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

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September 30, 2020

Mr. Michael Montgomery
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 2019/20 ANNUAL REPORT

Dear Mr. Montgomery:

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), a program of the City/County Association of Governments of San Mateo County (C/CAG), is pleased to submit the attached Fiscal Year 2019/20 Annual Report. This report describes Municipal Regional Permit (MRP) compliance activities conducted at the regional and countywide levels on behalf of San Mateo County municipalities. It also incorporates by reference and includes as appendices three reports submitted 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 2019/20 Annual Report was 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 the 22 municipal agencies in San Mateo County look forward to continuing to work with you and your staff on implementation of the MRP. If you have any questions or comments, please email me at mfabry@smcgov.org.

Sincerely,

Matthew Fabry

Matthew Fabry
Program Manager

Attachment: SMCWPPP FY 2019/20 Annual Report

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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FY 2019/2020 Annual Report




September 30, 2020

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

Prepared for:

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)
555 County Center, Redwood City, CA 94063
A Program of the City/County Association of Governments (C/CAG)

Prepared by:

EOA, Inc.
1410 Jackson St., Oakland, CA 94610

EOA inc.

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BASMAA	Bay Area Stormwater Management Agencies Association
BAWSCA	Bay Area Water Supply and Conservation Agency
BMPs	Best Management Practices
BSM	Biotreatment Soil Mix
C3TG	C.3 Stormwater Technical Guidance
CALBIG	California Building Inspectors Group
CASQA	California Stormwater Quality Association
C/CAG	City/County Association of Governments of San Mateo County
CEH	County Environmental Health
CEQA	California Environmental Quality Act
CII	Commercial/Industrial/Illicit Discharge
DC	Development Committee
DIY	Do-It-Yourself
DO	Dissolved Oxygen
DPR	Department of Pesticide Regulation
EPA	Environmental Protection Agency
FY	Fiscal Year
GSRD	Gross Solids Removal Device
GI	Green Infrastructure
GIS	Geographic Information System
IPM	Integrated Pest Management
IMR	Information Monitoring Report
JPA	Joint Powers Authority
LID	Low Impact Development
MRP	Bay Area Stormwater NPDES Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NDS	New Development Subcommittee
NPDES	National Pollutant Discharge Elimination System
OAL	California Office of Administrative Law
O&M	Operations and Maintenance
OWOW	Our Water Our World

PCBs	Polychlorinated Biphenyls
PIP	Public Information and Participation
POC	Pollutants of Concern
POTW	Publicly-Owned Treatment Works (sewage treatment plants)
RFQ	Request for Qualifications
RMP	San Francisco Estuary Regional Monitoring Program
SAP	Sampling and Analysis Plan
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFEP	San Francisco Estuary Partnership
SFEI	San Francisco Estuary Institute
SMC	San Mateo County
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SOP	Standard Operating Procedure
STLS	Small Tributaries Load Strategy
SWRP	Stormwater Resource Plan
SWPPP	Stormwater Pollution Prevention Plan
TAC	Technical Advisory Committee
TMA	Trash Management Area
TMDL	Total Maximum Daily Load
WLA	Waste Load Allocation
WY	Water Year

EXECUTIVE SUMMARY

INTRODUCTION

This FY 2019/20 Annual Report was developed in compliance with the reissued National Pollutant Discharge Elimination System (NPDES) Municipal Regional Permit (referred to as the MRP)[1] for stormwater runoff discharges from San Mateo County and certain other San Francisco Bay Area communities. It summarizes stormwater management activities implemented by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP or Countywide Program) in FY 2019/20. SMCWPPP's activities benefit 22 municipal agencies in San Mateo County: 15 cities, five towns, the County of San Mateo, and the San Mateo County Flood Control District.[2] Each of these agencies 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 2019/20.

SMCWPPP is a program of the City/County Association of Governments (C/CAG) of San Mateo County. C/CAG is a Joint Powers Authority (JPA) that addresses issues of regional importance to San Mateo County jurisdictions such as congestion management and water quality. The C/CAG Board of Directors is comprised of a local elected city council representative from each city and town in San Mateo County, 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 San Mateo County municipalities with complying with the municipal stormwater NPDES permit, including its latest incarnation as the MRP. Stormwater management-related activities of C/CAG and its various related committees and workgroups are described below.

C/CAG Board

Throughout FY 2019/20, the C/CAG Board of Directors received presentations, updates, and took actions on various stormwater-related issues, as summarized below (all C/CAG Board meeting agenda materials and minutes are available at www.ccag.ca.gov/board-of-directors):

- July 2019 - Board received a copy of extended Task Order with EOA, Inc. of Oakland CA for technical support to the Countywide Program;
- September 2019 – Received a presentation on the County's proposed disposable foodware ordinance including its benefits for trash load reduction; received copies letters to Assembly Member Mullin for his support in securing a $3 million budget allocation for C/CAG to advance multi-benefit regional stormwater projects and supporting AB 825 to establish the San Mateo County Flood and Sea Level Rise Resiliency District (FSLRRD);

[1]NPDES Permit No. CAS612008 (Order No. R2-2015-0049), dated November 19, 2015. The MRP has a five-year term: effective January 1, 2016 and expires December 31, 2020.

[2]As of January 1, 2020, the San Mateo County Flood and Sea Level Rise Resiliency District (SMCFSLRRD).

- October 2019 – Approved an amendment adding additional funds to the Paradigm Environmental Funding Agreement for developing a Countywide Sustainable Streets Master Plan; approved appointing Nikki Nagaya to the C/CAG Stormwater Committee to represent the City of Menlo Park;
- December 2019 – Approved materials to execute $2.94 M funding agreement with the California Natural Resources Agency (CNRA) for advancing multi-benefit regional stormwater projects, endorsing a new FSLRRD proposal; appointed of Sam Bautista to Stormwater Committee for City of Pacifica;
- February 2020 – Received notice of the March "Green Streets for Sustainable Communities" symposium and "Shore to Shore: Envisioning San Mateo County's Resilient Water Future" event (both were subsequently canceled due to COVID-19);
- April 2020 – Approved appointments of Peter Brown (Belmont) and Andrew Yang (Millbrae) to the C/CAG Stormwater Committee; approved reallocating unspent Measure M vehicle registration administration and interest earnings revenue to C/CAG programs, including $228k to the Countywide Stormwater Program;
- May 2020 - Received copies of no-cost time extensions for six Safe Routes to School / Green Streets Infrastructure Pilot Program projects for the following jurisdictions: Brisbane, Colma, East Palo Alto, Menlo Park, Pacifica and Redwood City; approved Resolution 20-21, authorizing the application for $97,671 in grant funding from the California Resilience Challenge for the Resilient San Carlos Schoolyards project; and
- June 2020 – Approved the FY 2019/20 C/CAG Budget, including budget for SMCWPPP; approved consultant Task Orders and Funding Agreements.

Program Manager and Staff

C/CAG's Program Manager oversees the overall Countywide Program, serving as staff to the C/CAG Board and liaison among San Mateo County municipalities, technical consultants, committees, the Bay Area Stormwater Management Agencies Association (BASMAA), the California Stormwater Quality Association (CASQA), and Regional Water Board staff. The Program Manager represents San Mateo County municipalities at regional and statewide meetings and manages technical consultants that support programmatic activities. C/CAG's Stormwater Program Specialist supports the Program Manager in implementing the Countywide Program. In addition to providing regular staff support, agenda reports, and presentations to the C/CAG Board and the Stormwater Committee, the Program Manager and staff participated in the following activities during the FY 2019/20 reporting year:

- BASMAA: The Program Manager continued representing the Countywide Program on the Board of Directors (continued serving as Vice-Chair in 2019 and again as Chair starting in 2020). Program Manager and staff participated in Board meetings, BASMAA regional project meetings, and BASMAA committee meetings.
- CASQA: The Program Manager finished the two-year term as co-chair of the CASQA Legislative Committee; staff attended and presented at the annual CASQA conference.
- San Francisco Estuary Partnership Implementation Committee: The Program Manager continued serving on the committee representing the municipal stormwater perspective, participating in quarterly meetings.

- The Program Manager continued serving a one-year term as an expert consultant to the US EPA Environmental Finance Advisory Board to assist in responding to a congressional request for information regarding stormwater funding and financing, including attending a second in-person meeting in Kansas City, MO in October.
- The Program Manager / staff gave presentations via organizations such as the Regional Water Board, Metropolitan Transportation Commission, FSLRRD, BASMAA, San Francisco Bay Regional Monitoring Program (RMP), and CASQA on a variety of topics such as stormwater management, sustainable streets, and green infrastructure (GI).
- Grant-funded Project Activities:
  - Continued representing BASMAA on the Urban Greening Bay Area grant from EPA (Water Quality Improvement Fund) to the San Francisco Estuary Partnership / Association of Bay Area Governments. Although BASMAA's grant project finished in FY 2018/19, additional unused funding from other grant tasks was shifted to the BASMAA Roundtable effort to further advance the specific actions to prioritize sustainable streets in funding sources. The Program Manager, in conjunction with the project consultant and Roadmap Implementation Committee, began work to create fact sheets that clarify the eligibility of GI in transportation funding programs. This work continued in FY 2019/20, including meeting with Metropolitan Transportation Commission, Caltrans, and California Transportation Commission staff, and getting review/comment on draft materials from Federal Highway Administration staff.
  - C/CAG staff worked with the CNRA to allocate $2.94 million in State General Funds to advance designs of multi-benefit regional stormwater capture facilities. $200K of the funds were kept with C/CAG for additional planning to find more regional stormwater capture project opportunities and develop project concepts and a business case for countywide collaboration on regional stormwater management (leveraging $100K obtained by the County Office of Sustainability for a similar purpose) and $913K each to the Cities of Belmont, Redwood City, and San Bruno for initiating design of regional stormwater capture projects at Twin Pines Park, the I-280/380 interchange, and Red Morton Park, respectively. C/CAG staff worked with the Cities of San Bruno and Redwood City and the County Office of Sustainability on a joint Request for Proposals for technical consultant support for each agency's respective components of the work. Belmont is working with the FSLRRD to pursue its regional project in conjunction with a $1 million grant to design creek restoration efforts in Twin Pines Park on Belmont Creek.
  - Continued implementing the Countywide Sustainable Streets Master Plan under the $986,300 Caltrans Adaptation Planning grant. This plan will prioritize street segments for including GI with other planned investments, such as bike/pedestrian and complete streets projects, safe routes to school improvements, and pavement rehabilitation. In developing the plan, C/CAG's consultant team will also be doing climate change modeling related to precipitation, public outreach/engagement, developing project concepts, and creating a web-based tracking tool. See Section 3 of this report (C.3 New Development and Redevelopment) for more details.
  - C/CAG staff submitted a successful grant proposal to the California Resilience Challenge, receiving $97K to develop resilient schoolyard concepts for San Carlos School District sites, showing how GI can be integrated to help reduce runoff, improve water quality, recharge groundwater, and reduce urban heat islands.

Stormwater Committee

C/CAG's stormwater management-related decisions are generally made in consultation with 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 San Mateo County municipalities 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.

The Stormwater Committee met six times during FY 2019/20 (August, September, November, April, May, and June) 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 2019/20. Details on Stormwater Committee meeting agendas, minutes, and presentations can be found on the Committee's website.

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 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 did not meet in FY 2019/20 but received regular emails from the Program Manager and staff with updates on key permit compliance topics and occasional requests for feedback. SMCWPPP has also established various subcommittees and work groups to the TAC that met regularly during FY 2019/20 to help implement the different aspects of MRP, as discussed below.

Flood and Sea Level Rise Resiliency District

AB 825 (Mullin) became law on January 1, 2020, officially revamping the San Mateo County Flood Control District to become the San Mateo County Flood and Sea Level Rise Resiliency District. The FSLRRD is intended to address sea level rise, coastal erosion, flooding, and regional stormwater management. As such, assuming the FSLRRD can secure long-term, sustainable funding during the startup period, it will likely play a key role in helping to design, build, and maintain regional stormwater facilities that will help achieve water quality goals in the MRP. The three-year funding commitment by the County and cities/towns ($4.5 million over three years) is an important step forward for achieving integrated water management in San Mateo County.

The C/CAG Board appointed the five city/town elected officials to the governing board. The County Board of Supervisors appointed the two supervisors. The seven governing board members representing the different geographic areas in the county are:

- North: Donna Colson, City of Burlingame
- Central: Diane Papan, City of San Mateo
- South: Lisa Gauthier, City of East Palo Alto
- Coast: Debra Ruddock, City of Half Moon Bay

- At-Large: Maryann Derwin, Town of Portola Valley
- Coast Supervisor: Don Horsley
- At-Large Supervisor: Dave Pine

In June 2019, the governing board began acting as an advisory committee to the Board of Supervisors in its capacity as the governing board of the existing Flood Control District as AB 825 moved through the legislature. The advisory committee initially focused on hiring an Executive Director for the FSLRRD, and Len Materman (former San Francisquito Creek Joint Powers Authority Executive Director) was brought on as Chief Executive Officer in May 2020. The advisory committee officially became the FSLRRD Board of Directors on January 1, 2020. Interim information from the advisory committee can be found at www.resilientsanmateo.org and information on the official FSLRRD can be found at its new website, www.oneshoreline.org. The FSLRRD inherits the MRP permittee responsibilities of the prior Flood Control District, with those duties currently contracted back to the County Department of Public Works for implementation and reporting. The FSLRRD will need to be included as a replacement permittee under the MRP with its reissuance in 2021.

Municipal Regional Permit Reissuance

It is anticipated that the MRP will be reissued in 2021. The reissued permit is referred to as MRP 3.0 (the current permit is referred to as MRP 2.0). During FY 2019/20, SMCWPPP and San Mateo County Permittee staff continued to participate in the ongoing reissuance process. The process facilitates Regional Water Board, Bay Area countywide stormwater program, and MRP Permittee staff, and representatives from other organizations, working together through an overarching Steering Committee and several workgroups specific to MRP provisions/topics. For example, SMCWPPP and San Mateo County Permittee staff participated in the MRP 3.0 C.3/GI Work Group to discuss, internally and with Regional Water Board staff, issues to be addressed in Provision C.3 (New Development and Redevelopment) of MRP 3.0. SMCWPPP staff helped to lead these efforts and co-led the Work Group. In FY 2019/20, the C.3/GI Work Group met approximately monthly, including 10 meetings held with Regional Water Board staff and several internal meetings. Key issues discussed included: regulated project thresholds, regulation of single-family homes, regulation of road reconstruction projects, alternative compliance options, Special Projects provisions, asset management, and future GSI requirements. During FY 2019/20, the Program Manager, SMCWPPP, and Permittee staff also participated in the Steering Committee and several other MRP 3.0 work groups (e.g., C.4/5, C.8, C.10, and C.11/12). In addition, SMCWPPP staff co-led the MRP 3.0 C.8 (Water Quality Monitoring) Work Group.

ORGANIZATION OF REPORT

This FY 2019/20 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.15. Exempted and Conditionally Exempted Discharges

The following sections briefly summarize how SMCWPPP provided assistance in FY 2019/20 in implementing the MRP for each of the above provisions.

C.2 Municipal Operations

The objective of MRP Provision C.2 is "to ensure development and implementation of appropriate Best Management Practices (BMPs) by all Permittees to control and reduce discharges of non-stormwater and stormwater runoff pollutants to storm drains and watercourses during operation, inspection, repair and maintenance activities of municipal facilities and infrastructure." Most MRP-required Provision C.2 Municipal Operations tasks are implemented individually by each Permittee in San Mateo County. The Countywide Program 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.

SMCWPPP performs a number of tasks to assist San Mateo County Permittees with implementation of Provision C.2, with input and assistance provided by the Public Works Municipal Maintenance Subcommittee. FY 2019/20 accomplishments included the following:

- Held three Public Works Municipal Maintenance Subcommittee meetings; and
- Updated a pesticide tracking template, in coordination with SMCWPPP's Parks Maintenance and IPM Work Group, to assist San Mateo County Permittees comply with pesticide tracking and reporting requirements in MRP Provision C.9.a.

C.3 New Development and Redevelopment

During FY 2019/20, SMCWPPP continued to provide compliance assistance with MRP Provision C.3, New Development and Redevelopment, through the New Development Subcommittee (NDS).

In support of the Green Infrastructure (GI) Plan requirement in the MRP and to more broadly plan for precipitation-based climate change impacts to the transportation network in San Mateo County, C/CAG has continued developing the San Mateo Countywide Sustainable Streets Master Plan under the Caltrans Adaptation Planning Grant program. This plan will provide an implementation-level approach to achieving water quality goals in the MRP and other community benefits associated with GI. To further support cost-effective GI implementation, and leveraging a State Budget Grant administered by the California Natural Resources Agency in the amount of $2.94 million, C/CAG is coordinating with the

Cities of Redwood City, San Bruno, Belmont, San Mateo County and the Flood and Sea Level Rise Resiliency District to advance designs of multi-benefit regional stormwater capture projects. C/CAG is also engaging consultant support with a portion of these funds in coordination with the County Office of Sustainability to identify new opportunities for regional stormwater capture projects and to develop initial design concepts to support project implementation. Lastly, C/CAG was awarded $97,000 from the Bay Area Council's California Resilience Challenge Grant to develop schoolyard greening concepts for up to six schools in San Carlos to accelerate climate adaptation with respect to managing climate change related precipitation impacts, mitigating urban heat island effects, and promoting sustainable stormwater management at schools, while making campuses safer and more enjoyable learning spaces.

SMCWPPP's accomplishments during FY 2019/20 include the following tasks to assist San Mateo County municipalities with implementation of Provision C.3:

- Held four meetings of the NDS to assist municipal agencies in San Mateo County to comply with MRP Provisions C.3 (New Development and Redevelopment) and C.6 (Construction Controls). SMCWPPP's facilitation of the four meetings and related review of work outside of the meetings allowed SMCWPPP to participate in further advancement of key elements included in the Permittee GI Plans, including the adoption of new GI-related policies, review of proposed project opportunities, integration with deliverables in the Countywide Sustainable Streets Master Plan and implementation of C.3 requirements.
- Completed a significant update to the C.3 Regulated Projects Guide (formerly known as the C.3 Stormwater Technical Guidance), part of the SMCWPPP GreenSuite, and minor updates to other SMCWPPP products for consistency with MRP requirements and ease of use by municipal staff.
- Completed an update to the Green Infrastructure Design Guide (GI Design Guide), the other part of the new SMCWPPP GreenSuite, for San Mateo County Permittees. The Green Infrastructure Design Guide includes broad guidance on the design and implementation of various green stormwater infrastructure treatment measures, typical details and standard specifications for numerous GI design options and settings. In FY 2019/20, the GI Design Guide was updated to an interactive PDF document for greater ease of use and functionality, given the size of the document and breadth of resources.
- Conducted a variety of GI outreach activities, including rain barrel program promotion, publishing newsletter articles, and social media posts. C/CAG staff attended classroom presentations and participated in efforts to engage schools via programs led by the San Mateo County Office of Education, including the C/CAG-funded Sustainable Watersheds teacher fellowship program and the Community Based Environmental Literacy Partners Program. C/CAG staff also supported local and regional implementation of GI, through presenting the Countywide Sustainable Streets Master Plan project at the CASQA Annual Conference in October 2019 and in regional planning meetings with the Metropolitan Planning Commission on identifying funding nexuses among stormwater and transportation programs. C/CAG staff has also stayed engaged with other regional and statewide efforts, including the Green Infrastructure Leadership Exchange and the Green Streets for Sustainable Communities Symposium. Other outreach on GI included C/CAG staff and consultants participating in a ReScape CA Maintenance Qualification Training on November 14, 2020, which included a session focused on maintaining green stormwater infrastructure and featured the SMCWPPP GI Design Guide. C/CAG also updated its outreach website, flowstobay.org, which includes several pages focused on raising awareness about GI in San Mateo County.

- Conducted two half-day C.3 workshops/webinars entitled “Reviewing C.3 Regulated Projects” and “Implementing Green Street Projects.”
- Participated in 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 San Mateo County Permittees in controlling the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable. San Mateo County Permittees are responsible for complying with various business inspection requirements under MRP Provision C.4. SMCWPPP's CII component assists San Mateo County Permittee 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, which met four times in FY 2019/20, with good participation by municipal staff.

During FY 2019/20, SMCWPPP performed a variety of tasks to assist San Mateo County Permittees with implementation of MRP Provision C.4, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- Developed a Vehicle Service BMP fact sheet;
- Translated the Vehicle Service BMP fact sheet and Food Service Facility BMP fact sheet into Spanish and Chinese; and
- Updated the business stormwater inspector contact list on the SMCWPPP website.

C.5 Illicit Discharge Detection and Elimination

Another important goal of SMCWPPP's CII component is to assist San Mateo County Permittees effectively prohibit the discharge of illicit, non-stormwater discharges to the municipal storm drain system. San Mateo County Permittees are responsible for controlling non-stormwater discharges prohibited by MRP Provision C.5. SMCWPPP's CII component assists San Mateo County Permittee 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.

During FY 2019/20, SMCWPPP performed a number of tasks to assist San Mateo County Permittees with implementation of MRP Provision C.5, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- Updated the inventory of mobile cleaner businesses in San Mateo County;
- Updated the table of stormwater enforcement actions against mobile businesses to share countywide with stormwater inspectors;
- Updated the Illicit Discharge Responder/Storm Drain Cleaning Contract List;
- Translated the mobile cleaner businesses BMP fact sheet into Spanish and Chinese;
- Conducted public outreach via the SMCWPPP website (flowstobay.org) to inform consumers about hiring mobile businesses that implement best practices for preventing non-stormwater discharges to storm drains; and

- Updated the Illicit Discharge contact list on the SMCWPPP website.

C.6 Construction Site Control

This component of SMCWPPP assists San Mateo County municipalities in complying with MRP Provision C.6 (Construction Site Control). This assistance continued to be provided through the New Development Subcommittee. SMCWPPP's accomplishments during FY 2019/20 include the following tasks to assist San Mateo County municipalities with implementation of MRP Provision C.6:

- Conducted a construction site controls training for the California Building Inspectors Group (CALBIG) on November 13, 2019.
- Printed 2,000 copies of the Construction Site Inspection Form and distributed them to the Subcommittee members.

The 2020 Construction Site Inspector Workshop scheduled for April 2020 was canceled due to the COVID-19 pandemic. The associated shelter-in-place order precluded conducting an in-person training with the field component that Permittee staff found to be very informative in previous years. A workshop is planned for FY 2020/21.

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 water quality in local creeks, lagoons, shorelines and neighborhoods;
- Encourage residents to adopt less polluting and more environmentally beneficial practices; and
- Increase residents' participation and involvement in SMCWPPP activities.

PIP is essential for controlling and reducing the source of pollution since many preventable pollutants are associated with everyday residential activity. Stormwater pollution may be reduced when residents are educated and motivated by the benefits of reducing pollutants. This approach of education and motivation is cost-effective and efficient in meeting the goal of reducing pollutants in stormwater to the maximum extent practicable.

The SMCWPPP PIP Subcommittee oversees the development of outreach and educational materials and guides the implementation of the PIP component of the program. The Subcommittee met two times in FY 2019/20 with good participation by municipal staff. SMCWPPP's PIP accomplishments during FY 2019/20 included the following:

- Partnered with the Bay Area Water Conservation Supply Agency (BAWSCA) on a Rain Barrel outreach campaign that received 474 website page views. Received 27 rebate applications from residents for a total of 33 rain barrel installations and distributed rain barrel rebate fliers at outreach events. Over 2,000 rain barrels have been installed to-date in San Mateo County under the rebate program.
- Promoted the Sustainable Streets Master Plan by conducting public outreach to educate the public about the project, convey technical issues in a clear manner, continue collecting feedback on priorities and preferences, and publicize upcoming public participation opportunities, reaching 231 residents in multiethnic communities.

- Conducted a countywide stormwater and green infrastructure community survey that recorded the opinions and findings of 1,214 San Mateo County residents.
- Promoted the San Mateo County Environmental Health Services (EHS) campaign to reduce littering of cigarette butts, as well as the San Mateo County Reusable Bag Ordinance Emergency Regulation and HHW Collection Program.
- Promoted Coastal Cleanup Day for 5,245 volunteers, raising awareness of the event and the consequences of littering behaviors.
- Promoted Caltrans educational materials regarding uncovered loads in English and Spanish.
- Gained 8,054 new Facebook fans and a total page reach of 121,789 with stormwater pollution prevention Facebook messaging.
- Sent 12 newsletters to a list of 3,515 active, opt-in subscribers with topics covering eco-friendly gardening practices, local cleanup events and stormwater pollution prevention information and tips.
- Received 24,357 visitors to the SMCWPPP website (flowstobay.org), which focuses on stormwater pollution prevention messaging and resources.
- Participated in 13 public outreach events in San Mateo County to speak one-on-one with residents and hand out collateral materials.
- Participated in a new, countywide stormwater-focused teacher fellowship program in coordination with the County Office of Education and also supported countywide school outreach efforts by creating a green infrastructure lesson plan and conducting in-class presentations.
- Performed point-of-purchase outreach with Our Water Our World materials to 10 hardware stores in San Mateo County while conducting in-store tabling events to engage residents on eco-friendly alternatives to pesticides.
- Promoted outreach messaging to residents regarding eco-friendly alternatives to pesticides in SMCWPPP's newsletter, website and social media channels.

C.8 Water Quality Monitoring

On behalf of its member agencies, SMCWPPP performs water quality monitoring activities in compliance with MRP Provision C.8. Some of this work is accomplished through participation in BASMAA regional projects. Per Provision C.8, a complete documentation of all water quality monitoring data collected from October 1, 2019 through September 30, 2020 (i.e., Water Year 2020 or WY 2020) will be presented in SMCWPPP's Urban Creeks Monitoring Report, which will be submitted to the Regional Water Board by March 31, 2021.

In addition, in accordance with MRP Provision C.8.f., Pollutants of Concern (POC) Monitoring, SMCWPPP will submit by October 15, 2020 a report describing the POC Monitoring tasks accomplished in WY 2020 and the planned allocation of sampling effort for POC Monitoring in WY 2021. The report will include monitoring locations, number and types of samples collected, a description of the objectives of the sampling (i.e., management question addressed), and the analytes measured. However, per Provision C.8.h., the results of the monitoring will not be included, but instead will be documented in the Urban Creeks Monitoring Report.

C.9 Pesticides Toxicity Control

The primary objective of MRP Provision C.9 Pesticides Toxicity Control is to prevent the impairment of urban streams by pesticide-related toxicity. As such, Provision C.9 helps implement the *TMDL for Diazinon and Pesticide-related Toxicity for Urban Creeks* in the San Francisco Bay region. Permittees are required to implement a pesticide toxicity control program that addresses their own use of pesticides and use by others within their jurisdictions. The focus is on pesticides that pose a threat to water quality, including applications with the potential to enter the municipal stormwater conveyance system.

Most MRP-required Provision C.9 tasks are implemented individually by each San Mateo County Permittee. 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 is coordinated through SMCWPPP's Parks Maintenance and Integrated Pest Management (IPM) Work Group. The exception is Provision C.9.h, the public outreach portion of Provision C.9, which is implemented through the SMCWPPP Public Information and Participation (PIP) component.

During FY 2019/20, SMCWPPP performed a number of tasks to assist San Mateo County Permittees with implementation of Provision C.9, with input and assistance provided by the Parks Maintenance and IPM Work Group. SMCWPPP's accomplishments included the following:

- Held one meeting of the Parks Maintenance and IPM Work Group with good participation by municipal staff.
- Conducted SMCWPPP's Annual Landscape IPM Training Workshop in March 2020.
- Continued coordinating with San Mateo County Agriculture / Weights and Measures staff.
- Participated in relevant BASMAA and CASQA activities.
- Continued to maintain retail partnerships at 10 top-tier stores (e.g., Home Depot and Hassett Ace Hardware) within San Mateo County. Tasks included ordering materials, organizing outreach collateral, checking in with store managers, and providing outreach to residents.
- Conducted outreach at community events to educate customers about less toxic alternatives to commercial pesticides and fertilizers. Conducted seven in-store tabling events for store customers.
- Facilitated an online webinar where residents were able to submit questions and discuss less toxic solutions to their specific pest problems with experts at the UC Master Gardeners of San Mateo and San Francisco Counties.
- Conducted outreach to all pest control operators in San Mateo County and created a database of active-licensed operators, a list of their IPM certifications, and contact information.

C.10 Trash Load Reduction

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

- Reduce trash discharges from 2009 levels by 80% by July 2019;

- Ensure that lands they do not own or operate but that are plumbed directly to their storm drain systems in Very High, High and Moderate trash generation areas are identified and equipped by full capture systems or managed to a level equivalent to full capture systems;
- Install and maintain full capture systems that treat a mandatory minimum acreage;
- Assess trash reductions associated with control measures other than full capture systems using a visual assessment protocol;
- Develop and implement a receiving waters trash monitoring program plan;
- Annually cleanup and assess a mandatory minimum number of creek/shoreline trash hotspots; and
- Maintain a Long-Term Trash Load Reduction Plan designed to achieve 100% trash reduction by July 2022.

SMCWPPP performs a variety of tasks to assist San Mateo County Permittees with implementation of MRP Provision C.10 and the requirements listed above, with input and assistance provided by the SMCWPPP Trash Subcommittee and Litter Work Group. FY 2019/20 accomplishments included the following:

- Coordinated and facilitated five meetings of SMCWPPP's Trash Subcommittee and one meeting of SMCWPPP's Litter Work Group;
- Assisted San Mateo County Permittees in delineating trash full capture treatment areas and managing trash full capture information in GIS (currently nearly 10,000 acres are treated by full capture systems in San Mateo County);
- Continued to implement SMCWPPP's Trash Assessment Strategy, including conducting roughly 560 On-land Visual Trash Assessments (OVTAs) at 236 sites and maintaining the Countywide Program's online OVTA database to allow San Mateo County Permittees access to timely load reduction estimates;
- Continued providing guidance to San Mateo County Permittees on MRP operation and maintenance requirements and standard operating procedures for trash full capture systems;
- Compiled and standardized data from 47 trash hot spot assessments and cleanups, and entered the data into the SMCWPPP hot spot database;
- Finalized and distributed the *New Development Projects Litter Reduction Fact Sheet* summarizing the best practices of the *Litter Reduction Toolkit for Multi-family Dwellings*;
- Coordinated with the SMCWPPP Public Information and Participation (PIP) Subcommittee on countywide school outreach and countywide litter campaign branding efforts;
- Responded to Regional Water Board staff requests for information on existing, planned, and potential locations for trash full capture systems that are mutually beneficial to San Mateo County Permittees and Caltrans;
- Coordinated with Caltrans on trash capture efforts, including the installation of trash full-capture systems through cooperative implementation agreements;
- Conducted qualitative trash receiving water monitoring at 30 creek/channel sites included in the *BASMAA Receiving Waters Trash Monitoring Program Plan;*

- Participated in the development and submittal of the *BASMAA Final Receiving Water Trash Monitoring Report*, in compliance with MRP provision C.10.b.v.; and
- Assisted San Mateo County Permittees in developing information necessary for reporting trash load reductions with their FY 2019/20 Annual Reports.

C.11 Mercury Controls

MRP 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. SMCWPPP performs a variety of activities to address mercury in stormwater runoff in compliance with MRP Provision C.11. Some of this work is accomplished via participation in BASMAA regional projects. Please note that efforts that address both PCBs and mercury are described in this section rather than the following section (Section 12, PCBs Controls). Section 12 focuses on efforts that address PCBs only.

Beginning with the FY 2016/17 Annual Report, Permittees are required to report annually the mercury loads reduced in stormwater runoff. Permittees are required to use the approved Interim Accounting Methodology to demonstrate cumulative pollutant loads reduced from each control measure implemented and progress toward achieving the load reductions required this permit term. SMCWPPP is tracking all existing and planned control measures that should result in pollutant load reduction credits towards meeting the San Mateo County portion of the mercury TMDL wasteload allocation and MRP 2.0 load reduction requirements. MRP 2.0 requires that an at least 6 grams/year mercury load reduction is achieved in San Mateo County via GI by June 30, 2020. From FY 2013/14 through FY 2019/20,[3] a 535 grams/year mercury load reduction has been realized via GI (parcel-based GI/LID and green streets) in the County and thus this requirement has been fulfilled.

Permittees are required to submit in this FY 2019/20 Annual Report an estimate of the amount and characteristics of land area that will be treated through green infrastructure implementation by 2020, 2030, and 2040, including all data used and a full description of models and model inputs relied on to generate this estimate. Permittees are also required to submit in this FY 2019/20 Annual Report a Reasonable Assurance Analysis (RAA) to demonstrate quantitatively that mercury reductions of at least 10 kg/yr will be realized by 2040 through implementation of green infrastructure projects. The MRP requires this submittal to include all data used and a full description of models and model inputs relied on to make the demonstration and documentation of peer review of the RAA. San Mateo County Permittees have fulfilled these MRP requirements via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

MRP Provisions C.11/12.d require that Permittees prepare a plan and schedule for mercury and PCBs control measure implementation and a corresponding RAA demonstrating quantitatively that sufficient control measures will be implemented to attain the mercury and PCBs TMDL wasteload allocations by 2028 and 2030, respectively. The plan must:

[3]Based on language in the MRP and discussions with Regional Water Board staff, it is assumed that applicable controls implemented from July 1, 2013 through the end of the permit term should result in credit towards the MRP 2.0 mercury and PCBs load reduction requirements.

1. Identify all technically and economically feasible mercury and PCBs control measures to be implemented (including green infrastructure projects).
2. Include a schedule according to which these technically and economically feasible control measures will be fully implemented.
3. Provide an evaluation and quantification of the mercury and PCBs load reduction of such measures as well as an evaluation of costs, control measure efficiency and significant environmental impacts resulting from their implementation.

San Mateo County Permittees have fulfilled this requirement via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

MRP Provisions C.11.e and C.12.h require Permittees to conduct an ongoing risk reduction program to address public health impacts of mercury and PCBs in San Francisco Bay fish. The fish risk reduction program is required to include actions to reduce actual and potential health risks in those people and communities most likely to consume San Francisco Bay-caught fish, such as subsistence fishers and their families. The program is required to have the potential to reach 3,000 individuals annually (Bay Area-wide total for all MRP 2.0 Permittees) who are likely consumers of San Francisco Bay-caught fish. Permittees are required to report on the status of the risk reduction program in each of their Annual Reports, including a brief description of actions taken, an estimate of the number of people reached, and why these people are deemed likely to consume Bay fish.

SMCWPPP is assisting San Mateo County municipalities comply with the risk reduction program requirements by coordinating with and reporting on the Fish Smart program conducted by San Mateo County Environmental Health Services (EHS). Fish Smart builds upon the San Francisco Bay Fish Project (sfei.org/sfbfp#sthash.eOcfwrhA.dpbs), a risk reduction framework developed regionally in the previous permit term. The Fish Project funded Bay Area community-based organizations to develop and deliver appropriate communications to appropriately targeted individuals and communities about how to reduce their exposure to mercury and PCBs from consuming San Francisco Bay fish.

During FY 2019/20, EHS conducted a variety of activities via its Fish Smart program that target at-risk populations (e.g., subsistence fisherman), including the following:

- EHS staff maintained signs posted along the San Francisco Bay shore (e.g., at fishing piers) in the Cities of Brisbane, South San Francisco, San Mateo, Burlingame, and Redwood City. One sign was replaced at the Brisbane Lagoon due to the previous sign and pole being knocked down.
- EHS continued to promote the Fish Smart program using the California OEHHA fish consumption advisories in various languages through flyer distribution at community events, bait and tackle stores, harbormaster offices, and WIC community offices. 1,075 flyers in various languages were distributed at 20 locations within the County.
- EHS staff spoke with 1,128 residents at 4 events where information on the Fish Smart in San Francisco Bay, California Coast, and Monterey Bay Aquarium's Seafood Watch Programs was provided.
- EHS maintained the smchealth.org/fishsmart webpage, which received 4,212 views.

- EHS created three social media posts and shared them on both Facebook and Twitter for a total of six posts. One of the posts was also shared to over 124,000 households countywide on Nextdoor.com. Posts combined had a reach or impression total of 16,961, depending on the platform. Combined, the posts had 1,250 engagements.

