	45°00'00"	4.7'	2.5'
12	4+24.8	4+29.0	6.0'	45°00'00"	4.7'	2.5'
13	4+53.2	4+57.2	6.0'	45°00'00"	4.7'	2.5'
14	4+60.1	4+64.3	6.0'	45°00'00"	4.7'	2.5'
15	4+62.2	4+66.4	6.0'	45°00'00"	4.7'	2.5'
16	4+67.2	4+71.5	6.0'	45°00'00"	4.7'	2.5'
17	5+10.0	5+14.3	6.0'	45°00'00"	4.7'	2.5'
18	5+17.3	5+21.5	6.0'	45°00'00"	4.7'	2.5'

PLAN
SCALE: 1" = 10'

CITY OF SAN CARLOS
PUBLIC WORKS DEPARTMENT
600 ELM STREET
SAN CARLOS, CA 94070
(650) 802-4204

No.	DATE	BY	REFERENCE

WRECO
1243 ALPINE ROAD, SUITE 108
WALNUT CREEK, CA 94596
PH (925) 941-0017 FX (925) 941-0018

FOR: BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

CHECKED BY AO
DESIGNED BY AC
DRAWN BY VP

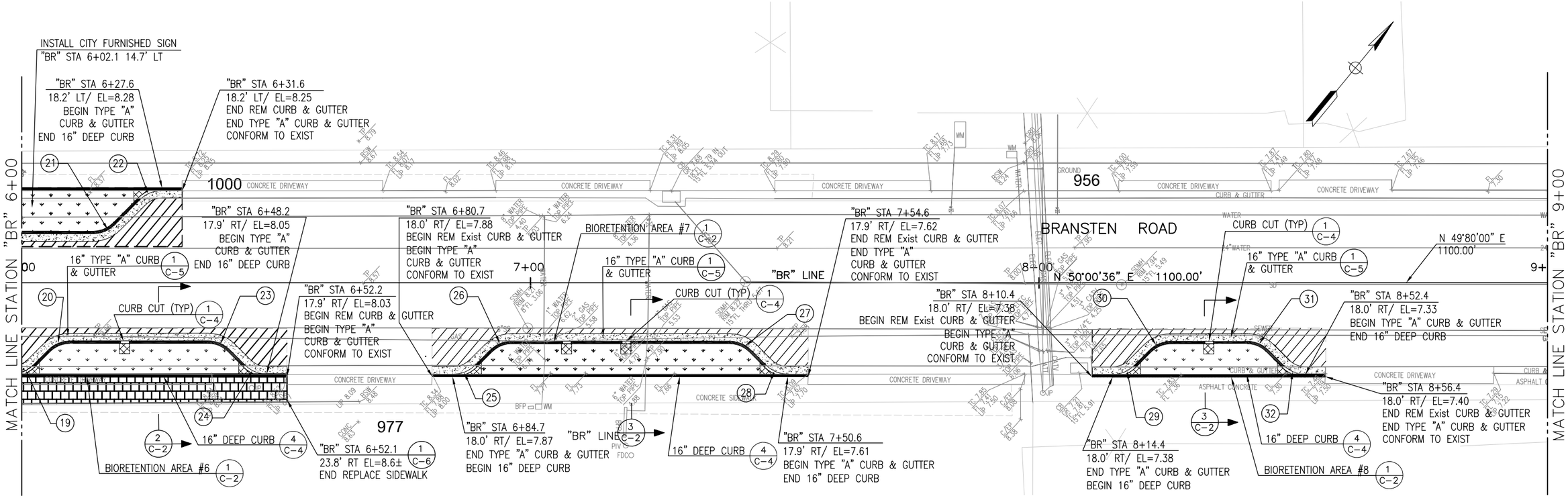
REGISTERED PROFESSIONAL ENGINEER
ANALETTE A. OCHOA
No. 55279
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DATE: 03/01/2013

BRANSTEN ROAD CURB EXTENSION AND STORMWATER TREATMENT
SAN CARLOS, SAN MATEO COUNTY, CA

LAYOUT PLAN

L-2

SHEET NO. 4 OF 25



PLAN

SCALE: 1" = 10'

CURVE DATA						
No.	BC STA	EC STA	RADIUS	DELTA	LENGTH	T
(19)	5+98.0	6+02.2	6.0'	45°00'00"	4.7'	2.5'
(20)	6+05.2	6+09.5	6.0'	45°00'00"	4.7'	2.5'
(21)	6+14.1	6+18.3	6.0'	45°00'00"	4.7'	2.5'
(22)	6+23.3	6+27.5	6.0'	45°00'00"	4.7'	2.5'
(23)	6+36.1	6+40.9	6.0'	45°00'00"	4.7'	2.5'
(24)	6+43.9	6+48.1	6.0'	45°00'00"	4.7'	2.5'
(25)	6+84.9	6+89.1	6.0'	45°00'00"	4.7'	2.5'

CURVE DATA						
No.	BC STA	EC STA	RADIUS	DELTA	LENGTH	T
(26)	6+92.1	6+96.3	6.0'	45°00'00"	4.7'	2.5'
(27)	7+39.1	7+43.4	6.0'	45°00'00"	4.7'	2.5'
(28)	7+46.4	7+50.6	6.0'	45°00'00"	4.7'	2.5'
(29)	8+14.5	8+18.7	6.0'	45°00'00"	4.7'	2.5'
(30)	8+21.7	8+25.9	6.0'	45°00'00"	4.7'	2.5'
(31)	8+40.9	8+45.1	6.0'	45°00'00"	4.7'	2.5'
(32)	8+48.1	8+2.4	6.0'	45°00'00"	4.7'	2.5'

CITY OF SAN CARLOS
PUBLIC WORKS DEPARTMENT
600 ELM STREET
SAN CARLOS, CA 94070
(650) 802-4204

No.	DATE	BY	REFERENCE

WRECO
1243 ALPINE ROAD, SUITE 108
WALNUT CREEK, CA 94596
PH (925) 941-0017 FX (925) 941-0018

FOR: BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

CHECKED BY	AO
DESIGNED BY	AC
DRAWN BY	VP

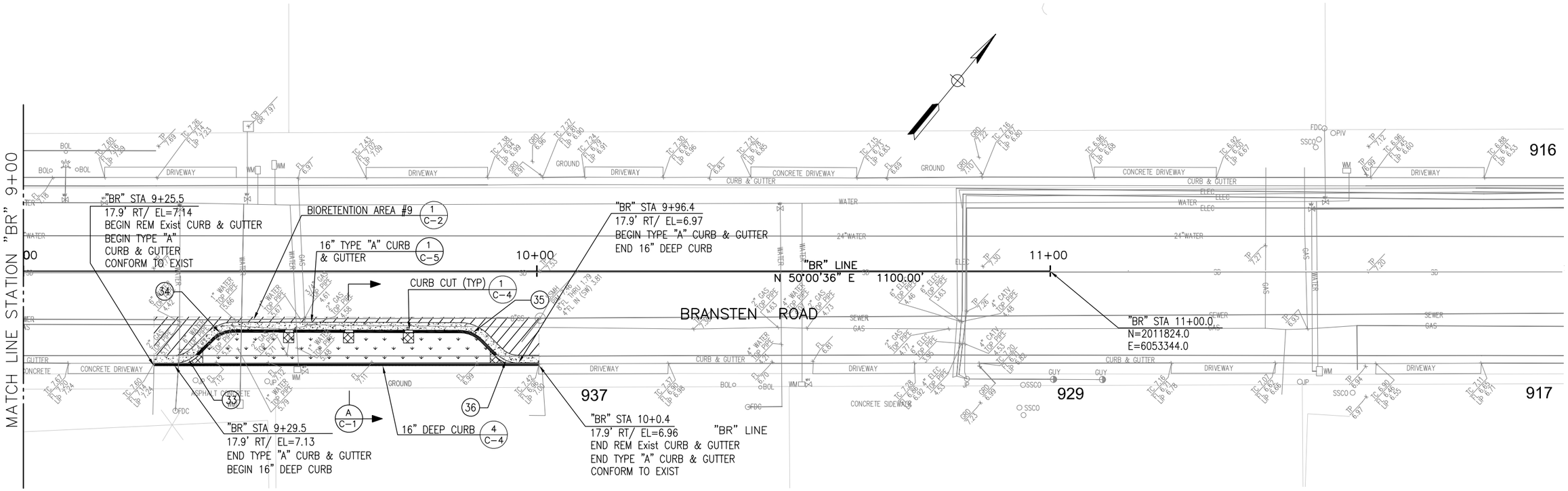
REGISTERED PROFESSIONAL ENGINEER
ANALETTE A. OCHOA
No. 55279
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DATE: 03/01/2013

BRANSTEN ROAD CURB EXTENSION AND STORMWATER TREATMENT
SAN CARLOS, SAN MATEO COUNTY, CA

LAYOUT PLAN

L-3

SHEET NO. 5 OF 25



PLAN

SCALE: 1" = 10'

CURVE DATA						
No.	BC STA	EC STA	RADIUS	DELTA	LENGTH	T
(33)	9+29.5	9+33.7	6.0'	45°00'00"	4.7'	2.5'
(34)	9+36.7	9+40.9	6.0'	45°00'00"	4.7'	2.5'
(35)	9+84.9	9+89.2	6.0'	45°00'00"	4.7'	2.5'
(36)	9+92.2	9+96.4	6.0'	45°00'00"	4.7'	2.5'

CITY OF SAN CARLOS
PUBLIC WORKS DEPARTMENT
600 ELM STREET
SAN CARLOS, CA 94070
(650) 802-4204

No.	DATE	BY	REFERENCE

WRECO
1243 ALPINE ROAD, SUITE 108
WALNUT CREEK, CA 94596
PH (925) 941-0017 FX (925) 941-0018

FOR: BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

CHECKED BY AO
DESIGNED BY AC
DRAWN BY VP

REGISTERED PROFESSIONAL ENGINEER
ANNALETTE A. OCHOA
No. 55279
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DATE: 03/01/2013

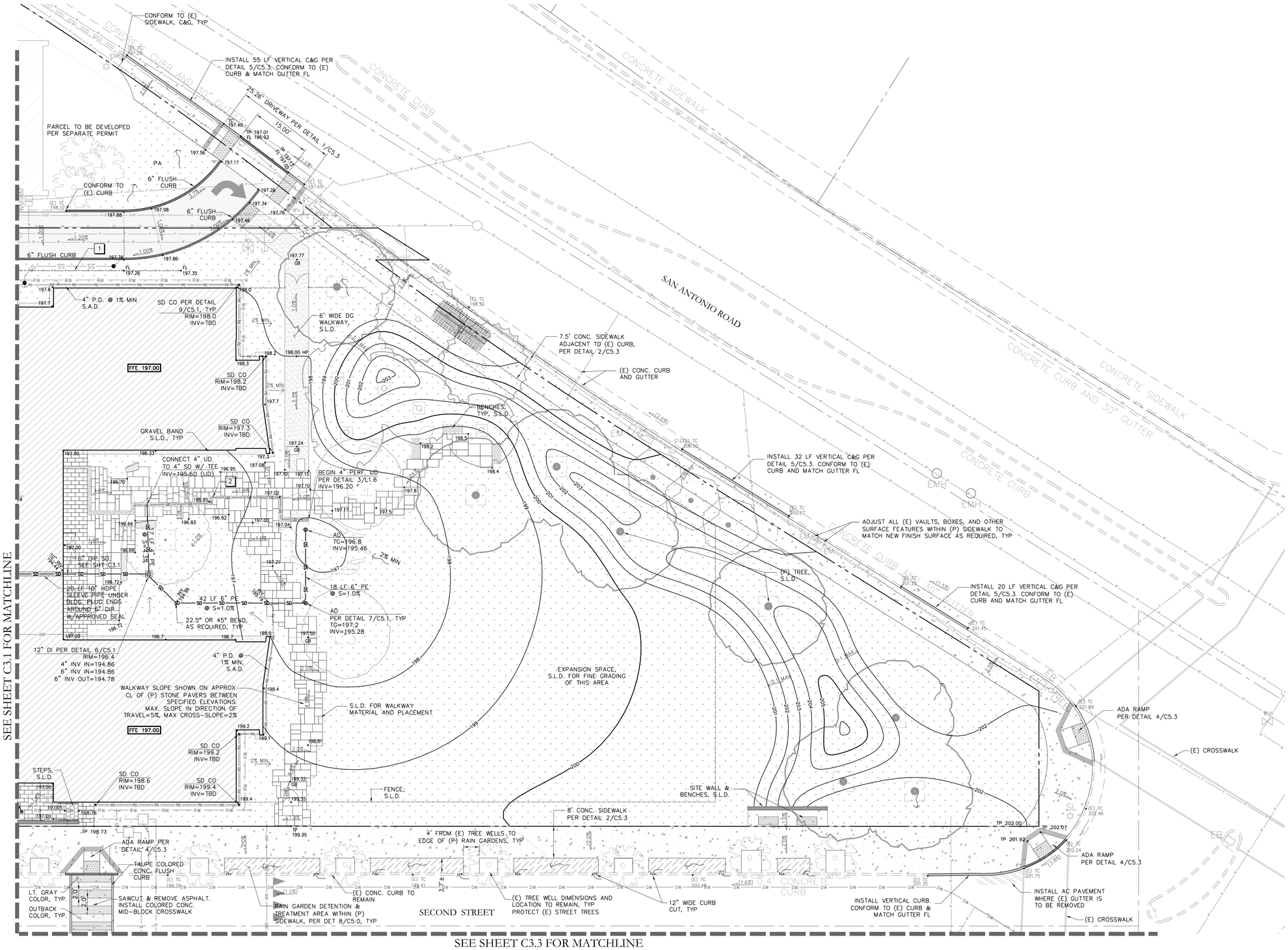
PROJECT TITLE

BRANSTEN ROAD CURB EXTENSION AND STORMWATER TREATMENT
SAN CARLOS, SAN MATEO COUNTY, CA

LAYOUT PLAN

L-4

SHEET NO. 6 OF 25



PLAN VIEW
Scale: 1" = 10'

0 5' 10' 20'

North

LEGEND

	EXISTING	PROPOSED
EASEMENT		
LIMITS OF WORK		
MAJOR CONTOUR	100	690
MINOR CONTOUR		
PROPERTY LINE		
TOP OF PAVEMENT ELEVATION	(E) EP 198.95	EP 196.78
TOP OF CURB ELEVATION	(E) TC 198.95	TC 196.78
FLOWLINE ELEVATION	(E) FL 198.95	FL 196.78
GRADE BREAK		
ROAD CENTERLINE		
STORM DRAIN	SD	SD
AREA DRAIN		
CLEANOUT		
DROP INLET		
FINISH FLOOR ELEVATION		FFE197.00
FLOW DIRECTION		
SLOPE DIRECTION SOFTSCAPE	2.0%	2.0%
SLOPE DIRECTION HARDSCAPE	2.0%	2.0%
SPOT GRADE ELEVATION		71.3
STORM DRAIN MANHOLE		
TRENCH DRAIN		
PERFORATED UNDER DRAIN		UD
VEGETATED SWALE		
CONCRETE VALLEY GUTTER		
FOUNDATION PERIMETER DRAIN		PD
UTILITY SLEEVE		

SURFACING LEGEND

- BUILDING FOOTPRINT (1ST FLOOR)
- ASPHALT PAVEMENT (PER DETAIL 3/C5.0)
- ASPHALT OVERLAY (PER SPECS)
- CONCRETE PAVING (PER DETAIL 4/C5.0)
- CONCRETE PAVERS (PER DETAIL 1/C5.0)
- PLANTED AREAS (S.L.D.)
- RAIN GARDEN (PER DETAIL 8/C5.0)
- DETECTABLE WARNING SURFACE (SEE NOTE 3 THIS SHEET)
- VERTICAL CURB (PER DETAIL 2/C5.0)
- FLUSH CURB (PER DETAIL 5/C5.0)

DRAINAGE KEYNOTES

1. 230 LF (TOTAL) VEGETATED SWALE, S=1.0% MIN PER DET 9/C5.0, SWALE #1
2. STONE DRAIN OVER INFILTRATION TRENCH. SLOPE 4" PERF UD @ 1% MIN. S.L.D. SHT L1.6 FOR TRENCH WIDTH AND ALIGNMENT.

NOTES:

1. SEE SHEET C0.0 FOR GRADING AND DRAINAGE NOTES.
2. SEE LANDSCAPE DRAWINGS FOR SURFACING MATERIALS AND SOIL PREPARATION WITHIN ALL PLANTED AREAS, THE COURTYARD, BUILDING ENTRIES, AND PATIOS.
3. PER CITY REQUIREMENTS, DETECTABLE WARNING SURFACES SHALL BE INSTALLED AT NEW CONCRETE CURB RAMPS AND SHALL BE CAST-IN-PLACE IRON WITH BAKED-ON OIL FINISH, 18"X24", MANUFACTURED BY EAST JORDAN IRON WORKS AS INDICATED IN THE CONTRACT PLANS, DETAILS AND THE TECHNICAL PROVISIONS.

Underground Service Alert
Call: TOLL FREE
1-800-227-2600
TWO WORKING DAYS BEFORE YOU DIG

Architect:
EHDD | ARCHITECTURE
Esherick Homsey Dodge & Davis
500 Treat Avenue, San Francisco, CA 94110
(415) 285-9193, fax (415) 285-3866

Consultant:
SHERWOOD Design Engineers
One Union Street
San Francisco, CA 94111
t (415) 677 - 7300
f (415) 677 - 7301
www.sherwoodengineers.com

PACKARD FOUNDATION
343 SECOND STREET Los Altos, CA

Printing:	Date:	Revisions:	Date:
100% Schematic Design	09/18/08		
100% Design Development	06/17/09		
40% Construction Documents	05/06/10		
Permit Set	07/26/10		
100% Construction Documents	11/04/10		
Issued for Construction	12/09/10		

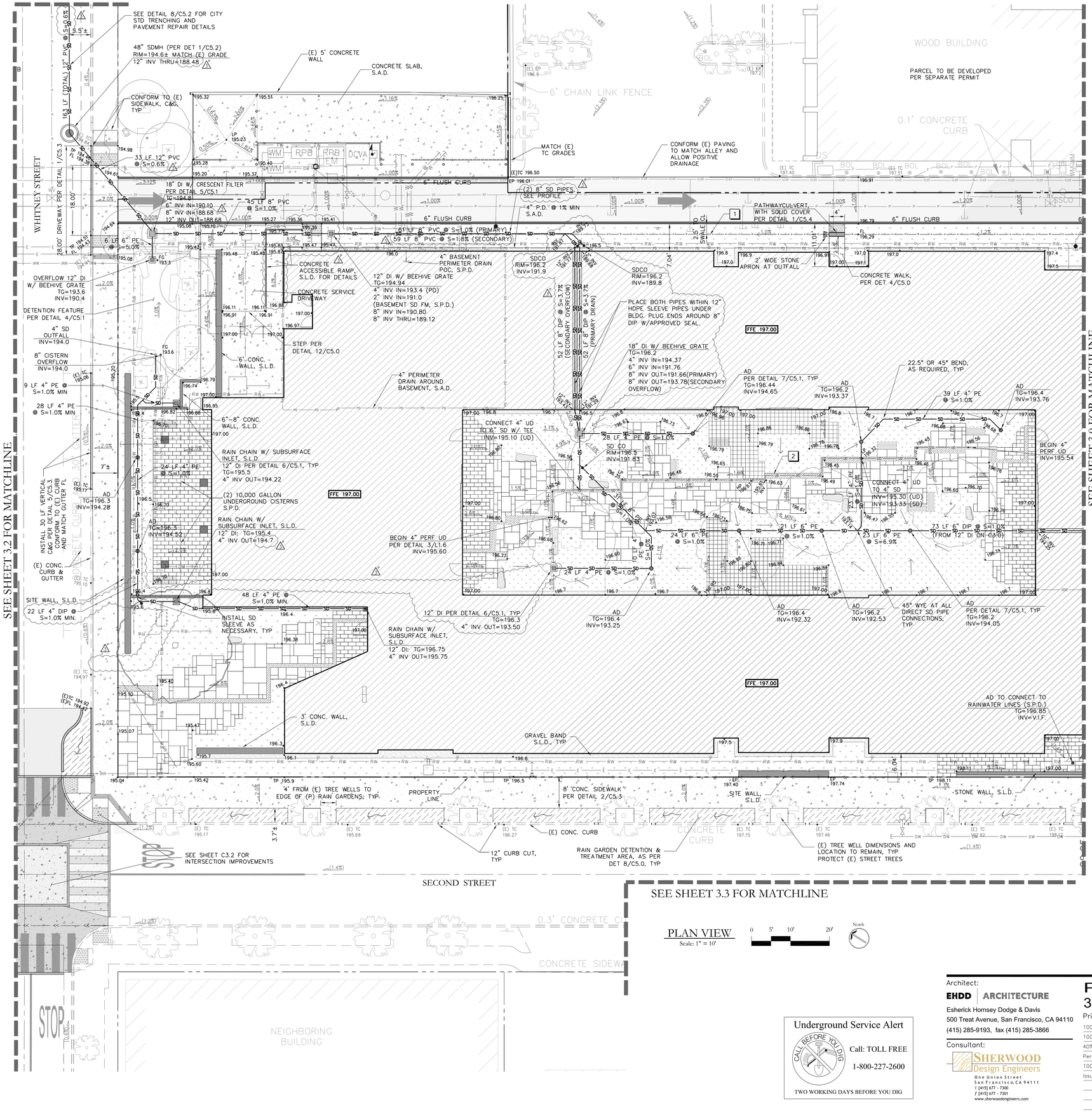
Stamp

Sheet Title:
GRADING & DRAINAGE PLAN
EXPANSION AREA

EHDD Job No.: 07023
File Location:
Drawn By: BW, IV
Scale: 1"=10'

Sheet No.:
C3.0

SEE SHEET C3.4
FOR CONTINUATION



PLAN VIEW
Scale: 1" = 10'

0 5' 10' 20'

North

DRAINAGE KEYNOTES

1. 230 LF (TOTAL) VEGETATED SWALE, S=1.0% MIN PER DET 9/C5.0, SWALE #1
2. SIDEWALK UNDERDRAIN (3"x12.5" RECTANGULAR CAST IRON PIPE) PER DETAIL 1/C5.1. CONNECT 12" DI TO UNDERDRAIN W/ 5 LF 6" DUCTILE IRON PIPE AND PIPE ADAPTOR.

NOTES:

1. SEE SHEET C3.0 FOR LEGEND.
2. SEE SHEET C0.0 FOR GRADING AND DRAINAGE NOTES.
3. SEE LANDSCAPE DRAWINGS FOR SURFACING MATERIALS AND SOIL PREPARATION WITHIN ALL PLANTED AREAS, THE COURTYARD, BUILDING ENTRIES, AND PATIOS.
4. PER CITY REQUIREMENTS, DETECTABLE WARNING SURFACES SHALL BE INSTALLED AT NEW CONCRETE CURB RAMPS AND SHALL BE CAST-IN-PLACE IRON WITH BAKED-ON OIL FINISH, 18"X24", MANUFACTURED BY EAST JORDAN IRON WORKS AS INDICATED IN THE CONTRACT PLANS, DETAILS AND THE TECHNICAL PROVISIONS.

Architect:
EHDD | ARCHITECTURE
Esherick Homsey Dodge & Davis
500 Treat Avenue, San Francisco, CA 94110
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Consultant:
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PACKARD FOUNDATION
343 SECOND STREET Los Altos, CA

Stamp

Printing:	Date:	Revisions:	Date:
100% Schematic Design	09/18/08		
100% Design Development	06/17/09		
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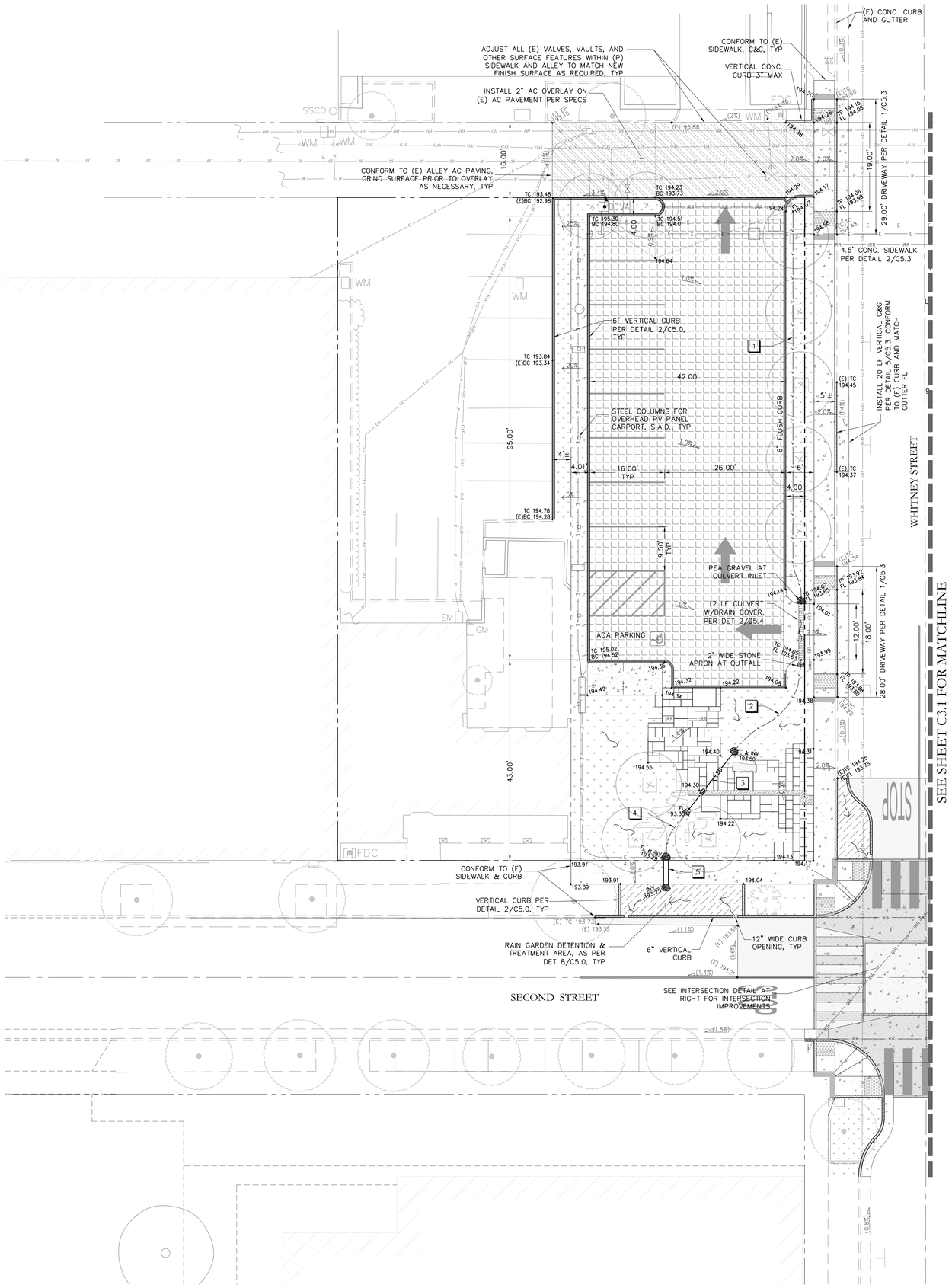
Permit Set	07/26/10		
100% Construction Documents	11/04/10		
Issued for Construction	12/09/10		

EHDD Job No.: 07023
File Location:
Drawn By: BW, IV
Scale: 1"=10'

Sheet Title:
GRADING & DRAINAGE PLAN
BUILDING SITE

Sheet No.:
C3.1



PLAN VIEW
Scale: 1" = 10'

0 5' 10' 20'

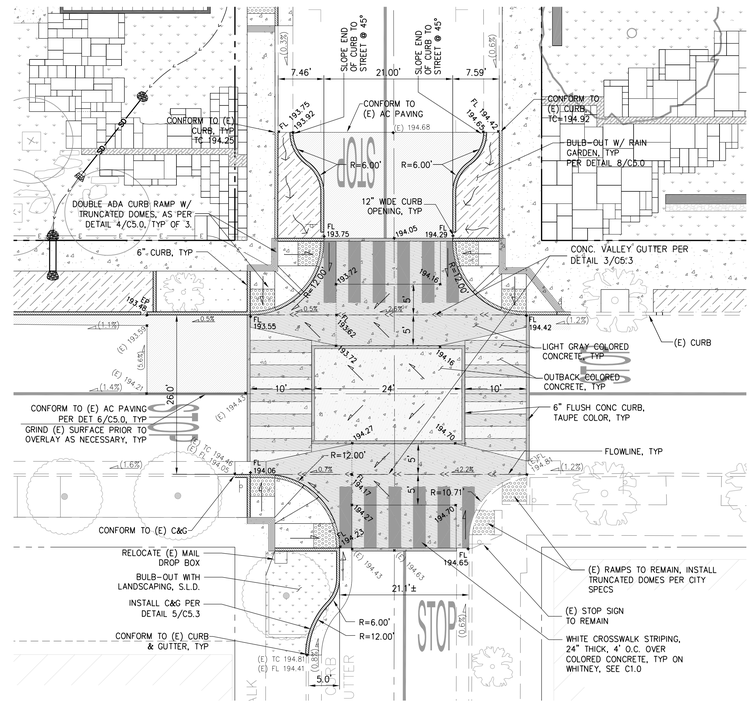
North

DRAINAGE KEYNOTES

1. 85 LF VEGETATED SWALE, S=0.5% PER DETAIL 9/C5.0, SWALE #2
2. 26 LF VEGETATED SWALE, S=0.5% PER DETAIL 9/C5.0, SWALE #2
3. 15 LF 4" PE SD, S=1.0% W/ PEA GRAVEL AT INLET AND 2' STONE APRON AT OUTFALL
4. 12 LF VEGETATED SWALE, S=0.5% PER DETAIL 9/C5.0, SWALE #2
5. SIDEWALK UNDERDRAIN (3"x12.5" RECTANGULAR CAST IRON PIPE) @ S=0.5%, PER DETAIL 1/C5.1. W/ PEA GRAVEL AT INLET AND OUTLET

NOTES:

1. SEE SHEET C3.0 FOR LEGEND.
2. SEE SHEET C0.0 FOR GRADING AND DRAINAGE NOTES.
3. SEE LANDSCAPE DRAWINGS FOR SURFACING MATERIALS AND SOIL PREPARATION WITHIN ALL PLANTED AREAS, THE COURTYARD, BUILDING ENTRIES, AND PATIOS.
4. PER CITY REQUIREMENTS, DETECTABLE WARNING SURFACES SHALL BE INSTALLED AT NEW CONCRETE CURB RAMPS AND SHALL BE CAST-IN-PLACE IRON WITH BAKED-ON OIL FINISH, 18"x24", MANUFACTURED BY EAST JORDAN IRON WORKS AS INDICATED IN THE CONTRACT PLANS, DETAILS AND THE TECHNICAL PROVISIONS.



PLAN VIEW - INTERSECTION
Scale: 1" = 10'

NOTE: DESIGN APPROVAL OF INTERSECTION DESIGN DEFERRED AND SUBJECT TO A FINAL APPROVAL BY THE CITY OF LOS ALTOS.

INTERSECTION NOTES:

1. CENTER OF INTERSECTION TO BE PAVED WITH CONC. PAVERS PER SPECS.
2. VALLEY GUTTER AND CROSSWALKS SHALL BE COLORED PER CONCRETE SPECS.
3. SEE SHEET C1.0 FOR STRIPING & SIGNAGE INFORMATION.
4. SEE LANDSCAPE DRAWINGS FOR SOIL PREPARATION AND PLANTING WITHIN BULB-OUT RAIN GARDENS.

Architect:
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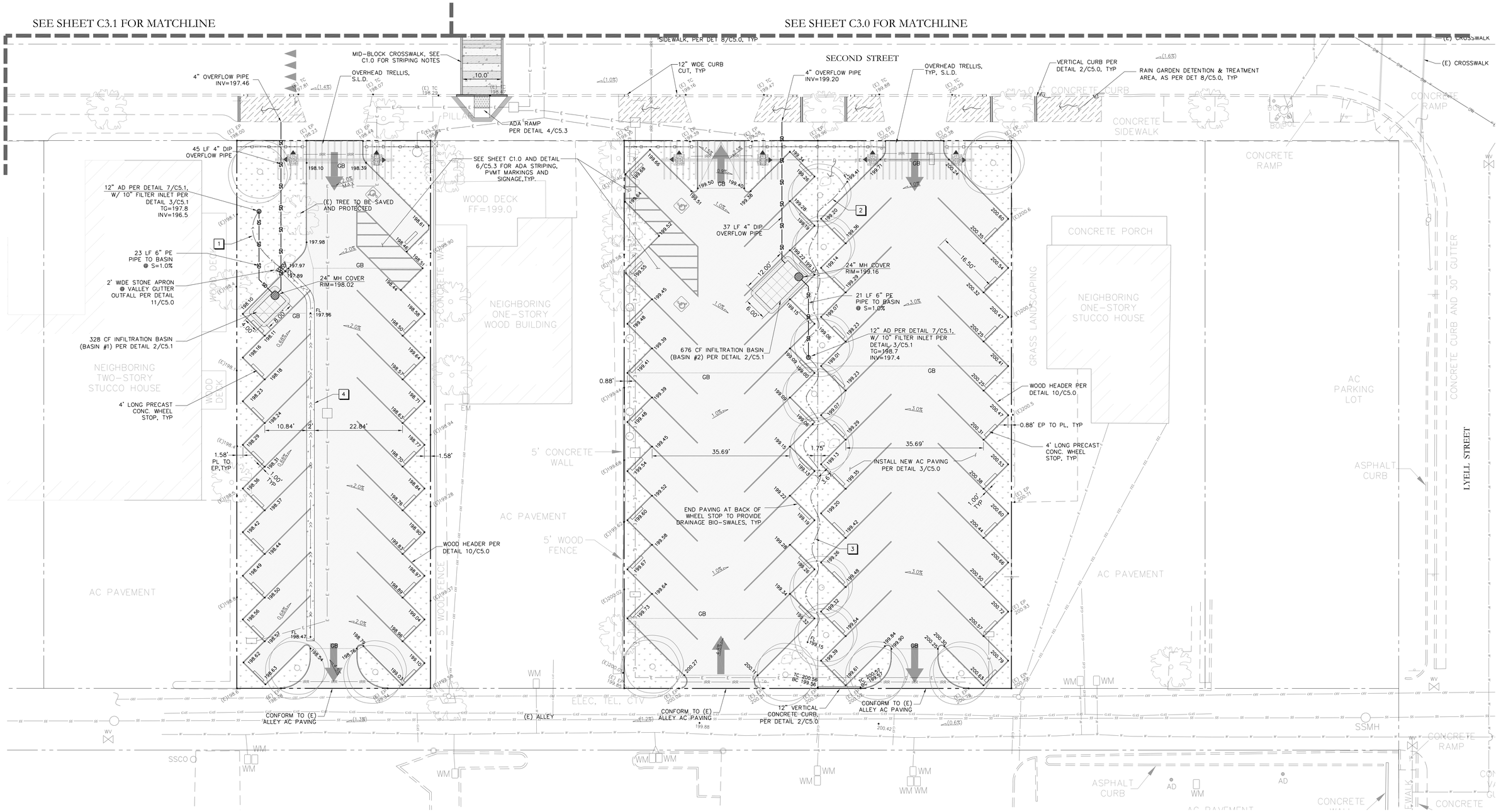
Sheet Title:
GRADING & DRAINAGE PLAN
VISITOR PARKING

EHDD Job No.: 07023
File Location:
Drawn By: BW, IV
Scale: 1"=10'

Sheet No.:
C3.2

SEE SHEET C3.1 FOR MATCHLINE

SEE SHEET C3.0 FOR MATCHLINE



PLAN VIEW
Scale: 1" = 10'

0 5' 10' 20'

North

DRAINAGE KEYNOTES

1. 20 LF VEGETATED SWALE, S=0.5% PER DETAIL 9/C5.0, SWALE #3
2. 52 LF VEGETATED SWALE, S=0.5% PER DETAIL 9/C5.0, SWALE #4
3. 83 LF VEGETATED SWALE, S=0.5% PER DETAIL 9/C5.0, SWALE #4
4. CONCRETE VALLEY GUTTER, S=0.6% MIN. PER DETAIL 7/C5.0

NOTES:

1. SEE SHEET C3.0 FOR LEGEND.
2. SEE SHEET C0.0 FOR GRADING AND DRAINAGE NOTES.
3. SEE LANDSCAPE DRAWINGS FOR SURFACING MATERIALS AND SOIL PREPARATION WITHIN ALL PLANTED AREAS, THE COURTYARD, BUILDING ENTRIES, AND PATIOS.
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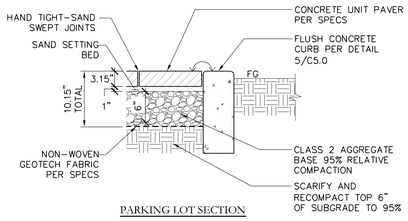
100% Construction Documents	11/04/10		
Issued for Construction	12/09/10		

Stamp

Sheet Title:
GRADING & DRAINAGE PLAN
SECOND ST. PARKING

EHDD Job No.: 07023
File Location:
Drawn By: BW, IV
Scale: 1"=10'

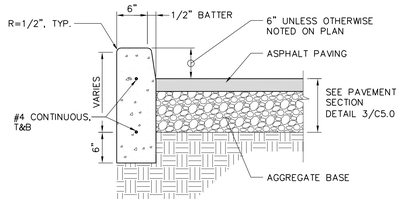
Sheet No.:
C3.3



PARKING LOT SECTION

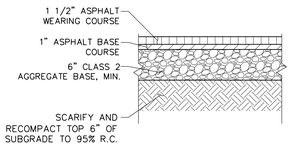
1 C5.0 CONCRETE PAVER SECTION

SCALE: NTS



2 C5.0 VERTICAL CONCRETE CURB

SCALE: NTS

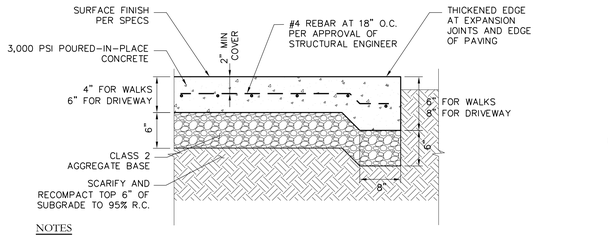


NOTE:
3" AC ON 9" AB FOR THE ALLEY EAST OF THE BUILDING AND PUBLIC STREET REPAIR.

ADD ALT NO. 1:
INSTALL 1/16" TO 1/8" THICK POLYMER COMPOSITE MICRO-OVERLAY IN LIGHT GRAY COLOR OVER ASPHALT COURSE WITHIN ALL SECOND STREET PARKING LOTS AND ALLEY EAST OF BUILDING. REFER TO SPECS FOR MORE INFORMATION.

3 C5.0 ASPHALT SECTION

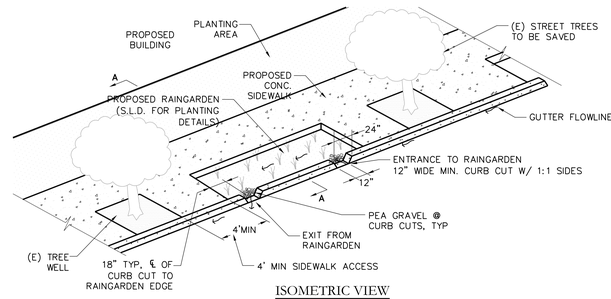
SCALE: NTS



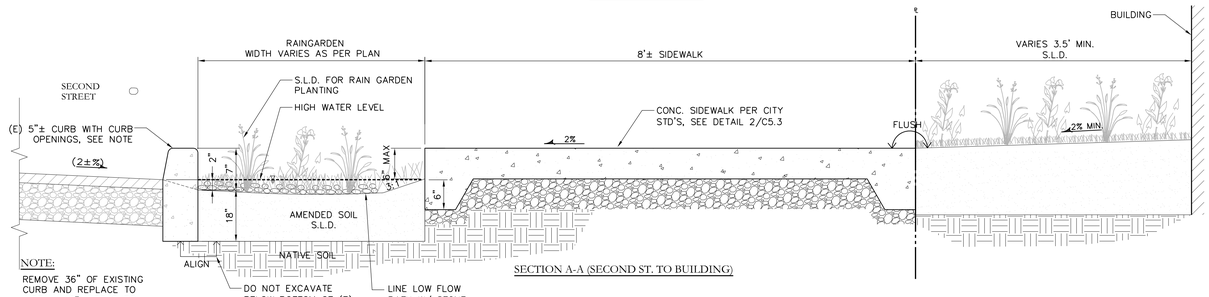
NOTES
1. WHERE (E) SUBGRADE IS DETERMINED TO BE UNSUITABLE BY GEOTECHNICAL ENGINEER, INSTALL GEOTECH FABRIC BEFORE PLACING AB.
2. REFER TO THE SPECS FOR JOINTING AND INSTALLATION INFORMATION.

4 C5.0 CONCRETE SECTION

SCALE: NTS



ISOMETRIC VIEW

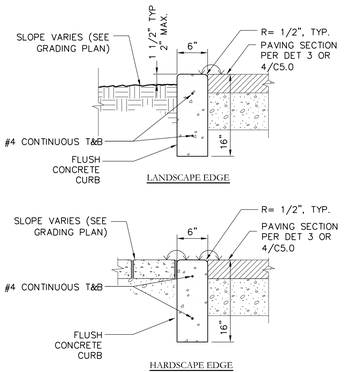


NOTE:
REMOVE 36" OF EXISTING CURB AND REPLACE TO INSTALL 12" WIDE CURB OPENINGS WITH 1:1 SIDES.

SECTION A-A (SECOND ST. TO BUILDING)

8 C5.0 CURBED RAIN GARDENS

SCALE: NTS



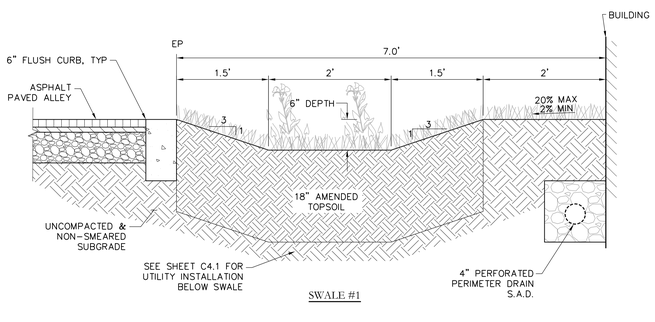
LANDSCAPE EDGE

HARDSCAPE EDGE

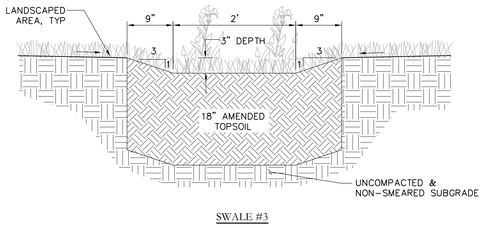
NOTES:
1. INSTALL CONTROL JOINT EVERY 15 FT, MIN.
2. INSTALL EXPANSION JOINT EVERY 45 FT, MIN.

5 C5.0 FLUSH CONCRETE CURB

SCALE: NTS



SWALE #1



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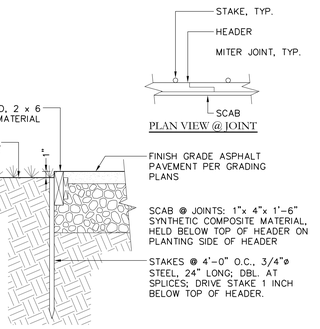
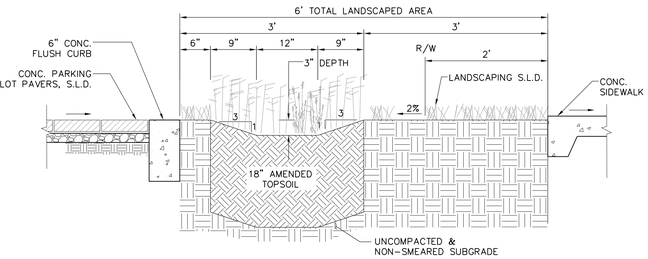


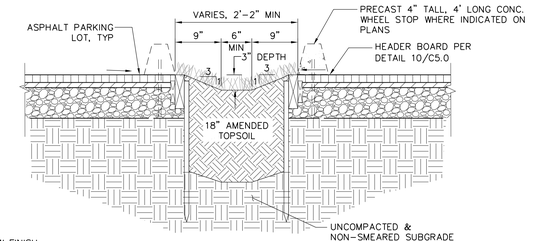
PLAN VIEW @ JOINT

SECTION



SWALE #2

NOTE:
TOP OF SOIL SHOULD BE 2" BELOW FINISH GRADE TO ALLOW FOR MULCH LAYER. S.L.D. FOR MULCH PLACEMENT.



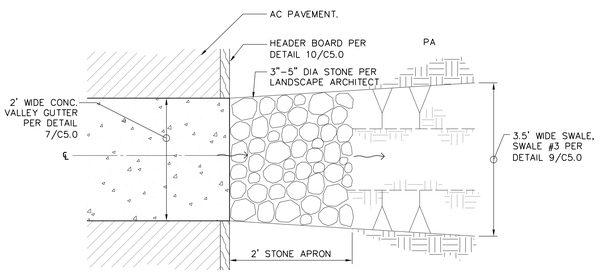
SWALE #4

9 C5.0 VEGETATED SWALES

SCALE: NTS

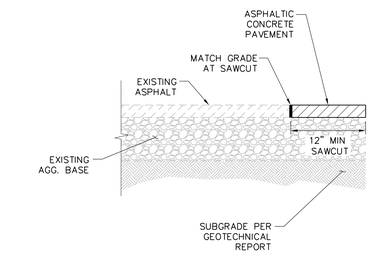
10 C5.0 HEADER BOARD

SCALE: NTS



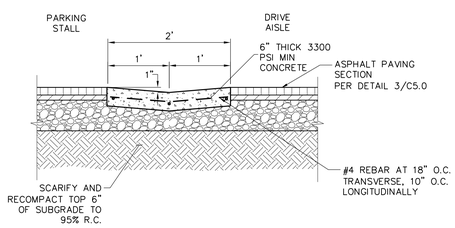
11 C5.0 STONE APRON

SCALE: NTS



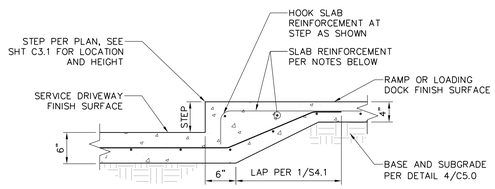
6 C5.0 PAVEMENT CONFORM

SCALE: NTS



7 C5.0 PARKING LOT VALLEY GUTTER

SCALE: NTS



NOTE:
1. PROVIDE REINFORCEMENT PER THE FOLLOWING:
DRIVEWAY AND LOADING DOCK: #4 @ 12" O.C. BOTH WAYS.
PED RAMP: #4 @ 18" O.C. BOTH WAYS.
2. SEE SPEC 02751 FOR ALL OTHER CONCRETE REQUIREMENTS

12 C5.0 STEP AT SLAB-ON-GRADE

SCALE: NTS

Architect:
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Sheet Title: SITE AND DRAINAGE DETAILS

EHDD Job No.: 07023
File Location:
Drawn By: BW, IV
Scale: NTS

Sheet No.: **C5.0**

Annual Reporting for FY 2012-2013

Regional Supplement for Training and Outreach

San Francisco Bay Area Municipal Regional Stormwater Permit

B A S M A A

Bay Area Stormwater Management Agencies Association

September 2013

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LIST OF ATTACHMENTS:

C.7.b. Advertising Campaign

Be the Street Report

C.7.c. Media Relations – Use of Free Media

BASMAA Media Relations Campaign Final Report

C.9.h.i. Point of Purchase Outreach

Photos of *Our Water, Our World* displays at major chains
Photos of training at major chains
Copies of *Our Water, Our World* advertisements
IPM Advocates for Retail Stores Final Report

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 2012-2013 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.

Subsequent to the development and implementation of the existing program, 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 the information; 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 initiated work on the enhancements. The project will be fully implemented in FY 13-14.

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. 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 12-13 included: maintaining a website, Facebook page, and YouTube Channel; issuing an e-newsletter; creating an Instagram account; conducting an "anti-littering" video contest and live streaming online awards show; and advertising the winning video on Pandora, YouTube, Google, Facebook, and KTVU (see attached *Be the Street* Report for details).

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 12-13 BASMAA Regional Media Relations project made seven pitches (see attached Media Relations Program Report for details):

- Pesticides: Exterior Spraying press release and PSAs,
- IPM Advocates press release,
- Holiday press release,
- Plastic bag bans press release,
- Be the Street press release,
- Car Washing PSAs, and
- Green Streets press release.

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 12-13 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 12-13.

- 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. Work with these major chains resulted in year-to-year increases in sales of less-toxic products of:
  - +29% in retail sales – OSH
  - +22-25% - Home Depot

  Our qualitative assessment suggests the following factors (in no particular order) behind these relatively large increases:
  - Early dry spring
  - Improved economy
  - Increased consumer interest and demand in organic and green products
  - Increased selection and higher visibility of less toxic products due to better displays and OWOW participation in end-cap displays
  - Increased participation of OWOW at these retailers (more call frequency as a whole)
  - Increased participation of OWOW with IPM Advocates (see below) at regional road shows and district kick-off meetings where we met with hundreds of employees we never have before reached in such numbers
  - Increased trainings of Home Depot and OSH employees at OWOW stores
  - Increased tablings at these two retailers

- 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 2012)
  - L&L Dealer Show, Reno (October 2012)
  - NorCal trade show (February 2013)

- 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 31 Home Depots (see photo attached).

- Provided print advertising and articles – Chinook Coupon Book (see ad attached) and distributed about 500 books that also had the *Our Water, Our World* label on the front cover at the BART Blue Sky Festival and San Francisco Earth Day (see ad attached).

- Provided print and web 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, finished developing and implementing a Pest Management Alliance grant from the Department of Pesticide Regulation (DPR) for the *IPM Advocates for Retail Stores* project. The project's purpose was to develop and implement a program that recruited, trained, and mentored individuals to help retail stores implement the *Our Water, Our World* program. The *IPM Advocates for Retail Stores* project kicked off in December 2010. In FY 12-13, the project team:

- through the Advocates, continued to work with the stores to set up displays and conduct trainings of store employees;
- sustained 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;
- evaluated the project; and
- identifed ways to sustain IPM Advocates after the grant expired (spring 2013).

(see attached IPM Advocates for Retail Stores report for details)

Additionally in FY 12-13, BASMAA initiated work on two other projects related to *Our Water, Our World*:

Got Ants – This DPR funded grant project is being led by the San Francisco Estuary Partnership and BASMAA is a sub-recipient of a small portion of the grant funds. The project is a social marketing outreach campaign designed to provide easy-to-use information on ant control methods that do not harm water quality and shift users' behavior to integrated pest management (see Got Ants? Get SERIOUS website for more information).

Greener Pesticides for Cleaner Waterways – This EPA funded grant project is being led by the San Francisco Estuary Partnership. The project is implementing pesticide pollution prevention through engaging residential pesticide users to use less toxic products. Part of the project involves doing so through the *Our Water, Our World* program using the IPM Advocates, the former managed and the latter qualified by BASMAA. (see Greener Pesticides for Cleaner Waterways for more details).

ATTACHMENTS

C.7.b. Advertising Campaign

Be the Street FY 2012-2013 Summary. Revised Report including SCVURPPP and ACCWP Program Staff Comments

Be the Street FY 2012-2013 Summary

Be the Street Facebook Page

The Be the Street Facebook page (https://www.facebook.com/BetheSt) was maintained throughout the year to engage the target audience, Bay Area youth ages 14-24 years old, with interesting content and event photos. The focus was on clean streets and community ownership as a social norm. The page allows fans to connect with Be the Street, get the latest program updates such as the PSA video contest news and winners announcement, share thoughts and photos and ask questions. Other outreach components such as the Be the Street website (www.BetheStreet.org), YouTube channel (http://www.youtube.com/bethestreet) and Instagram account (http://instagram.com/bethestreet) are linked on the page. The following are Facebook statistics from the year:

- 268 published posts;
- 1,062 new fans, resulting in a total of 1,468 fans;
- 2,048 total interactions (includes likes, comments, shares and responses to poll questions); and
- 115,513 total post views.

In addition, this year we created and integrated a customized Be the Street Instagram app (https://www.facebook.com/BetheSt/app_148296625321468) on the Facebook page to highlight our Be the Street Instagram account feed. It allows fans to easily connect with this additional social media channel. As well, fans can easily see and engage with a gallery of Be the Street photos.

eNewsletter

While we had originally planned on creating a quarterly eNewsletter, our analysis indicated that the readership of the eNewsletter was much lower than our interaction rates on social media outlets. This led to the discontinuation of this tactic in favor augmenting both the social media and video contest components

1. 2 eNewsletters released
2. 23% open rate
3. 13% click through rate

Be the Street YouTube Channel

The Be the Street YouTube channel (http://www.youtube.com/bethestreet) was maintained throughout the year to present clean street and pollution prevention related videos online. The channel hosted the PSA video entries, promotional videos and award show. The Be the Street YouTube channel allows for a positive visual association with the program and attracts new interest. Similar to other social media

channels, it offers an opportunity for viewers to comment or give feedback. It also offers quick access to links to easily share and embed these videos. Other outreach components such as the Be the Street website (www.BetheStreet.org), Facebook page (https://www.facebook.com/BetheSt) and Instagram account (http://instagram.com/bethestreet) are linked on the channel. The following are YouTube statistics from the year:

- 54 videos uploaded;
- 16 subscribers;
- 21 total interactions (includes likes/dislikes, comments and shares); and
- 15,506 video views.

Be the Street Instagram Account

The Be the Street Instagram account (http://instagram.com/bethestreet) was created and launched in November 2012 to build awareness and engagement with Bay Area youth ages 14-24 years old through photos. The value of this social media channel is that it combines mobile and photo sharing. The Instagram account allows Bay Area youth to follow the program's photos, comment on photos, like photos, tag themselves and tag the program @BetheStreet/#BetheStreet in their own photos. The photos tell the story of how the program and youth are inspiring others to take pride in clean streets and community ownership. It includes a link to the Be the Street Facebook page (https://www.facebook.com/BetheSt). The following are Instagram statistics from the year:

- 68 posted photos;
- 67 followers; and
- 729 total interactions (likes, comments and #BetheSteet).

Website

The Be the Street website (www.bethestreet.org) usage statistics are reported below. It should be noted that mobile visitors are underreported below as they are difficult for Google Analytics to accurately track right now. We hope that this issue is solved soon but we are unable to compensate for this tracking inadequacy for the time being.

1. Total Visits: 15,431
2. Unique Visitors: 10,040
3. Visit Duration: 2:19. We should highlight that this is a tremendously high average duration number. This has everything to do with our content rich work stemming from the video contest.

4. Page Views: 37,135

5. *Popup click through results: 39 (ran from 5/1/13-6/30/13 where Unique Visitors during that period were 3,171. This resulted in a 1.2% conversion.)

Video Contest

As its major effort of the Fiscal year, Be the Street conducted a video contest asking participants to submit their best anti-litter video. The contest was designed not only to render a crowd-sourced video advertisement which Be the Street subsequently put use to, but also to drive traffic to various Be the Street outlets (most notably the website and social media). As a whole, the video contest was a tremendous success, yielding dozens of local entries and exponentially increasing our traffic across the targeted outlets. Additionally, we allowed for voting and commenting on videos on our website. Finally, we conducted a live streaming online awards show to act as a lightning rod moment; something to get our audience in one place at one time.

1. 283 organizations reached out to
2. 52 video entries received
3. 4,844 votes cast (every IP address was only allowed to vote once to ensure real voters)
4. 593 unique views of the 25 minute Awards Show. This number represents more than 530 views as many people presumably watched the show in groups
5. 359 user comments on videos
6. While we are unable to track the exact number here, since each video was given a dedicated profile page on the website, we were able to track at least fourteen instances of filmmakers promoting their own page through their own social media channels.
7. More than fifteen users live commenting during our awards show

Ads

With our winning video, Be the Street launched a regional ad buy using Pandora, YouTube, Google, Facebook, and KTVU.

1. 3.82% click through rate on Pandora ad (against industry standard of 1.2)
2. Approximately 6.5 million impressions from target demographic of 14-24 year olds in the Bay Area
3. $7,800 in pro-bono donations gained with more coming in FY 13-14 based on media outlets' availability

C.7.b. Advertising Campaign
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7. More than fifteen users live commenting during our awards show

Media Advertising

With our winning video, Be the Street launched a regional ad buy using Pandora, Facebook, and KTVU, resulting in approximately 6.5 million impressions from target demographic of 14-24 year olds in the Bay Area. Below is a summary of media advertising:

1. TV advertising on KTVU Fox - The winning video ran 12 times in June and July 2013, and received 35,000 impressions in the 12-24 years age group. The video also ran on KTVU online 273 times.

2. Facebook ads - Advertisements promoting the Be the Street Facebook page were placed in August 2012, September 2012, March 2013, May 2013, and June 2013. Overall, the advertisements received 5,733,573 impressions and 2,173 click-throughs . The ads also resulted in 917 additional likes on the Be the Street Facebook page.

3. Pandora The placement of the winning video on Pandora resulted in 371,919 impressions and 13,143 "click-throughs". The 3.82% click through rate on Pandora ad on is significantly above the industry standard of 1.2%.

The media buys also resulted in $7,800 in pro-bono donations gained with more coming in FY 13-14 based on media outlets' availability

Be the Street Outreach Events

Permittees conducted the following community outreach events to promote the BE the Street Campaign to Bay Area youth:

Alameda Countywide Clean Water Program:

- First Friday at Uptown, Oakland, October 5, 2012
- Hayward High School Football Game, Hayward, October 19, 2012
- Creatures of Impulse - Teen Improv Troupe Show, Pleasanton, October 26, 2012
- Alameda County Clean Water Program Earth Day Event, Alameda County

Santa Clara Valley Urban Runoff Pollution Prevention Program:

- Twilight Opening AMC 16 Vallco Shopping Mall, Cupertino, November 15, 2012
- Twilight Century Cinemas 16, Mountain View, November 15, 2012
- Christmas in the Park, San Jose, December 8, 2012
- Mission College Eco Fair, Santa Clara, April 18, 2013

San Mateo Countywide Water Pollution Prevention Program:

- Jefferson High School's Environmental Club, Daly City March 2013
- Belmont Earth Day, Belmont, April 20, 2013
- Skyline College's Green Fair, San Bruno, April 24, 2013
- Portola Valley Earth Fair, Portola Valley, April 27, 2013
- San Mateo BE the Street TPumps Event, San Mateo
- San Mateo County Fair, San Mateo, June 8, 2013
- San Mateo County Fair, San Mateo, June 12, 2013
- East Palo Alto Anniversary, East Palo Alto, June 29, 2013

ATTACHMENT

C.7.c. Media Relations – Use of Free Media

BASMAA Media Relations Campaign Final Report

BASMAA
Media Relations Campaign
Final Report FY 2012-2013

Submitted by O'Rorke Inc
June 26, 2013

During the fiscal year 2012-2013, 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 BASMAA PIP committee to brainstorm pitch topics. As a result, O'Rorke developed and implemented an annual workplan that included seven planned pitches, including press releases, radio and online public service announcements, and/or Editorial Letters on key stormwater issues (addressed below), ; on-call time for monitoring of breaking news opportunities; the creation of a photo library; and 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.

In FY 2012-13 seven pitches were done that resulted in fifty total media placements (stories and PSAs). 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.

Exterior Spraying
O'Rorke used a two-pronged approach for this pitch: we used radio PSAs and a press release announcing the new regulations. A local press release was also developed. O'Rorke coordinated with the California Department of Pesticide Regulation on the copy/materials and pitch timing. The effort was successful: PSAs aired on two stations; Geoff Brosseau was interviewed by KBLX-FM; and SFGate.com, the San Jose Mercury News, the Marin Independent Journal and San Carlos Patch all ran stories.