A review of the Fish Smart program's accomplishments from FY 2015/16 through FY 2019/20 revealed the program succeeding in providing wide-ranging outreach about potential health impacts of consuming certain types of fish caught in San Francisco Bay. The review documented various quantitative measures of outreach efforts and outcomes (e.g., numbers of brochures distributed, numbers of people interacted with at outreach events, numbers of people receiving electronic newsletters, and social media postings impressions and reach). Based on the magnitude and targeting of these efforts, it is likely that the Fish Smart program has led to reduced health risks in those people and communities most likely to consume San Francisco Bay-caught fish, such as subsistence fishers and their families.

In addition, on February 13th, 2020, 13 surveys were conducted at the Pacifica Pier to discuss the OEHHA fish consumption guidelines. Results showed that 92% of respondents eat the fish they caught and shared at least some types of the fish they caught with their friends or family. When asked if they knew that certain fish were not safe to eat due to high mercury and PCB levels, 84% indicated they were aware of this. This result suggests the Fish Smart program's outreach and/or other related risk reduction information has reached most members of the group surveyed. However, the representativeness of the small group surveyed and the extent that this result could be extrapolated to a larger population have not been evaluated. EHS plans to continue to conduct surveys in FY 2020/21 to better understand Bay and Coast fish consumption patterns and fish consumption advisory knowledge.

C.12 PCBs Controls

MRP 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. SMCWPPP performs a variety of activities to address PCBs in stormwater runoff in compliance with MRP Provision C.12. Please note that efforts that address both PCBs and mercury are described in the previous section (Section 11, Mercury Controls). This section focuses on efforts that address PCBs only.

Beginning with the FY 2016/17 Annual Report, Permittees are required to report annually the PCBs loads reduced in stormwater runoff. Permittees are required to use the approved Interim Accounting Methodology to demonstrate cumulative pollutant loads reduced from each control measure implemented and progress toward achieving the load reductions required this permit term. SMCWPPP is tracking all existing and planned control measures that should result in pollutant load reduction credits towards meeting the San Mateo County portion of the PCBs TMDL wasteload allocation and MRP 2.0 load reduction requirements.

MRP 2.0 requires that an at least 15 grams/year PCBs load reduction is achieved in San Mateo County via GI by June 30, 2020. From FY 2013/14 through FY 2019/20,[4] a 42.5 grams/year PCBs load reduction

[4] Based on language in the MRP and discussions with Regional Water Board staff, it is assumed that applicable controls implemented from July 1, 2013 through the end of the permit term should result in credit towards the MRP 2.0 mercury and PCBs load reduction requirements.

has been realized via GI (parcel-based GI/LID and green streets) in the County and thus this requirement has been fulfilled.

In addition, the estimated PCBs load reduced to-date by all MRP Permittees during the FY 2013/14 through FY 2019/20 time period is described in a document entitled *PCBs and Mercury Regional Loads Reduced during MRP 2.0, September 30, 2020* (included in Appendix 11). The estimated PCBs load reduction across the permit area over this time period is 3017 grams/year, indicating that the MRP regional performance criterion of 3,000 grams/year of PCBs load reduced by June 30, 2020 has been achieved.[5]

Permittees are required to submit in this FY 2019/20 Annual Report an estimate of the amount and characteristics of land area that will be treated through green infrastructure implementation by 2020, 2030, and 2040, including all data used and a full description of models and model inputs relied on to generate this estimate. Permittees are also required to submit in this FY 2019/20 Annual Report a RAA to demonstrate quantitatively that PCBs reductions of at least 3 kg/yr will be realized by 2040 through implementation of green infrastructure projects. The MRP requires this submittal to include all data used and a full description of models and model inputs relied on to make the demonstration and documentation of peer review of the RAA. San Mateo County Permittees have fulfilled the above MRP requirements via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

As described in more detail above (C.11 Mercury Controls), MRP Provisions C.11/12.d require that Permittees prepare a plan and schedule for mercury and PCBs control measure implementation and a corresponding RAA demonstrating quantitatively that sufficient control measures will be implemented to attain the mercury and PCBs TMDL wasteload allocations by 2028 and 2030, respectively. San Mateo County Permittees have fulfilled this requirement via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

MRP 2.0 Provision C.12.e requires that Permittees collect samples of caulk and other sealants used in storm drains and between concrete curbs and street pavement and investigate whether PCBs are present in such material and in what concentrations. BASMAA has completed a regional investigation that addresses this requirement. SMCWPPP reported on the results of the investigation in its FY 2017/18 Annual Report.

MRP Provision C.12.f. requires that Permittees develop and implement or cause to be developed and implemented an effective protocol for managing materials with PCBs concentrations of 50 parts per million or greater in applicable structures[6] at the time such structures undergo demolition, so that PCBs do not enter municipal storm drain systems. A Permittee is exempt from this requirement if it provided

[5]It is important to note that the MRP allows Permittees to meet the regional criterion as a group – criteria for individual counties would only apply when the regional group criterion was not met.

[6]Applicable structures are buildings built or remodeled from January 1, 1950 through December 31, 1980, with the following exemptions: single-family residential buildings, wood-framed buildings, and partial building demolitions.

evidence acceptable to the Executive Officer in its FY 2016/17 Annual Report that the only buildings that existed pre-1980 within its jurisdiction were single-family residential and/or wood-frame buildings.

Permittees were required to develop a protocol by June 30, 2019 that includes each of the following components, at a minimum:

- The necessary authority to ensure that PCBs do not enter municipal storm drains from PCBs-containing materials in applicable structures at the time such structures undergo demolition;
- A method for identifying applicable structures prior to their demolition; and,
- Method(s) for ensuring PCBs are not discharged to the municipal storm drain from demolition of applicable structures.

By July 1, 2019 and thereafter, Permittees are required to:

- Implement or cause to be implemented the PCBs management protocol for ensuring PCBs are not discharged to municipal storm drains from demolition of applicable structures via vehicle track-out, airborne releases, soil erosion, or stormwater runoff; and,
- Develop an assessment methodology and data collection program to quantify in a technically sound manner PCBs loads reduced through implementation of the protocol for controlling PCBs during demolition of applicable structures.

On behalf of MRP Permittees, BASMAA conducted a multi-year regional project to assist MRP Permittees to address Provision C.12.f. The BASMAA project, which began in FY 2016/17 and was completed in March 2019, assisted Permittees in developing local programs to manage PCBs-containing materials during building demolition. It developed guidance materials, tools and training materials and conducted outreach. SMCWPPP actively participated in the project, including providing BASMAA's project manager.

At the outset of the project, a BASMAA Steering Committee was convened to provide project oversight and guidance during the project. The Steering Committee included BASMAA Directors, countywide stormwater program staff, and Permittee staff from various relevant municipal departments. The Steering Committee met periodically throughout the project. In addition, a project TAG, a small balanced advisory group formed from industry, regulatory, and Permittee representatives to provide review and input on selected project work products, was convened. The TAG was comprised of representatives from industry and state/federal regulatory agencies, and Permittees. Other efforts to engage key stakeholders included an industry stakeholder roundtable meeting (August 2017) and two larger stakeholder group meetings (December 2017 and May 2018) that included industry, regulatory and municipal representatives. During FY 2018/19, Permittees tailored the BASMAA products for local use, adopted the program (e.g., via local policy or ordinance), and trained local staff to implement the new program starting July 1, 2019.

Key BASMAA project deliverables provided to each Permittee to use as appropriate given local procedures and needs included:

- A protocol for pre-demolition building survey for priority PCBs-containing building materials;
- Model language for municipal adoption (e.g., ordinance) of the new program to manage PCBs materials during building demolition and model supporting staff report and resolution;

- CEQA strategy and model notice of exemption;
- Supplemental demolition permit model application materials, including forms, process flow charts, and applicant instructions; and
- An analysis to assist municipalities that pursue cost recovery.

Other project deliverables included:

- A coordination/communication strategy for the project;
- A technical memorandum summarizing any new information & decisions needed by BASMAA at outset, including an annotated table of regulatory drivers and relevant requirements;
- A technical memorandum with the state of the practice for identifying PCBs-containing building materials (developed to inform development of the pre-demolition building survey protocol listed below);
- Industry stakeholder outreach materials and a fact sheet for municipal staff;
- A spreadsheet tool used to develop the prioritized list of potential PCBs-containing building materials that the demolition program will focus on;
- A conceptual approach for an assessment methodology and data collection program to quantify PCBs loads reduced through managing PCBs-containing materials during building demolition.

During FY 2018/19, the BASMAA project concluded by conducting the following outreach and training tasks:

- Prepared training materials for municipal staff on adoption and implementation of the new program;
- Developed outreach materials and a standard presentation to inform industry stakeholders including developers, planning firms, urban planning non-governmental organizations, demolition firms, property owners, property managers, and realtors about the new program to manage PCBs in building materials during demolition;
- Using the above training materials, conducted training workshops (in-person and a webinar) for key municipal and countywide stormwater program staff;
- Conducted a webinar for industry stakeholders; and
- Developed a list of Bay Area opportunities, including contact information and dates, for municipal and/or stormwater program staff to conduct additional outreach to industry stakeholders using the above industry outreach materials.

In addition, during FY 2018/19 and FY 2019/20, San Mateo County and other MRP Permittees worked together through the BASMAA Monitoring and Pollutants of Concern Committee (MPC) to develop a framework to comply with data collection/evaluation and reporting requirements under Provision C.12.f. As mentioned previously, these requirements include developing an assessment methodology and data collection program to quantify PCBs loads reduced through implementation of the new program.

The regional process developed includes the following steps:

1. The municipality informs demolition permit applicants that their projects are subject to the MRP Provision C.12.f requirements, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.
2. For every demolition project, applicants complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality.
3. The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
4. The municipality then issues the demolition permit or equivalent, according to its procedures.
5. For Applicable Structures only, the municipality submits completed Screening Forms and any supporting documents (consultant's report from PCBs building survey, QA/QC checklist, and lab reports) to its countywide program; forms for exempt sites need not be submitted. Forms should be submitted to the countywide programs electronically if feasible, and at a minimum annually, but quarterly is preferred.
6. The countywide programs compile the completed Screening Forms and any supporting documents. The countywide program then works with the other MRP countywide programs through BASMAA to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

Permittees began implementing the program on or before July 1, 2019. Appendix 12 includes two documents prepared collaboratively by San Mateo County and other MRP Permittees in compliance with MRP reporting requirements in Provision C.12.f. (3) – (5):

1. Documentation of (a) the number of applicable structures that applied for a demolition permit during the reporting year, and (b) a running list of the applicable structures that applied for a demolition permit (since the date the PCBs control protocol was implemented) that had material(s) with PCBs at 50 ppm or greater, with the address, demolition date, and brief description of PCBs control method(s) used (*PCBS in Building Materials Management Program – Regional Data Summary, August 20, 2020*).
2. An assessment methodology and data collection program to quantify PCBs loads reduced through implementation of the protocol for controlling PCBs during building demolition (*Managing PCBs in Building Demolition – Regional Collaboration for a Data Collection and Assessment Program, August 20, 2020*).

MRP Provision C.12.g requires Permittees to conduct or cause to be conducted studies concerning the fate, transport, and biological uptake of PCBs discharged from urban runoff to San Francisco Bay margin areas. This requirement is being addressed through a multi-year project by the San Francisco Bay Regional Monitoring Program (RMP) to develop a series of conceptual models of PCBs in Priority Margin Units (PMUs). SMCWPPP's FY 2016/17 Annual Report included a workplan developed by BASMAA that describes how these information needs will be accomplished, including the studies to be performed and a preliminary schedule. SMCWPPP's March 30, 2020 Integrated Monitoring Report included a summary of the findings and results of the studies completed, planned, or in progress and the implications of the studies on potential control measures to be investigated, piloted, or implemented in future permit cycles.

SMCWPPP is assisting San Mateo County municipalities to comply with the risk reduction program requirements by coordinating with and reporting on the Fish Smart program conducted by San Mateo County Environmental Health Services (EHS). Please see Section 11 above for additional details.

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 2019/20 include the following tasks to assist San Mateo County Permittees with implementation of Provision C.13:

- Continued to train municipal inspectors on the MRP requirements and BMPs for architectural copper installation, cleaning, and treating. The trainings utilized a SMCWPPP factsheet entitled "Requirements for Architectural Copper: Protect water quality during installation, cleaning, treating, and washing!" which targets suppliers and installers of copper materials and is available on the SMCWPPP website (flowstobay.com). Building inspectors received the information from a SMCWPPP presentation at the California Building Inspectors Group (CALBIG) meeting on November 13, 2019.
- Provided information through the SMCWPPP website, via a fact sheet entitled *Best Management Practices for Pools, Hot Tubs, and Fountain Water Discharges,* and social media posts related to managing discharges from pools, spas and fountains that includes information on avoiding the use of copper-based algaecides.
- Provided information through the SMCWPPP website on ensuring through routine industrial facility inspections that proper BMPs are in place at industrial facilities likely to use copper or have sources of copper.

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 non-stormwater discharges that are potential sources of pollutants. SMCWPPP helps municipal staff understand the MRP's requirements and makes various MRP compliance support materials available for their use. SMCWPPP's PIP component conducts selected activities to assist San Mateo County Permittees comply with outreach requirements in Provision C.15.b.iv. (Individual Residential Car Washing Discharge), C.15.b.v (Swimming Pool, Hot Tub, Spa and Fountain Water), and Provision C.15.b.vi. (Irrigation Water, Landscape Irrigation, and Lawn or Garden Watering).

SMCWPPP performs a variety of activities to assist San Mateo County Permittees with implementation of Provision C.15. SMCWPPP's FY 2019/20 accomplishments included the following:

- Continued outreach efforts through social media posts to encourage residents to use car washes rather than washing their cars at home;
- Partnered with a local car wash company to offer an exclusive discount to residents in an effort to make professional car wash companies more accessible;

- Conducted targeted outreach to mobile car wash businesses and residents to educate them on the hazards of dumping their used wash waters down storm drains and related BMPs;
- Using a BMP fact sheet for swimming pools, hot tubs, spas, and fountain water discharges, promoted these types of BMPs through social media posts;
- Continued conducting outreach to San Mateo County residents, via social media, the SMCWPPP e-newsletter and blog, and through SMCWPPP's point-of-purchase program, to support and promote eco-friendly alternatives to toxic pesticides and help avoid pollutants in groundwater and surface water discharges;
- Promoted planting of drought tolerant, native vegetation via social media, and the SMCWPPP e-newsletter and blog; and
- Continued to promote water-saving tips via social media.

SECTION 1
INTRODUCTION

BACKGROUND

This FY 2019/20 Annual Report was developed in compliance with the reissued National Pollutant Discharge Elimination System (NPDES) Municipal Regional Permit (referred to as the MRP)[1] for stormwater runoff discharges from San Mateo County and certain other San Francisco Bay Area communities. It summarizes stormwater management activities implemented by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP or Countywide Program) in FY 2019/20. SMCWPPP's activities benefit 22 municipal agencies in San Mateo County: 15 cities, five towns, the County of San Mateo, and the San Mateo County Flood Control District.[2] Each of these agencies 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 2019/20.

The organizational structure of SMCWPPP is shown on Figure 1-1. SMCWPPP is a program of the City/County Association of Governments (C/CAG) of San Mateo County. C/CAG is a Joint Powers Authority (JPA) that addresses issues of regional importance to San Mateo County jurisdictions such as congestion management and water quality. The C/CAG Board of Directors is comprised of a local elected city council representative from each city and town in San Mateo County, 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 San Mateo County municipalities with complying with the municipal stormwater NPDES permit, including its latest incarnation as the MRP. Stormwater management-related activities of C/CAG and its various related committees and workgroups are described below.

C/CAG Board

Throughout FY 2019/20, the C/CAG Board of Directors received presentations, updates, and took actions on various stormwater-related issues, as summarized below (all C/CAG Board meeting agenda materials and minutes are available at www.ccag.ca.gov/board-of-directors):

- July 2019 - Board received a copy of extended Task Order with EOA, Inc. of Oakland CA for technical support to the Countywide Program;

[1]NPDES Permit No. CAS612008 (Order No. R2-2015-0049), dated November 19, 2015. The MRP has a five-year term: effective January 1, 2016 and expires December 31, 2020.

[2]As of January 1, 2020, the San Mateo County Flood and Sea Level Rise Resiliency District (SMCFSLRRD).

- September 2019 – Received a presentation on the County's proposed disposable foodware ordinance including its benefits for trash load reduction; received copies letters to Assembly Member Mullin for his support in securing a $3 million budget allocation for C/CAG to advance multi-benefit regional stormwater projects and supporting AB 825 to establish the San Mateo County Flood and Sea Level Rise Resiliency District (FSLRRD);
- October 2019 – Approved an amendment adding additional funds to the Paradigm Environmental Funding Agreement for developing a Countywide Sustainable Streets Master Plan; approved appointing Nikki Nagaya to the C/CAG Stormwater Committee to represent the City of Menlo Park;
- December 2019 – Approved materials to execute $2.94 M funding agreement with the California Natural Resources Agency for advancing multi-benefit regional stormwater projects, endorsing a new FSLRRD proposal; appointed of Sam Bautista to Stormwater Committee for City of Pacifica;
- February 2020 – Received notice of the March "Green Streets for Sustainable Communities" symposium and "Shore to Shore: Envisioning San Mateo County's Resilient Water Future" event (both were subsequently canceled due to COVID-19);
- April 2020 – Approved appointments of Peter Brown (Belmont) and Andrew Yang (Millbrae) to the C/CAG Stormwater Committee; approved reallocating unspent Measure M vehicle registration administration and interest earnings revenue to C/CAG programs, including $228k to the Countywide Stormwater Program;
- May 2020 - Received copies of no-cost time extensions for six Safe Routes to School / Green Streets Infrastructure Pilot Program projects for the following jurisdictions: Brisbane, Colma, East Palo Alto, Menlo Park, Pacifica and Redwood City; approved Resolution 20-21, authorizing the application for $97,671 in grant funding from the California Resilience Challenge for the Resilient San Carlos Schoolyards project; and
- June 2020 – Approved the FY 2019/20 C/CAG Budget, including budget for SMCWPPP; approved consultant Task Orders and Funding Agreements:
    - Amendment No. 1 to Task Order EOA-10 for completion of Water Year 2020 monitoring activities;
    - Task Orders EOA-11 and EOA-12 for FY 2019/20 general program support and Water Year 2021 monitoring activities;
    - Task Order LWA-06 for FY 2019/20 green infrastructure (GI) and Reasonable Assurance Analysis (RAA) support;
    - Task Order SGA-06 for FY 2019/20 outreach support; and,
    - Amendment No. 5 to the Bay Area Water Supply and Conservation Agency funding agreement for FY 2018/19 for countywide rain barrel rebate program.

Program Manager and Staff

C/CAG's Program Manager oversees the overall Countywide Program, serving as staff to the C/CAG Board and liaison among San Mateo County municipalities, technical consultants, committees, the Bay Area Stormwater Management Agencies Association (BASMAA), the California Stormwater Quality Association (CASQA), and Regional Water Board staff. The Program Manager represents San Mateo County municipalities at regional and statewide meetings and manages technical consultants that support programmatic activities. C/CAG's Stormwater Program Specialist supports the Program Manager in implementing the Countywide Program. In addition to providing regular staff support, agenda reports, and presentations to the C/CAG Board and the Stormwater Committee, the Program Manager and staff participated in the following activities during the FY 2019/20 reporting year:

- BASMAA: The Program Manager continued representing the Countywide Program on the Board of Directors (continued serving as Vice-Chair in 2019 and again as Chair starting in 2020). Program Manager and staff participated in Board meetings, BASMAA regional project meetings, and BASMAA committee meetings.
- CASQA: The Program Manager finished the two-year term as co-chair of the CASQA Legislative Committee; staff attended and presented at the annual CASQA conference.
- San Francisco Estuary Partnership Implementation Committee: The Program Manager continued serving on the committee representing the municipal stormwater perspective, participating in quarterly meetings.
- The Program Manager continued serving a one-year term as an expert consultant to the US EPA Environmental Finance Advisory Board to assist in responding to a congressional request for information regarding stormwater funding and financing, attending a second in-person meeting in Kansas City, MO in October.
- Presentations by the Program Manager / staff:
    - California's San Francisco Bay Regional Water Quality Control Board (Comments on the State's proposed Water Resilience Portfolio, September).
    - California Stormwater Quality Association, Annual Conference ("Battle-Testing Green Infrastructure Plans for Future Climate Change," October).
    - State of the Estuary Conference ("Modeling and Planning for Long-Term Green Infrastructure Implementation in San Mateo County," October).
    - San Francisco Bay Regional Monitoring Program (RMP) Annual Meeting (Contributions of the RMP to Local Stormwater Program Monitoring/Modeling Efforts and Vice Versa, October).
    - ReScape Landscape Maintenance Qualification Training (San Mateo Countywide Green Infrastructure Design Guide). November
    - FSLRRD ("Planning for Long-Term Green Infrastructure Implementation in San Mateo County," December).
    - Home for All's Housing and Climate Readiness Task Force ("Managing Runoff: The Housing-Climate Connection," February).
    - Bay Area Stormwater Management Agencies Association's Development Committee ("GI Implementation – LID, Sustainable Streets, and Regional Projects," February).
    - Sustainable Streets Regional Roundtable meetings with MTC and CTC ("Sustainable Streets Regional Roundtable: Developing Fact Sheets," February).
    - Green Infrastructure Leadership Exchange Annual Meeting ("Modeling and Planning for Long-Term Green Infrastructure Implementation in San Mateo County," May).

- California Resilience Challenge grant awards program virtual launch ("Resilient San Carlos Schoolyards Project," July).

- Grant-funded Project Activities:
  - Continued representing BASMAA on the Urban Greening Bay Area grant from EPA (Water Quality Improvement Fund) to the San Francisco Estuary Partnership / Association of Bay Area Governments. Although BASMAA's grant project finished in FY 2018/19, additional unused funding from other grant tasks was shifted to the BASMAA Roundtable effort to further advance the specific actions to prioritize sustainable streets in funding sources. The Program Manager, in conjunction with the project consultant and Roadmap Implementation Committee, began work to create fact sheets that clarify the eligibility of GI in transportation funding programs. This work continued in FY 2019/20, including meeting with Metropolitan Transportation Commission, Caltrans, and California Transportation Commission staff, and getting review/comment on draft materials from Federal Highway Administration staff.
  - C/CAG staff worked with the Natural Resources Agency to allocate $2.94 million in State General Funds to advance designs of multi-benefit regional stormwater capture facilities. $200K of the funds were kept with C/CAG for additional planning to find more regional stormwater capture project opportunities and develop project concepts and a business case for countywide collaboration on regional stormwater management (leveraging $100K obtained by the County Office of Sustainability for a similar purpose) and $913K each to the cities of Belmont, Redwood City, and San Bruno for initiating design of regional stormwater capture projects at Twin Pines Park, the I-280/380 interchange, and Red Morton Park, respectively. C/CAG staff worked with the cities of San Bruno and Redwood City and the County Office of Sustainability on a joint Request for Proposals for technical consultant support for each agency's respective components of the work, while Belmont is working with the FSLRRD to pursue its regional project in conjunction with a $1 million grant to design creek restoration efforts in Twin Pines Park on Belmont Creek.
  - Continued implementing the Countywide Sustainable Streets Master Plan under the $986,300 Caltrans Adaptation Planning grant. This plan will prioritize street segments for including GI with other planned investments, such as bike/pedestrian and complete streets projects, safe routes to school improvements, and pavement rehabilitation. In developing the plan, C/CAG's consultant team will also be doing climate change modeling related to precipitation, public outreach/engagement, developing project concepts, and creating a web-based tracking tool. See Section 3 of this report (C.3 New Development and Redevelopment) for more details.
  - C/CAG staff submitted a successful grant proposal to the California Resilience Challenge, receiving $97K to develop resilient schoolyard concepts for San Carlos School District sites, showing how GI can be integrated to help reduce runoff, improve water quality, recharge groundwater, and reduce urban heat islands.

Stormwater Committee

C/CAG's stormwater management-related decisions are generally made in consultation with 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 San Mateo County municipalities 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 met six times during FY 2019/20 (August, September, November, April, May, and June) 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 2019/20. Details on Stormwater Committee meeting agendas, minutes, and presentations can be found on the Committee's website.

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 and Regional Water Boards.

Membership

The Stormwater Committee is comprised of one director-level representative from each San Mateo County municipality, 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, 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 BASMAA;
- Convey relevant program and compliance information and direction to appropriate staff and departments within their agencies;
- Form ad-hoc work groups to address stormwater-related issues on an as-needed basis (e.g., permit reissuance);

- 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 MRP;
  - Permit requirements, especially those related to new and redevelopment, GI, 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 San Mateo County municipalities.

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 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 did not meet in FY 2019/20 but received regular emails from the Program Manager and staff with updates on key permit compliance topics and occasional requests for feedback.

SMCWPPP has established various subcommittees and work groups to the TAC to help implement the different aspects of MRP, as shown on Figure 1-1. The subcommittees and work groups met regularly during FY 2019/20 and are discussed further in the remaining sections of this report.

Flood and Sea Level Rise Resiliency District

AB 825 (Mullin) became law on January 1, 2020, officially revamping the San Mateo County Flood Control District to become the San Mateo County Flood and Sea Level Rise Resiliency District. The FSLRRD is intended to address sea level rise, coastal erosion, flooding, and regional stormwater management. As such, assuming the FSLRRD can secure long-term, sustainable funding during the startup period, it will likely play a key role in helping to design, build, and maintain regional stormwater facilities that will help achieve water quality goals in the MRP. The three-year funding commitment by the County and cities/towns ($4.5 million over three years) is an important step forward for achieving integrated water management in San Mateo County.

The C/CAG Board appointed the five city/town elected officials to the governing board. The County Board of Supervisors appointed the two supervisors. The seven governing board members representing the different geographic areas in the county are:

- North: Donna Colson, City of Burlingame
- Central: Diane Papan, City of San Mateo
- South: Lisa Gauthier, City of East Palo Alto

- Coast: Debra Ruddock, City of Half Moon Bay
- At-Large: Maryann Derwin, Town of Portola Valley
- Coast Supervisor: Don Horsley
- At-Large Supervisor: Dave Pine

In June 2019, the governing board began acting as an advisory committee to the Board of Supervisors in its capacity as the governing board of the existing Flood Control District as AB 825 moved through the legislature. The advisory committee initially focused on hiring an Executive Director for the FSLRRD, and Len Materman (former San Francisquito Creek Joint Powers Authority Executive Director) was brought on as Chief Executive Officer in May 2020. The advisory committee officially became the FSLRRD Board of Directors on January 1, 2020. Interim information from the advisory committee can be found at www.resilientsanmateo.org and information on the official FSLRRD can be found at its new website, www.oneshoreline.org. The FSLRRD inherits the MRP permittee responsibilities of the prior Flood Control District, with those duties currently contracted back to the County Department of Public Works for implementation and reporting. The FSLRRD will need to be included as a replacement permittee under the MRP with its reissuance in 2021.

Municipal Regional Permit Reissuance

It is anticipated that the MRP will be reissued in 2021. The reissued permit is referred to as MRP 3.0 (the current permit is referred to as MRP 2.0). During FY 2019/20, SMCWPPP and San Mateo County Permittee staff continued to participate in the ongoing reissuance process. The process facilitates Regional Water Board, Bay Area countywide stormwater program, and MRP Permittee staff, and representatives from other organizations, working together through an overarching Steering Committee and several workgroups specific to MRP provisions/topics. For example, SMCWPPP and San Mateo County Permittee staff participated in the MRP 3.0 C.3/GI Work Group to discuss, internally and with Regional Water Board staff, issues to be addressed in Provision C.3 (New Development and Redevelopment) of MRP 3.0. SMCWPPP staff helped to lead these efforts and co-led the Work Group. In FY 2019/20, the C.3/GI Work Group met approximately monthly, including 10 meetings held with Regional Water Board staff and several internal meetings. Key issues discussed included: regulated project thresholds, regulation of single-family homes, regulation of road reconstruction projects, alternative compliance options, Special Projects provisions, asset management, and future GSI requirements. During FY 2019/20, the Program Manager, SMCWPPP, and Permittee staff also participated in the Steering Committee and several other MRP 3.0 work groups (e.g., C.4/5, C.8, C.10, and C.11/12). In addition, SMCWPPP staff co-led the MRP 3.0 C.8 (Water Quality Monitoring) Work Group.

ORGANIZATION OF REPORT

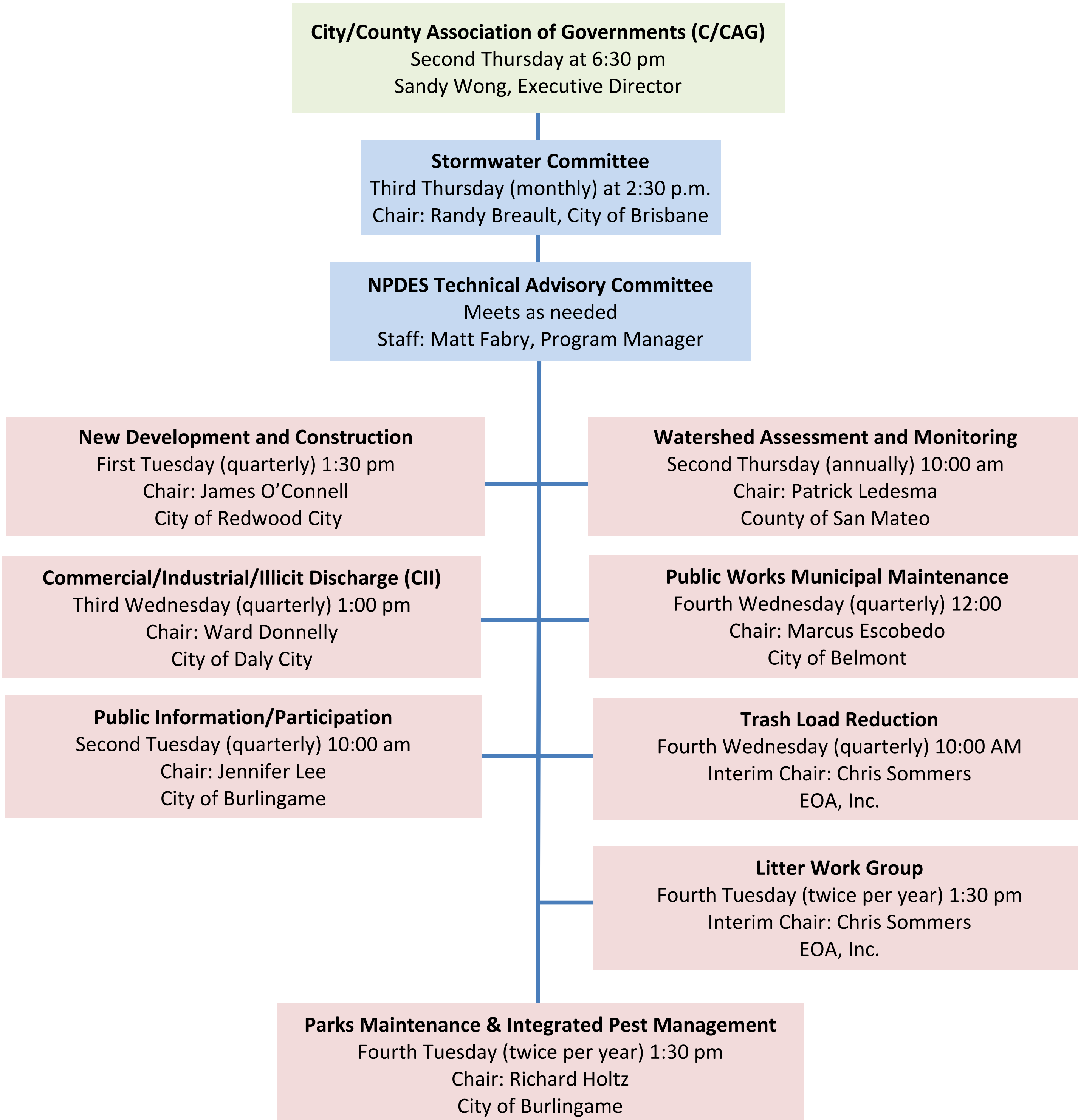
The remainder of this FY 2019/20 Annual Report is structured around the following major provisions of the reissued MRP:

- 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.15. Exempted and Conditionally Exempted Discharges

The following sections of this report summarize how SMCWPPP assisted San Mateo County Permittees with implementing the MRP in FY 2019/20 for each of the above provisions. Each section includes three sub-sections: 1) Introduction, 2) Implementation of MRP Actions, and 3) Future Actions.

Figure 1-1. Organizational Structure and FY 2019/20 Meeting Schedule.



SECTION 2
C.2 MUNICIPAL OPERATIONS

INTRODUCTION

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

Most MRP-required Provision C.2 Municipal Operations tasks are implemented individually by each Permittee in San Mateo County. The Countywide Program 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

SMCWPPP performs a number of tasks to assist San Mateo County Permittees with implementation of Provision C.2, with input and assistance provided by the Public Works Municipal Maintenance Subcommittee. FY 2019/20 accomplishments included the following:

- Held three Public Works Municipal Maintenance Subcommittee meetings; and
- Updated a pesticide tracking template, in coordination with SMCWPPP's Parks Maintenance and IPM Work Group, to assist San Mateo County Permittees comply with pesticide tracking and reporting requirements in MRP Provision C.9.a.

More information on each of these accomplishments is provided below.

Public Works Municipal Maintenance Subcommittee

The Public Works Municipal Maintenance Subcommittee provides the opportunity for sharing 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; and
- Stormwater pump station monitoring and inspections.

Marcus Escobedo from the City of Belmont continued to chair the Subcommittee during FY 2019/20. The Subcommittee generally meets twice during each fiscal year. The second meeting in FY 2018/19 was postponed until July 2019 to allow for a review of the MRP Annual Reporting forms. Therefore, the Subcommittee met three times in FY 2019/20, with good participation by municipal staff, as shown by the attendance list (Appendix 2).

Countywide Program staff also facilitated discussions at meetings about a variety of pertinent topics, including storm drain markers, asset management programs, corporation yard BMPs, activities during COVID-19, proposed revisions to Provision C.2, Municipal Operations, of MRP 3.0, and the SMCWPPP Green Infrastructure Design Guide. At one meeting, municipal staff received a presentation on the Rescape California training program that includes integrated pest management, firescaping, carbon sequestration, maintenance for Green Stormwater Infrastructure and Rescape Rated Landscapes. At another meeting, two of the CASQA municipal maintenance training videos were shown on concrete saw cutting and minor spill and leak cleanup.

Program Materials

Since the first version of the MRP was adopted in 2009, SMCWPPP staff has developed a variety of materials to assist municipal maintenance agency staff with implementing Provision C.2. These materials are all available on the SMCWPPP website (flowstobay.org) and continue to be useful tools that assist agency staff to achieve permit compliance. The materials are described below.

In FY 2009/10, SMCWPPP developed a Stormwater Pollution Prevention Plan (SWPPP) template for use by San Mateo County Permittees 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 also prepared “Sources of Stormwater BMP information for Maintenance Activities Listed in MRP’s Provision C.2,” to assist San Mateo County Permittees 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 were CASQA’s Stormwater BMP Handbook Municipal and Caltrans’ Storm Water Quality Handbook Maintenance Staff Guidance.

During FY 2010/11, SMCWPPP developed the “Stormwater Pump Station Dry Season DO Monitoring and Inspection Form” to assist San Mateo County Permittees in developing a systematic and efficient way to collect DO monitoring and inspection information. The following twelve agencies in San Mateo County operate stormwater 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.

In FY 2015/16, SMCWPPP developed a trash full capture device inspection and cleaning field form template, a Small Full Capture Device O&M Standard Operating Procedure (SOP), a Hydrodynamic Separator O&M SOP, and a Trash Full-Capture Device O&M Verification Program Template and Guidance document. These materials were developed in coordination with the Trash Subcommittee to help municipal staff comply with new requirements in MRP Provision C.10.b.i., Full Trash Capture Systems. These requirements include certifying that trash full capture systems are operated and maintained to meet full trash capture system requirements and keeping associated maintenance records.

In FY 2016/17, SMCWPPP developed a trash full capture device inspection and cleaning data tracking Microsoft Excel template to assist with tracking and reporting requirements in MRP Provision C.10.b.i. Also in FY 2016/17, SMCWPPP developed a template in Excel to assist with pesticide tracking and reporting requirements in MRP Provision C.9.a. The pesticides tracking template utilizes a lookup list of pesticides and active ingredients compiled from data tables available on the Department of Pesticide Regulation (DPR) website. In coordination with the Parks Maintenance and IPM Work Group, the template was updated during FY 2019/20 with the current two years of pesticide product data from the DPR website.

FUTURE ACTIONS

FY 2020/21 activities planned by SMCWPPP to assist San Mateo County Permittees comply with MRP requirements in Provision C.2 include the following:

- Continue holding Public Works Municipal Maintenance Subcommittee meetings;
- Update tracking templates and guidance materials, as needed; and
- Coordinate with SMCWPPP's New Development Subcommittee to provide guidance on GI maintenance and related training materials.

SECTION 3
C.3 NEW DEVELOPMENT AND REDEVELOPMENT

INTRODUCTION

This section describes SMCWPPP's activities to assist municipal agencies in San Mateo County to comply with MRP Provision C.3, New Development and Redevelopment. SMCWPPP continued to provide compliance assistance with MRP Provision C.3 (and Provision C.6 Construction Site Controls – see Section 6) through the New Development Subcommittee (NDS). In FY 2019/20, the Green Infrastructure Committee was merged into the NDS. SMCWPPP also obtained input and direction from agency representatives through the NDS. During FY 2019/20, the NDS was chaired by James O'Connell with the City of Redwood City. The NDS met four times in FY 2019/20 with good participation by municipal staff, as shown by the attendance list (Appendix 3).

In support of the Green Infrastructure (GI) Plan requirement in the MRP and to more broadly plan for precipitation-based climate change impacts to the transportation network in San Mateo County, C/CAG has continued developing the San Mateo Countywide Sustainable Streets Master Plan under the Caltrans Adaptation Planning Grant program. This plan will provide an implementation-level approach to achieving water quality goals in the MRP and other community benefits associated with GI. To further support cost-effective GI implementation, and leveraging a State Budget Grant administered by the California Natural Resources Agency in the amount of $2.94 million, C/CAG is coordinating with the Cities of Redwood City, San Bruno, Belmont, San Mateo County and the Flood and Sea Level Rise Resiliency District to advance designs of multi-benefit regional stormwater capture projects. C/CAG is also engaging consultant support with a portion of these funds in coordination with the County Office of Sustainability to identify new opportunities for regional stormwater capture projects and to develop initial design concepts to support project implementation. Lastly, C/CAG was awarded $97,000 from the Bay Area Council's California Resilience Challenge Grant to develop schoolyard greening concepts for up to six schools in San Carlos to accelerate climate adaptation with respect to managing climate change related precipitation impacts, mitigating urban heat island effects, and promoting sustainable stormwater management at schools, while making campuses safer and more enjoyable learning spaces.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP's accomplishments during FY 2019/20 include the following tasks to assist San Mateo County municipalities with implementation of Provision C.3:

- Held four meetings of the New Development Subcommittee (NDS) to assist municipal agencies in San Mateo County to comply with MRP Provisions C.3 (New Development and Redevelopment) and C.6 (Construction Controls). SMCWPPP's facilitation of the four meetings and related review of work outside of the meetings allowed SMCWPPP to participate in further advancement of key elements included in the Permittee GI Plans, including the adoption of new GI-related policies, review of proposed project opportunities, integration with deliverables in the Countywide Sustainable Streets Master Plan and implementation of C.3 requirements.
- Completed a significant update to the C.3 Regulated Projects Guide (formerly known as the C.3 Stormwater Technical Guidance), part of the SMCWPPP GreenSuite, and minor updates to other SMCWPPP products for consistency with MRP requirements and ease of use by municipal staff.
- Completed an update to the Green Infrastructure Design Guide (GI Design Guide), the other part of the new SMCWPPP GreenSuite, for San Mateo County Permittees. The Green Infrastructure Design Guide includes broad guidance on the design and implementation of various green stormwater infrastructure treatment measures, typical details and standard specifications for numerous GI design options and settings. In FY 2019/20, the GI Design Guide was updated to an interactive PDF document for greater ease of use and functionality, given the size of the document and breadth of resources.
- Conducted two half-day C.3 workshops/webinars entitled "Reviewing C.3 Regulated Projects" and "Implementing Green Street Projects."
- Participated in the BASMAA Development Committee.
- Conducted a variety of GI outreach activities, including rain barrel program promotion, publishing newsletter articles, and social media posts. C/CAG staff also attended classroom presentations and participated in efforts to engage schools via programs led by the San Mateo County Office of Education, including the C/CAG-funded Sustainable Watersheds teacher fellowship program and the Community Based Environmental Literacy Partners Program. C/CAG staff has also supported local and regional implementation of GI, through presenting the Countywide Sustainable Streets Master Plan project at the California Stormwater Quality Association Annual Conference in October 2019 and in regional planning meetings with the Metropolitan Planning Commission on identifying funding nexuses among stormwater and transportation programs. C/CAG staff has also stayed engaged with other regional and statewide efforts, including the Green Infrastructure Leadership Exchange and the Green Streets for Sustainable Communities Symposium. Other outreach on GI included C/CAG staff and consultants participating in a ReScape CA Maintenance Qualification Training on November 14, 2020, which included a session focused on maintaining green stormwater infrastructure and featured the SMCWPPP GI Design Guide. C/CAG also updated its outreach website, flowstobay.org, which includes several pages focused on raising awareness about green infrastructure in San Mateo County.

More information on these accomplishments is provided below.

C.3 Implementation and Outreach Products

With the assistance of the NDS, SMCWPPP developed, updated and/or assisted with the following technical and outreach products:

- Biotreatment Soil Media (BSM) Products – SMCWPPP updated the BSM Supplier List (Appendix 3). The NDS approved the update in January 2020 and the document is posted on the SMCWPPP website (flowstobay.org).
- C.3 Regulated Projects Guide – In 2019, SMCWPPP began updating the guide (formerly known as the C.3 Stormwater Technical Guidance) with new content and graphics, to match the look and feel of the Green Infrastructure Design Guide, for Permittee and design community use. The new guide was completed in January 2020 and incorporated several hundred comments from the NDS. It was finalized and posted on the SMCWPPP website (flowstobay.org) in February 2020.

2020 New Development (C.3) Workshops

In light of restrictions on in-person workshops due the the shelter-in-place order associated with the COVID-19 pandemic, SMCWPPP conducted two half-day on-line only webinars in June of 2020: Part 1 - "Reviewing C.3 Regulated Projects" was conducted on June 3 and Part 2 - "Implementing Green Street Projects" on June 17. The first webinar was attended by 77 people and the second webinar by 58 people. The first webinar started with a "basic training" providing an overview of stormwater control measures and the development-related requirements in the MRP with a focus on C.3 regulated projects. This was followed by an "advanced topics" presentation on hydraulic sizing and other issues related to regulated project review and design. Presentations were also given on reviewing regulated project submittals for compliance with the MRP with a presentation of an example project from Redwood City given by NDS Chair, James O'Connell. The second webinar focused on green streets – including GI types, design, and maintenance. The webinar agendas, attendance lists, and evaluation form summaries are provided in Appendix 3. Based on the evaluation forms submitted, attendees generally found that the webinars were valuable and met their expectations.

Green Infrastructure Planning

During FY 2019/20, SMCWPPP continued to provide GI Plan assistance to San Mateo County municipalities to meet the requirements of the MRP by:

- Providing guidelines and standards, typical details, and specifications approach, organization, and content, via updates to the Green Infrastructure Design Guide and the C.3 Regulated Projects Guide;
- Preparing final drafts of the Phase I and II reports for the Green Infrastructure Reasonable Analysis Assurance (RAA) that document its various modeling inputs, including new and redevelopment land use projections and regional project opportunities;
- Tracking and promoting development of GI-related policies (i.e., sharing and promoting new policies adopted by some jurisdictions to require stormwater treatment control measures on a broader array of projects, beyond what is required in the MRP, and/or requiring green stormwater infrastructure on the public right-of-way in association with development project frontage improvements); and

- Supporting GI implementation through the advancement of the San Mateo Countywide Sustainable Streets Master Plan project.

In FY 2019/20, SMCWPPP also completed an update to the San Mateo Countywide Green Infrastructure Design Guide and finalized the new C.3 Regulated Projects Guide. Both documents (comprising the GreenSuite) were posted to the SMCWPPP website (flowstobay.org) in February 2020 with the redesign of the SMCWPPP website.

Green Infrastructure Outreach

During FY 2019/20, SMCWPPP continued performing a variety of GI-related outreach, including the following efforts:

- Created and promoted the Green Infrastructure, Green Infrastructure Story Map, Green Infrastructure Design Guide, and the Sustainable Streets Master Plan pages on the redesigned SMCWPPP website (flowstobay.org).
- Developed a GI lesson plan for students in grades 9 through 12 in collaboration with the San Mateo County Office of Sustainability and their YESS Program (Youth Exploring Sea Level Rise). This lesson plan helps students understand how green infrastructure can help lessen the impacts of climate change, introduces various types of GI to students, and encourages them to them to explore and design GI solutions for their campus.
- Conducted a hands-on rain barrel installation at Tierra Linda Middle School in San Carlos to support the Eco Club in their sustainable school efforts. The 100-gallon catchment system was installed with the purpose of directly irrigating a newly installed rain garden. Students as well as members of the school and greater community engaged in a step-by-step instruction of a rain barrel installation and drip irrigation system.
- Continued the partnership with the County Office of Education to implement the Clean Water Pathways teacher fellowship program (now called the Sustainable Watersheds Institute), designed to support long-term incorporation of stormwater pollution prevention and GI design solutions into school curricula and programming across age groups (Pre-K through 12) throughout San Mateo County. SMCWPPP supported additional school-age outreach via classroom presentations and project ideation meetings with representatives from school districts, schools and partner agencies. More details on this program and other outreach activities are provided in Section C.7.
- Continued the Countywide Rain Barrel Rebate Program in partnership with the Bay Area Water Supply and Conservation Agency (BAWSCA), including regular social media, newsletter, and community outreach event promotion. The Rain Barrel Rebate Campaign received 5,029 website page views, and 27 applications for 33 rebates were submitted by San Mateo residents. Over 2,000 rain barrels have been installed to-date through this program. More details on this program and other outreach activities are provided in Section C.7 of this report. SMCWPPP also worked with BAWSCA to include expanded rebates for larger volume rain barrel capacity and to incentivize adding rain gardens to residential lawn replacement projects.
- Conducted and promoted three rain barrel workshops for community residents to learn more about rain barrel use, benefits, and installation. One participant from each workshop was awarded a free rain barrel for attending. C/CAG was also selected to present on its rain barrel rebate program at the 2019 Annual CASQA Conference.

- Held three outreach and public education events for Phase 2 of the community engagement for the San Mateo Countywide Sustainable Streets Master Plan that reached approximately 230 residents who learned about Sustainable Streets and were provided with the opportunity to provide their feedback on priorities and preferences. These events were identified as locations to reach a high volume of people, engage with diverse communities, specifically near disadvantaged or vulnerable areas, and target a wide range of locations within San Mateo County.
- Developed and promoted 4 blogs discussing the value of GI which received 663 pageviews. One specifically highlighted a "community" champion who told her story about how her 6,000-gallon cisterns have helped her farm prosper while conserving water.
- Conducted a combination intercept/online survey throughout the County to ask over 1,200 San Mateo County residents about their perceptions of GI. The results revealed that approximately 60% of those surveyed recognized the term "green infrastructure" and show strong support for spending on GI if it costs 0-25% more than traditional infrastructure.
- Developed four e-newsletters with GI-related topics that were distributed to 3,544 people.
- Made 39 social media posts related to GI, reaching 26,174 followers, including the following examples:
    - GI reduces pollution by allowing for natural filtration that removes pollutants like PCBs, mercury, and trash from the water column before these contaminants enter the Bay and ocean. At the same time, GI works above ground to filter air pollutants and particulates. Click here to learn more: bit.ly/TheFutureIsGreenInfrastructure.
    - NYC is adding 5,000 specially designed curbside rain gardens to their green infrastructure plans in an effort to combat ocean pollution and promote water infiltration. Similar work is underway in San Mateo County through our Sustainable Streets Master plan. Learn about your local Green Infrastructure projects here: bit.ly/SMCSustainableStreetsMasterPlan.
    - GI promotes traffic calming, thus increasing bike and pedestrian safety through protected lanes and other planned community designs. Learn more here: bit.ly/WhatIsGreenInfrastructure.
    - GI projects create protected habitat for wildlife in urban areas by increasing the safe, vegetative areas available to animals. Click here to learn more about the numerous benefits of GI: bit.ly/TheFutureIsGreenInfrastructure.
    - Looking for a low-cost project that's simple and will save you money? Look no further! We talk through the benefits of ownership and demystify the San Mateo County rain barrel rebate in our blog. Click here: bit.ly/smc-rb-rebate.
    - "If we want to protect our cities from flooding, reduce Bay pollution, and improve our resilience to climate change, we need to change the way we manage stormwater." Learn more about GI on @Save the Bay's recent blog!

- Great news for supporters of GI! In a new case study published in the Journal of Water Resources Planning and Management, researchers examined two distinct watersheds and demonstrated that even small decentralized stormwater management practices like rain gardens can make a big cumulative difference to the resiliency of a watershed. Read more here: http://bit.ly/2KxGl8N.

San Mateo Countywide Stormwater Resource Plan

In 2017 SMCWPPP completed the Countywide Stormwater Resource Plan (SRP) to support San Mateo County MRP Permittees in developing GI Plans and achieving San Francisco Bay mercury and PCBs TMDL implementation requirements. It also serves an essential role in pursuing funding needs and opportunities (e.g., Proposition 1 grants) for project implementation. The SRP identified and prioritized LID retrofit, green streets, and regional stormwater capture project opportunities, and the resulting prioritized list of potential projects included conceptual designs for four LID retrofit projects, three regional projects, and 15 green streets. These concepts include maps of the proposed projects and associated drainage areas, information to support future designs, modeled estimates of stormwater capture volumes and mercury and PCBs loads reduced, and cost estimates. The SRP and associated products (including a web-based map viewer) are now included on a dedicated page on the redesigned SMCWPPP website (flowstobay.org).

The SRP also provided the modeling foundation for the GI portion of the RAA for local GI Plans, as detailed in Section C.11 and Appendix 11 of this report and also supported the project opportunity and prioritization process laid out in the San Mateo Countywide Sustainable Streets Master Plan.

The following sections provide an update of early GI implementation and “no missed opportunity” efforts stemming from the SRP concepts and related prioritization efforts. C/CAG’s recently awarded $3 million State General Fund Grant for regional project designs and additional project opportunity identification will advance designs on multiple regional stormwater capture projects, including the projects described below.

Atherton

Atherton continued pursuing a new regional stormwater capture facility to help reduce existing flooding issues in the lower reaches of Atherton Creek and reduce pollutant loads. The Town hired a consultant that developed a preliminary project design in early 2018. The project was presented at the Town’s Park and Recreation Committee and Town Council multiple times. The project received significant public opposition with respect to siting the project in the Town’s only park (Holbrook-Palmer Park). As a result, the Council directed Town staff to evaluate other potential project locations at which a facility could be sited and still take advantage of the $13.6 million funding commitment for the project from Caltrans. The project team proposed relocating to Cartan Field at Menlo College in Atherton, but after advancing through the permitting and CEQA process, the project has since stalled as a result of a shift in priorities and resources at Menlo College following the COVID-19 pandemic. Local agency staff are continuing efforts to maintain the Caltrans funding for alternative projects in Atherton / San Mateo County.

Redwood City

Redwood City advanced through construction two green street projects that received funding via Round 1 of Proposition 1 stormwater implementation grants administered by the State Water Resources Control Board: Middlefield Road Streetscape and Kennedy Middle School Safe Routes to School. These green streets were originally included as a project concept in the Stormwater Resource Plan to ensure San Mateo County MRP Permittees would be eligible to compete for this type of funding. SMCWPPP also prepared the successful grant proposal for the City. SMCWPPP also further advanced a concept for regional stormwater retention facilities beneath playing fields at the City's Red Morton Park that would potentially manage runoff from up to 1,650 acres. The concept was presented to the City's Utilities Subcommittee and City Council as part of its GI Plan adoption, and C/CAG has since coordinated with the County Office of Sustainability to advance preliminary design of the project via funds awarded from the EPA San Francisco Bay Water Quality Improvement Fund to the County. C/CAG, the County Office of Sustainability, and the Cities of Redwood City and San Bruno released a Request for Proposals in May 2020 for advancing designs through CEQA documentation for the project in Redwood City, as well as for a project location at an the I-280/380 interchange in San Bruno (as described below).

San Bruno/Caltrans

SMCWPPP developed another concept for a regional retention facility on Caltrans property between the I-280 and I-380 interchange. The project concept was responsive to an identified need for upstream retention in San Bruno's Storm Drain Master Plan to alleviate downstream flooding. The project concept was submitted to Caltrans for consideration for funding given that approximately 40 acres of Caltrans rights-of-way are in the project drainage area. The concept is currently on a list for Caltrans consideration for future funding, but it is anticipated to be a low priority project for Caltrans due to low overall benefit relative to Caltrans interests (primarily trash load reduction and then TMDL pollutant load reductions). Because there is also upstream drainage area within unincorporated San Mateo County and the City of San Bruno, C/CAG, the County Office of Sustainability, and the City of San Bruno have coordinated to leverage the State General Fund Grant referred to above, as well as the County's EPA funds, to advance project designs through CEQA documentation in the same joint effort described above for the Redwood City project.

City of San Mateo

The City of San Mateo built Green Street projects at 4th Avenue and Fremont (with a stormwater curb extension), 5th Avenue and Delaware (stormwater curb extension and sidewalk planter), and 9th Avenue and Delaware (stormwater curb extensions) as part of the San Francisco Estuary Partnership / BASMAA Urban Greening Bay Area grant from EPA through its San Francisco Bay Water Quality Improvement Fund.

City of South San Francisco

The City of South San Francisco continues to pursue a regional retention facility at Orange Memorial Park with $9.5 million in funding from Caltrans in an initial Cooperative Implementation Agreement and an additional $6 million also from Caltrans to support their trash reduction goals. The City has completed the design and permitting phase for a stormwater capture facility that will remove sediment, clean water flowing from Colma Creek into San Francisco Bay, and potentially provide for parkland irrigation at Orange Memorial Park. This regional stormwater capture project would potentially capture flows from a large multi-jurisdictional area of primarily old urban land uses. The City anticipates starting construction in FY 2020/21.

City of Belmont and San Mateo County Flood and Sea Level Rise Resiliency District

SMCWPPP also developed a project concept for a small regional stormwater capture project at Twin Pines Park in Belmont as part of the SRP. The original project concept proposed approximately 0.5 acre-feet of storage capacity, draining about 30 acre-feet of upstream watershed area in Belmont, San Carlos and County unincorporated areas. In FY 2019/20, the County's Flood Resilience Program developed a Watershed Management Plan for Belmont Creek that included a revised project concept-level assessment and proposed a larger stormwater capture facility. The new proposed project described in the Belmont Creek Watershed Management Plan is a much larger detention facility, with a capacity of approximately 21 acre-feet. The Flood Resilience Program successfully obtained grant funds from the California Department of Water Resources to restore part of Belmont Creek and manage erosion issues upstream of Twin Pines Park. C/CAG has coordinated with the City of Belmont and the new San Mateo County Flood and Sea Level Rise Resiliency District (see Section 1 of this report) to leverage a portion of the State General Fund Grant referenced above along with the restoration grant to advance planning and design for the creek restoration project in coordination with the regional stormwater capture project at Twin Pines Park. The District and the Cities of Belmont and San Carlos will be leading a separate procurement process in FY 2020/21 for this coordinated effort on Belmont Creek.

Safe Routes to School/Green Streets Infrastructure Pilot Program

C/CAG awarded $2.1 million in December 2017 for 10 Safe Routes to School / Green Streets Infrastructure Pilot Projects funded by local Safe Routes to School and stormwater funding, all from vehicle registration fees imposed by C/CAG on registered vehicles in San Mateo County. Grants were awarded to the following jurisdictions:

- City of Brisbane
- Town of Colma
- City of Daly City
- City of East Palo Alto
- City of Half Moon Bay
- City of Menlo Park
- City of Millbrae (Figure 3-1)
- City of Pacifica
- City of Redwood City
- County of San Mateo

Figure 3-1. Completed Taylor Middle School Pilot Project, Millbrae

To date, projects have been completed in Half Moon Bay, Daly City, Millbrae, San Mateo County, Menlo Park and Pacifica (still needs to be planted, but substantially complete). Two additional projects (Brisbane, and Redwood City) will be completed in FY 2020/21, and two projects (Colma and East Palo Alto) will be constructed in early FY 2021/22. These and other green infrastructure projects can be viewed in more detail in the Program's Green Infrastructure Story Map.

Collectively these projects demonstrate commitment by SMCWPPP and San Mateo County MRP Permittees to pursue early implementation opportunities during the term of MRP 2.0. These projects will augment groundwater recharge, remove pollutants, and reduce the volume and velocity of stormwater runoff entering the storm drainage system and discharging into local creeks. They demonstrated proactive implementation of GI while these cities completed their GI Plans (which were submitted September 2019) as required by MRP 2.0.

Calm Before the Storm: San Mateo Countywide Sustainable Streets Master Plan

In May 2019, C/CAG was awarded a Caltrans Adaptation Planning Grant for $986,300 (with $145,185 in matching funds) to develop the San Mateo Countywide Sustainable Streets Master Plan. Now in its second (and final) year, this project is aimed at supporting GI Plan implementation with a variety of deliverables, including a refined drainage area analysis of San Mateo County watersheds at the catch-basin scale; a revised opportunity identification and prioritization analysis (which includes new ranking criteria related to opportunity engineering feasibility and new multi-benefit criteria related to climate change adaptation with respect to urban heat islands, vegetation gaps, and increased flow/volume management), as well as providing key linkages to transportation network project investments and planning timelines; an evaluation of future climate change related precipitation impacts on roadway runoff; and an interactive web-based mapping and tracking tool designed to support GI project implementation and tracking towards water quality and volume management goals. The San Mateo Countywide Sustainable Streets Master Plan will further support GI implementation via additional project concepts and typical details and the development of model Sustainable Streets policies to compliment local Complete Streets policies and expand local regulations and requirements for new and redevelopment projects to install and maintain green stormwater infrastructure in the public right-of-way via frontage improvements.

The overall goals and elements of the San Mateo Countywide Sustainable Streets Master Plan are:

- High resolution drainage mapping of street segments draining to individual catch-basins;
- Downscaled climate change analysis of precipitation-based climate change impacts to the transportation network and associated water quality and flood reduction benefits of GI;
- Countywide Master Plan with prioritized street segments and project opportunities associated with Sustainable Streets typologies and linked to funding mechanisms and implementation timelines;
- Model Sustainable Streets policies;
- Project concepts and typical design details;
- Updated web-based project mapping and tracking tool; and,
- Community engagement and consideration of disproportionate impacts to vulnerable communities.

Sustainable Streets combine Complete Streets that accommodate all modes and users’ safety and Green Streets that incorporate GI to manage stormwater. As climate change impacts local infrastructure, it will be increasingly important to focus on disadvantaged and vulnerable communities – flooding can have a disproportionate impact on those dependent upon walking, biking, or transit. The proposed project will take a multi-benefit approach to prioritizing Sustainable Streets opportunities throughout San Mateo County that includes evaluation of community-specific needs for safer, more sustainable streets.

The San Mateo Countywide Sustainable Streets Master Plan builds on existing efforts via the countywide modeling for the RAA and the SRP project prioritization, but its intent is to create a tangible and practical set of tools to further GI implementation and to address major obstacles, especially funding limitations. The San Mateo Countywide Sustainable Streets Master Plan also incorporates further refinements to the prioritization framework in the SRP to include more community priorities (various infrastructure improvements, pavement maintenance planning, community vulnerability to climate change, and climate resiliency).

The project team has convened multiple Stakeholder Advisory Committee meetings to provide a forum for input from transportation agencies and bike/pedestrian advocacy groups and continues to engage the public through a phased engagement strategy, now being done virtually via development of a project-specific website. The project team and C/CAG staff plan to present on several project deliverables at the California Stormwater Quality Association Annual Conference in September 2020, including a 2-hour workshop designed to walk participants through the entirety of developing a sustainable streets master plan. Other planned work includes finalizing the internal and public-facing components of the GI mapping and tracking tool, which also involves updating the process and forms that San Mateo County Permittees use for collecting data on C.3 regulated and voluntary GI projects. The project is due to be completed by the end of February 2021, with the rollout of the final Sustainable Streets Master Plan via a virtual workshop at the end of the calendar year.

Tracking and Reporting Progress on Green Infrastructure

During FY 2019/20, SMCWPPP continued to make progress towards development and implementation of methods to track and report implementation of GI in San Mateo County and track associated pollutant load reductions. The ongoing effort to update the associated GI inventory is described in Section 11 (Mercury Controls) of this report.

As mentioned above, C/CAG is leveraging funding through the San Mateo Countywide Sustainable Streets Master Plan project to create an updated San Mateo County GI tracking tool. The project will support local GI Plans by providing enhanced detail on green street priorities, higher-resolution drainage mapping, and an updated tracking tool consistent with the requirements in MRP Provision C.3.j.

Regional Collaboration

As in past years, throughout FY 2019/20 SMCWPPP participated in BASMAA's Development Committee (DC). Through the BASMAA DC, SMCWPPP participated in regional projects that assist SMCWPPP and its San Mateo County municipalities in meeting specific requirements of Provision C.3, as described below.

Biotreatment Soil Media (BSM) Specifications

In FY 2019/20, SMCWPPP continued to support municipal staff, consultants and suppliers who have questions on the review and use of BSM. SMCWPPP staff screened and worked with vendors that are supplying the BSM product in the Bay Area and wish to be added to the vendor list that is posted on the SMCWPPP website (flowstobay.org). The vendors must demonstrate an understanding of the BASMAA specification, submit lab results and a sample of their BSM product, and use consistent terminology on their websites advertising the product. See the basmaa.org/Announcements/basmaa-revisions-to-mrp-biotreatment-soil-mix-bsm-spec and flowstobay.org/newdevelopment for more details.

Biotreatment Soil Media Specifications and Bioretention Design with Trees

As a result of the Biotreatment Soil Roundtable held on June 30, 2016, a regional work group was formed to discuss designs that incorporate trees into bioretention areas. SMCWPPP staff took the lead on facilitating this Trees and BSM Design Work Group. In FY 2019/20, the Trees and BSM Design Work Group met and continued to compile information on various design issues with trees in bioretention areas. Members of the work group include several arborists, GI consultants, and municipal staff from parks departments and stormwater programs. City of Fremont staff provided design and maintenance information on their tree well filter systems. Information related to the integration of trees and stormwater treatment has been added to the C.3 Regulated Projects Guide. In FY 2020/21, the Work Group will continue to meet and review examples of tree-specific treatment measure designs, discuss soil and maintenance issues, and develop recommendations for design and maintenance of stormwater tree systems using the BASMAA GI Alternative Sizing guidance.

Participation in Processes to Promote Green Infrastructure

Provision C.3.j.iii requires that Permittees individually or collectively, track processes, assemble and submit information, and provide informational materials and presentations as needed to assist relevant regional, State, and federal agencies to plan, design, and fund incorporation of GI measures into local infrastructure projects, including transportation projects. SMCWPPP is tracking and participating in the BASMAA activities to assist Permittees comply with this provision.

To support San Mateo County Permittees in complying with the requirements of MRP Provision C.3.j.iii (Participate in Processes to Promote GI), the Countywide Program participated through BASMAA in the Urban Greening Bay Area Project's activities to implement the 2018 Roadmap of Funding Solutions for Sustainable Streets, which identifies specific actions to improve the funding of projects that include both complete streets improvements and GI. The work during the reporting period included continuing coordination with transportation agencies – including the Metropolitan Transportation Commission (MTC), the California Department of Transportation (Caltrans), the California Transportation Commission (CTC), and the Federal Highway Administration (FHWA) – to clarify GI eligibility in federal, regional, and state transportation grant programs (Roadmap Specific Actions 1-1, 1-2, and 1-3). In November 2019, BASMAA transmitted a memorandum to the above-listed regional and state agencies, documenting the eligibility of GI in applicable regional, state and federal transportation funding programs and requesting the agencies' participation in developing fact sheets that clarify eligibility for sustainable streets in two federal transportation funding programs – the Surface Transportation Block Grant Program (STP) and the Congestion Mitigation and Air Quality Improvement Program (CMAQ) – as well as the California Senate Bill 1 (SB 1) Road Maintenance and Rehabilitation Program.

On February 4, 2020, BASMAA representatives met with staff from MTC and Caltrans District 4 (the Caltrans District for the nine-county Bay Area), to develop an approach for a regional fact sheet that focuses on the eligibility of GI in projects funded by the STP and CMAQ through the One Bay Area Grant (OBAG) program administered by MTC. The draft regional fact sheet was reviewed by MTC staff and is scheduled to be finalized by September 2020.

BASMAA held a conference call with CTC staff on February 10, 2020, to develop an approach for a statewide fact sheet that focuses on the eligibility of GI in projects funded by Senate Bill 1. CTC staff provided comments on the draft statewide fact sheet but deferred further action pending documentation that there is interest in this topic beyond the San Francisco Bay Area. BASMAA drafted an online survey for distribution to stormwater programs within California. Before the fact sheet was distributed, BASMAA worked with the U.S. Environmental Protection Agency (USEPA) staff liaison to the Federal Highway Administration (FHWA) to have FHWA staff review BASMAA's November 2019 research memorandum. Similar to the CTC, FHWA questioned whether this issue is of interest beyond the San Francisco Bay Area and California. BASMAA is updating the draft online survey for national distribution through the Green Infrastructure Leadership Exchange. The SB 1 fact sheet is scheduled to be finalized by December 2020.

SMCWPPP's Program Manager was also on the planning committee and a participant in ReNUWIt's (Renewing our Nation's Urban Water Infrastructure) two-day July 2019 stormwater workshop among stormwater, flood, water supply, regulatory, and environmental organizations to talk about how stormwater could be better utilized as a water supply resource. The Program Manager also participated in a follow-up one-hour webinar on July 6, 2020.

The Program Manager participates in the Green Infrastructure Leadership Exchange, a national network of municipal/district/agency green infrastructure representatives, including attending the annual meeting (virtual this year, in May 2020), and actively participating in the Funding/Financing, GIS/Prioritization, and Climate Change workgroups.

The Program Manager is also participating in a Green Infrastructure Funding Academy hosted by American Rivers, Corona Environmental, and the Water Now Alliance, focused on developing GI credit trading marketplaces and approaches for debt-financing distributed GI. This is complementary to the Program Manager's role on the Advisory Committee for the EPA grant-funded Regional Compliance for a Sustainable Bay project being implemented in Contra Costa County.

FUTURE ACTIONS

In FY 2020/21, SMCWPPP plans to continue working with the NDS to conduct the following activities to assist San Mateo County municipalities to comply with MRP Provision C.3:

- Continue to exchange information with San Mateo County municipalities on MRP implementation and other timely issues through quarterly NDS meetings and the annual C.3 workshop.
- Revise checklists and outreach flyers as needed to respond to San Mateo County municipal staff issues, concerns, and suggestions for improvement.
- Support San Mateo County municipalities with GI Plan implementation.
- Conduct GI outreach and education with the public, municipal staff, and elected officials, including presentations to city councils and other relevant groups on the final Sustainable Streets Master Plan and further raising awareness about GI through the redesigned SMCWPPP website.
- Continue to coordinate with other related SMCWPPP subcommittees as needed (e.g., Litter Workgroup and deployment of the Litter Reduction Toolkit for Multi-Family Dwellings, Public Information and Participation Subcommittee to engage on GI outreach).
- Finalize process for tracking and mapping completed GI projects, through the tool developed as part of the San Mateo Countywide Sustainable Streets Plan effort.

- Continue to collaborate with BASMAA and Bay Area countywide stormwater programs on GI implementation and guidance, update the BSM specifications and BSM suppliers list, and develop designs for biotreatment areas with trees. To the extent possible, work with biotreatment mulch suppliers to develop better specifications for that product.
- Continue working with BASMAA on issues related to MRP implementation, particularly the GI requirements and related provisions.
- Plan and conduct a C.3 workshop for municipal staff (tentatively scheduled for June of 2021), building on the trainings conducted in previous years. Topics may include implementation of GI Plans, using SMCWPPP resources such as the GreenSuite, and example reviews of development project plans.
- Continue efforts to work with San Mateo County municipalities, schools, and the San Mateo County Office of Sustainability, to pursue funding for and facilitate implementation of cost-effective GI, including regional multi-jurisdiction and multi-benefit stormwater capture and treatment projects. This will include continuing to advance regional multi-benefit project designs in San Bruno, Belmont and Redwood City and additional project opportunities analyses/project concept designs through the $2.94 million in state grant funds issued to C/CAG by the California Natural Resources Agency. C/CAG will also be conducting a procurement process in FY 20/21 to develop schoolyard greening concept plans for up to six schools in the San Carlos School District.
- Continue developing an implementation-level approach to achieving water quality goals and other community benefits associated with GI, via final deliverables from the San Mateo Countywide Sustainable Streets Master Plan (funded by a Caltrans Adaptation Planning Grant issued to C/CAG).
- Support completion of the remaining four (of 10 total) integrated Safe Routes to School and Green Streets Infrastructure Projects, funded by C/CAG's local vehicle registration fee.
- Roll-out a pilot program to provide additional incentives for residential rain garden installations as part of the Lawn Be Gone! rebate in partnership with the Bay Area Water Supply and Conservation Agency.
- Where feasible, continue coordinating regional scale, multi-benefit stormwater capture efforts to support GI implementation and seek new project funding through the newly established Flood and Sea Level Rise Resiliency Agency (FSLRRD) (resilientsanmateo.org). C/CAG has set aside a portion of the State General Fund Grant ($2.94 million) to advance regional collaboration on sustainable stormwater management in San Mateo County, which will be supportive of building a business case for broader collaboration and potentially cost-sharing or credit trading for water quality and resiliency goals. See Section 1 for additional details.

SECTION 4
C.4 INDUSTRIAL AND COMMERCIAL SITE CONTROLS

INTRODUCTION

A primary goal of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component is to assist San Mateo County Permittees in controlling the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable. San Mateo County Permittees are responsible for complying with various commercial and industrial business facility inspection requirements under MRP Provision C.4. SMCWPPP's CII component assists San Mateo County Permittee staff with understanding these MRP requirements and develops various related tools, templates, reporting forms, and other MRP compliance support materials. The CII component also assists San Mateo County Permittees to comply with other MRP provisions that are discussed in other sections of this report (Sections 5, Illicit Discharge Detection and Elimination and Section 13, Copper Controls).

SMCWPPP’s assistance with MRP Provision C.4 and other CII component provisions is coordinated through the CII Subcommittee.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP performs a variety of tasks to assist San Mateo County Permittees with implementation of MRP Provision C.4, with input and assistance provided by the CII Subcommittee. FY 2019/20 accomplishments included the following:

- Held four CII Subcommittee meetings;
- Developed a Vehicle Service BMP fact sheet;
- Translated the Vehicle Service BMP fact sheet and Food Service Facility BMP fact sheet into Spanish and Chinese; and
- Updated the business stormwater inspector contact list on the SMCWPPP website.

More information on each of these accomplishments is provided below.

CII Subcommittee

The CII Subcommittee provides the opportunity for sharing information about MRP requirements related to commercial/industrial facility inspections and methods for achieving compliance. The Subcommittee met four times during FY 2019/20 with good participation by municipal staff, as shown by the attendance list (Appendix 4). Ward Donnelly from the City of Daly City continued to chair the CII Subcommittee during FY 2019/20.

The meetings provided the opportunity for municipal staff to share their experiences with implementing MRP provisions related to the CII component, including Provision C.4. During FY 2019/20 meetings, SMCWPPP staff focused on facilitating discussions about developing business inspection lists, potable water discharges, illicit discharges, inspection fees, SB205, inspection activities during the COVID-19 pandemic, and proposed revisions to Provision C.4, Industrial and Commercial Site Controls, of MRP 3.0.

Program Materials

In FY 2017/18 Countywide Program staff updated the SMCWPPP Stormwater Inspection Form Template and developed a Stormwater Inspection Tracking Excel Template for cities to track their stormwater inspection data, if needed.

In FY 2019/20, Countywide Program staff continued to update or develop outreach materials identified by the Subcommittee. A Vehicle Service BMP fact sheet was developed. The Vehicle Service BMP fact sheet and Restaurant BMP fact sheet were translated into Spanish and Chinese. These outreach materials are available on the SMCWPPP website (flowstobay.org) and are included in Appendix 4.