IPM Advocates
O'Rorke worked with the IPM committee to issue a press release regarding new trained advocates in stores. Promoted as a boon to consumers, this pitch did well with stories running on both Rockridge and Piedmont Patch. A local release was also developed. KATD, A Spanish language radio station, interviewed Riccardo Barajas of San Jose and copy from the release was carried in PSA format by KCBS and KDIA.

Holiday Pitch

O'Rorke wrote a press release dealing with various holiday water pollution prevention issues, including not burning gift wrap and setting out tress for post-Christmas recycling sans flocking. A local release was also developed.

This pitch took off with the help of photos and was carried by twelve Bay Area Patch.com sites, SFGate.com, Claycord.com, KMKY (Radio Disney), KOIT, KBLX, KFOX and news powerhouse, KCBS.

Bag Ban
This pitch focused on new and recent bag bans in cities around the region, including San Francisco's upgrade to including more stores in its ban. The pitch featured a press release and courtesy photos. A local release was also developed.

Information ran on KBAY, KCBS and on eight Bay Area Patch.com sites.

Be the Street
Coordinating with SGA, O'Rorke pitched the online awards ceremony and looked at potentially promoting Bay Area contest award winners. O'Rokre developed a media advisory for the online awards and made pitch calls to all major Bay Area media; a lack of local award winners curbed interest. No coverage was secured.

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 eleven radio stations, including the immensely popular KLLC, KCBS and KITS.

Green Streets
This pitch was focused on reaching out to select media—architecture, urban planning and some environmental reporters. No press release was issued, but a detailed pitch letter was sent along with photos highlighting Green Streets as an emerging trend in the Bay Area.

As of this writing, no coverage had been secured yet. But O'Rorke plans additional follow-up for July.

Recommendations for FY 2013-2014

- Continue to look to new local/regional studies as a jumping off point for pitching. The Green Streets report, due in September, represents an excellent opportunity.

- 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.

- Continue to pitch Patch sites; these were an important source of coverage in FY 13-14.

- Utilize BayWise.org in pitches as a resource; have homepage and content updated as needed to keep site relevant to media relations efforts.

- Pitch the upcoming Our Water, Our World/IPM app and new look; together these happenings could be a major pitch for FY 13-14.

ATTACHMENTS

C.9.h.i. Point of Purchase Outreach

Photos of *Our Water, Our World* displays at major chains

Photos of training at major chains

Copies of *Our Water, Our World* advertisements

IPM Advocates for Retail Stores Final Report


Got Bugs? Get Answers!
Choose less toxic products for a healthy home and garden
visit www.ourwaterourworld.org
our water our world
Look for this symbol before you buy
AMEND GARDEN SOIL
PATIO Plus
$.9%

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!

www.OurWaterOurWorld.org

2013

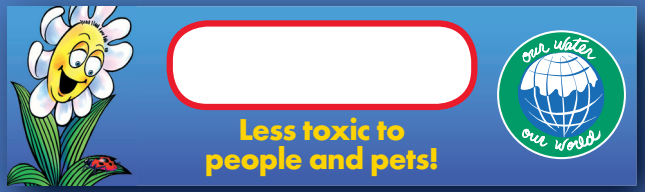
Chinook Book®

Everything we ♥ about the San Francisco Bay Area & Santa Cruz

Healthy Gardening for People, Pets, and Our Environment!

Choose less toxic products for a healthy home and garden

Look for this tag before you buy



www.OurWaterOurWorld.org

Brought to you by Bay Area Water Pollution Prevention Agencies

Nature News | On the Trail | Magazine

Leaves of three: The rash success of poison oak

Poison oak is one native plant people love to hate. But it does have a good side, feeding birds and other wildlife. For people, the best thing is to learn to recognize it, and step aside.

Current Issue

Subscribe

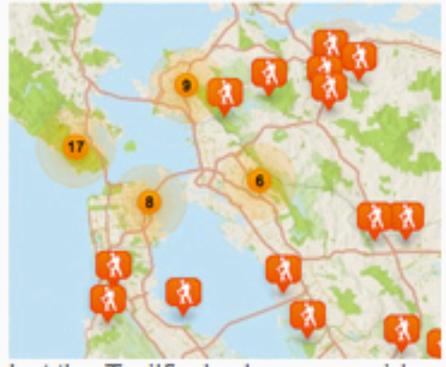
Jul-Sep 2013

Bay Nature joins this year's celebration of "The Year of the Bay" with the publication of "Baylands Reborn: Restoration and Renewal on San Francisco Bay." We also head to Butano State Park, take a close look at poison oak, and more!

Past Issues

More Magazine →

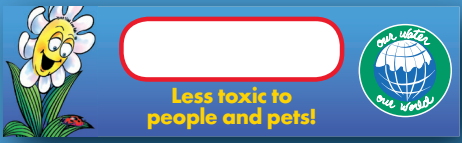
Find Your Next Hike!



Let the Trailfinder be your guide. Over 420 local parks, 320 trails!
Explore the Trailfinder now.

Choose less toxic products for a healthy home and garden!

Look for this tag before you buy



our water our world

www.OurWaterOurWorld.org

Brought to you by Bay AreaWater Pollution Prevention Agencies

IPM Advocates for Retail Stores

DPR Grant No. 10–PML–G001

Written by
Annie Joseph, Ann Joseph Consulting
for
Geoff Brosseau, Principal Investigator

May 8, 2013

Bay Area Stormwater Management Agencies Association
Our Water Our World
UC Statewide IPM Program

BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION

our water our world

UC IPM

dpr

TABLE OF CONTENTS

Funding for this project has been provided in full or in part through a grant awarded by the Department of Pesticide Regulation (DPR). The contents of this document do not necessarily reflect the views and policies of DPR, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

A note about use of the term *less-toxic pesticide*: Throughout this document, we define less-toxic pesticides as those that don't pollute waterways and minimize exposure to people, pets, or wildlife. Occasionally, we substitute the terms *environmentally friendly* and *green*. Whenever possible, IPM Advocates emphasize cultural and mechanical solutions to pest problems instead of chemical ones—for example, promoting the use of traps and tools.

IPM Advocates for Retail Stores

INTRODUCTION

Large retail stores and independent garden centers sell an assortment of less-toxic pesticides, traps, and tools. Despite a growing number of consumers interested in purchasing these products, store employees frequently direct consumers toward aerosol sprays, foggers, do-it-yourself perimeter sprays, and combination pesticide–fertilizers for lawns. Consumers purchase these, often using them without reading label directions, and risk exposure to excessive amounts of pesticides. Many of the products contain pyrethroids, which can run off into storm drains and contaminate surface water.

Since 1997, the successful Our Water, Our World program (OWOW)—an outreach arm of the Bay Area Stormwater Management Agencies Association (BASMAA)—has involved over 200 retail nurseries and garden centers in Northern California in programs that educate store employees and consumers about less-toxic management practices. By 2003, OWOW program consultant Annie Joseph was working with stores single-handedly, traveling to different locations daily to conduct employee-training workshops, hold tabling events for customers, and design endcap displays featuring environmentally friendly products. At the same time, more and more stores were requesting OWOW services.

Meanwhile, the UC Integrated Pest Management Program (UC IPM) was developing educational materials and online training for store employees, and lending touch-screen kiosks to cooperating retailers.

In assessing the situation, it was determined that a corps of "IPM Advocates" would help expand these components and respond to stores' needs for assistance with inventory selection, marketing, and employee training. To fill this need, this Pest Management Alliance project combined OWOW's retail expertise with UC IPM's wealth of technical information and resources to complement this collaborative outreach and training program.

The goal of the project was to improve delivery of IPM information at retail stores through education of employees and customers. In addressing this goal, this project helped address two fundamental issues: (1) environmental and health problems resulting from improper or overuse of pesticides sold to consumers and (2) the lack of knowledge by retailers and customers of safe IPM alternatives that reduce or avoid these problems.

Project investigators developed an IPM Advocate profile, wrote a curriculum, identified trainees, conducted the Advocate training and certificate program, and created a mentoring program. All ten IPM Advocates successfully completed the program and spent over a year assisting 30 stores with inventory selection, built over 60 in-store displays, trained 321 employees at 31 workshops, and reached out to over 2,000 customers through 60 tabling events. All ten Advocates continue to work with stores, subsidized by local government pollution prevention programs.

As a result of this project, 23 of 30 (77%) store managers surveyed reported greater sales of less-toxic products from 2011 to 2012, even with a depressed economy. Over 96% of the managers say their employees now have more confidence when identifying pest problems. More than 70% of the stores increased their shelf space for less-toxic products in 2012. The store managers directly attribute these changes to the impact of the IPM Advocate Program.

SCOPE OF WORK

OBJECTIVE 1. Develop a profile of what trainees should know to qualify as IPM Advocates (learning objectives)

TASK 1.1. Information needed for Advocates. Identify the key information and skills the IPM Advocates need to know when delivering IPM information to retailers. This information will serve as the learning objectives for the IPM Advocate training program. Discuss at initial meeting (Task 10.1).

The Management Team held its initial meeting on December 16, 2010 to develop learning objectives for the IPM Advocates, how to recruit candidates, and discuss logistical issues.

TASK 1.2. Survey. Carry out a survey of 30 Bay Area and Sacramento retail nursery and garden center stores about enlisting an IPM Advocate for their store. If Advocate services were available, what should that person know and how could they help? Tabulate and summarize survey responses.

PRELIMINARY STORE SURVEY

From December 17, 2010 to January 30, 2011, Annie Joseph surveyed 30 owners, managers, and product buyers of retail stores in the Bay Area and Sacramento about services an IPM Advocate should offer. She then summarized and discussed the results with the Management Team (**Table 1**).

Stores surveyed included: Alden Lane Nursery; Almaden Valley Nursery; Capital Nursery, Sacramento; Emigh Hardware, Carmichael; Green Acres Nursery, Sacramento; Orchard Supply Hardware's Corporate Office; Golden Nursery, San Mateo; Westbrae Nursery, Berkeley; Grand Lake Ace Hardware, Oakland; Yamagami's Nursery, Cupertino; SummerWinds Nursery, Cupertino; Orchard Nursery, Lafayette; Prickett's Nursery, Santa Rosa; Friedman's Home Improvement, Santa Rosa; Fairfax Lumber, Fairfax; Goodman Ace Nursery, Mill Valley; Sloat Garden Center's Corporate Office; Van Winden's Garden Center, Napa; Wegman's Nursery, Redwood City; Regan Nursery, Fremont; Evergreen Nursery, San Leandro; Navlet's Garden Centers, Concord; SummerWinds Nursery's Corporate Office; Palo Alto Ace Hardware, Palo Alto; Bill's Ace Hardware, Martinez; Flowercraft Garden Center, San Francisco; East Bay Nursery, Berkeley; Davis Ace Hardware, Davis; Bayside Gardens, Tiburon.

Table 1. Store survey: what should IPM Advocates know and how can they help stores?[*]

	If Advocate services were available, what should Advocates know?
76%	Know about local insect pests, diseases, beneficial insects, and how to identify these. Advocates should present this information on a seasonal basis or when pests appear.
73%	Have a background gardening, farming, landscaping, or working in a nursery.
63%	Have good communication skills so they can relate to employees and customers.
57%	Have retail experience or know how to handle themselves in a retail setting.
50%	Understand principles of IPM.
	If Advocate services were available, how could Advocates help your store?
97%	Conduct employee training on a yearly basis so employees keep current on invasive pests and plants and less-toxic ways to manage them. Advocates should have excellent public speaking skills so they can easily engage and inspire employees and customers.
73%	Inform buyers about new products coming to the market.
73%	Hold outreach events at their stores highlighting IPM practices, including use of beneficial insects, companion planting, insect pest and disease identification for customers. Share resources.
67%	Provide stores with marketing and display ideas and help build displays.
47%	Replenish shelf talkers and keep literature racks well stocked.
47%	Serve as a conduit for additional resources not found in stores.
37%	Gain familiarity with most of the staff, their positions, which less-toxic products their store carries, and how these can be recommended.

[*] *Survey of store owners, managers, and product buyers, n = 30.*

ADDITIONAL MISCELLANEOUS REQUESTS

Store owners, managers, and product buyers advised that Advocates should not be pushy. Advocates should know about pesticide regulations, which products might be going off the market, and less-toxic replacements. The following include other suggestions: be a good listener and willing to learn from us, be respectful of our knowledge base, know your audience, and don't talk over our heads. Know about the damage that pesticides can do to beneficial insects and wildlife, whether toxic or less toxic. Be able to tell us limitations of certain less-toxic pesticides, be able to think on your feet, know the effects of pesticides on pets and humans, know that changing to more environmentally friendly practices is a process that will take time. Be enthusiastic and passionate about your program—it will draw others to you. Don't be afraid to make suggestions even if you get rejected. Look at this from a business perspective—we're in the business of making money and this needs to be profitable partnership for us.

TASK 1.3. Learning objectives meeting. Assemble a group of Alliance partners, including representatives of stores, California Association of Nurseries and Garden Centers (CANGC), and product distributors to develop learning objectives. The survey responses, along with discussion at the initial meeting, data from a recent survey of stores by UC IPM, and past experience of Alliance members will form the starting point for this discussion.

On February 7 and 28, 2011, the Management Team met to develop learning objectives using the profiles proposed by the stores (**Appendix 1**). Attending this meeting were Geoff Brosseau, BASMAA; Annie Joseph, OWOW; Mary Lou Flint and Karey Windbiel-Rojas, UC IPM; Gina Purin, Marin County Stormwater Pollution Prevention Program; Nita Davidson, DPR; Chris Zanobini, CANGC; and Alan Borem, Central Garden & Pet, whose company distributes products to stores.

The learning objectives included detailed sessions on IPM, emphasizing hands-on activities with pests, diagnostics, tools and products, actual pesticide packages, and practice using the UC IPM web retail portal site. Another portion included information about specific categories of pesticides—insecticides, fungicides, herbicides, and rodenticides—and their target pests. Alternatives to pesticides were emphasized: physical or mechanical tools available in stores such as traps, barriers, and mulches. The classes would also cover cultural practices, resistant cultivars, pest-resistant plants, and biological control.

The learning objectives also included a component on communication with a practice presentation and role-playing exercises. The Advocates would need to know how to communicate with different store employees and customers, deal with conflict, and train store employees. Within the store, employees would need to know how to set up displays and understand how stores conduct business. They would also learn how to incorporate seasonal pests, new pests, and new products into a changing marketing program.

OBJECTIVE 2. Develop a training curriculum and certificate exam.

TASK 2.1. Curriculum development. Incorporate the learning objectives into a lesson plan and training curriculum.

TASK 2.2. Review of curriculum. Review the draft curriculum, involving team members and Alliance partners before finalization.

From April through June, 2011, Mary Lou Flint, Karey Windbiel-Rojas, Annie Joseph, Nita Davidson, and Gina Purin developed the curriculum and exams and submitted them to a review by Alliance partners. See Task 4.2 for a summary of the lesson plan and **Appendix 2** for the detailed training curriculum.

TASK 2.3. Exit exam development. Develop an exit exam for the course (to earn certification) based on the learning objectives and content.

See **Appendix 3** for the exit exam.

OBJECTIVE 3. Recruit, interview, and identify up to ten IPM Advocate trainees.

TASK 3.1. Carry out a selective recruitment process through active, targeted advertisement to find individuals who are well suited to the IPM Advocate job.

TASK 3.2. Review candidate applications and curriculum vitæ.

We actively recruited IPM Advocate candidates to interview through local retail nurseries and hardware stores, pesticide distributors, CANGC, UC Master Gardeners, the Northern California Spring Trade Show, California Landscape Contractors Association, Bay Friendly Landscapers, and through public agencies that participate in the Our Water, Our World program. Annie Joseph, Nita Davidson, Mary Lou Flint, Karey Windbiel-Rojas, and Gina Purin reviewed 27 applications and chose 20 people to interview in Sacramento, Martinez, and San Rafael. Annie, Karey, and Nita interviewed candidates on March 28–29 at Cal/EPA Headquarters, Sacramento; April 4 and 7 at Contra Costa County Public Works Department, Martinez; and April 11 and 15 at Marin County Civic Center, San Rafael.

See **Appendix 4** for interview questions posed to the applicants.

We chose 11 Advocate trainees for the program, all residing in Northern California: Suzanne Bontempo, San Francisco; Lisa Graves, El Cerrito; Steve Griffin, Brentwood; Teresa Lavell, Fairfield; Daniel Levy, Sebastopol; David Perkins, San Francisco; Anne Rogers, Sausalito; David Rosen, Woodland; Maris Sidenstecker, Seaside; Debi Tidd, Walnut Creek; and Steve Zien, Citrus Heights. David Rosen attended two classes, but had to leave the program for health reasons.

OBJECTIVE 4. Conduct a training program for up to ten IPM Advocate trainees. Trainees who successfully complete the curriculum and pass an exit exam will receive a joint certificate from UC IPM and BASMAA and will be designated IPM Advocates.

TASK 4.1. Conduct at least seven hands-on, interactive classes for candidates.

TASK 4.2. Assign homework and provide a library of resources to use during training and in future work as IPM Advocates.

Ten Advocate trainees participated in a 7-week training course during June and July, 2011. Formal training took place at weekly 3-hour classes in Oakland that featured lectures from Mary Lou Flint and Karey Windbiel-Rojas of University of California, Nita Davidson of DPR, and Annie Joseph of OWOW, and industry experts as well as hands-on activities and student presentations. Participants were expected to spend at least an additional 3 hours each week completing reading assignments and homework. Each participant was given a binder and additional resources that included books, Quick Tip cards, flyers, and web site references.

See **Appendix 2** for the lesson plan and training curriculum, homework assignments, and the library of resources.

The following is a summary of the classes:

WEEK 1, June 6. Overview of IPM Advocates training program and resources

Overview of IPM Advocate Program; introduction of trainees; review of class outline, books, and other resources; what is IPM?; introduction to pests, the importance of pest identification, pest detection, prevention, cultural or good gardening practices, biological control, mechanical and physical control, and pesticides; learning to use the UC IPM Retail Portal, UC IPM web site, OWOW web site, and other online resources to get pest information and solve problems.

WEEK 2, June 13. Introduction to pesticides and pest identification

What are pesticides—the different types, their environmental and health concerns, secondary pest outbreak, pesticide resistance, how pesticides get into water and how people are exposed, how to read a label including signal words; introduction to less-toxic pesticides; introduction to identification of arthropods and plant diseases

WEEK 3, June 20. Managing insects, mites, spiders, mollusks, and plant pathogens

Introduction to insect and disease pests and abiotic disorders of plants; pest identification practicum; indoor and nuisance arthropod pests and their management; management tools for arthropods, mollusks, and plant pathogens

WEEK 4, June 27. Managing weeds and vertebrate pests
Types of weeds and management practices and tools; designing weeds out of landscapes with mulches; resources for weed identification; vertebrate pests

WEEK 5, July 11. Communication: Working with stores, fostering teamwork, avoiding conflict, training store employees
Developing relationships with different types of stores, effective communication with store employees and team building, helping employees with customer expectations about products, tailoring an educational program to the customers and employees of each store based on the store's product mix, how to identify the less-toxic products each store carries, training methods used at the store level, and dealing with conflict

WEEK 6, July 18. Displays and Marketing: Understanding the business end of retail stores
Defining the retail store model and each Advocate's place in that setting; understanding pesticide manufacturers and suppliers, how to display information and products, improving exposure of less-toxic products

WEEK 7, July 25. Presentations, wrap-up, and mentoring (Figure 1)
Presentations by Advocates on observations in the field regarding displays**;** what will happen next with the mentoring component of this program; store assignments, expectations, duration; take-home exam distributed

TASK 4.3. Give exit exam based on curriculum.

After Week 7, Advocates were given a take-home exam covering class material, resources, and learning objectives (see **Appendix 3**). Questions were short answer or essay style and examinees were expected to use provided resources to research the answers. All ten Advocates passed the exam with grades above 84%. This allowed them to transition to internships, during which they were mentored in stores. Full certification was not awarded until the 11-month mentoring portion was completed and recognized by a graduation on June 1, 2012.

Figure 1. The ten IPM Advocates after their seventh class, July 2011.

OBJECTIVE 5. Develop and implement IPM Advocate coordination and mentoring program by identifying needs of individual stores and matching IPM Advocates to those stores. Mentor IPM Advocates as they work with stores.

TASK 5.1. Identify 20–30 stores in Sacramento and the Bay Area interested in working with Advocates.

Annie met with store managers of 40 stores in the Bay Area and Sacramento to see if they were interested in working with an Advocate and identified 30 stores in 12 counties (**Table 2**).

Table 2. Stores interested in working with IPM Advocates.

Alameda County	1. Orchard Supply Hardware, Berkeley; 2. Orchard Supply Hardware, Dublin; 3. Westbrae Nursery, Berkeley
Contra Costa County	4. Annie's Annuals, Richmond; 5. Bill's Ace, Martinez; 6. Navlet's Garden Centers, Concord; 7. Orchard Nursery, Lafayette; 8. Urban Farmer, Richmond
Marin County	9. Orchard Supply Hardware, San Rafael; 10. Pini Hardware, Novato; 11. Sloat Garden Center, Blithedale Ave., Mill Valley
Monterey County	12. Home Depot, Seaside; 13. Orchard Supply Hardware, Sand City
Napa County	14. Van Winden's Garden Center, Napa
Sacramento County	15. Capital Nursery, Citrus Heights; 16. Capital Nursery, Sacramento; 17. Emigh Ace Hardware, Sacramento; 18. Orchard Supply Hardware, Antelope
San Francisco County	19. Cole Hardware, San Francisco; 20. Flowercraft Garden Center, San Francisco
San Mateo County	21. Home Depot, Colma; 22. Orchard Supply Hardware, South San Francisco
Santa Clara County	23. Orchard Supply Hardware, Mountain View; 24. SummerWinds Nursery, Campbell; 25. Yamagami's Nursery, Cupertino
Santa Cruz County	26. Orchard Supply Hardware, Capitola
Solano County	27. Home Depot, Vallejo; 28. Orchard Supply Hardware, Fairfield
Sonoma County	29. Friedman's Home Improvement, Santa Rosa; 30. Prickett's Nursery, Santa Rosa

TASK 5.2. Match each IPM Advocate with two to three stores introducing each Advocate to store managers and key employees, and discuss expectations as well as specific concerns.

Table 3. Store assignments.

Anne Rogers: Sloat Gardens, Mill Valley; Orchard Supply Hardware (OSH), San Rafael; Cole Hardware, San Francisco
Daniel Levy: Friedman's Home Improvement, Santa Rosa; Prickett's Nursery, Santa Rosa; Pini Hardware, Novato
David Perkins: SummerWinds Nursery, Campbell; Yamagami's Nursery, Cupertino; OSH, Mountain View
Debi Tidd: Orchard Nursery, Lafayette; Westbrae Nursery, Berkeley
Lisa Graves: Urban Farmer Store, Richmond; Annie's Annuals, Richmond; OSH, Berkeley
Maris Sidenstecker: OSH, Sand City; Home Depot, Seaside; OSH Capitola
Steven Griffin: Navlet's Garden Centers, Concord; OSH, Dublin; Ace, Martinez
Steve Zien: Capital Nursery, Citrus Heights and Sacramento; OSH, Antelope; Emigh Hardware, Sacramento
Suzanne Bontempo: Flowercraft Nursery, San Francisco; Home Depot, Daly City; OSH, South San Francisco
Teresa Lavell: Home Depot, Vallejo; OSH, Fairfield; Van Winden's Garden Center, Napa

ADVOCATES IN STORES: INTRODUCTION TO THE RETAIL LIFE

In August 2011, Annie Joseph matched Advocates to two or three stores and introduced them to store managers and key employees (**Table 3**). The Advocates discussed goals, expectations, and concerns with store managers, including ideas for endcaps, training employees, displaying materials, incorporating online training from UC IPM, bringing in IPM kiosks, and setting up regional training in Oakland by UC IPM.

Annie Joseph coordinated schedules and staff and Advocates contacted before visits. Annie worked one on one with the Advocates, teaching them how to conduct training sessions and assemble displays.

The following is a log of Advocate activities during the first months of their mentorship. It highlights how Advocates became acquainted with their stores and the progress they made.

2011

August 8. Anne Rogers met Sloat Garden Center's buyer Scott Peterson for an annual review of products to add and delete in their ten stores. This was an opportunity for Anne to see how a regional chain store operates. She realized that her participation influenced product selection for the coming year; this affected ten stores in three counties and more than 70,000 consumers.

August 11. David Perkins met José, the store manager of SummerWinds Nursery, Campbell and key staff. He also met Aaron, the manager and key staff of OSH, Mountain View, and product buyer Amy Root of Yamagami's Nursery, Cupertino (see Figure 6). At Yamagami's, David placed literature racks in more visible areas. He experienced a store that's a member of a small regional chain store, SummerWinds Nursery; a large regional chain, Orchard Supply Hardware; and an independent nursery, Yamagami's Nursery.

August 15. Steve Griffin met Navlet's Garden Centers, Concord manager and key staff, distributor representative Wayne Booth, plant buyer George Wharton, and built a small display of mosquito dunks at the register. This was an opportunity for Steve to see how a small regional store chain such as Navlet's works. He met the plant buyer, a pesticide distributor representative, and asked for shelf space, which resulted in the mosquito dunks being placed in a high-traffic area.

September 2. Debi Tidd met Orchard Nursery, Lafayette managers and staff, and Westbrae Nursery staff in Berkeley. These are both independent nurseries that Debi will work with over the next year.

September 8. Steve Zien met Capital Nursery, Sunrise manager Mike; Capital Nursery, Sacramento manager Seth, and OSH, Antelope manager Ed. Steve's stores combined a small regional chain, Capital Nursery, and a large regional chain, OSH. At OSH, Antelope, Steve met the district manager, store manager, and the pesticide distributor representative from a nursery distributor, the Commerce Corporation. This gave Steve a chance to discuss building endcaps (see Figure 5).

September 9. Daniel Levy met David and Denise at Prickett's Nursery, Santa Rosa; Ed Casey at Friedman's Home Improvement, Santa Rosa; and Jim Stark at Pini Hardware, Novato. Daniel discussed training opportunities and the UC IPM Kiosk display opportunities.

September 12. Anne Rogers met Bill Selk at OSH, San Rafael and discussed moving the literature rack to an area with more traffic.

September 13. Anne Rogers met Molly, the manager at Sloat Garden Center, Blithedale Ave., Mill Valley and discussed training and displays.

September 14. Teresa Lavell met Van Winden's Garden Center, Napa and OSH, Fairfield managers and staff. This was an opportunity for Teresa to see how three different business models worked—an independent nursery, Van Winden's; a regional chain, OSH; and a large chain, Home Depot.

September 15. Lisa Graves met managers and key staff at OSH, Berkeley and Annie's Annuals, Richmond. (She started working at the Urban Farmer store in October.) Lisa worked with a small independent store, Annie's Annuals; a small regional chain, Urban Farmer; and a large regional chain, OSH.

September 16. Suzanne Bontempo met department manager Wendy and assistant manager Mo at OSH, South San Francisco. Later that day she met Tito at Home Depot, Colma, and Hazel, manager at Flowercraft Garden Center in San Francisco. Suzanne worked with the small independent Flowercraft, large regional chain OSH, and large chain, Home Depot.

September 28. Daniel attached shelf talker labels (**Figure 2**) at Friedman's Home Improvement, Santa Rosa with Annie Joseph.

September 29. Suzanne accompanied Annie to the San Francisco Public Utilities Commission office to get supplies and meet Meg Gale. She also met Tim Swillinger from San Mateo County Environmental Health when retrieving supplies for OSH and Home Depot.

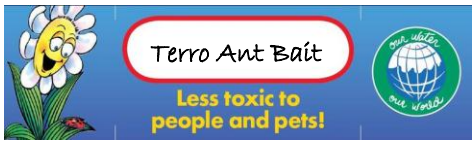


Figure 2. Shelf talker label.

TASK 5.3. Encourage regular communication between IPM Advocate and consultant [Annie Joseph] to discuss the Advocates' progress with each store and address issues that come up.

TASK 5.4. Stay in contact with store managers to get feedback about the program.

ADVOCATES IN STORES: OFFERING TRAINING WORKSHOPS, BUILDING DISPLAYS, AND GETTING FEEDBACK

Annie Joseph helped conduct training workshops and create displays with Advocates.

2011

October 7. Annie introduced Steve Griffin to Judy Macaluso at OSH, Dublin. They discussed outreach, training, and display ideas. Annie showed Steve how OSH shelf talkers are attached to shelves. They also discussed building an endcap for dormant sprays and how Steve could work with Judy, the store manager, to place orders for the products. Steve met Ace, Martinez manager Tom and they discussed an endcap display idea for fall and winter pests. Steve met Lisa, who's in charge of the endcap areas. They also refreshed shelf talkers and fact sheets.

October 12. Annie and Maris met the garden manager of Home Depot, secured the literature rack, displayed shelf talkers, and discussed training for October 26. They also met with the OSH, Sand City manager and attached shelf talkers and filled literature racks. They discussed outreach, potential training dates, and got feedback on Maris's progress.

October 18. Annie talked to the manager at Urban Farmer and worked out a date for Lisa to meet with staff.

October 20. Steve Zien and Annie met with Randy from Emigh Hardware. They discussed a training date for January, outreach for customers, and display ideas.

October 25. Lisa Graves met with Urban Farmer manager Kim and assistant manager Tom in Richmond and discussed display ideas and future training dates, probably in spring.

October 25. Annie and Geoff Brosseau met with OSH's Corporate Office in San José to discuss the IPM Advocate Program in OSH stores.

November 1. Anne and Annie met with Rick Cunningham at Cole Hardware in San Francisco to introduce Anne and schedule training and outreach. Later that day, Annie, Teresa Lavell, and Jennifer Kaiser met at Home Depot, Vallejo to discuss future partnership, put up shelf talkers, and meet staff.

2012

January 3–6. Annie worked with Daniel Levy and Gina Purin on a rat and mouse flier for stores in Marin and Sonoma counties.

January 6. Annie visited stores in Contra Costa and Alameda counties: Westbrae Nursery; Navlet's Garden Centers, Concord; Orchard Nursery, Lafayette; and Ace Hardware, Martinez to get feedback on Steve Griffin and Debi Tidd.

January 9. Annie visited Steve Zien's stores in Sacramento County to get feedback on his work.

January 10. Annie visited Anne Rogers's stores in San Francisco and San Rafael to get feedback.

January 13. Annie visited Prickett's Nursery and Friedman's in Santa Rosa to get feedback on Advocate Daniel Levy.

Figure 3. Lisa greeting customers at OSH, Berkeley.

January 18. Annie met Teresa at Home Depot, Vallejo. Together, they secured the literature rack and refreshed the shelf talkers. They then met the district manager, spoke with staff about the program, and discussed future training and outreach.

January 19. Annie and Daniel Levy conducted an outreach event at Friedman's, Santa Rosa.

January 24. Annie visited OSH stores in Berkeley, Dublin, and Mountain View; Yamagami's Nursery, Cupertino; and SummerWinds Nursery, Campbell to get feedback on Advocates Steve Griffin, Lisa Graves, and David Perkins.

February 2. Annie joined a Home Depot event with Teresa and Kevin Cullen from the Fairfield–Suisun Sewer District. Annie met with Bay Area stores to promote Home Depot's environmentally friendly products.

February 12. Annie helped David Perkins with tabling at SummerWinds Nursery, Campbell.

February 16. Annie staffed a booth at the Nor Cal Trade Show with Teresa Lavell, Steve Zien, and Anne Rogers. They were joined by Mae from the San Mateo County Department of Environmental Health. The Advocates met store employees, product distributors, and pesticide manufacturers.

February 17. Teresa Lavell and Annie secured a new area for literature rack placement at Home Depot, Vallejo. The store was reset, so shelf talkers needed updating.

February 21. Annie, Anne Rogers, and 100 employees participated in a special store event at Sloat's, Kentfield.

March 11. Annie attended a no-tax event at OSH, Berkeley with Lisa Graves (**Figure 3**).

March 24. Annie tabled with Teresa Lavell at Home Depot, Vallejo.

April 2. Annie visited Home Depot in Vallejo and with Teresa Lavell arranged for staff training on April 19.

April 4. Annie visited Friedman's and Prickett's Nursery in Santa Rosa and Pini Hardware in Novato to get feedback on the work of Daniel Levy.

April 5. Annie visited Navlet's Garden Centers, Concord; Ace, Martinez; and OSH, Dublin to get feedback on Steve Griffin's work.

April 9. Annie visited Yamagami's Nursery, Cupertino; OSH, Mountain View; and SummerWinds Nursery, Campbell to gather information on David Perkins's progress.

April 11. Annie visited Annie's Annuals and the Urban Farmer Store in Richmond and OSH, Berkeley to get feedback on Lisa Graves.

April 12. Annie met with Scott Peterson, a buyer from Sloat Garden Center, Mill Valley to get feedback on Anne Rogers and to discuss endcap ideas and possible store promotions.

April 14. Annie visited OSH, Fairfield and Van Winden's Garden Center, Napa to get feedback on the work of Teresa Lavell.

April 16. Annie visited Cole Hardware and Flowercraft Garden Center in San Francisco and Home Depot in Colma to get feedback the work of Suzanne Bontempo and Anne Rogers.

Figure 4. Debi (left) stocking the literature rack with Scott and Madeline at Orchard Nursery, Lafayette.

April 26. Annie visited Orchard Nursery, Lafayette and Westbrae Nursery to get feedback on Debi Tidd's work (**Figure 4**).

May 7. Annie met with the manager at OSH, Fairfield to discuss movement of less-toxic products this season and to get feedback on Teresa Lavell.

May 9. Annie visited OSH, Antelope and Emigh Hardware, Sacramento to get feedback from store managers and staff on Steve Zien.

May 19. Annie visited Capital Nursery in Sacramento and Citrus Heights to get feedback on Steve Zien.

May 30. Annie visited Sloat Garden Center, Mill Valley to get feedback on Anne Rogers and see how the less-toxic weed endcap was going.

June 11. Annie worked with Steve Griffin to set up a new Home Depot store in Roseville.

OBJECTIVE 6. IPM Advocates work with individual stores to help stores promote IPM practices and less-toxic products to their customers.

TASK 6.1. Advocates develop a relationship with employees and management of each store (20–30 stores), possibly advising on inventory selection, in-store displays, and marketing approaches that can inform customers about less-toxic products.

Figure 5. Steve Zien and Debbie, a product distributor from the Commerce Corporation, at OSH, Antelope presenting their new endcap display.

The IPM Advocates developed relationships with employees and managers of each store. Annie gave them procedural guides and checklists explaining how to call on the stores, whether independent nursery, hardware store, Orchard Supply Hardware, or Home Depot. Advocates also interacted with sales representatives and pesticide manufacturers **(Figure 5)**. These relationships grew as they worked together to make sure products were ordered for the displays they made.

Advocates suggested to store managers and buyers which less-toxic products to carry. They also advised on marketing approaches that informed customers about less-toxic products. Advocates frequently communicated with Annie Joseph during the year-long mentoring period. They suggested ideas and built over 60 displays in 93% of the stores. Highlights of the promotions from September 2011 through April 2012 include:

- **Van Winden's Garden Center**, Napa and **Sloat Garden Center**, Mill Valley. Created signage to promote the use of plants that attract beneficial insects.
- **Sloat Garden Center**, Mill Valley and **Orchard Nursery**, Lafayette. Focused on less-toxic options for weed management and more than doubled the sales of those products over the previous year.
- **Home Depot**, Seaside. Maris Sidenstecker created a display for less-toxic products. (This marks the first time Home Depot stores have promoted less-toxic products in off-the-shelf displays.)
- **Home Depot**, Vallejo. Added floor displays for less-toxic products in cooperation with Scott's Miracle-Gro merchandisers.

Figure 6. David with buyer Amy at Yamagami's Nursery, Cupertino showing off their new display.

TASK 6.2. Advocates carry out in-store training workshops for 100–150 store employees. The workshops will provide information about products sold, pesticide safety and environmental protection, common pest problems and IPM solutions, pest identification, and other topics.

Advocates held 31 training workshops in 30 stores, training a total of 321 store employees (**Table 4**). This more than doubled the projected goal of 150 store employees projected for training. Workshops were held in training rooms before or after hours so customers did not disturb participants. Annie Joseph attended as support for all but four of the workshops. Some of the workshops were attended by all store employees, including cashiers. This approach worked well, creating a sense of camaraderie. Employees eagerly attended the workshops, were actively engaged, and some came in to attend on their day off.

Table 4. In-store training workshops.

Store and location	Advocate Trainer	Date	# Trained
Annie's Annuals, Richmond	Lisa Graves	11/17/11	11
Bill's Ace, Martinez	Steve Griffin	3/16/12	10
Capital Nursery, Citrus Heights	Steve Zien	10/15/11	11
Capital Nursery, Sacramento	Steve Zien	10/22/11	6
Cole Hardware, Cole Street, San Francisco	Anne Rogers	11/15/11	3
Emigh Ace Hardware, Sacramento	Steve Zien	1/26/12	6
Flowercraft Garden Center, San Francisco	Suzanne Bontempo	1/7/12	4
Friedman's Home Improvement, Santa Rosa	Daniel Levy	12/7/11	7
Home Depot, Colma	Suzanne Bontempo	12/22/11	15
Home Depot, Seaside	Maris Sidenstecker	10/26/11	20
Home Depot, Vallejo	Teresa Lavell	4/19/12	11
Navlet's Garden Centers, Concord	Steve Griffin	9/28/11	9
Orchard Nursery, Lafayette	Debi Tidd	3/13/12	10
Orchard Supply Hardware, Antelope	Steve Zien	4/16/12	6
Orchard Supply Hardware, Berkeley	Lisa Graves	12/14/11	13
Orchard Supply Hardware, Capitola	Maris Sidenstecker	5/31/12	1
Orchard Supply Hardware, Dublin	Debi Tidd	2/12/12	38
Orchard Supply Hardware, Fairfield	Teresa Lavell	5/17/12	11
Orchard Supply Hardware, Mountain View	David Perkins	11/17/11	4
Orchard Supply Hardware, Sand City	Maris Sidenstecker	5/17/12	12
Orchard Supply Hardware, San Rafael	Anne Rogers	10/14/11	11
Orchard Supply Hardware, South San Francisco	Suzanne Bontempo	12/09/11	8
Pini Hardware, Novato	Daniel Levy	1/13/12	18
Prickett's Nursery, Santa Rosa	Daniel Levy	11/16/11	10
Sloat Garden Center, Blithedale Ave., Mill Valley	Anne Rogers	10/13/11	15
SummerWinds Nursery, Campbell	David Perkins	9/19/11	9
Urban Farmer Store, Richmond	Lisa Graves	12/20/11	5
Van Winden's Garden Center, Napa	Teresa Lavell	10/10/11	16
Westbrae Nursery Berkeley	Debi Tidd	11/18/11	4
Yamagami's Nursery, Cupertino	David Perkins	1/24/12	17
		Total store employees trained	321

TASK 6.3. Advocates consult on pest management issues specific to each store, and carry out informal employee training on selected topics as needed.

Advocates used the OWOW "Ask the Expert Feature" and the Collaborative Tools web site set up by UC IPM (see Task 7.1 below) to inquire about unfamiliar plant diseases and pests. Advocates trained the store employees how to use the UC IPM web site to diagnose plant diseases and pests, and also consulted on selected topics as needed.

TASK 6.4. Promote online pesticide safety and IPM training program.

Advocates encouraged the stores to use the UC IPM web site and training modules on pesticide safety and IPM for retailers. UC IPM "Meet the Beneficials" poster was handed out to each store and displayed in a prominent area. UC IPM also donated a set of the UC IPM Landscape Pest ID cards and a pest wheel for each store.

OBJECTIVE 7. Create a web page with links to online information and materials that will provide one-stop shopping for store employees, store managers, and IPM Advocates interested in keeping up with the latest IPM and product-related developments.

TASK 7.1. Set up a web page with links to information identified by Alliance Partners. Target audiences: retail nurseries, garden centers and IPM Advocates.

UC IPM created two web sites and a web-based communication tool for IPM Advocates and expects to maintain all three sites into the indefinite future to support the IPM Advocates and retail nursery and garden center industry.

The IPM Advocates web site, www.ipmadvocates.com, is the official site for the project. This site was used to recruit IPM Advocate applicants and promote their activities to the public. It includes a summary of the program, contact information for each of the IPM Advocates, and links to resources of interest to retailers or IPM Advocates. Each IPM Advocate was also given an "@ipmadvocate.com" e-mail address.

The IPM Advocates Collaborative Tools site is a web-based communication tool (maintained by the University of California ANR Communications Services unit) that allows the IPM Advocates to share their experiences and ask questions. This is a closed system that includes not only the Advocates and the team managers but also several University of California pest experts who are able to answer technical questions. For instance, IPM Advocates may send in a photo of a damaged plant or pest and request help with identification or advice on appropriate management. Collaborative conversations on over 100 different topics have been initiated since the site was opened in late 2011.

TASK 7.2. UC IPM update this new web page with educational materials related to pest problems, invasive pests and new products identified by Alliance Partners, IPM Advocates, or stores as being of special interest to retailers.

TASK 7.3. UC IPM modify existing information on its web site for better accessibility and usefulness for the above audiences.

The Retail Nursery & Garden Center Portal on the UC IPM web page, www.ipm.ucdavis.edu/RETAIL, provides in-depth information about pests and pest management tools tailored to help retail employees quickly find the information they need to answer customer questions. The site includes links to a quarterly newsletter for retail nurseries and garden centers, online training courses, upcoming in-person training workshops, as well as information on pesticides and their alternatives.

OBJECTIVE 8. Evaluate the program through feedback from stores, agency partners, IPM Advocates, and results of training.

TASK 8.1. IPM Advocates give pre- and post-surveys

The Advocates assessed the value of the in-store training workshops for store employees by having those attending take pre- and post-surveys. Annie compiled the results for all 30 stores (**Table 5**).

Table 5. Store employee responses before and after training.

Question (correct answer)	% Correct	
	Before Training	After Training
When water enters a sewer, where does it go? (To a treatment facility where it's cleaned of contaminants.)	53%	71%
When water enters a storm drain, where does it go? (Directly to the nearest body of water without treatment.)	82%	100%
What do you do when you have left over pesticide after you finish spraying? *(Follow the disposal directions on the label.)*	50%	100%
Where can you dispose of left over pesticides? (Take unused pesticides to a household-hazardous waste facility.)	58%	100%

After training store employees, Advocates conducted surveys of the training itself. Most employees found the training workshops enlightening and expected the information to help them do their jobs competently (see **Appendix 5**. Store Employee Evaluation of the Training Workshops).

TASK 8.2. IPM Advocates work with partner store to get data on sales

Annie worked with each partner store to get data on changes in the types of products available and changes in sales of less-toxic products. This required store visits, phone calls, and e-mail communication with store managers and department managers. Obtaining sales data is an involved process as stores have to get information from different vendors.

As a result of this project, 16 of the 30 (53%) stores reported an increase in sales of less-toxic products from 2011 to 2012, even with a depressed economy. Not all 30 stores had the capability to track sales, so 53% may be an underestimate as confirmed by the less formal survey of store managers in Task 8.3, in which 77% attributed increased sales of less-toxic products to the presence of IPM Advocates in their stores.

TASK 8.3. Each store [manager] participates in a follow-up survey to assess how the IPM Advocate program helped them better provide IPM information to their customers.

The Management Team created a survey to assess effectiveness of the IPM Advocates. Annie interviewed store managers in late 2012 in each of the 30 stores where IPM Advocates worked during their mentoring program. Results of the surveys are summarized below in **Table 6**. Some of the important findings managers attribute to the IPM Advocate Program included:

- Over 96% of stores reported increased employee confidence in identifying pest problems
- Over 76% of stores increased sales of green (less-toxic) products
- Over 70% of stores increased shelf space for green products
- Over 76% used the University of California web site for identifying pests or solving problems
- Over 66% said they would be increasing shelf space for green products in 2013.

Table 6. Store manager responses about effectiveness of the IPM Advocate program.

1	The following questions are about elements of the IPM Advocate Program and how these have affected your store. (n = 30 store managers)	Agree (%)	Somewhat agree (%)	Not sure (%)	Somewhat disagree	Disagree (%)	Does not apply (%)
a	Training employees helps them more confidently identify pests or diagnose plant diseases.	97%	3%	0%	0%	0%	0%
b	Training employees helps them more confidently recommend products.	93%	7%	0%	0%	0%	0%
c	Training employees has helped improve their morale.	77%	20%	3%	0%	0%	0%
d	Sales of green products have increased since introduction of the IPM Advocate Program.	77%	13%	10%	0%	0%	0%
e	Attaching shelf talkers helps increase sales of green products	73%	13%	10%	0%	3%	0%
f	As a result of this program, shelf or display space for green products has increased.	70%	23%	3%	0%	0%	3%
g	Customers have given positive feedback.	87%	10%	3%	0%	0%	0%

2	Which of the following resources have you or your employees used in response to Advocate presence in stores?	% total stores (n = 30)
a	UC IPM web site for identifying pests or finding management information	77%
b	Online retail training courses from the UC IPM web site	23%
c	*Meet the Beneficials* poster (posted in the store)	80%
d	Subscribed to UC IPM *Retail Nursery & Garden Center News*	33%
3	**Has the IPM Advocate Program influenced the type of pest management products your store will sell next year?**	**% total stores (n = 30)**
a	Will increase shelf or display space for green products	67%
b	Will keep shelf or display space for green products the same	7%
c	Will reduce shelf or display space for green products	0%
d	Haven't decided yet	3%
e	I don't make decisions on shelf or display space allocation.	23%

OBJECTIVE 9. Identify a way to maintain the IPM Advocates after the end of the grant and establish a continuing education requirement.

TASK 9.1. Identify a way to maintain IPM Advocates after the grant.

During the mentoring program, Annie introduced each Advocate to key representatives of sponsoring agencies in the area where they worked. This would enable Advocates to contract with local pollution-prevention agencies, have public speaking opportunities, and attend special events. Annie also promoted the Advocates at monthly BASMAA meetings by giving updates on their activities. With continued support by local agencies, the Advocates would still work in stores when the mentoring program ended in October 2012.

Annie helped the Advocates prepare to work in the field on their own, teaching them how to invoice, compile a scope of work, and acquire insurance.

This Alliance Grant showed how valuable the Advocates are to stores by improving employee morale and sales of less-toxic products. Based in part on this reputation, the U.S. EPA provided funding in October 2012 to support the work of eight Advocates in 14 additional stores through its San Francisco Bay Water Quality Improvement Fund. The project, Greener Pesticides for Cleaner Waterways, will also provide advertising, training for retail store employees, events, and a mobile phone app to help connect customers to less-toxic products for pest problems.

WHERE ARE THEY NOW?

As of April 2013, all ten Advocates were gainfully employed.

1. **Suzanne Bontempo** represents OWOW in stores and works on separate outreach activities with the San Mateo County Department of Environmental Health. She's part of U.S. EPA's Greener Pesticides Grant and contracts with the San Francisco Public Utilities Commission partnership with OWOW.
2. **Lisa Graves** subcontracts with Annie in OWOW stores for the Alameda Countywide Clean Water Program. She's also part of the U.S. EPA Greener Pesticides Grant and Annie is working with Debi Tidd to find opportunities in west Contra Costa County stores.
3. **Steve Griffin** works with the City of Roseville, the County of Alameda Clean Water Program, and the Santa Clara Valley Urban Runoff Pollution Prevention Program. He's also part of the U.S. EPA Greener Pesticides Grant and subcontracts with Debi Tidd for the Contra Costa Clean Water Program.
4. **Teresa Lavell** subcontracts with Annie in the Alameda Countywide Clean Water Program, Santa Clara Valley Urban Runoff Pollution Prevention Program, Napa County Flood Control and Water Conservation District, and Fairfield Suisun Sewer District. She's also a part of the U.S. EPA Greener Pesticides Grant.
5. **Daniel Levy** works with Annie in Santa Rosa and with the U.S. EPA Greener Pesticides Grant.
6. **David Perkins** is part of the U.S. EPA Greener Pesticides Grant.
7. **Anne Rogers** is part of the U.S. EPA Greener Pesticides Grant and works in two stores.
8. **Maris Sidenstecker** contracts with the Monterey Peninsula Stormwater Pollution Prevention Program.
9. **Debi Tidd** subcontracts with Annie on OWOW activities in the Santa Clara Valley Urban Runoff Pollution Prevention Program and Alameda Countywide Clean Water Program. She's also part of the U.S. EPA Greener Pesticides Grant and contracts with the Contra Costa Countywide Clean Water Program.
10. **Steve Zien** subcontracts with Annie in stores associated with the Sacramento County Storm Water Program.

TASK 9.2. Aligning the Advocates with a professional organization.

At the beginning of the project, BASMAA approached the CANGC about being an advisor to the project and CANGC accepted that role. CANGC was involved in helping with Task 1.3, establishing learning objectives, and also mentioned the project in its February 2011 e-Newsletter for members.

Now that the grant-funded portion of the project is ending, CANGC has agreed to include an article about the project and its results in an e-Newsletter in 2013. BASMAA is also approaching the Master Nursery Garden Centers about working with them to promote less-toxic products. Master Nursery Garden Centers is a national member-owned buying cooperative for independent garden centers with more than 700 members. They run discount programs, including a graduated green goods discount that allows members to earn an 18% discount from green goods growers.

TASK 9.3. Offer continuing education for IPM Advocates.

We held our first continuing education class for IPM Advocates on October 22, 2012 at the Benicia Community Center. Annie Joseph hosted the class, which focused on new products and changes in the marketplace. Mary Lou Flint, Andrew Sutherland, Steven Griffin, Steve Zien, Suzanne Bontempo, Lisa Graves, Teresa Lavell, and Debi Tidd attended.

Annie reviewed changes coming to the marketplace in 2013. For example, Home Depot planned to abandon support of the Elementals line of Scott's Miracle-Gro. The Bayer Company would offer its Natria line of pesticides in Home Depot. Orchard Supply Hardware would support Dr. Earth organic fertilizers and pesticides. OSH would reset its fertilizer aisle to showcase organic fertilizers prominently in front of the main pesticide aisle. Corry's planned to discontinue its snail and slug bait with metaldehyde and would package a new active ingredient, FeEDTA, an iron salt that is less toxic than metaldehyde.

On January 28, 2013, UC IPM conducted a continuing education class for the IPM Advocates on seasonal pests. IPM Advocates received information binders and PowerPoint presentations to use in their educational programs for retail stores. UC IPM will continue to conduct continuing education classes to keep Advocates up to date.

UC IPM will continue to maintain its IPM Advocates Collaborative Tools site to allow private and archived communication among Advocates, project team managers, and select affiliates, including UC pest experts to answer specific pest and plant problems, discuss issues common to the IPM Advocates, enhance communication, and send announcements of upcoming events or new publications of interest.

UC IPM created and printed brochures and posters "The IPM Advocates' Seasonal Guide to Home & Garden Pests in California" for the Advocates to use to publicize their programs and educate store employees. UC IPM also provides Advocates with copies of educational materials to distribute to their stores including copies of the quarterly retail *IPM News* newsletter, posters, Quick Tip collections on rings, bookmarks, and pest wheels.

OBJECTIVE 10. Grant administration meetings and reports

We held our initial meeting on December 16, 2010 in Davis at the UC IPM offices to develop learning objectives for the IPM Advocates. Annie met with Nita at DPR twice to discuss updates and transfer photos on November 3, 2011 and May 29, 2012. The Management Team communicated frequently through conference calls and in-person meetings.

CONCLUSIONS

Ten IPM Advocates volunteered more than 30 hours every month for a year at stores while holding down full-time jobs. Many traveled over 100 miles each week to attend the seven 3-hour classes that covered a wealth of material from pest management, water pollution prevention, store-relationship building, and marketing ideas for less-toxic products.

Over the course of the year they met with store owners, managers, pesticide buyers, and manufacturers. They placed displays of less-toxic products in prominent areas of the stores and made sure the products were properly tagged with shelf talkers so customers and employees could easily find them.

- Advocates trained a total of 321 store employees in 31 training workshops. This more than doubled the projected goal of 150 store employees we originally proposed to train.
- Each Advocate participated in two tabling events for all three of their stores, totaling 60 outreach events. During these tabling events they contacted over 2,000 customers.
- The Advocates spent time researching pest problems for their stores and made sure the employees knew how to find the information on their own using the OWOW Ask the Expert feature and the UC IPM web sites.

At the end of the year, many store managers recognized that the Advocates had improved sales and asked if Advocates could call on their stores all the time. Representatives from the pesticide industry mentioned the displays of less-toxic products they built with the expertise of the Advocates. Everyone who worked with the Advocates was excited about the support they received from the "experts." The bonds forged were lasting, and store managers and employees are still fondly recalling their year with the Advocates.

ACKNOWLEDGMENTS

Thank you to the following:

- **Geoff Brosseau**, Executive Director of BASMAA, who forged the path to make sure that the IPM Advocates Alliance Grant was supported by the public agencies from its infancy to fruition.
- **Gina Purin**, Education and Outreach Director for MCSTOPP. Her input for our classroom training and her steady support to keep us focused on the less-toxic message was felt throughout the project.
- **Mary Louise Flint**, Associate Director of Urban and Community IPM and Extension Entomologist, UC Davis, for bringing her ideas as well as UC IPM's resources, both of which sustained the project throughout its duration. **Karey Windbiel-Rojas**, Urban IPM Educator at UC IPM, for the knowledge and energy she brought to the classroom. Mary Lou and Karey provided the Advocates with tools for plant pest and disease diagnosis and donated UC IPM "Meet the Beneficials" posters, which were displayed in each store, in addition to pest wheels, UC IPM Landscape Pest ID cards, and several other publications. Their support also provided a forum for the Advocates and team members to discuss plant diseases and pests on Collaborative Tools.
- Our grant manager, **Nita Davidson** of DPR, whose vision championed the unique IPM Advocates Alliance. Her dedication motivated her to organize a session focused on this project at the Seventh International IPM Symposium in Memphis, Tennessee, and to participate in several outreach events, store training workshops, and trade shows on her own time.
- **Dan Joseph** and **Jenna Tidd**, for their support.
- And finally, our enthusiastic and committed IPM Advocates—**Suzanne Bontempo**, **Lisa Graves**, **Steve Griffin**, **Teresa Lavell**, **Daniel Levy**, **David Perkins**, **Anne Rogers**, **Maris Sidenstecker**, **Debi Tidd**, and **Steve Zien**.

Figure 7. Suzanne and employees at the end of a training class at Home Depot, Colma.

Figure 8. Securing the literature rack at Home Depot, Seaside from rogue forklifts.

APPENDICES

Appendix 1. Learning Objectives for the IPM Advocate Curriculum

The seven classes for IPM Advocates were based on these learning objectives:

1. Technical IPM

These sessions will include hands-on activities with pests, diagnostics, tools and products, actual pesticide packages, and practice using the UC IPM web retail portal site:

a. Pest and problem identification—How to identify and diagnose common home (including indoor pests) and garden pest problems including arthropods, weeds, plant disease, vertebrate pests, nematodes and abiotic disorders
b. What is IPM?
    i. The importance of preventing pest problems
    ii. Integrating multiple management tools
c. General pesticide information including hazards, safety, and labeling
    i. How to read a label including signal words
    ii. Pesticide regulations as they related to consumer products in California
    iii. Environmental and human health concerns,
    iv. How pesticides get into the environment
    v. How people get exposed to pesticides
    vi. Pesticide mitigation measures—how applications can be made safer,
    vii. Protective equipment and clothing—what is sold in store. When to use it
    viii. Application equipment—what is sold in stores. Basics of mixing and calibration
    ix. Safe storage and disposal practices
d. Information about *specific* insecticides, fungicides, herbicides, and rodenticides on the market
    i. Which pests they manage
    ii. How and when they must be applied
    iii. How and why they work
    iv. What are the advantages and disadvantages of different formulations and packaging (e.g., foggers, aerosols, granules, ready-to-use)
    v. Impacts on people, beneficials, and wildlife
    vi. Least-toxic pesticides—what they are, specific active ingredients, what they're effective against, and how to use them
e. Alternatives to pesticides
    i. Physical or mechanical tools—e.g., traps, barriers, mulches, hoses
    ii. Cultural practices including good plant care, how irrigation and fertilization practices impact pest problems and details on how products sold in stores can enhance good plant care and protect plants from pests
    iii. Resistant cultivars and pest-resistant plants—what these are, how and when to advise customers to purchase these. Includes UCD Arboretum All-Stars.
    iv. Biological control—naturally occurring and commercially available species. How to recognize them and encourage their activities.
f. How to research information related to pests and managing pests with least-toxic IPM practices. Gain familiarity with resources.

2. Communication

This session will include a practice presentation and role-playing exercises

a. Developing relationships with stores
b. Effectively communicating with different store employees
c. How to ask questions of customers to effectively solve their problems
d. Addressing customer expectations about products
e. How to match your education program to a store's products and customer base. How to know the products your store carries
f. Effective teaching methods

   g. Dealing with conflict
   h. Problem solving
   i. Training at the store level
2. Displays and Marketing—includes going to stores and observing displays
   a. Understand the business end of the retail stores
   b. Relationships with suppliers—how to best work with vendors
   c. How to display materials and information in the store to promote safer products
   d. How to incorporate seasonal pests, new pests, and new products into a changing market

Appendix 2. Lesson Plan and Training Curriculum

WEEK/DAY 1—June 6, 2011

OVERVIEW OF IPM ADVOCATES TRAINING PROGRAM AND RESOURCES

1. A. Introduction and Overview of the Program

- Overview of IPM Advocate Program—15 minutes (Geoff Brosseau, BASMAA and introduction of trainers (MLF, KWR, AJ, NAD))
- Introductions—30 minutes (trainees)
- Class outline, what to expect, introduction to books and other resources—15 minutes (MLF)

1. B. What is IPM?

Introduction to pests, the importance of pest ID, pest detection, prevention, cultural or good gardening practices, biological control, mechanical and physical control, and pesticides. Covers indoor and outdoor pests. 45 minutes (PowerPoint presentation—MLF)

Break—10 minutes

1. C. Hands-on Activity

Learning to use the UC IPM Retail Portal, UC IPM web site, and OWOW web pages, and other online resources to get pest information and solve problems. Trainees use their own laptop and Wi-Fi to follow along and look up information—1 Hour (KWR)

Homework

- Take the two online courses, *Introduction to Pesticides* and *Moving Beyond Pesticides* on the UC IPM web site, and get certificates
- Read pages 3-48 in *Pests of Landscape Trees and Shrubs* and review pages 3–35 in *Pests of the Garden and Small Farm*. Answer multiple-choice questions (handout given in class).
- Read Chapters 4 and 6 from *Lawn and Residential Landscape Pest Control* (copies in binder). Answer review questions at end of the chapter. (Optional: View online training course for Maintenance Gardeners chapters 4, 5, 6)

Information included in binder for Week 1

1. Name and contact information for IPM Advocates trainees and instructors
2. Information about the partners: UC IPM annual report; UC IPM Retail newsletter; OWOW brochure/info; Trainer bios; partner program info
3. Information about IPM Advocate Program
4. Class outline: Training schedule for 7 training sessions
5. List of books and other resources each trainee is being given
6. PowerPoint for "What is IPM?" presentation
7. Web demonstration handouts:
   a. Instructions for using UC IPM web site
   b. Web exercises
   c. Illustrated UC IPM web handout
8. Homework assignment and instructions.