CII Training Workshop

The Countywide Program postponed the inspector training workshop this fiscal year, which was scheduled for April 2020, due to the COVID-19 shelter-in-place orders.

FUTURE ACTIONS

FY 2020/21 activities planned by SMCWPPP to assist San Mateo County Permittees comply with MRP requirements in Provision C.4 include the following:

- Continue holding quarterly CII Subcommittee meetings;
- Continue to update existing or develop new business outreach materials as needed;
- Hold an inspector training workshop; and
- Assist San Mateo County Permittees with the implementation of commercial and industrial stormwater inspection tasks, including continuing to assist with Business Inspection Plans (BIPs) and associated prioritizing of inspections, data management, and Enforcement Response Plans (ERPs).

SECTION 5
C.5 ILLICIT DISCHARGE DETECTION AND ELIMINATION

INTRODUCTION

A primary goal of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component is to assist San Mateo County Permittees to effectively prohibit the discharge of illicit, non-stormwater discharges to the municipal storm drain system. San Mateo County Permittees are responsible for controlling non-stormwater discharges prohibited by MRP Provision C.5. SMCWPPP's CII component assists San Mateo County Permittee staff with understanding these MRP requirements and develops various related tools, templates, reporting forms, and other MRP compliance support materials. SMCWPPP's CII component also assists Permittees to comply with other MRP provisions that are discussed in other sections of this report (see Sections 4, Industrial and Commercial Site Controls, and 13, Copper Controls).

SMCWPPP’s CII component is coordinated through the CII Subcommittee. See Section 4 for further details about the CII Subcommittee.

IMPLEMENTATION OF MRP PROVISIONS

During FY 2019/20, SMCWPPP performed a number of tasks to assist San Mateo County Permittees with implementation of MRP Provision C.5, with input and assistance provided by the CII Subcommittee. Accomplishments included the following:

- Updated the inventory of mobile cleaner businesses in San Mateo County;
- Updated the table of stormwater enforcement actions against mobile businesses to share countywide with stormwater inspectors;
- Updated the Illicit Discharge Responder/Storm Drain Cleaning Contract List;
- Translated the mobile cleaner businesses BMP fact sheet into Spanish and Chinese; and
- Conducted public outreach via the SMCWPPP website (flowstobay.org) to inform consumers about hiring mobile businesses that implement best practices for preventing non-stormwater discharges to storm drains;
- Updated the Illicit Discharge contact list on the SMCWPPP website.

More information on these accomplishments is provided below.

Countywide Program Materials

SMCWPPP has developed a variety of materials to assist municipal agency staff with implementing Provision C.5. These materials are all available on the SMCWPPP website (flowstobay.org) and continue to be useful tools that assist agency staff to achieve permit compliance. The materials include an Illicit Discharge Investigation Field Form template, an Illicit Discharge Tracking Excel Template, and outreach items.

Also available on the password protected section of the SMCWPPP website is the countywide inventory of mobile businesses operating in San Mateo County. The mobile businesses identified in the inventory fall into the following categories: carpet cleaners, auto washers, steam cleaners, power washers, and pet care providers. The county inventory of mobile businesses is also periodically updated. Beginning in FY 2013/14, the CII Subcommittee surveyed San Mateo County agencies and compiled information on mobile businesses that were subject to stormwater enforcement actions during that fiscal year. This information was compiled in a table and made available on the password protected section of the SMCWPPP website. The table is periodically updated with additional enforcement action information, including an update that was conducted during FY 2019/20.

In FY 2018/19, the Mobile Business BMPs brochure was updated to a new fact sheet format. In FY 2019/20 the Mobile Business BMPs fact sheet was translated into Spanish and Chinese. SMCWPPP also conducted public outreach to inform consumers about hiring mobile businesses that implement best practices for preventing non-stormwater discharges to storm drains by making these materials available on the SMCWPPP website (flowstobay.org). The materials are also included in Appendix 5.

In addition, 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). See the following BASMAA report for more information: *Annual Reporting for FY 2019-2020, Regional Supplement for Training and Outreach* (Appendix 13). San Mateo County Permittees have continued to refer cleaners to BASMAA's website for surface cleaning training materials.

FUTURE ACTIONS

During FY 2020/21, SMCWPPP will assist San Mateo County Permittees comply with the requirements in MRP Provision C.5 by continuing to:

- Hold CII Subcommittee meetings;
- Assist with the implementation of illicit discharge detection and elimination tasks, including updating existing or developing new outreach materials as needed, Enforcement Response Plans (ERPs), and complaint tracking and follow-up; and
- Assist Permittees comply with the requirements for controlling mobile sources in MRP Provision C.5.e., including providing updated information on mobile business BMPs as needed, sharing enforcement information, periodically updating the regional enforcement inventory, and conducting outreach activities.

SECTION 6
C.6 CONSTRUCTION SITE CONTROL

INTRODUCTION

This component of SMCWPPP assists San Mateo County municipalities in complying with MRP Provision C.6 (Construction Site Control). This assistance continued to be provided through the New Development Subcommittee (NDS, see Section 3 for more details). SMCWPPP staff also obtained input and direction from municipal agency representatives through the NDS when planning the trainings and other compliance assistance activities described below.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP's accomplishments during FY 2019/20 include the following tasks to assist San Mateo County municipalities with implementation of MRP Provision C.6:

- Conducted a construction site controls training for the California Building Inspectors Group (CALBIG) on November 13, 2019; and
- Printed 2,000 copies of the Construction Site Inspection Form and distributed them to the Subcommittee members;

CALBIG Training Meeting

In FY 2019/20, SMCWPPP continued its partnership with CALBIG, a group in which many building inspectors from San Mateo County municipalities participate. At the group's November 13, 2019 meeting, SMCWPPP staff gave a presentation covering an overview of the MRP and Provisions C.3 and C.6, current stormwater requirements for construction sites, proper implementation of construction BMPs, Provision C.13.a (architectural copper), tips for keeping construction inspection programs in compliance, and the new program to manage PCBs during building demolition. Approximately 33 people attended the training, including agency inspectors, local stormwater program staff, and contractors. The meeting announcement, agenda, and attendance list are provided in Appendix 6.

Construction Site Inspection Form

In August 2019, SMCWPPP staff printed and distributed 2,000 copies in triplicate form of the SMCWPPP Construction Site Inspection Report to San Mateo County municipalities.

2020 Construction Site Inspector Workshop

The 2020 Construction Site Inspector Workshop scheduled for April 2020 was canceled due to the COVID-19 pandemic. The associated shelter-in-place order precluded conducting an in-person training with the field component that Permittee staff found to be very informative in previous years. A workshop is planned for FY 2020/21.

FUTURE ACTIONS

In FY 2020/21, SMCWPPP staff plans to work with the NDS to conduct the following activities to assist San Mateo County municipalities comply with MRP Provision C.6:

- Continue to share information about construction site controls among San Mateo County municipalities through quarterly NDS meetings;
- Plan and conduct a Construction Site Inspector Workshop focusing on field trainings, BMP inspections, Enforcement Response Plans and/or other topics of interest to the NDS; and
- Continue to coordinate with partner organizations, such as CALBIG, to provide additional training on construction-related stormwater issues.

SECTION 7
C.7 PUBLIC INFORMATION AND PARTICIPATION

INTRODUCTION

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

- Educate the public about the causes of stormwater pollution and its adverse effects on water quality in local creeks, lagoons, shorelines, and neighborhoods;
- Encourage residents to adopt less polluting and more environmentally beneficial practices; and
- Increase residents' participation and involvement in SMCWPPP activities.

PIP is essential for controlling and reducing the source of pollution since many preventable pollutants are associated with everyday residential activity. Stormwater pollution may be reduced when residents are educated and motivated by the benefits of reducing pollutants. This approach of education and motivation is cost-effective and efficient in meeting the goal of reducing pollutants in stormwater to the maximum extent practicable.

Summary of Accomplishments in FY 2019/20

The SMCWPPP PIP Subcommittee oversees the development of outreach and educational materials and guides the implementation of the PIP component of the program. The Subcommittee met two times in FY 2019/20 with good participation by municipal staff, as shown by the attendance list, included in Appendix 7.

SMCWPPP's PIP accomplishments during FY 2019/20 include the following:

- Partnered with the Bay Area Water Conservation Supply Agency (BAWSCA) on a Rain Barrel outreach campaign that received 474 website page views. Received 27 rebate applications from residents for a total of 33 rain barrel installations and distributed rain barrel rebate fliers at outreach events. Over 2,000 rain barrels have been installed to-date in San Mateo County under the rebate program.
- Promoted the Sustainable Streets Master Plan by conducting public outreach to educate the public about the project, convey technical issues in a clear manner, continue collecting feedback on priorities and preferences, and publicize upcoming public participation opportunities, reaching 231 residents in multiethnic communities.
- Conducted a countywide stormwater and green infrastructure community survey that recorded the opinions and findings of 1,214 San Mateo County residents.

- Promoted the San Mateo County Environmental Health Services (EHS) campaign to reduce littering of cigarette butts, as well as the San Mateo County Reusable Bag Ordinance Emergency Regulation and HHW Collection Program.
- Promoted Coastal Cleanup Day for 5,245 volunteers, raising awareness of the event and the consequences of littering behaviors.
- Promoted Caltrans educational materials regarding uncovered loads in English and Spanish.
- Gained 8,054 new Facebook fans and a total page reach of 121,789 with stormwater pollution prevention Facebook messaging.
- Sent 12 newsletters to a list of 3,515 active, opt-in subscribers with topics covering eco-friendly gardening practices, local cleanup events and stormwater pollution prevention information and tips.
- Received 24,357 visitors to the SMCWPPP website, which focuses on stormwater pollution prevention messaging and resources.
- Participated in 13 public outreach events in San Mateo County to speak one-on-one with residents and hand out collateral materials.
- Participated in a new, countywide stormwater-focused teacher fellowship program in coordination with the County Office of Education and also supported countywide school outreach efforts by creating a green infrastructure lesson plan and conducting in-class presentations.
- Performed point-of-purchase outreach with Our Water Our World materials to 10 hardware stores in San Mateo County while conducting in-store tabling events to engage residents on eco-friendly alternatives to pesticides.
- Promoted outreach messaging to residents regarding eco-friendly alternatives to pesticides in SMCWPPP's newsletter, website and social media channels.

IMPLEMENTATION OF MRP PROVISION C.7

C.7.b. Outreach Campaigns

(1) Rain Barrel Outreach Campaign Description

As a result of the California drought and in an attempt to pursue alternative approaches to public engagement, SMCWPPP partnered with the Bay Area Water Supply Conservation Agency (BAWSCA) in 2014 to implement a pilot countywide rain barrel rebate program. During FY 2019/20, SMCWPPP continued its partnership with BAWSCA to promote the program, which subsidizes the cost of purchasing a rain barrel by providing rebates up to $100. The program objectives include: 1) educate residents about the benefits of rain barrels to water conservation and water quality efforts, 2) promote green infrastructure tools for keeping local waters clean, and 3) encourage residents to participate in the Rain Barrel Rebate Program. Over 1,080 rain barrels have been installed to-date in San Mateo County under the rebate program.

Prior to this partnership, the only agency in San Mateo County offering rain barrel rebates was the City of Millbrae. C/CAG previously provided BAWSCA with an additional $25,000 to subsidize the rebates for San Mateo County residents, which, like BAWSCA's other water conservation programs, is a subscription-based program in which BAWSCA's member agencies (water supply agencies that receive water from the San Francisco Public Utilities Commission) can choose to participate. Those funds were still being used in FY 2019/20 to supplement countywide residential rebates. The program provides rebates for up to two rain barrels for single-family residential and four for multi-family/commercial properties. C/CAG's funding provides rebates of $50 per barrel, countywide. Rebates are matched (total of $100 per barrel) in areas of the county where a water supply agency is participating in the program.

(2) Summary of How the Effectiveness Assessment was Implemented

The rain barrel campaign measured and tracked three different metrics to access the effectiveness of the campaign:

- Online reach and impressions
- Workshop attendance and post-workshop surveys
- Number of rain barrel rebates applied for

An-depth review of the outreach strategy and tactics follows.

During FY 2019/20, SMCWPPP's PIP component continued efforts to promote the rain barrel program and inspire San Mateo County residents to join the rainwater harvesting movement. SMCWPPP conducted outreach to inform residents about the rebate and also the non-monetary benefits. The outreach strategy consisted of promoting the rain barrel rebate program through offline, online, and community outreach tactics.

As an offline tactic, rain barrel tip cards were distributed at community outreach events and made available as point-of-purchase materials at home improvement stores. The tip cards helped to create awareness of the purpose of rain barrels, emphasize how easy they are to install, and provide examples of financial and environmental benefits for installing a rain barrel.

Online tactics included an "opt-in" map hosted on the rain barrel page of the SMCWPPP website. The "opt-in" map allows users to enter their location onto a map to demonstrate that they have installed a rain barrel and place themselves on a map of San Mateo County. By placing themselves on the map, all website visitors will see how many rain barrels are being used throughout San Mateo County. This helps to establish the social norm of rainwater harvesting and encourage others to join the movement. The opt-in map (Figure 7-1) can be viewed on the SMCWPPP website (flowstobay.org/rainbarrel).

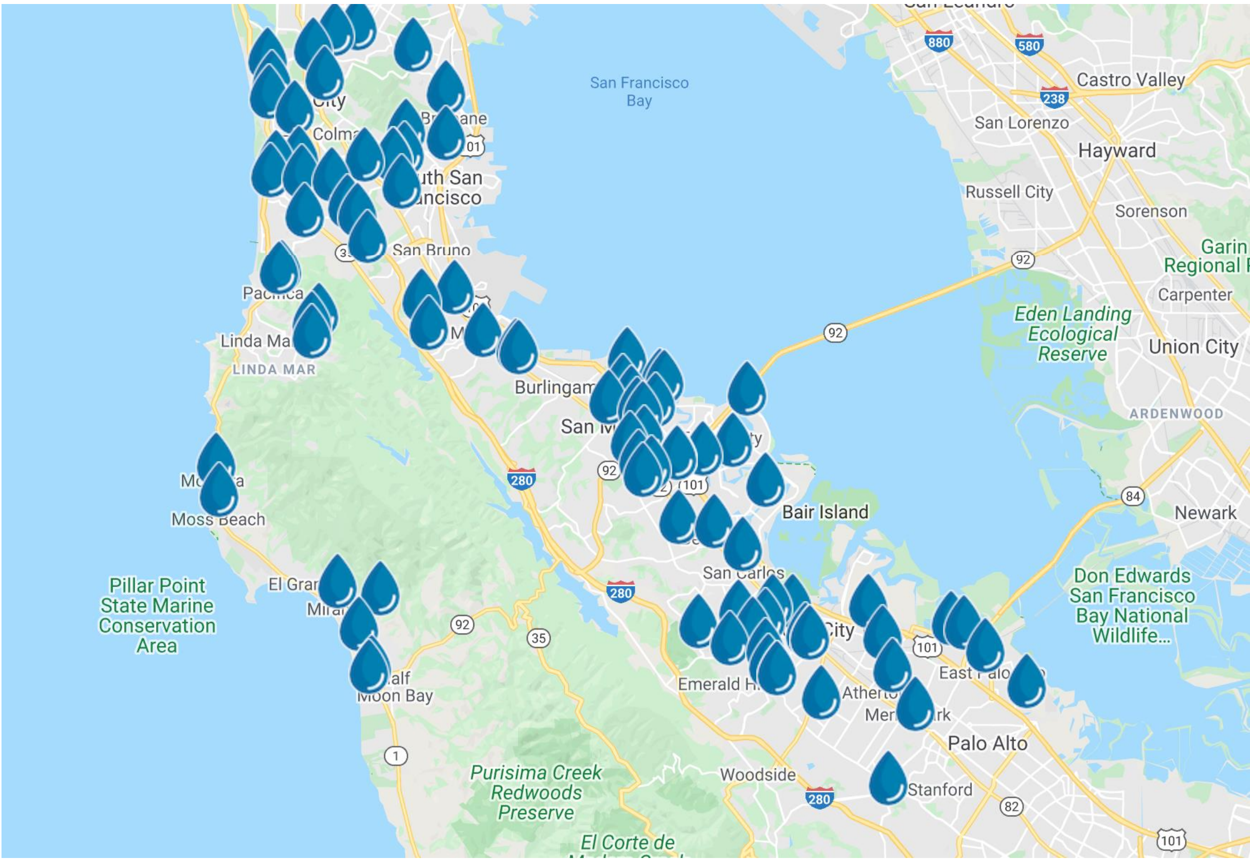


Figure 7-1. Rain Barrel Opt-in Map.

SMCWPPP also promoted the rain barrel rebate program via a social media channel on Facebook. Educational posts were created to inform residents about the functions and benefits of rain barrels. SMCWPPP used posts showing photos of various rain barrels, while encouraging use of the "opt-in" map and using ads to reach a wider audience. Posts were also created to promote three free rain barrel workshops for County residents, including one hands-on installation workshop where participants learned step-by-step instructions for installing a rain barrel and drip irrigation system connected to a rain garden.

Another tool used for analyzing outreach success was the signups received on SMCWPPP's online rain barrel opt-in map, which provides a record of locations in San Mateo County where residents have installed barrels (Figure 7-1). As a result of these workshops and the promotion conducted through e-newsletters, partners, and on Facebook, the rain barrel opt-in map showed that the number of rain barrels installed grew 116% during the fiscal year.

Figure 7-2 provides examples of Facebook posts regarding the rain barrel rebate program.

Flows To Bay
Published by Stephen Groner [?] · October 4, 2019 ·

Need plans next Saturday? Join us in Half Moon Bay from 10-12 for our Rain Barrel Workshop and you just might be the lucky attendee driving home with a brand new rain barrel! Register here: bit.ly/RainBarrelWorkshop2019

EVENTBRITE.COM
Rain Barrel Workshop with Flows to Bay
Join us for the 3rd installment of our Free Rain Barrel Workshop series!

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

271 People Reached	2 Engagements	Boost Post

Kathy Mccauley

Like · Comment · Share

Performance for Your Post

271 People Reached

1 Likes, Comments & Shares

1 Likes	1 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
0 Shares	0 On Post	0 On Shares

1 Post Clicks

0 Photo Views	1 Link Clicks	0 Other Clicks

NEGATIVE FEEDBACK

0 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · October 22, 2019 ·

Want to win a free rain barrel, indulge in a delicious smoothie, or witness and participate in a live rain barrel installation? Join us on November 2nd in San Carlos at the Tierra Linda Middle School! Register here: bit.ly/RainBarrelInstallationDemo

EVENTBRITE.COM
Rain Barrel Installation Workshop
Join us for our free community hands-on installation rain barrel...

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

1,249 People Reached	70 Engagements	Boost Post

Anna Quevedo, Raquelina McConn and 8 others — 6 Shares

Like · Comment · Share

Performance for Your Post

1,249 People Reached

34 Reactions, Comments & Shares

21 Like	10 On Post	11 On Shares
6 Love	0 On Post	6 On Shares
1 Comments	0 On Post	1 On Shares
6 Shares	6 On Post	0 On Shares

36 Post Clicks

0 Photo Views	6 Link Clicks	30 Other Clicks

NEGATIVE FEEDBACK

1 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · November 16, 2019 ·

Today is #americarecyclesday and do you know what's great for recycling?? 🌧️ Rainwater 💦

We recently hosted a hands-on rain barrel workshop 💦 at the Tierra Linda Elementary School in San Carlos. Our rain barrel specialist, Chris Corvetti, worked with residents from across San Mateo County and the students from the school's eco club to install two permanent rain barrels and demonstrate the installation of low-flow drip irrigation which will help water their new rain garden. There was a raffle for a free rain barrel, snack, giveaways, and even a person-powered, smoothie-making bike providing delicious refreshments. Learn more about rain barrels and the San Mateo County Rain Barrel Rebate Program of up to $100 at flowstobay.org and start that rainwater recycling!! Join our e-newsletter list to learn more about upcoming fun, free, and educational workshops.

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

542 People Reached	47 Engagements	Boost Post

Davena Gentry, RethinkWaste and 13 others — 1 Share

Like · Comment · Share

Performance for Your Post

542 People Reached

16 Reactions, Comments & Shares

12 Like	12 On Post	0 On Shares
3 Love	3 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
1 Shares	1 On Post	0 On Shares

31 Post Clicks

10 Photo Views	0 Link Clicks	21 Other Clicks

NEGATIVE FEEDBACK

1 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · December 9, 2019

Did you know that every single resident of San Mateo County is eligible to receive a $50 rain barrel rebate on newly purchased barrels? Residents within 8 cities are eligible to receive rebates of up to $100! Click here to learn more: http://bit.ly/smc-rb-rebate

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

1,657 People Reached | 395 Engagements | Boost Post

Gail Hyde, Kevin Jacks and 19 others | 10 Shares

Like | Comment | Share

Performance for Your Post

1,657 People Reached

85 Reactions, Comments & Shares

41 Like	20 On Post	21 On Shares
8 Love	1 On Post	7 On Shares
5 Wow	0 On Post	5 On Shares
21 Comments	0 On Post	21 On Shares
10 Shares	10 On Post	0 On Shares

310 Post Clicks

22 Photo Views	55 Link Clicks	233 Other Clicks

NEGATIVE FEEDBACK

2 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · February 3

Have you put your rain barrel on our map yet? Click here to view residential rain barrel locations throughout San Mateo County and show us where yours is: bit.ly/2PaND63

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

524 People Reached | 32 Engagements | Boost Post

Carl Brun, Karen Mizerak-Mohun and 3 others | 1 Comment 2 Shares

Like | Comment | Share

Performance for Your Post

524 People Reached

15 Reactions, Comments & Shares

7 Like	5 On Post	2 On Shares
1 Love	0 On Post	1 On Shares
5 Comments	4 On Post	1 On Shares
2 Shares	2 On Post	0 On Shares

17 Post Clicks

0 Photo Views	4 Link Clicks	13 Other Clicks

NEGATIVE FEEDBACK

0 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

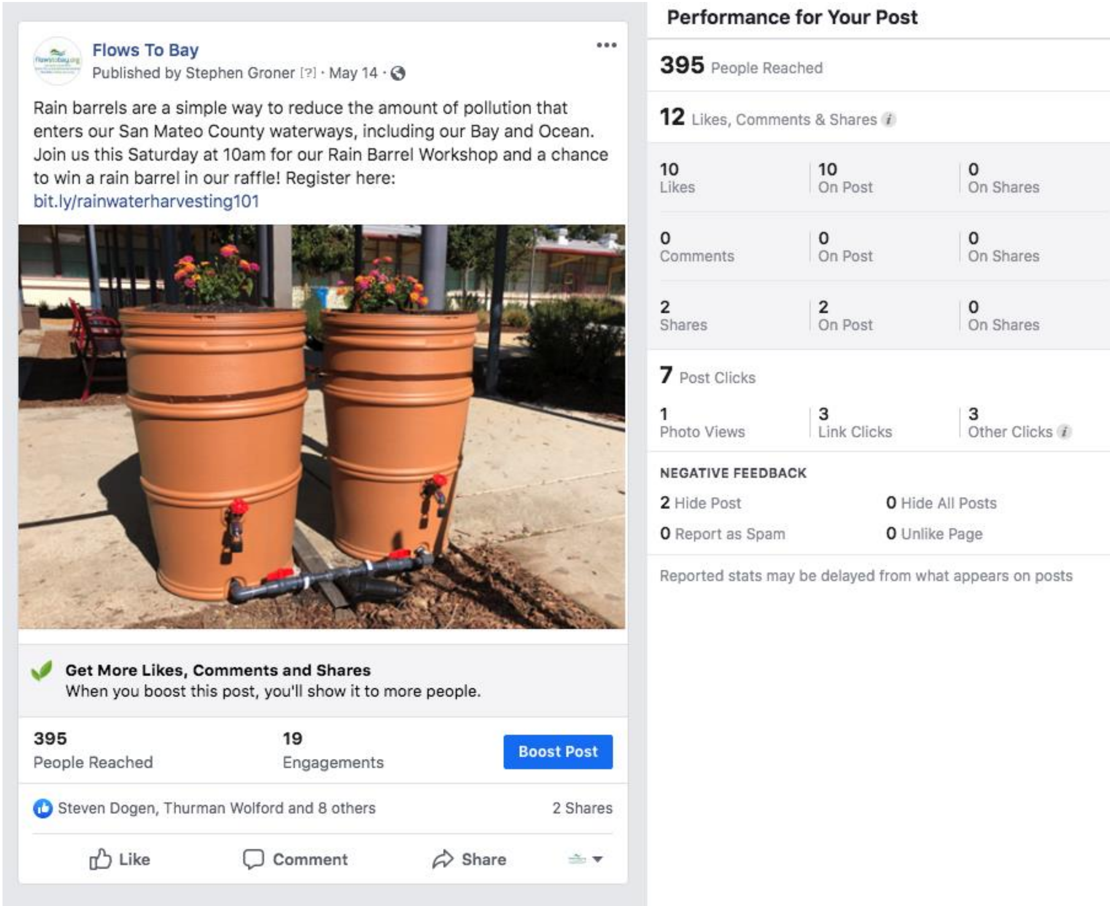


Figure 7-2. Examples of Rain Barrel Facebook Posts.

SMCWPPP hosted a rain barrel workshop at the Half Moon Bay Public Library on October 12, 2019. There were a total of 80 registrations for the workshop and a total of 27 attendees representing seven different jurisdictions. Based on the post-workshop survey, 78% of attendees responded that they were likely or very likely to purchase or use a rain barrel within the next 12 months. At the workshop, one free 50-gallon rain barrel was raffled off (Figure 7-3), and materials on stormwater pollution prevention, the countywide rebate program, and rain barrel tip cards were provided. Noah Katz, from the San Mateo Resource Conservation District (RCD), presented on the free services that the RCD provides to residents. Workshop attendees were also given the opportunity to tour the library's green roof.

On November 2, 2019 at Tierra Linda Elementary School in San Carlos, SMCWPPP hosted its second rain barrel workshop of the year (Figure 7-4). This workshop was a hands-on installation demonstration of two rain barrels that were donated by Hassett ACE Hardware. With the help of Chris Corvetti, a rain barrel specialist and expert installer, county residents and the school's environmental club permanently installed the donated barrels on campus as an example of a small-scale green infrastructure project. The rain barrel specialist also showed attendees how to attach a low-pressure drip irrigation system to the barrels. There were a total of 39 attendees representing 13 jurisdictions. Similar to the October workshop, one free 50-gallon rain barrel was raffled off, and materials on stormwater pollution prevention, the countywide rebate program, and rain barrel tip cards were provided.

Figure 7-3. Photo of the Rain Barrel Winner (left), and classroom workshop (right) from the October 12, 2019 Rain Barrel Workshop - Half Moon Bay.


EarthMinded

Figure 7-4. Photos from the November 2, 2019 Rain Barrel Workshop at Tierra Linda Elementary School in San Carlos.

Due to the COVID-19 pandemic, SMCWPPP also helped promote, facilitate, and sponsor a third virtual rain barrel event on May 16, 2020 in partnership with the City of Burlingame and BAWSCA. There were a total of 352 registrants (a record high for SMCWPPP), and a total of 143 attendees (another record high for SMCWPPP).

As an incentive for attending the workshop, a rain barrel was raffled off for participants who filled out the post-event survey. The rain barrel raffle winner was a resident of Redwood City and she sent images of the newly installed barrel (Figure 7-5).

Figure 7-5. Rain barrel drawing winner from the May 16, 2020 rain barrel event.

(3) Effectiveness Assessment Results and (4) Measurable Change in Awareness/Behavior

The Rain Barrel Campaign achieved measurable and impressive results in FY 2019/20 even while facing COVID-19 challenges. What follows is a summary of the results and discussion of measurable changes in awareness and behavior change.

Online Reach and Impressions

There was a total of 29 posts online regarding rain barrel related factoids and rain barrel rebate information and promoting the three rain barrel workshops held this fiscal year. A total of 13,544 impressions and 1,039 engagements (which includes links, comments, or post shares) were received. The impression figure provides a sense of awareness while the engagement count indicates how many people interacted or engaged with the post, displaying an even greater awareness. Figure 7-6 shows that the rain barrel and rebate page on SMCWPPP's website (flowstobay.org) achieved a total of 4,443 pageviews, of which 87% were unique. The average time visitors spent on the page was about five minutes. The number of unique pageviews demonstrates that SMCWPPP was able to broaden and expand the reach of its audience, attracting almost 4,000 new members of the San Mateo County community that hadn't previously visited the rain barrel and rebate page, speaking to an increase in awareness. The time spent on the page, especially in comparison to the average time of 2:47, speaks to the visitor's intentions and attitudes. The number of link clicks (226) to the BAWSCA website to apply for the rebate (Figure 7-7) shows not only interest and intention, but also demonstrates the beginning stages of behavior change.

	Page	Pageviews	Unique Pageviews	Avg. Time on Page
		47,226 % of Total: 100.00% (47,226)	39,963 % of Total: 100.00% (39,963)	00:02:47 Avg for View: 00:02:47 (0.00%)
1.	/	7,355 (15.57%)	6,123 (15.32%)	00:01:21
2.	/preventing-stormwater-pollution/at-home/rain-barrels-rebate-program/	4,553 (9.64%)	3,957 (9.90%)	00:04:58
3.	/newdevelopment	3,365 (7.13%)	2,836 (7.10%)	00:10:16
4.	/construction	1,420 (3.01%)	1,213 (3.04%)	00:08:36
5.	/preventing-stormwater-pollution/with-new-redevelopment/c-3-regulated-projects/	1,083 (2.29%)	853 (2.13%)	00:06:07
6.	/preventing-stormwater-pollution/in-my-community/teacher-parent-resources/	973 (2.06%)	875 (2.19%)	00:02:30

Figure 7-6. Google Analytics results for FY 19/20 highlighting the metrics of the rain barrel page.

Plot Rows | Secondary dimension | Sort Type: Default

	Event Label	Total Events
		5,386 % of Total: 29.30% (18,382)
1.	https://protect-us.mimecast.com/s/LLbnBMH7JlNuZ	612 (11.36%)
2.	http://www.smchealth.org/ccd	281 (5.22%)
3.	http://bawsca.org/conserve/rebates/barrels	226 (4.20%)
4.	http://museumca.org/creeks/wb-AA-LowerPeninsula.html	188 (3.49%)
5.	http://www.smchealth.org/hhw	165 (3.06%)
6.	http://flowstobay.org/sites/default/files/SMCWPPP-C-6_Inspection_Report-August-2017-PDF-Form.pdf	146 (2.71%)

Figure 7-7. Google Analytics showing number of direct clicks to the BAWSCA rain barrel page.

Workshop Attendance and Post-Workshop Surveys

Between the three workshops, 209 residents attended, representing 18 of 20 jurisdictions within San Mateo County. SMCWPPP partnered and cross-promoted these workshops with multiple local organizations and partners, including: Grassroots Ecology, the RCD, Sea Hugger, and the SMC Office of Sustainability. Furthermore, a partnership with a local business, Hassett Ace Hardware, enabled us to raffle off two rain barrels and provide a 20% discount for a 50-gallon EarthMinded rain barrel to all attendees. After each workshop, attendees were encouraged to fill out a survey which provided insight into their intentions and behavior change.

Workshop attendees were asked to fill out a survey designed to gauge previous knowledge of rain barrels and how helpful the attendees found the workshop. The overall results of the survey were favorable, with the majority of survey participants indicating they learned the following: the environmental benefits of rain barrels, preparation of how to install rain barrels, and knowledge of local rebates – and that they learned those items in an interesting/fun format.

Tables 7-1 to 7-4 highlight a portion of the survey results for the October 12th and November 2nd workshops. Appendix 7 includes the event invitations and full survey results.

Table 7-1. Rating Percentages of Environmental Information Provided (1 - poor, 5 - great)

	1	2	3	4	5
Attendees	0%	0%	1.8%	21.8%	76.4%

Table 7-2. Rating Percentages of Rain Barrel Installation Instruction (1 - poor, 5 - great)

	1	2	3	4	5
Attendees	0%	0%	0%	30.9%	69.1%

Table 7-3. Rating Percentages regarding Rain Barrel Rebate Information Provided (1 - poor, 5 - great)

	1	2	3	4	5
Attendees	1.85%*	0%	1.85%	12.96%	83.33%

*The 1 attendee who responded with this rating noted with it "came late."

Table 7-4. Rating Percentages regarding if the Information was Presented in an Interesting/Fun Format (1 - poor, 5 - great)

	1	2	3	4	5
Attendees	0%	0%	0%	21.8%	78.2%

Table 7-5 summarizes the results of a question asked at all 3 workshops:

Table 7-5. Rating Percentages regarding the Likelihood of Purchasing/Using a Rain Barrel within the Next 12 Months? (1 - not at all likely, 5 - very likely)

	1	2	3	4	5
Attendees	1.34%	6.71%	18.79%	22.15%	51.01%

Table 7-5 show results for the question most likely to measure intention and behavior change. Of all survey takers, 73% expressed that they were likely to very likely to purchase or use a rain barrel within the next 12 months, while only 1% indicated they were not at all likely.

Number of Applications for Rain Barrel Rebates

In FY 2019/20, a total of 33 rain barrel rebates were issued from 27 applications. This was a 36% decrease from the previous year's efforts. This decline in rebate applications does not align from the impressions, webpage visitors, clicks to the BAWSCA webpage, or information gathered from workshop surveys. SMCWPPP hypothesizes that there may be additional behavior change barriers involved in the actual rebate application. Another theory is that the incentive amount is to small for the amount of work needed to apply for the rebate.

(5) Future Outreach Plans

SMCWPPP plans to extend its rain barrel rebate contributions to a tiered system in FY 2020/21 that increases monetary incentives for larger rain barrel systems. SMCWPPP will work with the lead agency, BAWSCA, to adjust the application system to make it easier to apply. To promote this new and restructured rebate and campaign, there will also be a countywide digital ad campaign and supplemental workshops to educate the public.

During FY 2019/20, PIP Subcommittee members were provided with marketing material to promote the rain barrel rebate program:

1. Pre-crafted copy and photos to be used for any medium that best suits their constituents;
2. Redesigned Rain Barrel Tip cards to provide at community outreach events (Figure 7-8);
3. BAWSCA rain barrel rebate cards (Figure 7-9); and
4. A link to the Rain Barrel Opt-in map to encourage residents to join the movement at FlowsToBay.org/rainbarrel.

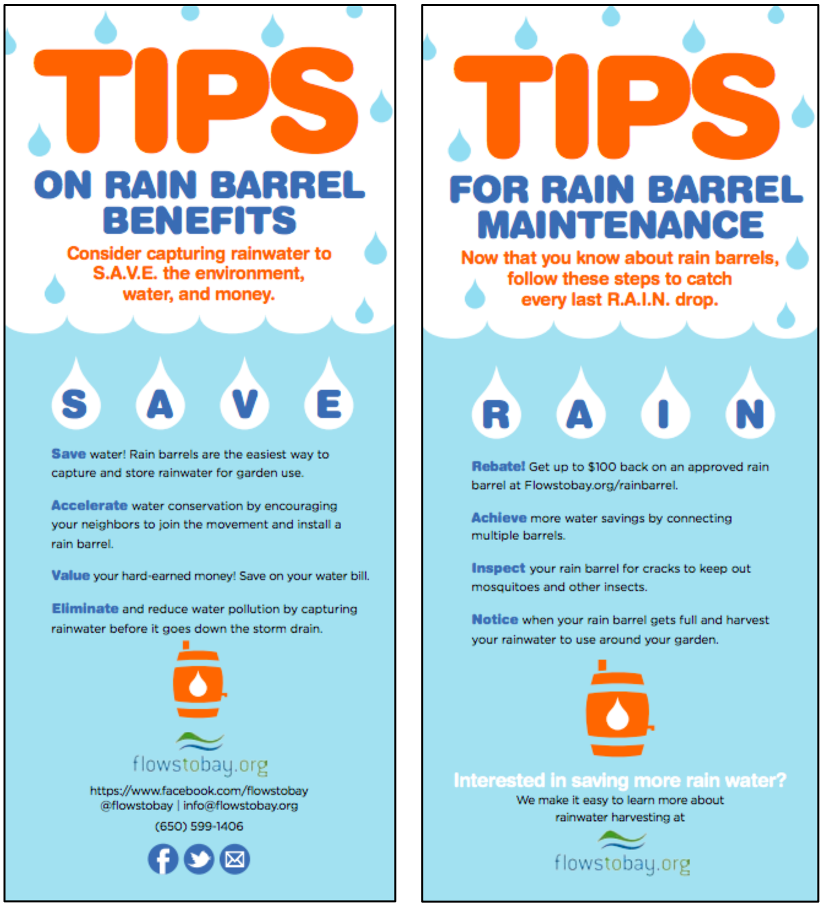


Figure 7-8. Rain Barrel Tip Card

Figure 7-9. Rain Barrel Rebate Card

San Mateo Countywide Sustainable Street Master Plan Outreach

Phase 2 of the community engagement for the San Mateo Countywide Sustainable Streets Master Plan (SSMP) took place in January and February of 2020 as part of sustained project community outreach. During Phase 2 of the outreach, the planning team engaged with the community to educate people about the project, convey technical issues in a clear manner, continue collecting feedback on priorities and preferences, and publicize upcoming public participation opportunities. Public feedback gathered during the outreach activities will help guide the final stages of the project development, ensure that priority project designs and implementation plans meet the needs of the community, and publicize upcoming community engagement opportunities to help gather public support for the plan.

In January and February 2020, Alta Planning + Design, an outreach consultant for the County's Sustainable Streets Master Plan, attended pop-up workshops at high profile community events and popular community destinations in the cities of Millbrae, Redwood City, and East Palo Alto. These events were identified as locations to reach a high volume of people, engage with diverse communities, specifically near disadvantaged or vulnerable areas, and target a wide range of locations within San Mateo County.

The Phase 2 Outreach events raised public awareness about the San Mateo Sustainable Streets Master Plan Project. Alta staff had conversations to educate the public about the SSMP project and collect public feedback with almost 300 people who work, live, and visit San Mateo County. Hundreds more walked by the Alta pop-up events, reading the project boards, and learning that the county is working to improve sustainable transportation and green infrastructure efforts. Detailed descriptions of each outreach event can be found in the following sections of the memo.

Overall, staff learned that:

- School Safety Plans, Streetscape Characteristics, Bicycle and Pedestrian Improvements, and Vulnerable Communities stood out as the most important prioritization criteria for the public. Low Vehicle Ownership Rates and the Urban Heat Island Effect were less important to the people Alta talked to.
- People responded positively to the idea of maximizing public investment by constructing green infrastructure alongside transportation projects.
- Climate change, bicycle and pedestrian safety, and overburdened transportation systems are public concerns in San Mateo County. The public is supportive of the project and appreciates San Mateo County's work to address these issues

Table 7-6 is a list of the events attended, number of people reached, and number of email signups received.

Table 7-6. San Mateo Countywide Sustainable Streets Master Plan Outreach Events

Date	Event Location	Booth Attendance	# of Fliers Distributed	# of Email Signups
1/26/20	Lunar New Year Festival, Millbrae, CA	101	50	15
2/1/20	Lunar New Year Festival, Redwood City, CA	90	40	0
2/22/20	Cardenas Market, East Palo Alto, CA	40	10	0

Stormwater & Green Infrastructure Community Survey

SMCWPPP conducted a survey from June to August 2019 among San Mateo County residents in order to better understand (a) how important water pollution is to residents of the County, (b) which types of potential stormwater activities residents engage with the most, (c) which types of events/activities residents engage with the most, and finally (d) to get a sense residents' knowledge of and support for green infrastructure in the County. Overall, 1,214 individuals participated in the survey; 208 participated in the intercept survey and 1,006 participated in the online survey. Figure 7-10 provides a detailed summary of the demographic characteristics of these participants.

	Intercept n=208	Online n=1006	Combined* n=1214
Gender			
Male	57.2%	29.4%	34.2%
Female	42.8%	62.1%	58.8%
Non-binary	0.0%	0.4%	0.3%
Declined	0.0%	7.2%	5.9%
Age			
18-25	13.5%	1.2%	1.0%
26-35	26.4%	10.1%	8.4%
36-45	16.3%	17.0%	14.1%
46-55	16.3%	17.9%	14.8%
56-65	14.9%	21.7%	18.0%
66+	12.0%	26.1%	21.7%
Declined	0.5%	6.4%	5.3%
Household languages			
English	47.1%	83.3%	77.1%
Bilingual English + Other	39.9%	8.7%	14.1%
Monolingual (non-English)	13.0%	2.3%	4.1%
Declined	0.0%	1.5%	1.2%
Single-family homeowner			
Yes	38.9%	70.3%	58.2%
No	61.1%	25.0%	20.7%
Declined	0.0%	5.2%	4.3%
City of residence			
San Mateo	11.5%	23.6%	19.5%
Redwood City	10.6%	11.9%	9.9%
Pacifica	9.6%	10.2%	8.5%
Half Moon Bay	0.5%	6.7%	5.5%
Daly City	26.0%	5.9%	4.9%
Menlo Park	4.8%	4.6%	3.8%
Belmont	1.0%	4.5%	3.7%
South San Francisco	3.4%	4.1%	3.4%
San Bruno	6.7%	3.7%	3.0%
Burlingame	2.9%	3.5%	2.9%
Foster City	2.9%	2.7%	2.2%
Millbrae	1.9%	2.7%	2.2%
Other	18.3%	7.5%	6.2%

Figure 7-10. Demographics by survey type

<u>Campaign Evaluation</u>

Participant Demographics

Participants in the intercept survey had a more equal distribution across gender and age and were more likely to live in households that used languages other than English. Online participants tended to be more female (61.9% online v. 42.8% intercept) and older: 61.9% of online participants were female and nearly half (47.6%) of online participants were over age 56. Overall, 77.1% of households spoke English only, however participants in the intercept survey were more than twice as likely to speak a language other than English at home. Interestingly, the overall homeownership rate among participants (58.2%) was similar to that of the County's (61%). The most common city of residence among intercept and online participants was Daly City and San Mateo, respectively. Overall, 19.5% of participants lived in San Mateo. The cities of Hillsborough, East Palo Alto and Colma each comprised less than 1% of the total sample and were therefore included in the "Other" category. One question, "Which race or ethnicity do you associate with?" had a high refusal rate (n=407 or 33.5% of total sample) among survey participants and as such, meaningful insights regarding participants' race could not be made. For this reason, participants' race was omitted from Figure 7-10.

How important is water pollution to residents of the County?

Most participants expressed concern over water pollution. Overall, 76.3% of participants stated that they were 'moderately concerned' or 'very concerned'. Concern over water pollution was more prevalent among online participants (79.8%) than intercept participants (59.1%). Water pollution ranked fourth overall among a list of eight environmental concerns (third among online and fifth among intercept participants).

	Intercept n=208	Online n=1006	Combined* n=1214
Have you seen, read or heard about how to dispose of pollutants or minimize what goes into the Bay?			
Have seen	58.7%	75.6%	72.7%
Have not seen	36.5%	11.8%	16.1%
Unsure	4.8%	11.6%	10.5%
Declined	0.0%	0.9%	0.7%
Which of the following have you or someone in your household done in the last 3 months?			
Worked on lawn/yard	54.8%	70.0%	67.4%
Gardened	56.3%	66.5%	64.7%
Picked up litter	61.1%	54.5%	55.6%
Walked a dog	44.7%	42.6%	43.0%
Worked on vehicle	45.7%	36.9%	38.4%
Declined	5.3%	2.5%	3.0%
Do you wash your car yourself or take it to a car wash?			
Take to car wash	53.4%	70.1%	67.2%
Wash at home	28.4%	24.2%	24.9%
Do not own a car	13.5%	2.2%	4.1%
Unsure	1.9%	2.7%	2.6%
Declined	4.8%	0.9%	1.6%

Figure 7-11. Participants' engagement in potential stormwater activities

What types of potential stormwater activities do residents engage with most?

Overall, most participants (72.7%) have heard, read or seen information about how to minimize or dispose of stormwater pollutants (Figure 7-11). Participants in the online survey were much more likely than intercept participants to have encountered this information (75.6% versus 58.7%). Participants were most likely to have spent time working on their lawns (67.8%) or gardening (64.7%) in the past three months. However, online participants were more likely to engage in these activities than intercept participants; 70.0% of online participants worked on their lawns compared to only 54.8% of intercept participants, and 66.5% of online participants gardened compared to 56.3% of intercept participants. Overall, about half of participants stated that they had picked up litter (55.6%). Participants were least likely to have spent time walking a dog (43.0%) or working on a vehicle (38.4%) in the past three months. Regarding car washing behaviors, most participants take their cars to a car wash to get washed (67.2%); the remainder either wash their car at home (24.9%) or don't own a car (4.1%).

Regarding pesticide use, most participants reported not using pesticides in their home and garden; only 11% of participants stated they used pesticides. Pesticide use was equal across intercept and online survey types (11.1% and 11.2%, respectively). Compared to the 2009 Countywide Stormwater Survey, self-reported pesticide usages decreased from 15% in 2009 to 11% in 2019.

Do residents understand what is meant by "green infrastructure"? To what extent do they support government investment in green infrastructure?

Most participants recognized the term "green infrastructure" (60.6%) and showed strong support for spending on green infrastructure if it cost 0-25% more than traditional infrastructure (88.8%). Intercept participants were less likely than online participants to support green infrastructure if it cost 75-100% more than conventional infrastructure (13.0% intercept versus 21.7% online).

There was not a significant difference in support for green infrastructure across survey groups and, in fact, intercept survey participants were slightly more likely than online participants to support green infrastructure if they know that it reduces pollution in neighborhoods (+6.7%) and makes communities greener (+10.0%) and safer (+12.1%).

Survey Limitations

Given that participants in the online survey were recruited via member agency and agency partner social media accounts or email newsletters, and that they opted to participate (as opposed to being randomly selected), there is an inherent degree of selection bias which resulted in higher rates of pro-environmental responses among this sample. Specifically, online survey participants expressed greater familiarity with the subject matter and reported higher levels of concern over water pollution and water quality. Online survey participants were also more likely to belong to environmental organizations like the Sierra Club and Nature Conservancy. Additionally, because the intercept surveys were conducted in-person, it's possible that favorable responses are slightly inflated due to social desirability bias—or the tendency of some participants to report and answer in a way they deem to be more socially acceptable than would be their "true" answer. Appendix 7 includes the full survey report.

C.7.c. Stormwater Pollution Prevention Education

SMCWPPP continued to use social media, the FlowsToBay.org website, and the electronic newsletter to promote stormwater pollution prevention messages.

Social Media

SMCWPPP continued to maintain the social media platform Facebook. This platform was used as a tool for two-way communication and has continued to be an effective method to engage with residents in the absence of face-to-face interactions. The SMCWPPP Facebook page (facebook.com/flowstobay) experienced a significant increase in followers this reporting period and gained 8,054 total page Likes (accounting for followers gained minus followers lost), reaching a total of 26,174 page Likes between July 1, 2019 and June 30, 2020, a 44% increase from FY 2018/19.

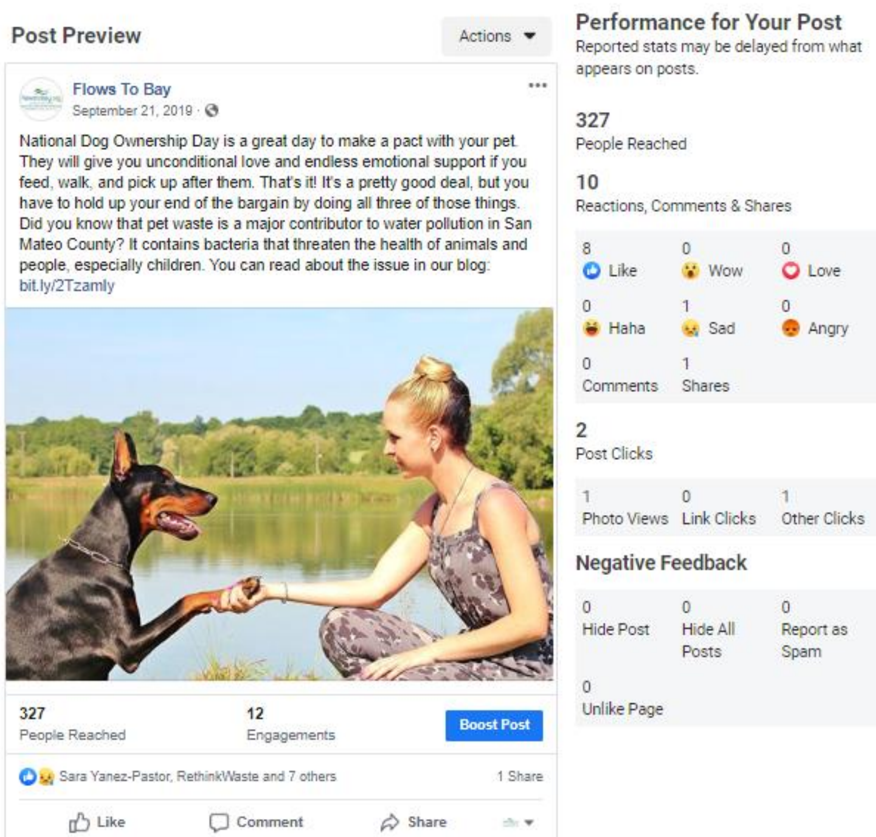
Facebook was used to publicize stormwater issues, watershed characteristics, and stormwater pollution prevention alternatives. The platform was primarily used to inform the public of environmental outreach events, to promote a shift towards incorporating sustainable behaviors into daily lifestyles, and to provide environmental and marine news relevant to San Mateo County pollution prevention. The accounts were monitored on a daily basis throughout the fiscal year. As part of the overall effort to enhance social presence and engagement with followers, polls were published to the SMCWPPP Facebook page to get a sense of followers' areas of interest and gaps in their knowledge. The SMCWPPP social media team wrote blogs and posted about "community champions" (i.e., residents of San Mateo County who had gone above and beyond to be environmental stewards in their communities), and responded to residents' questions—often directing them to SMCWPPP's web-based resources.

The following is a breakdown of tasks and evaluation metrics associated with social media activity for FY 2019/20:

- Continued utilizing Facebook as a two-way communication tool to share and exchange information between SMCWPPP residents, businesses, nonprofits, and community stakeholders within San Mateo County on pollution prevention messages. Specific program messages included watershed protection, water pollution and Bay area marine news, wash water pollution prevention, the benefits of Green Infrastructure, household hazardous waste, and used motor oil & filter recycling content.

- Continued to utilize Facebook as the SMCWPPP website's advertising platform to further promote messages.
- Facebook metrics:
  - Gained 8,054 Facebook Page Likes, reaching a total of 26,174 Page Likes.
  - Garnered 516,436 total page impressions (number of people that viewed SMCWPPP's page).
  - Reached a total of 121,789 people (number of people who had content from SMCWPPP's page enter their screen).
  - Garnered 3,655 interactions (likes, comments, and shares).
  - Published a total of 227 Facebook posts.

Figure 7-12 presents some examples of FY 2019/20 Facebook Posts.



Flows To Bay
Published by Stephen Groner [?] · May 22 ·

Now that you're spending more time at home you might be noticing more bugs in your house. If they're ants, you can follow them, see where they go, and then plug the crack or hole they came through. You can often avoid pesticides by deploying simple integrated pest management practices like this one. If the problem persists, consider calling one of the local experts on our list: bit.ly/2VKsUXX

FLOWSTOBAY.ORG
Pest Management – Flows to Bay
Did you know that less than 3% of the insects you encounter in the...

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

224 People Reached | 17 Engagements | Boost Post

Sara Halstead Harsch, Veronica DE Leon and 7 others — 2 Shares

Like · Comment · Share

Performance for Your Post

224 People Reached

11 Likes, Comments & Shares

9 Likes	9 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
2 Shares	2 On Post	0 On Shares

6 Post Clicks

0 Photo Views	2 Link Clicks	4 Other Clicks

NEGATIVE FEEDBACK

1 Hide Post	0 Hide All Posts
0 Report as Spam	0 Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · December 19, 2019 ·

Winterizing your pool? Did you know it's illegal to discharge swimming pool or hot tub water into storm drains? To learn more about this and to avoid fines, click here: bit.ly/2GBSJTI

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

474 People Reached | 12 Engagements | Boost Post

Joelle Johnson, Marlayna Reden and 2 others — 1 Share

Like · Comment · Share

Performance for Your Post

474 People Reached

5 Likes, Comments & Shares

4 Likes	4 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
1 Shares	1 On Post	0 On Shares

7 Post Clicks

2 Photo Views	2 Link Clicks	3 Other Clicks

NEGATIVE FEEDBACK

0 Hide Post	0 Hide All Posts
0 Report as Spam	0 Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · December 3, 2019 ·

If you own or hire a mobile business then you probably already know that wash water discharged into storm drains goes straight to local creeks, the Bay and the Ocean without ANY treatment. Wash water may contain soaps, toxic chemicals, and other pollutants that are harmful to waterways and wildlife. Click here to learn what steps you can take avoid stormwater pollution: bit.ly/2NO1yvG

BIT.LY
bit.ly

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

320 People Reached | 12 Engagements | Boost Post

Dolly Ward, Linda Barraza and 2 others — 1 Share

Like | Comment | Share

Performance for Your Post

320 People Reached

5 Reactions, Comments & Shares

3 Like	3 On Post	0 On Shares
1 Sad	1 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
1 Shares	1 On Post	0 On Shares

7 Post Clicks

0 Photo Views	3 Link Clicks	4 Other Clicks

NEGATIVE FEEDBACK

0 Hide Post	**1** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · December 12, 2019 ·

Commonly used pesticides have been detected in urban creeks and waterways throughout California and around the country. In our waters, these pesticides poison birds, fish, and sensitive aquatic wildlife. In some locations, water contaminated with pesticides can migrate from creeks and surface waters into drinking water wells. We all need to do what we can to keep pesticides out of our creeks, streams, rivers, bays, and lakes. Learn more here: bit.ly/2Sq5Yya

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

433 People Reached | 23 Engagements | Boost Post

Rommel Olivetto, Mary Radix and 10 others — 1 Share

Like | Comment | Share

Performance for Your Post

433 People Reached

14 Likes, Comments & Shares

13 Likes	12 On Post	1 On Shares
0 Comments	0 On Post	0 On Shares
1 Shares	1 On Post	0 On Shares

9 Post Clicks

1 Photo Views	0 Link Clicks	8 Other Clicks

NEGATIVE FEEDBACK

0 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · August 5, 2019 ·

Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on less toxic chemicals and the long-term prevention of pests thus minimizing risks to people and the environment. Check out our website for a list of pest control companies that use IPM strategies right here in San Mateo County: bit.ly/2AMT2aM

Flows To Bay
Environmental Conservation Organization
Send Message

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

571 People Reached | 17 Engagements | Boost Post

Ganel Craig, Monique P Decharat and 5 others · 1 Share

Like · Comment · Share

Performance for Your Post

571 People Reached

9 Likes, Comments & Shares

8 Likes	7 On Post	1 On Shares
0 Comments	0 On Post	0 On Shares
1 Shares	1 On Post	0 On Shares

8 Post Clicks

1 Photo Views	3 Link Clicks	4 Other Clicks

NEGATIVE FEEDBACK

2 Hide Post	2 Hide All Posts
0 Report as Spam	0 Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · May 29 ·

Commercial car washes are better for the environment than the DIY approach. If you choose to wash your car at home, make sure water drains to grass, gravel, or landscaped areas, so it soaks into the ground and doesn't enter storm drains! It's also a good idea to first clean your wheels with a rag to remove any dust from brake pads, which can contain copper - a hazardous metal. Click here for well-tuned automotive information: bit.ly/2VTkspa

FLOWSTOBAY.ORG
Automotive Care – Flows to Bay
Automobile fluids and toxins from leaks or maintenance are a common...

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

503 People Reached | 30 Engagements | Boost Post

Wanda Runyon, Heide Holstein and 19 others · 1 Share

Like · Comment · Share

Performance for Your Post

503 People Reached

22 Reactions, Comments & Shares

20 Like	20 On Post	0 On Shares
1 Love	1 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
1 Shares	1 On Post	0 On Shares

8 Post Clicks

0 Photo Views	2 Link Clicks	6 Other Clicks

NEGATIVE FEEDBACK

3 Hide Post	1 Hide All Posts
0 Report as Spam	0 Unlike Page

Reported stats may be delayed from what appears on posts

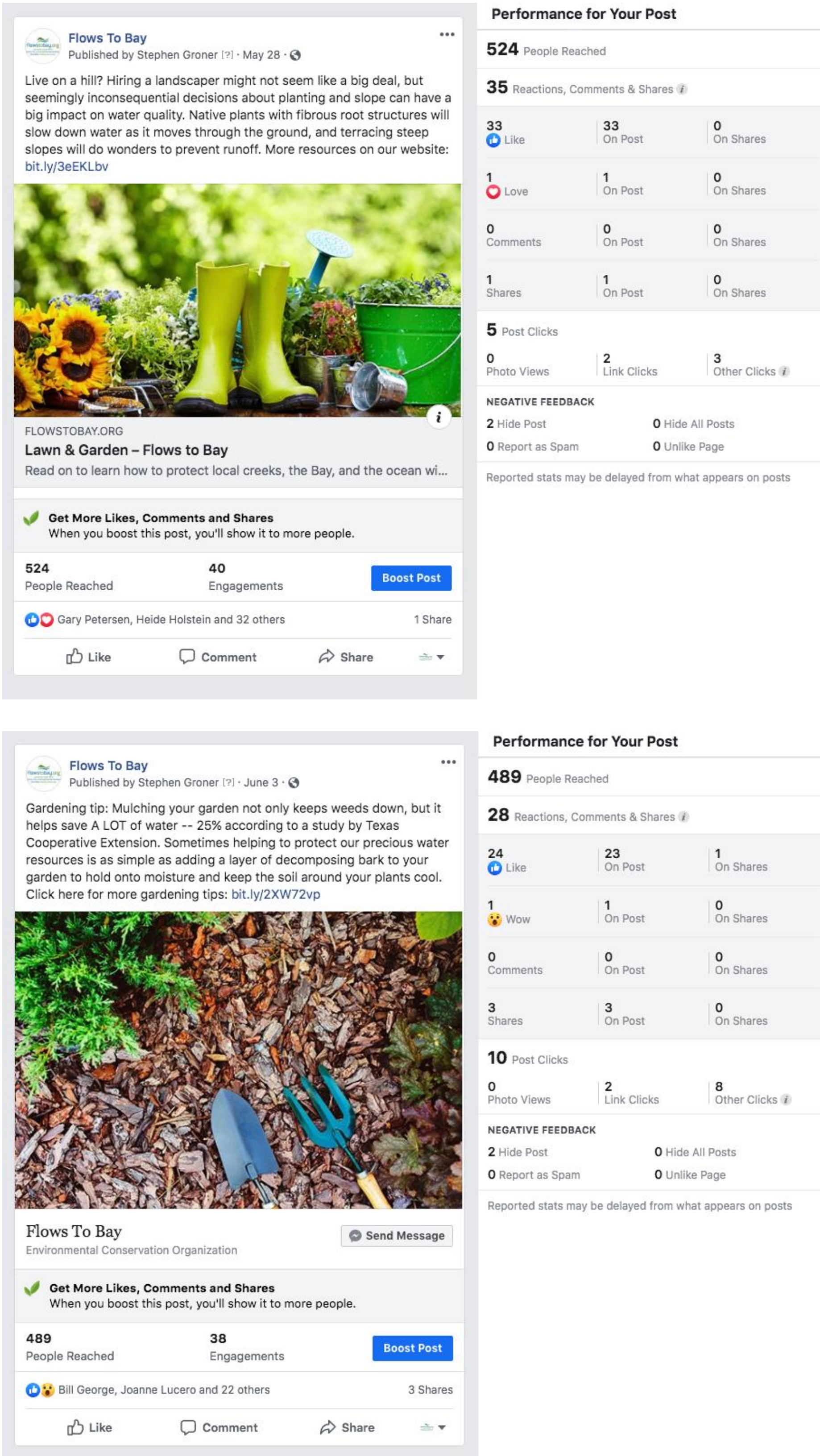


Figure 7-12. Examples of FY 2019/20 Facebook Posts

In addition to the standard Facebook social media activity, Facebook Ads Campaigns consistently ran from July 1, 2019 – June 30, 2020. These campaigns ran on an appropriate monthly budget approved by SMCWPPP and increased SMCWPPP's reach to potential community members through the use of audience location and interest targeting. The Facebook Ads Campaigns resulted in a significant increase in followers during this reporting period. Over the entire fiscal year, the SMCWPPP Facebook page (facebook.com/flowstobay) gained 8,054 total page Likes (accounting for followers gained minus followers lost), reaching a total of 26,174 page Likes between July 1, 2019 and June 30, 2020, a 44% increase from FY 2018/19.

In April 2020, the traction of the Facebook ads was tested among Spanish speakers by running two parallel campaigns, one in English and one in Spanish, that were identical in their budget, copy, creative, and targeting. During that month, the Spanish campaign outperformed the English campaign, garnering 161 likes at $0.53 each, as opposed to the English campaign's 151 likes at $0.56 each.

In May and June, SMCWPPP's social media team did not run Page Likes campaigns because annual goals had already been exceeded. Instead, the remaining ad budget was used to promote events that had to be adapted into webinar format due to the outbreak of COVID-19.

Facebook Ads in FY 2019/20 resulted in a total of:

- 8,054 Page Likes
- 13,240 total clicks on Ad Campaigns
- 134,214 total reach of Ad Campaigns
- $0.68 per like on average (total cost of all ad campaigns/total # of likes garnered on all ad campaigns)
- $0.31 per click on average (Cost Per Click (All)/# of Ad Campaigns)

Figure 7-13 presents some examples of FY 2019/20 Facebook Advertisements.

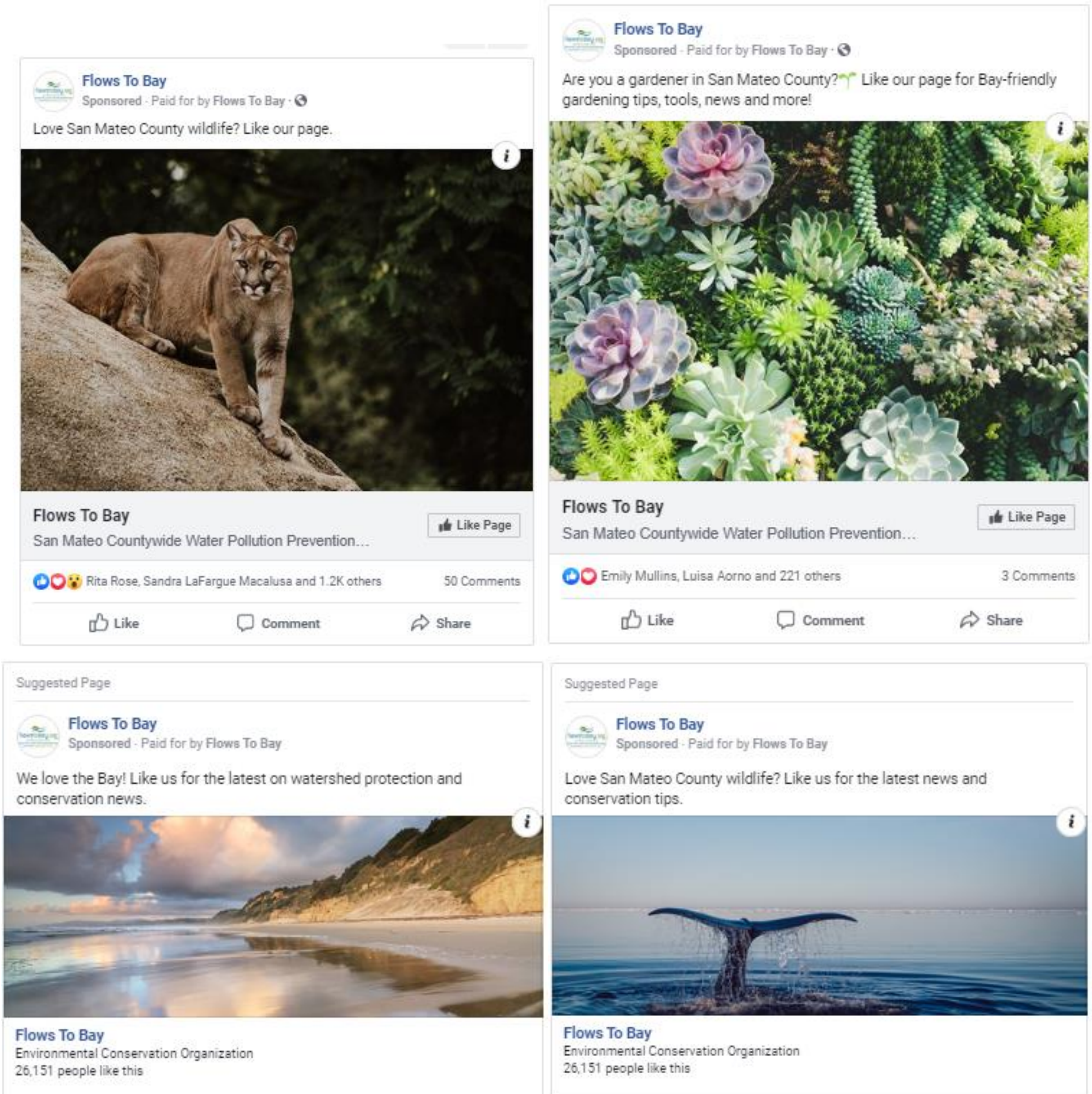


Figure 7-13. Examples of FY 2019/20 Facebook Advertisements.

Newsletter

The SMCWPPP newsletter was utilized to publicize stormwater issues, watershed information, upcoming workshops and webinars, and stormwater pollution prevention options to residents. A total of fourteen community newsletters were sent out to a subscriber list. SMCWPPP's subscriber list reached a total of 3,787 subscribers in FY 2019/20. For examples of the newsletter, please see Appendix 7. Table 7-7 provides a breakdown for each newsletter in the FY 2019/20 campaign.

Table 7-7. SMCWPPP E-Newsletter Metrics for FY 2019/20.

Subject line	E-newsletter content	Send Date	Total Recipients	Open rate	Click through rate	Opened Click Rate
Join our Garden and Pesticide Q&A Webinar	• Register for the Master Gardener Webinar • Learn More about the Webinar	6/9/20	3,544	19.5%	1.5%	7.7%
Join Our May 16th Rain Barrel Webinar	• Rain Barrel Webinar • San Mateo Environmental Learning Collaborative (SMELC) Fellowship	5/14/20	3,585	22.4%	1.7%	7.4%
Hot off the Keyboard: Our New Website!	• New Website • T-Shirt Design Contest	5/12/20	3,612	24.5%	1.3%	5.2%
5 Water Wise Activities from Home this Earth Day	• Water Wise Activities from Home • HHW Storage Do's and Don'ts • Online Event Opportunities	4/22/20	3,633	23.0%	3.2%	14.1%
Are You a Community Champion?	• Community Champion Nomination Form • 3 Featured Community Champions	3/10/20	3,678	22.5%	1.1%	4.8%
2 Simple Actions that Build Eco-Resilience During the Rains	• About Rain Barrels + Rebate • Adopt a Drain	12/18/19	3,684	20.4%	2.6%	12.5%
Only 13 spots left for our rain barrel installation workshop – Nov.2 ☔	• Space is Limited – Reserve Your Spot Today • Why You Should Install and Own a Rain Barrel	10/26/19	3,666	24.2%	0.8%	3.2%
Hands-on Rain Barrel Workshop - Nov. 2 ☔	• Space is Limited – Reserve Your Spot Today • Why You Should Install and Own a Rain Barrel	10/22/19	3,637	23.3%	1.0%	4.4%
Reminder: Free rain barrel workshop on Oct. 12! ☔	• Why You Should Install and Own a Rain Barrel • Space is Limited – Reserve Your Spot Today	10/05/19	3,644	21.9%	0.4%	1.8%

Subject line	E-newsletter content	Send Date	Total Recipients	Open rate	Click through rate	Opened Click Rate
Join our rain barrel workshop on Oct. 12! ☔	• Why You Should Install and Own a Rain Barrel • Space is Limited – Reserve Your Spot Today	9/27/19	3,690	23.8%	0.8%	3.6%
Volunteers Wanted: First Flush & Coastal Cleanup Day!	• First Flush Training • Coastal & Bay Cleanup Day	9/06/19	3,705	22.5%	1.8%	7.8%
🐾 🐶 Do you have a 4-legged fury friend? Here are a few tips and a coupon!	• Reasons Why Picking Up After Your Pet Matters • DoodyCalls Coupon	8/14/19	3,742	22.1%	2.6%	11.7%
We want to hear about what matters most to you!	• Share your Thoughts in this 5-minute Survey	7/30/19	3,701	27.0%	5.8%	21.7%
Getting Your Car Washed in San Mateo County? Here Are a Few Tips and a Coupon!	• Responsible (And Eco-Friendly) Car Washing • Ducky's Car Wash Coupon	7/18/19	3,787	37.3%	6.4%	17.1%

** Industry average open rate is 28.77% and average click rate on articles is 3.99% (source from October 2019)*

SMCWPPP Website Update

During FY 2019/20, SMCWPPP planned, designed, and launched an updated SMCWPPP website (flowstobay.org).

The challenges SMCWPPP experienced with the old website included: its lack of being mobile-friendly; the Drupal content management system (CMS was difficult to use, thus difficult to update content on the site when needed); difficulty faced for each target audience to quickly find what they are seeking; an outdated appearance that is not as aesthetically-pleasing to the viewer compared to current government websites.

The previous website content (links, contact information, and resources) was analyzed and edited to be up-to-date. The various design options for the website were created and then decided upon and the website migrated from Drupal to WordPress. The website redesign incorporated the following principles:

- User-friendly, public-facing look and feel

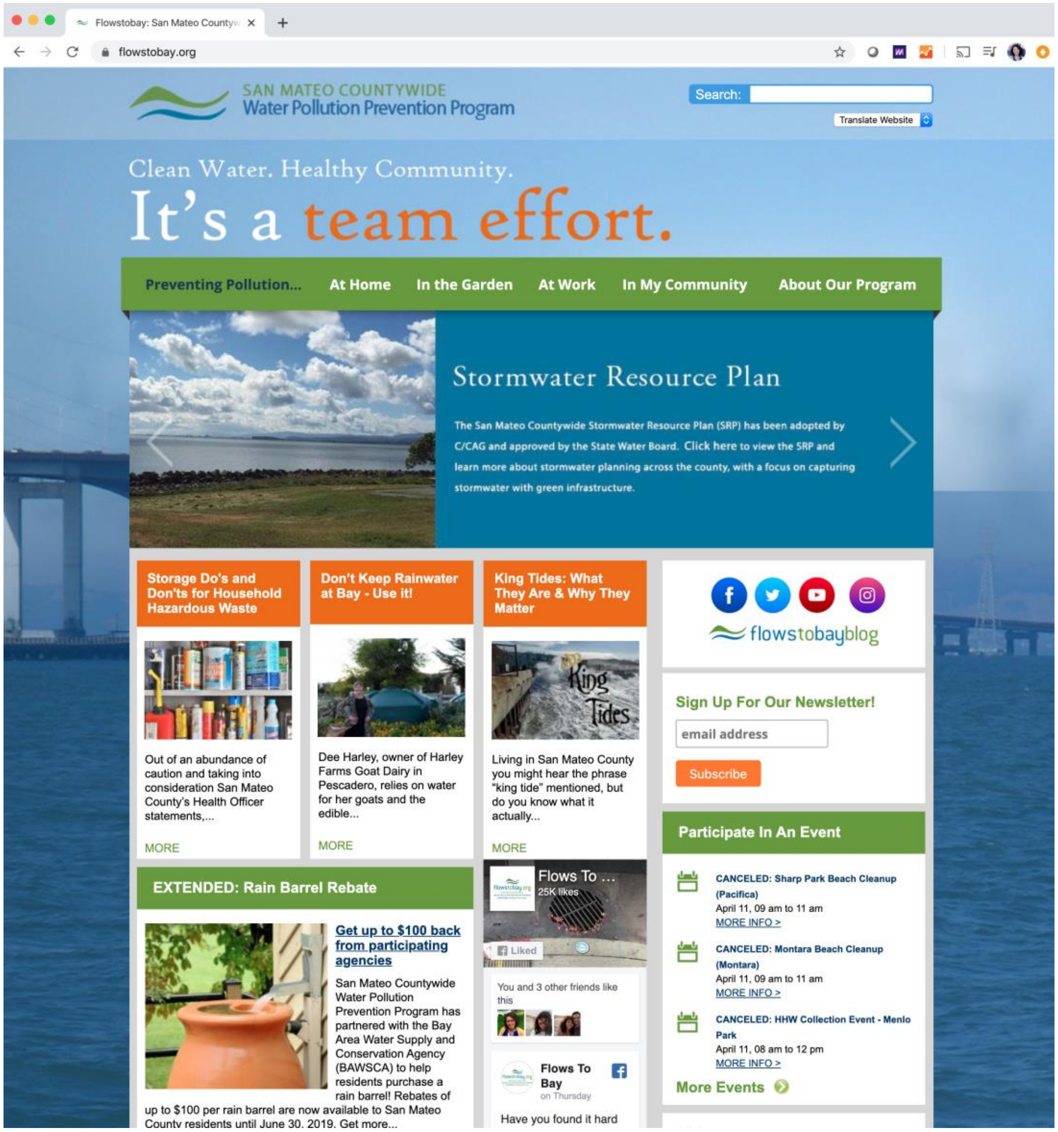
- Responsive design that adapts to visitors using smartphones and tablets, especially since 26% of people who have accessed the website since July 1, 2018 have used mobile and tablet devices.
- Ease of customization for new pages including but not limited to blog posts and calendar updates

Also, the site's web content was restructured and reconfigured to make things easier to find for each target audience that visits the site including residents, businesses, and agency partners; that content features the importance and benefits of stormwater capture and community use. Stock images were used for webpages' featured image and within webpage copy to support its polished and professional aesthetic. The events calendar can have narrow search results by: event category, city, and organizers.