9. Reading assignment questions.
10. Copies of Chapters 4 ("Pesticides and Their Hazards") and 6 ("Selection and Use of Pesticide Application Equipment") from *Lawn and Residential Landscape Pest Control*. (for homework reading)

Resources provided to each IPM Advocate on first day

1. A binder for training materials (will be added to each week)—bring to each class
2. UC IPM Quick Tip collection on a key ring
3. *Pests of Garden and Small Farm*, UC ANR publication 3332
4. *Pests of Landscape Trees and Shrubs*, UCANR Publication 3359
5. *Landscape Pest Identification Cards*, UC ANR publication 3513
6. *Natural Enemies Handbook*, UC ANR publication 3386
7. *Wildlife Pest Control Around Gardens and Homes*, UC ANR Publication 21385
8. *Retail Garden Center Manual*, UC ANR Publication 3492
9. Laminated Natural Enemies poster
10. *Watershed map*
11. Hand lens and UC IPM lanyard
12. OWOW Fact Sheets
13. OWOW Booklet
14. Mac's Field Guide
15. Top 10 Most Wanted

WEEK/DAY 2—June 13

PESTICIDES AND INTRODUCTION TO PEST IDENTIFICATION

2. A. Introduction to Pesticides—60 minutes (PowerPoint, MLF)

- What are pesticides, different types
- Environmental and health concerns, acute and chronic toxicity
- Secondary pest outbreak, pesticide resistance
- How pesticides get into water and how people are exposed
- How to read a label including signal words
- Laws and regulations related to consumer pesticides in California
- Pesticide formulations and packaging including advantages and disadvantages of each (e.g., ready-to-use, aerosols, liquid concentrates, granules, foggers, baits)
- Protective equipment and clothing with an emphasis on what is sold in stores
- Pesticide application equipment sold in stores, how it works
- Storage and disposal
- Introduction to less-toxic pesticides. Organic pesticides. What they are; how they work.
- Resources for pesticide information

Break—10 minutes

2. B. Hands-on Activity Related to Pesticides—75 minutes (MLF and KWR)

We will have a range of pesticide products, application equipment and safety equipment that is sold in stores. A very brief introduction to what is on display will be given. Then IPM Advocate trainees will be broken into 3 groups of 3 or 4. Each group will have 30 minutes to study the items in their section and prepare a 15-minute presentation for the group based on their research. They can use their laptops to search the Internet. Groups will listen to presentations, ask questions and discuss related issues.

Group 1—Pesticide Labels

Group will be provided with 15 product containers. They should do the following:

a. Find the key parts of the label—trade name, active ingredient, formulation, signal word, manufacturer, U.S. EPA number, precautionary statements including hazards, direction for use. How do the labels differ in the way they present the material? Which labels are most helpful? Which are the least helpful? Discuss examples of information that you thought might be confusing for consumers.
b. For each pesticide, determine what the formulation is. How does the formulation affect how it would be used?

c. Go on the internet and find MSDS sheets for some of these products. What information do the MSDS sheets have that labels don't have?

Group 2—Application Equipment and Personal Safety Equipment

Included will be a backpack sprayer, a compressed sprayer, a squirt bottle, a hose end sprayer, aerosol can, a drop spreader. Also goggles, gloves, boots, plastic hat, cloth baseball cap. Measuring equipment for mixing up pesticides. We will also have a pesticide to mix up (This will actually be colored water).

Group will explain or demonstrate:

a. What each type of equipment is and what it is used for, when it should be used, and what are advantages and disadvantages of each.

b. How to mix up a pesticide following label directions in the backpack or compressed air sprayer. Use the measuring equipment and colored "pesticide" water. Be sure to put on appropriate protective equipment.
c. Once you are finished applying the pesticide, what will you do with any left over in the tank? What about the material remaining in the pesticide container? How do you handle the clothing you wore when you applied the pesticide?

Group 3—Organic Pesticides and Exempt (25b) Pesticides

- Examples of the following pesticides will be presented (2 or more trade names if possible).
  Bacillus *thuringiensis* var. *kurstaki*
- *Bacillus thuringiensis* var. *israelensis*
- *Bacillus subtilis* (Serenade, Bayer Advanced Natria)
- Codling moth granulosis virus (Cyd-X)
- Borate-based baits (including Gourmet liquid ant bait)
- Insecticidal soap
- Spinosad
- Pyrethrin (without piperonyl butoxide—PBO)
- Azadiractin
- Horticultural oil
- Neem oil
- D-Limonene oil
- Canola oil
- Rosemary, clove, cinnamon, phenylethyl proprionate (derived from peanuts) and other 25b oils
- Copper ammonium complex (Kop-R-Spray)
- Copper soaps
- Iron phosphate
- Plant-based herbicide oils (Greenmatch EX, Matran)
- Acetic acid (vinegar) (Ecosharp Weed and Grass Killer)

a. Group will review definition of organic pesticide, identify what OMRI on the label means, and identify what a 25b pesticide is. What are inert ingredients?

b. Group will introduce each product, explain what pests it is used against, what plants and sites can be treated, and any known problems or advantages. Consult the UC IPM web page for help.

2. C. Introduction to Arthropod and Plant Pathogen Identification

Will introduce insect orders (and common pest groups) and major groups of plant pathogens. Will also review resources for pest identification in preparation for Week 3.—Last 30 minutes (PowerPoint, MLF)

Homework

- Research how and where to dispose of home use pesticides in your county.
- Read introductory parts of chapters on insect and pathogen pests from *Pests of Landscape Trees and Shrubs*. Answer homework questions.
- View narrated biological control presentation (24 minutes).

- View 20-minute video, *Managing Argentine Ants Around the Home*.

Week 2 binder materials

1. DPR hand-outs
   - What is a pesticide?
   - Read the Label First!
   - Buy less, lock it away, and dispose with care
   - Emergency! What to do when accidents happen
2. UC IPM handout: "Choosing Less-Toxic Insecticides and Fungicides for Use in Landscapes and Gardens"
3. UC IPM handout: "Some Organically Acceptable Pesticides Used in Landscapes"
4. OWOW Pesticide list
5. Pest Note: *Pesticides: Safe and Effective Use in the Home and Landscape*
6. Pesticide label illustration from page 17 of *Lawn and Residential Landscape Pest Control*.
7. Printed PowerPoint for "Introduction to Pesticides" presentation
8. Printed PowerPoint for "Introduction to Arthropod and Plant Pathogen Identification"
9. Assigned reading questions for homework

WEEK/DAY 3—June 20

MANAGING INSECTS, MITES, SPIDERS, MOLLUSKS, AND PLANT PATHOGENS

3. A. Introduction to Insect and Disease Pests and Abiotic Disorders of Plants

An introduction to the pest ID cards, including general management approaches for pest groups. 30 minutes (Mary Lou)

3. B. Pest Identification Practicum

Hands-on ID with 75 samples of arthropod pests and pathogen damage and natural enemies. Each IPM Advocate will have a list of pests and damage symptoms on display so they can check off the pests as they view them and identify them using the Landscape Pest ID cards.—35 minutes (MLF and KWR)

3. C. Indoor and Nuisance Arthropod Pests and Their Management

Introduction to managing spiders, bed bugs, mosquitoes, roaches, fleas, yellowjackets, and kitchen pests; when customers should consider hiring a professional to solve their pest problems. PowerPoint presentation—30 minutes (NAD) (*Note: Ants are covered in online video homework, so were not covered in detail here.*)

Break—15 minutes

3. D. Management Tools for Arthropods/Mollusks and Plant Pathogens

A brief introduction to tools on display (see attached list of tools) and directions for hands-on activity.—10 minutes (MLF and KWR)

3. E. Hands-on Activity:

IPM Advocates work in teams of twos and identify several examples of less-toxic tools from the products on display (see attached list—Products and Tools for Week 3) that they would suggest for managing each pest on their lists. (See pest lists). Also consult UC IPM web site—Pest Notes for help and OWOW lists. 20 minutes for research, then 40 for reports and discussion (each group gets 6 minutes)—Total 60 minutes)

Homework

- Read *Weeds in Lawns* and *Weeds in Landscapes* Pest Notes plus some sections of *Managing Wildlife Around Homes*.
- Bring three samples of insect of pathogen pests or pest damage to share with the group in Week 4. Use print and online resources to identify them, research solutions, and be prepared to show them to the group. Prepare them using guidelines
- Bring in three weeds to be used in identification exercise for Week 4.

Week 3 binder materials

1. Handout on how to prepare a pest ID sample
2. List of pests on display
3. List of products on display
4. Pest Notes for spiders, fleas, bed bugs, cockroaches, mosquitoes, pantry pests

5. Pest Notes for *Weeds in Lawns* and *Weeds in Landscapes*
6. Printed copies of PowerPoint presentations
7. The 10 Most Wanted Bugs in Your Garden (OWOW brochure)
8. List of common insectary plants that provide food for natural enemies (OWOW fact sheet, *Healthy Garden to Manage Pests Naturally*

WEEK/DAY 4—June 27

MANAGING WEEDS AND VERTEBRATE PESTS

Beginning of class: Advocates lay out homework specimens for others to view

4. A. Management Tools for Weeds—30 minutes (PowerPoint, Mary Lou)

Brief intro to weeds—broadleaf, grass, sedge; annual, perennial, biannual; summer and winter weeds.

- Environments favoring weeds
- Cultural practices
- Irrigation practices
- Solarization
- Mulches
- Hand weeding and cultivation tools
- Keeping weeds out of planting beds with barriers
- Designing weeds out of landscapes
- Herbicides

4. B. Weed Management Tool Display and Time for Viewing—10 minutes

Brief introduction to activity (Mary Lou)

Tools

- Fabric mulches
- Organic mulches—various sizes of bark chips and other organic mulches, rocks
- Plastic for solarization
- Drip irrigation?
- Barriers to keep lawn weeds out of planting beds
- Dandelion removal tools
- Hand cultivation tools
- Weed whacker
- Herbicides
  - Traditional products—Glyphosate, weed & feed product, trifluralin, benefin, dithiopyr, dicamba, 2,4-D, fluazifop
  - Organic products: plant oils: clove, lemongrass, eugenol; acetic acid, soaps, corn gluten meal

4. C. Resources for Identifying Weeds—5 minutes (Karey)

UC IPM web site, books

4. D. Hands-on Activity (Karey)

Advocates work in pairs. Each pair is given 3 weeds (from selections brought in by Advocates). For each weed, they must use web resources to fill out a form with the information below.

- Common and scientific name
- Annual or perennial?
- How does it reproduce?
- What environmental conditions favor its growth and spread?
- What are some nonchemical management practices?
- What herbicides manage it?

Advocates will be given 20 minutes to fill out their forms. Then everyone will report on what their weeds were and how to manage them. (5 minutes per pair = 30 minutes)

Break—10 minutes

4. E. Vertebrate Pests

Overview of management of rodents with focus on rats, mice, pocket gophers, ground squirrels, squirrels and some information on deer, skunks, raccoons and moles—45 minutes (PowerPoint, Roger Baldwin, Wildlife IPM Specialist, UC Statewide IPM Program)

4. F. Display and Discussion of Rodent Management Tools Sold in Stores—30 min. (Roger Baldwin)

- Various repellents for deer and rabbits
- Screens for rodent-proofing houses
- Clippers for removing ivy
- Barriers to keep squirrels out of trees?
- Ultrasonic devices, vibrating stakes, pinwheels
- Netting (especially for birds)
- Fencing, trunk guards,
- Gopher baskets
- Traps—live traps
  - Traps for gophers: box, Macabee, Gophinator, Cinch
  - Traps for moles: harpoon, scissor-jaw, mole worm bait?
  - Traps for rats and mice: snap traps, glue traps, electrocution (zapper) traps
  - Bait stations
- Repellents such as castor oil for moles and gophers
- Rodenticides: Labels of common materials. Note that second-generation anticoagulant rodenticides will be removed from consumer market June 30, 2011. Emphasize problem with nontarget predators.
- Probe (with or without bait dispenser)
- Smoke or gas cartridges and explosives
- Other items (shovel, boards, stakes)

Homework

UC guide to healthy turf; how to exclude rodents around your home and landscape

Week 4 binder materials

1. List of items on display for weed management
2. List of items on display for rodent management
3. Pest Note: *Weeds in Lawns*
4. Pest Note: *Weeds in Landscapes*
5. Printed copies of PowerPoint presentations

WEEK/DAY 5—July 11

COMMUNICATION

All presentations and activities led by Annie unless otherwise noted

5.A Developing Relationships with Different Types of Stores—1 Hour (PowerPoint)

- Independent Nursery
- Franchise: Ace, Do It Best, True Value Hardware
- Small Regional Chain: e.g., SummerWinds Nursery, Sloat Garden Center, Cole Hardware
- Large Regional Chain: Orchard Supply Hardware
- Big Box Store: Home Depot, Lowe's

5.B Effective Communication with Store Employees and Team Building—30 minutes

- How to identify key players in a store and understand the store hierarchy
- Learn who makes recommendations for pest management and who makes decisions for purchasing
- Know which employees can influence purchasing

Break—10 Minutes

5.C Helping Employees with Customer Expectations About Products—30 minutes

- Preparing the customer with the right expectations so they don't abandon less-toxic practices
- Hands-on activity with less-toxic products, and how they work: Advocates will break up into groups and present alternative strategies for pest management, defining how the products work, and how this information will be communicated to the stores

5.D. Tailoring Your Educational Program to the Customers and Employees of Each Store, Based on the Store's Product Mix—30 minutes

5.E. How to Identify the Less-toxic Products Each Store Carries—15 minutes

5.F. Training Methods Used at the Store Level—10 minutes

- PowerPoint presentations
- Hands-on activities
- Flip Charts

5.G. Dealing with Conflict—20 minutes

- Learn about different challenges and how to handle them
- Three case studies

Homework

- Make a list of the services your local Mosquito and Vector Control offers your community.
- Locate a creek in your area (you may have to consult a street map if the creek is well hidden). Draw a section of the creek and imagine that there is an outfall pipe that brings in water from storm drains. Look around the nearest street and describe—pictorially or in words—how contaminated water would move from houses (or if you are in a commercial area, from a potential spraying site) to the storm drain. What features such as surface substrate, slope, and sprinkler placement may contribute to runoff into the storm drain?

Week 5 binder materials

1. List of stores and type of chain of command
2. Conflict reading info
3. Team building reading info
4. Importance of key contacts in areas: County Agricultural Department, Mosquito and Vector Control, Household Hazardous Waste, Cooperative Extension, local Stormwater Pollution Prevention group, Green Waste.
5. Local Creek Information (how to access locations)

WEEK/Day 6—July 18

DISPLAYS AND MARKETING: UNDERSTANDING THE BUSINESS END OF RETAIL STORES

6.A. Define the Retail Store Model and Our Place in That Setting—30 minutes

6.B. Learn about pesticide manufacturers and suppliers, the roles they play in the stores, and how you can work best with them.—45 minutes

Break—10 Minutes

6.C. How to Display Information and Products—30 minutes

- Learn how to get additional display space and improve the exposure of the less-toxic products.
- Learn how to encourage more ad space for products in the store's advertising.

6.D. Learn How to Incorporate Seasonal Pests, New Pests, and New Products Into Your Store's Marketing Program—1 hour (ppt)

Guest Speakers on Displays and Marketing: SummerWinds Nursery Management Team—45 minutes

Homework

- Prepare a 10-minute presentation for Week 7
- For presentation, present your observations on store placement of less-toxic products and what could be done to improve their promotion

Week 6 binder materials

1. List of vendors that call on stores
2. List of seasonal pests and display ideas for stores
3. PowerPoint presentation handouts
4. Homework assignment and instructions

WEEK/Day 7—July 25

PRESENTATIONS, WRAP UP, AND MENTORING

7.A. Presentations

Each advocate gives a 10-minute presentation on what they observed in the field, regarding displays: What works, what doesn't, and why. Followed by questions.

(11 presenters x 10 minutes: 110 minutes)

Break—10 minutes

7.B. Mentoring—1 hour

- What will happen next with the mentoring component of this program
- Store assignments, expectations, duration

7.C. Take-home exam distributed

Appendix 3. Exit Exam for IPM Advocates

When answering these questions, consult the resources used in the IPM Advocate training program. Refer to the UC IPM resources (e.g., books, web site, Pest Notes, Quick Tips, online training), the OWOW resources, the posted presenters' PowerPoint presentations, the binder, and your class notes. Resources from other states and organizations may not have correct or appropriate information for California, and your answer may be marked incorrect.

Work on the exam on your own—do not consult or collaborate with others in the class.

If you need clarification about a question, email Karey at kwindbiel@ucanr.edu and one of the instructors will address the question**. Do not post your query on Collaborative Tools.**

E-mail your final answers as an attachment directly to Karey no later than 5:00 p.m. on August 8. DO NOT POST YOUR ANSWERS ON COLLABORATIVE TOOLS.

1. Define the critical features of an integrated pest management program. (3)

2. It's June and a customer comes in complaining about volcano-shaped piles of soil in their turf, which is tall fescue. (6)

   a. Where on the UC IPM web site could you go to diagnose a problem on turf? (cut and paste the URL)

   b. What "pests" might be causing this problem? How would you distinguish between the symptoms of the different pests that might leave these mounds in a lawn?

   c. What would you tell the customer to do? What products do many garden centers sell that can help reduce each of these problems?

3. Attached are 3 home-use pesticide labels. Answer the following questions for **each** product (15):

   a. What is the trade name and what is the active ingredient?

   b. On what sites, plants or situations can it be used?

   c. What is the formulation? What equipment (including safety equipment) do you need to apply it?

   d. Go to the UC IPM web site home-use pesticide database and note the active ingredient's:

      1. Water quality rating
      2. Impact on natural enemies

3. Impact on honey bees
4. Acute toxicity to people
5. Names of some other home-use pesticide products that contain this active ingredient

4. Use the UC IPM web page to identify this weed (8).

a. What is its scientific name, common name, and any other names it is sometimes called?

b. Use the UC IPM Pest Note as a resource. What are some nonchemical control products sold in stores that can be used to manage this weed?

c. What herbicides are suggested by UC IPM to manage this pest? Are any of these products on the OWOW list?

d. What are 25b products? Are there any 25b products suggested for managing this weed? What are the benefits and drawbacks of this (these) product(s)?

e. What are pre-emergent herbicides? Are there pre-emergent herbicides suggested for this weed?

5. One of your stores is stocking "ladybugs" (convergent lady beetles). What advice would you give them about how to properly handle lady beetles in the store and what to recommend to customers who purchase them? (Research the UC IPM web site for this information and note where you found it.) (3)

6. A customer brings you the insect pictured below that she found in her kitchen. It's a little under ½ inch long. (9)

a. What is its common name and species name? What is its preferred habitat?

b. What would you suggest she buy to determine the **extent** of her problem?

c. What are some nonchemical tools and products she might find in her local hardware store to help limit the problem?

d. Fill out first 3 columns in the table below with the following: What types of pesticide formulations are recommended in the Pest Note for use against this pest? How is each formulation used? For each type, list active ingredients (a.i.s) that can be found in that formulation.

e. For the fourth column, go to the Sortable Less-toxic Product List (version 3) on the IPM Advocates Collaborative Tools web site (which is a modification of the OWOW product list in a sortable and expanded format).

List trade names for each for the formulation/active ingredient combinations you listed in **d** above. (This Pest Note is not up to date on product names.)

Example Table for Question 6—add additional lines or reformat as needed.

Formulation type	How Used	Active Ingredients	Product Names	Found in Store?

f. Go to a well-stocked hardware or big box store and note which of these products and active ingredients found there (last column). What store did you visit?
g. At the store, you will find other pesticide formulations are available for management of this pest. What are these? Are there situations when these types of pesticides should be recommended?
7. A customer brings you the plant sample and damage pictured below. (9)

a. What is the plant? What is the common name of the problem indicated by the symptoms? What organism caused it?
b. Where can you find information on the UC IPM web site about managing this problem? (list URL)
c. What are some nonchemical controls for this problem?
d. Might your store sell varieties of this plant that resist this problem? If so, name some of the varieties? Are there other ornamentals that don't get this problem?
e. List less-toxic active ingredients that can be used to manage this problem.

f. For each active ingredient, include product names available in stores. What are 3 different resources you can use to find this information? (You should have used all 3 sources in this training.)
g. What is a synthetic product that is effective against this problem?
h. Use the "Active Ingredient/Compare Risks" button at the bottom of the Pest Note to determine which product has the highest risk to water quality, the highest risk to natural enemies, and which may pose a long-term risk to people. List these here.

9. A store manager asks your advice about how he can quickly get his new employees up to speed regarding pesticides and alternatives to pesticides. What free training resources would you recommend? (3)

10. What are the steps you follow when diagnosing an insect or disease problem on a plant? How do you distinguish a biotic disorder from an abiotic one? (Include resources you would use and how you would use them. Also note what information you need to make a good diagnosis.) (6)

11. What problems occur when pyrethroid insecticides such as bifenthrin run off into storm drains? Why should we care? (3)

12. In some stores (e.g., Home Depot, OSH, Ace) you may find some nonpesticidal pest management items located in the cleaning, appliance, or paint departments. (3)

For each of the pests in the table below, list one nonpesticidal tool ideal for managing this pest. Refer to resources such as handouts and PowerPoint presentations—you don't have to go to the store to answer this question.

TARGET PEST	ITEM
Spiders	
Drain flies	
Ants (and other pests)	

13. A customer complains that he has so many moths flying out of his kitchen cupboard that he can't keep up with them. He sees them fluttering in his kitchen every night, collecting on the walls and ceiling. He thinks these moths had their start breeding in dog kibbles that he keeps in a kitchen cupboard. They've now spread to dried fruit and rice he stores in plastic zip bags in the same cupboard. He's looking for a spray to kill the moths in his cupboard and on the kitchen ceiling. You try to dissuade him from spraying. (8)

a. List two things he can do to clean up the infestation. b. List two ways he can prevent future infestations.
c. List a product he can purchase to detect the moths. d. What's the common name of the moth in his kitchen cupboard?

He is also concerned that some of the moths have moved to a closet and are now devouring his woolen clothes. You explain that the moth in his kitchen and those in his closet are two distinct types of moth (and actually the larvae or caterpillars are the culprits).

e. What are the common names of the two possible moths in his closet? f. Should he buy some moth balls? What are two things he can do reduce future infestations?

14. From what sources do Ace Hardware stores get pesticides? What are the advantages of each? (3)

15. Define the role of the following individuals and how they influence the sales of pesticides in Home Depot and OSH: (6)

A. Department lead
B. Merchandiser from pesticide manufacturer or distributor
C. Sales staff in garden section
D. Shelf stocker employed by store
E. Nursery staff

16. Describe a conflicting situation you may come across with an employee in a store and how you'd resolve it. (3)

17. What is the main goal of a retail business? (3)
18. Why would it be important for you to know about the local Household Hazardous Waste Facility and Mosquito and Vector Control Agencies that are in your store area? (3)
19. What are four of the most important things to remember when you're training store employees on IPM? (3)
20. What do you do when store employees ask you about a pest or pest control product you are not familiar with? (3)

Appendix 4. Recruitment of IPM Advocates

INTERVIEW QUESTIONS

1. Describe your knowledge and experience with horticulture as it relates to gardening, the retail sector, or landscaping.
2. Describe any training or experience you've had in pest management including pest identification and use of pesticides. Any classes? Special workshops?
3. What experience do you have working with retail nurseries and garden centers?
4. What are your thoughts on the use of pesticides as part of an IPM program? (This includes conventional, organic, and less-toxic products).
5. Tell us how you might go about researching a pest-related question asked by a store or customer. How would you find management solutions?
6. How would you describe your people skills?
7. Have you been involved in any activities where you had to advocate for a new program or a new way of doing something? Were you successful? Why or why not? How might you change the process if you were to do it over again?
8. Give an example of a situation in which you've dealt with conflict or a challenging person. How did you handle the situation?
9. What experience have you had giving presentations, lectures, or training classes? Have you had experience explaining technical or scientific terms to the general public?
10. Describe your experience working with people from diverse socioeconomic and ethnic backgrounds.
11. Why are you interested in becoming an IPM Advocate?
12. What are your short-term career goals? Long-term goals?
13. Are you currently employed? (no | yes—full-time/part-time)
14. Explain any conflicts that may arise from working as an IPM Advocate.
    Would the time commitment interfere with your current job or business?
    What, if any, are your time constraints?
15. Approximately how many hours during the week can you devote to IPM Advocate training and homework? What about mentoring?
16. We anticipate that many IPM Advocates will work as self-employed consultants like Annie does.
    Do you have any experience working on your own in a business or other activity?
17. If selected as an IPM Advocate, how will you feel about traveling using your personal vehicle as part of the training and mentoring portions, and for future work in this field?
18. As an IPM Advocate, you'd have to establish a working relationship with new people. Describe how you'd go about doing this.

Appendix 5. Store Employee Evaluation of the Training Workshops

Survey question (number of responses)	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The training workshop was well organized and interesting. (n = 245)	67%	28%	4%	1%	0%
My training manual will be a useful resource in the future. (n = 248)	68%	24%	7%	1%	0%
The information will help me recommend and sell less-toxic products. (n = 219)	76%	20%	4%	1%	0%
The instructor was responsive to questions. (n = 251)	80%	16%	3%	0%	0%
The level of detail was appropriate. (n = 239)	69%	27%	3%	1%	0%
Visual aids were effective. (n = 237)	68%	27%	4%	1%	0%
Written materials were effective. (n = 232)	68%	25%	6%	1%	0%
I would recommend the training to my co-workers. (n = 246)	74%	17%	8%	0%	0%
I'd like to learn more about IPM practices and certification. (n = 219)	50%	27%	21%	1%	0%

TRAINING WORKSHOPS FOR STORE EMPLOYEES

LEFT: Teresa Lavell training employees at OSH, Fairfield

RIGHT Annie Joseph and Anne Rogers training employees at Sloat Garden Center, Mill Valley

THE IPM ADVOCATES—CHANGING HOW STORES SELL PESTICIDES

Left to right, top to bottom: ❶ Suzanne Bontempo attaching shelf talkers with Tito, lead for the garden department at Home Depot, Colma ❷ A display of less-toxic products at Home Depot, Sacramento set up for the 2012 season ❸ Steve Griffin after setting up an endcap display at Navlet's Garden Center, Concord with Marsha, the store manager ❹ Display of traps and tools and other less-toxic products at Cole Hardware, San Francisco ❺ Maris at OSH, Sand City presenting a fact sheet about rodent exclusion ❻ Daniel Levy with Ed Casey, a buyer for Friedman's Home Improvement, Santa Rosa

Alameda Countywide
Clean Water Program

Contra Costa
Clean Water Program

Fairfield-Suisun
Urban Runoff
Management Program

Marin County
Stormwater Pollution
Prevention Program

Napa County
Stormwater Pollution
Prevention Program

San Mateo Countywide
Water Pollution
Prevention Program

Santa Clara Valley
Urban Runoff Pollution
Prevention Program

Sonoma County
Water Agency

Vallejo Sanitation
and Flood
Control District

Regional Pollutants of Concern Report for FY 2012-2013

September 12, 2013

Bay Area

Stormwater Management

Agencies Association

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Table of Contents

INTRODUCTION

This document (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.

In two previous Fiscal Years, the Regional POC Report was accompanied by semi-annual Monitoring Status Reports that provided updates on activities related to MRP Provision C.8 (Water Quality Monitoring) prior to the submittal of the first Urban Creeks Monitoring Report in March 2013. Monitoring activities starting October 1, 2011 are now reported separately from the Regional POC Report as prescribed by MRP Provision C.8.g.

Regionally-implemented activities to address Pollutants of Concern (POCs) 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 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.

POLLUTANTS OF CONCERN OVERVIEW

Provisions C.9 through C.14 of the MRP address pollutants that are identified as being of regulatory concern for 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 currently being implemented by BASMAA agencies 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 are being implemented through participation in regional or state-wide collaboratives, such as:

- The Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP); 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 2012-13 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, Program Manager of the Napa County Stormwater Pollution Prevention Program.

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 effect on 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 2012-13 was another productive year. Table 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.

Table 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13.

Outcome in 2012-13	CASQA Participation Actions*
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. In September and October 2012, the Pyrethroid Working Group (a pesticide industry group) placed videos that provide instruction to the pest management industry on how to comply with the new California DPR Surface Water Regulations on YouTube (see https://www.youtube.com/user/PWG2PMP?feature=mhee).	Commendation letter and award to DPR 9/13/12** 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 2012/13 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 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions*
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 was 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 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions*
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, EPA 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. EPA 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, EPA admitted that there is no current target implementation date for the new labels and that not all manufacturers are voluntarily making the label changes. On January 10, 2013, in response to requests from pesticide users and regulators facing pest problems not present in California, EPA modified label language designed to minimize water pollution to allow additional types of applications on buildings by professional applications under limited circumstances. EPA's language changes clarify the legality of California's regulatory exception allowing treatments under building eaves in areas full sheltered from rain. Otherwise, these changes should not affect California because DPR's surface water protection regulations do not include the new exceptions. EPA has only required this language be placed on labels for the pyrethroids that were reviewed in EPA's last review cycle, re-registration (cypermethrin, permethrin, allethrins, tau-fluvalinate, resmethrin, sumithrin, and tetramethrin). For all other pyrethroids (bifenthrin, cyhalothrin, cyhalothrin, cyfluthrin, tralomethrin, deltamethrin, esfenvalerate, etofenprox) the language is voluntary.	Since the mid 2000s, multiple meetings and ongoing communications with California DPR and EPA 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.

Table 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions (*see end note)
(continued) 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 EPA 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]	
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 EPA'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.	Letter to DPR 11/15/12 Since the early 2000s, multiple meetings, letters, and ongoing communications with California DPR.

[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 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions (*see end note)
(continued) In February 2013, based on CASQA, BACWA, and Water Board comments, DPR was challenged by the need to make a decision about registering a silver-based biocide designed to be impregnated into paint and other products. Treated products, like paint, are not regulated as pesticides, so DPR has no control of these products in commerce. DPR ultimately determined to register the silver biocide to avoid disadvantaging California manufacturers. However, it determined to start working with EPA on the exemption for treated products and on the gaps in EPA's environmental risk assessments for silver and other biocides that are widely used in these products. In its "Notice of Proposed and Final Decisions and Public Reports" DPR noted its commitment to working with EPA on silver: "…DPR is still concerned about the potential impact of silver pesticides on California POTWs and surface water quality. DPR has initiated discussions with the U.S. Environmental Protection Agency on this particular issue."	
DPR and EPA to Improve Ability to Model Pesticides in Urban Runoff. California input to EPA and DPR has long encouraged development of modeling methods that EPA and DPR can use to evaluate water quality risks associated with pesticide use in urban areas. In 2011, U.S. EPA 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 EPA will be better able to predict water pollution before it occurs. In a February 2013 letter to EPA on the chlorinated isocyanurates registration review, CASQA recognized the improved examination of surface water quality risks done by EPA for that registration review. CASQA noted EPA developed conceptual models that appropriately identified pathways for transport of chlorinated isocyanurates through urban storm drainage systems to surface waters. Also noting that identifying all pathways by which antimicrobials may flow into and through urban storm drainage is a critical first step in a thorough ecological risk assessment.	Letter to EPA on improved examination of surface water quality risks and chlorinated isocyanurates registration review, 2/12/13 Since the early-2000s, multiple meetings, letters, and ongoing communications with EPA and DPR about the need for predictive modeling tools to inform pesticide registration decisions.

Table 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions (*see end note)
EPA Proposed Special Regulation of Nanoparticle Pesticides. In fall 2011, EPA 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 EPA with the ability to obtain data to characterize their potential water quality impacts. EPA is currently considering public comments on the proposed policy, but signaled its intent to regulate nanoparticle pesticides separately through product-specific decisions on nanosilver pesticides. In September 2012, CASQA commented on the registration review of nanosilver pesticides. The input to EPA included information about nanosilver pesticides sources and pathways to urban runoff and surface waters; an explanation of the regulatory consequences and costs of pesticide water pollution; and specific recommendations: of questions to address as a result of a nanosilver disinfectant case study; of uses to evaluate for their potential environmental exposures; to develop a more robust and informative assessment plan for nanosilver; to require the registrants to develop water, soil and sediment chemical analysis methods for nanosilver with appropriate method detection limits; and to investigate cumulative impacts.	Letter to EPA 9/10/12
EPA Proposed to Restructure the Pesticide Registration Review Process. EPA is proposing to slightly restructure the pesticide Registration Review process in response to problems that have been encountered with pesticide Endangered Species Act (ESA) Consultations, which are required for nearly every pesticide in Registration Review. This restructured process would apply to all pesticide registration reviews. Water quality agencies have significant concerns about the main element of the restructuring proposal – closed-door kick-off meetings with pesticide manufacturers – based on very negative experience with similar meetings during re-registration. There is also concern about the proposal for early communications, which would only give manufacturers and farmers input into EPA's decisions. Despite these concerns, this is a significant opportunity. If the structure were slightly revised to provide stormwater quality and other experts and interested parties opportunity for early input, the change would strengthen the Registration Review process.	Letter to EPA 10/16/12

Table 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions (*see end note)
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 EPA 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 EPA and DPR are currently reviewing the registration application. In comments developed in late FY 2012-13 (submitted 7/6/13), CASQA commented on the registration review of cyantraniliprole urban products. The input to EPA focused on only one use – broadcast applications on urban impervious surfaces (e.g., building perimeter sprays to control ants). EPA's modeling predicts that such applications could cause toxicity to aquatic invertebrates. EPA's risk managers proposed mitigation measures that address toxicity in agricultural areas, but do not work in the urban setting. The letter proposes alternative measures, similar to those that California Department of Pesticide Regulation adopted for the pyrethroid insecticides (which were agreeable to the industry).	Letter to EPA 7/6/13

Table 1. Pesticide Regulatory Process Participation and Outcomes in 2012-13 (continued).

Outcome in 2012-13	CASQA Participation Actions (*see end note)
Other Comments Were Submitted and Are Awaiting Responses. EPA is currently considering public comments for: • Acetamiprid (a very highly toxic to aquatic organisms potential substitute for pyrethroids) • Dichlobenil (highly toxic root control product that could potentially be mis-applied in storm drains) • Hydramethylnon (a very highly toxic to aquatic organisms pesticide appearing in "uncontainerized baits," which are granules intended for broadcast distribution) • MGK-264 (a synergist commonly used with pyrethroids as well as other pesticides) • Polyhexamethylenebiguanide (PHMB) (registered uses as a swimming pool fungicide, algaecide and sanitizer can result in discharges to the storm drain system and ultimately surface waters) • Prallethrin (a pyrethroid that does not currently have a lot of use, but that could potentially become a substitute for the common pyrethroids) • Resmethrin (a pyrethroid that will in the future be used primarily for mosquito abatement (other uses are being phased out)) • Triclosan (a biocide incorporated into many personal care products and a wide range of other consumer products – mainly those made of plastic materials – that can receive outdoor exposure, which could contribute Triclosan to urban storm drain systems via leaching or degradation of the impregnated products)	Five Letters to EPA on 9/10/12; Letter to EPA 11/26/12; Letter to EPA 2/12/13; Letter to EPA 5/28/13

***Below is a list of 15 comment letters developed by CASQA's Pesticides Subcommittee in FY 2012-13**

September 10 – Comments to EPA on Dichlobenil Registration Review
September 10 – Comments to EPA on MGK-264 Registration Review
September 10 – Comments to EPA on Nanosilver Registration Review
September 10 – Comments to EPA on Polyhexamethylenebiguanide (PHMB) Registration Review
September 10 – Comments to EPA on Prallethrin Registration Review
September 10 – Comments to EPA on Resmethrin Registration Review
October 16 – Comments to EPA on ESA Consultation & Enhanced Stakeholder Input
November 15 – Comments on DPR Proposed Decision to Register Bactiblock 101 S.1.19
November 26 – Comments to EPA on Acetamiprid Registration Review

February 12 – Comments to EPA on Improved Examination of Surface Water Quality Risks and Chlorinated Isocyanurates Registration Review
February 12 – Comments to EPA on Hydramethylnon Registration Review
February 27 – Comments to Water Board on Coordinated Pesticides Monitoring in Urban Watersheds
March 28 – Comments to Central Coast Regional Water Board on Proposed TMDL for Toxicity and Pesticides in the Santa Maria Watershed
May 28 – Comments to EPA on Triclosan Registration Review
July 6 – Comments to EPA on Proposed Registration – Cyantraniliprole Urban Products

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, 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 2012-13 directly by Permittees, and at the countywide stormwater program and regional levels on behalf of Permittees. Actions implemented 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 that direction of the BASMAA Trash Committee and are approved by the BASMAA Board of Directors (BOD) prior to finalization. A status summary for BASMAA regional projects implemented on behalf of Permittees in compliance with Provision C.10 of the MRP is included in this section.

Trash Generation Rates Project

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 generation.

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 at project monitoring sites. The results of these events were combined with the first two events and a variety of analyses were conducted to refine trash generation rates. Additionally, two hydrodynamic separators (HDS) devices were monitored to assist in comparisons to refined trash generation rates based on all four monitoring events. The HDS devices receive runoff from catchments that are larger and have more heterogeneous land uses and income categories. The HDS units are located in the cities of San Jose and Dublin.

A final technical report on the generation rates is currently being finalized by BASMAA and will be completed in late 2013. The final technical report describes all methods used and analyses conducted to develop final trash generation rates that are being used by Permittees as a starting point for developing Long-Term Trash Load Reduction Plans due to the Water Board by February 1, 2014.

Long-Term Plan Framework and Guidance

Provision C.10.c of the MRP requires each Permittee to submit a *Long-Term Trash Load Reduction Plan* (Long-Term Plan) by February 1, 2014. The Long-Term Plans must describe control measures that are currently being implemented, including the level of implementation, and additional control measures that will be implemented and/or increased level of implementation designed to attain a 70% trash load reduction by July 1, 2017, and 100% (i.e., "No Visual Impact") by July 1, 2022.

A work group of MRP Permittee, SMCWPPP and other Bay Area countywide stormwater program staff, and Regional Water Board staff met between October 2012 and March 2013 to better define the process for developing Long-Term Trash Reduction Plans, methods for assessing progress toward reduction goals, and tracking and reporting requirements. Through these discussions, a framework for developing and implementing Long-Term Plans was developed and agreed upon by Permittee and Water Board staff. The Long-term Plan framework is comprised of the following tasks:

1. Identify and map very high, high, moderate, and low trash generating areas based on land use and other factors that affect the level of trash discharged from the MS4 from each area.

2. As needed, identify trash sources in high and moderate generation areas to assist in focused control measure implementation.
3. Identify and prioritize trash management areas and the types of trash problems that need to be addressed within those areas.
4. Identify control measures for reducing trash in prioritized areas and minimizing problems associated with trash.
5. Define the assessment methods(s) that will be used to demonstrate progress and success.
6. Select and implement trash control measures to reduce trash in prioritized areas and minimizing problems associated with trash.
7. Evaluate and document progress towards goals using defined assessment methods.
8. Modify trash generating area designations and reprioritize areas and control measures as needed.

A foundational task in the framework is the identification of very high, high, moderate, and low trash generating areas within each Permittees jurisdictional areas (i.e., Task #1). In FY 2012-13, final trash generation rates developed through the BASMAA Trash Generation Rates Study were used by Permittees as a starting point for differentiating and delineating land areas with varying levels of trash generation. Permittees then used local knowledge and field and/or desktop assessments to confirm/refine the level of trash generation for specific areas. Permittees then began delineating and prioritizing preliminary trash management areas. Final draft trash generation maps and preliminary management area maps are included in each Permittee's FY 2012-13 Annual Report. Delineations of land areas treated by full trash capture devices conducted to-date and locations of all devices installed/constructed to-date are also included in the trash generation maps.

A BASMAA regional project to develop a general outline and further guidance for developing Long-term Plans is also currently underway. The guidance and outline is intended to assist Permittees with developing their plans. This project is scheduled for completion in the fall of 2013.

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. 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.

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). 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 appear representative of the known types of potentially effective control measures and the geographic area of potential wider implementation in the future.

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:

- 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 TMDL water quality restoration programs. CW4CB is helping 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. For the most recent status of the CW4CB pilot projects please refer to the semi-annual progress report dated April 30, 2013 that was submitted to USEPA.

Integrated Monitoring Report

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. The results and status of all MRP C.11/12 pilot projects will be documented in the IMR, including a number of pilot projects not required to be reported on in the 2013 Annual Report (e.g., CW4CB projects). BASMAA will assist Permittees in developing and submitting the IMR. In addition to synthesizing the water quality monitoring conducted per Provision C.8, the IMR 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. The IMR will also incorporate information gained through pollutant loading station monitoring conducted per provision C.8.e. The IMR will address:

- Lessons learned,
- Pilot programs and BMP cost-effectiveness,
- Load reductions, and
- Recommendations on steps and criteria to identify opportunities for future implementation.

C.11/12.f. Pilot Stormwater Diversion Projects

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 FY 2009-10 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 total of five diversion projects were selected by Permittees based on the criteria included in the revised report. One project is located each of the five MRP-associated counties.

Work plans for each project were submitted to the Water Board in May 2012. Work plans 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.

In FY 2012-13, Permittees implemented diversion projects consistent with the project work plans. The following pages provide a brief overview and current status for each of the pilot diversion project, including modifications to the work plan that were necessary during FY 2012-13. Table 1 includes an updated implementation schedule for each project.

Ettie Street Pump Station (Alameda County)

The Alameda County pilot project is at the Ettie Street Pump Station (ESPS), located in the City of Oakland and operated by the Alameda County Flood Control and Water Conservation District (ACFCWCD). The pump station was selected based on elevated PCB and mercury concentrations found in previous studies of sediment in the pump station and its catchment area, and the geographical proximity to the East Bay Municipal Utilities District (EBMUD) conveyance and wastewater treatment systems. The diversion project is designed to further evaluate the potential benefits of diversions from the pump station to EBMUD.

The ESPS pilot project consists of two elements. The initial pilot phase installed a pilot test diversion to evaluate the feasibility of using a continuous turbidity sensor to direct selective pumping of stormwater from the ESPS wet well to a storage tank for detention and pretreatment. Water from the storage tank can be directed either to an existing sanitary sewer line or to a 2-bed media filter treatment system to be installed in fall 2013 as one of the CW4CB retrofit pilot projects.

Monitoring focuses on sampling the diverted water for PCBs and mercury to relate the concentrations of these sediment-associated pollutants to the turbidity data to help optimize their captured during diversion pumping. Based on comments by Water Board staff on the May 2012 work plan, the monitoring design was revised to leverage the CW4CB monitoring efforts planned for FY 2013-14. ACCWP monitored turbidity during the FY 2012-13 wet season and sampled stormwater from a November 2012 storm event, which was analyzed to provide particle distribution data requested by CW4CB consultants to inform monitoring plan design for the CW4CB Task 5 retrofits. However recurrent data quality problems were observed with the turbidity probe output showing a bias toward lower readings, which were attributed to fouling of the sensor glass and wiper. The probe mount was redesigned to permit regular wet season maintenance without confined space entry, and additional monitoring is planned for FY 2013-14 that will be coordinated with parallel monitoring of the retrofit media filters.

The redesign of the monitoring also permitted reallocation of resources to evaluation of costs and benefits associated with the second phase of the study, a larger scale diversion concept similarly based on detention of wetweather diversions, An engineering feasibility study of larger-scale diversion will be completed in fall 2013 and include the following elements:

- Larger pretreatment storage facilities constructed on adjacent land underneath the MacArthur Freeway if feasible through either acquisition of easement rights granted by the State of California to ACFCWCD or a Common Use Agreement between the State and ACFCWCD.
- Permanent diversion conveyance from the pump station to the pretreatment facility.
- Permanent diversion conveyance from pretreatment to sanitary sewer to be implemented by EBMUD and sized to carry typical dry weather flows from the ESPS (approximately 1000 gallons per minute). This conveyance, now in the initial planning stage, will be available in non-peak flow periods for transfer of pretreated stormwater from the ESPS. ACCWP will qualitatively review challenges in obtaining easements for a new larger-scale conveyance across existing freeways and railroads, in reference to the alternatives being considered by EBMUD for connection to existing conveyance lines owned by EBMUD or the City of Oakland.
- Wet weather diversion from pump station to pretreatment to be triggered by elevated turbidity during storm events. Multiple scenarios of diversion timing and volume will be developed in consideration of alternative turbidity thresholds and 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.

All information available to-date about the project will be included in the Integrated Monitoring Report (IMR) Part B, which will be submitted to the Water Board on March 15, 2014.

North Richmond Stormwater Pump Station (Contra Costa County)

The Contra Costa Clean Water Program (CCCWP) is facilitating implementation of a stormwater diversion pilot project to divert urban runoff from the North Richmond Stormwater Pump Station (North Richmond Station) to the West County Wastewater District (WCWD). The North Richmond Station is designed to control stormwater flooding conditions for the unincorporated area of North Richmond. The station receives water from a network of stormwater collection sewers which drain into the wet well of the pump station. Stormwater is then pumped into the discharge channel of the pump station which drains by gravity into a 78-inch discharge pipeline.

To assist with the pilot project, the County sought and obtained grant funding administered by the San Francisco Estuary Project through the United States Environmental Protection Agency (USEPA) 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 the County to plan, design, construct, and monitor an engineered diversion into WCWD.

Baseline water quality monitoring was performed per the scope of the grant between 2010 and 2012. WCWD staff had substantial input on the monitoring parameters for that baseline study. The baseline study was completed and reported in 2012. The water quality characterizations from the North Richmond Station, along with assessments of sediments in the associated drainage area, indicate that mercury and PCB concentrations in sediments are high enough to provide potentially significant benefits for stormwater management in that area. Additionally, based on the results of a stormwater runoff characterization study conducted for the Small Tributaries Loading Strategy (STLS) of the Regional Monitoring Program (RMP), mercury to suspended sediment ratios are the third highest of twenty-two Bay Area watersheds characterized by SFEI in 2011. PCB to suspended sediment ratios are the fifth highest of Bay Area watersheds assessed in that same study.

A probable construction cost estimate and preliminary schedule for the Project was developed by Brown and Caldwell in December 2012. The estimated construction cost, $764,000, exceeds the original grant assumption. Design costs for the diversion are approximately $100,000, in addition to the construction cost. The construction costs reflect not only the diversion, but also much needed infrastructure rehabilitation at the North Richmond Station. The diversion construction costs represent a moderate (i.e., approximately $50,000 - $100,000) in additional design and construction costs added to the costs of the infrastructure rehabilitation necessary to meet flood control needs.

The current recommended approach is a "hard-piped" diversion, with flows routed into the nearest sanitary sewer collections system. One main pump and one back-up low flow pump (0.4 mgd) would be installed in the North Richmond Station wet well. The pumps would be connected to and controlled by a supervisory control and data acquisition system (SCADA). Water level sensors in the outlet of the conveyance pipe would allow the pumps to be shut down via the SCADA system if the conveyance was reaching its capacity. In addition, the SCADA system would be connected to continuous water quality probes that could detect petroleum or other spills and trigger pump shut-down.

Some of the more substantial costs of the diversion pilot are related to planning, monitoring, and risk management. The initial pre-diversion monitoring cost was approximately $180,000. Planning support by CCCWP consultants has cost $80,000 to date, and continues to accrue. Although pre-diversion monitoring has been completed, concerns raised by WCWD may require additional monitoring. As of June 2013, the need for additional monitoring to support the Project is being discussed by the CCCWP Monitoring Committee.

Between January and April 2013, CCCWP staff, along with County and Richmond staff, engaged directly with WCWD staff. In those discussions technical concerns about

conveyance capacity, toxicity to activated sludge microorganisms, effluent quality, bio-solids quality and spills and illicit discharges were fleshed out by WCWD.

CCCWP is currently developing a technical memorandum addressing the above concerns expressed by WCWD. Concurrently, the County is moving forward with procurement of a design consultant to develop biddable plans, specifications, and cost estimates for the Project. The County continues to negotiate with WCWD over the terms and conditions of a permit to discharge dry weather urban runoff and first flush into the WCWD collection system. A significant challenge to obtaining that permit is regulatory relief from consequences should the diversion cause a sewage treatment system upset, a sanitary sewer overflow, or exceedance of an effluent limit.

At present, it is anticipated that construction of the Project would commence in the dry season of 2014, to be ready for a diversion pilot in wet season 2014 – 2015. The proposed approach is for late dry season flows to continue to be diverted to the flood control channel, per normal operations. Weather reports would be monitored, and when there is a significant probability of a storm (e.g., greater than 75 percent chance of at least 0.5 inches of rain in a 24 hour period), the WCWD would be notified and the pump station valving changed to redirect flows to the WCWD. Diversions would continue until level sensors determined that pipeline capacity was less than 0.5 mgd.

The diversion would resume after capacity was restored. This pattern of weather tracking, notification, and diversion would continue for one month. Approximately six months after the first flush diversion was implemented and evaluated, a dry weather diversion would be implemented. The dry weather diversion would be conducted for a summer season (e.g., June through August).

All information available to-date about the project will be included in the Integrated Monitoring Report (IMR) Part B, which will be submitted to the Water Board on March 15, 2014.

Pulgas Creek Pump Station (San Mateo County)

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) pilot diversion project evaluated the diversion of dry weather runoff 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. 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 part of a stormwater runoff characterization study conducted for the Small Tributaries Loading Strategy (STLS) of the Regional Monitoring Program (RMP), analyses of PCBs and mercury were performed on stormwater samples from the two storm drain lines that flow to the Pulgas Creek Pump Station. Results indicated that stormwater

flowing into the pump station contained between about 19,000 and 84,500 picograms per liter (pg/L) of total PCBs. These concentrations are relatively elevated compared to the 886 pg/L Event Mean Concentration (EMC) of total PCBs calculated by SFEI from stormwater runoff sampling with similar methods from a parking lot and recreation area in Daly City. The data also show that the concentrations of total PCBs from the north Pulgas Creek storm drain line were generally higher than those found in the south storm drain line.

In early FY 2012-13, Countywide Program staff worked with SBSA and City of San Carlos staff to obtain a wastewater discharge permit for the City of San Carlos. The permit authorizes the diversion of a limited volume of dry weather urban runoff and stormwater. The permit describes discharge, monitoring, and reporting requirements. 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.

As outlined in the May 2012 project work plan, wet and dry weather pilot scale diversions of urban runoff from the north Pulgas Creek storm drain line were scheduled to occur during FY 2012-2013. In preparation for monitoring, initial installation of the continuous monitoring equipment (data loggers, flow and turbidity meters, and batteries) in the north drain line was accomplished in October 2012. A rainfall gauge was also installed on the roof of the Pulgas Creek Pump Station. At a follow-up maintenance visit in November, however, technical problems were discovered with the flow/turbidity data logger which prevented logging of continuous turbidity measurements, although continuous flow measurements were being made. The data logger and turbidity sensors were removed and taken to the laboratory for troubleshooting. After several weeks of unsuccessful attempts to resolve the issues, replacement equipment was procured and installed at the site in December 2012. Due to the equipment malfunctions, no turbidity measurements were recorded, and only limited flow measurements (between the initial installation in October and removal of the data logger in November) were recorded.

Following the December installation, regular maintenance events were conducted throughout the remainder of the rainy season (approximately every two weeks through the end of April) in order to download data and assure proper operation of all equipment. From December 2012 through May 2013, continuous flow, turbidity and rainfall data were measured at the site. Additionally, one dry weather diversion event was conducted in November 2012. Immediately prior to the diversion, water samples were collected from the north storm drain line according to the methods and procedures described in the work plan. Using a portable, submersible pump, approximately 500 gallons of water were pumped out of the North Pulgas storm drain line through flexible conduit into a stainless steel tank. The City of San Carlos maintenance staff removed the water from the tank using their Vactor truck. The water was taken to the City's corporation yard and discharged into the sanitary sewer line, per the SBSA permit.

One storm diversion event was also conducted in March 2013. Samples were collected from the north storm drain line during the storm event according to the methods and procedures described in the work plan. Stormwater was diverted from the storm drain line using the submersible pump/conduit system used for the dry weather diversion into the same stainless steel tank. Following the storm (during dry weather), the City of San Carlos maintenance staff removed the water from the tank using their Vactor truck and discharged the stormwater into the sanitary sewer line, per the SBSA permit. Samples of the water were collected as it was discharged into the sanitary sewer line and analyzed according to the SBSA permit requirements.

The site was demobilized for the season in May 2013. Due to the equipment issues [4] at the beginning of the 2012 wet season and the lack of storms during the remainder of the rainy season, only one storm was monitored and only one wet weather diversion was completed in FY 2012-13. During the demobilization, water samples were collected from the Pulgas North storm drain line to provide additional data on concentrations of POCs during dry weather, but no water was diverted to the sanitary sewer.

To complete the remaining monitoring outlined in the work plan, this project will continue into the 2013-2014 wet weather season. Weather permitting, three wet weather diversion events will be conducted at this site between October 2013 and April 2014. SMCWPPP is coordinating with SBSA to obtain an extension of the SBSA discharge permit for San Carlos through June 30, 2014. All information available to-date for the project will be included in the Integrated Monitoring Report (IMR) Part B, which will be submitted to the Water Board on March 15, 2014.

Palo Alto Diversion Structure (Santa Clara County)

The pilot diversion project in Santa Clara County is currently being implemented by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), in cooperation with the City of Palo Alto. The project is an evaluation of an existing dry and wet weather diversion structure located in the City of Palo Alto. 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 no more than 0.5 million gallons per day (MGD).

A work plan that describes the methods used to evaluate the effectiveness of the Palo Alto diversion structure and to fulfill the objectives of the project was provided to the Water Board in May 2012. The work plan was designed to guide monitoring and data

[4] Significant communication issues between the data loggers and samplers/probes deployed at the site caused monitoring to be postponed. Communication issues have been subsequently addressed.

collection activities over Fiscal Year 2012-13. Work plan tasks included: (1) project planning; (2) water quality monitoring; (3) evaluation of diversion costs and operational challenges; (4) cost and benefit analysis; and (5) reporting. Monitoring activities outlined in the work plan include continuous monitoring of the volume and turbidity of urban runoff flowing into and through the diversion structure. Water quality sampling includes suspended sediment concentrations, particle size distribution, and mercury and PCB concentrations during two dry weather events and three wet weather events. These data will be used to calculate loads removed from urban runoff due to operation of the diversion structure.

Targeted storm diversion events for FY 2012-13 included the first rain event of the season that generated runoff at the site and additional storm diversion events selected to represent the range of expected flow conditions at the site. The schedule of the project, however, was delayed in FY 2012-13 due to technical problems with the flow/turbidity data logger that prevented logging of continuous turbidity measurements. Initial installation of the continuous monitoring equipment (data loggers, flow and turbidity meters, and batteries) at the Bryant/Channing diversion structure in Palo Alto, CA was completed in January 2013. Following the January installation, regular maintenance events were conducted throughout the remainder of the rainy season (approximately monthly through the end of April) in order to download data and assure proper operation of all equipment. Between January and May 2013, continuous flow was measured at both locations and turbidity was measured at the upstream location only. Rainfall data were collected from nearby existing rain gauges during the same timeframe.

In FY 2012-13, three diversion monitoring events, including two dry weather events and one wet weather event, were conducted at the Palo Alto diversion structure. The two dry weather urban runoff diversion monitoring events were conducted in January and May 2013, and the wet weather event in March 2013. Samples were collected and analyzed according to the methods and procedures described in the May 2012 work plan. The site was demobilized in May 2013 for the season, but will be remobilized and continue during the 2013-14 wet weather season in order to monitoring during two additional wet weather events between October 2013 and April 2014. All information available to-date will be included in the Integrated Monitoring Report (IMR) Part B, which will be submitted to the Water Board on March 15, 2014.

State Street Pump Station (Solano County)

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 six acres. The contributing area is commercial, of which a significant portion is automotive repair.

Normal discharges from the State Street Pump Station were terminated in mid-June 2012. 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. This June 18, 2012 sample was analyzed for PCBs, mercury, total organic carbon, total metals, and suspended sediment concentration. The contents were trucked and discharged to the FSSD treatment plant. As an "in-house" pilot project, there were no formal agreements needed for treatment plant's acceptance of the discharge.

There was minimal subsequent dry weather runoff accumulation in the pump station. FSURMP and FSSD removed approximately 1200 gallons on September 20, 2012, and analyzed a sample for the same suite of constituents as the June sample. Following collection of this sample, the pump station was returned to normal wet season operation. Flows into the pump station were also monitored during summer 2013. All information available to-date will be included in the Integrated Monitoring Report (IMR) Part B, which will be submitted to the Water Board on March 15, 2014.

Table 2. Revised Implementation Schedule for Pilot Stormwater Diversion Projects (September 2013).

Project Name, Location / Operating partner	Tasks	2012				2013				2014			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Alameda County Ettie St. Pump Station City of Oakland / ACFCWCD	1. Pre-project wet and/or dry season monitoring and analysis		▮	▮									
	2. Detailed planning and work plan development	▮	▮										
	3. Equipment installation/construction and implementation	▮	▮	▮			▮						
	3.a Large scale scenario development				▮	▮	▮	▮					
	4. Post installation/construction monitoring and analysis			▮	▮	▮	▮		▮	▮			
	5. Data analysis and interpretation and project reporting			▮	▮		▮	▮	▮	▮			
Contra Costa County North Richmond Pump Station City of Richmond/CC County	1. Pre-project wet and/or dry season monitoring and analysis	▮											
	2. Detailed planning and work plan development		▮	▮	▮	▮	▮						
	3. Equipment installation/construction and implementation							▮	▮				
	4. Post installation/construction monitoring and analysis									▮			
	5. Data analysis and interpretation and project reporting										▮		
San Mateo County Pulgas Creek Pump Station City of San Carlos	1. Pre-project wet and/or dry season monitoring and analysis	NA											
	2. Detailed planning and work plan development	▮	▮										
	3. Equipment installation/construction and implementation			▮	▮								
	4. Post installation/construction monitoring and analysis				▮	▮	▮	▮	▮	▮			
	5. Data analysis and interpretation and project reporting						▮	▮	▮	▮	▮		
Santa Clara County Passive MS4 Diversion Structure City of Palo Alto	1. Pre-project wet and/or dry season monitoring and analysis	NA											
	2. Detailed planning and work plan development	▮	▮										
	3. Equipment installation/construction and implementation		▮	▮									
	4. Post installation/construction monitoring and analysis				▮	▮	▮	▮	▮	▮			
	5. Data analysis and interpretation and project reporting						▮	▮	▮	▮	▮		
Solano County State Street Pump Station City of Fairfield/FSSD	1. Pre-project wet and/or dry season monitoring and analysis	▮											
	2. Detailed planning and work plan development	▮	▮										
	3. Equipment installation/construction and implementation			▮									
	4. Post installation/construction monitoring and analysis			▮	▮	▮	▮	▮					
	5. Data analysis and interpretation and project reporting						▮	▮	▮				

MERCURY CONTROLS

As described above, the results and status of most MRP provisions for C.11 are not required to be reported on in the 2013 Annual Report, and will be presented in the Integrated Monitoring Report to be submitted in March 2014.

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 previously submitted Monitoring Status Reports, methylmercury monitoring began in FY 2011-12 with annual reporting of results in the Urban Creeks Monitoring Report or Integrated Monitoring Report submitted by March 15 of each year beginning in March 2013.

PCB CONTROLS

As described above, the results and status of MRP provisions for C.12 are not required to be reported on in the 2013 Annual Report, and will be presented in the Integrated Monitoring Report to be submitted in March 2014.

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 annually on legislation development and implementation status, and also in the 2013 Annual Report to assess the status of copper water quality issues associated with automobile brake pads and recommend brake pad-related actions for inclusion in subsequent permits if needed.

Permittee compliance is achieved through continued participation in a process originally initiated by the Brake Pad Partnership (BPP) that achieved the 2010 passage of Senate Bill 346 which will phase out copper and other heavy metals in brake pads over the next 15-20 years (see Table 2)[5].

Permittees continue to track and support implementation of SB 346through participation in CASQA, which has engaged in the development of regulations for SB 346 by the Department of Toxic Substances Control (DTSC) and also by Washington

[5] full text of the legislation was submitted with the FY2010-11 Regional POC Report

Department of Ecology for that state's Better Brakes Law, which is similar to SB 346 in many respects[6].

Key implementation milestones for brake pad regulation were reached in FY 2012-13 with the participation of CASQA and other stakeholders:

- 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 percentage content of substances regulated by the laws.
- Identification of two certification organizations to collect baseline reporting information regarding copper, nickel, zinc, and antimony content in brake pads, required from manufacturers by January 2013 under the Washington law.