The approach taken to redesign the Flows to Bay website was completed in several phases to ensure the new website fulfills the program's requirements. The phases were:

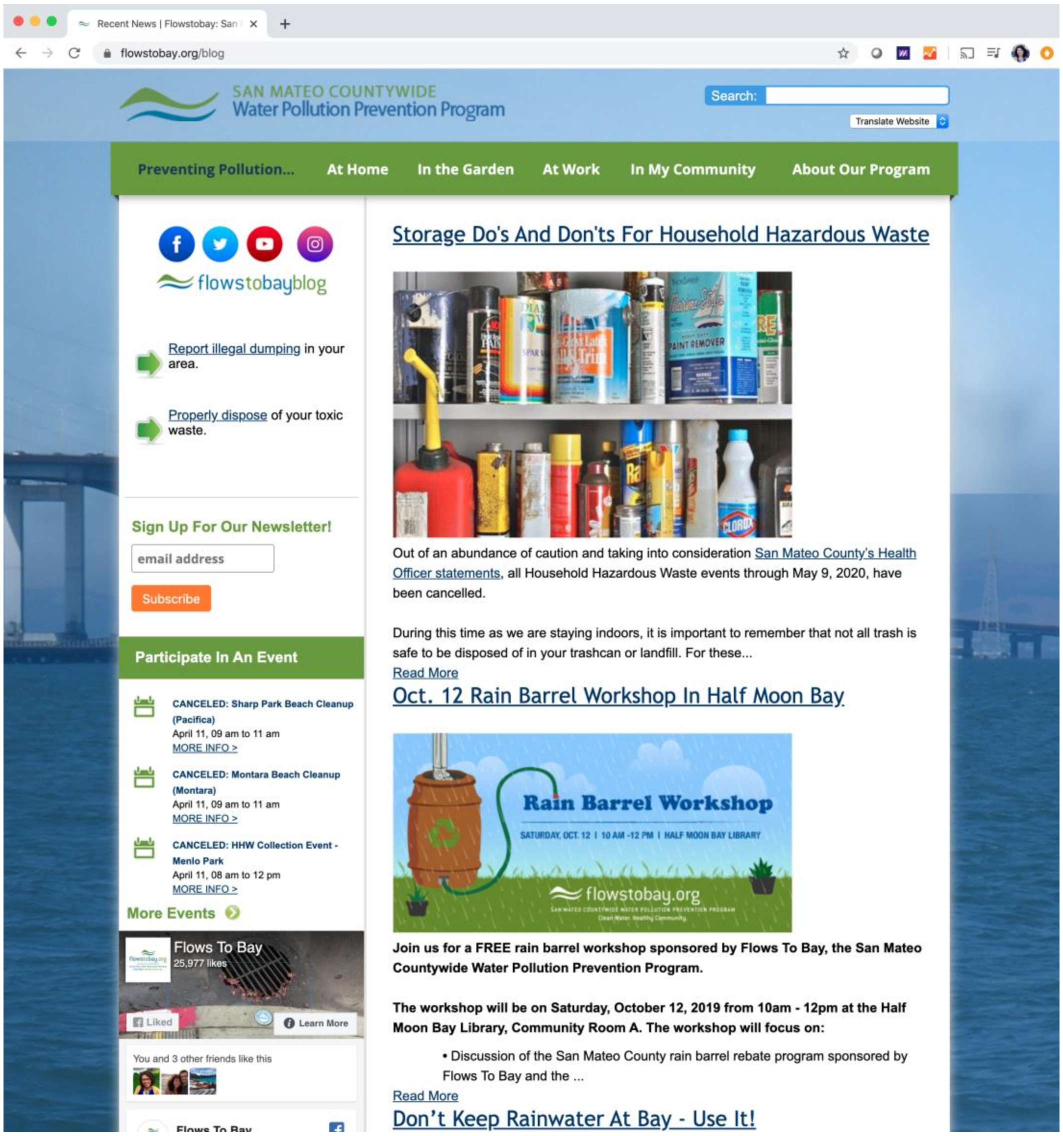
1. Research & Strategy
2. Architecture
3. Design
4. Content Migration/Site Creation
5. Test and Finalize
6. Launch and Post-Launch

Figures 7-14 through 7-16 compare the old website and the new website.



flowstobay.org
SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Search:
Translate Website
Clean Water. Healthy Community.
It's a team effort.
Preventing Pollution... At Home In the Garden At Work In My Community About Our Program
Stormwater Resource Plan
The San Mateo Countywide Stormwater Resource Plan (SRP) has been adopted by C/CAG and approved by the State Water Board. Click here to view the SRP and learn more about stormwater planning across the county, with a focus on capturing stormwater with green infrastructure.
Storage Do's and Don'ts for Household Hazardous Waste
Out of an abundance of caution and taking into consideration San Mateo County's Health Officer statements,...
MORE
Don't Keep Rainwater at Bay - Use it!
Dee Harley, owner of Harley Farms Goat Dairy in Pescadero, relies on water for her goats and the edible...
MORE
King Tides: What They Are & Why They Matter
Living in San Mateo County you might hear the phrase "king tide" mentioned, but do you know what it actually...
MORE
flowstobayblog
Sign Up For Our Newsletter!
email address
Subscribe
Participate In An Event
CANCELED: Sharp Park Beach Cleanup (Pacifica)
April 11, 09 am to 11 am
MORE INFO >
CANCELED: Montara Beach Cleanup (Montara)
April 11, 09 am to 11 am
MORE INFO >
CANCELED: HHW Collection Event - Menlo Park
April 11, 08 am to 12 pm
MORE INFO >
More Events
EXTENDED: Rain Barrel Rebate
Get up to $100 back from participating agencies
San Mateo Countywide Water Pollution Prevention Program has partnered with the Bay Area Water Supply and Conservation Agency (BAWSCA) to help residents purchase a rain barrel! Rebates of up to $100 per rain barrel are now available to San Mateo County residents until June 30, 2019. Get more...
Flows To ...
25K likes
Liked
You and 3 other friends like this
Flows To Bay
on Thursday
Have you found it hard

Figure 7-14. Homepage: Old Website (Top) Compared to the New Website (Bottom).


Recent News | Flowstobay: San
flowstobay.org/blog
SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Search:
Translate Website
Preventing Pollution...
At Home
In the Garden
At Work
In My Community
About Our Program
flowstobayblog
Report illegal dumping in your area.
Properly dispose of your toxic waste.
Sign Up For Our Newsletter!
email address
Subscribe
Participate In An Event
CANCELED: Sharp Park Beach Cleanup (Pacifica)
April 11, 09 am to 11 am
MORE INFO >
CANCELED: Montara Beach Cleanup (Montara)
April 11, 09 am to 11 am
MORE INFO >
CANCELED: HHW Collection Event - Menlo Park
April 11, 08 am to 12 pm
MORE INFO >
More Events
Flows To Bay
25,977 likes
Liked
Learn More
You and 3 other friends like this
Storage Do's And Don'ts For Household Hazardous Waste
Out of an abundance of caution and taking into consideration San Mateo County's Health Officer statements, all Household Hazardous Waste events through May 9, 2020, have been cancelled.
During this time as we are staying indoors, it is important to remember that not all trash is safe to be disposed of in your trashcan or landfill. For these...
Read More
Oct. 12 Rain Barrel Workshop In Half Moon Bay
Rain Barrel Workshop
SATURDAY, OCT. 12 | 10 AM -12 PM | HALF MOON BAY LIBRARY
flowstobay.org
Join us for a FREE rain barrel workshop sponsored by Flows To Bay, the San Mateo Countywide Water Pollution Prevention Program.
The workshop will be on Saturday, October 12, 2019 from 10am - 12pm at the Half Moon Bay Library, Community Room A. The workshop will focus on:
• Discussion of the San Mateo County rain barrel rebate program sponsored by Flows To Bay and the ...
Read More
Don't Keep Rainwater At Bay - Use It!

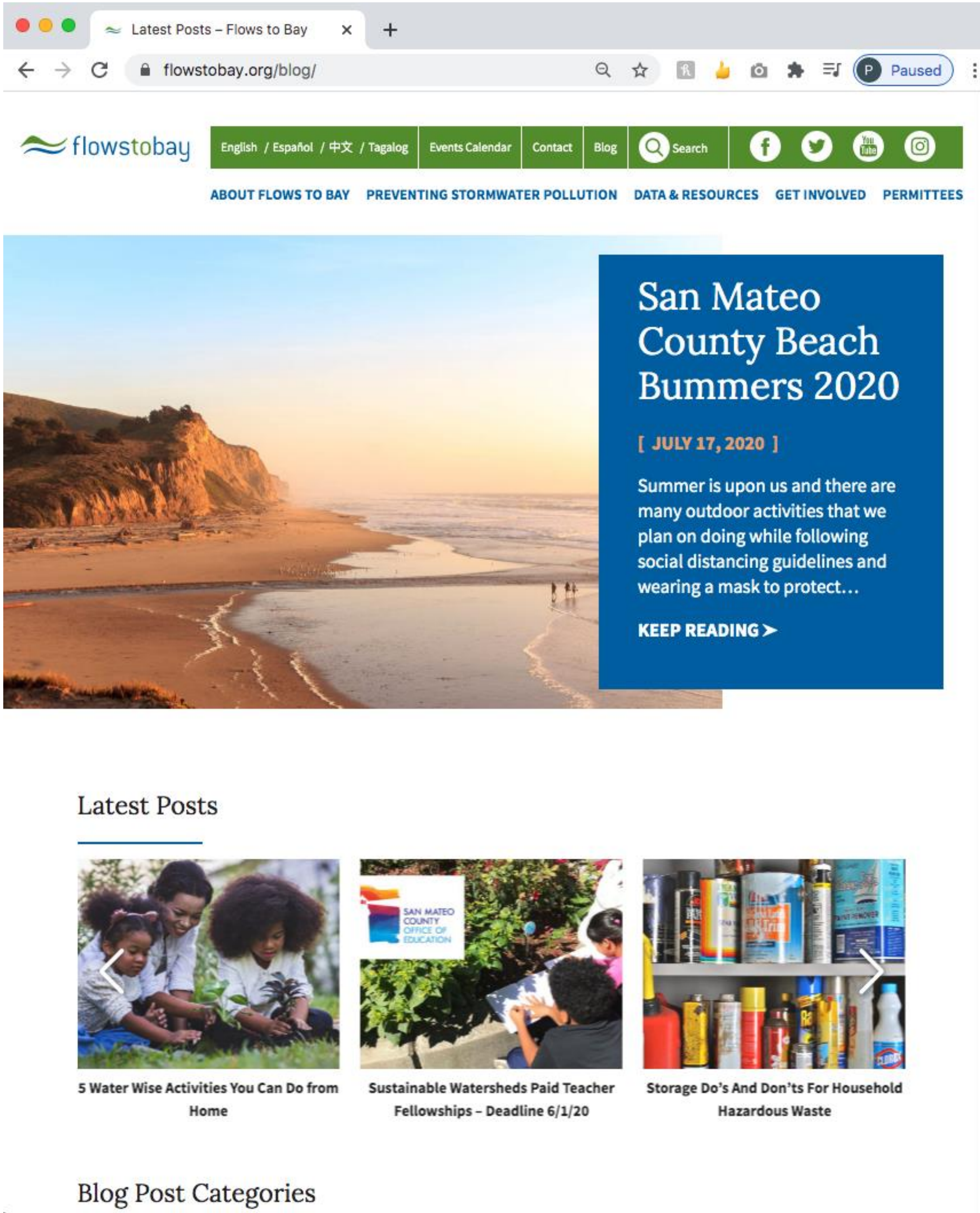
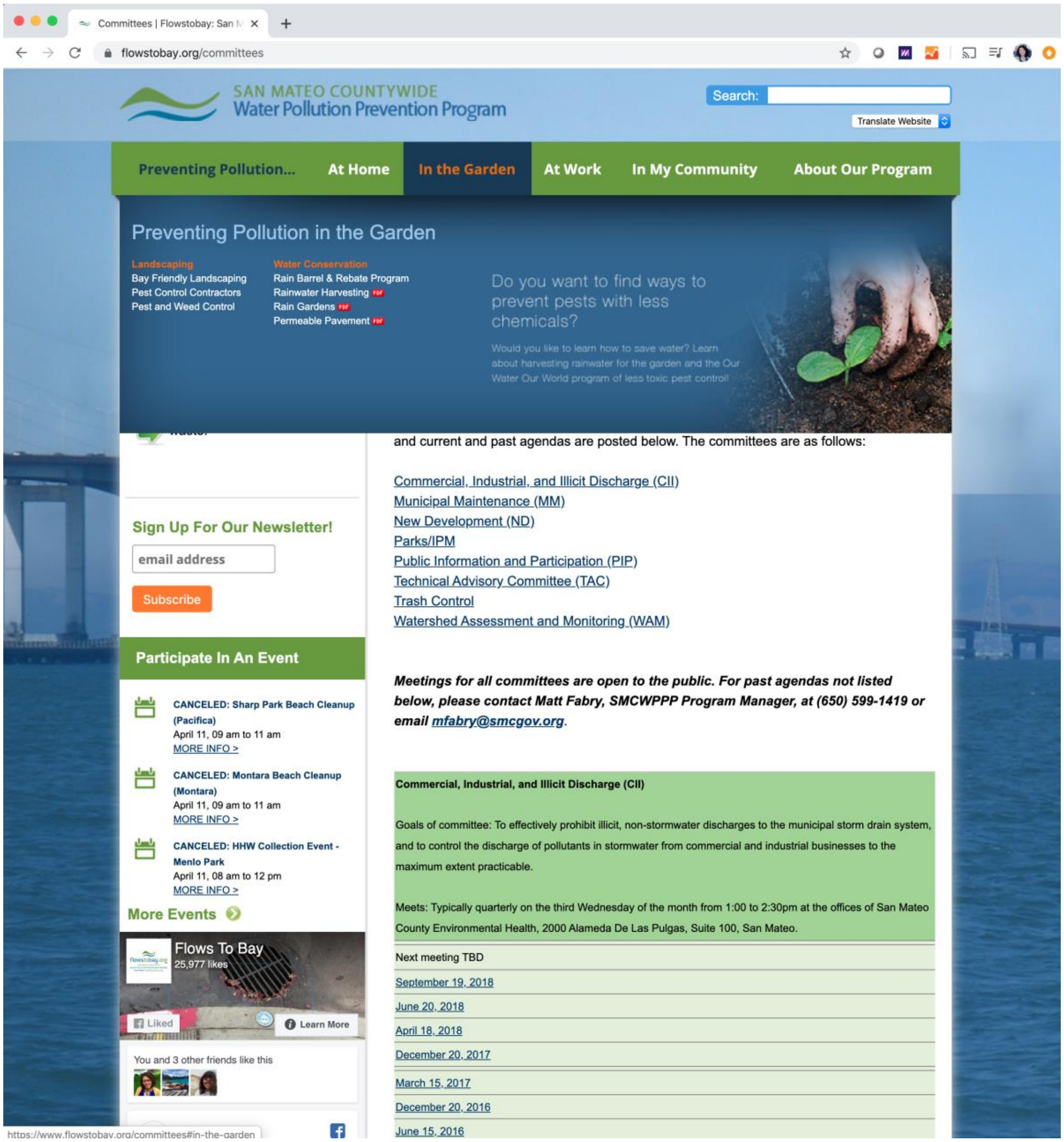
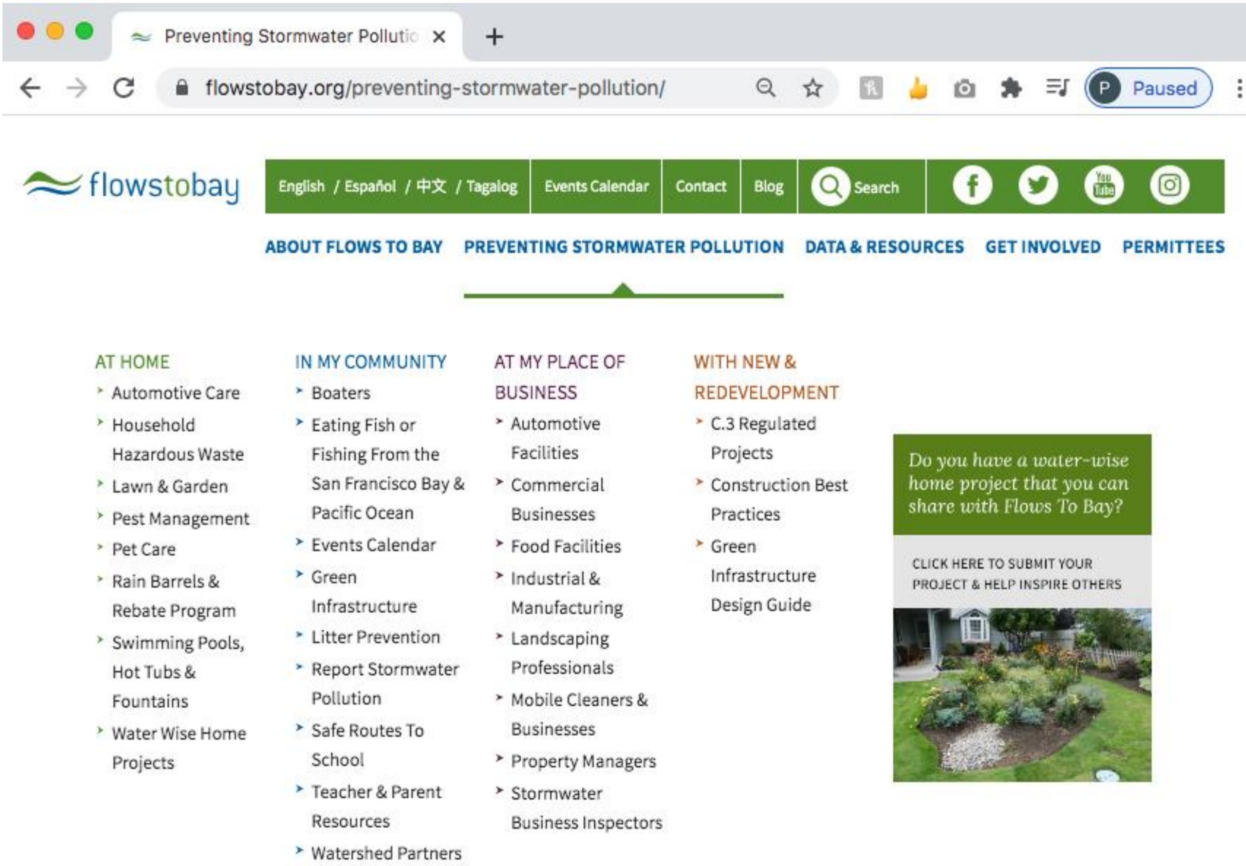


Figure 7-15. Blog Page: Old Website (Top) Compared to the New Website (Bottom).


Committees | Flowstobay: San M
flowstobay.org/committees
SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Search:
Translate Website
Preventing Pollution...
At Home
In the Garden
At Work
In My Community
About Our Program
Preventing Pollution in the Garden
Landscaping
Bay Friendly Landscaping
Pest Control Contractors
Pest and Weed Control
Water Conservation
Rain Barrel & Rebate Program
Rainwater Harvesting
Rain Gardens
Permeable Pavement
Do you want to find ways to prevent pests with less chemicals?
Would you like to learn how to save water? Learn about harvesting rainwater for the garden and the Our Water Our World program of less toxic pest control!
and current and past agendas are posted below. The committees are as follows:
Commercial, Industrial, and Illicit Discharge (CII)
Municipal Maintenance (MM)
New Development (ND)
Parks/IPM
Public Information and Participation (PIP)
Technical Advisory Committee (TAC)
Trash Control
Watershed Assessment and Monitoring (WAM)
Meetings for all committees are open to the public. For past agendas not listed below, please contact Matt Fabry, SMCWPPP Program Manager, at (650) 599-1419 or email mfabry@smcgov.org.
Commercial, Industrial, and Illicit Discharge (CII)
Goals of committee: To effectively prohibit illicit, non-stormwater discharges to the municipal storm drain system, and to control the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable.
Meets: Typically quarterly on the third Wednesday of the month from 1:00 to 2:30pm at the offices of San Mateo County Environmental Health, 2000 Alameda De Las Pulgas, Suite 100, San Mateo.
Next meeting TBD
September 19, 2018
June 20, 2018
April 18, 2018
December 20, 2017
March 15, 2017
December 20, 2016
June 15, 2016
Sign Up For Our Newsletter!
email address
Subscribe
Participate In An Event
CANCELED: Sharp Park Beach Cleanup (Pacifica)
April 11, 09 am to 11 am
MORE INFO >
CANCELED: Montara Beach Cleanup (Montara)
April 11, 09 am to 11 am
MORE INFO >
CANCELED: HHW Collection Event - Menlo Park
April 11, 08 am to 12 pm
MORE INFO >
More Events
Flows To Bay
25,977 likes
Liked
Learn More
You and 3 other friends like this
https://www.flowstobay.org/committees#in-the-garden



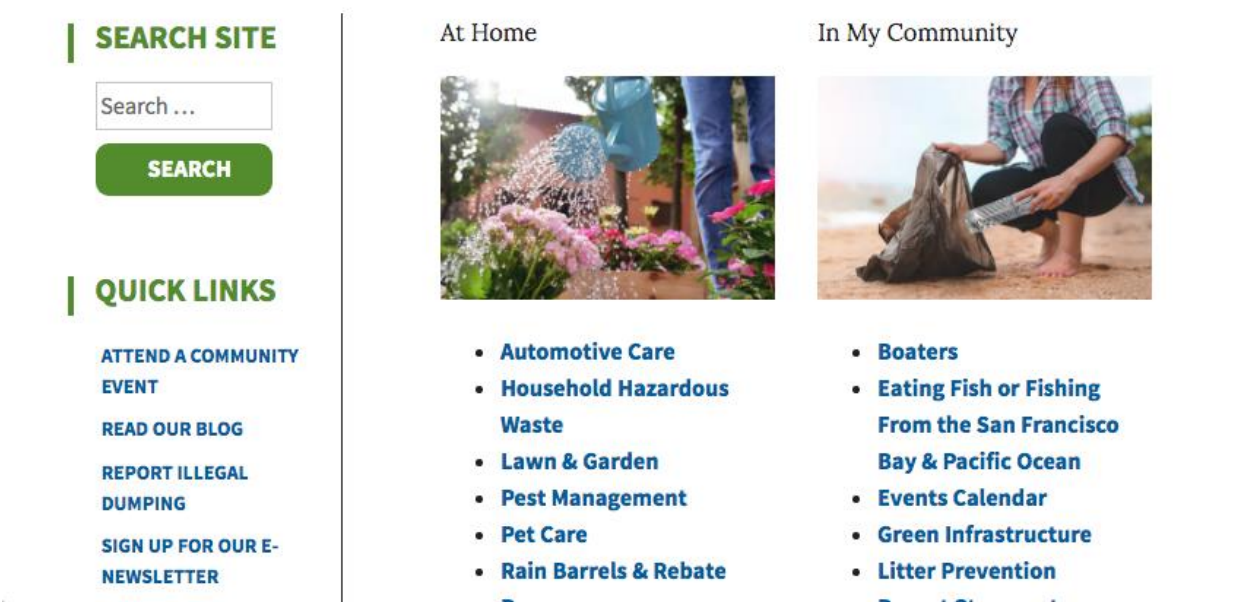


Figure 7-16. Restructuring of Menu to Enhance the User-Experience to Make Items Easier to Find for Each Target Audience: Old Website (Top) Compared to the New Website (Bottom).

To promote SMCWPPP's new, informative, mobile-friendly, and user-friendly website, a variety of strategies were incorporated:

- Facebook Posts and Ads. A Facebook post announced the updated SMCWPPP website (Figure 7-17) and subsequent posts were linked to various pages on the new website to drive traffic to its informative content. Figure 7-18 shows one of the posts.
- E-Newsletter: Sent on 5/12/20, was received by 3,612 recipients, and had an open rate of 24.5%, click through rate of 1.3%, and opened click rate of 5.2% (Figure 7-19).
- Email to all PIP members: Sent on April 23, 2020 and was received by 63 PIP members.
- Google Ads Search Campaign: Launched on 5/1/20 and received 58,714 impressions, 1,250 clicks, and had an average click-through rate of 2.13%. The campaign was based off of particular interests, including IPM, DIY projects, activities for children (due to COVID-19), HHW disposal, etc. The campaign was used to drive traffic to various pages on the new website (Figure 7-20).

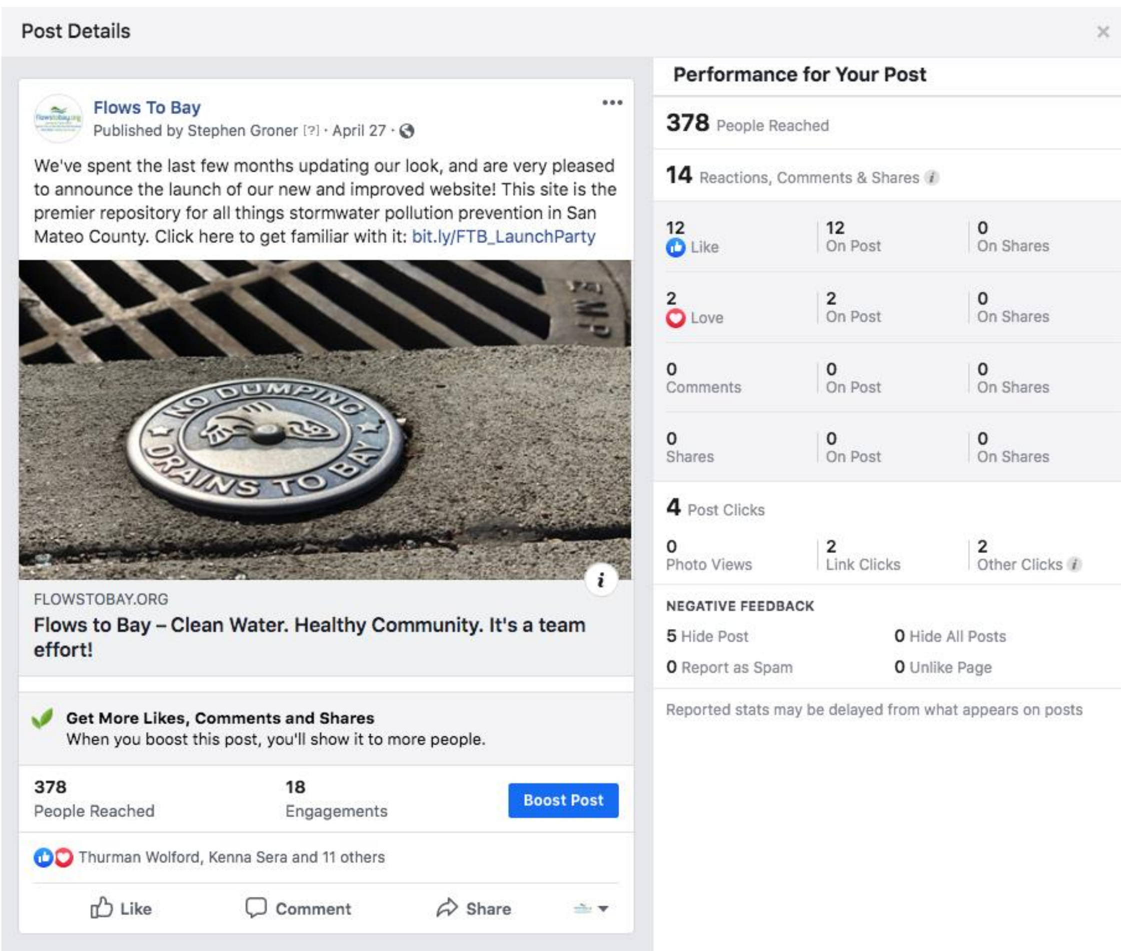


Figure 7-17. Facebook Post Announcing the Updated SMCWPPP Website.

Figure 7-18. Facebook Post Linked to the Updated Website to Drive Traffic to its Informative Content.

View this email in your browser

flowstobay.org

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

Clean Water. Healthy Community.

Two Exciting Announcements

Our New Website | T-Shirt Design Contest

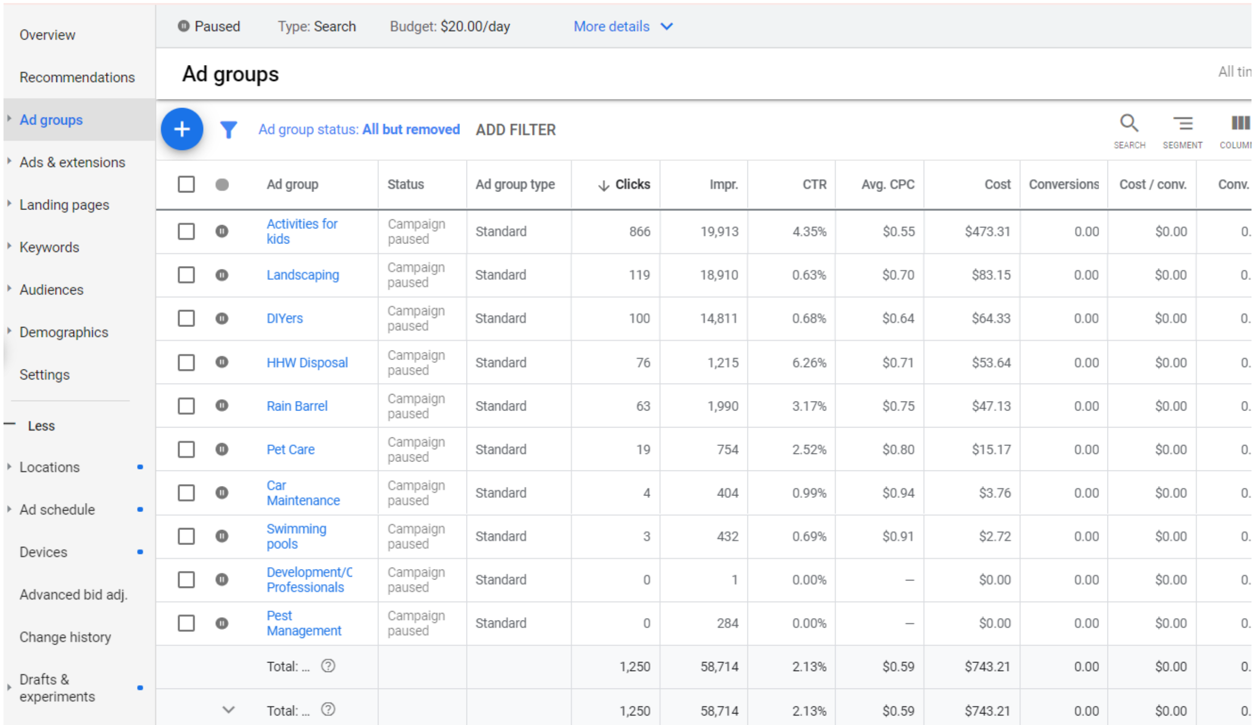
We've been hard at work at revamping the **flowstobay.org** website to provide you more content and resources!

Some of the many features include a filterable **events calendar** (search by event category, city, and event organizer) and webpages to **nominate a Community Champion**, find **water wise home projects**, learn how to **prevent stormwater pollution**, and view new **stormwater related data & resources** and **educational materials**.

That's just a sample of what's new—there's plenty more to see!

Learn more about our new website here

Figure 7-19. Part of the E-Newsletter Announcing the Updated SMCWPPP Website.



Paused Type: Search Budget: $20.00/day More details

Ad groups

Ad group status: All but removed ADD FILTER

Ad group	Status	Ad group type	Clicks	Impr.	CTR	Avg. CPC	Cost	Conversions	Cost / conv.	Conv.
Activities for kids	Campaign paused	Standard	866	19,913	4.35%	$0.55	$473.31	0.00	$0.00	0.
Landscaping	Campaign paused	Standard	119	18,910	0.63%	$0.70	$83.15	0.00	$0.00	0.
DIYers	Campaign paused	Standard	100	14,811	0.68%	$0.64	$64.33	0.00	$0.00	0.
HHW Disposal	Campaign paused	Standard	76	1,215	6.26%	$0.71	$53.64	0.00	$0.00	0.
Rain Barrel	Campaign paused	Standard	63	1,990	3.17%	$0.75	$47.13	0.00	$0.00	0.
Pet Care	Campaign paused	Standard	19	754	2.52%	$0.80	$15.17	0.00	$0.00	0.
Car Maintenance	Campaign paused	Standard	4	404	0.99%	$0.94	$3.76	0.00	$0.00	0.
Swimming pools	Campaign paused	Standard	3	432	0.69%	$0.91	$2.72	0.00	$0.00	0.
Development/C Professionals	Campaign paused	Standard	0	1	0.00%	–	$0.00	0.00	$0.00	0.
Pest Management	Campaign paused	Standard	0	284	0.00%	–	$0.00	0.00	$0.00	0.
Total: ...			1,250	58,714	2.13%	$0.59	$743.21	0.00	$0.00	0.
Total: ...			1,250	58,714	2.13%	$0.59	$743.21	0.00	$0.00	0.

Figure 7-20. Google Ads Search Campaign Driving Traffic to Various Pages on the Updated Website.

After launch, the website was updated several times a month to include new blog posts and add events to a calendar. Regular maintenance and updates were also performed on SMCWPPP's "members only" pages for subcommittee members, such as the PIP Subcommittee and to upload new entries to the form "Current Records for Applicable Structures Being Demolished" on the page "Managing PCBs In Building Materials During Demolition."

Total statistics for website total visits, unique users, pageviews, and other significant website metrics for FY 2019/20 fiscal year are shown in Table 7-8 (examples of website pages are available in Appendix 7).

Table 7-8. Cumulative data for the flowstobay.org website for FY 2019/20, compared to FY2018/19 to express the increased amount of website traffic and activity.

Time Period	Sessions (Total Visits)	Users (Unique)	Page Views (Unique)	New Visitors %	Returning Visitors %	Overall Bounce Rate
July 1, 2019 through June 30, 2020	29,742	21,888	39,963	88.7%	11.3%	60.97%
July 1, 2018 through June 30, 2019	20,839	14,415	29,102	87.3%	12.7%	54.9%

C.7.d. Public Outreach and Citizen Involvement Events

Overview

SMCWPPP directly participated in 13 public outreach events in FY 2019/20 in order to reach a wide array of residents in different parts of the County. SMCWPPP partnered with the UC Master Gardeners of San Mateo & San Francisco Counties to table 7 events throughout the County's hardware stores and held one virtual event with them during the COVID-19 pandemic to safely reach residents during the shelter in place order. There were also three free community rain barrel workshops (two in person, and one online). The first of these was held at the Half Moon Bay Library. The second, a hands-on installation workshop, took place at Tierra Linda elementary school in San Carlos where SMCWPPP installed 2 permanent rain barrels on campus. The third event was done virtually during the COVID-19 pandemic to safely reach residents during the shelter-in-place directive. SMCWPPP also partnered with the San Mateo Resource Conservation District and individual Permittees to distribute outreach materials and promote these events through their own channels. There were an additional eight public outreach and citizen involvement events where SMCWPPP materials were distributed by the San Mateo Resource Conservation District. Table 7-9 provides a breakdown of these events.