Washington Ecology also provided CASQA representatives with a preliminary summary of baseline data received from manufacturers by January 2013, which represent only a portion of the total friction materials available for sale in the U.S. in 2011. These initial data generally supported the assumptions used by the BPP concerning the copper content of brake pads in the current population of U.S. automobiles, suggesting agreement with earlier estimates of SB 346's effect on copper loads to California water bodies.

When the full baseline dataset becomes available it may also be used to update load reduction estimates prepared for southern California stormwater programs to show that SB 346 will help them meet the copper load reductions required by TMDLs for local streams. Ongoing CASQA participation in SB 346 implementation and evaluation of progress toward reducing discharges of brake-related copper are likely to continue without additional intervention by MRP Permittees during the next MRP permit term.

[6] 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 required adoption of implementing regulations by December 2012, which was ahead of DTSC's timeline for preparing regulations for SB 346. Washington Department of Ecology adopted final Better Brakes Rules in October 2012; available at http://www.ecy.wa.gov/programs/hwtr/betterbrakes.html

Table 3. Implementation Timeline for SB 346 Regulation of Vehicle Brake Pads..

Year	SB 346 Key Milestones or Provisions
2011	SB 346 becomes effective January 1. When reformulating brake pads, manufacturers must select alternatives to copper that pose less potential hazard to public health and the environment.
2012	Target date - finalization for certification and marking criteria.
2014	Limits on cadmium, chromium, lead, mercury and asbestos take effect January 1. (Non-compliant pads can be sold solely for inventory depletion until 2024) Compliance certification must be marked on pads and listed on the Internet.
2018	Cal-EPA Secretary appoints extension application advisory committee.
2019	Manufacturers may apply for extensions to the 2025 0.5% copper limit beginning January 1.
2021	5% copper limit takes effect January 1. (No extensions allowed, but non-compliant pads for pre-2021 vehicles may continue to be sold indefinitely)
2023	State Water Board & DTSC report to legislature on brake pad copper reductions and copper TMDL implementation progress. (The report can make recommendations for any additional brake pad copper controls needed to achieve TMDLs)
2025	0.5% copper limit takes effect January 1.
2032	Final end date for all light duty vehicle compliance extensions. (Non-compliant replacement pads for pre-2025 vehicles may continue to be sold indefinitely)

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 with this provision has been achieved through continued participation in the RMP, whose Multi-year planning process addresses these gaps through studies overseen by the Exposure and Effects Workgroup. While the MRP requires no reporting for this provision in FY2012-13, the RMP continued efforts to address these uncertainties:

- A study of the olfactory effects of copper on seawater-phase salmonids was completed in 2012 and found inhibition of the olfactory nerves of young (smolt

stage) Chinook salmon in salt water was induced at higher copper concentrations than in previous freshwater studies. The study concluded that existing regulatory thresholds for copper in San Francisco Bay are likely to be protective for salmonids. A final summary of the study results is available at http://www.sfei.org/sites/default/files/SeawaterEOG2012report12202012_final.pdf

In 2013 additional external funding was provided to the RMP for further evaluation of the copper olfactory effects at intermediate salinities. Due to the effect of federal budget cuts on study facilities, the additional tests will be conducted with coho salmon instead of Chinook salmon used in previous tests, resulting in extension of the project timeline into 2014.

- Ongoing exploration of the causes of moderate sediment toxicity in San Francisco Bay included an expert workshop in November 2012, the second in a series of discussions on stressor identification. Workshop participants identified a number of possible chemical and non-chemical stressors that could affect the laboratory organisms used for the toxicity tests (the amphipod *Eohaustorius estuarius*), and a follow-up proposal to test the effects of sediment particle size and shape was recommended for 2014 pilot/special studies funding

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. Previous reporting for this provision focused on characterizing the representative distribution of these pollutants or pollutant groups in the urban landscape and in urban runoff. The reporting requirement for 2013 is to report on the results of the following MRP implementation objectives:

- Provide information to allow calculation of loads to San Francisco Bay of PBDEs, legacy pesticides, and selenium from urban runoff conveyance systems throughout the Bay.
- Identify control measures and/or management practices to eliminate or reduce discharges of PBDEs, legacy pesticides, or selenium conveyed by urban runoff conveyance systems.

Water Board staff recognized that these three pollutants or pollutant groups are distinct in terms of origin and transport, but grouped them into this provision because the requirements are identical. The original purpose of this provision was to gather concentration and loading information on pollutants of concern for which TMDLs were planned or in the early stages of development, and inform development of TMDL

implementation plans. However regulatory priorities have altered in response to newer information regarding trends of PBDEs and legacy pesticides; as described in Appendices 1 and 2, these POC groups are both declining in the biota of San Francisco Bay, and are unlikely to be causing impairment to beneficial uses. For selenium, the Regional Board is developing separate TMDLs to address 303(d) listing of the North and Central/South portions of San Francisco Bay.

through separate regulation strategies

The Permittees' compliance approach for the characterization and load calculation requirements of this provision is based on the Regional Watershed Spreadsheet Model (RWSM) developed for the Small Tributaries Loading Strategy, a collaboration between the RMP and BASMAA that uses a combination of monitoring and modeling to address questions listed in MRP Provision C.8.e concerning POC contributions from local watersheds to San Francisco Bay. The RWSM provides a framework and user interface that can be used as the basis for various pollutant-specific sub-models to estimate overall loads from local watersheds. Pollutant profiles containing the information needed to construct sub-models for load estimation of PBDEs and legacy pesticides are attached to Appendices 1 and 2, respectively. Preliminary recommendations for selenium sub-model development were included in the Year 2 progress report for the RWSM, included in the FY 2011-12 Regional POC Report as part of Appendix B4b.

To comply with Provisions C.14.a.v and C.14.a.vii BASMAA developed a regional project to prepare separate sub-reports describing control measures and /or management practices to eliminate or reduce discharges for each of the three pollutant categories (included in this Regional POC Report as Appendices 1, 2 and 3). Each report follows a similar format and includes the following information:

- A review of basic information on the pollutant or pollutant group, including chemical qualities, known adverse effect concentrations and applicable water quality objectives.
- A summary of uses, sources and pathways based on available information. Where possible this relies on POC fact sheets and Conceptual Model reports developed for the Bay Area by the RMP and other regional initiatives.
- An overview of the status of water quality regulations and policies associated with the POC, including Bay Area 303(d) listing basis and TMDL schedule where applicable.
- A summary of the MRP requirements in Provision C.14.
- A summary of characterization information for the pollutant or pollutant group, integrating available data sources including some that were provided in previous reporting for Provision C.14.a.
- A description of control measures that may be applicable to reducing loads for the pollutant or pollutant group, whether implemented in current or previous permit periods, or planned by MRP Permittees and other related agencies. For some POCs applicable control measures can include those that are being pilot tested or implemented for PCBs and/or mercury. Potential enhancements to

existing or planned control measures are discussed where there is a strong likelihood of improvement to water quality in return for reasonable effort.

These sub-reports identify many existing control measures that are serving to reduce loads of these POCs to San Francisco Bay, both through MRP provisions and also the construction and industrial general stormwater permits. Pilot or focused implementation of additional management measures aimed at reducing PCBs and mercury will also help reduce a wide range of other POCs, particularly those associated with sediment including PBDEs and Legacy Pesticides. Considering the regulatory status of PBDEs, legacy pesticides, and selenium the existing control programs described in the subreports provide sufficient reductions of these POCs in urban runoff.

APPENDICES

Control Program for PBDEs, Legacy Pesticides, and Selenium

Appendix 1. Poly-brominated diphenyl ethers (PBDEs) Sub-Report

Appendix 2. Legacy Pesticides Sub-Report - Chlordanes, DDTs and Dieldrin

Appendix 3. Selenium Sub-Report - Urban Runoff Characterization and Control Measures Plan

SEPTEMBER 13, 2013

Polybrominated Diphenyl Ethers (PBDEs) Sub-Report

Submitted on behalf of all Permittees in Compliance with Provision C.14.a of Order R2-2009-0074 to:

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN FRANCISCO BAY REGION

prepared for:

Bay Area Stormwater Management Agencies Association

prepared by:

LARRY WALKER ASSOCIATES

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GLOSSARY OF ACRONYMS

ADC	Alternate Daily Cover
ASW	Automobile Shredder Waste
BEARHFTI	California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation
BMP	Best Management Practice
CWA	Clean Water Act
DNQ	Detected, but not quantified
DTSC	California Department of Toxic Substances Control
LC50	Concentration that is lethal to 50% of test species
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter (concentration)
mL	Milliliter (volume)
MS4	Municipal Separate Stormwater Sewer System
ND	Non-Detect
ng/L	Nanograms per liter (concentration)
NPDES	National Pollutant Discharge Elimination System
OEHHA	California Office of Environmental Health Hazard Assessment
PBDE	Polybrominated Diphenyl Ether
POC	Pollutant of Concern
QAPP	Stormwater Program Quality Assurance Project Plan
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
TMDL	Total maximum Daily Load
USEPA	United States Environmental Protection Agency
WDR	Waste Discharge Requirements
WQO	Water Quality Objectives

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1 Introduction and Purpose of Sub-Report

The Municipal Regional Stormwater NPDES Permit (MRP), adopted by the San Francisco Regional Water Quality Control Board (Regional Water Board) on October 14, 2009, authorizes stormwater discharges from 77 Permittees comprised of municipalities and local agencies in Alameda, Contra Costa, San Mateo, and Santa Clara counties, and the cities of Fairfield, Suisun City, and Vallejo.

Provision C.14 of the MRP specifies requirements for polybrominated diphenyl ethers (PBDEs), legacy (organochlorine) pesticides and selenium. Provisions C.14.a.i. through a.vii. require Permittees to characterize the representative distribution of these three pollutant groups in urban areas and provide information to allow a calculation of loads to San Francisco Bay from urban runoff conveyance systems. Provision C.14.a also requires Permittees to determine if there are potential sources or source areas that may contribute to discharges in urban runoff and to identify control measures and/or management practices to eliminate or reduce these discharges. C.14.a.i. through C.14.a.v. requirements regarding characterization and load estimation in the Bay have been addressed through a Regional Watershed Spreadsheet Model developed through a separate collaborative effort as described in Attachment A. C.14.a.vi. and C.14.a.vii. requirements are addressed through three separate sub-reports on PBDEs, legacy pesticides, and selenium.

This sub-report addresses all C.14 requirements with respect to PBDEs. It summarizes urban runoff characterization information compiled through other sources and also identifies control measures and/or management practices to eliminate or reduce their discharges from urban runoff conveyance systems.

2 Introduction to PBDEs

PBDEs are semi-volatile, diphenyl ethers with one to ten bromine atoms attached. **Figure 1** displays the structure of a diphenyl ether, as well as the structure for one of the 209 PBDE congeners that could possibly exist. Although 209 congeners are possible, only some of these congeners are manufactured or result as degradation products. In this document, PBDE congeners are denoted by PBDE-X or BDE-X, where X denotes the specific congener being referenced. BDE-47 and BDE-209 are the two most widely referenced congeners in literature studies and appear to be the two most widely monitored PBDE congeners. The three commercial mixtures of PBDEs, each named for the average bromination level of its components, are PentaBDE, OctaBDE, and DecaBDE. PBDEs have low water solubilities. Congener vapor pressures vary with bromination level, which affects their movement into and within environmental media (USEPA 2010). For example, at air temperatures of 25°C, more than 98%of the single, double, and triple brominated congeners may be found in air in the vapor phase. Congeners with four or five bromines begin to partition to atmospheric particles, such that BDE-47 (four bromines) is 10% particle phase, and BDE-99 (five bromines) is 39%particle phase. Congeners with six or seven bromines are 87-99% particle phase, while the fully brominated BDE-209 is expected to be 99% associated with airborne particles (Sutton et al. 2013). Physical properties of the commercial mixtures were summarized in European Union risk assessment reports (European Chemicals Bureau 2000, 2002, 2003, 2004; **Table 1**).Differences in the physical properties listed in **Table 1** have important implications for the transport of PBDE congeners through urban runoff conveyance systems, as referenced in **Section 3.3**.

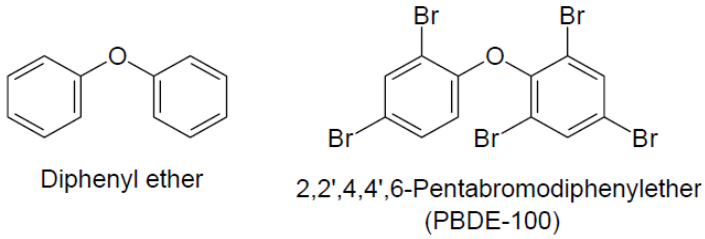

Figure 1. Diphenyl ether structure and structure of BDE-100 (Cal/EPA 2006).

Table 1. Physical properties of commercial PBDEs (European Chemicals Bureau 2000, 2002, 2003, 2004)

Property	PentaBDE	OctaBDE	DecaBDE
Physical state at 20°C and 1,013 hPa	Amber, viscous liquid or semi-solid	Off-white powder or flaked material	Fine crystalline powder
Melting point	-7 to -3°C	Varying by specific commercial product	300-310°C
Boiling point	Decomposes at >200°C	Decomposes at >330°C	Decomposes at 320°C
Vapor pressure	4.69x10-5 Pa at 21°C	6.69x10-5 Pa at 21°C	4.63x10-6 Pa at 21°C
Water solubility	13.3 µg/L at 25°C	0.5 µg/L at 25°C	<0.1 µg/L at 25°C
Log octanol-water partition coefficient	6.57	6.29	6.27
Estimated atmospheric half-life	12.6 days	76 days	94 days

Once higher-brominated PBDEs (e.g. BDE-209) enter the environment, they may undergo transformation via microbial, metabolic, or photolytic processes (reviewed by USEPA2010). This transformation is referred to as debromination. Debromination is the transformation of a higher-brominated compound into a lower-brominated compound. Relative to the fully brominated BDE-209, many lower-brominated congeners (e.g., BDE-47) are considered more toxic and certainly more bioaccumulative, causing biota and humans to be more at risk (Darnerud 2003). Other lower-brominated products of debromination are not found in commercial mixtures and have not been subjected to toxicity tests (Sutton et al. 2013).

There is concern over human exposure to PBDEs, especially for young children receiving higher exposures through ingestion of PBDE-laden indoor dust due to high amounts of hand-to-mouth activity (Sutton et al. 2013).Studies on mice and rats have shown that exposure to PBDEs cause neuro-developmental toxicity, weight loss, toxicity to the kidney, thyroid, and liver, and dermal disorders (ATSDR 2004; Birnbaum and Staskal 2004; De Wit 2002). Studies on animals and human beings have shown that some PBDEs can act as endocrine system disruptors and also tend to deposit in human adipose tissue (ATSDR 2004; Birnbaum and Staskal 2004; He et al. 2006; McDonald 2002). A study has indicated that OctaBDE may be a potential teratogen; exposure to OctaBDE may affect fetal development and lead to birth defects or developmental malformations (He et al. 2006). According to USEPA, DecaBDE is described as possessing "suggestive evidence of carcinogenic potential" (USEPA 2008).

Sutton et al. (2013) cited several studies that have documented the susceptibility of wildlife to the toxicological effect of PBDEs. For example, in birds, PBDEs have been associated with various reproductive effects in American Kestrels (McKernan et al. 2009) and Ospreys (Henny et al. 2009) at concentrations within the range of those found in San Francisco Bay tern eggs (She et al. 2008). Laboratory studies probing the effects of a PBDE-laden diet on fish suggest that juvenile Chinook salmon become more susceptible to infection (Arkoosh et al. 2010) and juvenile zebrafish display altered locomotion behavior (Chou et al. 2010).

The European Union risk assessments developed predicted environmental concentrations of PBDEs from water, sediments, air, and biota and predicted no effect concentrations at which no effect would be expected (European Chemicals Bureau, 2000, 2002, 2003). With similar or lower levels than have been observed in San Francisco Bay (Werme et al. 2007), the European Union risk assessments suggested that concentrations of PBDEs were high enough to pose possible local risks to aquatic life in the sediments and possible risk to top predators from PentaBDE. Lower risk was expected from OctaBDE except when the hexabrominated component was considered, in which case there were possible risks to predators, and probably low risks from DecaBDE except if it underwent debromination.

As discussed in **Section 4.1**, production and use of certain PBDEs in California has been banned, although these actions did not result specifically or solely because of concerns for beneficial uses of the San Francisco Bay (Werme et al. 2007).

3 PBDE Uses, Sources, and Transport Pathways

This section provides an overview of the existing literature regarding PBDE uses, sources, and transport pathways.

3.1 PBDE USES

PBDEs are added to some plastics, electrical and electronic equipment, upholstered furniture, non-clothing textiles, and foam products for use as a flame retardant. These materials are found in products in many applications, including within homes, offices, automobiles, and airplanes (Sutton et al. 2013).Household products that may contain PBDEs include curtains, carpet padding, furniture cushions, mattress pads, and pillows. Because PBDEs are added to the products rather than chemically bound into them, they can be slowly and continuously released from the products during their manufacture, while in use, or after their disposal. **Table 2** lists the predominant usage for the three commercial mixtures of PBDEs (PentaBDE, OctaBDE, and DecaBDE). Further information is available in the PBDEs Pollutant Profile included herein as Attachment A.

Table 2. Commercial mixtures of PBDE flame retardants, congeners comprising each mixture, and the predominant usage of each mixture (see also Attachment A)

Commercial Mixture	Congeners present, listed in order of dominant composition (greatest to least)[a]	Predominant usage
PentaBDE (commercially known as DE-71 and Bromkal 70-5DE)	BDE 99 (35-50%), 47 (25-37%), 100, 153, 154 and possibly minor amounts of 17, 28, 66, 85, 138 and 183	Approximately 95% used in polyurethane foam in furniture cushions, automobile seats and head rests, and mattresses; approximately 5% used in foam-based packaging and carpet padding
OctaBDE (commercially known as DE-79)	BDE 183 (40%), 197 (21%), 203 (5-35%), 196, 208, 207, 153 and 154.	Approximately 95% used in Acrylonitrile Butadiene Styrene (ABS) resins; approximately 5% used in other plastics for computers and kitchen appliances
DecaBDE (commercially known as DE-83R and Saytex 102E)	BDE 209 (97.5%), 206, 207 and 208.	General purpose flame retardant used in virtually any type of polymer, including thermoplastics, textiles, and back-coatings of consumer electronics, the backs of television sets, wire insulations, upholstery, electrical boxes, and high impact polystyrene plastic

[a](Alaee et al. 2003, USEPA 2010)

As shown in **Table 3**, there is very little data regarding market demand statistics for PBDEs. Total self-reported environmental releases of DecaBDE in the United States peaked in 1999 (53.9 metric tons), and stayed at similar levels through 2002 (Attachment A). There has since been a steady decline down to 21.1 metric tons in 2007 and 8.4 metric tons in 2011 (Attachment A), likely due to the imminent ban on production and usage, which is further discussed in **Section** 4. Detailed information is also available in the PBDEs Pollutant Profile included herein as Attachment A.

Table 3. Market demand statistics for PBDEs reported in the literature (see also to Attachment A). Data in metric tons.

	1991	1999[a]			2001[b]			2003[c]
	PentaBDE	PentaBDE	OctaBDE	DecaBDE	PentaBDE	OctaBDE	DecaBDE	All PBDEs
Americas	4,000	8,290	1,375	24,300	7,100	1,500	24,500	not reported
Europe	unknown	210	450	7,500	150	610	7,600	not reported
Asia	unknown	---	2,000	23,000	150	1,500	23,000	not reported
Rest of world	unknown	unknown	unknown	unknown	100	180	1,050	not reported
Total	4,000	8,500	3,825	54,800	7,500	3,790	56,100	56,418

[a]Watanabe and Sakai 2003
[b]USDHHS 2004
[c]USEPA 2010

3.2 PBDE SOURCES

PBDEs have been widely used as a flame retardant in textiles, plastics, and polyurethane foam products since the 1970's and are now both ubiquitous in the urban environment and also possibly being redistributed to the rural environment through application of biosolids and atmospheric deposition. In the San Francisco Bay Area, SFEI made a preliminary categorization of potential source areas for PBDEs (Attachment A) from urban and non-urban categories in the Bay Area:

- Areas surrounding manufacturing facilities that have previously reported air emission releases of PBDEs. Legacy contamination may exist; the USEPA Toxic Release Inventory includes two business locations within the Bay Area that self-report on- and off-site releases of decaBDE. Both locations are in the Peninsula region and are associated with Tyco Thermal Controls.
- Lands where application of treated biosolids may cause them to be sources of PBDEs in runoff. Although the total volume of biosolids applied within the San Francisco Bay Area is unknown, Solano County reported an approximate average of 10,000 tons being land applied annually between 2002 and 2011 (County of Solano 2012). The same application volumes have not been reported from other less-agricultural counties in the Bay Area.
- PBDEs were added as fire retardants in the plastics and foam within automobiles and thus automobile shredding facilities (autoshredders) produce particulate autoshredder waste (ASW) which may contain PBDEs. There are two autoshredder facilities in the Bay Area which generate an estimated 300,000 tons of waste (including millable components of automobiles, refrigerators, and ovens) each year (California Department of Toxic Substances Control (DTSC) 2002). ASW consists of mostly non-metallic materials: glass, fiber, rubber, automobile fluids, dirt and plastics found in automobiles and household appliances that remain after the recyclable metals have been removed (DTSC 2002). ASW materials are treated with inorganic binders to reduce their potential to leach heavy metals, for example in ultimate disposal as alternative daily cover (ADC) at landfills. While usage as ADC in lined landfills is not expected to release PBDEs into the environment (U.S. Department of Health and Human Services 2004) such that it would be available for transport to the Bay, production or transportation of ASW or "auto fluff" may involve release to the environment and storm drain conveyances. Ambient air monitoring taken by the California Air Resources Board showed PBDE levels in urban

areas increased ten-fold in the vicinity of e-waste recycling and autoshredder facilities (Charles et al. 2005)

- Other source areas noted in Attachment A are: carpet/foam recycling facilities and plastics, electronics, cars and textiles manufacturers; however few data are available on these sources or from areas surrounding these types of facilities.

3.3 PBDE TRANSPORT PATHWAYS

The pathways by which PBDEs get from a source into the physical environment are not fully understood (Alcock et al., 2003), and the pathways to the San Francisco Bay are even less known. Conceptually, release can occur during initial synthesis, during incorporation into commercial products, during wear or degradation of products, or during disposal and recycling (Hale et al., 2003). PBDEs are not manufactured in the San Francisco Bay Area; however, manufacturing of PBDE-containing products and/or use of PBDE-containing products is widespread. The release of PBDEs from PDBE-containing products has been quantified in few studies (Palm et al. 2002; Alcock et al. 2003), and no comprehensive survey has been done in California (Werme et al. 2007).

In the San Francisco Bay Area, PBDEs follow the following pathways (Werme et al. 2007):

- Direct input from activities in ports and other entities operating in close proximity to the estuary.
- Discharge of municipal and industrial wastewater.
- Atmospheric deposition.
- Runoff from local watersheds.
- Transport from the Sacramento and San Joaquin rivers.

This sub-report specifically addresses the runoff from the local watersheds pathway. The runoff from the local watersheds pathway represents a particularly important pathway for the particle-bound, higher-brominated PBDEs like BDE-209 to move from the terrestrial landscape to the Bay. **Figure 2** presents a conceptual model of how sources are released and transported through this pathway.

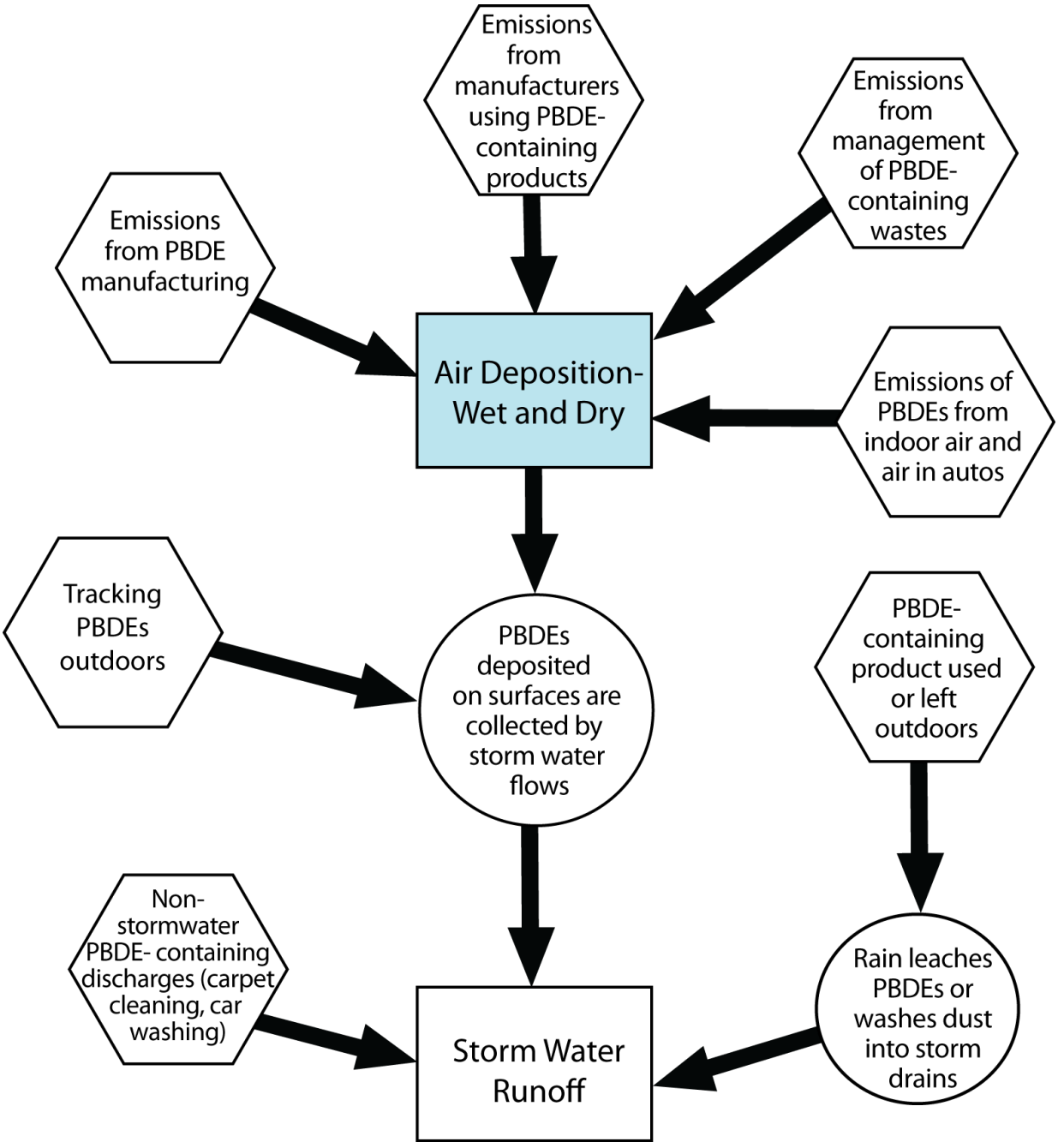

Figure 2. Sources and pathways of PBDEs that enter the San Francisco Bay in stormwater runoff (Werme et al. 2007)

4 Regulatory Status of PBDEs

Over the last 60 years, concurrent with increasing applications of petroleum-based polymers, usage of flame retardants also increased as regulations led to their integration into the polymers to meet fire safety expectations (Attachment A). The following section discusses regulations aimed at decreasing the use of PBDEs as flame retardants, proposed revisions to the standards that resulted in the use of PBDEs as flame retardants, and existing assessments of whether water bodies within the San Francisco Bay Area are impaired due to PBDEs.

4.1 REGULATIONS AND POLICIES BANNING PBDES PRODUCTION AND USE

Governments have responded to the rising environmental and health concerns over PBDEs with bans on production and usage. Due to the greater evidence of bioconcentration by lower-brominated congeners, PentaBDE and OctaBDE were banned in most places prior to DecaBDE (**Table 4**). As indicated in **Table 4** and further detailed in Attachment A, Europe phased out PBDEs faster than the U.S. In 2003, California passed Assembly Bill 302, becoming the first U.S. state to prohibit the manufacture, distribution, and processing of products containing PentaBDE and OctaBDE. This phase-out was originally scheduled for 2008, although the Legislature later accelerated that timeframe for phase-out to begin as of June 1, 2006 (Attachment A). Also, USEPA has issued a Significant New Use Rule to phase out the PentaBDE and OctaBDE homologs (USEPA 2013). According to this rule, no new manufacture or import of these two homologs has been allowed since January 1, 2005, without a 90-day notification to USEPA for evaluation (USEPA 2013). As a result, the major manufacturers of PentaBDE and OctaBDE ceased production of these compounds at the end of 2004.

USEPA has also supported and encouraged the voluntary phase-out of manufacturing and importation of DecaBDE. USEPA received commitments from the principal manufacturers and importers of DecaBDE to initiate reductions in the manufacture, import, and sales of DecaBDE starting in 2010, with all sales to cease by December 31, 2013. The USEPA intends to encourage other importers of DecaBDE to join this initiative. As part of this encouragement, the USEPA intends to develop "Design for the Environment and Green Chemistry Alternatives Assessment" for DecaBDE to aid users in selecting suitable alternatives (USEPA 2013).

Table 4. Years when bans on PBDEs went into effect in various parts of the world (see also Attachment A)

Location	PentaBDE	OctaBDE	DecaBDE
California	2006	2006	2013
European Union	2004	2004	2008
Sweden	1999	unknown	2007
Australia	2007	2007	unknown
China	2006	2006	unknown

4.2 ADDITONAL PBDE REGULATIONS

The Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (BEARHFTI), through their promulgation n 1975 of strict fire-resistance standards for upholstery, furniture, carpets, and other consumer products, is the State of California agency that is largely responsible for the widespread use of PBDEs and other chemical flame retardants. The

BEARHFTI has proposed revised flammability standards that could eliminate the incentive to incorporate these substances into upholstered furniture and many items for infants and young children (BEARHFTI 2013a).The BEARHFTI has determined that the 1975standarddoes not "adequately address the flammability performance of the upholstery cover fabric and its interactions with underlying filling," and has proposed a new standard that is designed to better address fires caused by smoldering materials, the predominant source causing upholstered furniture fire deaths. The new standard will be implemented starting July 1, 2014, but will allow products manufactured prior to this date to continue to be offered for sale without a sell by date. Nevertheless after July 2014, chemical fire retardants would disappear from a variety of newly produced consumer goods (BEARHFTI 2013b). It is anticipated that after current PBDEs-containing products have reached their useful life, the concentration of PBDEs in California's environment will see significant reductions.

4.3 IMPAIRMENT ASSESSMENT

There are no local, state, or federal criteria, standards, or screening levels for PBDEs in water, sediment, fish, or wildlife tissues. USEPA continues to evaluate and assess the risks posed by PBDEs (USEPA 2013). No federal cleanup standards or guidelines have been set for PBDEs (ATSDR 2004; USEPA 2013). Although numeric objectives have not been set for PBDEs, the following narrative objectives from the San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)[1] could be interpreted to evaluate whether urban runoff loads of PBDEs are contributing to an impairment of beneficial uses:

> "Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish or other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered."
>
> "Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life."

Without defined standards, it is not possible to definitively state that PBDEs are impairing water bodies located within the San Francisco Bay Area. During the 2006 and 2010 303(d) listing cycle, the Regional Water Board made the decision not to place the San Francisco Bay on the 303(d) list as impaired by PBDEs because, without a numeric guideline or objective, it could not be determined if the pollutant is likely to cause or contribute to -adverse effects on biota.

Sutton et al. (2013) cited several studies that have assessed whether San Francisco Bay PBDE concentrations are impairing beneficial uses related to wildlife. PBDE contamination of the San Francisco Bay does not impair the commercial and sport fishing (COMM) beneficial use based on comparison to thresholds developed by the Office of Environmental Health Hazard Assessment (OEHHA) (Klasing and Brodberg 2011). PBDE concentrations are also unlikely to impair reproduction and development of San Francisco Bay birds, according to a recent study of the toxicity of PentaBDE to tern eggs (Rattner et al. 2011). An analysis of whether current concentrations of PBDEs in the San Francisco Bay impair the health of harbor seals has been inconclusive (Neale et al. 2005) and further research would be necessary to evaluate this risk.

[1] http://www.waterboards.ca.gov/rwqcb2/basin_planning.shtml

5 MRP Requirements (C.14)

Provisions C.14.a.i. through vii. of the MRP ask Permittees to undertake efforts to determine if urban runoff is a conveyance mechanism associated with the possible impairment of San Francisco Bay for PBDEs, legacy pesticides (such as DDT, dieldrin, and chlordane), and selenium. The provisions specify actions that MRP Permittees must take regarding PBDEs. The C.14.a. provisions and actions undertaken by Permittees to comply with the provisions, in regards to PBDEs, are summarized as follows:

- Characterize the representative distribution of PBDEs in the urban areas of the San Francisco Bay Region (a.ii. and a.iii.). The Permittees developed the Regional Watershed Spreadsheet Model Profile to comply with this requirement.
- Provide information to allow calculation of PBDE loads to San Francisco Bay from urban runoff conveyance systems (a.iv. and a.v.). San Francisco Estuary Institute (SFEI) is developing a report "PBDEs in San Francisco Bay", cited herein as Sutton et al. (2013). The Report is based on environmental and biota data from the Regional Monitoring Program for Water Quality in the San Francisco Bay (RMP) and will be finalized for submittal with the MRP 2013 Annual Report. Many of the preliminary findings are summarized in Section 6 of this Report.
- Identify control measures and/or management practices to eliminate or reduce discharges of PBDEs conveyed by urban runoff conveyance systems (a.vi. and a.vii.). The document herein satisfies this requirement.

6 Pollutant of Concern Characterization Summary

As part of the RMP, SFEI has undertaken a series of monitoring and research projects to investigate the effects of PBDEs on the San Francisco Bay (Sutton et al. 2013). The following sections include summary text, tables and figures of the distributions of PBDEs found via urban San Francisco Bay area monitoring data and PBDE concentrations that have been measured in runoff from local watersheds within the San Francisco Bay Area.

6.1 PBDE DISTRIBUTIONS DERIVED FROM URBAN SAN FRANCISCO BAY AREA MONITORING DATA

Sutton et al. (2013) found that PBDEs are widely detected in San Francisco Bay matrices including water and sediment, in small and large tributaries to the Bay, and wildlife in the area. **Figure 3** and **Figure 4** illustrates a spatial distribution of PBDE concentrations in water and sediment, respectively, in the Bay Area while **Figure 5** shows a comparison of average concentrations found in shiner surfperch (Sutton et al.2013).

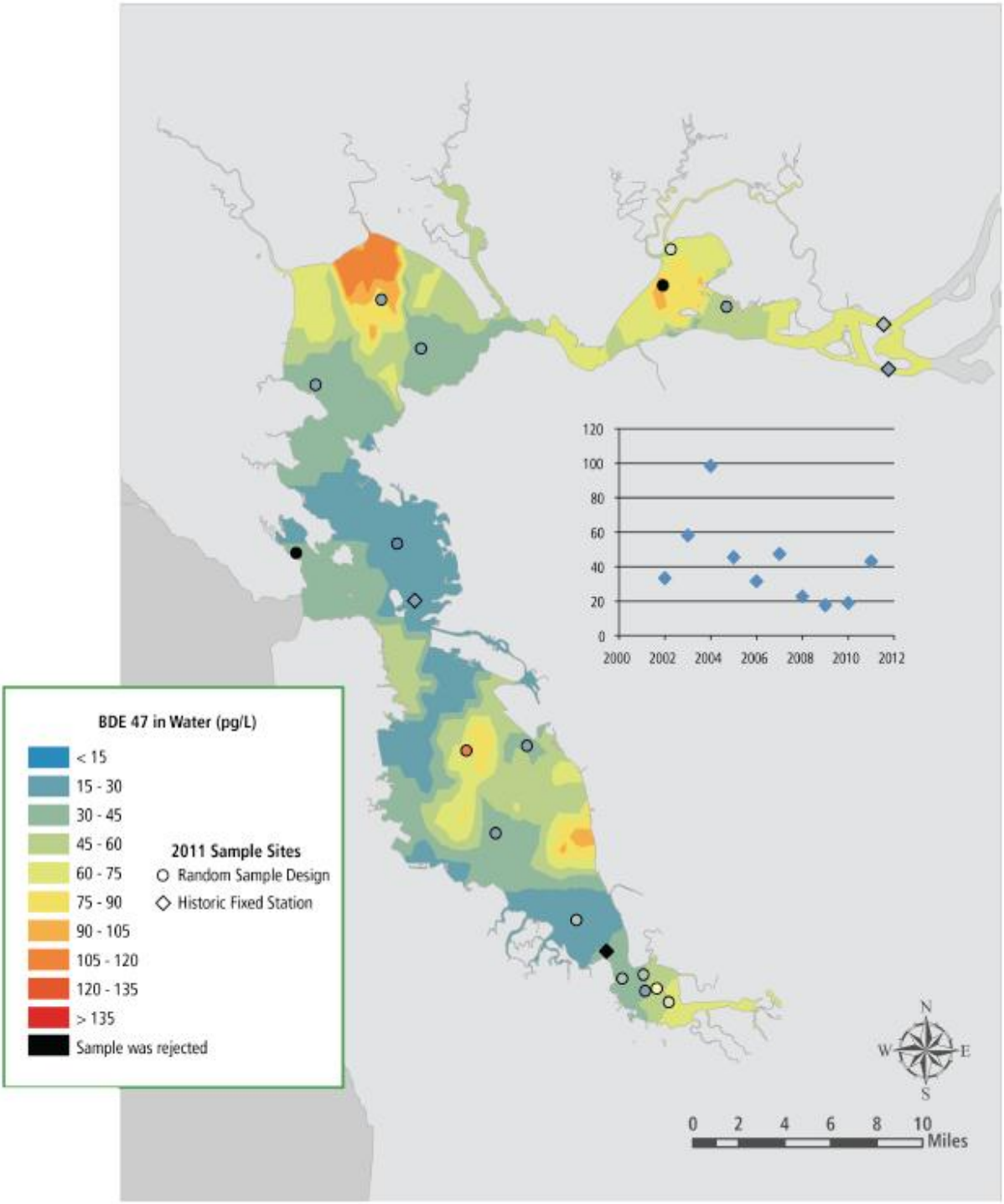

Figure 3. Concentrations of BDE-47 in water in San Francisco Bay (pg/L) (Sutton et al. 2013). Map plot based on 206 RMP data points from 2002-2011. Trend plot shows annual Bay-wide averages. Colored symbols on map show results for samples collected in 2010: circles represent random sites, and diamonds represent historic fixed stations.

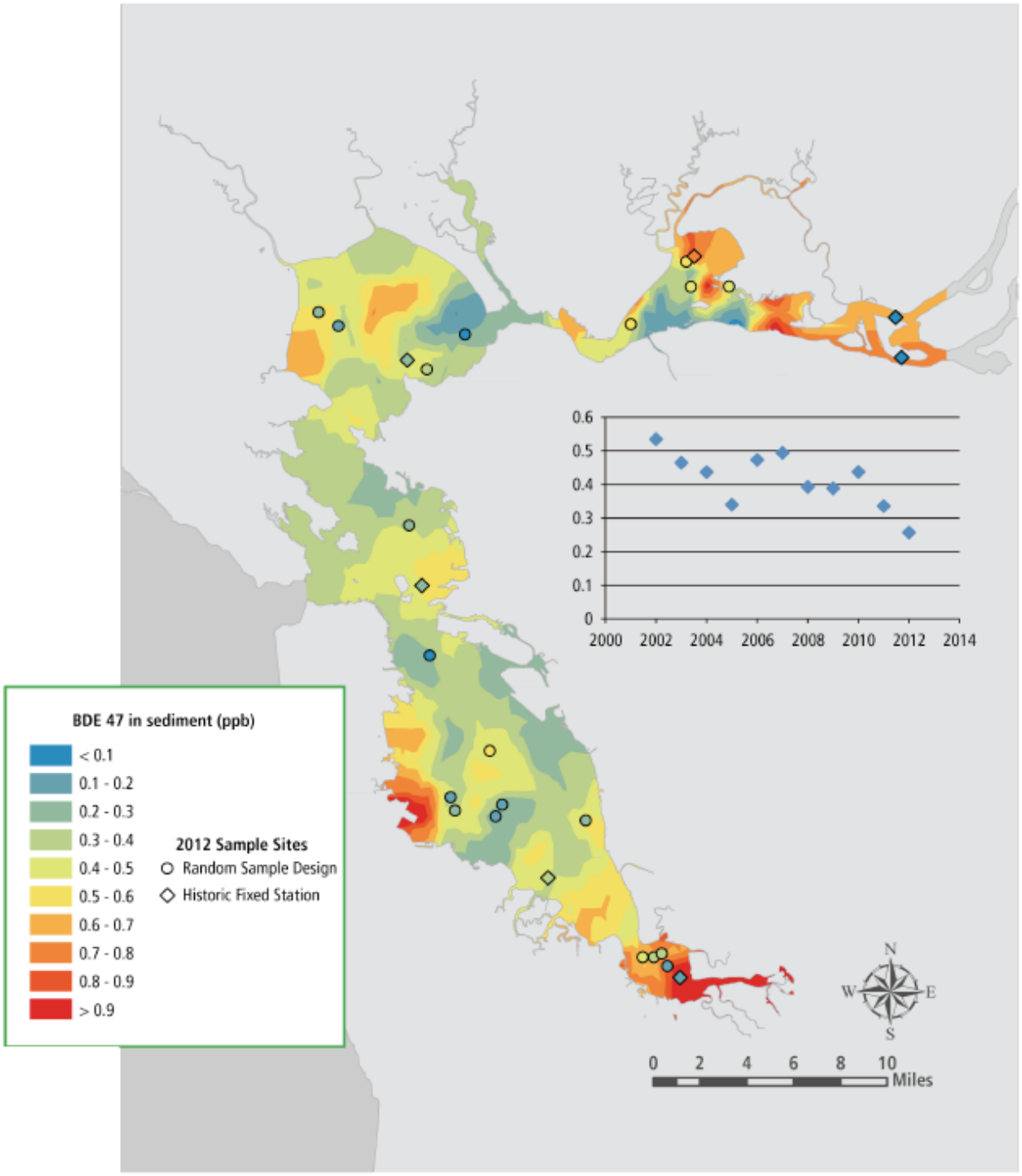

Figure 4.Concentrations of BDE-47 in sediment in San Francisco Bay (ng/g dry weight) (Sutton et al. 2013). Contour plot based on 338 RMP data points from 2002–2009 and 2011. Trend plot shows annual Bay-wide averages. Colored symbols on map show results for samples collected during the wet season (April) in 2012. Circles represent random sites. Diamonds represent historic fixed stations. Red circle on trend plot indicates a wet season sample; other samples were dry season.

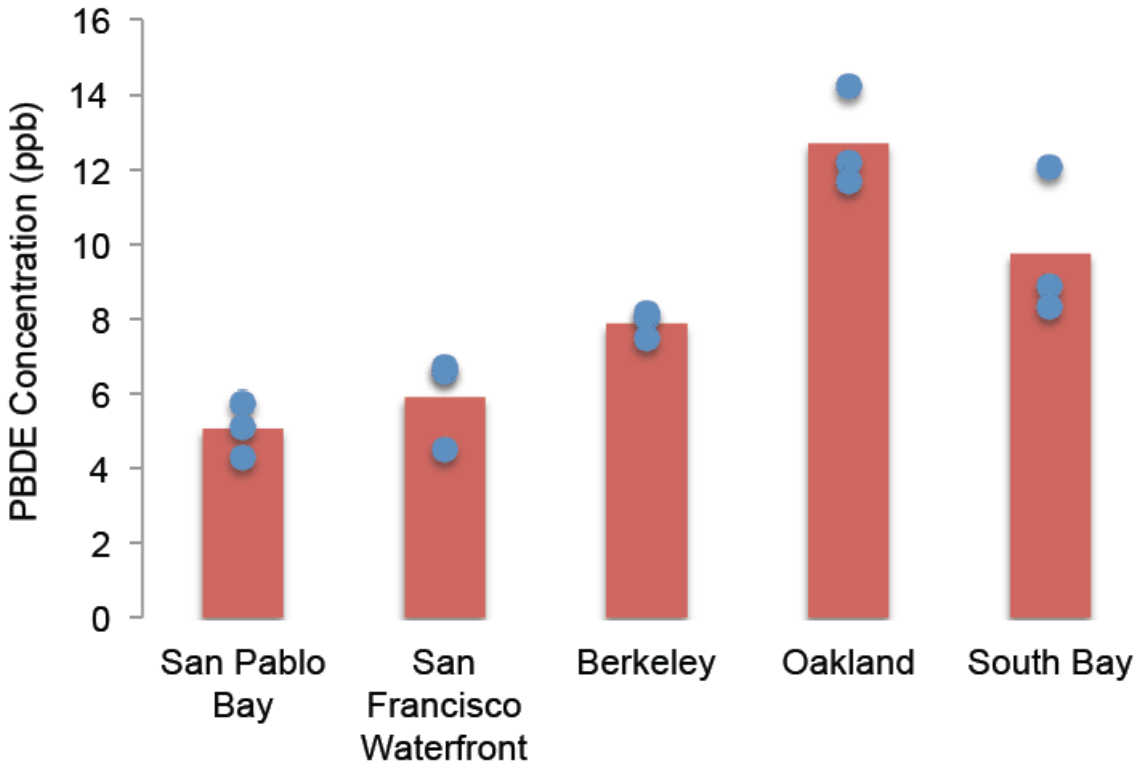

Figure 5. PBDE concentrations (ppb) in shiner surfperch in San Francisco Bay, 2009 (Sutton et al. 2013). Bars indicate average concentrations. Points represent composite samples.

Likely in response to the regulatory actions and policies banning production and use of PBDEs described in **Section 4.1**, Sutton et al. (2013) indicated a decline in contaminant levels for all San Francisco Bay organisms under study (**Figure 6**, **Figure 7**, **Figure 8**, **Table 5**, and **Table 6**). PBDEs are one success story, where a ban and phase-out in 2004 appear to have caused a marked decline in concentration in the San Francisco Bay food web (Mumley et al. *in progress*). This decline is expected to continue and should diminish any potential impacts of PBDEs on San Francisco Bay biota (Sutton et al. 2013). Sutton et al. (2013) developed a PBDE mass budget model that indicates rapid recovery is possible with reduced contaminant loads expected as these compounds are removed from the market.

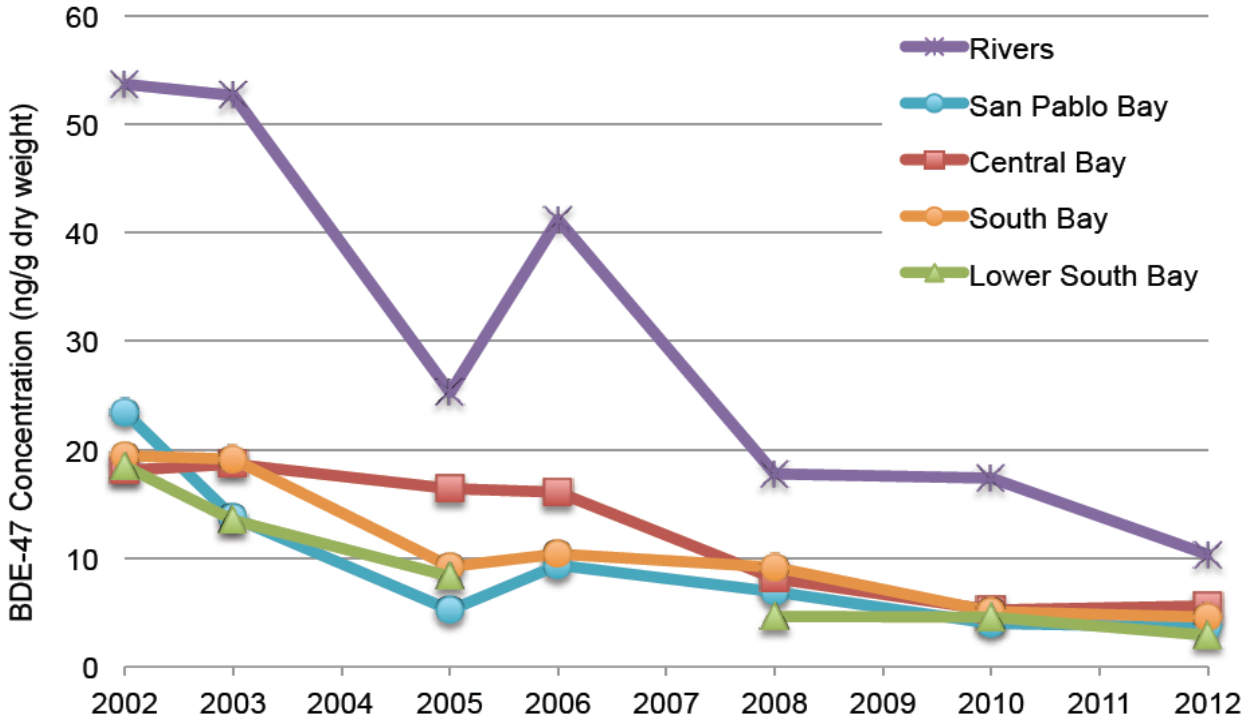

Figure 6. Concentrations of BDE-47 in bivalves (ng/g dry weight) (Sutton et al. 2013)

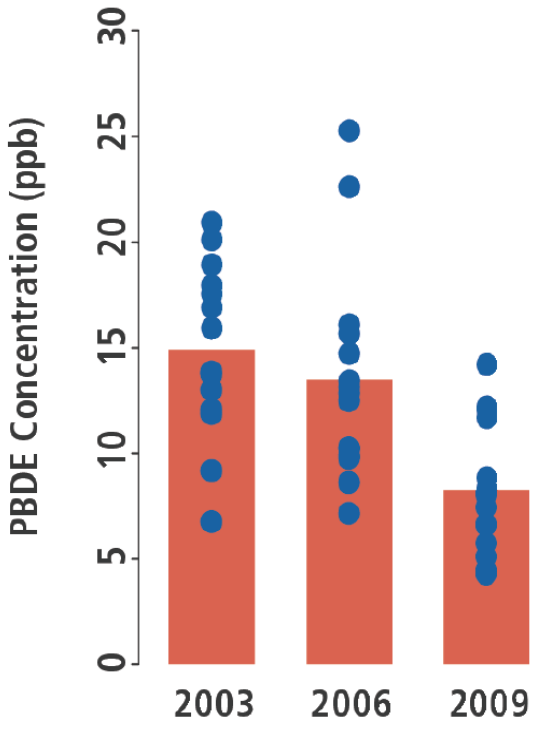

Figure 7. PBDE concentrations (ppb) in shiner surfperch in San Francisco Bay, 2003-2009 (Sutton et al. 2013). Bars indicate average concentrations. Points represent composite samples.

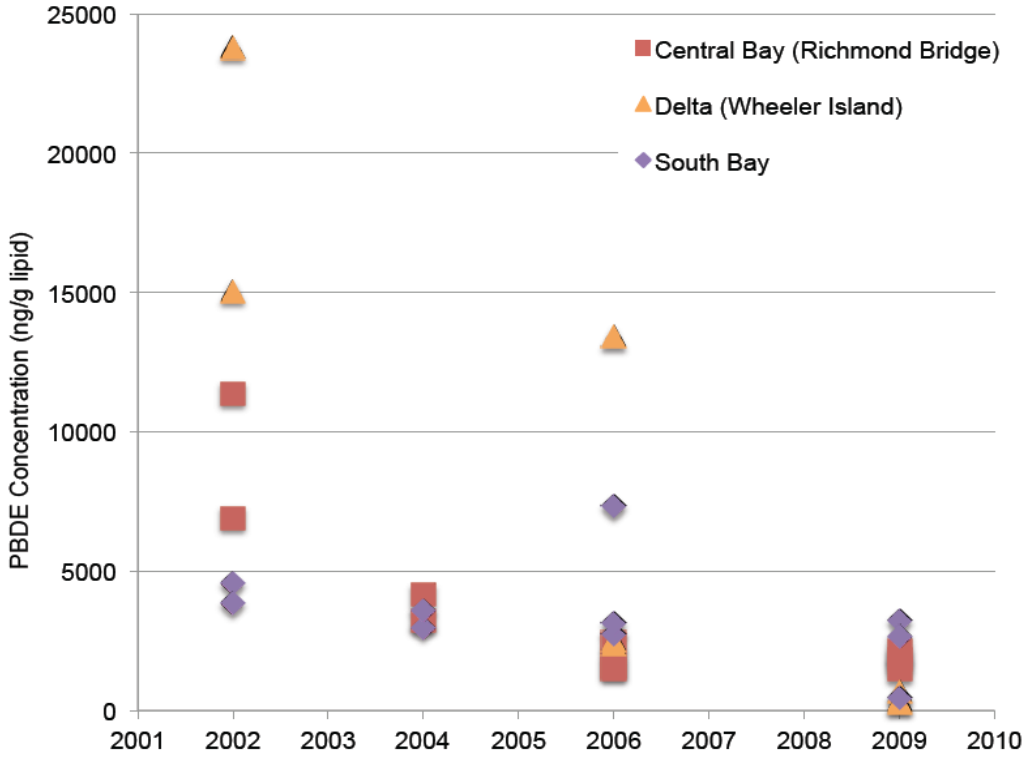

Figure 8. Concentrations of total PBDEs in cormorant eggs (ng/g lipid) (Sutton et al. 2013)

Table 5. Total PBDE concentrations in Forster's tern eggs from San Francisco Bay (ng/g lipid) (Sutton et al. 2013)

Year	2000[1]	2001[1]	2002[1]	2003[1]	2009[2]
Samples (n)	5	29	20	22	18
Maximum (ng/g lipid)	3560	62400	63300	26000	2350
Minimum (ng/g lipid)	1080	1460	2590	666	668
Mean (ng/g lipid)	2160	7610	9420	5610	1440
Median (ng/g lipid)	1820	4380	5460	3600	1450
SD (ng/g lipid)	1010	11400	13400	5540	495

[1] Values from She et al. 2008
[2] Values measured by the RMP

Table 6. Recently collected total PBDE measurements in Bay harbor seals (Sutton et al. 2013)

Year	1998[1]	2006[2]	2007-2008[3]	2007-2008[4]
Samples (n)	2	2	9	5
Maximum (ng/g lipid)	8325	1600	11000	5076
Minimum (ng/g lipid)	2985	550	300	530
Geometric mean (ng/g lipid)	4985	940	970	1076

[1] She et al. 2002
[2] The RMP
[3] Greig et al. 2011; seals from central California, including regions outside San Francisco Bay
[4] Klosterhaus et al. 2012

Despite the decline in contaminant levels for all San Francisco Bay organisms under study, Sutton et al. (2013) documented that San Francisco Bay water and sediment concentrations have shown fewer clear temporal trends. San Francisco Bay-wide averages of the dominant congener in water, PentaBDE component BDE-47, suggest that this congener has disappeared from most locations in the San Francisco Bay with the exception of the Lower South Bay (**Figure 9**). In contrast, San Francisco Bay-wide averages of BDE-47 and the dominant congener in sediment, DecaBDE component BDE-209, show little change (Sutton et al. 2013). Because the phase-out of DecaBDE is still ongoing (**Section 4.1**), and because natural mixing and sample compositing may cloud any signal of recent changes to sediment contaminant loads, it may be some time before a clear trend emerges from study of this matrix (Sutton et al. 2013).

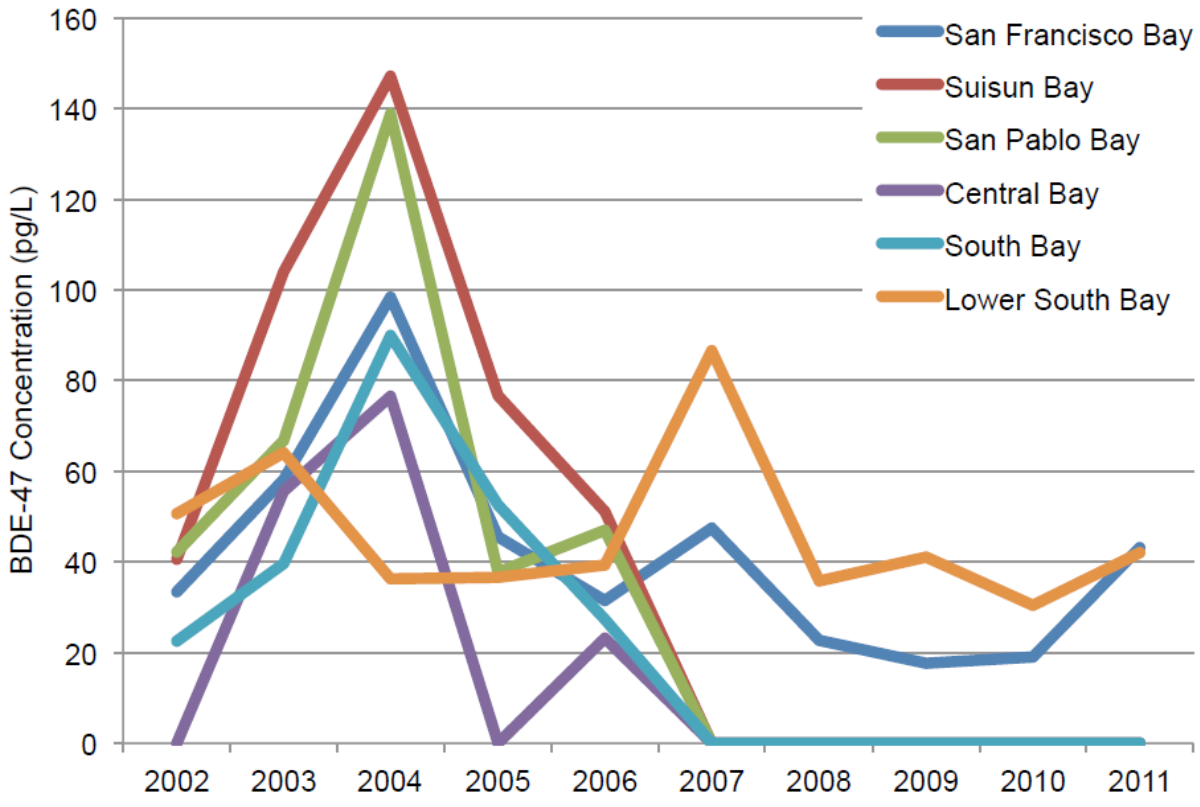

Figure 9. Regional distribution of BDE-47 in San Francisco Bay water over time (pg/L) (Sutton et al. 2013)

6.2 PBDE CONCENTRATIONS IN RUNOFF FROM LOCAL WATERSHEDS

Little data exist in the world literature on PBDE concentrations in stormwater, and where PBDEs have been sampled in stormwater, it has been done in mixed-use urban areas (Attachment A). Through funding from the RMP, SFEI has sampled 10 mixed-use watersheds around the San Francisco Bay Area for PBDEs in stormwater runoff. **Table 7** presents summary statistics for this monitoring effort. As noted in the table, most of these watersheds have only been studied at a pilot level, with fewer than 10 samples collected. One Alameda County watershed (Zone 4 Line A in Hayward) had 38 sample points with mean and median concentrations of 47 ng/L and 27 ng/L, respectively.

Table 7. PBDE concentrations in runoff from local watersheds based on locally collected data by the RMP. All watersheds include mixed-urban land uses (see also Attachment A)

Specific Location	N	PBDE concentrations (ng/L)				Reference
		Min	Max	Mean	Median	
Borel Ck, Peninsula Bay Area, CA	3	9	20	14	12	McKee et al. 2012
Coyote Ck, Santa Clara County, CA	7	7	36	15	13	SFEI unpublished
Guadalupe River, San Jose, CA	13	15	369	88	38	SFEI unpublished (WY 2012); McKee et al. 2006
Lower Marsh Ck, Brentwood, CA	1	20	20	20	20	SFEI unpublished
Lower Penetencia Ck, Milpitas, CA	4	13	22	18	19	McKee et al. 2012
San Leandro Ck, San Leandro, CA	3	41	80	57	50	SFEI unpublished
Santa Fe Channel, Richmond, CA	2	24	30	27	27	McKee et al. 2012
Sunnyvale East Channel, Sunnyvale, CA	6	5	100	48	42	McKee et al. 2012; SFEI unpublished (WY 2012)
Zone 4 Line A, Hayward, CA	38	0	430	47	27	Gilbreath et al. 2012
Zone 5 Line M, Union City, CA	4	34	128	75	69	McKee et al. 2012

6.2.1 Results of Investigation of Local Watershed with Anomalous Elevated PBDE Concentrations

Although the stormwater data for the San Francisco Bay Area does not exist for homogenous land uses, SFEI preliminarily explored correlations between PBDE concentrations in the San Francisco Bay Area watersheds and the land uses in those watersheds (Attachment A). This exploration yielded strong correlations with the combined sum of High Residential and Open Compacted spaces (**Figure 10**). However, the linear trend line in **Figure 10** excludes the Zone 5 Line M watershed in Union City because it does not follow this correlation. The Zone 5 Line M watershed land uses are approximately 31% residential, 11% transportation, 36% open, 15% commercial, and 7 % industrial (Attachment A). SFEI conducted a cursory review of the current industrial sector of this small watershed using Google Maps and Google Earth. This cursory review revealed several parcels that may be contributing to the elevated PBDE concentrations. These parcels included two custom plastics manufacturers, and a furniture distribution warehouse plus possible small-scale furniture recycling at this location. Given the anomalous results obtained from this watershed, SFEI suggested that these parcels may warrant local or site-

specific control measures after further investigation. Past uses as industrial facilities (e.g. Pacific States Steel clean-up site) may also pose legacy issues in this watershed.

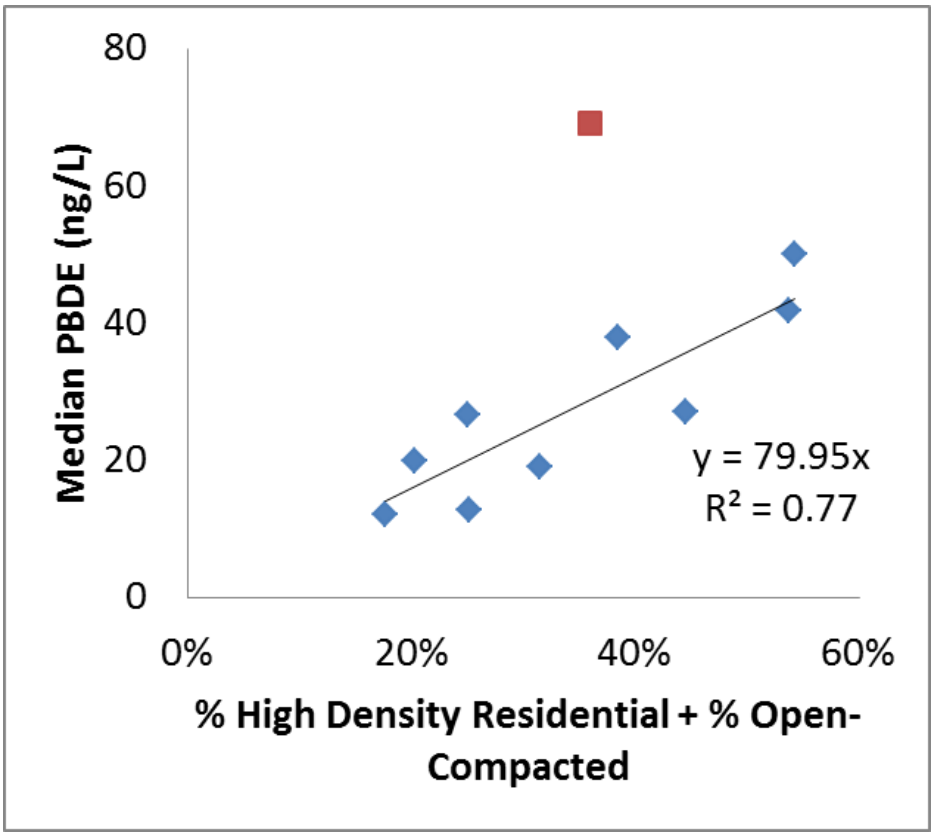

Figure 10. Median PBDE concentrations in relation to the percentage of high density residential development (< 0.333 acres/unit) and percentage compacted open space in nine Bay Area watersheds (see also Attachment A). The linear trend line is related only to the nine watersheds represented by blue markers; the red marker is Zone 5 Line M.

6.2.2 Correlation between Elevated PBDE Concentrations and Other POCs

SFEI also regressed local PBDEs in stormwater data with total mercury (HgT) and PCBs (sum of 40 congeners) to provide preliminary evidence if, at a regional average scale, targeting the clean-up of either of these high priority POCs would result in multiple benefits for management of PBDEs (Attachment A). In water, median PBDE concentrations correlated fairly well with HgT, but not with PCBs (**Figure 11**). When normalized to suspended sediment concentration, PBDEs did not correlate well with either HgT or PCBs (**Figure 12**). This data suggests that, on a spatial scale, control measures aimed at reducing HgT loads in water may be coordinated with control measures aimed at reducing PBDE loads in this media. However, control measures aimed at reducing PCBs in water and sediment or HgT in sediment may not be beneficial for reducing corresponding PBDE loads in those media.

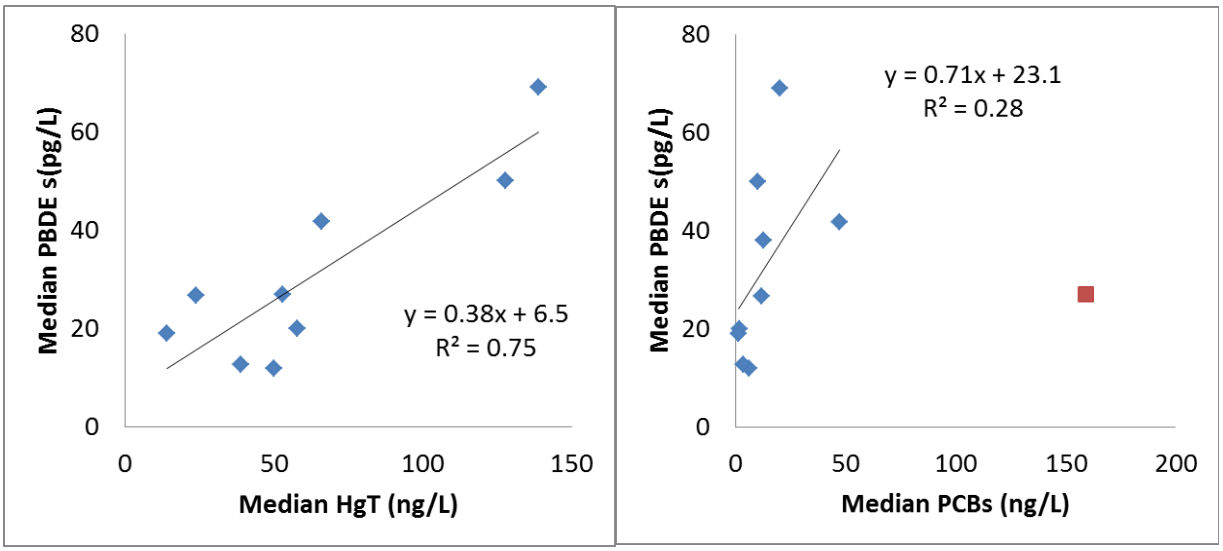

Figure 11. Median PBDE concentrations in relation to median HgT and median PCB concentrations in San Francisco Bay area watersheds (Attachment A). The Guadalupe River watershed data is excluded as anomalous from the regression with median HgT due to Hg mining influence in this watershed. The outlier data point in red for median PCBs is the PCB hot spot watershed, Santa Fe Channel.

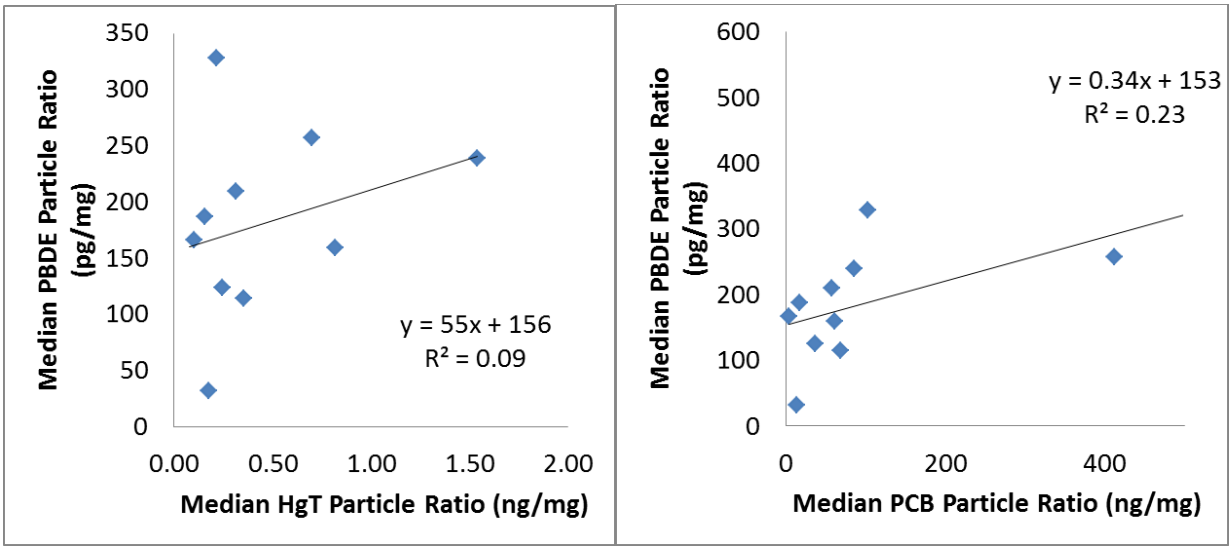

Figure 12. Relationships of median PBDE particle ratios with HgT and PCB particle ratios in San Francisco Bay Area watersheds (Attachment A)

7 Current and Planned Control Measures

This section provides a summary of control measures implemented by Permittees to control the discharge of PBDEs from municipal stormwater to the San Francisco Bay.

Under the MRP, and through many other efforts, Permittees are currently implementing a series of control measures to improve the quality of stormwater runoff into the Bay. These measures, though not directly aimed at controlling PBDEs, have the effect of reducing all Pollutant of Concern loads conveyed through stormwater into the Bay. The evidence of declining PBDE levels in San Francisco Bay biota and the outcome of the RMP's modeling suggest that existing management actions to eliminate production and use of PBDEs should be sufficient to address the potential impacts of contamination of San Francisco Bay (Sutton et al. 2013). Therefore new PBDE-specific control measures for municipal stormwater Permittees in the Bay Area are not included in the list below or planned for the future. The implementation of pilot and new control measures that are focused on other high priority sediment-associated pollutants (e.g., PCBs and mercury) will also have reduction benefits for PBDEs.

7.1 MEASURES TO PREVENT AND REDUCE PBDE DISCHARGES

Many existing activities in the MRP serve to reduce discharges of PBDEs.

- Best Management Practices (BMPs) at municipal operations sites: Provision C.2 requires development and implementation of appropriate BMPs by all Permittees to control and reduce non-stormwater discharges and polluted stormwater to storm drains and watercourses during operation, inspection, and, routine repair and maintenance activities of municipal facilities and infrastructure. Requirements such as development of site-specific BMPs and implementation of Stormwater Pollution Prevention Plans at corporate yards can reduce sediment and runoff discharges into the stormwater conveyance systems ultimately reducing the POC loadings (including PBDEs) into the Bay.
- Source control, site design, stormwater treatment, and low impact development for land development projects: Practices required under Provision C.3 are ultimately aimed at retaining or infiltrating stormwater on site and reducing runoff volumes to the Bay. Increases in runoff may cause excess erosion in stream channels, releasing potentially contaminated sediments, including those with elevated PBDE concentration.
- Industrial and Commercial Site Controls: Provision C.4 of the MRP requires Permittees to implement an industrial and commercial site inspection and control program at all sites that could reasonably be considered to cause or contribute pollutants to urban runoff. Follow-up and enforcement actions consistent with local Enforcement Response Plans (ERPs) to prevent discharges of pollutants and impacts on beneficial uses of receiving waters are implemented as needed. Inspections are carried out to ensure that the facilities have implemented adequate and appropriate control measures. The ERP provision allows for future incorporation of information-gathering at specific types of facilities if regulatory priorities for PBDEs change in the future. Facilities covered under the new statewide Industrial General Permit would also be subject similar self-reporting standards.

  Enhancing stormwater pollution prevention plans at industrial and commercial sites can be beneficial for reducing PBDEs and other contaminants in their stormwater. If PBDE

loading reductions increase in priority, local agencies may choose to identify electronics and carpet/foam recycling facilities, as well as manufacturers of plastics, electronics, cars, and textilesas potential sources which could be prioritized for higher frequency inspections. In one recent case, USEPA conducted several inspections and noted evidence of non-compliance with the Federal Clean Water Act at Sims Metal, an autoshredder in Redwood City. Under an EPA-issued Order, Sims Metal is now required to sample storm water discharges more frequently throughout the rainy season, to revise their stormwater pollution prevention plan to update monitoring and sampling, and to develop and implement stormwater pollution control measures for all areas of activity (USEPA2011). As further noted in Section 7.3, DTSC has initiated a review of current technical data and information on treatment processes at these facilities and it is re-evaluating the non-hazardous waste classification of autoshredder waste. A decision is expected late 2014.

- Construction Site Control: Provision C.6 of the MRP requires Permittees to implement a construction site inspection and control program at all construction sites. Permittees conduct inspections to determine compliance and effectiveness of the construction site measures, and require timely correction if violations are found. Permittees require all construction sites to have site-specific and seasonally- and phase-appropriate control measures such as:
    - Erosion and sediment control;
    - Good site management;
    - Run-on and Run-off control;
    - Non-urban runoff management; and
    - Active treatment systems (as necessary).

  Erosion and sediment control approaches are helpful in preventing mobilization of sediment that may have been enriched by PBDEs from legacy uses.

- Urban Runoff Treatment Retrofits: Storm drain inlet inserts, flow through separation devices (e.g., hydrodynamic separators), vegetated filtration systems (grassy swales), infiltration trenches/basins, media filtration, detention basins, wet ponds and constructed wetlands can intercept sediments in the urban runoff conveyance system and may reduce the load of POCs, including PBDEs, to the Bay. These urban runoff treatment structures may be installed by municipalities on public and capital improvement projects or as retrofits projects targeting pollutants of concern. Through pilot studies conducted in compliance with provisions C.11/12.e of the MRP, Permittees are currently evaluating the effectiveness of urban runoff treatment retrofits and assessing the costs of implementing these actions. The focus of these studies is PCBs and mercury, however, all pollutants in urban runoff, including PBDEs will likely benefit from the information being collected. Although sources and pathways differ between PBDEs and other POCs, potential focused implementation of enhanced urban runoff system operation and maintenance for PCBs/mercury in the future may also assist Permittees in reducing the load of PBDEs to the Bay from urban runoff.

- Solid and Household Hazardous Waste Disposal. Permittees also operate, promote, coordinate or otherwise facilitate programs for collection of household hazardous waste or electronic waste, and recycling or collection of furniture and other bulky waste. These

efforts are driven primarily by targets for solid waste reduction but also have the effect of reducing PBDE release from improper disposal of various consumer goods.

7.2 BAY AND WATERSHED MONITORING

Through their participation in the RMP, the MRP Permittees have supported status and trends monitoring of PBDEs in San Francisco Bay water and sediment since 2002 (reviewed in Sutton et al. 2013). The RMP has also supported research into PBDE effects on biota through funding from the Pilot/Studies and Special Studies program. While these data show that regulatory bans and phase-outs have already led to declines in PBDE contamination in Bay biota over the last decade, there may be increasing occurrence in the Bay of alternative (non-PBDE) flame retardants substituted in consumer products by manufacturers; thus Sutton et al. (2013) propose that continuing RMP monitoring and research on PBDEs be combined with additional investigation of the most likely alternative chemicals. Future RMP planning will consider these recommendations and allocate resources for monitoring and special studies according to the management priorities and information needs for PBDEs or alternative flame retardants.

The Small Tributaries Loading Strategy (STLS) is a collaboration of Permittees and the RMP that addresses the MRP Provision C.8.e requirement to conduct Pollutants of Concern (POC) monitoring to assess inputs of priority POCs to the San Francisco Bay from local tributaries and urban runoff, and also provide stormwater monitoring data for POCs with lower regulatory priority including PBDEs. The STLS Multi-Year Plan*[2] documents monitoring methods and design, as well as the complementary development of a Regional Watershed Spreadsheet Model (Lent and McKee 2011, Lent et al. 2012) and guidance for articulating the model for specific POCs (e.g. Attachment A for PBDEs).

Due to limited data, the contribution of specific potential sources identified in Attachment A to PBDE releases into the Bay is unclear. It is also unknown what portions of those releases are conveyed through stormwater. Many of the sources may release PBDEs through air emissions which ultimately accumulate into the Bay through air depositions. Any such releases are beyond the scope of the stormwater controls.

7.3 RELATED REGULATORY CHANGES

The types of facilities identified as potential PBDE sources (autoshredders, electronics and carpet/foam recyclers, and plastics, electronics, cars, and textiles manufacturers) are also considered industrial operations under the Federal Clean Water Act and are subject to the State's Industrial General Stormwater Permit. This permit is in the process of being reissued by the State Water Resources Control Board (State Water Board); increased monitoring, more stringent BMPs, and increased self-inspections are proposed in the draft permit[3] (State Water Board draft 2013). In addition, these facilities are regulated directly by the Regional Water Board and USEPA can enforce the Federal Clean Water Act.

As previously mentioned, autoshredders generate considerable amounts of non-metallic waste from materials found in automobiles and household appliances that remain after the recyclable

[2] STLS Multi-Year Plan included as Appendix D-1 of the Urban Creeks Monitoring Report available at www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/UC_Monitoring_Report_2012.pdf

[3] The anticipated effective date of the reissued permit is January 1, 2015.

metals are removed. These waste materials are treated with inorganic binders to reduce their potential to leach heavy metals in their ultimate disposal as ADC at landfills. In 2012, the Altamont Landfill in Livermore used a total of 131,700 tons of autoshredder waste (ASW) for ADC (CalRecycle 2012). In recent years ASW has come under scrutiny from DTSC as the Department is concerned that the concentrations of heavy metals in this waste may ultimately pose environmental risks (DTSC 2013). The treated waste is currently subject to an exemption from hazardous waste designation; the exemption allows the facilities to treat their waste on-site without a DTSC permit, and allows for the treated ASW to be disposed as nonhazardous waste (hence its disposal as ADC in municipal landfills).According to DTSC, the exemption was granted in the late 1980s and it is based on scientific evidence available at that time (DTSC 2013). To account for advances in testing and analytical methods, DTSC has initiated a review of current technical data and information on ASW treatment processes and it is re-evaluating the non-hazardous waste classification of ASW. Because DTSC is involving many stakeholders not only from the industry but also from affected state and local agencies (CalRecycle, State Water Board, local air quality management districts, etc.), the re-evaluation process is expected to last until late 2014. DTSC will announce its decision at that time and then develop a course of action based on the findings of this process (DTSC 2013).

Ultimately, a potential classification of ASW as hazardous waste may not necessarily affect the release of PBDEs from autoshredding sites, but would prevent the PBDE-containing ASW from being disposed in municipal landfills and from potentially being released back into the environment from these sites. This type of wide-reaching regulatory decisions can have significant impact in controlling PBDE releases into the environment. Overall, source-control activities taken at the local level have limited effectiveness for PBDEs; the most effective form of source control is legislation to ban the use and importation of PBDEs as flame retardants.

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ATTACHMENT **A**

PBDEs Pollutant Profile (Hunt et al. 2013)

PBDEs Pollutant Profile

Introduction and Purpose of Document

This profile was prepared by SFEI as one of a series supporting development of the Regional Watershed Spreadsheet Model (RWSM) for estimating pollutant loads to the San Francisco Bay per the joint RMP-BASMAA Small Tributaries Loading Strategy. The RWSM will be used to generate pollutant-specific sub-models using spatial datasets that define input runoff coefficients for local land use types and also pollutant-specific "source areas". The first step for each pollutant-specific sub-model is to review what is known locally and/or internationally about the sources or use characteristics and processes of release and transport of the San Francisco Bay. 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. This information for Polybrominated Diphenyl Ethers (PBDEs) is compiled into this profile. BASMAA funded the preparation of this document to assist in fulfilling C.14 MRP requirements, but the profile's focus is on all potential sources to Bay, as well as conveyance by stormwater and local tributaries from the SF Bay watershed.

PBDEs: description, historical usage, and behavior in environment

Polybrominated diphenyl ethers (PBDEs) are a group of flame retardant additives used in thermoplastics, polyurethane foam, and textiles. These materials are found in products within clothing, homes, offices, automobiles and airplanes. PBDEs are diphenyl ethers with one to ten bromine atoms attached (Figure 1) and although 209 congeners are possible, only some of the congeners are manufactured or result as degradation products.

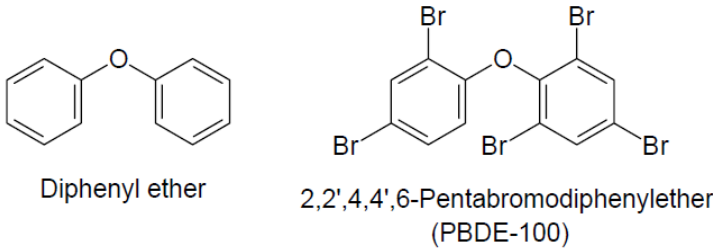

Figure 1. Diphenyl ether structure and structure of BDE-100 (illustration from California Environmental Protection Agency, 2006).

Over the last 60 years, concurrent with increasing applications of petroleum-based polymers, usage of flame retardants also increased as regulations led to their integration into the polymers to meet fire safety expectations. Organobromine compounds are the most effective of the halogenated organic flame retardants, and widespread usage and commercial production of PBDEs as a flame retardant began in the 1970s. There are

three commercial mixtures of PBDEs, each named for the average bromination level of the various congeners that comprise the mixture ("penta-", "octa-", and "deca-BDE"; Table 1).

Table 1. Commercial mixtures of PBDE flame retardants, congeners comprising each mixture, and the predominant usage of each mixture.

Commercial Mixture	Congeners present, listed in order of dominant composition (greatest to least)[a]	Predominant usage
pentaBDE[b] (commercially known as DE-71 and Bromkal 70-5DE)	BDE 99 (35-50%), 47 (25-37%), 100, 153, 154 and possibly minor amounts of 17, 28, 66, 85, 138 and 183	Approx 95% used in polyurethane foam in furniture cushions, automobile seats and head rests, and mattresses; Approx 5% used in foam-based packaging and carpet padding
octaBDE[b] (commercially known as DE-79)	BDE 183 (40%), 197 (21%), 203 (5-35%), 196, 208, 207, 153 and 154.	Approx 95% used in ABS resins; Approx 5% used in other plastics for computers and kitchen appliances
decaBDE[b] (commercially known as DE-83R and Saytex 102E)	BDE 209 (97.5%), 206, 207 and 208.	General purpose flame retardant used in virtually any type of polymer, including thermoplastics, textiles, and back-coatings of consumer electronics, the backs of television sets, wire insulations, upholstery, electrical boxes, and high impact polystyrene (HIPS) plastic

[a]Congener composition information from Alaee et al. 2003 and U. S. Environmental Protection Agency 2010.
[b]For this report, "pentaBDE", "octaBDE", and "decaBDE" will refer to the commercial mixtures and not the homologue group.

Scarce data on market demand for PBDEs is available (Table 2). The period of peak usage of each formulation is not well-known and likely varies across regions of the world. As described in a review by Hale et al. (2006), sediment core data from Europe and Japan show peaks in the early to mid-1990's, suggesting that peak market demand and usage occurred sometime prior given the time required for PBDEs to cycle from their products into sediments where they would be observed in sediment core data. In contrast, total self-reported environmental releases of decaBDE in the United States (U.S.) peaked in 1999 (53.9 metric tons (metric t)), and stayed at similar levels through 2002 (Toxic Release Inventory, accessed January 2013). There has since been a steady decline down to 21.1 metric t in 2007 and 8.4 metric t in 2011, likely due to the imminent ban on production and usage (in 2013, discussed later). If the US market tracks self-reported releases by US production/processing entities, this may suggest concentrations in the U.S. environment may not be expected to peak until post-2002, although it is unclear whether or not environmental peaks have yet occur ed. Indeed, core data from two out of three wetland areas in the San Francisco (SF) Bay collected in 2005-2006 showed increasing trends in PBDE concentrations without any sign of plateau (Yee et al., 2011). On the other hand, in a recent review of PBDEs in the SF Bay, Sutton et al., (in prep) reported that concentrations in water and sediment over the ten year period of record have not shown distinct trends, while concentrations in Bay wildlife are trending downward.

Table 2. Market demand statistics for PBDEs. Data in metric tons (metric t).

	1991	1999[a]			2001[b]			2003[c]
	PentaBDE	PentaBDE	OctaBDE	DecaBDE	PentaBDE	OctaBDE	DecaBDE	All PBDEs
Americas	4,000	8,290	1,375	24,300	7,100	1,500	24,500	not reported
Europe	unknown	210	450	7,500	150	610	7,600	not reported
Asia	unknown	---	2,000	23,000	150	1,500	23,000	not reported
Rest of world	unknown	unknown	unknown	unknown	100	180	1,050	not reported
Total	4,000	8,500	3,825	54,800	7,500	3,790	56,100	56,418

[a] = Watanabe and Sakai, 2003
[b] = U.S. Department of Health and Human Services, 2004
[c] = U.S. Environmental Protection Agency, 2010

Recent History of Environmental Concerns and Regulatory Response:

Studies of PBDEs in laboratory animals have suggested potential concerns about liver toxicity, thyroid toxicity, developmental and reproductive toxicity, and developmental neurotoxicity (reviewed in U.S. Environmental Protection Agency, 2010). There is concern over human exposure to PBDEs, especially in children given the typical exposure mechanism being indoor dust coupled with the increased hand-to-mouth frequency for children. Studies of human blood, breastmilk and adipose tissue samples indicated rapidly increasing concentrations of PBDEs over the last two decades, with concentrations in North Americans generally several times higher than those seen in Europeans (U.S. Environmental Protection Agency, 2010). Although the most recent findings suggest that concentrations in SF Bay biota are decreasing (Sutton et al., 2013), PBDEs measured in humans and wildlife in the SF Bay Area are amongst the highest concentrations reported anywhere in the world (She et al., 2007; reviewed in Shaw and Kannan, 2009). One hypothesis for these elevated concentrations is the existence of California Technical Bulletin 117 (Zota et al., 2008) first passed in 1975, which requires a stricter degree of flame retardation in upholstered furniture than fire safety regulations elsewhere. Until phase-out in 2006, pentaBDE was the predominant flame retardant used to comply with TB 117.

Governments have responded to the rising environmental concerns over PBDEs with bans on production and usage (Table 3). The earliest bans went into effect in parts of Europe, and focused on the penta- and octa-BDE formulations due to the evidence that lower-brominated congeners bioconcentrate more readily than the higher-brominated congeners. Nevertheless, bans on deca-BDE have followed in some locations. In 2003, California passed Assembly Bill 302, becoming the first U.S. state to prohibit the manufacture, distribution, and processing of products containing the penta- and octaBDE formulations. This phase-out was originally scheduled for 2008, although the Legislature later accelerated that timeframe for phase-out to begin as of June 1, 2006. The United Stated Environmental Protection Agency (USEPA) has now negotiated with the two major U.S. manufacturers to end production, importation, and sales of decaBDE for most uses by December 31, 2012, and to end all uses by late 2013 (U.S. Environmental Protection Agency, 2010). The USEPA has also encouraged the other minor importers of decaBDE to join this initiative, although the ban does not prevent decaBDE importation.

Table 3. Years when bans on PBDEs went into effect in various parts of the world.

	Year of Ban		
Location	**pentaBDE**	**octaBDE**	**decaBDE**
California	2006	2006	2013[1]
European Union	2004	2004	2008
Sweden	1999	unknown	2007
Australia	2007	2007	unknown
China	2006	2006	unknown

How do PBDEs behave in the environment?

PBDEs enter our surface waters primarily from stormwater runoff and sewage treatment plant discharges, as well as in minor amounts from rainfall and direct atmospheric deposition. PBDEs in the terrestrial landscape are primarily atmospherically deposited after emissions from production, use, and disposal/recycling. PBDEs are semivolatile organic compounds and have low water solubilities, however their vapor pressures differ enough from one another to affect their movement into and within various media of the environment. At air temperatures of 25°C, > 98% of the mono-, di-, triBDE (homologue group) congeners may be present in the vapor phase, tetra- and pentaBDE (homologue group) congeners begin to distribute more to atmospheric particles (e.g. BDE-47 is 10% particle phase, BDE-99 is 39% particle phase), hexa- and hepta- congeners are 87 - 99% particle phase, and 99% of BDE-209 is expected to be associated with airborne particles. This vapor versus particle phase distribution has important implications for how and where different BDEs move and settle in the environment.

Air: Lower-brominated homologs (e.g., tri- and tetraBDE) are volatile and persistent enough to permit long-range transport. In fact, the tetra-brominated BDE-47 has even been detected in environmental samples in remote regions of the world such as the Arctic and Tibetan Plateau (de Wit et al., 2006; Wang et al., 2009a). Higher-brominated congeners (e.g. BDE-209) may also be found in air samples, but are more likely to deposit closer to their sources as they are more prone to wet and dry atmospheric deposition. For example, in a study of atmospheric concentrations of PBDEs in urban and rural areas of the Great Lakes region, Strandberg et al. (2001) found that the dominant congeners in air samples were BDE-47, -99, and -100, while BDE-209 was only detected in the Chicago area, likely near to point sources. Ambient and near source air monitoring has been conducted by the California Air Resources Board (CARB) in California urban areas and near automobile shredders and electronics recycling facilities. While all urban areas contained background levels, the near source areas were highly elevated in comparison (results discussed in greater detail later).

[1] As described in the text above Table 3, this "ban" is actually a negotiation between the U.S. EPA and the two major U.S. manufacturers to end production, importation, and sales of all decaBDE by the end of 2013. This does not effectively ban importation of decaBDE by smaller importers.

Soil/Sediment: Adsorption of PBDEs increases with bromination and organic carbon content of soil and sediment. PBDEs in soils across the landscape are therefore expected to be in greater concentrations nearest to point sources – urban areas, and source areas within the urban environment. In particular, decaBDE (predominantly BDE-209) is expected to deposit near its source and not be particularly mobile in the environment. DecaBDE will transport however, via the particle it is bound to as that particle is mobilized through the environment (e.g. in stormwater runoff).

Water: In water, greater proportions of the lower-brominated homologs will remain suspended in the water column as compared to the higher-brominated homologs that are more likely to settle out on sediment particles. In the SF Bay, BDE-47 is the congener found in the highest concentrations in the water column, whereas BDE-209 is the dominant congener in the Bay's surficial sediment samples (Klosterhaus et al., 2012).

Stormwater: Stormwater represents an important pathway particularly for the particle-bound higher-brominated PBDEs (e.g. BDE-209) to move from the terrestrial landscape to the Bay. Stormwater concentrations in Zone 4 Line A, a 100% urban tributary in Hayward, showed a strong correlation with turbidity, for both the sum of PBDEs as well as the individual congeners BDE-47 and BDE-209 (r^2 = 0.88, 0.9, and 0.86, respectively; Gilbreath et al., 2012). In this watershed, an estimated 99.3% of the total PBDE load was transported during storm flow conditions and 58% of the total load was BDE-209 and 6% was BDE-47 thus the majority of PBDEs in stormwater are accounted for with these two BDEs alone. BDE-99, 206, 207 and 208 contributed another 5-10% of the load. These observations are consistent with other local urbanized tributaries in the SF Bay Area well (Oram et al., 2008).

Debromination and Transformation: Lower-brominated PBDEs are more lipophilic, and hence more likely to accumulate in aquatic organisms, than their higher-brominated counterparts. However, studies suggest that transformation of higher-brominated congeners to more bioaccumulative forms may occur through microbial degradation, metabolic debromination, photodegradation, and possibly reaction with the hydroxyl radical (reviewed in U.S. Environmental Protection Agency, 2010).

Release Mechanisms to the Environment and Possible Pollutant Source Areas

Environmental sediment core data from numerous studies generally show increases in PBDEs beginning in the late 1960's or early 70's (Qiu et al., 2010; Zegers et al., 2003), concurrent with the beginnings of commercial production. Although in California the penta- and octa- formulations were banned in 2006, and production, importation, and sales of decaBDE by the two major US manufacturers will end for all uses by the end of 2013, the volume of PBDEs still in use in products manufactured prior to these bans is enormous. Steadily over the next several years to decades, this standing stock will be disposed of or recycled, creating still further opportunities for PBDEs to enter the environment. Releases of PBDEs to the environment can occur during initial synthesis of

the compounds, during its incorporation into polymers, during the usage of products containing PBDEs, and as the result of disposal, recycling or incineration of PBDE-containing products. These pathways of release into the SF Bay Area environment are explored in this section.

Initial Synthesis: There are no locations of manufacture of PBDEs in the SF Bay Area. PBDEs were historically manufactured within the U.S. only in Arkansas and will no longer be manufactured at all in the U.S. after 2013.

Releases from Incorporation Processes into Polymers: Given the recent bans on usage in consumer products, sites of PBDE incorporation into polymers should not be a continuing mechanism of release into the environment. However, legacy contamination may exist around areas where such manufacture occurred in the past. While not an exhaustive list of decaBDE sources as only certain emitters are required to self-report, the USEPA Toxic Release Inventory (TRI) includes two business locations within the Bay Area that self-report on- and off-site releases of decaBDE. Both locations are in the Peninsula region (Redwood City and Menlo Park) and are associated with Tyco Thermal Controls. While the majority of decaBDE disposal from these businesses has been done through landfilling and recycling, air emission releases have also been reported. At the Redwood City location for nearly the entire period between 1991 and 2005, Tyco self-reported air emission releases of 113 kg of decaBDE each year. This is a significant load in relation to the previously estimated annual load to the SF Bay of 33-52 kg (BDEs 47+209; Oram et al., 2008). Other business types that may be important source areas include manufacturers of electronics equipment, plastics, cars, carpet and furniture.

During Product Usage: Degradation of in-use products containing PBDEs is an important mechanism of exposure for humans and release particularly to the indoor environment. PBDEs are additive flame retardants, meaning they are simply blended into polymers rather than chemically bonded, enabling them to readily leach out of products. As a result, indoor dust represents the primary exposure pathway for most humans. Some of this dust migrates outside, some goes down our drains to sewage treatment plants, and some goes into the garbage can (e.g. through disposal of waste from vacuum cleaners) for disposal at a landfill. In addition, clothing is both a source as well as a filter for air and thus dryer lint is enriched with PBDEs (Stapleton et al., 2005), which is usually partially trapped in the dryer lint trap and disposed of in the garbage and partially vented to an outside wall of each house. In the outdoor environment, PBDEs are found ubiquitously, with more densely populated urban areas generally containing higher concentrations of PBDEs than agricultural and rural areas (with the exception of sewage sludge-applied lands (e.g. Strandberg et al., 2001)).

Source areas of in-use products that may have concentrations of PBDEs greater than the general urban signal might include:

- Carpet, upholstery and furniture manufacturers and warehouses
- Electronics manufacturers and distribution warehouses
- Foam manufacturers and distributors

Due to recent bans on PBDEs, these source areas are not expected to continue to release PBDEs at the same rates in the future, however, the immediate surrounding landscapes of the above-listed areas may have elevated PBDE concentrations due to a legacy build-up of leached PBDEs.

Disposal and Recycling: The most important remaining pathway for PBDE release into the environment is in the process of disposal – into landfills, recycling, or in sewage sludge. Landfill disposal is not expected to result in significant environmental releases because of the US laws for municipal solid waste landfills aimed at creating conditions to prevent such releases (liners, treated leachate[2]) (U.S. Environmental Protection Agency, 2010). However, environmental releases are expected or have been shown to result for all of the following source areas:

- E-waste recycling facilities
- Automobile shredding and recycling facilities or "Autoshredders"
- Carpet and foam recycling facilities
- Sewage Sludge application to rural lands
- Publicly Owned Treatment Works (POTW) sewage sludge incinerators

California e-waste is estimated at 1200 metric t/yr (Petreas and Oros, 2009) and comprises the largest proportion of PBDEs in the California waste stream. E-waste today is reflective of the magnitude of electronics sold in previous years, which increased (by weight, see Figure 2) steadily in the 1980's, and sharply in the 1990's to a peak of nearly 3 million short tons (2.92 M metric t) in 2000, and has since plateaued (U.S. Environmental Protection Agency, 2011). The USEPA estimates the average lifespan of most electronic products to range between 5 and 15 years, depending on the product. Therefore, despite the recent PBDE bans in California, we would expect PBDEs to remain in the e-waste stream for many years to come, and BDE-209 is expected to dominate the congener profile for these products. E-wastes are usually recycled, landfilled or incinerated, and a large proportion of e-wastes are exported to China. Elevated PBDE concentrations in runoff from e-waste recycling facilities may be expected, however the only studies to report sample data near such facilities are from China (see Table 4) where e-waste recycling practices may differ from practices in the U.S.

Autoshredders may pose as another important source area for PBDE releases given that PBDEs have been used in the plastics and foam within automobiles. Seven autoshredder facilities in California, two of which are in the SF Bay Area (Sims Metal Recycling in Redwood City and Schnitzer Steel in Oakland), generate an estimated 300,000 tons of waste (including millable components of automobiles, refrigerators, and ovens) each year (Department of Toxic Substances Control, 2002) primarily to be used as alternative daily cover (ADC; material other than soil placed on the surface of municipal solid-waste

[2] Untreated leachate has been found to contain PBDEs, however in the one study that addressed PBDE concentrations in treated leachate, no PBDEs were detected (reviewed in U.S. Environmental Protection Agency, 2010).

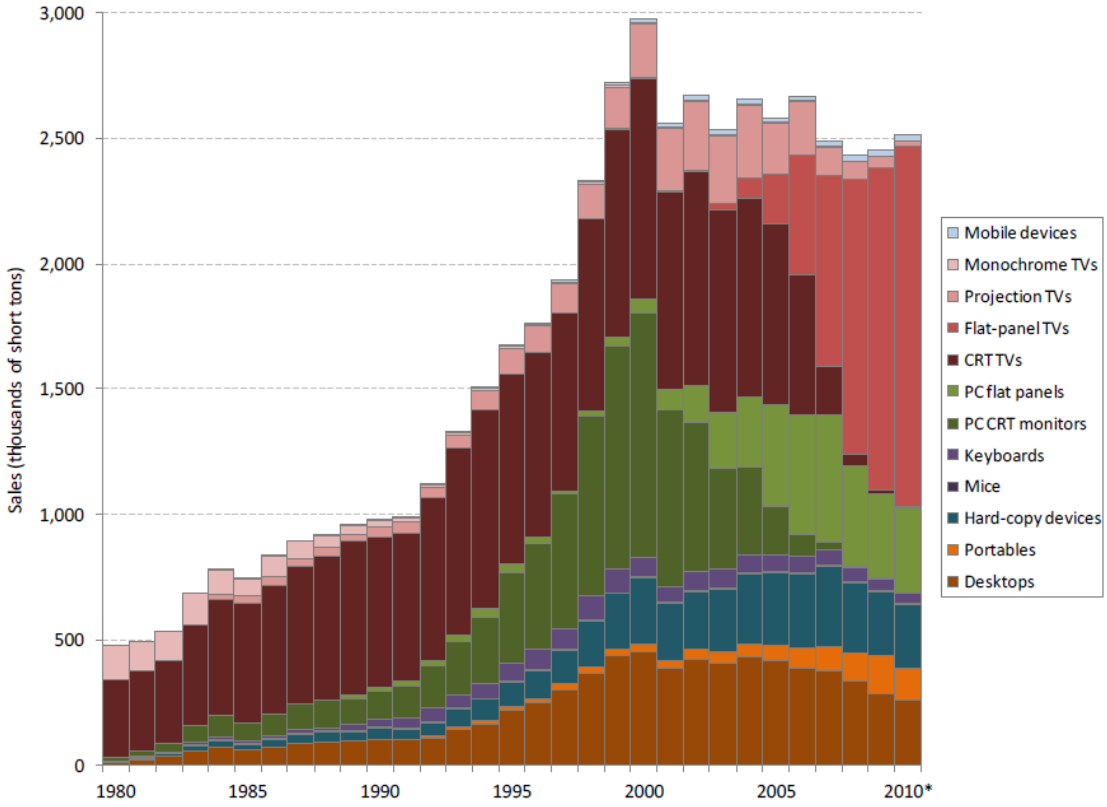

Figure 2. Annual sales of electronic products (in thousands of short tons) (from U.S. Environmental Protection Agency, 2011, without permission). PBDEs in these products range up to 30% by weight (Hale et al., 2003).

landfills at the end of each operating day). Shredder waste consists of glass, fiber, rubber, automobile fluids, dirt and plastics found in automobiles and household appliances that remain after the recyclable metals have been removed (Department of Toxic Substances Control, 2002). Autoshredder waste sampled in the SF Bay Area contained approximately 50,000 ng/g of total PBDEs (Petreas and Oros, 2009), though higher levels have been reported elsewhere (310,000 ng/g in Japan, Sakai et al., 2006). While usage as ADC in lined landfills is not expected to release PBDEs into the environment (U.S. Department of Health and Human Services, 2004) such that it would be available for transport to surface waters, autoshredder facilities can be an important local source when wind blows shredder residue or "auto fluff" onto surface waters or surrounding areas).

The CARB conducted ambient air monitoring in urban areas of California and near e-waste recycling and autoshredder facilities. BDE-209 near an electronics recycling facility measured up to 11,000 pg/m^3 and up to 1,900 pg/m^3 near an auto-shredding facility (Charles et al., 2005). These elevated near-source concentrations contrast sharply with ambient urban concentrations averaging 25 pg/m^3 of BDE-209 in six SF Bay Area

and Southern California cities (average of 160 pg/m^3 for the sum of PBDEs in 2004 monitoring; CARB website http://www.arb.ca.gov/app/dioxin/cadamp.php).

No data could be found on water or soil concentrations of PBDEs in or around carpet, carpet padding and foam recycling facilities. However, exposure to these sources has been shown to cause significantly elevated blood serum levels of PBDEs in humans (Stapleton et al., 2008) and thus areas surrounding these facilities may have elevated concentrations due to PBDE releases through the crumbling of this material at the end of its life and as it is being physically manipulated for disposal. A simple hypothetical scenario (inclusive of numerous untested assumptions) illustrates the potential magnitude of PBDEs that may be released into the environment from this source. An estimated 175,000 metric t of carpet and carpet padding was discarded to landfills and recycling in California in 2011 (CARE, http://www.carpetrecovery.org/, accessed Jan.2013). Assuming carpet padding represents approximately one quarter of the total discarded mass by weight, PBDEs in the carpet padding equal approximately 0.3% by weight (based on studies overseen by Dr. Robert Hale and reported by the Carpet Cushion Council, http://www.carpetcushion.org/bonded-cushion.cfm), 0.5%[3] of the PBDEs in that material are released to the environment during the disposal or recycling process, and then weighting the resulting load by the percentage of the California population living in the Bay Area (19%), then 125 kg of PBDEs would be released annually from discarded carpet padding. Again, this is a significant load in relation to the previously estimated annual load to the SF Bay of 33-52 kg (BDEs 47+209; Oram et al., 2008).

PBDEs have been found in high concentrations in sewage sludge. Land application of biosolids is generally viewed as beneficial (e.g. the U.S. EPA: http://water.epa.gov/polwaste/wastewater/treatment/biosolids/genqa.cfm), however, it also is a mechanism of redistribution of PBDEs out into the rural environment. Hale et al. (2001) tested 11 sludge samples from four different states and found that the sum concentrations of the -47, -99, -100, -153, and -154 congeners were relatively consistent regardless of location of pre-treatment, ranging from 1,100 to 2,290 ng/g. This exceeds some European sludge concentrations of these congeners by 10 to 100-fold (Hale et al., 2001; reviewed in de Wit, 2002). Concentrations of BDE-209 in the Hale et al. (2001) samples varied more greatly between 84.8–4,890 ng/g. Measurements of PBDEs in sewage sludge of the SF Bay Area are within a similar range: one POTW sampled in 2002 (North, 2004) and three others sampled in 2005 (Petreas and Oros, 2009) contained average total PBDE concentrations of 2,600 ng/g, and biosolids measured from two SF Bay Area treatment plants were 2,917 and 3,651 ng/g (County of Solano, 2012).

A report commissioned by the Bay Area Clean Water Agencies noted that the SF Bay Area produced 158,000 metric t of sewage sludge in 2007, and this number is projected to rise with increasing population (Mitchell, 2009). Of this, 19% (~30,000 metric t) was land applied (Figure 3; Mitchell, 2009). At an average concentration of 2,800 ng/g, an estimated total of 84 kg of PBDEs are annually released through sewage sludge land application. Although it is unknown how much of this load is applied within the Region 2

[3] It is unknown how realistic this assumption is.

boundary, Solano County reported an approximate average of 10,000 tons being land applied annually between 2002 and 2011 (County of Solano, 2012), so at least approximately 25-30 kg of PBDEs are being land applied within Solano County. Again, as compared with the previously estimated annual loads to the SF Bay, this back-of-the-envelope calculation shows that sewage sludge land application may have a significant role in PBDE loading to the Bay from at least certain small tributaries. Note however, that Solano has a higher proportion of crop agricultural land than most other Bay Area counties thus Solano is not necessarily typical.

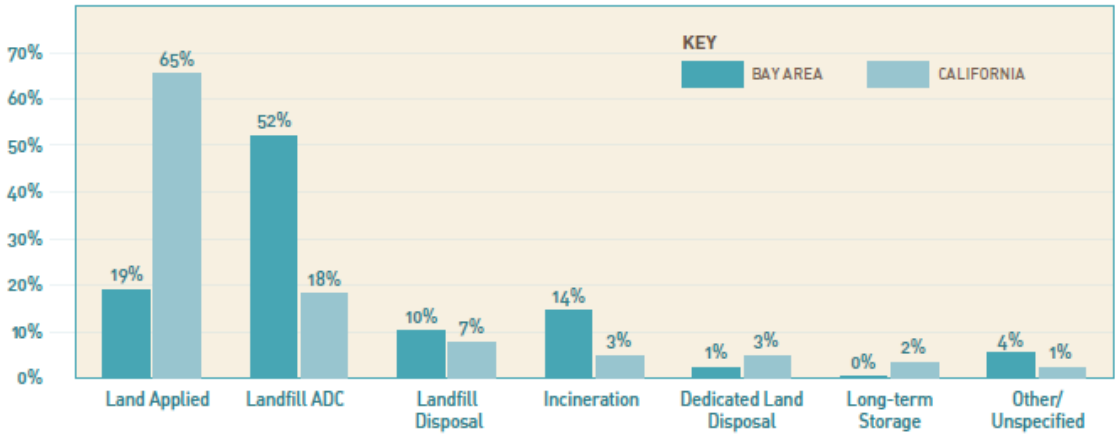

Figure 3. Bay Area and California biosolids management practices in 2007 (figure from Mitchell, 2009 without permission).

Landfilling of sewage sludge (as ADC) is not expected to result in environmental release, but incineration may. Only two POTWs in California incinerate biosolids, both of which are located in the SF Bay Area, explaining why a much greater portion of biosolids in the SF Bay Area are incinerated as compared to California as a whole (Figure 3). In a 2004 study in which stack emissions from a SF Bay Area POTW incineration facility were analyzed for brominated dioxins and furans, North noted that PBDEs were not measured because it was assumed all PBDEs would be transformed to dioxins during the process. Given that this study reported 96% of the PBDEs entering the POTW were trapped within the sludge, a follow-up study to verify that assumption may be warranted. Areas surrounding the two POTW incinerators located in the cities of Palo Alto and Concord may therefore represent source areas, however this hypothesis has not been studied.

Source Areas and Pollutant Concentrations in Soils

Soils data from a survey of the world literature supports the hypothesis that higher PBDE concentrations are generally found in the urban environment relative to the rural environment. The world literature on PBDE concentrations in soils is dominated by studies conducted in Europe (UK, Sweden, Norway, France) and China. Few studies have reported soils concentrations in the U.S. and to our knowledge, no soils data is available

for the SF Bay Area. In the following tables, we report statistics on soils data collected in individual studies (Table 4), as well as summarize this data into land use classes (Table 5) that may be considered for our regional modeling efforts.

The ordering scheme was chosen because most of the studies reported mean concentration data, whereas fewer studies reported medians (Table 5). The ordering would be very similar if the classes had instead been organized by maximum concentrations measured in each class, though the "urban" category would have moved farther down the list. This general ordering matches the conceptual model of PBDEs as a relatively ubiquitous urban contaminant, with a few important source areas. However, there is much deviation within this scheme when considering the individual studies (Table 4), and in part this is due to the variable definitions for land use terms. For example, Duan et al. (2010) looked at PBDE concentrations on a small island in China where the mean concentrations sampled amongst the various rural land uses there (5.5-14 ng/g) are elevated above some urban areas in France, the UK, and even other locations in China (Muresan et al., 2010; Harrad, 2006; Jiang et al., 2010). Likely, these more elevated concentrations are the result of Chongming Island's proximity to a very urban landscape (Chongming Island is part of the Shanghai municipal area and includes modern shipbuilding, port machinery and communications equipment manufacturing, and biopharmaceutical manufacturing). Other agricultural areas in China also indicate more elevated concentrations (e.g., Luo et al., 2009; Zou et al., 2007) and again, this may be due to the proximity to urban centers, or in the case of agriculture, it may be due to practices in biosolids application. With this in mind, there may be good justification to create a new land use category that describes open spaces that are in close proximity to urban (e.g. "rural with urban influence"), and to recognize that agricultural lands may have widely varying concentrations depending on biosolids application practices.

The very elevated levels of PBDEs in sludge applied lands are striking in that it provides further support for the hypothesis that PBDE distributions in soils are not isolated to the urban environment alone and PDBEs are being redistributed at high concentrations into portions of the rural environment. Commensurate with usage and market demand statistics, PBDE concentrations in sewage sludge tend to be higher in the U.S. than in Europe (Hale et al., 2001; Andrade et al., 2010), and therefore sludge applied lands in and near the SF Bay Area may have concentrations elevated beyond those reported outside the US. Ironically, of the studies reported here, the U.S. sludge applied lands return some of the lower concentrations. Complicating the understanding of PBDE concentrations in sludge applied lands, Andrade et al. (2010) demonstrated that multiple applications over the years leads to greater PBDE concentrations in the soil, and Gorgy et al. (2013) found that PBDE concentrations decrease exponentially with time following the application of biosolids with part of the losses attributed to downward migration of the PBDEs into the soil and hypothesizing that a large proportion of the PBDEs degrade. One might also hypothesize that some of the losses may be attributed to mobilization in stormwater runoff or irrigation runoff. Further additional factors such as the tonnage of biosolids applied per acre or differences in crop practices that enhance local degradation, resuspension, or wash-off of PBDEs may alter PBDE mass that may find its way into stormwater and result in elevated concentrations from sewage applied lands.

Table 4. PBDE concentrations in soils data from a search of world literature.

Class	Description	Specific Location	PBDE concentrations (ng/g)				Reference
			Min	Max	Mean	Median	
Background	Arctic	Russian Arctic	0.16	0.23	0.20[a]		de Wit et al., 2006
	Reference soils	Sweden	0.03	1.9	0.15	0.61	Sellström et al., 2005
	Upland soils	Tibetan Plateau, China	0.004	0.04	0.0111		Wang et al., 2009a
Open Space	Woodland	Chongming Island, China	7.0	16	12		Duan et al., 2010
	Woodland	France	0.23	5.1	1.2	0.59	Muresan et al., 2010
	Woodland	UK	0.11	12	6.1[a]	2.5	Hassanin et al., 2003
	Woodland	Norway	0.13	3.0	1.6[a]	0.97	Hassanin et al., 2003
	Grassland	Chongming Island, China	0.48	9.5	5.5		Duan et al., 2010
	Grassland	UK	0.07	6.0	3.0[a]	0.61	Hassanin et al., 2003
Agriculture	Agriculture	Pearl River Delta, China			15		Zou et al., 2007
	Agriculture	USA	< MDL	11	2.2	< MDL	Andrade et al., 2010
	Agriculture	USA			0.5		Rieck, 2004
	Agriculture	Canada			0.3		Gorgy et al., 2013
	Agriculture	France	0.24	44	1.9	0.66	Muresan et al., 2010
	Agriculture	Sweden	0.03	0.10	0.066	0.06	Matscheko et al., 2002
	Agriculture	Surabaya, Indonesia	0.08	0.35	0.23		Ilyas et al., 2010
	Agriculture (near urbanized area)	Chongming Island, China	0.32	37	14		Duan et al., 2010
	Agriculture (rural)	Qingyuan,China	5.3	29	20		Luo et al., 2009
	Agriculture near an electric and electronic manufacturing zone	Qingyuan,China	50	81	64		Luo et al., 2009
Rural	Rural	UK	0.07	0.29	0.22	0.24	Harrad, 2006
	Road - Rural (near urbanized area)	Chongming Island, China	5.7	26	14		Duan et al., 2010
Urban	Suburban	UK	0.24	0.40	0.32	0.32	Harrad, 2006
	Urban	Taiyuan city, China	0.02	211	26	2.1	Li et al., 2008
	Urban	France	0.32	18	2.2	1.1	Muresan et al., 2010
	Urban	UK	0.54	3.9	1.8	0.84	Harrad, 2006
	Urban	Shanghai, China	0.02	3.8	0.74		Jiang et al., 2010
	Urban	Harbin, China	0.002	0.06	0.026		Wang et al., 2009b
	Urban	Ningbo, China	1.0	20	11[a]	10	Wang et al., 2011

[a] The mean reported here was calculated as the average of the minimum and maximum concentrations reported in each reference.

Table 4 (cont). PBDE concentrations in soils data from a search of world literature.

Class	Description	Specific Location	PBDE concentrations (ng/g)				Reference
			Min	Max	Mean	Median	
Urban (cont.)	Urban roads	Surabaya, Indonesia	1	22	10		Ilyas et al., 2010
	Urban sewer sediments	Hochiminh city	55	119	82	83	Minh et al., 2010
	Urban	15 states in USA	0.09	1200	82	5.3	Offenberg et al., 2006 *in* U.S. Environmental Protection Agency, 2010
	Mixed urban/rural: Floodplain soils	Shiawassee R, Michigan	0.94	55	14		Yun et al., 2008
	Mixed urban/rural: Floodplain soils	Saginaw R, Michigan	0.09	19	3.0		Yun et al., 2008
Industrial	Industrial	Taiyuan city, China	6.0	144	46	28	Li et al., 2008
	Urban/Low-voltage electrical industrial area	Liushi, China	1.0	155	78[a]	30	Wang et al., 2011
Sludge Applied Lands	Sludge Applied Lands (1x application)	USA	0.51	34	14	11	Andrade et al., 2010
	Sludge Applied Lands (2x applications)	USA	8.5	140	58	55	Andrade et al., 2010
	Sludge Applied Lands	Sweden	0.06	3900	608	1.2	Sellström et al., 2005
	Sludge Applied Lands	Spain	30	689	266	184	Eljarrat et al., 2008
	Sludge Applied Lands	USA	140	7600	3870[a]		Rieck, 2004
	Sludge Applied Lands	Canada	30	600	315[a]		Gorgy et al., 2013
At and Near E-waste Centers	E-waste site soils	China	858	991	940	961	Cai and Jiang, 2006
	E-waste site soils (acid leaching and printer-roller dump site)	Guiyu, China	1440	3570	2505		Leung et al., 2007
	Near E-waste site soils	Pearl River Delta, China	28	122	79	86	Zou et al., 2007
	Road soils of e-waste recycling area	Qingyuan, China	191	9156	2689		Luo et al., 2009
	Urban/E-waste heavy area	Fengjiang, China	95	220	158[a]	140	Wang et al., 2011
	Ag soils near e-waste recycling area	Qingyuan, China	5.0	207	42		Luo et al., 2009
Near Polyurethane Foam (PUF) Plant	Near PUF manufacturing plant	USA	ND	76	30	14	Hale et al., 2002

[a] The mean reported here was calculated as the average of the minimum and maximum concentrations reported in each reference.

Table 5. Summary of PBDE concentrations by class and organized from least to greatest by the mean of the mean[4] concentrations within each class.

Class	N studies	PBDE concentrations (ng/g)		
		Minimum	Maximum	Mean of Means
Background	3	0.004	1.9	0.12
Open Space	6	0.065	16.2	4.9
Rural	2	0.073	26.0	7.3
Agriculture	10	ND	81.2	12
Urban	12	0.002	1200	20
Near PUF Plant	1	ND	76.0	30
Industrial	2	1.00	155	62
Sludge Applied Lands	6	0.063	7600	855
At and Near E-waste Centers	6	5.00	9156	1250

Given the differences in usage of PBDEs between the U.S. and Europe (see market demand in Table 2), and the differences in end-use disposal practices between the U.S. and China (the U.S. typically exporting large quantities of e-waste to China), extrapolation from the world literature to the SF Bay should be done with caution. Although magnitude of use may be elevated in California relative to European countries, the use categories should be the same perhaps leading to generally similar land use relationships.

It should be noted that the PBDE concentrations presented in these two tables are generally much less than seen in the SF Bay Area for PCBs in soils and sediments (e.g. Yee and McKee, 2010). For example, the open space and urban soil concentrations for PCBs are approximately 0.02 mg/kg and 0.06 mg/kg or 20 ng/g and 60 ng/g respectively. Given we generally see higher concentrations and loads of PBDEs relative to PCBs in our mixed land use urban areas, it is a little surprising that PBDE soil concentrations are not at least as high if not higher than the PCB concentrations. If PBDEs are not in the soils at the same magnitude as PCBs and yet they are in urban stormwater at 2-3 times the concentrations of PCBs, they must be coming from real source areas that are specific to PBDEs or from atmospheric fallout onto impervious surfaces such as roadways and rooftops and being washed off during storm events and particulate phase. At this time we cannot be certain of the pathways and processes.

Pollutant Concentrations in Stormwater

Little data exist in the world literature on PBDE concentrations in stormwater, and where PBDEs have been sampled in stormwater, it has been done in mixed-use urban areas

[4] This includes central tendency figures calculated by averaging the minimum and maximum concentrations provided by each reference for those cases in which no average concentration was reported.

(Table 6). Only two studies from outside of the SF Bay Area were found to report on concentrations in small tributaries in Washington and Oregon. Through funding from the RMP, SFEI has sampled 10 mixed-use watersheds around the SF Bay Area for PBDEs in stormwater runoff. Most of the SF Bay Area watersheds have only been studied at a pilot level, with <8 samples collected. In two of these watersheds, more concentration and loading information exists (Guadalupe and Zone 4 Line A).

Table 6. PBDE concentrations in stormwater based on review of peer-reviewed literature and locally collected data by the RMP. All watersheds include mixed-urban land uses. White and light gray highlighted data are from studies outside of the SF Bay Area, and dark gray highlighted data are from local small tributaries.