SMCWPPP used online channels, such as Facebook and the SMCWPPP website, to promote events and gather volunteers. In addition, SMCWPPP collected a total of 23 signups from San Mateo County residents to join an email marketing program from the events that SMCWPPP coordinated. There was more of an emphasis, however, on one-on-one conversations about stormwater pollution and how residents can help reduce it with 1,572 total personal interactions. Event metrics are shown below.

Event Goals

- Educate residents through personal interaction and educational materials
- Build the existing database of residents interested in stormwater issues
- Provide a platform for residents to engage with SMCWPPP messages
- Develop outreach partnerships with County agencies, NGOs and CBOs
- Promote local cleanup events, such as Coastal Cleanup Day

Outreach Materials

The following SMCWPPP items are given out at outreach events and/or by request provided to Permittees, organizations, and residents in San Mateo County (not including the less-toxic pest control items listed in section C.9.h.ii).

- "You Are the Solution To Water Pollution" pamphlet (English and Spanish)
- Stormwater tip card (English, Mandarin, and Spanish)
- Rain barrel tip card
- BAWSCA Rain barrel rebate card
- Two children's activity books: "Pest or Pal" (OWOW – Our Water, Our World) and "Discover Storm Water"
- Green Infrastructure Fact Sheet
- Dog waste bag canister

- Branded metal straw with rubber tip and cleaner
- Recycled water bottle pens
- Reusable bags
- Sea animal stickers
- Fish carabiners
- Fish erasers

Table 7-9. FY 2019-20 Public Outreach and Citizen Involvement Events and Metrics

Dates	Event Location	Event Name	Type of Event	Estimated Event Attendance	Estimated Reach
8/3/19	San Pedro Valley Park Visitors Center	San Pedro Watershed Coalition Public Meeting	Public Outreach	50	50
8/3/19	Pacifica State Beach	Dog Surfing Competition	Public Outreach	5,000	61
8/17/19	Pescadero	Pescadero Arts and Fun Festival	Public Outreach	5,000	250
8/24/19	San Mateo, Home Depot	Master Gardener Tabling Event	Public Outreach	150	28
8/31/19	Daly City, Home Depot	Master Gardener Tabling Event	Public Outreach	150	22
9/7/19	Colma, Home Depot	Master Gardener Tabling Event	Public Outreach	150	35
9/10/19	Half Moon Bay	RCD First Flush Training	Citizen Involvement + Public Outreach	13	13
9/14/19	Redwood City, Hassett ACE Hardware	Master Gardener Tabling Event	Public Outreach	100	27
9/21/19	San Mateo County	Coastal Cleanup Day	Public Outreach	5,245	500
9/21/19	East Palo Alto, Home Depot	Master Gardener Tabling Event	Public Outreach	200	43
9/28/19	San Mateo, Home Depot	Master Gardener Tabling Event	Public Outreach	150	23
10/5/19	Half Moon Bay, Hassett ACE Hardware	Master Gardener Tabling Event	Public Outreach	100	10
10/12/19	Half Moon Bay	Rain Barrel Workshop	Citizen Involvement + Public Outreach	29	29
11/2/19	San Carlos	Rain Barrel Installation Workshop	Citizen Involvement + Public Outreach	39	39

Dates	Event Location	Event Name	Type of Event	Estimated Event Attendance	Estimated Reach
11/26/19	San Mateo County (Midcoast)	First Flush Event	Citizen Involvement	13	13
1/26/20	Millbrae	Millbrae Lunar New Year Festival	Public Outreach	1,000	101
2/1/20	Redwood City	Redwood City Lunar New Year Festival	Public Outreach	1,000	90
2/20/20	Half Moon Bay	First Flush Results Presentation	Citizen Involvement + Public Outreach	27	27
2/22/20	East Palo Alto	Cardenas Market Pop-Up		150	40
3/18/20	Online	First Flush Results Presentation	Public Outreach	28	28
5/16/20	Online	Master Gardener Q&A Webinar	Citizen Involvement + Public Outreach	143	143

**Events highlighted in grey were attended by the San Mateo Resource Conservation District where SMCWPPP outreach materials were distributed or referenced.*

C.7.e. Watershed Stewardship Collaborative Efforts

Rain Barrel Rebate Program

During FY 2019/20, SMCWPPP continued its partnership with BAWSCA to promote a countywide rain barrel rebate program and inspire San Mateo County residents to join the rainwater harvesting movement and to help promote other water conservation events. The program subsidizes the cost of purchasing a rain barrel by providing rebates up to $100. As part of this collaborative effort, SMCWPPP:

- Promoted 26 social media posts about rain barrels and rebate related information;
- Hosted 3 separate rain barrel workshops where the BAWSCA rebate and partnership with SMCWPPP was discussed in detail;
- Created and launched online paid ads to bring awareness to the rebate program;
- Sent multiple communications to over 4,000 Flowstobay newsletter subscribers about the BAWSCA program; and
- Promoted various BAWSCA events taking place in San Mateo County or online.

In FY 2019/20, a total of 33 rain barrel rebates were issued from 27 rain barrel applications. Over 2,000 rain barrels have been installed to-date in San Mateo County under the rebate program. There was a total of 29 posts online regarding rain barrel related factoids, rain barrel rebate information, and promoting the three rain barrel workshops we held throughout the year. A total of 13,544 impressions and 1,039 engagements (which includes links, comments, or post shares) were received. The impression figure provides a sense of awareness while the engagement count indicates how many people interacted or engaged with the post, displaying an even greater awareness. The rain barrel and rebate page on the outreach website (flowstobay.org) which highlighted the BAWSCA rebate program achieved a total of 4,443 pageviews and of these 87% were unique pageviews. The average time visitors spent on that particular page was 4 minutes and 58 seconds. In terms of evaluation, the number of unique pageviews means that we were able to broaden and expand the reach of the audience, attracting almost 4,000 new members of the San Mateo County community that hadn't previously visited the rain barrel and rebate page, speaking to the increase in awareness. The time spent on the page, especially in comparison to the average time of 2:47 on the site total, speaks to the visitors intentions and attitudes. The number of link clicks (226) to the BAWSCA website to apply for the rebate (Figure 7-7), shows not only interest and intention, but also demonstrates that beginning stages of behavior change.

Workshop attendance and post-workshop surveys

Between the three workshops which the BAWSCA rain barrel rebate was spotlighted, 209 residents representing 18 of 20 jurisdictions within San Mateo County attended. Workshop attendees were asked to fill out a survey designed to gauge previous knowledge of rain barrels and how helpful the attendees found the workshop. For the question "How likely are you to purchase/use a rain barrel within the next 12 months?" 73% of survey takers expressed that they were likely to very likely to purchase or use a rain barrel within the next 12 months, while only 1% indicated they were not at all likely. Full survey results and questions can be found in Appendix 7.

In FY 2019/20, a total of 33 rain barrel rebates were issued from 27 applications. This was a 36% decrease from the previous year's efforts. This decline in rebate applications does not align with the impressions, webpage visitors, clicks to the BAWSCA webpage, or information gathered from workshop surveys. SMCWPPP hypothesizes that there may be additional behavior change barriers involved in the actual rebate application. Another possible explanation is that the incentive amount is too small for the amount of work needed to apply for the rebate.

Social Media on Behalf of Partners

As part of SMCWPPP's watershed stewardship collaborative efforts, content was posted on SMCWPPP's Facebook social media platform. Requests from partners to post and promote their messaging to SMCWPPP's social media platforms included the following:

- Partner Event Promotion: 12 posts
- Battery Recycling Promotion: 1 post
- Wash Water Pollution Prevention: 8 posts
- Clean Water Pathways Teacher Fellowship: 6 posts

Figure 7-21 presents some examples of FY 2019/20 Facebook Posts on Behalf of Partners.

Post Preview

Actions

Flows To Bay
October 18, 2019 ·

Need help figuring out how to turn your yard into a serene, pollinator-friendly habitat? Join our friends at the Millbrae Library on Wednesday, Oct. 23 evening for a free workshop! Copy and paste this link into your browser to find the event and register: http://bawsca.org/conserve/programs/events

FREE Landscape Class

Bought to you by:

BAWSCA

MILLBRAE

Friends of the Millbrae Library

Native Plant & Pollinator Gardens Workshop

October 23, 2019
7:00 pm - 9:00 pm

Millbrae library

- Create a native plant pollinator garden and habitat.
- Learn how to create a landscape plan, what plants to use, and how to maintain the garden.
- Incorporating native wildflowers, shrubs, and trees into landscapes conserves water and promotes local biological diversity and provides shelter and food for a diversity of wildlife.

Attend and enter a raffle for free native plants!

RSVP: www.bawsca.org or 650-349-3000

326
People Reached

11
Engagements

Boost Post

Sarah Ramstetter Coffey, Samantha Spare and 2 others

1 Share

Like Comment Share

Performance for Your Post

Reported stats may be delayed from what appears on posts.

326
People Reached

7
Reactions, Comments & Shares

6 Like	0 Wow	0 Love
0 Haha	0 Sad	0 Angry
0 Comments	1 Shares	

4
Post Clicks

2 Photo Views	0 Link Clicks	2 Other Clicks

Negative Feedback

1 Hide Post	0 Hide All Posts	0 Report as Spam
0 Unlike Page		

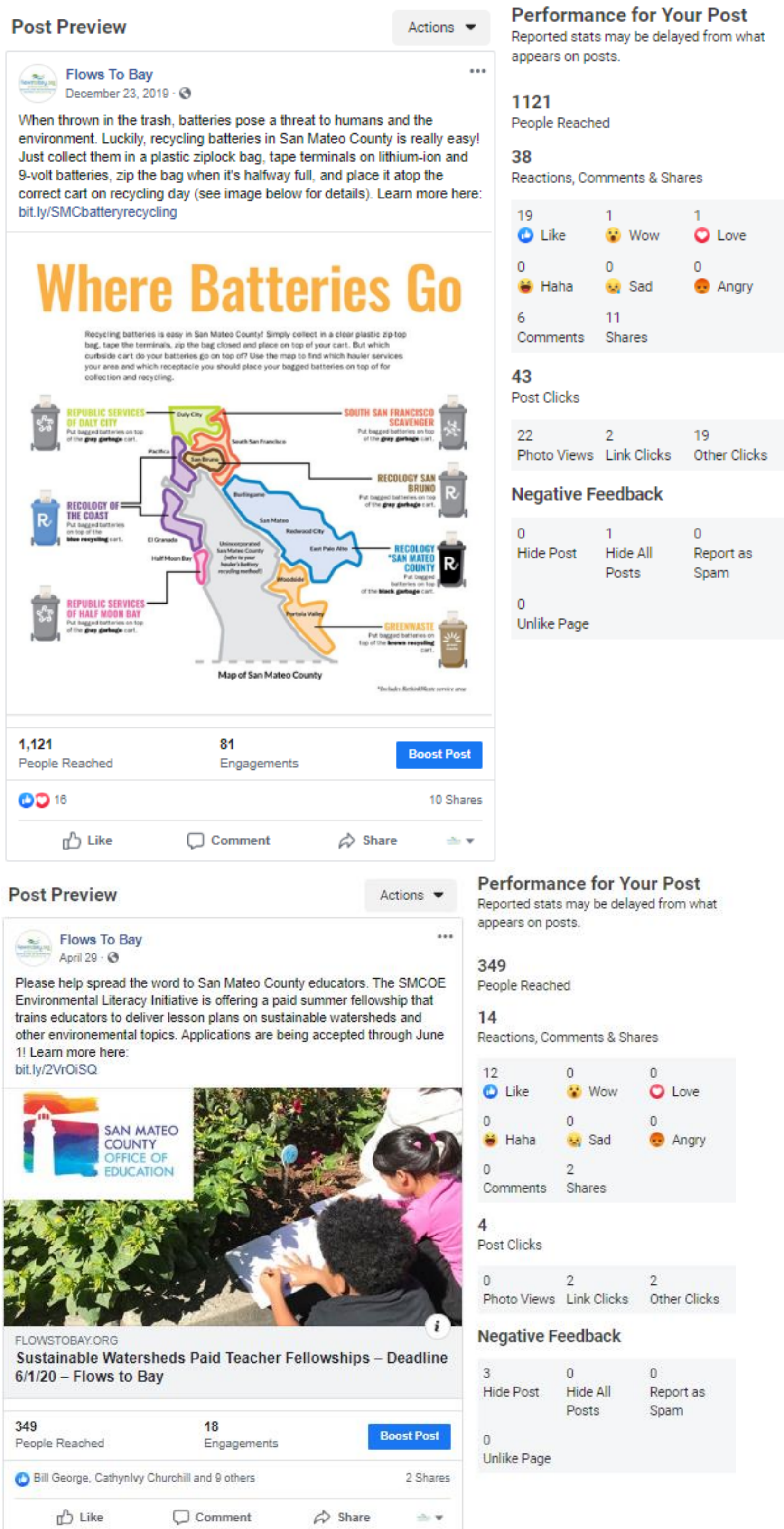


Figure 7-21. Examples of FY 2019/20 Facebook Posts on Behalf of Partners.

C.7.f. School-Age Children Outreach

Overview

During FY 2019/20, SMCWPPP partnered with the San Mateo County Office of Education (SMCOE). The collaboration between the SMCOE and SMCWPPP, and the funding from SMCWPPP, provided the opportunity for the SMCOE to pilot a topical strand for water in the SMELC Teacher Fellowship Program. This strand was referred to as the "Clean Water Teacher Fellowship Program." The fellowship was a semester-long professional learning program that supported teachers at each grade-band level (K-2, 3-5, 6-8, 9-12) to develop and implement comprehensive, standards-aligned, project-based learning units. The focus of the water strand was on the environmental, social, and economic issues related to the water system. Solutionary Units of Study were grounded in developing student awareness of the problems and issues associated with the water system and culminated with students engaging in civic action. Teachers were awarded a $500 stipend for completion of the following requirements:

- Summer Institute Training: 3 Days
- Guided Implementation: Working with a coach to develop and implement a Solutionary Unit of Study with students
- Deliverables: Completing a unit write-up and capstone presentation at the completion of the program in February

During the pilot program, a total of 14 fellows were recruited to participate in the summer training, with six fellows completing the program with pollution prevention projects in San Mateo County. Recruitment included a mailer, multiple email blasts, and outreach to district curriculum and instruction, principals, and department heads. The six fellows who completed the program meeting all the requirements for this grant came from the districts and grade levels listed in Table 7-10.

Table 7-10. Teachers Who Participated in the Clean Water Pathways Program

Teacher Name	Grades Taught	School District	# of Students Reached
James Anderson	6-7 Social Studies	San Mateo-Foster City SD	185
Oceane Stanek	4 All Science	San Mateo-Foster City SD	27
Racquel Fiz	K-1 All	Redwood City SD	20
Christopher Reily	1 All	Ravenswood SD	29
Kristin Duriseti	9-12 Math	Sequoia Union HSD	24
Charlene Calaunan	4-8 Math	Private – Millbrae	15
			300 Total Students

Survey results showed that for those who completed the program, it was highly successful with 85% reporting the program was extremely effective and the remaining 15% reporting it was very effective.

A few quotes from participants on the final survey:

- "This project was so powerful for our students. They loved being given the opportunity to find solutions to a problem and make an impact on our community."
- "This program has inspired me to incorporate environmental education into all content areas, not just science."

- "Marine Science Institute and the Pollution Prevention Program were wonderful community partners to work with. They made information available, answered questions, and were kind to the students. I will work with these partners in the future."
- "This was a wonderful opportunity and I learned a lot; I am grateful for the learning and sharing of ideas. I feel quite isolated on my school site (lack of teamwork and administrative support) so it was very refreshing to discuss ideas and points of view with other teachers during summer institute ;) Thank You!"
- "Thank you for the opportunity to sit, reflect, and put my unit into action. Thank you for my teaching practice and for my students."
- "This was a really valuable experience as it allowed me to provide my students with a unique opportunity that they would not have been able to have with the traditional curriculum."
- "Thank you for the very well developed summer institute, and program. It is very nice that the follow up has a stipend. It all was extremely well thought out and organized!"
- "I thought the support provided by my instructional coach was super helpful. It allowed me to develop ideas I had swimming around in my head but could not quite make concrete."

It should also be noted that the remaining fellows did complete the program, but were either out of San Mateo County, or did not do a stormwater pollution prevention project in the solutionary phase. Additionally, the other "Science and the Environment" SMELC Teacher Fellowship had 12 teachers focus on the topic of water, with ten who focused specifically on pollution prevention content and projects.
Benefits to teachers were promoted as the following:

- A $500 stipend upon completion of the program
- A deep understanding of the environmental, social, and economic issues related to stormwater pollution prevention
- The confidence and ability to successfully use problem-based learning strategies, including: inquiry, systems thinking, and civic engagement
- Connection with local stormwater community-based organizations, and hands-on experiences to enhance classroom teaching
- Increased student engagement and comprehension, and greater and lasting educational impact on your students
- The tools and resources to make a significant impact in your school community towards cleaner waterways
- The chance to collaborate and share best practices with fellow teachers within their cohort

C.7.g. Outreach to Municipal Officials

SMCWPPP has conducted the following outreach to municipal officials (e.g., elected officials, city/county managers etc.) to inform them about Green Infrastructure and other activities being implemented to meet MRP requirements:

- Outreach to municipal officials in regard to presentations to the C/CAG Board
  - Annual Stormwater Program update to the C/CAG Board in October 2019, including a summary of C/CAG's multi-pronged approach to green infrastructure implementation (site level LID, green streets, regional projects). The Board received specific information on efforts to advance green infrastructure with the updated GI Design Guide and C.3 Regulated Projects Guide, Green Infrastructure Modeling for the RAA, development of regional project designs at several sites with $2.4 million in State grant funds, continued work on the Sustainable Streets Master Plan (including an analysis of future runoff impacts related to climate change) and the 10 C/CAG-funded Safe Routes to School and Green Streets Infrastructure Projects.
- Outreach to municipal staff related to the Sustainable Streets Master planning activities
  - Four quarterly updates to the New Development/Green Infrastructure Subcommittee, providing status updates and opportunities for municipal staff to engage with project deliverables, including reviewing the approach to developing model sustainable streets policies and providing review/comment on draft technical memorandums for the climate adaptation and green infrastructure analysis and project opportunity identification and prioritization methodology and related prioritization outputs.
  - Six Stormwater Committee meetings, including updates to the municipal Public Works Directors on the Countywide Green Infrastructure Reasonable Assurance Analysis reports and project updates for the Sustainable Streets Master Plan.

FUTURE ACTIONS

In FY 2020/21, SMCWPPP plans to continue working with the PIP Subcommittee to conduct the following activities to assist member agencies to comply with MRP Provision C.7:

- Continue to grow the reach, engagement, and following of SMCWPPP's Facebook account with posts and advertisements while starting engagement on a new social media platform, Instagram, to help reach a different segment of the San Mateo County audience;
- Promote county outreach events through the website and social media;
- Continue facilitating online virtual events while COVID-19 continues to be a challenge for in-person events and outreach;
- Maintain and update SMCWPPP's website to revise and update the content;
- Continue outreach and promotion of stormwater messaging through the e-newsletter, one of the top performing platforms;
- Growing SMCWPPP's e-newsletter subscribership numbers through cross-promotion on the website, social media platforms, giveaways, contests, and paid advertising media;

- Support the new tiered Rain Barrel Rebate Program pilot and Rain Garden Rebate program in partnership with BAWSCA, with C/CAG providing ongoing funding;
- Extend rain barrel rebate contributions to a tiered system that increases monetary incentives for larger rain barrel systems. SMCWPPP will work with the lead agency, BAWSCA, to adjust the application system to make it easier to apply. To promote this new and restructured rebate and campaign, there will also be a countywide digital ad campaign and supplemental workshops to educate the public.
- Spearhead a Green Streets Stewards Youth Pilot Program to encourage learning, stewardship, and cleanup efforts of green infrastructure facilities throughout San Mateo County;
- Create a comprehensive program that shares eco-friendly and stormwater pollution prevention practices, rebates and educational workshops with residents; and
- Build upon a partnership with the San Mateo County Office of Education to expand the school outreach program and become a staple within San Mateo County schools and curriculum.

SECTION 8
C.8 WATER QUALITY MONITORING

On behalf of its member agencies, SMCWPPP performs water quality monitoring activities in compliance with MRP Provision C.8. Some of this work is accomplished through participation in BASMAA regional projects. Per Provision C.8, a complete documentation of all water quality monitoring data collected from October 1, 2019 through September 30, 2020 (i.e., Water Year 2020 or WY 2020) will be presented in SMCWPPP's Urban Creeks Monitoring Report, which will be submitted to the Regional Water Board by March 31, 2021.

In addition, in accordance with MRP Provision C.8.f., Pollutants of Concern (POC) Monitoring, SMCWPPP will submit by October 15, 2020 a report describing the POC Monitoring tasks accomplished in WY 2020 and the planned allocation of sampling effort for POC Monitoring in WY 2021. The report will include monitoring locations, number and types of samples collected, a description of the objectives of the sampling (i.e., management question addressed), and the analytes measured. However, per Provision C.8.h., the results of the monitoring will not be included, but instead will be documented in the Urban Creeks Monitoring Report, as described above.

SECTION 9
C.9 PESTICIDE TOXICITY CONTROLS

INTRODUCTION

The primary objective of MRP Provision C.9 Pesticides Toxicity Control is to prevent the impairment of urban streams by pesticide-related toxicity. As such, Provision C.9 helps implement the *TMDL for Diazinon and Pesticide-related Toxicity for Urban Creeks* in the San Francisco Bay region. Permittees are required to implement a pesticide toxicity control program that addresses their own use of pesticides and use by others within their jurisdictions. The focus is on pesticides that pose a threat to water quality, including applications with the potential to enter the municipal stormwater conveyance system.

Most MRP-required Provision C.9 tasks are implemented individually by each San Mateo County Permittee. 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 is coordinated through SMCWPPP's Parks Maintenance and Integrated Pest Management (IPM) Work Group. The exception is Provision C.9.h, the public outreach portion of Provision C.9, which is implemented through the SMCWPPP Public Information and Participation (PIP) component.

IMPLEMENTATION OF MRP PROVISIONS

During FY 2019/20, SMCWPPP performed a number of tasks to assist San Mateo County Permittees with implementation of Provision C.9, with input and assistance provided by the Parks Maintenance and IPM Work Group. SMCWPPP's accomplishments included the following:

- Held one meeting of the Parks Maintenance and IPM Work Group;
- Conducted SMCWPPP's Annual Landscape IPM Training Workshop in March 2020.
- Continued coordinating with San Mateo County Agriculture / Weights and Measures staff;
- Participated in relevant BASMAA and CASQA activities;
- Continued to maintain retail partnerships at 10 top-tier stores (e.g., Home Depot and Hassett Ace Hardware) within San Mateo County. Tasks included ordering materials, organizing outreach collateral, checking in with store managers, and providing outreach to residents.
- Conducted outreach at community events to educate customers about less toxic alternatives to commercial pesticides and fertilizers. Conducted seven in-store tabling events for store customers.
- Facilitated an online webinar where residents were able to submit questions and discuss less toxic solutions to their specific pest problems with experts at the UC Master Gardeners of San Mateo and San Francisco Counties.

- Conducted outreach to all pest control operators in San Mateo County and created a database of active-licensed operators, a list of their IPM certifications, and contact information.
- Presented at ReScape Landscape Maintenance Qualification Training in Redwood City on November 7 - 15, featuring ReScape regenerative landscape best practices and training for landscape maintenance to reduce the need for use of pesticides.

More information on each of these accomplishments is provided below.

Parks Maintenance and IPM Work Group

The Parks Maintenance and IPM Work Group provides the opportunity for sharing information about MRP Provision C.9 requirements and approaches for achieving compliance. Richard Holtz from the City of Burlingame chaired the work group. The Parks Maintenance and IPM Work Group met one time in FY 2019/20. The attendance list is included in Appendix 9.

Coordination with San Mateo County Department of Agriculture

As in past years, San Mateo County Agriculture / Weights and Measures staff attended the FY 2019/20 meeting of the Parks Maintenance and IPM Work Group and received information on water quality issues and the MRP. In addition, SMCWPPP worked closely with San Mateo County Agriculture / Weights and Measures staff to provide Department of Pesticide Regulations Continuing Education Credits for participants in the Landscape IPM Workshop.

Seventeenth Annual Landscape Integrated Pest Management Workshop

The seventeenth Annual SMCWPPP Landscape IPM Workshop was held on March 3, 2020 at the City of Foster City's Library Community Center. The workshop was attended by 64 municipal staff and contractors and covered the following topics:

- Pesticides and Water Quality
- Soil Management for Weed Control
- Using Goats for Vegetation Management in Urban Landscapes
- Spring Applications for Landscape and Tree Care
- Regulatory Update and Common Violations

Evaluation forms completed by the workshop's attendees included many positive comments and indicated that overall, the workshop met expectations. Appendix 9 includes the workshop agenda, attendance list and a summary of the evaluations. Other workshop materials are available on the SMCWPPP website (flowstobay.org).

SMCWPPP also presented at the ReScape Landscape Maintenance Qualification Training in Redwood City on November 7 - 15, 2019, featuring ReScape regenerative landscape best practices and training for landscape maintenance to reduce the need for use of pesticides.

Pesticide Tracking Template

In FY 2016/17, SMCWPPP developed a template in Excel to assist with pesticide tracking and reporting requirements in MRP Provision C.9.a. The pesticides tracking template utilizes a lookup list of pesticides and active ingredients compiled from data tables available on the Department of Pesticide Regulation (DPR) website. The template was updated during FY 2019/20 with the current two years of pesticide product data from the DPR website.

Participation in BASMAA and CASQA

MRP Provision C.9.f requires Permittees to track and participate in regulatory processes relevant to pesticide toxicity control. During FY 2019/20, SMCWPPP accomplished this task by working with BASMAA and CASQA. For additional information, see *Pesticides Subcommittee Annual Report and Effectiveness Assessment - 2019-2020, California Stormwater Quality Association, Final Report, August 2020* (Appendix 13). In addition, SMCWPPP staff stayed current with pesticide controls and regulatory efforts by participating in selected CASQA Pesticide Committee meetings.

Point of Purchase Outreach

SMCWPPP conducted point-of-purchase outreach to home improvement store consumers at frequently visited stores (e.g., Home Depot and Hassett Ace Hardware), providing tips to residents about the proper use and disposal of pesticides and other lawn and garden chemicals. Through a partnership with experts at the UC Master Gardeners of San Mateo and San Francisco Counties, SMCWPPP was able to provide the public with a credible and reliable source of information at these tabling events. Master Gardeners educated consumers about proper pesticide use, less toxic pesticide options, and effective alternatives to pesticides. Tabling events were held at larger store locations to optimize the outreach effort (Figure 9-1). The COVID-19 shelter-in-place order forced the cancellation of three tabling events, but SMCWPPP coordinated, promoted, and executed an online event with the Master Gardeners instead. Both tabling events and the online event were promoted via Facebook, by the SMCWPPP event calendar, and through the PIP Subcommittee members.

SMCWPPP's in-store tabling events consisted of educating consumers about: (1) stormwater runoff, (2) the role residents play in reducing pesticide use, (3) the less toxic pesticides sold in the store, and (4) proper usage of pesticides and current pest problems and less toxic solutions to these problems. A total of 188 consumers were engaged with directly. Table 9-1 lists information from the seven in-person tabling events and the one online event held during FY 2019/20.

During the in-person tabling events, program materials were provided directly to the public via point-of-purchase displays, a time when residents may be most receptive to hearing the message. Additionally, shelf talkers were placed next to products that have been certified as "less-toxic" by the Our Water Our World (OWOW) program. All of these efforts helped to promote the regional OWOW program. Table 9-2 lists the 10 San Mateo County stores that currently participate in the OWOW point-of-purchase program.

The online educational event featured an expert panel of four Master Gardeners who fielded both pre-submitted and live questions from workshop attendees. Before the workshop, SMCWPPP worked with member agencies to promote the event and created a landing page where registrants could pre-submit questions. Following the event, SMCWPPP created a permanent webpage to host a complete list of all of the questions asked by residents and the subsequent answers provided by the Master Gardeners, as well as links to resources related to Integrated Pest Management, proper plant care, and water pollution prevention tips.

Table 9-1. FY 2019/20 San Mateo County IPM in-Store Tabling Events & Online Webinar

Store	Date of Tabling Event	Number of People Reached	Number of Surveys Taken
Home Depot, San Mateo	08/24/2019	28	N/A
Home Depot, Daly City	08/31/2019	22	10
Home Depot, Colma	09/07/2019	35	10
Hassett Hardware, Redwood City	09/14/2019	27	10
Home Depot, East Palo Alto	09/21/2019	43	5
Home Depot, San Mateo	09/28/2019	23	10
Hassett Hardware, Half Moon Bay	10/05/2019	10	4
Online: Master Gardener Q&A Webinar	06/13/2020	35	15

Table 9-2. FY 2019/20 San Mateo County Participating OWOW Hardware Stores

Store Name	Address	City
Brisbane Hardware	1 Visitacion Ave.	Brisbane
Hassett Ace Hardware	1029 Alameda de las Pulgas	Belmont
Hassett Ace Hardware	545 1st Ave.	San Mateo
Hassett Ace Hardware	111 Main St.	Half Moon Bay
Hassett Ace Hardware	282 Woodside Plaza	Redwood City
Home Depot	2 Colma Blvd.	Colma
Home Depot	303 Lake Merced Blvd.	Daly City
Home Depot	1781 E Bayshore Rd.	East Palo Alto
Home Depot	2001 Chess Dr.	San Mateo
Lyngso Garden Materials, Inc	345 Shoreway Rd.	San Carlos


Recording
Speaker View
Pre-Submitted Questions:
"Apparently rats are our biggest garden pest. Is there any way we can stop them without spending more than our produce is worth?"
"How do I protect fruit from vermin? Netting did not seem to help unless it was wrapped so thickly that sunlight could barely get through."
Susan
Barbara Cohrssen
Janice Moody
Igor Lacan
Participants (39)
Panelists (6)
Attendees (33)
Search
Total 2 phone call-in listeners
14153005920
16502833132
Alessa Therapeutics
ally
betsy
brit
Carla Teehankee
caryl
catherine
christina
cynthia knowles
Donna
Doreen
Gina
Helen
Lower All Hands
Unmute
Start Video
Participants
Chat
Share Screen
Polling
Record
Q&A
Leave


flowstobay
TIPS
SAN MATEO COUNTYWIDE
Water Pollution Prevention Program


PESTICIDES
HEALTHY GARDEN
ANTS
HORMIGAS
APHIDS
COCKROACHES
FLEAS
PULGAS
LAWN
RATS AND MICE
ROSES
pest problems

Figure 9-1. FY 2019/20 San Mateo County IPM Events: (from top to bottom row) Screenshot of Online Master Gardener Q&A Webinar in June 2020; Master Gardener tabling event in Daly City; Our Water Our World shelf talkers on display in Half Moon Bay; and Master Gardener tabling event in Colma.

Pest Control Contracting Outreach

During FY 2019/20, SMCWPPP also implemented outreach that directly targeted residents and pest control contractors, to (1) encourage San Mateo County communities to reduce their reliance on toxic pesticides that threaten water quality, (2) encourage public and private landscape irrigation practices that minimize pesticide runoff, (3) promote appropriate disposal of unused pesticides, and (4) encourage residents to hire pest control professionals that use IPM practices.

SMCWPPP conducted this outreach via Facebook. Examples of social media posts are shown in Figure 9-2. The following is a breakdown of posts related to pest control promoted during FY 2019/20:

Facebook

- 39 posts
- 501 Engagements (likes, comments, shares, and link clicks)
- 19,071 reach

In addition to social media posts, SMCWPPP stocked OWOW fact sheets detailing IPM approaches to various pest-related problems, as well as resources for hiring pest control companies and disposing of pesticides responsibly in literature racks at the hardware stores listed in Table 9-2.

In addition, to help fulfill the MRP Provision C.9.e.ii.(3) requirement for outreach to pest control operators, the Countywide Program incorporated direct outreach to pest control operators. The aim of this outreach was to inform pest control operators of the hazards of pesticides and to encourage the reduction of their usage. Businesses that agreed to sign a pledge were asked to take a photo of themselves with the pledge, which would then be spotlighted on flowstobay.org and on the SMCWPPP Facebook page. Businesses were also encouraged to share the signed pledged on their digital platforms. The operators who use IPM practices were added to the list of pest control operators on the SMCWPPP website Pest Operators webpage. This project can be broken down into multiple steps and focuses, which all build upon each other:

- Conducted research about pest control operators - 40 operators were found from the DCA License Search Database using the following parameters:
  - License Type (Rank) = Structural Pest Control Board > Operator
  - Counties = San Mateo
  - Primary Status = Active
- Created a pledge (Appendix 9)
- Created a database with pertinent data about pest control operators (Appendix 9)
- Researched additional contact information not found in the DCA License Search Database
- Created the call script
- Conducted outreach calls
- Created email templates
- Followed up with contacts

Results of the outreach included the following:

- Six contacts agreed to sign the pledge and they sent a signed pledge back to us, (12) contacts could not be reached after multiple attempts via phone and email communication, and (14) had phone numbers that didn't work, had an expired license, or didn't hold a valid position. Table 9-3 summarizes the total numbers of communications with contacts throughout this project (105 phone calls were conducted, and 33 e-mails were sent).
- The phone calls also aimed to learn about the contacts' IPM practices, certifications, and if they received SMCWPPP's letter in April 2019 regarding the focuses of this outreach. Table 9-4 summarizes the numbers of contacts who: (11) use IPM practices, (8) received SMCWPPP's letter, (5) are EcoWise certified, and (1) are GreenPro certified (1).

Table 9-3. Summary of FY 2019/20 Communications with Pest Control Operators by Type

Type of Communication	Total Amount Conducted
Phone	105
E-mail	33

Table 9-4. Results of FY 2019/20 Pest Control Operator Inquiries

Uses IPM	Sometimes Uses IPM	Received Letter	Unsure if Received Letter	EcoWise Certification	GreenPro Certification
11	1	8	6	5	1

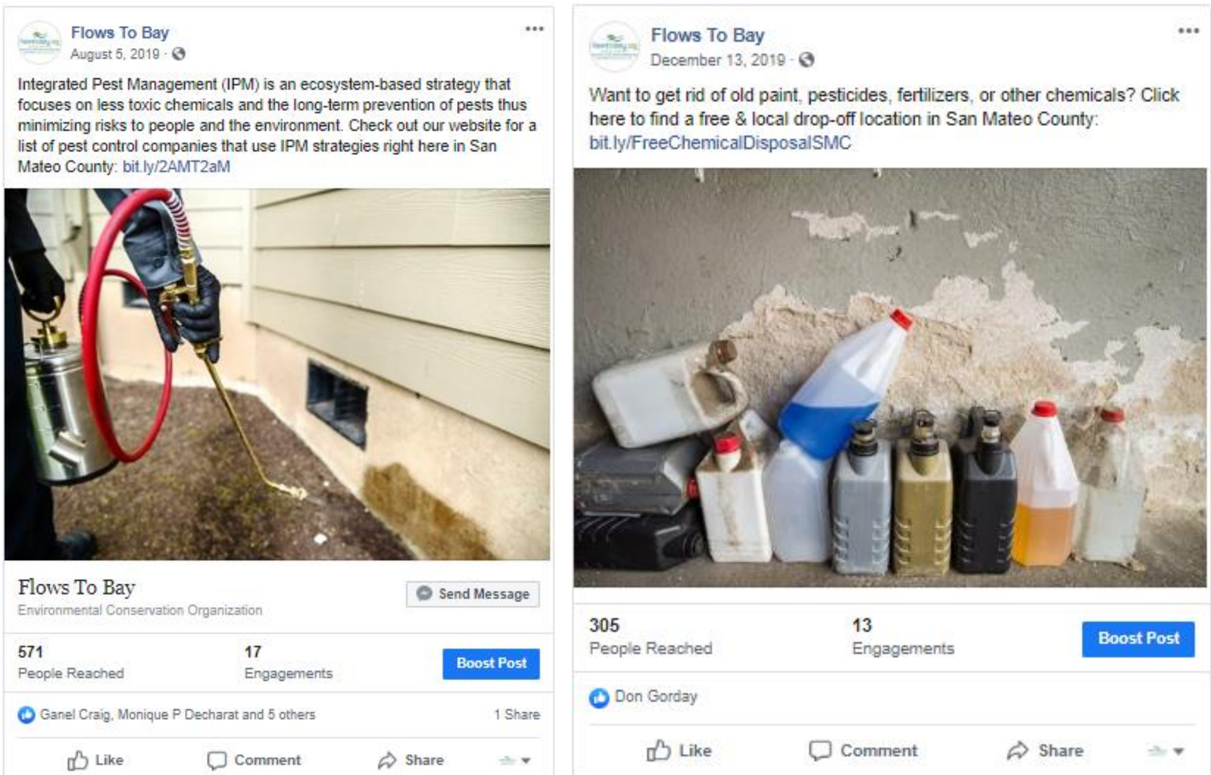


Figure 9-2. Examples of Social Media Posts Promoting Pesticide Pollution Prevention

FUTURE ACTIONS

SMCWPPP activities planned for FY 2020/21 to assist San Mateo County Permittees comply with MRP requirements in Provision C.9 include the following:

- Continue to assist San Mateo County Permittees implement their IPM programs and policies, with input and assistance provided by the Parks Maintenance and IPM Work Group;
- Hold one Parks Maintenance and IPM Work Group meeting;
- Continue to coordinate with San Mateo County Agriculture / Weights and Measures staff, as needed;
- Conduct a landscape IPM training workshop;
- Continue participating in relevant BASMAA and CASQA activities;

- Continued to maintain retail partnerships at top-tier stores within San Mateo County, using signage and materials developed by BASMAA for the point-of-purchase program;
- Continue conducting outreach at community events to educate customers about less toxic alternatives to commercial pesticides and fertilizers;
- Perform outreach messaging to residents on best practices for hiring pest control contractors certified in IPM via fact sheets, SMCWPPP's website, social media posts, and a quarterly newsletter;
- Send direct mailers to pest control professionals that encourage IPM certification and education; and
- Conduct direct outreach to pest control professionals by speaking with them directly regarding their certifications and IPM practices.