Specific Location	N	PBDE concentrations (ng/L)				Reference
		Min	Max	Mean	Median	
Spokane River, WA	14			7	5	Lubliner, 2009
Columbia River Basin	16	ND	53	9	0.2	Morace, 2012
Borel Ck, Peninsula Bay Area, CA	3	9	20	14	12	McKee et al., 2012
Coyote Ck, Santa Clara County, CA	7	7	36	15	13	SFEI unpublished
Guadalupe River, San Jose, CA	13	15	369	88	38	SFEI unpublished (WY 2012); McKee et al., 2006
Lower Marsh Ck, Brentwood, CA	1	20	20	20	20	SFEI unpublished
Lower Penetencia Ck, Milpitas, CA	4	13	22	18	19	McKee et al., 2012
San Leandro Ck, San Leandro, CA	3	41	80	57	50	SFEI unpublished
Santa Fe Channel, Richmond, CA	2	24	30	27	27	McKee et al., 2012
Sunnyvale East Channel, Sunnyvale, CA	6	5	100	48	42	McKee et al., 2012; SFEI unpublished (WY 2012)
Zone 4 Line A, Hayward, CA	38	0	430	47	27	Gilbreath et al., 2012
Zone 5 Line M, Union City, CA	4	34	128	75	69	McKee et al., 2012

Table 7. Summary table of PBDE concentrations in SF Bay Area stormwater runoff data.

	Bay Area Data (N=10)
Minimum of dataset (all watersheds, all samples) (ng/L)	**0.4**
Maximum of dataset (all watersheds, all samples) (ng/L)	**430**
Mean of the Means (ng/L)	**41**
Mean of the Means % BDE-47	**8**
Mean of the Means % BDE-209	**58**
Mean of the Means Ratio BDE-209:BDE-47	**10**

Although stormwater data does not exist for homogenous land uses, we preliminarily explore concentrations in the SF Bay Area watersheds with the land use in those watersheds. This exploration yielded strong correlations with the combined sum of High Residential and Open Compacted spaces (Figure 4). The linear trendline in these graphs excludes the one high outlier watershed, Zone 5 Line M in Union City. Zone 5 Line M also had elevated median concentrations, particularly for total mercury (HgT) and to a lesser degree PCBs relative to other watersheds sampled in WY 2011 reconnaissance study (McKee et al., 2012). Although Zone 5 Line M represents an anomaly relative to the other nine Bay Area watersheds with PBDE data, it also represents an opportunity to investigate possible sources. The watershed land uses are approximately 31% residential, 11% transportation, 36% open, 15% commercial, and 7 % industrial. The watershed includes former industrial areas that have been re-zoned and are being redeveloped into a mixed-use transit village. Additionally, a cursory review of the current industrial sector of this small watershed using Google Maps and Google Earth revealed several parcels that may be contributing to the PBDEs or HgT concentrations. These parcels included two custom plastics manufacturers, and a furniture distribution warehouse plus possible small-scale furniture recycling at this location. The most elevated sample concentration at this location was unlike the other samples collected in the same watershed and unlike the rest of the Bay Area samples in that the ratio BDE-209:BDE-47 was 38, as opposed to the SF Bay Area average ratio of 10, and 90% of the sample was comprised of BDEs 206-209, indicating that decaBDE was the dominant source. Further investigation could be done in this watershed to identify important source areas for the regional modeling effort. Particle ratios of PBDEs to suspended sediment concentration (SSC) in local stormwater data was also analyzed for relationships to land uses. No strong correlation was noted. The relationship to percent high density residential was only R^2=0.05. The strongest relationship was to industrial land use (R^2=0.42).

For perspective, Oram et al. (2008) completed a first effort at estimating PBDE loads into SF Bay from various sources. In this study, Oram and colleagues estimated that the small tributaries contributed 11-27% of the BDE-47 load to SF Bay, and 74% of the BDE-209 load. In contrast, effluent from POTWs has concentrations similar to stormwater runoff in the SF Bay Area (mean 29 ng/L; North, 2004) but is dominated by BDE-47 and other pentaBDE congeners (North, 2004). POTW effluent contributes an estimated 36-75% of the BDE-47 load to the Bay, and only 9% of the BDE-209 load (Oram et al., 2008). Presumably most of the BDE-209 load into POTWs is settled out in the sewage sludge. These concentrations in effluent from POTWs and stormwater runoff from small tributaries are about 3 orders of magnitude greater than concentrations sampled in SF Bay waters (Werme et al., 2007).

Local PBDEs in stormwater data was regressed with total mercury (HgT) and PCBs (sum of 40 congeners) to provide preliminary evidence if, at a regional average scale, targeting the clean-up of either of these high priority pollutants of concern would result in multiple benefits for management of PBDEs. On a water concentration basis, PBDEs were correlated with HgT, but not with PCBs (Figure 5). When normalized to suspended sediment concentration, PBDEs did not correlate well with either HgT or PCBs, nor did HgT and PCBs correlate well with one another (Figure 6). The relationship between

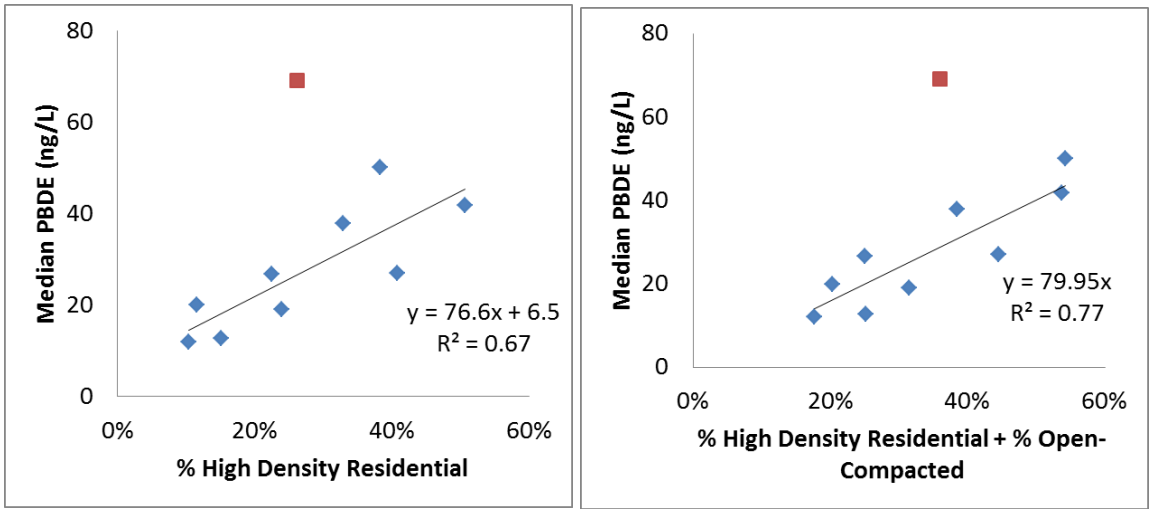

Figure 4. Median PBDE concentrations in relation to the % high density residential (< 0.333 acres/unit) and % compacted open space in nine Bay Area watersheds. The linear trendline is related only to the nine watersheds represented by blue markers; the red marker is Zone 5 Line M.

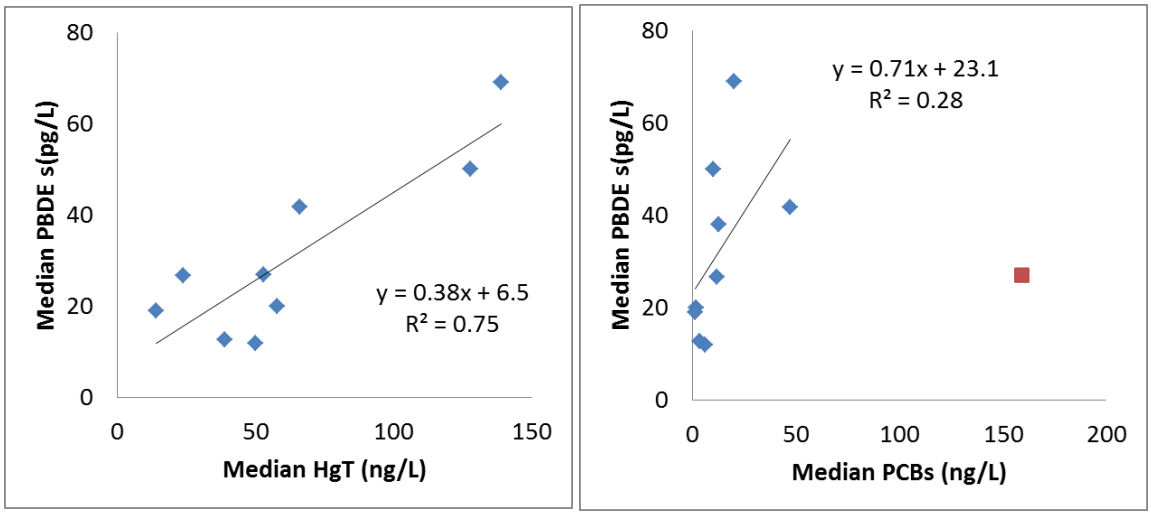

Figure 5. Median PBDE concentrations in relation to median HgT and median PCB concentrations in Bay Area watersheds. The Guadalupe River watershed data is excluded as anomalous from the regression with median HgT due to Hg mining influence in this watershed. The outlier datapoint in red for median PCBs is the PCB hot spot watershed, Santa Fe Channel.

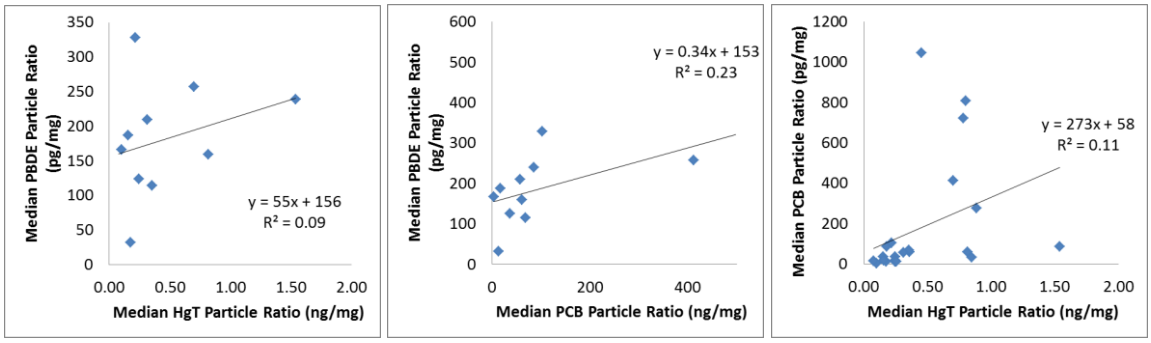

Figure 6. Relationships of median PBDE, HgT and PCB particle ratios in Bay Area watersheds.

median particle ratios for PBDEs and PCBs (Figure 6, center graph) is improved when removing the high PCB outlier (Santa Fe Channel) on the far right of the graph, in which the R^2 raises to 0.45 and the equation line is y = 1.64x + 92.4. No relationship could be found between land use and the ratio of PCBs to PBDEs (median particle ratios), nor between HgT and PBDEs (median particle ratios), for local watersheds. This data suggests that management of PBDEs may coordinate with management of HgT, but not with PCBs. This matches our conceptual models of HgT as being a largely ubiquitous, atmospherically derived source versus PCBs being very much associated with very specific source areas. This is further corroborated by regression of the ratio of median PBDE:PCB water concentrations in stormwater and landscape characteristics (imperviousness, open space, and residential land use) (Figure 7). If we accept the standing hypothesis that PCBs are associated most strongly with sources and source areas in older industrial settings, these relationships appear to suggest that PBDEs are not strongly associated with local old industrial sources/source areas. Instead, more ubiquitous urban use and atmospheric deposition play a stronger role in PBDE concentrations observed in SF Bay Area stormwater.

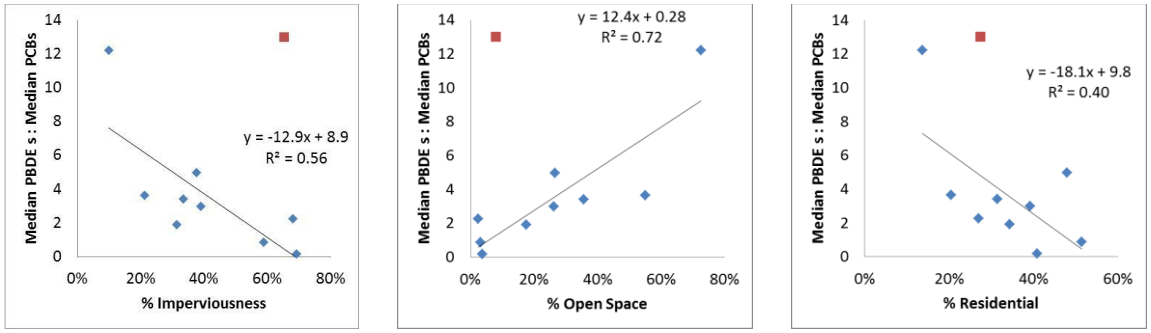

Figure 7. Relationships between landscape characteristics and median PBDE:PCB concentrations in stormwater during rain storms in Bay Area watersheds. The outlier in red is Lower Penetencia Creek.

Summary and Options for Event Mean Concentration (EMC) Development for Pollutant

PBDEs have been widely used as a flame retardant in textiles, plastics, and polyurethane foam products since the 1970's and are now both ubiquitous in the urban environment and also possibly being redistributed to the rural environment through application of biosolids and atmospheric deposition. PBDE loads to SF Bay have been previously estimated (Oram et al., 2008). However, since that time, more local empirical data has been collected for input, calibration, and verification for an improved estimate of loads from the small tributaries, and through the development of this contaminant profile, at least two important sources (sludge applied lands and areas surrounding Tyco Thermal Controls in the Peninsula) have been identified that were not previously captured by the input data into the previous estimate.

To model loads of PBDEs in stormwater runoff from the small tributaries to the SF Bay, unique PBDE concentration/loadings factors could be applied to select land use and source area classes. The systematic review of synthesis, product incorporation and uses, disposal processes, and soil and water concentration data supports a general distinction in PBDE concentrations between urban and rural areas, as well as select source areas. A strong correlation exists between PBDE concentrations in stormwater runoff from nine SF Bay watersheds and the percentage of high residential and compacted open spaces in those watersheds. This correlation alone may provide a good basis for an improved estimation of regional loads, however the one high outlier watershed (Zone 5 Line M) highlights the potential importance of adding in source areas to the PBDE model, to be weighed against the effort needed to identify and obtain reliable data for each type of source area. The potential source areas of most interest for PBDEs and the estimated magnitude of emission factor for each category is presented in Table 8.

Table 8. Proposed land use / source area categories for PBDE based on our present conceptual model generated through this review.

<table>
<tr><th>Land use / source areas</th><th>Estimate emission factor[1]</th><th>GIS layer created?[2]</th><th>Particle concentration data? [2]</th><th>Water concentration data? [2]</th></tr>
<tr><td>All industrial</td><td>M/H</td><td>Y</td><td>Y</td><td rowspan="18">N</td></tr>
<tr><td>Plastics, Electronics, Cars and Textiles Manufacturers</td><td rowspan="5">H</td><td rowspan="5">N</td><td rowspan="3">N</td></tr>
<tr><td>Autoshredders</td></tr>
<tr><td>Carpet/Foam Recycling Facilities</td></tr>
<tr><td>Electronics Recycling Facilities</td><td>Y</td></tr>
<tr><td>Area surrounding Tyco Thermal Controls</td><td rowspan="3">N</td></tr>
<tr><td>Auto recycling/ refurbishing</td><td>M/H</td><td>Y</td></tr>
<tr><td>Landfills that use auto-shredder fluff as daily alternative cover</td><td rowspan="4">M</td><td>N</td></tr>
<tr><td>All transportation</td><td rowspan="7">Y</td></tr>
<tr><td>Urban (except industrial)</td><td>Y</td></tr>
<tr><td>Commercial</td><td rowspan="3">N</td></tr>
<tr><td>High density residential</td><td>M/H</td></tr>
<tr><td>Low density residential</td><td>L/M</td></tr>
<tr><td>All nonurban (except sludge applied lands)</td><td>L</td><td rowspan="2">Y</td></tr>
<tr><td>Sludge Applied Lands</td><td>H</td><td>N</td></tr>
</table>

[1] Estimated magnitude of emission factor: High (H); Medium (M); Low (L).
[2] Indication of current availability of GIS shapefile and concentration data for each source area category: Yes (Y); No (N). An "N" indicates additional effort is needed to integrate this category into the RWSM.

To support the development of a regional PBDE loads model, GIS databases and shapefiles of the above listed source areas could be developed, and average soils, suspended particulate matter, or stormwater concentrations in those areas would need to be defined. Differences in usage patterns between the U.S. and elsewhere, and even California versus the rest of the U.S., confounds the usage of concentration data from outside areas but the general pattern of more highly versus less contaminated areas might hold true for the SF Bay Area more than the magnitude of concentrations. Therefore, to the extent possible, we recommend the use of local data as a starting point and data from the rest of the U.S. and outside of the U.S. for making decisions about the relative order magnitude of EMCs or concentration factors. Where necessary, data from outside the SF Bay Area can be used to augment the local dataset with the expectation that initial model runs might indicate the need for development of local data for input into the model. Options for developing the SF Bay Area specific EMC estimates needed for input into the spreadsheet model include:

A. Back calculating the EMCs for both land uses and source areas from the current local stormwater datasets. This method has shown promise for the Hg and PCB versions of the RWSM, however the success of this method is in part dependent on the source area classes being present in the watersheds with empirical data and the size of the data set (number of locations sampled assuming a robust number of samples per location – at least 4 but ideally 6-8 samples collected during storm flow conditions).

B. Conduct empirical studies of PBDEs in runoff or soils from the above listed source areas. Such studies may have added benefit for sampling of other priority analytes in similar source area classes (e.g. metals near autoshredders). These source area EMCs could potentially be added to the more generalized urban versus rural land use model, or a model that applies concentrations based on high residential and compacted open spaces.

C. Use air monitoring data and assumptions regarding particle settlement and air deposition of PBDEs to estimate EMCs for source areas where air sampling has occurred (near autoshredders, e-waste recyclers, etc.) assuming storage and runoff characteristics of the local landscape (e.g. perhaps scaling for the runoff coefficient).

Preliminary Recommendations for Pollutant RWSM development

Most studies reporting environmental concentrations of PBDEs are for soils. Unfortunately no local soils data have been collected for comparison to measurements from other parts of the world, and given differences in use and recycling practices, we suggest using the soils data in combination with a sediment model only as a line of basic QA. Fewer stormwater studies have been conducted and none for homogenous land use types, but we do have 10 local watershed datasets and preliminary analysis of this data shows concentrations correlate fairly strongly with some identified land uses. As a result,

we suggest estimating regional loads of PBDEs based on the application of our local stormwater concentration data to the volume results of the hydrology model. In short, we recommend a land-use based volume-concentration model. This approach appears to be supported by the correlations with mercury and the lack of correlations with PCBs. Given that concentrations of PBDEs in stormwater are expected to be continually trending downward due to the effects of the recent bans on PBDEs, such modeling should be considered to represent baseline conditions and not to predict future loads.

To develop a baseline model of the regional PBDE load, we suggest the following steps:

1) Further explore land use correlations between the SF Bay Area specific stormwater runoff data and the >150 ABAG defined land use classes. This may be the simplest approach towards reaching a calibrated model with a level of uncertainty we can feel comfortable with in this first version of the PBDE model. This approach would allow us to utilize the already-developed land-use based volume-concentration model that was used for the test case copper model.

2) If the above approach does not produce strong enough results, develop GIS layers for some or all of the source areas identified and apply effort towards developing EMCs for those source areas (further updated literature review focused on recent studies to account for the expected downward trend in PBDE concentrations due to the effects of recent bans on PBDEs, back calculation, or – as a last resort – empirical field data collection). This type of model would also be a land-use based volume-concentration model; however it would require integration of the source areas into the land use layer as was done for the Hg and PCB models.

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Legacy Pesticides Sub-Report

Chlordanes, DDTs and Dieldrin

Submitted on behalf of all Permittees in Compliance with Provision C.14.a of Order R2-2009-0074

Prepared as a Regional Project for:

Bay Area Stormwater Management Agencies Association

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LIST OF ABBREVIATIONS

303(d) list	United States Clean Water Act 303(d) list
ATSDR	Agency for Toxic Substances and Disease Registry
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
CEP	Clean Estuary Partnership
CM/IA	Conceptual Model/Impairment Assessment
CTR	California Toxics Rule
CD3	Contaminant Data Display & Download
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
ERL	Effects Range - Low
ERM	Effects Range - Median
MRP	Municipal Regional Stormwater NPDES Permit (Order R2-2009-0074)
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OEHHA	Office of Environmental Health Hazard Assessment
PBDEs	Polybrominated diphenyl ethers
PCBs	Polychlorinated biphenyls
POC	Pollutants of Concern
POTW	Publicly Owned Treatment Works
RMP	Regional Monitoring Program
SFEI	San Francisco Estuary Institute
SWRCB	State Water Resource Control Board
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1.0 INTRODUCTION

This *Legacy Pesticides Sub-Report* was prepared for the Bay Area Stormwater Management Agencies Association (BASMAA) representing all towns, cities, counties and flood control agencies (i.e., Permittees) subject to the Municipal Regional Stormwater NPDES Permit (MRP, Order R2-2009-0074) issued by the San Francisco Regional Water Quality Control Board (Water Board) on October 14, 2009. This report addresses the requirements of MRP Provisions C.14.a.iii-vii for characterizing legacy pesticide concentrations in urban stormwater and identifying control measures and/or management practices to eliminate or reduce discharges of legacy pesticides discharged by urban runoff conveyances systems.

Requirements associated with legacy pesticides are included in the MRP because regulatory agencies have previously identified legacy pesticides as impairing beneficial uses in the San Francisco Bay, and determined that urban stormwater is a likely or potential cause or contributor to the impairment (SFRWQCB 2009). In 1994, the Water Board conducted a study to measure the level of chemical contaminants in sport fish in the San Francisco Bay. The study found levels of PCBs, mercury, dioxins, and legacy pesticides (chlordanes, DDTs and dieldrin) in fish exceed potential levels of concern (OEHHA 2007). Based on the findings of the study, the California Office of Environmental Health Hazard Assessment (OEHHA) confirmed the potential health risk and issued an interim advisory directed at consumption of sport fish from the Bay (OEHHA 2007). As a result of the advisory, the United States Environmental Protection Agency (USEPA) added the San Francisco Bay to the 1998 United States Clean Water Act 303(d) list as impaired by legacy pesticides. Currently, the San Francisco Bay is on the most recent 303(d) list as impaired by legacy pollutants (SWRCB 2011) and the sport fish advisory is still in place (OEHHA 2007).

Provision C.14 of the MRP includes the same requirements for legacy pollutants, polybrominated diphenyl ethers (PBDEs), and selenium (hereinafter C.14 pollutants) in urban runoff. Total Maximum Daily Loads (TMDLs) and reevaluations of impairments are planned or are in the early stages of development for each of the C.14 pollutants. Provision C.14 serves as an interim step between impairment listings and TMDL development or delisting. In particular, the MRP provisions require Permittees to implement a plan that characterizes the representative distribution of C.14 pollutants in the urban areas of the San Francisco Bay Region to answer the following questions:

- Are C.14 pollutants present in urban runoff?
- Are C.14 pollutants (relatively) uniformly distributed in urban areas?
- Are storm drains or other surface drainage pathways sources of C.14 in themselves?
- Are there specific locations within the urban watershed where prior or current uses result in land sources contributing to discharge of C.14 pollutants to the Bay via urban runoff conveyance systems?

Permittees are also required to provide information to allow for the calculation of C.14 pollutant loadings to San Francisco Bay from urban runoff conveyance systems and identify control measures and/or management practices to eliminate or reduce discharges from these systems.

This report addresses all questions and requirements regarding legacy pesticides that are included in the MRP. With regard to urban runoff characterization data, results of monitoring studies implemented prior to and during MRP implementation are described. Pre-MRP monitoring data described include those collected via the Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs and Organochlorine Pesticides (KLI and EOA 2002), which sampled storm drain sediments and included legacy (organochlorine) pesticides in the analyses. Monitoring data collected in compliance with

Provision C.8 of the MRP, including fine-grained bedded sediments sampled from receiving waters (i.e., creeks) in 2012 and described in the Water Year 2012 Regional Urban Creek Monitoring Report are also summarized.

2.0 BACKGROUND

During the mid-20th Century, organochlorine pesticides were used as insecticides for agriculture, pest control and mosquito abatement. Though their use was discontinued in the late 1980s, these pesticides have persisted in the environment and presently remain a concern to water quality regulators and managers. Because of their persistence, these pesticides are known as legacy pesticides. In the San Francisco Bay, the main legacy pesticides of concern are chlordanes, dichlorodiphenyltrichloroethane (DDTs), and dieldrin. These organochlorine pesticides are especially problematic because they are lipophilic and bioaccumulate in fish and wildlife (Connor et al. 2004, Connor 2007). Due to their hydrophobic properties, legacy pesticides also associated with both bedded and suspended sediments in the Bay and its tributaries.

2.1. Chlordanes

Chlordanes are a toxic, bioaccumulative (USEPA 2011a) synthetic chemical mixture of many related chemicals including pure chlordane and the following (Connor et al. 2004):

- alpha-chlordane
- gamma-chlordane
- cis-nonachlor
- trans-nonachlor
- oxychlordane
- heptachlor
- heptachlor epoxide
- oxychlordane

Chlordane was first used in the United States in 1948 as a pesticide on agricultural crops, lawns, and as a fumigating agent. Thirty years later in 1978, the EPA banned its use on food crops and phased out other above-ground uses over the next five years. Its use as an underground termite control was still allowed until 1988, when all uses of chlordane were banned (USEPA 2011a).

Exposure to chlordane can harm the endocrine, nervous, and digestive systems and the liver. It is a likely carcinogen, and may cause liver cancer. Additionally, it may cause behavioral disorders in children if their mother has ingested contaminated fish or shellfish and chlordane is transmitted through their mother's blood stream or breast milk. Chlordane has been found to be toxic to many aquatic species at concentrations ranging from 0.2 to 2.0 µg/L (USEPA 2000), including the fathead minnow (*Pimephales promelas*), rainbow trout (*Oncorhynchus mykiss*) and aquatic invertebrates.

2.2. DDTs

Like chlordanes, DDTs are a synthetic chemicals that are bioaccumulative. DDT will break down in the environment due to microorganisms (ATSDR 2002b), but its breakdown products – dichlorodiphenyldichloroethylene (DDE) and dichlorodiphenyldichloroethane (DDD) – are also persistent, toxic and bioaccumulative (ATSDR 2002b). DDT is degraded to DDE under aerobic conditions and to DDD in anoxic systems (USEPA 2000). For purposes of this plan, the term DDTs includes both DDE and DDD.

DDT is a pesticide whose usage was widespread in the United States. Beginning in 1939, it was used for mosquito abatement and residential and agricultural applications (Connor et al. 2004). In 1963, the

State of California restricted its use (Connor et al. 2004), and in 1972, the federal government banned its use except for public health emergencies (ATSDR 2002b).

DDTs are probable carcinogens that damage the liver and may cause liver cancer (USEPA 2011b, ATSDR 2002b). It can also damage the reproduction system and temporarily damage the nervous system. DDT is also highly toxic to many aquatic invertebrate species at varying concentrations and can cause problems for wildlife, including eggshell thinning, estrogenic properties, antiandrogenic sexual development feminization of males (CCCWP 2004), embryo mortality, and decreased hatchling survival (USEPA 2000).

Invertebrate species are generally more sensitive than fish to DDT in the water column (USEPA 2000), and sediments contaminated with DDT have been shown to affect benthic communities at low concentrations (USEPA 2000). Field and laboratory studies found that chronic effects from DDT occur at concentrations greater than 2 µg/kg in sediments (USEPA 2000). For both freshwater and saltwater fish, short-term exposure to concentrations less than 1 µg/L have led to toxic responses (USEPA 2000). DDT may be transferred to embryos, and concentrations of 1.1 to 2.4 mg/kg have been associated with fry mortality (USPEA 2000).

2.3. Dieldrin

Dieldrin is the breakdown product of aldrin, a synthetic compound that was used in the United States between 1948 and 1987 as a pesticide on corn, cotton, and citrus crops, for control of termites and other soil dwelling insects; as a wood preservative; and for moth-proofing clothing and carpets (Connor et al 2007, Connor et al. 2004). The United States Department of Agriculture cancelled all uses in 1970, but in 1972, the USEPA approved its use for termite control. Dieldrin was used for termite control until 1987, when the manufacturer voluntarily canceled its registration for termite control (ATSDR 2002a).

Unlike aldrin, dieldrin degrades very slowly in water or soil. Dieldrin sorbs tightly to soil and sediment, particularly if substantial amounts of organic carbon are present (USEPA 2000). Dieldrin is toxic to aquatic organisms, birds, and mammals and is capable of producing carcinogenic, teratogenic (e.g., cleft palate, webbed feet, skeletal anomalies), and reproductive effects (USEPA 2000). Dieldrin is a probable human carcinogen (ATSDR 2002a) that can damage the nervous system, immune system, and kidneys (USEPA 2011c). It may also increase infant mortality and cause birth defects (USEPA 2011c).

In fish, dieldrin produces adverse enzymatic and hormonal changes that lead to impaired reproductive ability (CCCWP 2004). The LC50s for freshwater and saltwater aquatic invertebrates exposed to sediment spiked with dieldrin in the laboratory have been shown to range from 0.0041 to 386 µg/g dry weight (USEPA 2000). For wildlife, mammals appear to be more sensitive to dieldrin poisoning than birds. Brain concentrations in mammals of 5 mg/kg are associated with lethality. Concentrations as low as 1 mg/kg in the brain might trigger irreversible starvation in some birds and concentrations of 10 mg/kg are associated with lethality (USEPA 2000).

3.0 REGULATORY STATUS

3.1. Water Quality Criteria and Sediment Objectives/Guidelines

Aquatic life and human health water quality criteria for legacy pesticides were included in the 2000 California Toxics Rule (CTR), and are shown in Table 3-1. Human health criteria are much lower than those for aquatic life. In 2002, the USEPA updated the human health criteria for legacy pesticides for the protection of human health, but California has not adopted the new criteria. Compared to the CTR criteria, the USEPA revised human health criteria (Table 3-2) are higher for chlordane, but lower for DDT and dieldrin (USEPA 2002).

Table 3-1. California Toxics Rule water quality criteria for legacy pesticides in µg/L (CTR 2000)

Parameter	Aquatic Life				Human Health	
	Fresh Water		Salt Water		Fresh Water	Salt & Fresh Water
	1-hour	4-day	1-hour	4-day	Water & Organisms	Organisms Only
p,p'-DDD (4,4'-DDD)	-	-	-	-	0.00083	0.00084
p,p'-DDE (4,4'-DDE)	-	-	-	-	0.00059	0.00059
p,p'-DDT (4,4'-DDT)	1.1	0.001	0.13	0.001	0.00059	0.00059
Chlordane	2.4	0.0043	0.09	0.004	0.00057	0.00059
Dieldrin	0.24	0.056	0.71	0.0019	0.00014	0.00014

Table 3-2. USEPA water quality criteria for legacy pesticides in µg/L (USEPA 2002)

Parameter	Fresh Water	Salt & Fresh Water
	Water & Organisms	Organisms Only
p,p'-DDD (4,4'-DDD)	0.00031	0.00031
p,p'-DDE (4,4'-DDE)	0.00022	0.00022
p,p'-DDT (4,4'-DDT)	0.00022	0.00022
Chlordane	0.00080	0.00081
Dieldrin	0.000052	0.000054

3.2. Sediment Quality Guidelines and Objectives

While there are no numeric standards for legacy pesticides in the San Francisco Bay sediments, the State Water Resources Control Board (SWRCB) adopted narrative sediment quality objectives in 2011 in order to comply with Section 13393 of the California Water Code (SWRCB 2011). The narrative objectives for Aquatic Life, Human Health, and Wildlife and Resident Finfish are shown in Table 3-3. The Aquatic Life narrative objective will be implemented using multiple lines of evidence – sediment toxicity, benthic

community condition, and sediment chemistry (SWRCB 2011). The Human Health and Wildlife and Resident Finfish narrative objectives will be implemented on a case-by-case basis, based on a human health risk assessment and ecological risk assessment, respectively (SWRCB 2011).

Table 3-3. Proposed California Sediment Quality Objectives (SWRCB 2011)

Parameter	Sediment Quality Objective
Aquatic Life – Benthic Community Protection	Pollutants in sediments shall not be present in quantities that, alone or in combination, are toxic to benthic communities in bays and estuaries of California.
Human Health	Pollutants shall not be present in sediments at levels that will bioaccumulate in aquatic life to levels that are harmful to human health in bays and estuaries of California.
Wildlife and Resident Finfish.	Pollutants shall not be present in sediment at levels that alone or in combination are toxic to wildlife and resident finfish by direct exposure or bioaccumulate in aquatic life at levels that are harmful to wildlife or resident finfish by indirect exposure in bays and estuaries of California.

In addition to the narrative sediment quality objectives, the National Oceanic and Atmospheric Administration (NOAA) has developed numeric sediment quality guidelines that can be used as screening tools (Buchman 2008). There are two thresholds – the Effects Range-Low (ERL), which is the tenth percentile of pollutant concentrations in sediments determined to be toxic, and the Effects Range-Median (ERM), which is the median pollutant concentration in sediments determined to be toxic to aquatic life (Buchman 2008). The ERL and ERM for legacy pesticides are shown in Table 3-4.

Table 3-4. Effects Range-Low (ERL) and Effects Range-Median (ERM) for legacy pesticides in µg/kg (Buchman 2008).

Parameter	ERL	ERM
DDT	1	7
DDE	2.2	27
DDD	2	20
Chlordanes	0.5	6
Dieldrin	0.02	8

3.3. Beneficial Use Impairment and Trends

The Clean Water Act 303(d) list of water quality limited segments (i.e., impaired segments) is updated typically every 2 years. The 303(d) in California was last updated in 2010. A description of the five beneficial uses in the San Francisco Bay that could be impaired by legacy pesticides is provided in Table **3-5**. On the current list, the beneficial use of sport fishing is listed as impaired by legacy pollutants for all sections of San Francisco Bay (SWRCB 2011).

Table 3-5. Beneficial uses in the San Francisco Bay that could be impaired by legacy pesticides (SFBRWQCB 2011).

Beneficial Use	Description
Sport Fishing (COMM)	Uses of water for commercial or recreational collection of fish, shellfish, or other organisms, including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
Preservation of Rare and Endangered Species (RARE)	Uses of waters that support habitats necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened, or endangered.
Fish Spawning (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.
Wildlife Habitat (WILD)	Uses of waters that support wildlife habitats, including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.
Estuarine Habitat (EST)	Uses of water that support estuarine ecosystems, including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds), and the propagation, sustenance, and migration of estuarine organisms.

In 2004, the Clean Estuary Partnership (CEP) assessed the level of impairment of beneficial uses in the San Francisco Bay, utilizing the following five levels of impairment (Connor et al. 2004):

- **No impairment:** The available data demonstrate no negative effect on beneficial uses of the Bay, and there is sufficient information to make the finding.
- **Impairment unlikely:** The data indicate that legacy pesticides cause no impairment to the Bay. However, there is some uncertainty, due to lack of sufficient information or disagreement about how to interpret the data.
- **Possible impairment:** There is some suggestion of impairment, but the uncertainties preclude making a definitive judgment.
- **Definite impairment:** The data clearly demonstrate a negative effect on the beneficial uses of the Bay.
- **Unable to determine impairment:** There is insufficient information to make any determination.

A summary of their findings is shown in Table 3-6. The assessment found that the Bay may be impaired by legacy pesticides, particularly for fishing and fish consumption, but other environmental beneficial uses (preservation of rare and endangered species, fish spawning, wildlife and estuarine habitat) are less likely to be impaired (Connor et al. 2004). While insightful, this assessment has no regulatory standing and may not reflect the true impairment in the Bay as it was based on fish tissue from only six locations in the Bay and was based on two types of fish (white croaker and shiner surfperch) which are consumed by relatively few anglers (Connor et al. 2004). Additionally, dieldrin concentrations were below detection limits (Connor et al. 2004), which severely limits the conclusions that can be made about impairment due to dieldrin.

Table 3-6. Estimated San Francisco Bay impairments by legacy pesticides (Connor et al. 2004).

Matrix	DDTs	Chlordanes	Dieldrin
Fish	Possible impairment of COMM	Impairment unlikely	Possible impairment of COMM
Water	Possible impairment of COMM	Impairment unlikely	Possible impairment of COMM
Sediments	Impairment unlikely	Possible impairment of RARE, SPWN, WILD, or EST	Impairment unlikely
Wildlife	Impairment unlikely	Impairment unlikely	Impairment unlikely

Since the impairment assessment conducted by the CEP in 2004, additional water, sediment and sport fish monitoring data for legacy pesticides have been collected by the Regional Monitoring Program for the San Francisco Bay (RMP). Water and sediment data collected between 2002 and 2011 by the RMP are presented in Figures 3-1 and 3-2, respectively. Legacy pesticide concentrations in Bay water are compared to water quality criteria presented in Tables 3-1 and 3-2. Bay sediment concentrations of legacy pesticides are compared to sediment quality guidelines developed by NOAA (Buchman 2008).

As illustrated in Figures 3-1 and 3-2, concentrations of legacy pesticides in water and sediment in the Bay are consistently below levels of concern. Both water quality objectives and sediment quality guidelines for legacy pesticides in the San Francisco Bay have been consistently met in recent years (CEDEN 2013). Fish tissue concentrations also appear to be below adverse thresholds (SFEI 2012a). As a result, the Water Board is considering removing the San Francisco Bay from the next 303(d) list for legacy pesticides impairment (SFEI 2012a).

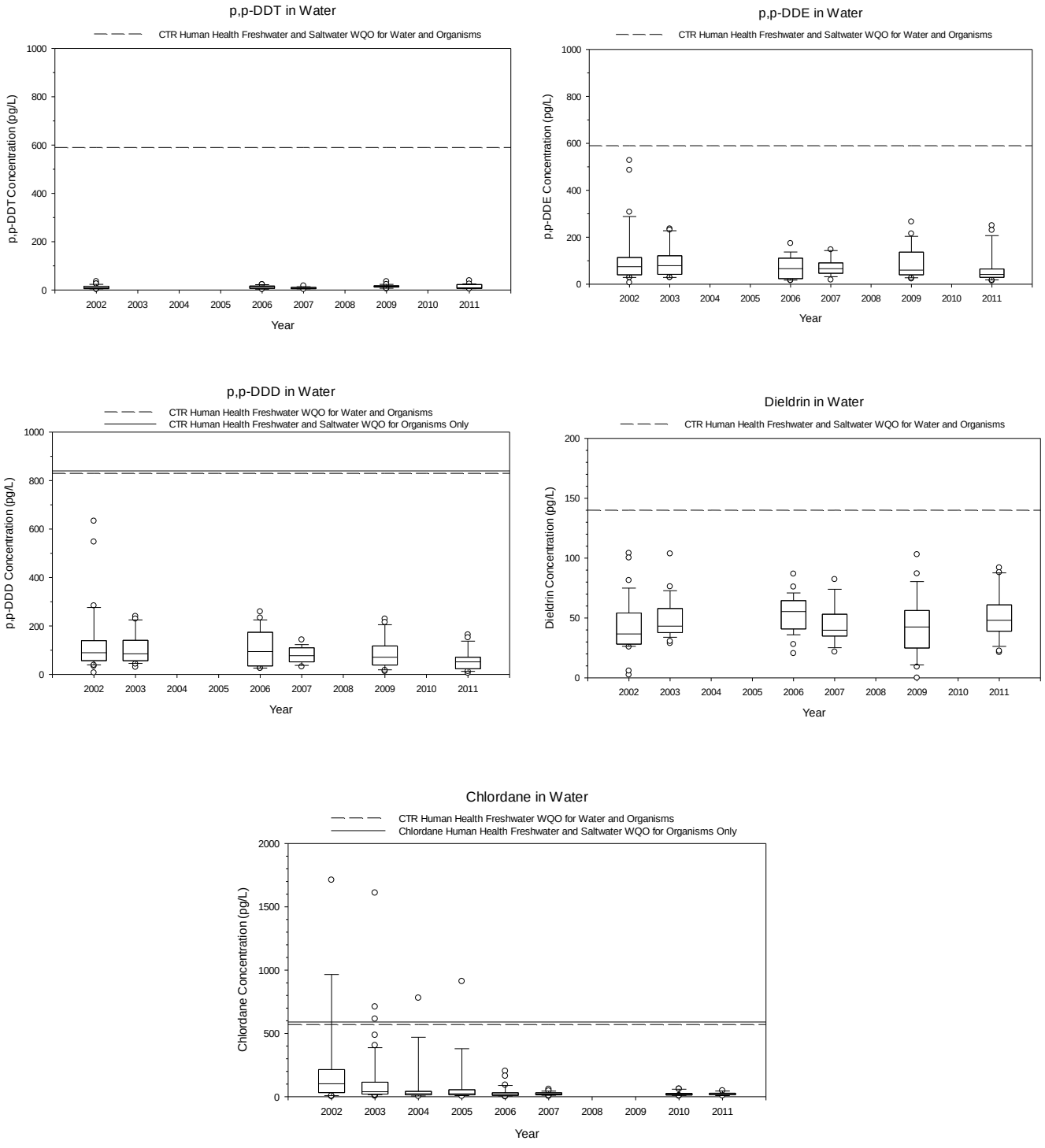

Figure 3-1. Water column concentrations of legacy pesticides in the San Francisco Bay between 2002 and 2011 (CEDEN 2013) compared to water quality objectives.

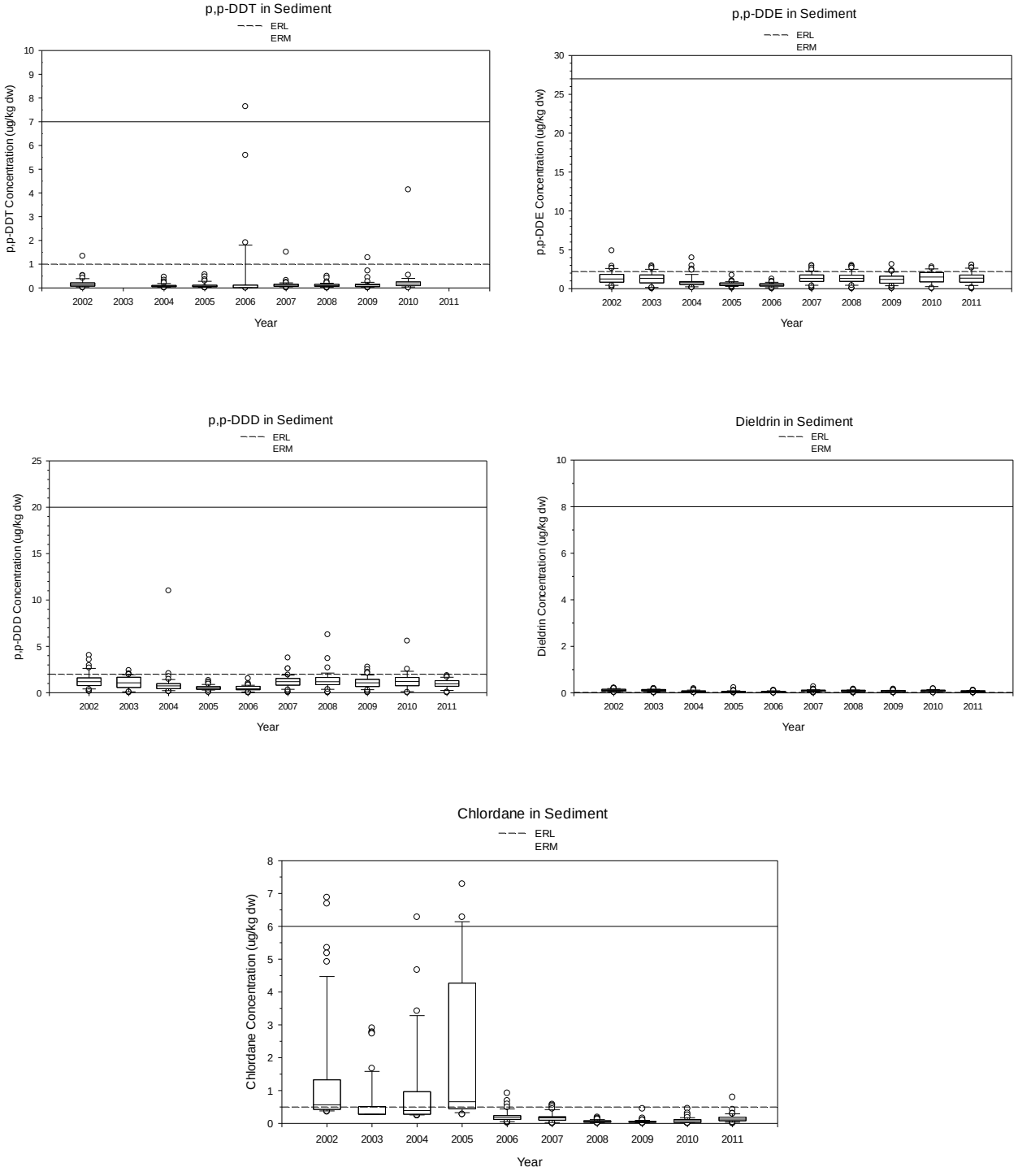

Figure 3-2. Bedded sediment concentrations of legacy pesticides in the San Francisco Bay between 2002 and 2011 (CEDEN 2013) compared to sediment quality guidelines.

4.0 SOURCES, PATHWAYS AND ENVIORNMENTAL FATES

4.1. Conceptual Model of Legacy Pesticide Sources and Pathways

In 2004, the Clean Estuary Partnership (CEP) developed a conceptual model (Figure 4-1) describing the current state of knowledge of legacy pesticides in the in the San Francisco Bay. The CM/IA computer model predicted that under a scenario in which no new legacy pesticides entered the Bay, the system would remove legacy pesticides within one to three decades. However, under scenarios of continued inputs to the Bay, recovery time would be considerably longer or not reached at all.

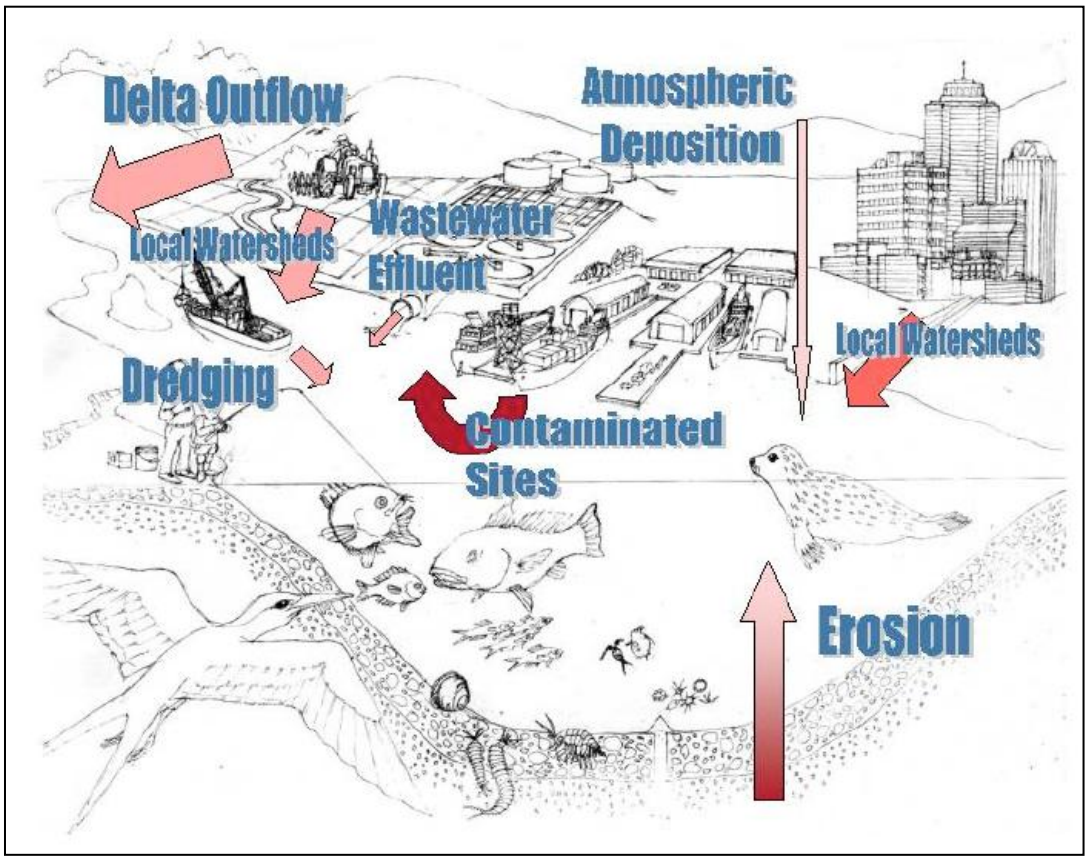

Figure 4-1. Sources and pathways of legacy pesticides to the San Francisco Bay (Connor et al. 2004)

4.2. Sources

Though legacy pesticides were banned over 25 years ago, they remain present in the watershed soils and sediments of floodplains, banks, and channel beds throughout California and the Bay Area (Connor et al. 2004). DDTs and dieldrin were primarily used in agricultural areas on crops, although urban uses did exist. Chlordanes were primarily used in urban areas for pest control. Historic, direct application on crops and soils is the main source of legacy pesticides today. Detectable concentrations can be found in the soils in agricultural areas, surrounding wooded structures, and other areas where applications occurred. Additionally, application, inappropriate disposal or leaks from unused stocks of legacy pesticides are another potential source to various transport pathways.

4.3. Transport Pathways

The San Francisco Bay is a dynamic system that is continually mixed due to rainfall, inflows, tides, winds, and human activities (e.g., dredging). As a result, legacy pesticides that would be buried deeply under new sediment layers in a quiescent system become re-mobilized and extend the timeframe needed for the Bay to recover from water quality impacts associated with these pollutants. The following sections provide a summary of pathways that may transport legacy pesticides to the Bay.

4.3.1. Urban and Agricultural Runoff

Both the Sacramento River and San Joaquin Rivers convey runoff to the Bay from most of the State of California. Surface runoff from Central Valley (via the Sacramento and San Joaquin Rivers) is responsible for the largest freshwater inflows and sediment transport to the Bay. Therefore, the northern portion of the Bay, which receives Central Valley runoff, is well-flushed. In contrast, the South Bay, which receives little freshwater inflows has a longer residence time for water, sediment, and associated pesticides. In addition, small tributaries draining local watersheds adjacent to the Bay also serve as important transport mechanisms. Specifically, DDT and chlordane concentrations in sediments in Bay Area watersheds are higher in urbanized regions than in non-urbanized, non-agricultural open spaces (Connor et al. 2004).

4.3.2. Municipal and Industrial Wastewater

An estimated 600 million gallons of municipal effluent is discharged to the Bay each day from Publicly Owned Treatment Works (POTWs) (Connor et al 2007). These POTWs receive legacy pesticides from human and food waste, stormwater runoff (i.e., combined sewer systems), landfill leachate, hazardous waste disposal and other sources. POTWs generally cannot effectively remove the legacy pesticides from their discharges and as a result are one transport pathway of legacy pesticides to the Bay. Due to the absence of current uses, industrial discharges are believed to be a much smaller pathways of legacy pesticides to the Bay that POTWs (Connor et al 2007).

4.3.3. Atmospheric Deposition

Though DDT was banned in 1972, it is still commonly used in other countries, including Mexico (ATSDR 2002) and therefore atmospheric deposition of DDTs from foreign sources may be important pathways to receiving waters in the U.S. (USEPA 2011b). Given the current limited sources of chlordanes or dieldrin (aldrin), atmospheric deposition is likely a much less important pathway for these pesticides. All legacy pesticides, however, may volatilize from contaminated water and soil and then redeposit back on land or water (ATSDR 2002).

4.3.4. Remobilization of Historic Sediment Deposits

Deep burial of legacy pesticides in the Bay sediments below the active sediment layer is responsible for a loss of pollutants from the water column. However, there has been net erosion of sediments from both the Northern portion (Suisun and San Pablo Bays) and the Southern portion of the Bay (South Bay) (Connor et al. 2007), which has remobilized historic deposits of sediment-bound organochlorine pesticides in the Bay water column.

Contaminated sediments may also become remobilized via tides and wind. The strongest tidal events occur during spring tides caused by new and full moons while the strongest winds occur during the spring and summer. Dredging also remobilizes sediments contaminated with legacy pesticides buried deeply in the Bay, but since more material is disposed of outside of the Bay, it is assumed that dredging results a net loss rather than net input of legacy pesticides in the Bay (Connor et al. 2007).

4.3.5. Estimated Loads from Transport Pathways

The CM/IA also estimated legacy pesticide loads from various pathways to the San Francisco Bay (Conner et al. 2004). The median and range (minimum and maximum) of legacy pesticide loads from each pathway are shown in Table 4-1. Total annual inputs of DDTs are greater than chlordanes, which are greater than dieldrin. The largest loads of all three pollutants are due to stormwater runoff from local watersheds. While local watersheds may currently be comprised of mostly urban land uses, historically there were substantial nonurban, agricultural regions (e.g., Santa Clara County and Eastern Alameda and Contra Costa County). Therefore, legacy pesticide loads from local watershed runoff is not likely attributable to urban land uses alone.

Table 4-1. Estimated median and range of annual legacy pesticide loads (kg/year) to the San Francisco Bay (Connor et al. 2004)

Pathways	DDTs	Chlordanes	Dieldrin
Runoff from Central Valley	15 (5 – 40)	2 (0.7 – 5)	5 (2 – 13)
Runoff from local watersheds	40 (9 – 190)	30 (7 – 160)	3 (0.7 – 15)
Municipal wastewater (POTWs)	0.2 (0.02 – 2)	0.1 (0.003 – 2)	0.06 (0.008 – 0.4)
Industrial discharges	< 0.2	< 0.1	< 0.06
Atmospheric deposition	1 (0.02 – 2)	0.9	1 (0.2 – 2)
Historic sediment deposits	9 (0.2 – 18)	2 (0 – 4)	0.2 (0 – 0.6)
Dredged Material	-2 (-3 – -0.03)	-0.3 (-0.6 – 0)	-0.03 (-0.1 – 0)
Total	**60 (10 – 250)**	**30 (10 – 170)**	**10 (3 – 30)**

As described in Appendix A - pollutant profile for legacy pesticides, legacy pesticides loading estimates are also under development through activities of the Small Tributaries Loading Strategy (STLS) work group, an RMP work group that includes representatives of BASMAA, the Water Board, SFEI, and technical advisors. To date, the STLS workgroup has developed a pollutant profile for legacy pesticides that is intended to assist in the modeling of loads of pollutants in urban runoff to the Bay.

4.4. Environmental Fates

The San Francisco Bay is a dynamic system that is able to slowly purge itself of legacy pesticides. Removal of legacy pesticides from the San Francisco Bay occurs, in relative order, through degradation in sediments, outflow through the Golden Gate Strait, and volatilization (Connor et al. 2007).

4.4.1. Transport through the Golden Gate

While the San Francisco Bay receives inputs from numerous sources, the Pacific Ocean is its only hydrologic output. The Bay is connected to the Pacific Ocean via the Golden Gate, and outflow through the Golden Gate is an important loss pathway for the legacy pesticides (Connor et al. 2007). Dieldrin is

more soluble in water than DDTs and chlordane, and as a result, flow out of the Golden Gate plays a larger role in its removal (Connor et al. 2004).

4.4.2. Losses in Sediment

Chlordane is persistent and has been known to remain in some soils for over 20 years. Its persistence is greater in heavy, clay or organic soils than in sandy soils where is can evaporate more quickly (ATSDR 1994). The evaporation rate of chlordane on soil surfaces is roughly two to three days (ATSDR 1994). Because it is hydrophobic, chlordane attaches to sediments and particles in the water column. It is unknown how much, if any, chlordane breaks down in water or sediment, but it does break down in the atmosphere by reacting with light and certain chemicals in the environment (ATSDR 1994). Connor et al. (2007) estimate that the half-life of chlordanes in the Bay sediments is 2.3 years assuming first-order decay.

DDT is very persistent and while it will degrade in the environment, degradation can take more than 15 years (USEPA 2011b). Degradation in soils is generally due to microorganisms, but depends on temperature, type of soil, and soil moisture (ATSDR 2002). In California, the half-life of DDT was calculated to be 7-13 years (Connor et al. 2007). DDT degradation increases with increasing moisture, suggesting that degradation rates would be higher in Bay sediments than in the watershed soils (Connor et al. 2007). Connor et al. (2007) estimate that the half-life of DDT is 9 years in the Bay sediments. DDT that has evaporated into the atmosphere or has attached to solids in the air has a much shorter half-life, calculated to be 1.5-3 days (ATSDR 2002).

While aldrin degrades readily to dieldrin due to sunlight and bacteria (ATSDR 2002), dieldrin is a very persistent organic chemical. Dieldrin is hydrophobic and adsorbs to soil where it remains unchanged for many years (ATSDR 2002). Connor et al. (2007) estimate that the half-life of dieldrin in Bay sediments is 2.8 years, assuming first-order decay. It can however, evaporate slowly into the atmosphere where it changes to photodieldrin within a few days (ATSDR 2002).

4.4.3. Degradation in Water

Reported degradation rates of legacy pesticides in the water column are higher than the rates in sediments (Leatherbarrow et al. 2006, Connor et al. 2007). However, sorption of DDTs to sediments can decrease the rate of photolysis, and turbidity can limit photolysis to the top few centimeters of the water column (Connor et al. 2007). Additionally, only a small portion of the mass of legacy pesticides is dissolved in the water column. Therefore any removal of legacy pesticides from the Bay through degradation in water is believed to be minor.

4.4.4. Volatilization

Volatilization is also a possible loss pathway of legacy pesticides, but there have been no data collected to study the air-water exchange of legacy pesticides within the Bay.

4.4.5. Consumption by Fish and Wildlife

The last loss pathway for legacy pesticides from the San Francisco Bay water column and sediments is through the integration into the food web. This occurs through uptake from sediment and water into aquatic flora and fauna, including fish. The RMP monitors contaminants in sport fish from the Bay every three years, and currently data are available on the RMP's website through 2009. No efforts to-date have been made to quantify this loss pathway, but it is believed to be minor.

5.0 URBAN RUNOFF CHARACTERIZATION SUMMARY

During 2000 and 2001, six stormwater agencies in the San Francisco Bay area conducted a study that sampled and analyzed storm drain sediments at 70 monitoring stations in residential/commercial, industrial, and mixed and open space (nonurban) land use areas in Alameda, Marin, San Mateo, Santa Clara, Contra Costa, and Solano Counties (KLI and EOA 2002). The first year focused on mercury and polychlorinated biphenyls (PCBs), while the second year also analyzed sediments for the organochlorine (legacy) pesticides chlordanes, dieldrin and DDTs.

Summary statistics of legacy pesticide concentrations observed during the study are presented in Table 5-1 by land use category. Box and whisker plots of DDT and chlordane concentrations by land use are shown in Figure 5-1. Dieldrin was detected in very few samples and was excluded from the box plots and analysis.

Table 5-1. Summary statistics for legacy pesticide concentrations in four land use categories. All data normalized to fine fraction (<62.5 µm) (KLI and EOA 2002).

Parameter	N	% Detected	Min Detected	Max Detected	Mean	SD	Percentile		
							25th	50th	75th
Industrial									
Chlordanes	45	77.8	1.7	24,296	1315	4,849	2.8	69.0	404
DDTs	45	68.9	19.1	24,541	881	4,915	16.4	97.9	426
Aldrin	45	2.2	11	11	0.2	-	-	-	-
Dieldrin	45	13.3	4.4	2.8	1.5	-	-	-	-
Residential									
Chlordanes	11	100	54.3	3,744	964	1,185	327	550	1633
DDTs	11	72.7	7.2	1,307	239	455	17.7	161	188
Aldrin	11	0	-	-	-	-	-	-	-
Dieldrin	11	36.4	6.6	70	11	-	-	-	-
Mixed									
Chlordanes	13	84.6	4.5	268	65	87	5.2	34	109
DDTs	13	84.6	14.1	734	123	240	17.1	39.8	98.0
Aldrin	13	0	-	-	-	-	-	-	-
Dieldrin	13	7.7	3.4	3.4	0.52	-	-	-	-
Open									
Chlordanes	4	75	0.72	4.0	1.6	2.2	-	-	3.3
DDTs	4	25	0.82	0.82	-	-	-	-	-
Aldrin	4	0	-	-	-	-	-	-	-
Dieldrin	4	0	-	-	-	-	-	-	-

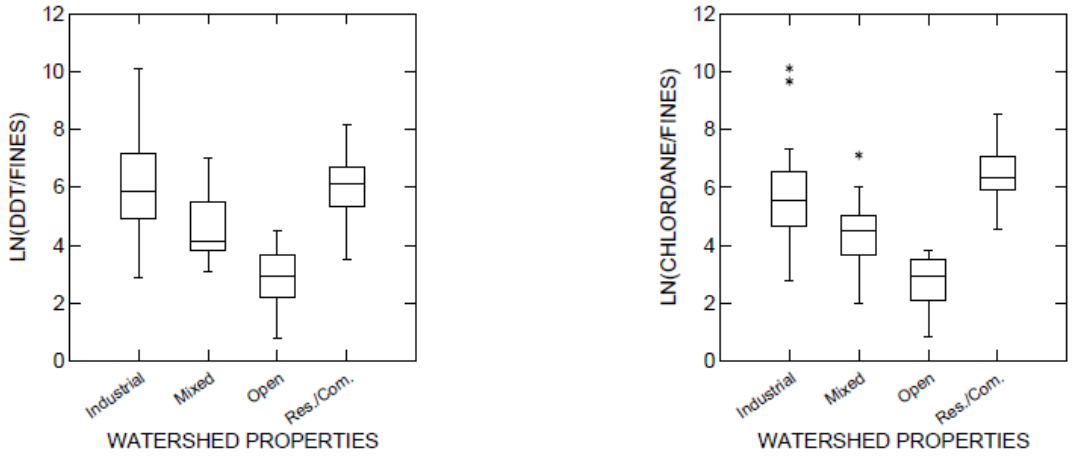

Figure 5-1. Comparison of DDT and chlordane concentrations in the fine fraction of storm drain sediments from four land use categories in the San Francisco Bay watershed[1].

Data from the study showed that chlordane and DDT concentrations were significantly different for urban and non-urban land use classifications. Moreover, chlordane concentrations at residential/commercial sites were significantly higher than at the three other land use categories monitored (KLI and EOA 2002). Summary statistics of legacy pesticide concentrations separated by urban and nonurban land use are shown Table 5-2, with corresponding box plots in Figure 5-2. The median concentration of chlordane in samples collected from urban sites were 40 times greater than the median for nonurban sites. Similarly, for DDTs the urban sites were 100 times greater (KLI and EOA 2002). However, it is important to note that nonurban sites were not adequately characterized, given that only four open space/nonurban sites were monitored.

Table 5-2. Summary statistics for legacy pesticide concentrations in urban and nonurban land use categories. All data normalized to fine fraction (<62.5 µm) (KLI and EOA 2002).

Parameter	N	% Detected	Min Detected	Max Detected	Mean	SD	Percentile		
							25th	50th	75th
Urban									
Chlordanes	69	82.6	1.7	24296	1023	3957	8.5	69	433
DDTs	69	72.5	7.2	24541	636	3966	13.5	78.9	353
Aldrin	69	1.4	11	11	0.16	-	-	-	-
Dieldrin	69	15.9	3.4	70	2.8	-	-	-	-
Nonurban									
Chlordanes	4	75	0.72	4.0	1.6	2.2	-	-	3.3
DDTs	4	25	0.82	0.82	-	-	-	-	-
Aldrin	4	0	-	-	-	-	-	-	-
Dieldrin	4	0	-	-	-	-	-	-	-

[1] Horizontal bar = Median; Top of upper box = 75th percentile; Bottom of lower box = 25th percentile; 75th percentile – 25th percentile = interquartile range; Upper whisker = 75th percentile + (1.5 x interquartile range); Lower whisker = 25th percentile – (1.5 x interquartile range); Dots = outliers.

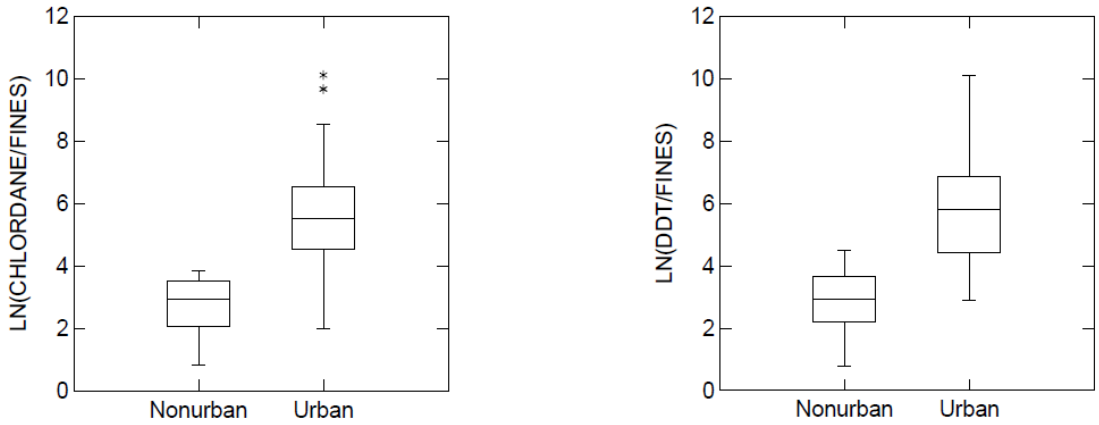

Figure 5-2. Comparison of chlordane and DDT concentrations in the fine fraction of storm drain sediments in urban and nonurban land use categories in the San Francisco Bay watershed.

Using data from the regional study, preliminary loading estimates of chlordane and DDT loads to the San Francisco Bay were developed by the authors. Two major assumptions were necessary to develop these loading estimates. The first assumption was that legacy pesticides in sediments collected from storm drains were associated with particles less than 62.5 µm. Secondly, it was assumed that this fine fraction of the bedded sediment was representative of the suspended material measured as Total Suspended Solids (TSS) in urban runoff from local watersheds. Estimates of chlordane and DDT loads from urban stormwater sources are shown in

Table 5-3, compared to 17 San Francisco Bay watersheds. Since dieldrin was detected in few samples, it was excluded from the calculation. The estimates indicate that the majority of the chlordane load and nearly the entire DDT load to the San Francisco Bay from local watersheds are from urban land areas.

Table 5-3. Median estimates of chlordane and DDT loads from stormwater to the San Francisco Bay from 17 watersheds and portions contributed by urban sources. Low (25th percentile) and high (75th percentile) estimates are included in parentheses (KLI and EOA 2002).

Parameter	San Francisco Bay Watersheds		Urban Sources	
	Pounds	Kilograms	Pounds	Kilograms
Chlordane	85 (48-261)	33 (19-103)	84 (48-260)	33 (19-102)
DDT	23 (2.3-51)	9.2 (0.9-20)	23 (2.3-50)	9.2 (0.9-20)

The pollutant profile included in Appendix A provides additional information on the concentrations of legacy pesticides in urban runoff. The profile is intended to assist Permittees in assessing whether legacy pesticides are present in urban runoff and distributed uniformly in urban areas.

6.0 CURRENT AND PLANNED CONTROL MEASURES

This section provides a summary of control measures implemented by Permittees to control the discharge of legacy pesticides from municipal stormwater to the San Francisco Bay. Control measures are implemented in compliance with the MRP. Given that recent monitoring data from San Francisco Bay (SFEI 2011, SFEI 2012a, CEDEN 2013) indicates that water quality standards for legacy pesticides are consistently achieved, new control measures for municipal stormwater Permittees in the Bay Area are currently not planned or included in this section. However, as discussed in this section the continued implementation current control measures associated with legacy pesticides, and the implementation of pilot and new control measures focused on other high priority sediment-associated pollutants (e.g., PCBs and mercury) will have reduction benefits for legacy pesticides in the future.

Stormwater control measures applicable to legacy pesticides focus on both preventing legacy pesticides from entering the environment and intercepting these pollutants once available for potential transport to the Bay via urban stormwater runoff. Since legacy pesticides are hydrophobic and have a strong association with sediments, most stormwater control measures described do not specifically target legacy pesticides, but instead aim to prevent sediments that may have elevated concentrations pesticides from entering the San Francisco Bay. Legacy pesticides are not the only pollutants of concern associated with sediments, and many of the control measures below are used to control other pollutants, such as polychlorinated biphenyls (PCBs) and mercury. In addition, many of the legacy pesticide control measures described are implemented in compliance with MRP provisions other than C.14. Control measures are described fall into three general categories: 1) Pollution Prevention, 2) Interception, and 3) Treatment.

6.1. Pollution Prevention Activities

6.1.1. Public Education and Outreach

The goal of public education and outreach is to identify and change behaviors that adversely affect water quality, and to increase the understanding and appreciation of streams and the Bay. Permittee approaches to pesticide management focus on the use of best management practices for source control and pollution prevention, including the following:

- Development and distribution of public education material on integrated pest management to highlight less-toxic methods of pest prevention and pest control;
- Promoting proper disposal of pesticides at household hazardous waste facilities or events;
- Outreach to landscape maintenance contractors; and
- Outreach to structural pest control operators.

6.1.2. Household Hazardous Waste Disposal

Permittees also successfully promote, coordinate and staff household hazardous waste (HHW) facilities collection events that result in the proper disposal of unused stocks of legacy pesticides. Data on the amounts of pesticides collected via HHW facilities events by Permittees and associated agencies are available via CalRecycle, the State agency that oversees HHW activities.

6.1.3. Commercial and Industrial Site Controls

Provision C.4 requires Permittees to implement an industrial and commercial site inspection and control program at all sites which could reasonably be considered to cause or contribute to pollution of

stormwater runoff, with follow-up and enforcement consistent with local Enforcement Response Plans (ERPs), to prevent discharges of pollutants and impacts on beneficial uses of receiving waters. These programs assist Permittees in preventing pollutants like legacy pesticides from entering stormwater conveyances.

6.1.4. Illicit Discharge Control Activities

Provision C.5 requires Permittees to implement an illicit discharge control program that includes an active surveillance component, a centralized complaint collection component, and a follow-up component to target illicit discharge and non-stormwater sources. Similar to commercial and industrial site inspection programs, illicit discharge control programs also assist Permittees in preventing pollutants such as legacy pesticides from entering stormwater conveyances.

6.1.5. Construction Site Inspection and Enforcement

Provision C.6 of the MRP requires Permittees to implement a construction site inspection and control program at all construction sites, with follow-up and enforcement. Permittees require all construction sites to have site-specific and seasonally- and phase-appropriate Best Management Practices (BMPs) that fall into the following six categories:

- Erosion control;
- Sediment control;
- Good site management; and
- Run-on and Run-off control;
- Non stormwater management.
- Active treatment systems (as necessary);

Permittees also conduct inspections to determine compliance and effectiveness of the construction site BMPs, and require timely correction if violations are found.

6.2. Activities to Intercept Sediment and Legacy Pesticides

6.2.1. Stormwater System Operation and Maintenance

Permittees currently remove sediment and organic materials through routine maintenance of their stormwater conveyance systems. Control measures include inlet/catch basin cleaning, street sweeping and channel desilting. Frequencies and efficiencies of these control measure vary widely due to site-specific conditions and different levels of implementation by Permittees. Through pilot studies conducted in compliance with provisions C.11/12.c of the MRP, Permittees are currently evaluating the effectiveness of enhanced operation and maintenance activities and assessing the costs of implementing enhanced actions. The focus of these studies is PCBs and mercury, however, all sediment bound pollutants, including legacy pesticides, will benefit from the information being collected. Although sources and pathways differ between legacy pesticides and other sediment-bound pollutants, potential focused implementation of enhanced stormwater system operation and maintenance for PCBs/mercury in the future will also assist Permittees in reducing the load of legacy pesticides to the Bay from urban runoff.

6.3. Stormwater Treatment and Diversions

6.3.1. New and Redevelopment Runoff Controls

Provision C.3 of the MRP requires Permittees to use their planning authority to require source control, site design, and stormwater treatment measures in new and redevelopment projects to prevent stormwater runoff pollutant discharges from and prevent increases in runoff from projects that create and/or replace more than 10,000 ft^3 of impervious surface area. Increases in runoff may cause excess erosion in stream channels, releasing potentially contaminated sediments, including those with elevated concentrations of legacy pesticides.

6.3.2. Stormwater Treatment Retrofits

Storm drain inlet inserts, flow through separation devices (e.g., hydrodynamic separators), vegetated filtration systems (grassy swales), infiltration trenches/basins, media filtration, detention basins, wet ponds and constructed wetlands can intercept sediments and legacy pesticides in the stormwater conveyance system and reduce the load of legacy pesticides to the Bay. These stormwater treatment structures may be installed by municipalities on public and capital improvement projects or as retrofits projects targeting pollutants of concern. Through pilot studies conducted in compliance with provisions C.11/12.e of the MRP, Permittees are currently evaluating the effectiveness of stormwater treatment retrofits and assessing the costs of implementing these actions. The focus of these studies is PCBs and mercury, however, all sediment bound pollutants, including legacy pesticides, will benefit from the information being collected. Although sources and pathways differ between legacy pesticides and other sediment-bound pollutants, potential focused implementation of enhanced stormwater system operation and maintenance for PCBs/mercury in the future may also assist Permittees in reducing the load of legacy pesticides to the Bay from urban runoff.

6.4. Bay and Watershed Monitoring

6.4.1. San Francisco Bay Status and Trends Monitoring

The RMP monitors contaminants, including legacy pesticides, in Bay water, sediments, and fish/wildlife tissue on an ongoing basis through its Status and Trends Program (SFEI 2012b). The status and trends program currently includes:

- Biennial water chemistry monitoring;
- Biennial sediment chemistry monitoring, alternating between wet and dry seasons;
- Biennial bivalve bioaccumulation monitoring;
- Sediment toxicity and benthic taxonomic classification;
- Suspended sediment dynamics (USGS);
- Hydrographic studies (USGS);
- Triennial bird egg monitoring (cormorant and tern); and
- Triennial sport fish monitoring.

The RMP is currently funded through Permittee and other discharger contributions. These contributions provide the adequate funding necessary to support water quality and beneficial uses assessments in the Bay.

6.4.2. Small Tributary POC Loads Monitoring/Modeling

Provision C.8 of the MRP prescribes water quality monitoring conducted by Permittees in tributaries to the Bay. Provision C.8.e of the MRP requires Permittees to conduct pollutants of concern (POC)

monitoring to assess inputs of POCs to the San Francisco Bay from local tributaries and urban runoff, assess progress toward achieving wasteload allocations for TMDLs, and help resolve uncertainties associated with loading estimates for these pollutants. As a result, Permittees developed the Small Tributaries Loading Strategy Multi-Year Plan, which includes the following:

- Watershed modeling of runoff, pollutants, and sediment discharged to San Francisco Bay, using the Regional Watershed Spreadsheet Model, including legacy pesticides;
- Bay margins modeling;
- Source area runoff monitoring;
- Small tributaries monitoring in local watersheds.

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ATTACHMENT A

Legacy Organochlorine (OC) Pesticide Pollutant Profile (SFEI 2013)

Legacy Organochlorine (OC) Pesticide Pollutant Profile

Legacy Pesticides: description, historical usage, and behavior in the environment

Description and historical usage

The legacy pesticides are a subset of organochlorine pollutants that were heavily used as insecticides in California up until their respective regulatory bans. These pollutants are highly toxic to wildlife and humans and are part of the dirty dozen variously chlorinated pollutants (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene, dioxins, furans, hexachlorobenzene, and PCBs) that were banned or heavily regulated in the 1970s and 1980s (Werner and Hitzfeld 2012). All are considered legacy since they are no longer in use yet they still exist in the environment and continue to enter the Bay from local drainages. To support Provision C.14. of the Municipal Regional Stormwater Permit (MRP) (SFBRWQCB 2009), this report focuses on three organochlorine pesticides: Dichlorodiphenyltrichloroethane(DDT), chlordane, and dieldrin.

The term DDT (Figure 1) is generally used to describe six isomers which are a combination of technical grade DDT as well as degradation products (Mischke *et al.* 1985). DDT was used widely in the landscape during its period of usage. It was initially used as an agricultural pesticide and for controlling disease carrying vectors but then usage in residential applications became commonplace (Mischke *et al.* 1985). The use of DDT in California began around 1944, was restricted in 1963 and banned in 1972 consistent with the national ban (Mischke *et al.* 1985). California recordkeeping on pesticide use did not start until 1971 therefore County or even State resolution use statistics on DDTs are not available. However there are records of production for the whole of the US. It appears that more than 600,000 tonnes (1.35 billion lbs) was applied in the U.S. before the 1972 ban. Usage apparently peaked in 1962 at about 82,000 tonnes per year, coincidentally around the time of the publication of Rachel Carson's book "Silent Spring". Scaled to the US population of the 1960s census (181 million), the Bay Area was 2% of the US population and the total use of DDT in the nine county Bay Area was therefore approximately 12,000 metric tonnes (26.5 million lbs).

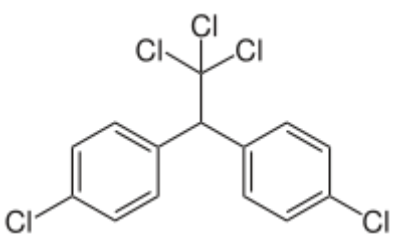

Figure 1 . Chemical structure of DDT.

The term Chlordane (Figure 2) also represents a pesticide category with multiple isomers. Chlordane was manufactured and sold in the United States from 1948 to 1988. In the Bay Area, this pesticide group had more structural (64%) applications than other legacy pesticides (Figure 3) and was primarily used in termite control. Early applications also included home/garden use (Dearth and Hites 1991). Over the period 1974-1980, Santa Clara County registered the highest Bay Area chlordane use accounting for about 30% of total use (Figure 4 and Figure 5). In the Bay Area, chlordane use declined from 117,000 pounds in 1975 to 53,000 pounds in 1980 – more than a 50% reduction in 5 years. Chlordane was restricted for use in California in 1975 and banned nationally in 1978 except for use in termite control (Dearth and Hites 1991; Kratzer 1999). The production of chlordane was ceased nationally in 1988.

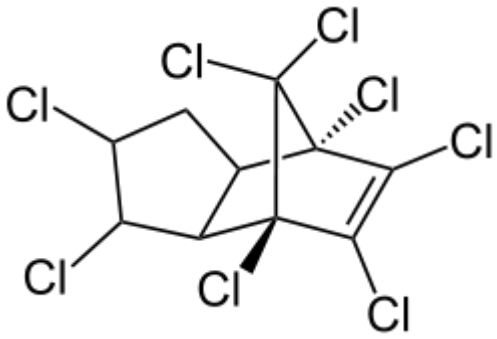

Figure 2. Chemical structure of chlordane.

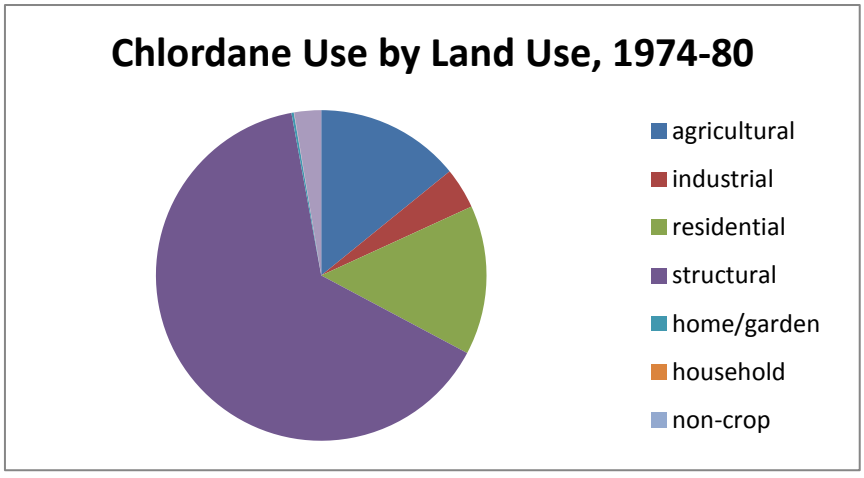

Figure 3. Bay Area chlordane usage (in pounds) by land use 1974-1980 (California Department of Pesticide Regulation data).

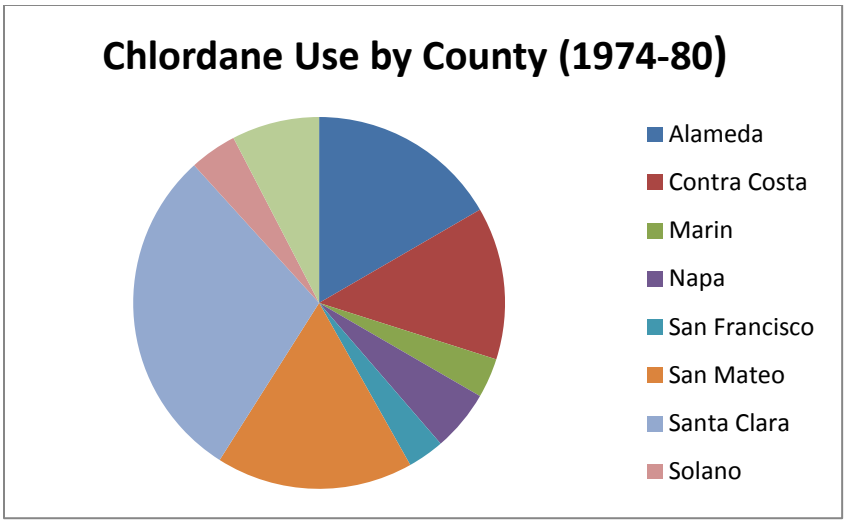

Figure 4. Bay Area chlordane usage (in pounds) by county 1974-1980 (California Department of Pesticide Regulation Data).

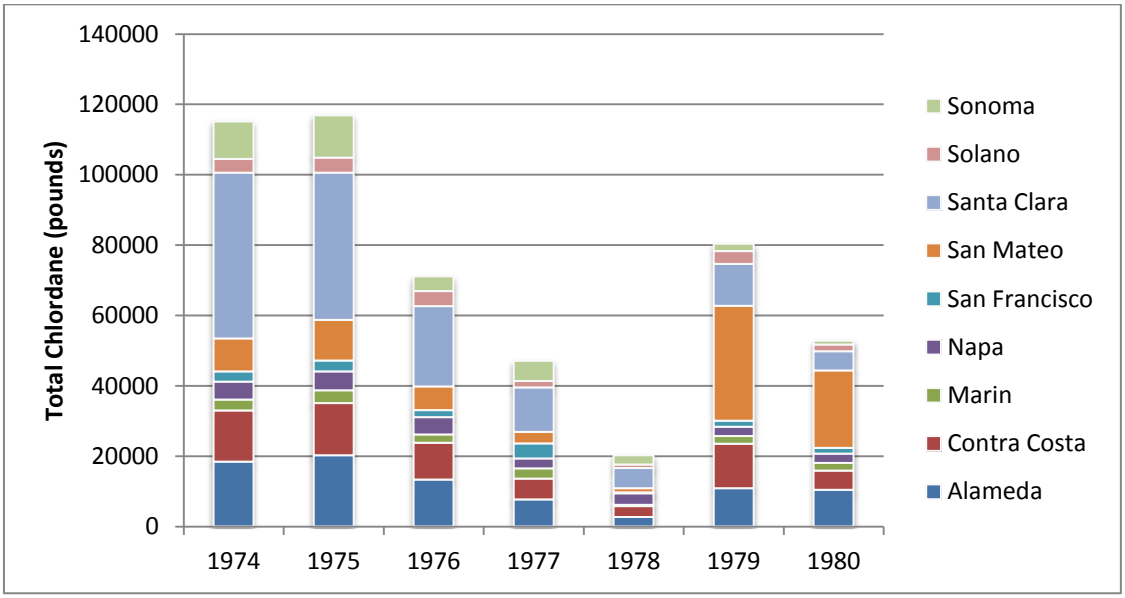

Figure 5. Bay Area chlordane usage (in pounds) by county 1974-1980 (California Department of Pesticide Regulation Data).

Dieldrin is a chlorinated hydrocarbon (Figure 6) originally produced in 1948 as an insecticide. Dieldrin is closely related to aldrin, which reacts further to form dieldrin. Aldrin is not toxic to insects; it is oxidized in the insect to form dieldrin which is the active compound. Both dieldrin and aldrin are named after the Diels-Alder reaction which is used to form aldrin from a mixture of norbornadiene and hexachlorocyclopentadiene. Dieldrin proved to be a highly effective insecticide and was very widely used during the 1950s to early1970s. Endrin is a stereoisomer of dieldrin. However, it is an extremely persistent organic pollutant; it does not easily break down.

Furthermore it tends to biomagnify as it is passed along the food chain. Long-term exposure has proven toxic to a very wide range of animals including humans, far greater than to the original insect targets. For this reason it is now banned in most of the world. It has been linked to health problems such as Parkinson's, breast cancer, and immune, reproductive, and nervous system damage.

Historically, dieldrin applications included termite control, wood preservation, and moth proofing, particularly by the textile industry (Meharg *et al.* 2000). Dieldrin use began in 1950 and, in the Bay Area, was primarily used in residential (47%), agriculture (29%), and commercial (24%) applications (Figure 7). Alameda and Solano counties (26% each) had the highest dieldrin use in the Bay Area over the period 1974-1980 (Figure 8 and Figure 9). The pesticide was restricted in 1974 and banned in 1985 except for underground termite control (Kratzer 1999). However, dieldrin use was effectively discontinued in the Bay Area in 1978 (Figure 9). A full national ban occurred in 1987.

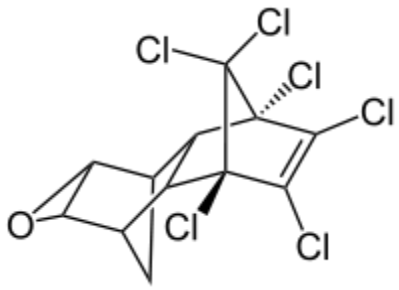

Figure 6. Chemical structure of dieldrin.

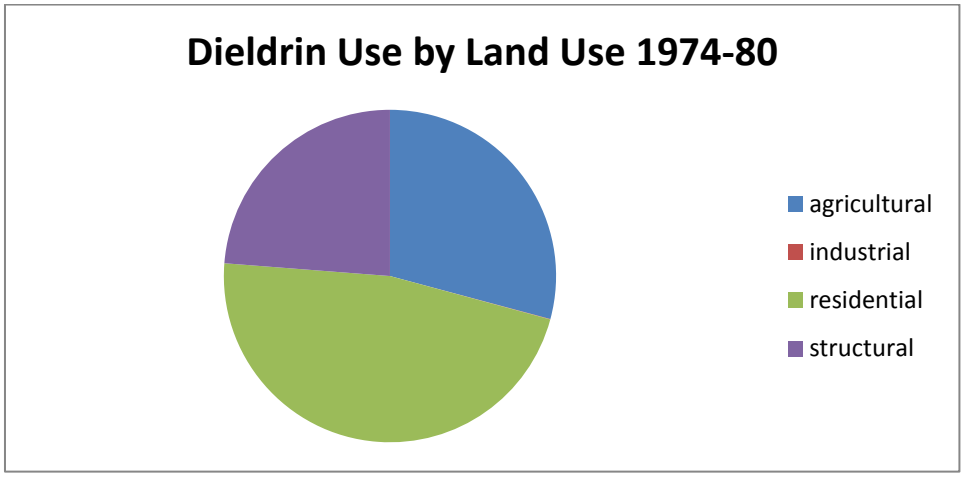

Figure 7. Dieldrin usage by land use 1974-1980 (California Department of Pesticide Regulation data).

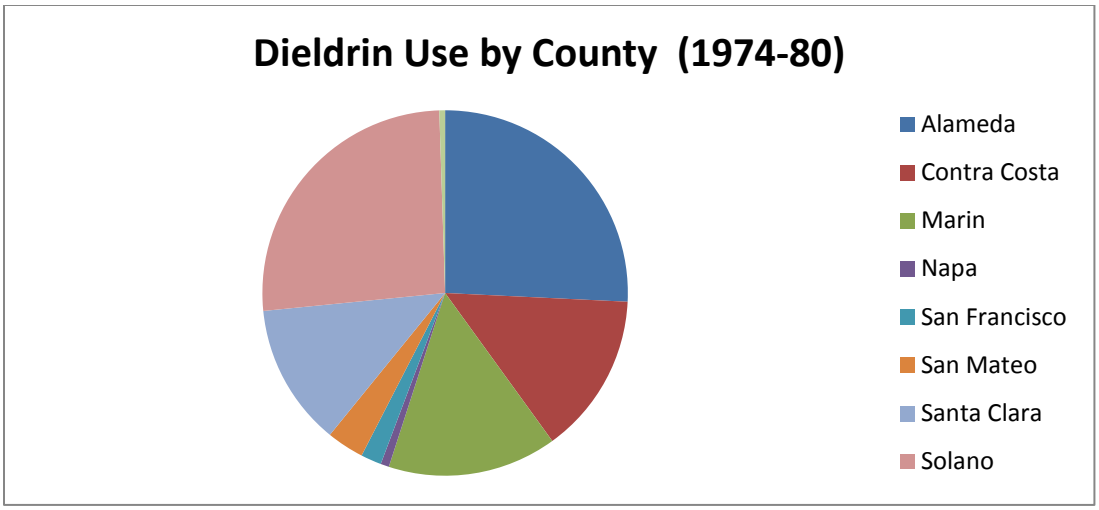

Figure 8. Bay Area dieldrin usage (in pounds) by county 1974-1980 (California Department of Pesticide Regulation Data).

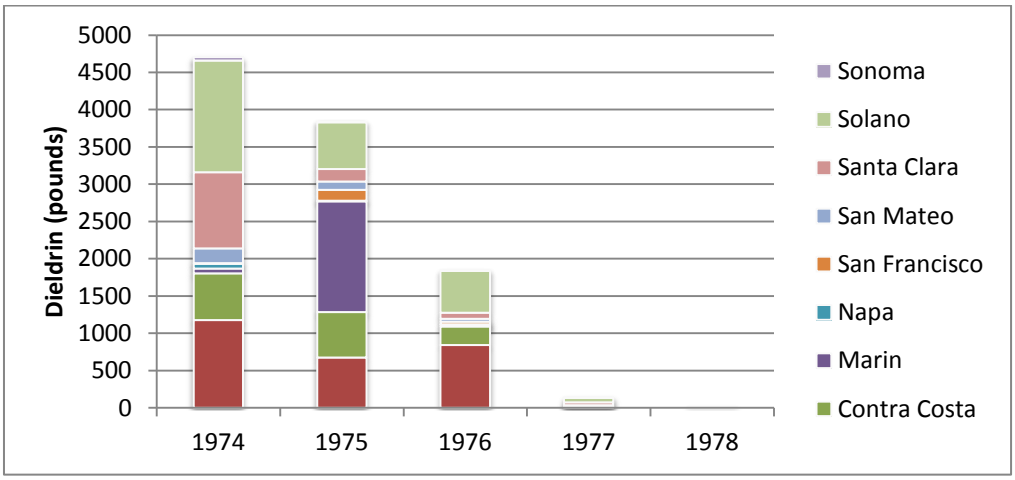

Figure 9. Bay Area dieldrin usage (in pounds) by county 1974-1980 (California Department of Pesticide Regulation Data).

How do legacy pesticides behave in the environment?

Technical grade DDT is a mixture of three DDT isomers, p,p'-DDT (85%) and lower percentages of o,p'-DDT and o,o'-DDT (Network). DDE is the primary degradation product in oxygenated soils (Guenzi and Beard 1976). DDT and degradation products are persistent in the environment and, once in aquatic environments, have bioaccumulative properties (Kratzer 1999; Nowell *et al.* 1999). Soil half-lives for DDT and degradation products range from 110 days - 5690 days (0.3 – 15.6 years) (Nowell *et al.* 1999). Additionally, soil conditions can greatly affect chemical degradation (Guenzi and Beard 1976; Hitch and Day 1992).

Technical grade chlordane consists of an estimated 147 structurally related compounds (Dearth and Hites 1991). The most dominant isomers in technical grade are the cis- and trans-chlordanes which are also racemic in the mixture (Dearth and Hites 1991; Bidleman *et al.* 2004). Both isomers show low solubility in water, high affinity to bind with organic carbon in soils and have a half-life of about 365 days (Nowell *et al.* 1999; Medina *et al.* 2009). Other isomers, such as oxychlordane, are more water-soluble and have lower affinities for soil binding (Nowell *et al.* 1999). Legacy contaminated US Air Force sites showed high chlordane soil concentrations (up to 20 ppm) 20-60 years post application. Volatilization from soils is one of the primary pathways of transport (Bidleman *et al.* 2004; Scholtz and Bidleman 2007; Medina *et al.* 2009).

Dieldrin is more soluble (particularly at higher temperatures) than the other organochlorine pesticides discussed and has a lower affinity for binding with soils (Eye 1968; Nowell *et al.* 1999). However, dieldrin has been shown to remain in soils with half-lives ranging from 2 to 7 years depending on soil type (as reviewed in (Eye 1968). Flood events can mobilize dieldrin contaminated sediment particles from land based sources. When these are in a micro-particulate form (experimentally <32 µm) they can be prone to desorption, resulting in aqueous transport of dieldrin (Smit *et al.* 2008).

As noted above, as a general rule, all three chlorinated pesticides (DDT, chlordane, and dieldrin) can remain in soils for long periods of time and can be released to the atmosphere from contaminated soils or, through erosional processes, release to rivers, creeks, and other drainage systems via stormwater (Foster *et al.* 2000; McKee *et al.* 2004). Connor et al (2004) reviewed legacy pesticide transport pathways to San Francisco Bay. At that time, the authors estimated that local tributaries accounted for an estimated 71% of DDT loads, 91% of chlordane loads, and 33% of dieldrin loads to the Bay, the single largest pathway (Table 1). Keeping in mind that the errors and biases in the loads estimates may have been relatively large due to a lack of spatially and temporally resolute data, loads from the Central Valley Rivers were also identified as a larger contribution compared to other sources such as direct atmospheric deposition or wastewater loads.

Table 1. Legacy pesticide loading estimates including upper and lower bounds (kg/year) for San Francisco Bay (reproduced from Connor et al., 2004).

Pathway	DDTs	Chlordanes	Dieldrin
Central Valley	15 (5–40)	2 (0.7–5)	5 (2–13)
Local Watershed	40 (9–190)	30 (7–160)	3 (0.7–15)
Municipal Wastewater	0.2 (0.02–2)	0.1 (0.003–2)	0.06 (0.008-0.4)
Industrial Wastewater	<0.2	<0.1	<0.06
Atmospheric Deposition	1 (0.02–2)	0.9	1 (0.02–2)
Erosion of Sediment deposits	9 (0.2 – 18)	2 (0 – 4)	0.2 (0 – 0.6)
Dredged material	-2 (-3 – -0.03)	-0.3 (-0.6 – 0)	-0.03 (-0.1-0)
Total best estimate	**60 (10 – 250)**	**30 (10-170)**	**10 (3-30)**

Release mechanisms to the environment and possible pollutant source areas

Conceptually, release of organochlorine pesticides into the environment could have occurred during initial synthesis (true sources), contamination of soils due to spillage during transportation to market, (by definition) during usage, and during disposal of contaminated storage containers, equipment, or unused product. These conceptual categories will be explored in this section.

Initial synthesis: That we are aware of, there are no legacy locations of manufacture of organochlorine pesticides in the Bay Area. United Heckathorn formulated, packaged, and shipped pesticides from a five acre site at the head of the Lauritzen and Parr channels of Richmond Harbor. No chemicals were manufactured on site. Heckathorn would receive technical grade pesticides from chemical manufacturers, grind them in air mills, mix them with other ingredients such as clays or solvents, and package them for final use in liquid or powder form. Although many pesticides were handled at United Heckathorn, DDT accounted for approximately 95% of the operations (EPA, 2013). We are not aware of any factories where mixing or alternative formulations were prepared. Thus, there are no true sources in the Bay Area.

Contamination of soils due to spillage during transportation to market: Given DDT use likely peaked in California in around 1962, the main transportation rout for DDT product would have been rail transport. Thus, historic rail yards and connected warehousing in older industrial areas could be considered legacy source areas. Production and use of chlordane and dieldrin occurred later but still within the same general period when rail transport was a strong component of Bay Area transport systems relative to today. Other legacy source areas may include wholesale and retail depots such as agricultural supply stores or supply depots for commercial pesticide applicators.

Use Area: Given the use history of DDT, chlordane, and dieldrin, organochlorine pesticides are likely relatively ubiquitous in soil residues across Bay Area watersheds. However, despite the ubiquitous application and wind and atmospheric dispersion of these pollutants, there are potential land uses that can be identified in local watersheds. For example, soils in plant and tree nurseries have been found to contain excessively high concentrations of organochlorine pesticides (Mangiafico *et al.* 2008). From the Bay Area pesticide use data available, chlordanes were primarily used in structural applications for termite control while dieldrin was primarily used as a residential pesticide. These applications are spatially disparate in watersheds making source area identification more difficult.

Disposal and recycling: Like many chemicals, both in modern use and historic use, bulk product was delivered in metal drums. Source areas therefore likely include drum recycling facilities and perhaps more generally metals recycling facilities. There may also be some legacy product still being discarded into landfills as packages containing pesticides, sometimes with obscured labels, are discarded from storage.

Source areas and pollutant concentrations in soils

Since no previous literature review was available on OC pesticides in soils for the Bay Area (the RMP nor and SFEI grant funded project competed such a review), we carried out a brief survey of peer-reviewed literature as well as reviewed data available locally based mainly on BASMAA studies carried out during 2000 and 2001.

Previous analyses of local DDT and chlordane storm drain sediment data found very limited statistical differences in chlordanes and DDTs by land use (KLI and Eisenberg 2002). In the following tables, concentrations and statistics on soils data collected in individual studies are shown (Table 2 - Table 4), as well as a summary based on simple land use classes (Table 5 -

Table 7) that may be considered for our regional modeling efforts. For chlordanes, soil and sediment concentrations from residential/commercial land use were statistically higher than other land uses (industrial, mixed, and open). Chlordane was used more extensively as a structural pesticide which may partly explain why concentrations were highest in residential/commercial areas. However, there were no apparent statistical differences for DDT soil/sediment concentrations in these same land uses suggesting widespread usage and dispersion of DDTs. It is also interesting to note that concentration data from the historic study by Law and Goerlitz (1974) shows a similar range of concentrations for both DDT and chlordane compounds perhaps indicating no trend. Unfortunately, it is not possible to separate out specific source areas such as depots, railway loading areas, or nurseries and other possible source areas. Soils data from a survey of the local literature and local studies supports the hypothesis that:

- Maximum DDT concentrations were highest in soil and sediments from industrial land uses and lowest from open space. Residential/commercial land uses had the intermediate concentrations,
- Maximum chlordane concentrations were also highest in soil and sediment from industrial land uses and lowest in open space. Residential/commercial land uses also had intermediate concentrations,
- Dieldrin soil and sediment concentrations are highest in residential/commercial areas and lowest in open space.

Pollutant concentrations in stormwater

Despite regulatory actions banning use of these chemicals, legacy pesticides are still being found in Bay Area stormwater (KLI and Eisenberg 2002; Salop *et al.* 2002; McKee *et al.* 2004; Hunt *et al.* 2012). DDT isomer percentage (DDT: DDD and DDT: DDE) greater than 5% may indicate fresh sources of DDT or lower soil degradation rates from DDT to DDE (J Davis, personal communication). Based on this conceptual model, local data suggest that fresh DDT is still being transported from some watersheds (Guadalupe River, Zone 4 Line A, Richmond Pump Station). Soil temperatures, oxygen levels, and other soil conditions can affect the degradation of DDT to DDE with higher temperatures resulting in higher degradation rates (Guenzi and Beard 1976; Hitch and Day 1992; Rinella *et al.* 1993). It is unclear if higher DDT isomer percentages, in stormwater, are a

result of ongoing illegal applications of private stockpiles or from soil conditions that hinder degradation to DDE in the watershed.

Table 2. Sediment and soil DDT concentrations, by land's use, from local studies and world literature. The fines fraction is <62.5 µm. For the tabulated data, DDT concentrations are comprised of p,p'-DDT, o,p'-DDT p,p'-DDD, o,p'-DDD, p,p'-DDE, and o,p'-DDE, unless otherwise noted. Zero (0) is entered for non-detect (ND) concentrations. Soil/sediment samples consist of grab and composite samples. Statistics are within study average, minimum, maximum, and median concentrations except where noted.

Land Use Source Category	Specific Location	Region (Bay Area, Arid West, US, World)	Reference	units	Media (stormwater, soil)	Type of Result (particle normalized, water concentration, sediment concentration)	Average	Maximum	Median	Minimum	Non-averaged result
Agricultural	Yolo Bypass	Central Valley California	Smalling et al., 2007	µg/kg	Creek bed	Sediment Concentration					263
Agricultural	Yolo Bypass	Central Valley California	Smalling et al., 2007	µg/kg	Soil	Sediment Concentration	355	786	374	11	
Industrial	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	244	4037	74	10	
Industrial	Bay Area	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	881	24541		19	
Mixed	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	30	73	29	8	
Mixed	Bay Area	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	123	734		14	
Open	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	6	15	1	1	
Open	Bay Area	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	1	1		1	
Residential/commercial	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	267	2157	41	6	
Residential/commercial	Bay Area	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	239	1307		7	
Unknown	Marin County	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	60	155	40	6	
Unknown	San Mateo County	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	75	264	52	12	
Urban	Ballona Creek	Arid West	Curren Et al. 2011	µg/kg	Storm drain	Particulate concentration		70		0	
Urban	Beijing China	World	Zhang et al., 2010	ng/g	Street dust	Sediment Concentration	20	59		1	
Urban/Rural	26 Bay Area creeks	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	63				
Urban/Rural	Alameda Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	18				
Urban/Rural	Alamitos Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	60				
Urban/Rural	Arroyo Corte Madera del Persidio	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	69				
Urban/Rural	Arroyo de la Laguna	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	36				
Urban/Rural	Belmont Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	347				
Urban/Rural	Colma Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	11				
Urban/Rural	Cordilleros Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	46				
Urban/Rural	Corte Madera Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	106				
Urban/Rural	Coyote Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	99				
Urban/Rural	Green Valley Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	5				
Urban/Rural	Guadalupe River	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	8				
Urban/Rural	Los Gatos Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	53				
Urban/Rural	Los Trancos Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	22				
Urban/Rural	Miller Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	48				
Urban/Rural	Napa River	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	58				
Urban/Rural	Navato Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	20				
Urban/Rural	Petaluma River	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	20				
Urban/Rural	Redwood Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	42				
Urban/Rural	San Francisquito Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	193				
Urban/Rural	San Lorenzo Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	16				
Urban/Rural	San Pablo Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	11				
Urban/Rural	San Rafael Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	270				
Urban/Rural	Sanoma Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	4				
Urban/Rural	Stevens Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	49				
Urban/Rural	Union Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	66				
Urban/Rural	Wildcat Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	29				

Table 3. Sediment and soil chlordane (sum of 6 isomers) concentrations by land use from local studies and world literature. Chlordane concentrations are comprised of Chlordane, cis-, Chlordane, trans-, Heptachlor, Nonachlor, cis-, Nonachlor, trans-, Oxychlordane, Heptachlor epoxide, unless otherwise noted. Zero (0) is entered for non-detect (ND) concentrations. Soil/sediment samples consist of grab and composite samples. Statistics are within study average, minimum, maximum, and median concentrations except where noted.

Land Use Source Category	Specific Location	Region (Bay Area, Arid West, US, World)	Reference	units	Media (stormwater, soil)	Type of Result (particle normalized, water concentration, sediment concentration)	Average	Maximum	Median	Minimum
Industrial	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	388	11496	55	9
Industrial	Bay Area storm drains	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	1315	24296		2
Mixed	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	31	111	21	6
Mixed	Bay Area storm drains	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	65	268		5
Open	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	5	13	1	1
Open	Bay Area storm drains	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	2	4		1
Res/Com	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	363	2657	92	10
Residential/commercial	Bay Area storm drains	Bay Area	KLI 2002	µg/kg fines	Storm drain	Sediment Concentration	964	3744		54
Unknown	Marin County	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	336	1125	106	7
Unknown	San Mateo County	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	64	227	41	15
Urban	Ballona Creek	Arid West	Curren Et al. 2011	µg/kg	Storm drain	Particulate concentration		191		0
Urban/Rural	26 Bay Area creeks	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	122			
Urban/Rural	Alameda Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	33			
Urban/Rural	Alamitos Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	46			
Urban/Rural	Arroyo Corte Madera del Persidio	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	140			
Urban/Rural	Arroyo de la Laguna	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	111			
Urban/Rural	Belmont Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	660			
Urban/Rural	Colma Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	29			
Urban/Rural	Cordilleros Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	27			
Urban/Rural	Corte Madera Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	103			
Urban/Rural	Coyote Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	77			
Urban/Rural	Green Valley Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	0			
Urban/Rural	Guadalupe River	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	13			
Urban/Rural	Los Gatos Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	140			
Urban/Rural	Los Trancos Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	21			
Urban/Rural	Miller Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	310			
Urban/Rural	Napa River	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	36			
Urban/Rural	Navato Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	62			
Urban/Rural	Petaluma River	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	130			
Urban/Rural	Redwood Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	40			
Urban/Rural	San Francisquito Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	339			
Urban/Rural	San Lorenzo Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	15			
Urban/Rural	San Pablo Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	65			
Urban/Rural	San Rafael Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	800			
Urban/Rural	Sanoma Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	4			
Urban/Rural	Stevens Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	99			
Urban/Rural	Union Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	200			
Urban/Rural	Wildcat Creek	Bay Area	Law and Goerlitz, 1974	µg/kg	Creek bed	Sediment Concentration	66			

Table 4. Sediment and soil dieldrin concentrations by land use from local studies only. Zero (0) is entered for non-detect (ND) concentrations.

Land Use Source Category	Specific Location	Region (Bay Area, Arid West, US, World)	Reference	units	Media (stormwater, soil)	Type of Result (particle normalized, water concentration, sediment concentration)	Average	Maximum	Median	Minimum
Industrial	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	25	570	7	1
Mixed	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	7	17	5	0
Open	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	6	14	3	0
Res/Com	Bay Area	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	118	1300	11	0
Unknown	Marin County	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	8	14	6	0
Unknown	San Mateo County	Bay Area	KLI database	µg/kg	Sediment	Sediment Concentration	13	82	5	4

Table 5. Summary statistics for DDTs in sediment and soils by land use for local studies only.

Land Use Source Category	units	Count	Minimum	Maximum	Average
Industrial	µg/kg	4	10	4037	1091
Residential/commercial	µg/kg	4	6	2157	618
Urban/Rural	µg/kg	27	4	347	66
Unknown	µg/kg	8	6	264	83
Mixed	µg/kg	4	8	73	35
Open	µg/kg	4	1	15	6
Industrial	µg/kg fines	3	19	24,541	8480
Residential/commercial	µg/kg fines	3	7	1307	518
Mixed	µg/kg fines	3	14	734	290
Open	µg/kg fines	3	1	1	1

Table 6. Summary statistics for chlordane and sediment in soils by land use our local studies only. Zero (0) is entered for non-detect (ND) concentrations.

Land Use Source Category	units	Count	Minimum	Maximum	Average
Industrial	µg/kg	4	9	11496	2987
Residential/commercial	µg/kg	4	10	2657	781
Unknown	µg/kg	8	7	1125	240
Urban/Rural	µg/kg	27	0	800	137
Mixed	µg/kg	4	6	111	42
Open	µg/kg	4	1	13	5
Industrial	µg/kg fines	3	2	24296	8538
Residential/commercial	µg/kg fines	3	54	3744	1587
Mixed	µg/kg fines	3	5	268	113
Open	µg/kg fines	3	1	4	2

Table 7. Summary statistics for dieldrin in sediment and soils by land use for local studies only. Zero (0) is entered for non-detect (ND) concentrations.

Land Use Source Category	units	Count	Minimum	Maximum	Average
Residential/commercial	µg/kg	4	0	1300	357
Industrial	µg/kg	4	1	570	151
Unknown	µg/kg	8	0	82	16
Mixed	µg/kg	4	0	17	7
Open	µg/kg	4	0	14	6

OC pesticide data in stormwater are available from a number of Bay Area rivers, creeks, and stormdrains (Table 8-Table 11). However, since most of the sampling locations are at the downstream points of our systems, pollutant contributions from distinct land uses or source areas are not available. The local exception is the Heckathorn United Inc. Superfund site which can be considered a source area. Recent stormwater monitoring at this location, showed most stormwater samples below detection. But a storm event in May 2012 produced maximum stormwater concentrations for DDT (267 ng/L) and dieldrin (13 ng/L) (Services 2013). After this storm event, a cracked pipe in the stormwater collection system was found and believed to be the source of the pesticides in stormwater. As part of the Superfund remediation, the site has been engineered with a concrete cap covering the contaminated area as well as an extensive stormwater collection system. There is potential for additional leaking from the capped area if the engineered system becomes compromised.

There are also nonlocal pesticide findings that do provide some basis of pollutant contributions from land use/source areas, in particular from agricultural areas. DDT and dieldrin stormwater concentrations from plant nurseries in Southern California were elevated compared with local stormwater concentrations. Maximum DDT was measured at 620 ng/L and maximum dieldrin was measured at 20 ng/L (Mangiafico *et al.* 2009). An additional study at Southern California citrus/avocado groves also found elevated DDT concentrations of stormwater (136 ng/L) (Mangiafico *et al.* 2009). It is unclear why pesticide concentrations were elevated since property owners did not report using these pesticides. The papers hypothesized pollutants may be spray drift from adjacent properties or legacy contaminants that are continuing to be mobilized. No similar Bay Area studies were found. Therefore it is unclear if local nurseries and other agricultural areas are sources of organochlorine pesticides.

To explore possible regional scale variations in applications in relation to land use, the ratios of chlordane to dieldrin were computed for the local stormwater data as well as the available storm drain sediment data. No unequivocal patterns were isolated in relation to imperviousness or land use characteristics for the stormwater data except there appears to be an indication that older industrial areas exhibit less chlordane relative to dieldrin (Table 12). A better pattern may have been observed if the Richmond sampling location had more wet weather data (the data currently available is from the original Richmond pump station data set which was predominantly dry flow (Hunt et al., 2012)) or if data were available from more locations than just four. There appears to be a more robust pattern emerging from the bed sediment data (Table 13). Chlordane use in the Bay Area was mostly structural while dieldrin was residential. From the usage history, we might expect open spaces and residential/commercial land uses to have lower ratios and that does appear to bear out in the bed sediment data – although there are many structures in residential/commercial areas but perhaps dieldrin was used more in industrial applications - not in residential or commercial areas. This pattern appears to be directly opposite to the pattern seen in the stormwater data (although the n is small for the stormwater data).

Table 8. DDT concentrations in stormwater, by land use, from local studies and world literature

Analyte	Land Use Source Category	Specific Location	Region (Bay Area, Arid West, US, World)	Reference	units	Media (stormwater, soil)	Type of Result (particle normalized, water concentration, sediment concentration)	Average	Maximum	Median	Minimum
DDT-Sum	Agricultural	Orestimba Creek at River Road	Arid West	Kratzer 2007	µg/kg	Stormwater	Particulate concentration	316			
DDT-Sum	Agricultural	San Joaquin River tributaries	Arid West	Kratzer 2007	µg/kg	Dry Season Runoff	Sediment Concentration	307	617	258	71
DDT-Sum	Agricultural	San Joaquin River tributaries	Arid West	Kratzer 2007	µg/kg	Stormwater	Particulate concentration	205	458	193	4.6
Sum p,p isomers	Hekathorn Superfund Site	Heckathorn Superfund Site	Bay Area	Environmental Technical Services, 2013	ng/L	stormwater	Water Concentration		267		0.0
DDT-Sum	Mixed	Guadalupe River at hwy 101	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	35	71	35	3.3
DDT-Sum	Mixed	Mallard Island	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	0.8	1.6	0.5	0.3
DDT-Sum	Mixed	Mallard Island	Central Valley	Bergamaschi et al., 2001	µg/kg	Stormwater	Particulate concentration	6.0	11		4.0
DDT-Sum	Mixed	Richmond Pumpstation	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	1.2	3.6	0.5	0.0
DDT-Sum	Mixed	Zone 4 Line A	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	20	59	10	7.4
DDT-Sum	Urban	Beijing China	World	Zhang et al., 2010	ng/L	Stormwater	EMC	12	1.3		1.3
Sum p,p isomers	Citrus/avocado grove	Ventura County	Arid West	Mangiafico et al., 2009	ng/L	Stormwater	Water Concentration		136		
Sum p,p isomers	Plant nursery	Ventura County	Arid West	Mangiafico et al., 2008	ng/L	Stormwater	Water Concentration		374		
Sum p,p isomers	Plant nursery	Ventura County	Arid West	Mangiafico et al., 2009	ng/L	Stormwater	Water Concentration		620		

Table 9. Chlordane concentrations in stormwater, by land use, from local studies and world literature

Analyte	Land Use Source Category	Specific Location	Region (Bay Area, Arid West, US, World)	Reference	units	Media (stormwater, soil)	Type of Result (particle normalized, water concentration, sediment concentration)	Average	Maximum	Median	Minimum
Chlordane	Agricultural	Orestimba Creek at River Road	Arid West	Kratzer 2007	µg/kg	Stormwater	Particulate concentration	7			
Chlordane	Agricultural	San Joaquin River tributaries	Arid West	Kratzer 2007	µg/kg	Dry Season Runoff	Sediment Concentration	11	31	6	0
Chlordane	Agricultural	San Joaquin River tributaries	Arid West	Kratzer 2007	µg/kg	Stormwater	Particulate concentration	12	43	5	0
Chlordane	Mixed	Guadalupe River at hwy 101	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	29	64	26	3.4
Chlordane	Mixed	Mallard Island	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	0.10	0.18	0.10	0.04
Chlordane	Mixed	Mallard Island	Central Valley	Bergamaschi et al., 2001	µg/kg	Stormwater	Particulate concentration	0			
Chlordane	Mixed	Richmond Pumpstation	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	1.8	5.6	0.73	0.27
Chlordane	Mixed	Zone 4 Line A	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	9.3	16	9.3	3.5
Heptachlor and trans chlordane	Plant nursery	Ventura County	Arid West	Mangiafico et al., 2008	ng/L	Stormwater	Water Concentration		37		
Sum of cis,trans-chlordane, Heptachlor, heptachlor epoxide	Hekathorn Superfund Site	Heckathorn Superfund Site	Bay Area	Environmental Technical Services, 2013	ng/L	stormwater	Water Concentration		0		0
Technical chlordane	Hekathorn Superfund Site	Heckathorn Superfund Site	Bay Area	Environmental Technical Services, 2013	ng/L	stormwater	Water Concentration		0		0
Trans chlordane	Plant nursery	Ventura County	Arid West	Mangiafico et al., 2009	ng/L	Stormwater	Water Concentration		12		

Table 10. Dieldrin concentrations in stormwater, by land use, from local studies and world literature

Land Use Source Category	Specific Location	Region (Bay Area, Arid West, US, World)	Reference	units	Media (stormwater, soil)	Type of Result (particle normalized, water concentration, sediment concentration)	Average	Maximum	Median	Minimum
Agricultural	England	England	Meharg et al., 2000	ng/L	Water	Water Concentration	3.0	13		0.16
Agricultural	Orestimba Creek at River Road	Arid West	Kratzer 2007	µg/kg	Stormwater	Particulate concentratio	4.6			
Agricultural	San Joaquin River tributaries	Arid West	Kratzer 2007	µg/kg	Dry Season Runoff	Sediment Concentration	4.8	7.9	5.3	0
Agricultural	San Joaquin River tributaries	Arid West	Kratzer 2007	µg/kg	Stormwater	Particulate concentratio	3.0	8.8	2.0	0
Hekathorn Superfund Site	Heckathorn Superfund Site	Bay Area	Environmental Technical Services, 2013	ng/L	stormwater	Water Concentration		13		0
Industrial	England	England	Meharg et al., 2000	ng/L	Water	Water Concentration	3.0	13	0	0.16
Mixed	Guadalupe River at hwy 101	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	2.8	6.0	2.7	0.64
Mixed	Mallard Island	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	0.16	0.25	0.16	0.06
Mixed	Richmond Pumpstation	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	0.85	1.1	0.90	0.46
Mixed	Zone 4 Line A	Bay Area	SFEI Loading Studies	ng/L	Stormwater	Water Concentration	1.5	4.6	0.85	0.71
Plant nursery	Ventura County	Arid West	Mangiafico et al., 2008	ng/L	Stormwater	Water Concentration		20		

Table 11. Summary statistics for DDT, dieldrin, chlordanes in stormwater by land use, from local studies. Sum of p,p isomers include DDT, DDD, and DDE.

Contaminant	Land Use Source Category	Units	Count of Sites	Maximum	Minimum	Average
Sum p,p isomers	Hekathorn Superfund Site	ng/L	2	267	0	134
DDT-Sum	Mixed	ng/L	48	71	0	10
Dieldrin	Hekathorn Superfund Site	ng/L	2	13	0	6.5
Dieldrin	Mixed	ng/L	48	6	0.06	1.1
Sum of cis,trans-chlordane, Heptachlor, heptachlor epoxide	Hekathorn Superfund Site	ng/L	2	0	0	0
Technical chlordane	Hekathorn Superfund Site	ng/L	2	0	0	0
Chlordane	Mixed	ng/L	48	64	0	7.1

Table 12. The ratio of chlordane to dieldrin based on stormwater loading studies in the Bay Area.

	Ratio of Chlordane/Dieldrin in Stormwater	% Impervious	% Old Industrial (1974)	% Res/Com
Guadalupe River at hwy 101	10	39	2	50
Zone 4 Line A	4.8	68	18	62
Richmond Pumpstation*	0.91	62	33	35
Mallard Island	0.73	-	-	-

*Based mostly on dry weather data.

Table 13. The ratio of chlordane to dieldrin based on bed sediment studies in the Bay Area (KLI and EOA, 2002).

	Ratio of Chlordane/Dieldrin in Stormdrain Sediment
Unknown	16
Industrial	15
Mixed	4.8
Res/Com	3.1
Open	0.93

Relationships with other Contaminants

Investigating local data can provide information that can be used to identify relationships between hydrophobic contaminants. These relationships do not necessarily identify source areas but they can identify contaminants that co-occur spatially or are transported during storm water runoff following similar release and transport processes. DDTs, chlordanes, and dieldrin stormwater and storm drain concentrations were found to be highly correlated with PCB concentrations in local watersheds (Zone 4 Line A, Guadalupe River, Richmond Pump Station, and various watersheds in KLI 2002) suggesting that land/stream based transport mechanisms for organic pollutants, in these watersheds, are similar (Table 14 and Table 15). These correlations suggest that management actions, designed to remove PCBs, may also be effective in removing DDTs, chlordanes, and dieldrin. They suggest that management of Hg will not be as effective for removal of other contaminants.

Table 14. Pearson correlation coefficients between legacy pesticides, PCBs, and Mercury for stormwater data from Zone 4 Line A, Guadalupe River, and Richmond Pump Station. Yellow highlights indicate well correlated data.

	Dieldrin	*Total Mercury*	*Sum of 40 PCBs (SFEI)*	*Sum of Chlordanes (SFEI)*	*Sum of DDTs (SFEI)*
Dieldrin	1				
Mercury	0.27	1			
Sum of 40 PCBs (SFEI)	0.87	0.28	1		
Sum of Chlordanes (SFEI)	0.86	0.26	0.87	1	
Sum of DDTs (SFEI)	0.84	0.23	0.88	0.95	1

Table 15. Pearson correlation coefficients between legacy pesticides, PCBs, and mercury for storm drain sediment data from KLI 2002 (utilizing data normalized to percent fines <62.5 µm). Yellow highlights indicate well correlated data.

	Chlordane	*Sum DDT*	*Sum PCB*	*Total Mercury*
Chlordane	1			
Sum DDT	0.87	1		
Sum PCB	0.96	0.97	1	
Total Mercury	0.70	0.27	0.50	1

Summary and Options to support Model development

The compilation of local and literature soil/sediment and stormwater organochlorine pesticide concentrations provides a starting point for identifying possible land use and/or source area contributions to pollutant loading. The soil/sediment data provide more classes of land use than the stormwater data. Additionally, these data (maximum concentrations) also span many orders of magnitude between the land uses (chlordane = 4; DDT and dieldrin = 3) which provides a range of pollutant contributions from high to low. However, much of the soil/sediment data are more than 10 years old and therefore may not be representative of current conditions. In contrast, the stormwater data span about 2 orders of magnitude but do have some empirical data on source areas (Superfund site, nurseries, agriculture). There were no identified organochlorine pesticide soil/sediment source area data sets.

Since there is limited specific legacy pesticide source area information, our current GIS land-use designations would be the most relevant spatial data set for attempting to model loading estimates. The newly revised old industrial land use data layer (old industrial areas pre-1968) will aid in identifying those areas that were polluted during the period of max organochlorine usage (1960s). Industrial areas showed the highest soil/sediment concentrations for DDTs and chlordanes. There would be some benefit to incorporating

stormwater source area data as well since this information could provide a finer spatial scale of pollutant sources in the landscape. However, using the source area stormwater data would require a hybrid model (a combination of the base sediment and the base hydrology spreadsheet models) or converting the stormwater concentrations to particulate concentrations (if feasible). As noted above, the soil/sediment database is more extensive and provides information on the land-use basis. Below is a summary of recommendations:

What is the proposed model architecture for integrating OP pesticides into the RWSM?

- Given there is more sediment data available, more variability in sediment data between land uses, sediment appear to be the optimal basis for modeling regional scale loads of OP pesticides (This assumes the successful development of a calibrated sediment model which was still in development at the writing of this report section)
- Could explore the hybrid model architecture that capitalizes on available soil/sediment as well as stormwater data
- Could consider development of a co-transport model based on the relationship between local empirical legacy pesticide and PCB data

What GIS layers are proposed for modeling OC pesticides using the suggested modeling architecture? What is the availability and quality of those GIS layers?

- Primary GIS layers include current land use (industrial, commercial, residential, agriculture, open space) data including the updated pre-1968 industrial data layer. Other GIS data layers already in existence to support source area resolution in the model include rail transport, and recycling for drums and metals more generally. These data layers are already developed and are of good quality but could be optimized to be a little more specific to OC pesticides; for example, splitting out warehousing or light industrial from "old industrial".
- Consider development of GIS source area data layers for nurseries and wholesale/ retail agricultural and garden supply centers and wholesale for commercial pesticide applicators.

What are the proposed data to support the concentration inputs and calibration/validation for the suggested model?

- Local and world literature soil/sediment/stormwater empirical data have been collated to be used as input coefficients for each of the proposed model parameters. Additional exploration of other potential legacy pesticide source areas could provide more spatially resolute information on pollutant contributions.
- Calibration/verification data at the watershed scale are presently sparse.

What data could be developed to support the model, and what is the relative importance of each dataset suggested (e.g. how high of a priority and how much would it help the model outcome or reduction in uncertainty)?

- Consider selectively adding legacy pesticides to the pollutant list for influent data at monitoring sites associated with the BASMAA EPA grant funded "Clean Water for a Clean Bay project". Stormwater data are being collected at a number of sites and would provide information at finer spatial scales in industrial drainage areas.
- Consider adding legacy pesticides to existing stormwater monitoring projects at Bay Area LID sites being monitoring through grant projects especially in areas with high percent urban, industrial, or agricultural land use.
- Consider mining county records for legacy pesticide use and spatial application data during peak period of the 1960s in order to determine relative application of OC pesticides in the Bay Area.

What methods do we suggest for developing that data? – Back-calculation from existing data; monitoring specific sites?

- An option is to use the inverse optimization methodology (Lent, 2011) for estimating land use based input concentrations (EMCs) using local empirical sediment data.
- Could consider adding OC pesticides to the analytic list for source area monitoring (RMP funding) should it occur in relation to improving PCB and Hg information.

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Selenium Sub-Report

Urban Runoff Characterization and Control Measures Plan

Submitted on behalf of all Permittees in Compliance with Provision C.14.a of Order R2-2009-0074

Prepared as a Regional Project for:

Bay Area Stormwater Management Agencies Association

Prepared by:

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September 11, 2013

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ABBREVIATIONS

BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
CRWQCB	California Regional Water Quality Control Board
CTR	California Toxics Rule
DL	Detection Limit
MRP	Municipal Regional Stormwater NPDES Permit
MS4s	Municipal Separate Storm Sewer Systems
NPDES	National Pollutant Discharge Elimination System
OEHHA	Office of Environmental Health Hazard Assessment
POTW	Publicly Owned Treatment Works
RMP	Regional Monitoring Program
SCVURPPP	Santa Clara Valley Urban Runoff Pollutant Prevention Program
SFEI	San Francisco Estuary Institute
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resource Control Board
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This *Selenium Control Measures Plan* was prepared for the Bay Area Stormwater Management Agencies Association (BASMAA) representing all towns, cities, counties and flood control agencies (i.e., Permittees) subject to the Municipal Regional Stormwater NPDES Permit (MRP, Order R2-2009-0074) issued by the San Francisco Regional Water Quality Control Board (Regional Board) on October 14, 2009. This report addresses the requirements of MRP Provisions C.14.a.iii-vii for characterizing selenium concentrations in urban runoff and identifying control measures and/or management practices to eliminate or reduce discharges of selenium discharged by urban runoff conveyances systems.

Requirements associated with selenium are included in the MRP because regulatory agencies have previously identified selenium as impairing beneficial uses in the San Francisco Bay, and determined that urban runoff is a likely or potential cause or contributor to the impairment (SFRWQCB 2009). In 1986, a health advisory was issued to hunters against the consumption of San Francisco Bay Area diving ducks. After a Selenium Verification Study conducted from 1985 to 1990 showed potentially toxic concentrations of selenium in diving ducks, San Francisco Bay was listed as impaired by selenium in 1998 (SFBRWQCB 2011). The 303(d) listing has since been amended to specify inclusion of specific segments as described in Section 3 of this report. The requirement to characterize selenium concentrations in urban runoff and identify control measures is included in the MRP to assist with the development of Total Maximum Daily Loads (TMDLs) for segments of North and South San Francisco Bay in which elevated selenium levels in some fish and diving birds threaten beneficial uses.

Provision C.14 of the MRP includes the same requirements for legacy pollutants, polybrominated diphenyl ethers (PBDEs), and selenium (hereinafter C.14 pollutants) in urban runoff. TMDLs and reevaluations of impairments are planned or are in the early stages of development for each of the C.14 pollutants. Provision C.14 serves as an interim step between impairment listings and TMDL development or delisting. In particular, the MRP provisions require Permittees to implement a plan that characterizes the representative distribution of C.14 pollutants in the urban areas of the San Francisco Bay Region to answer the following questions:

- Are C.14 pollutants present in urban runoff?
- Are C.14 pollutants (relatively) uniformly distributed in urban areas?
- Are storm drains or other surface drainage pathways sources of C.14 pollutants in themselves?
- Are there specific locations within the urban watershed where prior or current uses result in land sources contributing to discharge of C.14 pollutants to the Bay via urban runoff conveyance systems?

Permittees are also required to provide information to allow for the calculation of C.14 pollutant loadings to San Francisco Bay from urban runoff conveyance systems and identify control measures and/or management practices to eliminate or reduce discharges from these systems. This report addresses all questions and requirements regarding selenium that are included in the MRP. With regard to urban runoff characterization data, results of monitoring studies implemented during the MRP via the Regional Monitoring Program for the San Francisco Bay's (RMP) Small Tributaries Loading Strategy (STLS) are also described.

2.0 BACKGROUND

Selenium is a naturally occurring trace element that can be found in sedimentary rocks, soils, and mineral deposits of marine origin throughout California. Average concentrations of total recoverable selenium (total selenium) found in sediments and soils usually range from 0.01 to 0.02 mg/kg with most seleniferous soils containing less than 2 mg/kg. In natural freshwater and estuarine ecosystems total selenium concentrations are typically low, ranging from 0.1 to 1 µg/L (SFBRWQCB 2011). Selenium is elementally similar to sulfur and is strongly associated with sulfur in nature.

Selenium is also an essential micronutrient for plants and animals that plays an important role in thyroid and immune system functions as well as the prevention of oxidative stress or inflammation. However, too much selenium can be harmful. In fact, the disparity between the selenium concentrations required for a healthy diet in plants, animals, and humans and the levels at which selenium becomes toxic or poisonous, is very small compared to other micronutrients (SFBRWQCB 2011).

2.1. Selenium Speciation

Selenium species found in San Francisco Bay include the following:

- Elemental selenium (Se^0);
- Selenide (Se^{2-});
- Selenite Se^{4+} (SeO_3^{2-}); and
- Selenate Se^{6+} (SeO_4^{2-})

Elemental selenium is insoluble and occurs in particulate form. In the Bay, elemental selenium is most common in bed sediments (SFBRWQCB 2011, Tetra Tech 2008a). The oxidized and more stable form, selenate, is more likely found suspended in the water column. The relatively reduced form, selenite, is the most readily bioavailable species. It readily sorbs to particulate matter and therefore is more likely found in suspended particulates. (SFBRWQCB 2011, Abu-Saba and Ogle 2005) In the Bay, as in most aerobic surface waters, selenate and selenite are the most soluble and most mobile forms of selenium (SFBRWQCB 2011).

Biological uptake of selenium species results in biological conversion to the most reduced species, selenide, which is incorporated into organic compounds called organoselenides (Abu-Saba and Ogle2005). This process is generally carried out by algal or bacterial species (Tetra Tech 2008a).

Although particulate selenium typically only accounts for 2-18% of the total selenium in the Bay, this portion is important to Bay food webs (Abu-Saba and Ogle 2005, SFBRWQCB 2011). Particulate selenium consumed by aquatic organisms is bioaccumulated into, and transformed and transported through the food web, thus increasing the potential for toxicity to organisms. Particulate selenium suspended in the water column of the Bay is likely a result of: 1) deposition from various non-point sources discharging into the Bay, 2) generation in situ (by phytoplankton uptake of dissolved selenium), or 3) erosion from the sediment bed (SFBRWQCB 2011). Riverine and non-point sources discharging into the Bay are the primary source of particulate selenium, with smaller contributions from generation and erosion (SFBRWQCB 2011). Table 2-1 provides further description of the four common selenium species, their key characteristics, and importance to selenium cycling.

Table 2-1. Selenium Speciation Information (Abu-Saba and Ogle 2005).

Oxidation State	Selenium Species	Key Characteristics	Importance to Selenium Cycling
Se +6	Selenate (SeO4+2)	Extremely soluble with a very low affinity for sorption to particulates. Thermodynamically most stable in oxic waters.	Principal form in minerals (e.g. marine shales), therefore dominant species in leached agricultural drainwaters. Very low bioaccumulation and/or biotransformation by algae. Uptake is inhibited by sulfate.
Se +4	Selenite (SeO3+2)	Extremely soluble with a much greater affinity for sorption to particulates than selenate. Thermodynamically less stable in oxic waters, but still common due to very slow oxidation rate.	Principal form of concern as it accumulates in phytoplankton ~10-fold more readily than selenate; Uptake is not inhibited by sulfate.
Se 0	Elemental Selenium	Insoluble precipitate, formed primarily from dissimilatory reduction of selenite in anoxic sediments.	Removal pathway from water bodies; conversion to particulate organoselenium is important bioaccumulation pathway for benthic invertebrates.
Se -2	Inorganic selenide (Se2-)	Highly reactive, forms insoluble precipitates with metals analogous to sulfide; Se2- often co-occurs with inorganic sulfide ores (e.g., cinnabar)	Formation of highly insoluble HgSe (cinnabar analogue) may explain mechanism of Hg detoxification by Se.
	Cellular (aka particulate) Organoselenium	Selenium that has been incorporated into phytoplankton/higher organisms. Selenium substitutes for sulfur in amino acids (e.g. selenomethionine)	Particulate organoselenium is major bioaccumulation pathway for benthic invertebrates (particularly for bivalves like *Corbula/Potamocorbula*)
	Dissolved Organoselenium (aka, organoselenide)	Dissolved organic compounds (e.g. selenomethionine) released from decaying cellular tissues.	Regenerative pool of selenium with uncertain bioavailability
	Dimethylselenide, Dimethydiselenide	Methylated selenium is produced by microbes, plants, and animals.	Provides gaseous escape from sediments and surface waters into the atmosphere.

2.2. Selenium Bioaccumulation

In the San Francisco Bay, Asian clams (*Corbula amurensis, formerly Potamocorbula amurensis*) play a notable role in the bioaccumulation of selenium. This non-native clam feeds on particles containing selenium. Studies show that this clam displays a rate constant for selenium loss that is 10 times slower compared to common crustaceans (SFBRWQCB 2011). Figure 2-1 depicts the process of bioaccumulation of selenium through the foodweb as observed in North San Francisco Bay.

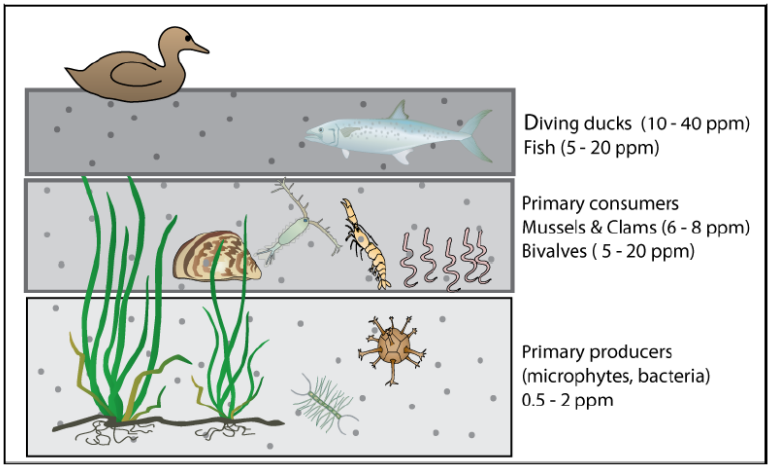

Figure 2-1. Conceptual representation of selenium biomagnification in the North San Francisco Bay. Concentrations (ppm) illustrate the range of selenium found in the North Bay species (SFBRWQCB 2011).

2.3. Selenium Thresholds

Selenium has been observed in San Francisco Bay in the tissues of diving birds and benthic-feeding fish at concentrations that are potentially toxic to aquatic life. Selenium toxicity is of greatest concern for higher trophic level species because, much like mercury, bioaccumulation magnifies the element's toxic effects. Selenium in excess can cause reproductive impacts, such as those observed in bird embryos and hatchlings in the Central Valley's Kesterson wildlife refuge in the early 1980s (Abu-Saba and Ogle2005). Selenium-rich agricultural drainage waters discharging into the refuge were determined to be the cause of these defects. The deformities and fish mortality at the site sparked concern over selenium pollution in California waters and the San Francisco Bay.

Potential declines in the reproduction of benthic-feeding species in the Bay are currently a concern to the Water Board (SFBRWQCB 2011). These include fish, such as white sturgeon and Sacramento splittail, and diving ducks, such as Greater Scaups and Surf Scoters. Existing ecological risk guidelines for selenium in fish and wildlife reported by Beckon et al. (2001) are presented Table 2-2. More stringent site-specific thresholds relevant to North San Francisco Bay are summarized by SFBRWQCB (2011) in the North Bay TMDL Preliminary Project Report. Site-specific thresholds are currently proposed for the North Bay by the Regional Board due to concerns of selenium toxicosis and reproductive impairment in diving ducks.

Table 2-2. Selenium Ecological Risk Guidelines for Fish and Wildlife (Beckon et al. 2001).

Matrix	Effect on	Ecological Risk Guidelines - µg/g-dw		
		No Effect	Concern	Toxicity
Warm Water Fish (Wholebody)	Fish growth/condition/survival	<4	4-9	>9
Vegetation (as diet)	Bird Reproduction	<3	3-7	>7
Invertebrates (as diet)	Bird Reproduction	<3	3-7	>7
Sediment	Fish and bird reproduction	<2	2-4	>4
Avian Eggs	Egg Hatchability	<6	6-10	>10

3.0 REGULATORY STATUS

The Federal Clean Water Act (CWA) requires that states develop water quality standards protective of human health and the aquatic environment. Section 303(d) of the CWA requires the development of a list of "impaired" water bodies that do not meet these standards. The State Water Resources Control Board (State Board) and its Regional Water Quality Control Boards are responsible for compiling and periodically updating the 303(d) list of impaired water bodies in California. The list is subject to approval by the United States Environmental Protection Agency (USEPA). The 303(d) list in California was last updated in 2010. TMDLs are a type of water quality obtainment strategy used in an effort to restore impaired water bodies.

3.1. Water Quality Objectives and Criteria

The USEPA promulgated numeric water quality criteria on behalf of the State of California in 2000 to protect and maintain freshwater and marine aquatic ecosystems (USEPA 2000). The California Toxics Rule (CTR) establishes water quality criteria for acute (1-hr) and chronic (4-day average) concentrations of potentially harmful pollutants. While the USEPA did approve criteria for total selenium through the promulgation of the CTR, the agency specified that for San Francisco Bay and Delta, more stringent criteria must apply due to the scientific evidence of selenium bioaccumulation in the Bay (SFBRWQCB 2011, USEPA 2000). Therefore, the USEPA promulgated the freshwater National Toxic Rule (NTR) criteria for selenium in San Francisco Bay and Delta. These applicable numeric criteria are listed in Table 3-1 and are also described in the Basin Plan (SFBRWQCB 2007).[1] At this time, no water quality objectives for the protection of human health have been adopted by the Regional Board, State Board, or the USEPA (USEPA 2000).

Table 3-1. Selenium Water Quality Criteria for protection of aquatic life in the San Francisco Bay. (USEPA 2000, SFBRWQCB 2007)

Water Quality Criteria	Fresh Water		Salt Water	
	1-hr	4-day	1-hr	4-day
California Toxics Rule (µg/L)	20	5	290	71
National Toxics Rule (µg/L)	20	5	20	5

3.2. Beneficial Use Impairment and Trends

In 1986, a health advisory was issued to hunters against the consumption of Bay area diving ducks (Greater Scaups and Surf Scoters) (SFBRWQCB 2011). In response to the advisory, and a subsequent second health advisory about diving duck consumption, a Selenium Verification Study was conducted from 1985 to 1990 by the Regional Board. The study showed that selenium levels in surf scoters were three times higher than thresholds determined by the US Fish and Wildlife Service (USFWS) to cause selenium toxicosis and reproductive impairment (SFBRWQCB 2011). The advisories and the observed presence of elevated selenium levels in wildlife led to the 303(d) listing of all segments of the San

[1] The USEPA is currently reevaluating the selenium criteria for the protection of semi-aquatic wildlife in the San Francisco Bay and Delta. Modeling of the fate and transport of selenium in San Francisco Bay conducted by the United State Geological Survey (USGS) serves as the basis for the reevaluation. When USEPA completes its reevaluation, it will formally request public comment on the USGS modeling report as well as draft revised selenium criteria for the San Francisco Bay and Delta (USEPA 2011).

Francisco Bay as impaired by selenium in 1998. Since that time, the 303(d) list has been amended to specify inclusion of specific Bay segments listed in Table 3-2. Figure 3-1 provides an illustration of all segments of the San Francisco Bay.

Table 3-2. San Francisco Bay segments listed as impaired by selenium on the in 2010 303(d) list (SFBRWQCB 2011).

San Francisco Bay Segment		Impairment Description	TMDL Under Development
North Bay	Sacramento-San Joaquin Delta	Hatchability in nesting diving birds; Health consumption advisory in effect for scaup and scoter (diving ducks)	Yes
	Suisun Bay		
	Carquinez Strait		
	San Pablo Bay		
	San Francisco Bay - Central		
Lower & South Bay	San Francisco Bay – Lower • Central Basin • Oakland Inner Harbor - Pacific Dry Dock (Part of Lower Bay)	Health consumption advisory in effect for benthic-feeding ducks	No
	• San Francisco Bay - South		

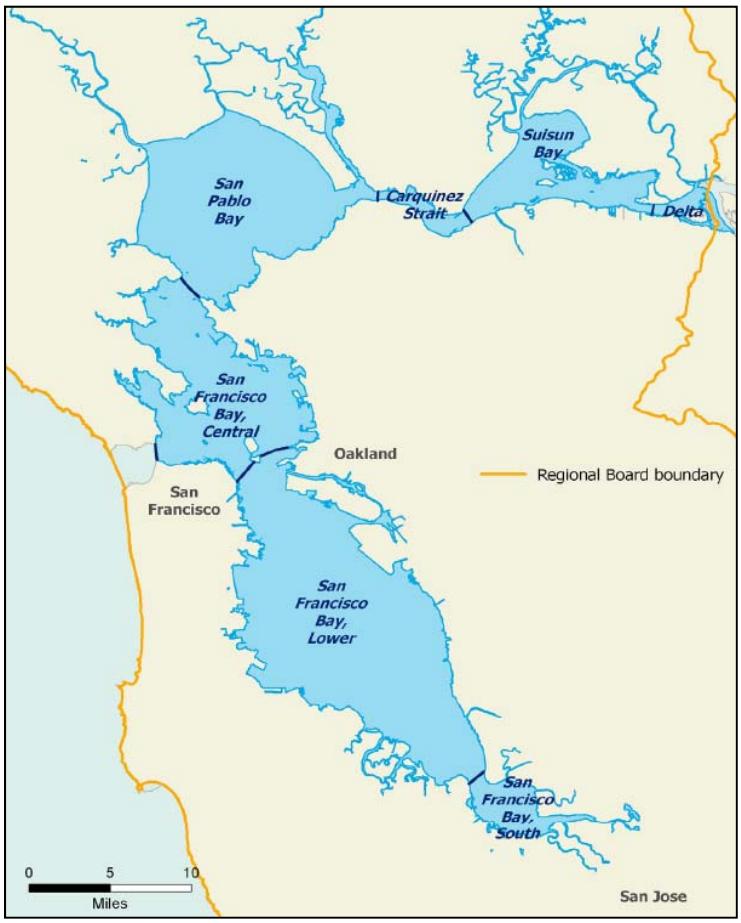

Figure 3-1. The San Francisco Bay system and specific segments.

Specific beneficial uses in North San Francisco Bay that are reported by the Water Board as threatened by selenium bioaccumulation include Estuarine Habitat (EST), Preservation of Rare and Endangered Species (RARE), and Ocean, Commercial and Sport Fishing (COMM) (SFBRWQCB 2011). Descriptions of each use are included in Table 3-3.

Table 3-3. Descriptions of North Bay beneficial uses potentially impaired by selenium (SFBRWQCB 2007; SFBRWQCB 2011).

Designated Beneficial Use	Description
Estuarine Habitat (EST)	Uses of water that support estuarine ecosystems, including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g. estuarine mammals, waterfowl, shorebirds), and the propagation, sustenance, and migration of estuarine organisms.
Preservation of Rare and Endangered Species (RARE)	Uses of waters that support habitats necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened, or endangered.
Ocean, Commercial and Sport Fishing (COMM)	Uses of water for commercial or recreational collection of fish, shellfish, or other organisms in oceans, bays, and estuaries, including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Although impairment listings for the northern and southern portion of the Bay are currently in place, concentrations of selenium in the water column of San Francisco Bay are well below numeric water quality criteria listed in Table 3-2 (SFEI 2011, SFBRWQCB 2011). Average concentrations of total selenium measured in water throughout the San Francisco Bay from 2002 through 2010 by the Regional Monitoring Program for the San Francisco Estuary (RMP) are shown in Figure 3-2. Bay-wide, the average concentration of selenium in water during this timeframe was 0.13 µg/L (SFEI 2011). The highest concentration was 1.15 µg/L, well below the 5 ug/L water quality criteria. As illustrated in Figure 3-1, Bay-wide average selenium concentrations post-2002 are relatively consistent.

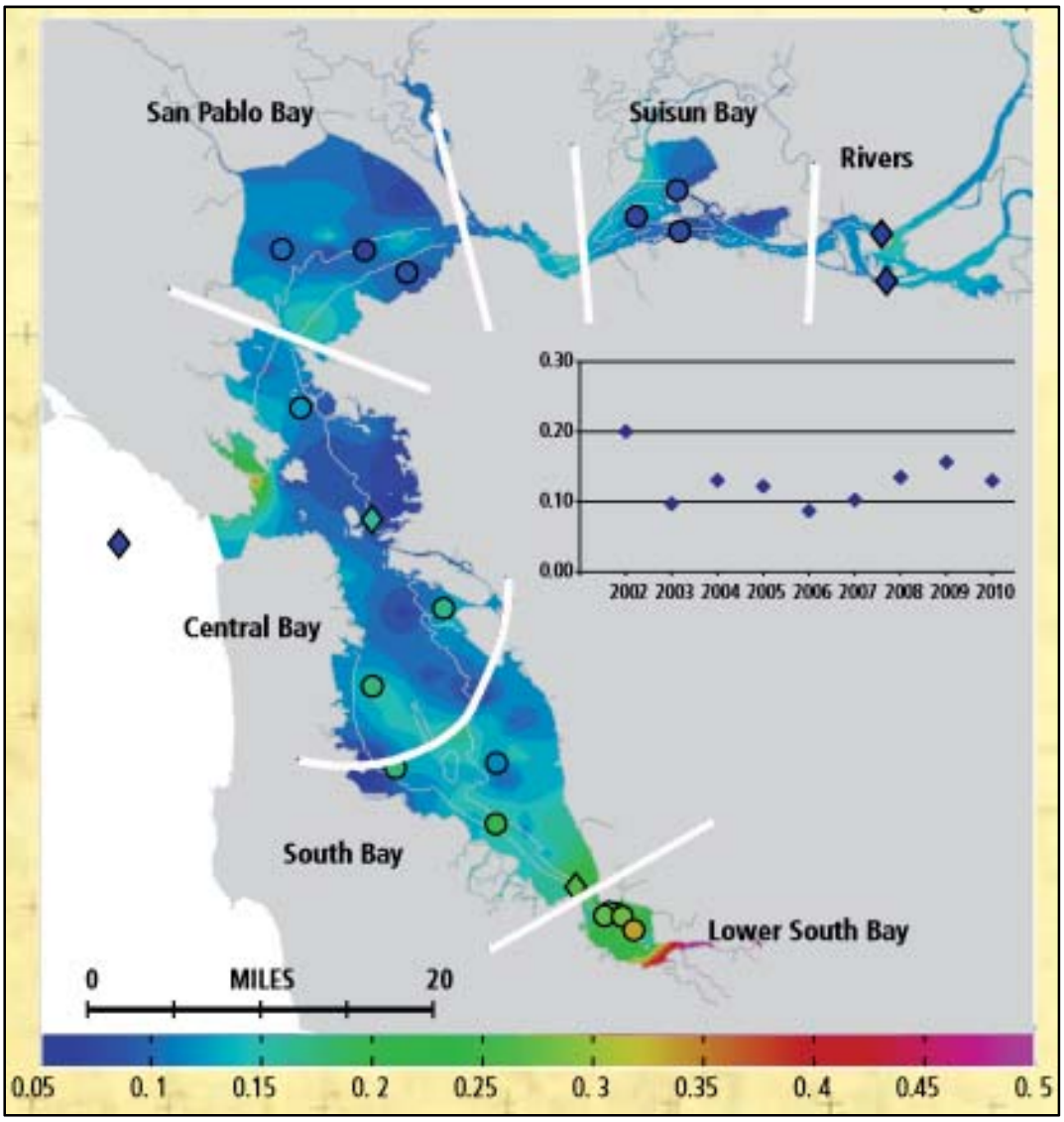

Figure 3-2. Selenium concentrations (ug/L) in the San Francisco Bay between 2002 and 2010 (SFEI 2011).

Triennially, the RMP also conducts monitoring of pollutants in sport fish tissue. The most recent monitoring was conducted in 2012, but data for this year are not yet available. As illustrated in Figure 3-2, concentrations of selenium in white sturgeon between 1997 and 2009 show no trend. Additionally, the RMP monitoring in 2009 indicates that selenium concentrations in multiple sport fish species are well below guidelines set by the Office or Environmental Health and Hazard Assessment (SFEI 2012). The OEHAA guideline for white sturgeon is 2.5 ppm (mg/kg – wet weight) (OEHAA 2011).

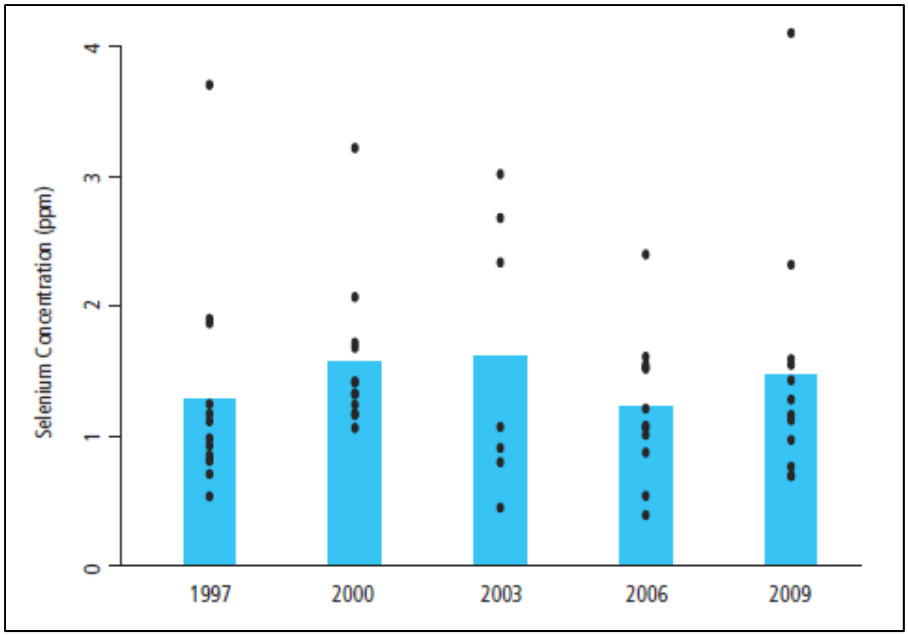

Figure 3-1. Selenium concentrations (ppm wet weight) in white sturgeon in San Francisco Bay between 1999 and 2009. Bars indicate average concentrations. Points represent individual samples (either composites or individual fish) (SFEI 2012).

3.3. Status of TMDL Development

The Regional Board is currently addressing 303(d) listing of the North and South San Francisco Bay through separate regulation strategies because of their differences in selenium sources (SFBRWQCB 2011). Primary sources for the North and South Bays are described in Section 4 of this report. The TMDL development process for all segments of North San Francisco Bay is currently underway with the goal of addressing the issue of selenium bioaccumulation in fish and birds. The North Bay Selenium TMDL Project was initiated by the Water Board in 2007 (SFBRWQCB 2011). After data collection and analysis in support of TMDL development, a Preliminary Project Report was released in 2011 summarizing findings and current knowledge regarding selenium impairment and relevant sources. As described in the report, a TMDL target based on fish tissue will likely be proposed for adoption instead of a water-based, total selenium target that is not directly representative of toxic effects to wildlife (SFBRWQCB 2011). The initial proposed fish tissue target for white sturgeon is 6.0 – 8.1 ug/g (dry weight).[2] The target is based on the proposed USEPA wildlife criterion for San Francisco Bay/California and represents the estimated selenium concentration in fish at which an effect is observed in 5 - 10% of the population (SFBRWQCB 2011). The North Bay TMDL is currently progressing and is scheduled for completion in 2014 or 2015.

The process for developing a selenium TMDL for Lower and South Bay segments has not formally begun. Based on the TMDL development schedules recently presented by Water Board staff, the process will begin within the next 2 to 5 years, unless other regulatory processes are implemented as alternatives to a TMDL.

[2] Concentrations of total selenium presented in Figure 3-1 should not be compared to the proposed fish tissue target due to the difference in units (wet v. dry weights).

4.0 USES, SOURCES, PATHWAYS AND FATES

Selenium uses, sources, transport pathways and environmental fates are described in this section. Additionally, conceptual models of these processes are presented. Sources and transport pathways differ geographically for North and South San Francisco Bay segments (SFBRWQCB 2011) and therefore these segments are discussed separately.

4.1. Selenium Uses

Selenium is a naturally occurring trace element that is widely distributed but dispersed in the environment. Selenium is used in a variety of applications, including those listed in Table 4-1. The vast majority of uses (~70% of the market share) are associated with the manufacturing of glass, metal, chemicals and pigments.

Table 4-1. Selenium uses and estimated market shares (SFBRWQCB 2011,Lent and McKee 2011, USGS 2004).

Selenium Use	Use Description	Market Share
Glass Manufacturing	• Combined with other chemicals to produce colored glass • Used as decolorizer in windows • Used in powdered glass applied to ceramic products	25%
Metal Manufacturing	• Additives to steel, copper and lead alloys	24%
Chemical and Pigment Manufacturing	• Catalyst and oxidizing agents in organic chemical production • Used as pigments in coloring of plastics	22%
Pharmaceutical, Cosmetic and Nutrition Industries	• Catalyst in pharmaceutical manufacturing • Feed additive for livestock • Dietary supplement • Antidandruff shampoos	19%
Electronics	• Photographic exposure meters • Xerographic copiers • Solar photocells	10%

4.2. Conceptual Model of Selenium Sources and Pathways

Primary sources and transport pathways for selenium in the Bay are listed in Table 4-2 and depicted in the conceptual model (Figure 4-1) developed via the Selenium Conceptual Model and Impairment Assessment (CM/IA) funded through the Clean Estuary Partnership (Abu-Saba and Ogle 2005). Due to the differences in sources and transport pathways for North and South San Francisco Bay are listed separately in Table 4-2 and described separately in the following sections.

Table 4-2. Selenium sources and transport pathways to North and South San Francisco Bay (SFBRWQCB 2011).

Bay Segment	Prominent Sources	Prominent Transport Pathways
North Bay	• Natural sources o Groundwater o Soils/sediment • Extracted petroleum	• Urban Runoff • Agricultural Runoff • Agricultural Drainwater • Petroleum Refinery Discharges • Municipal and Industrial Wastewater • Resuspension of sediments in Bay • Atmospheric Deposition
South/Lower South Bay	• Natural sources o Groundwater o Soils/sediment	• Urban Runoff • Pumped Groundwater • Municipal and Industrial Wastewater • Resuspension of sediments in Bay • Atmospheric Deposition

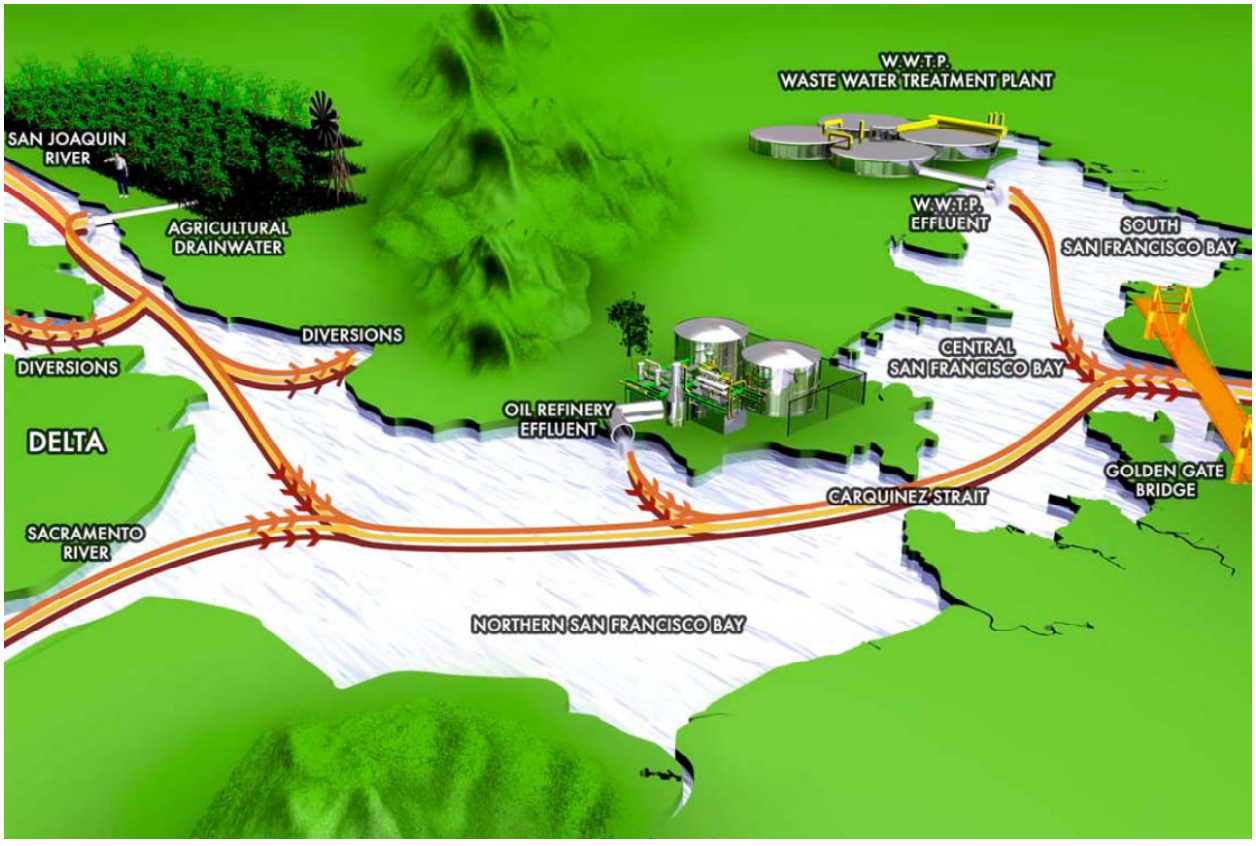

Figure 4-1. Generalized conceptual model of selenium sources and pathways in San Francisco Bay (Abu-Saba and Ogle 2005).

4.3. North Bay Sources, Transport Pathways and Loads

Information on major sources and pathways of selenium to the North Bay is included in North Bay Selenium TMDL – Preliminary Project Report (SFBRWQCB 2011). The primary source to the North Bay is naturally occurring selenium in soils, sediments and groundwater. Petroleum that is extracted and refined provides an additional source of selenium via discharges of refinery treatment plant effluent. Annual loading estimates for the primary source and pathways presented in the TMDL Project Report indicate that the Sacramento and San Joaquin Rivers provide the greatest load of both dissolved and particulate selenium to the North Bay. At roughly an order-of-magnitude less load than the two rivers, petroleum refineries, municipal and industrial wastewater discharges, and urban and non-urban run-off each provide roughly the same mass of total selenium to the North Bay. Atmospheric deposition is believed to contribute a relatively small load to the Bay. Loading estimates developed by the Water Board (SFBRWQCB 2011) for each selenium source and pathway are included in Table 4-3.

Table 4-3. Characteristics and loads of selenium sources and transport pathways to North San Francisco Bay (SFBRWQCB 2011).

Source/Transport Pathway		Description/Notes	Dominant Forms and Species	Estimated Load [kg] [a]
External	Municipal and Industrial wastewater	POTWs and industrial wastewater effluents	**Predominantly dissolved Se:** selenate (60%), selenite (25%), organic and elemental Se (15%)	**230**
	Petroleum Refineries	Refinery effluents	**Predominantly dissolved Se:** selenate (56-64%), organic selenide (~20%), selenite (15-22%)	**540**
	Central Valley watersheds via Delta inflow	Delta inflow consists of flow from the San Joaquin and Sacramento Rivers. Much of San Joaquin River flows are currently diverted before entering the Bay.	**Dissolved selenium:** Sacramento River - selenate (50-70%), selenite (10-20%), organic selenide (15-20%) San Joaquin River **-** selenate (60-70%), selenite (3-10%), organic selenide (15-20%)	**3940** (annual average) (1110 - >11000)
			Particulate selenium	**770** (part. Se annual average) (170 - 1660)
	Urban and non-urban runoff	Includes both agricultural and urban runoff.	Speciation not measured but assumed to be similar to Sacramento River	**350-840** (>1500)
	Atmospheric deposition	Includes both dry and wet deposition to the Bay water surface.	Wet deposition (selenite) Dry deposition	**20** (120) **<10** (130)
Internal	Erosion and sediment transport in the Bay	Can be either a source or sink of selenium.	**Particulate selenium**	**280**

[a]Unless noted, loads are expressed as total selenium. Values in bold represent the best estimate, values in parenthesis show the range and/or the highest estimate. Estimates are rounded to the nearest 10 kg

4.4. South Bay Sources, Transport Pathways and Loads

Sources and pathways of selenium to the South Bay (including Lower South Bay) are not well documented (Abu-Saba and Ogle 2005). Sources are likely natural and similar to the North Bay, with the exception of petroleum from refineries that are strictly located in the North Bay. Loading estimates for selenium sources to the South Bay have not yet been developed.

Compared to the North Bay, the South Bay receives much less freshwater inflow and is typically characterized by more localized occurrences of high selenium levels. Because selenium concentrations are primarily locally elevated in the South Bay, the widespread effects of bioaccumulation of selenium are less pronounced than in the North Bay (SFBRWQCB 2011). Data collected by the RMP in between 1989 and 2004 indicate that in sloughs at the outlet of tributaries to the South Bay, selenium concentrations are typically higher than average South Bay or Lower South Bay concentrations (Figure 4-2). Specifically, selenium concentrations in water in Alviso Slough during low-tides are substantially higher than high-tide concentrations (Watson et al. 1998), suggesting that freshwater sources of selenium may play an important role in the slough. Furthermore, based on surface water and groundwater studies conducted in the Guadalupe River watershed (Zawislanski 2003, SCVWD 1994), elevated concentrations in the slough may be attributable to the discharge of pumped groundwater from dewatering operations in the lower Guadalupe River. The relative magnitude of selenium load to the slough from this pathway is currently unknown.

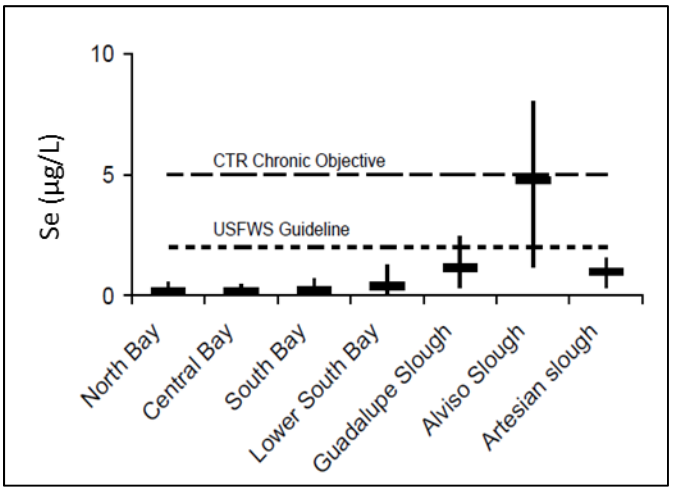

Figure 4-2. Selenium concentrations in segments and sloughs of the San Francisco Bay in 1986-2004.

4.5. Environmental Fate of Selenium

Cycling of selenium in the Bay is carried out through four main processes. Selenium can be:

- absorbed to or ingested by organisms,
- bound or complexed with particulate matter,
- free in solution, or
- released to the atmosphere through volatilization.

Selenium associated with particulate matter and embedded in sediment of the Bay will likely remain in the Bay longer than suspended or dissolved selenium in the water column. As shown in Figure 4-3, water borne selenium is cycled by water flows much more quickly than sediment-bound selenium (Abu-Saba and Ogle 2005). Therefore, even when dissolved selenium concentrations decrease, ecological effects may continue for a longer period of time due to the long residence time (T in Figure 4-4) of selenium in Bay sediments. This is especially important because low-trophic level organisms, consume particulate selenium in sediment, which facilitates the bioaccumulation, and thus the potential for toxicity associated with selenium.

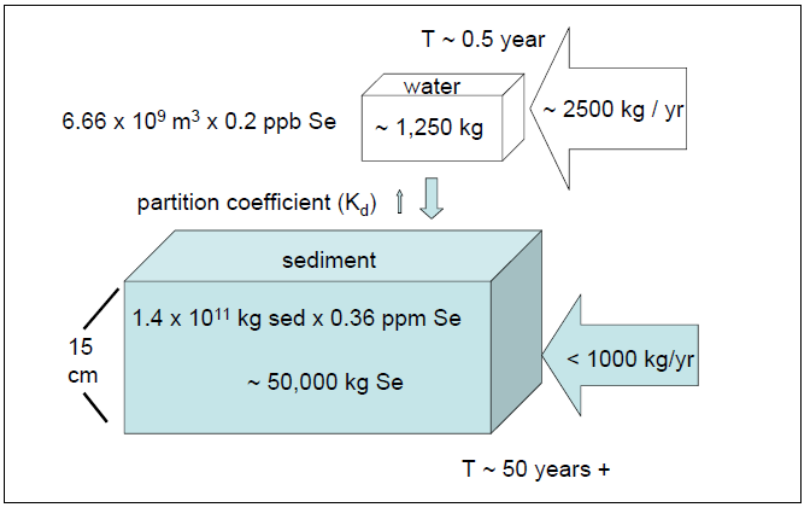

Figure 4-3. Mass balance for selenium in water and sediment of the San Francisco Bay. T = Residence time of selenium in water and sediments. (Abu-Saba and Ogle 2005).

5.0 URBAN RUNOFF AND TRIBUTARY CHARACTERIZATION

Permittees are required to provide information to allow for the calculation of selenium (dissolved and/or total) loadings to San Francisco Bay from urban runoff conveyance systems. To address this requirement, Permittees are conducting pollutants of concern (POC) monitoring and modeling of selenium from local tributaries and urban runoff. Watershed modeling and monitoring of urban runoff, pollutants and sediment discharged to San Francisco Bay are conducted through the RMP's Small Tributaries Loading Strategy (STLS). Information gained to-date through these efforts is summarized in this section, which includes data from urban runoff conveyances and within receiving water bodies (i.e., tributaries).

5.1. Selenium in Urban Runoff

Through a brief literature review, Lent and McKee (2011) summarized "central tendency" total selenium concentrations in urban runoff. Selenium concentrations are presented by land use in Table 5-1 and include values derived from studies in Southern California, Western Maryland and two cities of the San Francisco Bay Area. Based on the review, central tendency concentrations of total selenium in runoff from agricultural land uses are predicted to be an order-of-magnitude greater than runoff from other land use types (Lent and McKee 2011). Typical concentrations are intended to represent average annual concentrations that may be used as inputs to the regional watershed spreadsheet model currently under development through the STLS. Dissolved selenium concentrations or selenium species are currently unavailable for urban runoff.

Table 5-1. Total selenium concentrations in urban runoff by land use type (Lent and McKee 2011).

Land Use Category	Location	Minimum (µg/L)	Maximum (µg/L)	Central Tendency (µg/L)
Commercial	Southern CA	<MDL	13.2	0.1
Open	Southern CA	<MDL	13.9	0.1
Residential	Southern CA	<MDL	24	0.2
Industrial	Southern CA	<MDL	11.9	0.2
Agriculture	Southern CA	<MDL	5.6	1.6
Mixed urban	Hayward, CA	0.053	2.9	0.14
Open	Western Maryland	-	-	0.04
Open	Western Maryland	-	-	0.03
Industrial	Richmond, CA	0.342	7.5	-

MDL = Method Detection Limit

BASMAA also conducted studies in the late 1980's through the mid 1990's in efforts to characterize the concentrations of pollutants in urban runoff in the Bay area. Monitoring at stations representing light and heavy industrial, residential, commercial, transportation, and open space land uses were monitored for a variety of constituents, including total selenium. Although the compilation of the BASMAA data was not part of the scope for this report, the data are readily available and could be used to further assess the contributions of selenium to San Francisco Bay from urban runoff conveyance systems.

5.2. Selenium in Tributaries to the Bay

Given that selenium is present in groundwater that infiltrates to local tributaries independently from urban runoff conveyances, this section specifically discusses concentration of selenium measured in local small tributaries to the Bay.

Selenium in tributaries is mostly dissolved, but similar to urban runoff, little information is available about selenium speciation or bioavailability in Bay tributaries (Tetra Tech 2008c). Data that are available were collected through Pollutant of Concern (POC) monitoring conducted as part of the STLS by BASMAA member agencies and the RMP in fulfillment of Provision C.8.e of the MRP. The POC monitoring program was designed with the primary goal of addressing pollutants of concern in local tributaries and providing one mechanism to assess progress toward achieving waste load allocations (WLAs) for existing TMDLs (BASMAA 2013). While the primary goal of this study was to assess priority POCs, it also aimed to provide a limited characterization of additional lower priority analytes, including selenium. The results available to-date from four stations monitored as part of the STLS, and in compliance with the MRP are presented in Table 5-2. All data presented were collected during a combination of dry weather and storm flows. A report summarizing POC loads monitoring data collected in Water Year 2012 (October 2011 – September 2012) was submitted to the Water Board on March 15, 2013 as part of the *Water Year 2012 Urban Creeks Monitoring Report* (BASMAA 2013).

Table 5-2. Selenium concentrations in San Francisco Bay Area small tributaries monitored in Water Year 2012 (BASMAA 2013, McKee et al. 2013)

Site Location	Analyte	Mean (µg/L)	Min (µg/L)	Max (µg/L)
Marsh Creek	Total Se	0.72	0.65	0.78
	Dissolved Se	0.64	0.48	0.80
San Leandro Creek	Total Se	0.21	0.11	0.29
	Dissolved Se	0.13	0.07	0.20
Guadalupe River	Total Se	1.30	1.20	1.60
	Dissolved Se	1.04	0.77	1.32
Sunnyvale East Channel	Total Se	0.41	0.33	0.49
	Dissolved Se	0.32	0.31	0.33

As discussed in section 4.4, monitoring data collected in Water Year 2012 further illustrate that selenium concentrations in the Guadalupe River, while well below applicable water quality criteria, are notably higher than samples from other monitoring sites. The results are not surprising given that the region surrounding the Guadalupe River is known to have high concentrations of selenium in groundwater. The Santa Clara Valley Subbasin is shown to have concentrations typically ranging from 2.5 to 3.8 µg/L in the Principal Aquifer Zone and 0.4 to 2 µg/L in the Upper Aquifer Zone based on data from 1997 to 2000 (SCVWD 2001). Other studies have also found elevated concentrations in soils and groundwater samples from this area, ranging from less than the method detection limit to 12 µg/L (Alvarez et al. 1998, Anderson 1998).

6.0 CURRENT AND PLANNED CONTROL MEASURES

This section provides a summary of control measures implemented by Permittees to control the discharge of selenium from municipal urban runoff conveyance systems to the San Francisco Bay. Control measures are implemented in compliance with the MRP. Given that monitoring data and conceptual models indicate that urban runoff conveyances are not likely causing or contributing to exceedances of water quality standards for selenium (SFEI 2011, SFEI 2012, BASMAA 2013), new control measures for Permittees in the Bay Area are currently not planned or included in this section. However, as discussed, the continued implementation of current urban runoff control measures, and the implementation of pilot and new control measures focused on other high priority pollutants (e.g., PCBs and mercury) will likely have further reduction benefits for selenium in the future. Reduction benefits associated with some new control measures, however, may be limited for selenium due to fact that most selenium in urban runoff is dissolved and new controls are generally focusing on high priority sediment-bound POCs such as PCBs and mercury.

Applicable urban runoff control measures described in this section focus on both preventing selenium from entering the environment and intercepting selenium once available for transport to the Bay via urban runoff. Control measures fall into three general categories: 1) Pollution Prevention, 2) Interception, and 3) Treatment.

6.1. Pollution Prevention Activities

6.1.1. Industrial Facility Inspections

Provision C.4 of the MRP requires Permittees to implement an industrial and commercial site inspection and control program at all sites that could reasonably be considered to cause or contribute pollutants to urban runoff. Follow-up and enforcement actions consistent with local Enforcement Response Plans (ERPs) to prevent discharges of pollutants and impacts on beneficial uses of receiving waters are implemented as needed. Inspections are carried out to ensure that the facilities have implemented adequate and appropriate control measures. Facilities that may use equipment that contains selenium are inspected via this program and therefore may reduce the risk of selenium discharges to the urban runoff conveyance system.

6.1.2. Household Hazardous Waste Disposal

Permittees also successfully promote, coordinate and staff household hazardous waste (HHW) facilities and collection events that result in the proper disposal of items that contain selenium. Items that contain selenium that are collected at HHW facilities and events include:

- Electronics (selenium used in photocopying, photocells, light meters and solar cells, selenium rectifiers, DC power surge protectors, xeroradiography and in solid state, flat-panel x-ray cameras, blue and white LEDs);
- Print photography products (selenium used in toners, intensifiers, and extenders); and,
- Pharmaceuticals (selenium in small amounts in dietary supplements).

6.1.3. Commercial and Industrial Site Controls

Provision C.4 requires Permittees to implement an industrial and commercial site inspection and control program at all sites which could reasonably be considered to cause or contribute to pollution of urban runoff, with follow-up and enforcement consistent with local Enforcement Response Plans (ERPs), to

prevent discharges of pollutants and impacts on beneficial uses of receiving waters. These programs assist Permittees in preventing pollutants such as selenium from entering urban runoff conveyances.

6.1.4. Illicit Discharge Control Activities

Provision C.5 requires Permittees to implement an illicit discharge control program that includes an active surveillance component, a centralized complaint collection component, and a follow-up component to target illicit discharge and non-urban runoff sources. Similar to commercial and industrial site inspection programs, illicit discharge control programs also assist Permittees in preventing pollutants such as selenium from entering urban runoff conveyances.

6.1.5. Construction Site Inspection and Enforcement

Provision C.6 of the MRP requires Permittees to implement a construction site inspection and control program at all construction sites, with follow-up and enforcement. Permittees require all construction sites to have site-specific and seasonally- and phase-appropriate control measures that fall into the following six categories:

- Erosion control;
- Sediment control;
- Good site management; and
- Run-on and Run-off control;
- Non urban runoff management.
- Active treatment systems (as necessary);

Permittees also conduct inspections to determine compliance and effectiveness of the construction site measures, and require timely correction if violations are found.

6.2. Activities to Intercept Pollutants in Urban Runoff

6.2.1. Urban Runoff System Operation and Maintenance

Permittees currently remove sediment and organic materials through routine maintenance of their urban runoff conveyance systems. Control measures include inlet/catch basin cleaning, street sweeping and channel desilting. Frequencies and efficiencies of these control measure vary widely due to site-specific conditions and different levels of implementation by Permittees. Through pilot studies conducted in compliance with provisions C.11/12.c of the MRP, Permittees are currently evaluating the effectiveness of enhanced operation and maintenance activities and assessing the costs of implementing enhanced actions. The focus of these studies is PCBs and mercury, however, all pollutants, including selenium, will benefit from the information being collected. Although sources and pathways differ between selenium and other targeted pollutants, potential focused implementation of enhanced urban runoff system operation and maintenance for PCBs/mercury in the future may also assist Permittees in reducing the load of selenium to the Bay from urban runoff.

6.3. Urban Runoff Treatment and Diversions

6.3.1. New and Redevelopment Runoff Controls

Provision C.3 of the MRP requires Permittees to use their planning authority to require source control, site design, and urban runoff treatment measures in new and redevelopment projects to prevent urban runoff pollutant discharges from and prevent increases in runoff from projects that create and/or replace more than 10,000 ft^3 of impervious surface area. Increases in runoff may cause excess erosion

in stream channels, releasing potentially contaminated sediments, including those with elevated concentrations of selenium.

6.3.2. Urban Runoff Treatment Retrofits

Storm drain inlet inserts, flow through separation devices (e.g., hydrodynamic separators), vegetated filtration systems (grassy swales), infiltration trenches/basins, media filtration, detention basins, wet ponds and constructed wetlands can intercept sediments and selenium in the urban runoff conveyance system and may reduce the load of selenium to the Bay. These urban runoff treatment structures may be installed by municipalities on public and capital improvement projects or as retrofits projects targeting pollutants of concern. Through pilot studies conducted in compliance with provisions C.11/12.e of the MRP, Permittees are currently evaluating the effectiveness of urban runoff treatment retrofits and assessing the costs of implementing these actions. The focus of these studies is PCBs and mercury, however, all pollutants in urban runoff, including selenium will likely benefit from the information being collected. Although sources and pathways differ between selenium and other pollutants, potential focused implementation of enhanced urban runoff system operation and maintenance for PCBs/mercury in the future may also assist Permittees in reducing the load of selenium to the Bay from urban runoff.

6.3.3. Conditionally Exempt Groundwater Discharges

Control measures for groundwater discharges to the urban runoff conveyance system are described in Provision C.15 of the MRP, and may assist in reducing impacts associated with selenium. Uncontaminated pumped groundwater, foundation drains, crawl space pumps and footing drains from single family homes are exempted non-urban runoff discharges allowed by per MRP Provision C.15.a. For all other new discharges of uncontaminated pumped groundwater, foundation drains, crawl space pumps and footing drains that have flows less than 10,000 gallons per day, Permittees encourage discharge to landscape areas or bioretention facilities as a control measure. If the discharge is directed to the urban runoff conveyance system, proper control of the discharge is required by the MRP. New discharges of uncontaminated groundwater greater than 10,000 gallons per day are reported to the Water Board and may be subject to separate NPDES permitting requirements.

Permittees who use groundwater for drinking water must implement control measures when drinking water is discharged. Appropriate control measures may include filtration, settling, coagulant application with no residual coagulant discharge, minor odor or color removal with activated carbon, small-scale peroxide addition, or other minor treatment to remove total suspended solids and silt.

Groundwater discharged from dewatering activities at construction sites disturbing one acre or more of land are subject to the Statewide General Construction Stormwater Permit (Order No. 2009-0009-DWQ). These authorized non-stormwater discharges must have appropriate control measures in place and conduct monitoring, consistent with the General Permit.

6.4. Bay and Watershed Monitoring

6.4.1. San Francisco Bay Status and Trends Monitoring

The RMP monitors contaminants, including legacy pesticides, in Bay water, sediments, and fish/wildlife tissue on an ongoing basis through its Status and Trends Program (SFEI 2012b). The status and trends program currently includes:

- Biennial water chemistry monitoring;

- Biennial sediment chemistry monitoring, alternating between wet and dry seasons;
- Biennial bivalve bioaccumulation monitoring;
- Sediment toxicity and benthic taxonomic classification;
- Suspended sediment dynamics (USGS);
- Hydrographic studies (USGS);
- Triennial bird egg monitoring (cormorant and tern); and
- Triennial sport fish monitoring.

The RMP is currently funded through Permittee and other discharger contributions. These contributions provide the funding necessary to support water quality and beneficial uses assessments in the Bay.

6.4.2. Small Tributary POC Loads Monitoring/Modeling

Provision C.8 of the MRP prescribes water quality monitoring conducted by Permittees in tributaries to the Bay. Provision C.8.e of the MRP requires Permittees to conduct pollutants of concern (POC) monitoring to assess inputs of POCs to the San Francisco Bay from local tributaries and urban runoff, assess progress toward achieving wasteload allocations for TMDLs, and help resolve uncertainties associated with loading estimates for these pollutants. As a result, Permittees developed the Small Tributaries Loading Strategy Multi-Year Plan, which includes the following:

- Watershed modeling of runoff, pollutants, and sediment discharged to San Francisco Bay, using the Regional Watershed Spreadsheet Model, including legacy pesticides;
- Bay margins modeling;
- Source area runoff monitoring;
- Small tributaries monitoring in local watersheds.

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