SECTION 10
C.10 TRASH LOAD REDUCTION

INTRODUCTION

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

- Reduce trash discharges from 2009 levels by 80% by July 2019;
- Ensure that lands they do not own or operate but that are plumbed directly to their storm drain systems in Very High, High and Moderate trash generation areas are identified and equipped by full capture systems or managed to a level equivalent to full capture systems;
- Install and maintain full capture systems that treat a mandatory minimum acreage;
- Assess trash reductions associated with control measures other than full capture systems using a visual assessment protocol;
- Develop and implement a receiving waters trash monitoring program plan;
- Annually cleanup and assess a mandatory minimum number of creek/shoreline trash hotspots; and
- Maintain a Long-Term Trash Load Reduction Plan designed to achieve 100% trash reduction by July 2022.

IMPLEMENTATION OF MRP PROVISIONS

SMCWPPP performs a variety of tasks to assist San Mateo County Permittees with implementation of MRP Provision C.10 and the requirements listed above, with input and assistance provided by the SMCWPPP Trash Subcommittee and Litter Work Group. FY 2019/20 accomplishments included the following:

- Coordinated and facilitated five meetings of SMCWPPP's Trash Subcommittee and one meeting of SMCWPPP's Litter Work Group;
- Assisted San Mateo County Permittees in delineating trash full capture treatment areas and managing trash full capture information in GIS (currently nearly 10,000 acres are treated by full capture systems in San Mateo County);
- Continued to implement SMCWPPP's Trash Assessment Strategy, including conducting roughly 560 On-land Visual Trash Assessments (OVTAs) at 236 sites and maintaining the Countywide Program's online OVTA database to allow San Mateo County Permittees access to timely load reduction estimates;

- Continued providing guidance to San Mateo County Permittees on MRP operation and maintenance requirements and standard operating procedures for trash full capture systems;
- Compiled and standardized data from 47 trash hot spot assessments and cleanups, and entered the data into the SMCWPPP hot spot database;
- Finalized and distributed the *New Development Projects Litter Reduction Fact Sheet* summarizing the best practices of the *Litter Reduction Toolkit for Multi-family Dwellings*;
- Coordinated with the SMCWPPP Public Information and Participation (PIP) Subcommittee on countywide school outreach and countywide litter campaign branding efforts;
- Responded to Regional Water Board staff requests for information on existing, planned, and potential locations for trash full capture systems that are mutually beneficial to San Mateo County Permittees and Caltrans;
- Coordinated with Caltrans on trash capture efforts, including the installation of trash full-capture systems through cooperative implementation agreements;
- Conducted qualitative trash receiving water monitoring at 30 creek/channel sites included in the *BASMAA Receiving Waters Trash Monitoring Program Plan;*
- Participated in the development and submittal of the *BASMAA Final Receiving Water Trash Monitoring Report*, in compliance with MRP provision C.10.b.v.; and
- Assisted San Mateo County Permittees in developing information necessary for reporting trash load reductions with their FY 2019/20 Annual Reports.

More information on each of these accomplishments is provided below.

Trash Subcommittee

SMCWPPP's Trash Subcommittee assists San Mateo County Permittees with the implementation of new or enhanced trash control measures and actions required by the MRP. The Trash Subcommittee generally meets quarterly. Additional meetings are scheduled as necessary to address high priority issues.

During FY 2019/20, SMCWPPP staff facilitated five Trash Subcommittee meetings, which were chaired by Chris Sommers (EOA, Inc.). The Trash Subcommittee continued to have excellent participation by municipal staff and other stakeholders as shown in the FY 2019/20 attendance list (Appendix 10).

During the Trash Subcommittee meetings in FY 2019/20, Subcommittee members discussed and provided input on the following topics/projects:

- C.10 requirements in the MRP;
- SMCWPPP Litter Work Group activities, reports, and work plan;
- New or planned installations of trash full capture systems in San Mateo County Permittee jurisdictions;
- BASMAA's Receiving Water Monitoring Plan;
- The FY 2019/20 Annual Report format for Provision C.10;
- Opportunities for collaboration with Caltrans;

- SMCWPPP Trash Assessment Strategy, including OVTAs conducted in Trash Management Areas (TMAs); and
- Modifications to Permittee trash control measures occurring as a result of the COVID-19 pandemic.

Demonstration of Trash Load Reductions (C.10.a.ii)

SMCWPPP developed the *Pilot Trash Assessment Strategy* (Strategy) in FY 2013/14 on behalf of San Mateo County Permittees. The Strategy was submitted to the Regional Water Board on February 3, 2014 as part of San Mateo County Permittee Long-Term Trash Load Reduction Plans, and was intended to serve as version 2.0 of the trash tracking method required by the Permit. SMCWPPP began to implement the Strategy in FY 2013/14 and continued to implement it at a full-scale in FY 2019/20 on behalf of (and in collaboration with) all San Mateo County Permittees.

The Strategy is intended to provide information on the magnitude and extent of trash reductions associated with stormwater in the San Mateo County. It is consistent with trash monitoring, assessment and reporting requirements in the MRP and is primarily designed to answer the following core management question:

> *Have MS4 trash load reduction targets (i.e., 40%, 70%, and No Adverse Impacts) been achieved by San Mateo County Permittees?*

The primary environmental and programmatic indicators that SMCWPPP and San Mateo County Permittees currently track to answer this core management question are:

1. **Full Capture Systems** – The extent of areas effectively treated by trash full capture devices and the operation and maintenance of these devices;
2. **Other Trash Controls** – Reductions in the levels of trash observed on-land and available to enter MS4s;
3. **Source Controls** – Reductions in the levels of litter prone items observed in the environment that are subject to source controls, such as ordinances that limit or prohibit the distribution of specific types of items;
4. **Additional Creek and Shoreline Cleanups (Offset)** – The volumes of trash removed via creek and shoreline cleanup events (above and beyond those required by the MRP); and
5. **Direct Discharge Programs (Offset)** – The extent and magnitude of trash removed or prevented from entering a receiving water body from pathways other than stormwater that are directly impacting those water bodies (e.g., illegal dumping or illegal encampments).

In selecting the indicators above, San Mateo County Permittees recognized that no one indicator can provide the information necessary to effectively determine progress made in reducing trash discharged from MS4s. SMCWPPP's methods used to collect or track information on the primary indicators 1 - 4 listed above are briefly described below, along with summaries of associated activities conducted by SMCWPPP in FY 2019/20. Methods used to assess indicator 5 have not been implemented to-date because none of the San Mateo County Permittees has submitted or implemented an optional direct discharge plan as outlined in the MRP. Additional information and the results of data collected to support indicators 1 - 4 are found in Section 10, Provision C.10.b.ii., Parts A and B, of individual San Mateo County Permittee FY 2019/20 Annual Reports.

1. **Full Capture Systems (Including Operation and Maintenance)**

Devices and facilities meeting the trash full capture design criteria described in the MRP and certified by the State Water Resources Control Board (State Water Board) are effective trash controls if adequately maintained to ensure their capture efficiency. Consistent with the Long-Term Plan Framework and the State Water Board's Trash Amendments, if a full capture device is maintained effectively then trash from the area draining to the device is effectively reduced to a level of "no adverse impacts" and has achieved the ultimate trash reduction goals outlined in the MRP. Additional trash reductions, therefore, are not needed in areas draining to (and treated by) full capture systems.

From FY 2013/14 through FY 2019/20, SMCWPPP and San Mateo County Permittees have expended considerable time and resources identifying and mapping areas draining to full capture devices, using a combination of fieldwork and desktop Geographical Information System (GIS) analysis. Drainage areas for newly installed full capture devices are delineated and mapped as part of an annual update of individual San Mateo County Permittee full-capture device GIS data layers. As a result, all drainage areas have been delineated for all devices installed to-date in San Mateo County. Nearly 10,000 acres of land area is currently treated by full capture systems in San Mateo County. Trash reductions associated with these areas are calculated based on the baseline trash generation levels established on San Mateo County Permittee baseline trash generation maps.

Additionally, SMCWPPP completed the development of a Model Trash Full Capture Device O&M Verification Program in FY 2015/16. The O&M Verification Program is intended to ensure that devices are operated at a level necessary to maintain their full capture designation. In FY 2019/20, SMCWPPP continued to provide guidance to San Mateo County Permittees on O&M requirements and standard operating procedures developed for San Mateo County Permittees as part of the Model Verification Program. San Mateo County Permittees with full capture devices have an O&M verification program tailored to fit the types of devices in their stormwater conveyance system and the associated maintenance procedures needed to adequately maintain these devices. Individual San Mateo County Permittee Annual Reports provide information regarding O&M of full capture devices and any associated issues with the devices (see Section 10, Provision C.10.b.i).

2. **Other Trash Control Measures (via On-land Trash Visual Assessments)**

In FY 2013/14, SMCWPPP developed a pilot approach to assess trash reductions on land areas that generate substantial levels of trash (i.e., very high, high or moderate trash generation) and are not treated by full capture devices. The approach uses on-land visual trash assessment (OVTA) protocols to record changes in the levels of trash on streets, sidewalks, and properties over time. The assessment protocols score sites/areas using a 4-tier system (A - D, A being the least amount of trash). The four OVTA scoring categories correspond with the four trash generation rate categories (i.e., very high, high, moderate and low) and the associated weighting factors included in the MRP.

Consistent with the MRP, OVTAs are conducted at randomly selected street/sidewalk sites representing 10% of the applicable street miles in each trash management area (TMA) where trash reductions are being reported by San Mateo County Permittees. OVTAs are conducted at a frequency necessary to confidently detect reductions in trash levels at these sites. Based on the findings of the *Tracking California's Trash* State Water Resources Control Board funded project, conducting between 4 and 6 assessments at a site will allow improvements in trash levels to be detected with an acceptable level of confidence. Currently, SMCWPPP annually conducts roughly three assessments at each site and then averages two years of data to calculate trash load reductions in a given fiscal year. For example, in reporting reductions for FY 2019/20, results from assessments conducted in both FY 2018/19 and FY 2019/20 were averaged and used to represent the "current" levels of trash within the applicable land areas.

During FY 2019/20, SMCWPPP staff conducted 562 OVTAs at 236 assessment sites (averaging 1,000 feet in length). All OVTA sites were assessed at least two times during FY 2019/20 and many were assessed three times. During a typical year, all sites are assessed three times. Table 1 provides a summary of OVTAs conducted between FY 2014/15 and FY 2019/20.

Table 10-1. Number of OVTAs completed in San Mateo County by fiscal year.

FY 14/15	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20
601	688	499	827	704	562

Assessment results are stored in SMCWPPP's online OVTA Database. In FY 2019/20, SMCWPPP staff entered assessment results within one week of conducting an assessment, which provided San Mateo County Permittee staff with timely access to the results.

Effects of Covid-19 Pandemic on OVTA Scores

In March 2020, the County of San Mateo issued a Shelter-in-Place (SIP) Order to slow the spread of COVID-19 in the county. As a result, OVTAs were ceased from March 19, 2020 until May 2020. During those months, a determination was made that OVTAs are essential services because they are conducted in response to regulatory mandates and as a result, OVTA Standard Operating Procedures (SOPs) were adjusted to conform to the Order. Assessments using the modified SOPs were conducted from late May through July 2020. Because trash control measures implemented by Permittees may have been suspended or modified during these months due to the CODIV-19 pandemic (see additional descriptions in Permittee FY 2019/20 annual reports), an evaluation of OVTA data collected during that timeframe was compared to data collected during the previous fiscal year. The following comparisons were made to evaluate the potential effects of the pandemic on OVTA scores:

1. Average OVTA scores at each site assessed during both FY 2018/19 and FY 2019/20.
2. Baseline trash generation and average OVTA scores at each site assessed during both 2018/19 and FY 2019/20.

Only sites assessed at least once during FY 2018/19 and at least once during the SIP Order in FY 2019/20 were included in the analysis. A total of 205 sites met this requirement across 18 SMCWPPP Permittees that conduct OVTAs. Results of the data analysis are summarized below:

- **Changes in Average OVTA Scores at Sites in FY 2018/19 and FY 2019/20**
    - Results from this analysis indicate that on average, OVTA scores increased by 29% at sites in FY 2019/20 (Table 2). Increases in average OVTA scores resulted in lower trash load reductions associated with "Other Management Actions" being reported by SMCWPPP Permittees in FY 2019/20.

Table 10-2. Changes in average OVTA scores (0 to 1 – Low, 1 to 2 - Moderate, 2 to 3 – High, and 3 to 4 - Very High) on a Permittee and Countywide level in FY 2019/20.

Permittee	FY 2018/19 Average Score	FY 2019/20 Average Score	% Change
Atherton	0.26	0.25	-2%
Belmont	0.31	0.36	14%
Brisbane	1.00	1.25	25%
Burlingame	0.33	0.33	1%
Colma	0.63	0.49	-23%
Daly City	0.96	1.01	5%
East Palo Alto	0.92	1.20	30%
Foster City	0.23	0.38	60%
Menlo Park	0.31	0.55	80%
Millbrae	0.55	0.63	14%
Pacifica	0.43	0.40	-7%
Portola Valley	0.08	0.67	700%
Redwood City	0.70	0.90	27%
San Bruno	0.41	0.71	73%
San Carlos	0.37	0.41	12%
San Mateo	0.49	0.66	35%
San Mateo County	0.47	0.55	18%
South San Francisco	0.51	0.83	63%
Countywide	***0.50***	***0.64***	***29%***

Possible reasons for the increase in average OVTA scores in FY 2019/20 include the following:

- Modifications in Permittee trash control measure implementation such as street sweeping and parking enforcement due to the SIP Order.
- Increases in residents staying at home during the SIP Order, resulting in more vehicles parked on the street during street sweeping events, reducing the effectiveness of this control.
- Closures of businesses during SIP, reducing clean-up efforts conducted by private parties in commercial and retail areas.

Although each of these are possible reasons for the increases in average OVTA scores, the worsening of OVTA results cannot be attributed to a single cause. Based on the analysis performed, it is likely that a combination of one or more the causes above are responsible for changes in FY 2019/20.

- **Baseline trash generation compared to average OVTA scores at each site assessed during both FY 2018/19 and FY 2019/20.**
  - In 2018/19, 94% of sites showed improvements compared to baseline conditions. In FY 2019/20, improvements were observed at 90% of sites.
  - These observations demonstrate that the average trash levels observed continue to be better than baseline conditions, despite the increases in scores observed in FY 2019/20.
- **Changes in the number of single-use plastic grocery bags observed each site assessed during both FY 2018/19 and FY 2019/20.**

- A total of six SMCWPPP Permittees observed no single-use plastic grocery bags in at least one of the two years analyzed. Therefore, the results from these Permittees could not be compared. The remaining 10 Permittees that have OVTA data were analyzed to compare the number of bags observed during FY 2018/19 and FY 2019/20.
- The average number of bags observed per 1,000 feet on a countywide scale decreased by 17% in FY 2019/20, when compared to FY 2018/19. Results on a Permittee-scale were also evaluated. Based on statistical test of significance (i.e., paired t-test) conducted to determine if the changes observed at either the Countywide or Permittee level were significant or likely due to chance, however, it appears that there is no significant difference between the number of bags observed between the two fiscal years.

Regardless of the changes in OVTA results observed during the SIP Order, all OVTA data collected between July 2018 and July 2020 were used by San Mateo County Permittees to report trash load reduction estimates for “Other Trash Management Actions” in Section C.10 (Provision C.10.b.ii., Part B) of their FY 2019/20 Annual Reports. This resulted in some Permittees reporting less trash load reduction in FY 2019/20 compared to the previous fiscal year. Additional assessments are planned for FY 2020/21, consistent with the SMCWPPP Trash Assessment Strategy.

3. Source Controls (Via Surveys and Characterization Studies)

San Mateo County Permittees are implementing actions to reduce the sale or distribution of litter-prone items and stop litter at its source. These source controls include the adoption and enforcement of ordinances enacted by San Mateo County Permittees to eliminate the distribution of single-use plastic grocery bags and expanded polystyrene (EPS) food service ware in their jurisdictions. To assist San Mateo County Permittees in determining to what degree these ordinances have reduced the level of these products found in the environment, SMCWPPP used the findings of a study conducted in Santa Clara County between March 2015 and July 2017. As part of the study, debris and trash were collected from large and small full-capture treatment systems within jurisdictions that have installed these devices.

Results from the project, which characterized the number of bags and amount of EPS observed in trash full capture systems pre- and post-ordinance, indicate that on average 72% fewer single-use plastic grocery bags and 74% less EPS food service ware was observed in storm drains systems after the ordinances went into effect. Along with other lines of evidence, these observed average reductions are used by San Mateo County Permittees to demonstrate trash load reductions associated with the implementation of these ordinances. For additional details on results of the project, see the *Storm Drain Trash Monitoring and Characterization Project Technical Report* provided in Appendix 10.1 of the Santa Clara Valley Urban Runoff Pollution Prevention Program’s FY 2015/16 Annual Report.

Effects of COVID-19 Pandemic

In March 2020 as part of the County of San Mateo’s Department of Public Health Shelter-in-Place Order due to the COVID-19 pandemic, the use of reusable grocery bags by customers in stores was disallowed to protect public health. Additionally, single-use plastic bags were temporarily allowed in some jurisdictions. In June 2020, the County reissued its Order, which allows customers to use their own reusable bags as long as businesses require customers using these bags to bag their own groceries.

In an effort to evaluate whether the 3-month moratorium on the use of reusable bags and the temporary allowance of single-use plastic bags, the number of single-use plastic bags observed during OVTAs conducted in FY 2018/19 (pre-COVID) were compared to FY 2019/20 (during-COVID). Results did not indicate statistically significant ($p<0.05$) changes in the number of single-use plastic bags observed on streets and sidewalks occurred between FY 2018/19 and FY 2019/20. The average number of bags observed per 1,000 feet did increase slightly in FY 2019/20, but not to a level that would be considered statistically significant.

4. **Additional Creek and Shoreline Cleanups (via volumes of trash removed from waterways)**

   San Mateo County Permittees are also allowed to claim up to a 10% trash load reduction for conducting trash cleanups in local water bodies above and beyond cleanups required by the MRP. SMCWPPP assists San Mateo County Permittees by calculating load reductions associated with these efforts based on the volumes of trash reported. Load reductions associated with these efforts are calculated based on methods described in the MRP and are reported in Section C.10.c. of individual San Mateo County Permittee Annual Reports.

5. **Direct Discharge Programs**

   To-date, San Mateo County Permittees have not submitted or implemented an optional direct discharge plan as outlined in the MRP.

Trash Hot Spot Cleanup and Assessment Guidance

Provision C.10.c.i. of the MRP requires Permittees to clean up trash hot spots to a level of "no visual impact" at least annually over the permit term. To assist Permittees in meeting this requirement, SMCWPPP 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 each Permittee are included in individual San Mateo County Permittee Annual Reports.

During FY 2019/20, San Mateo County Permittees continued conducting annual cleanups and assessments required by the MRP. Results from this year's annual cleanups indicated that a total of 47 trash hot spot assessments and cleanups were conducted within San Mateo County Permittee jurisdictions. Approximately 116 cubic yards of trash was removed from these hot spots during FY 2019/20.[1] The timing of annual assessments and cleanups vary among hot spots due to the location of the hot spot, potential for natural resource impacts, crew availability, and other site-specific factors.

BASMAA Final Receiving Water Trash Monitoring Report

Permit Provision C.10.b.v requires public agencies to develop, submit and test a Receiving Water Trash Monitoring Program Plan (Trash Monitoring Plan). In July 2017, the Bay Area Stormwater Management Agencies Association (BASMAA) submitted the first iteration of the Trash Monitoring Plan to Water Board staff for review and comment. The Final Trash Monitoring Plan that addressed all comments was submitted to Water Board staff in October 2017. Implementation of the Trash Monitoring Plan represents the "pilot-testing phase" of trash receiving water monitoring in the San Francisco Bay Area, during which the pilot protocols and methods were applied during the MRP 2.0-specified timeframe of October 2017 to July 2020.

[1]Only hot spot cleanups and assessments conducted in compliance with MRP provision C.10.b.iii. are included in this estimate. Some SMCWPPP San Mateo County Permittees conduct cleanups at trash hot spots more frequently than the MRP-required annual cleanup, and/or at more sites than the MRP requires. See Section 10, C.10.e. of San Mateo County Permittee Annual Reports for additional information.

The results of the testing phase of the Trash Monitoring Plan were submitted to the Water Board as a Final Report on July 1, 2020. The Final Report provides analysis of all information/data collected from trash assessments and monitoring conducted between October 2017 and March 2020. Monitoring Plan objectives and scientific monitoring questions outlined in the Trash Monitoring Plan were used to guide the evaluation of trash monitoring and assessment data results presented in the Final Report.

Monitoring Questions

1. Are significantly strong correlations observed between qualitative and quantitative methods?
2. What is the current level of trash deposited in flowing waterbodies in the entire MRP area?
3. What is the range of trash levels observed at sites targeted for cleanup? How do these ranges compare to levels in all flowing waterbodies?
4. Do trash levels in flowing waterbodies differ significantly between wet and dry seasons?
5. What percentages of trash observed in receiving waters are attributable to wind/litter, illegal dumping, illegal encampments and other (stormwater/upstream sources)?
6. Do trash levels in flowing waterbodies strongly correlate to trash generation levels depicted on Permittee maps?

The Trash Monitoring Plan primarily focuses on two types of monitoring designs: 1) probabilistic (randomly) selected monitoring sites that are intended to represent the trash conditions in all creek, channel and riverine sites that flow through the urban Bay Area; and 2) targeted sites in urban creeks, channel and river segments and sites along San Francisco Bay shorelines where trash regularly deposits and is periodically removed by MRP Permittees. The design also includes a small number of targeted locations where trash booms are deployed to intercept trash prior to transport downstream to San Francisco Bay.

Two trash assessment tools were developed and applied for the pilot testing phase of the Trash Monitoring Plan. Qualitative trash assessments are visual surveys of trash levels (i.e., conditions). Trained personnel assign a trash condition score from 1 to 12 (12 being the most trash) to a site based on the level of trash that is observed both within the water body and along its banks or shoreline within a defined assessment area. Quantitative trash monitoring entails removing, sorting and measuring the volume of trash that is found within the assessment area at a targeted site. Both quantitative trash monitoring methods and the qualitative assessment methods were used at targeted sites to allow for the comparison of qualitative and quantitative approaches.

A total of 125 urban creek, channel and riverine probabilistic sites throughout the MRP Area were qualitatively assessed for trash. A total of 625 qualitative trash assessments were conducted over five sampling events (three during wet season and two during dry season) between October 2017 and March 2020. A total of 100 targeted sites were selected for both qualitative and quantitative trash assessments. A total of 200 trash assessments were conducted over two sampling events at targeted sites. Targeted monitoring was conducted at nine trash boom locations in Alameda, Santa Clara, and San Mateo Counties.

Key findings included the following:

1. Significant correlations were observed between qualitative trash condition scores and trash density (volume per unit area) at both regional and countywide scale. The visual assessment tool is recommended as a valid approach to assess conditions when using volume of trash as the indicator for trash conditions.
2. Regionwide, approximately 77% of the urban stream lengths in the MRP Area exhibit low to moderate levels of trash.
3. Trash condition scores at targeted sites were generally higher (more trash), compared to probabilistic sites.
4. Seasonality appears to have no effect on trash levels observed/measured at receiving water sites. Trash levels were highly similar between the dry and wet seasons. Storm intensity and frequency did not appear to have an influence on trash levels observed during the wet season.
5. Litter/Wind and Other/Stormwater trash pathways were the most frequent pathways reported at all monitoring sites, however, Illegal Encampments and Illegal Dumping trash pathways were associated with largest proportion of trash observed.

An evaluation of methods and monitoring design used during the pilot-testing phase of the Trash Monitoring Plan is provided in the report. This evaluation provides guidance for potential revisions to methods that may be used to monitor trash in receiving waters.

Coordination with San Mateo Countywide Recycling Committee

To increase coordination among solid waste and recycling programs and San Mateo County Permittee MS4 trash reduction activities, SMCWPPP staff began attending Countywide Recycling Committee meetings in FY 2012/13. SMCWPPP continued to coordinate with the Recycling Committee in FY 2019/20, specifically targeting outreach and coordination with municipally solid waste/recyclables haulers in San Mateo County to reduce trash impacts associated with inadequate waste container management. SMCWPPP staff also coordinated with the Recycling Committee on collection activities, PCBs and demolition regulations, litter reduction and zero waste building design and operation, source reduction policies and zero waste programs.

Litter Work Group

SMCWPPP's Litter Work Group, which was formed in March 2014, coordinates litter reduction efforts among SMCWPPP, waste and stormwater program staff from San Mateo County municipalities, the San Mateo Countywide Recycling Committee, and franchised waste collection and processing companies serving those jurisdictions. The Litter Work Group met one time in fiscal year 2019/20. Attendees included representatives from San Mateo County municipalities (especially stormwater and zero waste program staff), the local hauling community and staff from Rethink Waste (the South Bayside Waste Management Authority) to work on litter reduction efforts both in Santa Clara and San Mateo Counties. The goals of the Litter Work Group include developing a litter reduction program for San Mateo County related to waste issues and specific to its needs, developing BMPs for the waste collection industry, educating the public and those involved with litter control efforts, producing guidance on building design and operation related to litter and waste reduction and coordinating and sharing information with the Zero Litter Initiative in Santa Clara County.

The Litter Work Group completed the following tasks in FY 2019/20:

- Held a Work Group remote meeting on April 27, 2020. Attendance by municipal staff is provided in the FY 2019/20 attendance list (Appendix 10). In addition to municipal staff, attendees included staff from Rethink Waste, Recology - San Mateo County and South San Francisco Scavenger Company.
- Provided support to a single-use plastic foodware effort coordinated by Thrive, a San Mateo County non-profit organization that brings together experts on various important issues affecting county residents, businesses and municipalities. The effort is a three phase multi-year campaign to identify the problems with single-use plastic foodware, strategies for reducing the problems and actions that can be taken locally. https://www.thrivealliance.org/env-reduce-rethink
- Started developing a Sampling and Analysis Plan (SAP) for conducting a trash characterization study in San Mateo County. The purpose of the trash study is to evaluate the effectiveness of existing single-use carryout plastic bag and EPS food & beverage ware ordinances and filling information gaps on the dominant types of trash in stormwater in San Mateo to inform future source control measures in San Mateo County. The SAP will include a summary of existing information on trash types in stormwater, specific management questions that will be addressed via the SAP, monitoring site locations, sampling frequencies, a trash characterization plan, and data analysis techniques that will be employed.
- Continued to distribute the report on *Franchise Agreement Best Practices for Litter Reduction*. Provided technical support for Rethink Waste's franchise agreement with Recology of San Mateo County.
- Finalized and distributed the *New Development Projects Litter Reduction Fact Sheet* (Appendix 10), which summarizes the best practices of the *Litter Reduction Toolkit for Multi-family Dwellings* (Toolkit). The fact sheet was produced for building and planning permit counter staff to distribute to professionals in the design and construction sector. It highlights the most important aspects of the Toolkit and can be customized by the jurisdiction to reiterate the local requirements for development permits and conditions of approval. It references documents developed by SMCWPPP and other agencies for reducing litter and waste at existing and new multi-family residential properties in San Mateo County. The fact sheet and Toolkit are posted on the Countywide Program's website (www.flowstobay.org/preventing-stormwater-pollution/in-my-place-of-business/property-managers/).
- Coordinated with Caltrans on trash capture efforts, including the installation of trash full-capture systems through cooperative implementation agreements.
- Coordinated litter reduction action and policy development with the Zero Litter Initiative from the Santa Clara Valley.
- Coordinated with SMCWPPP's PIP Subcommittee on public outreach efforts targeting litter reduction.
- Developed the FY 2019/20 Litter Work Group Work Plan (included in Appendix 10) which includes the following tasks:
    - Supporting ongoing Litter Work Group meetings;
    - Coordinating and facilitating a 5th Litter Roundtable on the results of the trash characterization study and coordination with franchised waste haulers and transportation agencies;

- Finalizing and implementing the Sampling and Analysis Plan (SAP) for conducting a trash characterization study which assesses the types of trash found in stormwater and informing future source control actions;
- Assisting SMCWPPP's PIP Subcommittee with outreach efforts to reduce litter; and
- Conducting other countywide coordination efforts.

Identification of Existing, Planned and Potential Locations for Trash Full Capture Systems Mutually Beneficial to San Mateo County Permittees and Caltrans

On February 13, 2019, the Regional Water Board adopted a Cease and Desist Order (CDO) against Caltrans, requiring it to significantly increase the rate and extent of control measure implementation to address trash discharges from its right-of-way (ROW). To meet the CDOs required targets, Caltrans is attempting to identify trash full capture systems that would be mutually beneficial to Caltrans and MRP Permittees. In an effort to assist Caltrans in identifying these systems, on April 24, 2019, Regional Water Board staff requested that all MRP Permittees identify the following:

- Mapped drainage areas of municipal jurisdiction that abut Caltrans ROW; and
- A list of already completed, planned, or potential projects in municipal drainage areas that abut Caltrans ROW that control or would control trash from the adjacent Caltrans ROW.

In response to this request, SMCWPPP conducted a preliminary analysis and worked with San Mateo County Permittees to develop a list and series of maps illustrating completed, planned, and potential trash full capture projects in municipal drainage areas in San Mateo County that also address trash in stormwater that is generated on Caltrans ROW. The list included the following preliminary information:

- Estimated Caltrans ROW addressed by San Mateo County Permittees' existing or planned Trash Capture Systems (large and small);
- Whether the Permittee has an existing Cooperative Implementation Agreement with Caltrans on Trash Capture System(s);
- Caltrans ROW within Permittee boundaries that is not addressed by existing systems;
- Estimated Caltrans ROW that may be addressed by potential (future) trash capture systems and should be evaluated further; and
- San Mateo County Permittee contact Information.

This information was submitted to Regional Water Board staff in June 2019, in response to the request.

In FY 2019/20, San Mateo County Permittees with support from SMCWPPP Program staff, continued to discuss potential cooperative agreements and reimbursements with Caltrans for existing, planned and potential full capture systems that are mutually beneficial to Caltrans and San Mateo County Permittees. A number of meetings between Caltrans and SMCWPPP Permittees were coordinated by SMCWPPP in an effort to continue the discussion. This resulted in at least one project being included for a cooperative implementation agreement with Caltrans.

FUTURE ACTIONS

FY 2020/21 activities that are planned by SMCWPPP to assist San Mateo County Permittees comply with MRP requirements in Provision C.10 include the following:

- Continued facilitation of SMCWPPP Trash Subcommittee meetings;
- Continued implementation of the SMCWPPP trash assessment strategy designed to demonstrate progress towards MRP trash load reduction goals;
- Continued maintenance of the SMCWPPP online OVTA database;
- Continued support for long-term plan implementation and control actions for trash management;
- Continued calculation and reporting on trash load reductions for each San Mateo County Permittee;
- Continued calculation and reporting on the amount and types of trash removed via creek and/or shoreline cleanups required by the MRP;
- Continued update/revision of trash generation and full capture system maps and GIS data layers in preparation for the FY 2019/20 Annual Report submittal;
- Continued implementation of the Litter Work Group FY 2019/20 Work Plan tasks, including supporting ongoing Litter Work Group meetings, conducting the 5th Litter Roundtable, developing a sampling and analysis plan for assessing the types of trash found in stormwater, and informing future source control actions;
- Continued coordination and information sharing with the SMCWPPP PIP Subcommittee on countywide litter reduction efforts;
- Continued coordination and information sharing with the Zero Litter Initiative in Santa Clara County;
- Continued implementation of the Sampling and Analysis Plan (SAP) for conducting a trash characterization study in San Mateo County;
- Receiving water monitoring data scoring/collection training for municipal staff;
- Continued coordination with Caltrans for trash capture device design review, purchase, installation, and maintenance agreements; and
- Continued coordination with the New Development Subcommittee (and State Water Resources Control Board) on trash load reduction credits for LID facilities.

SECTION 11
C.11 MERCURY CONTROLS

INTRODUCTION

MRP Provision C.11 Mercury Controls implements stormwater runoff-related actions described in the San Francisco Bay mercury Total Maximum Daily Load (TMDL) water quality restoration program. SMCWPPP performs a variety of activities to address mercury in stormwater runoff in compliance with MRP Provision C.11. Some of this work is accomplished through participation in BASMAA regional projects.

Efforts that address PCBs in addition to mercury are described in this section rather than Section 12 (PCBs Controls). Section 12 focuses on efforts that address PCBs only.

IMPLEMENTATION OF MRP PROVISIONS

C.11/12.a. Implement Control Measures to Achieve Mercury/PCBs Load Reductions

Efforts by SMCWPPP and San Mateo County Permittees to address MRP Provisions C.11/12.a., Implement Control Measures to Achieve Mercury/PCBs Load Reductions, are described below and in a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

C.11/12.b. Assess Mercury/PCBs Load Reductions from Stormwater

MRP Provisions C.11/12.b., Assess Mercury/PCBs Load Reductions from Stormwater, required Permittees to submit in their 2015/16 Annual Report for Executive Officer approval an assessment methodology. The purpose of the assessment methodology is to quantify in a technically sound manner mercury and PCBs loads reduced through implementation of a variety of pollutant controls, including pollution prevention, source control, and stormwater runoff treatment measures such as green infrastructure. SMCWPPP and San Mateo County municipalities helped develop the assessment methodology through participation in a BASMAA regional project. The methodology developed via the BASMAA regional project is referred to as the Interim Accounting Methodology and has been approved by the Executive Officer of the Regional Water Board.

Beginning with the FY 2016/17 Annual Report, Permittees are required to report annually the mercury and PCBs loads reduced in stormwater runoff. Permittees are required to use the approved assessment methodology to demonstrate cumulative pollutant loads reduced from each control measure implemented and progress toward achieving the load reductions required this permit term.

SMCWPPP is tracking all existing and planned control measures that should result in pollutant load reduction credits towards meeting the San Mateo County portion of the PCBs and mercury TMDL wasteload allocations and MRP 2.0 load reduction requirements. All existing controls that commenced or were enhanced in about 2005 or later are assumed to reduce stormwater runoff pollutant loads relative to the baseline loads in the TMDLs. This year was selected because load reductions due to controls fully implemented before about 2005 were already accounted for in the TMDL baseline stormwater runoff load estimates.

SMCWPPP has identified selected urban catchments with potential pollutant source areas, which are referred to as Watershed Management Areas (WMAs). The WMAs identified in San Mateo County and the associated control measures currently implemented within these WMAs are described in SMCWPPP's FY 2018/19 Annual Report. An update of this information is summarized in Appendix 11, Table App11-1 (*PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee, September 30, 2020*). In addition, each WMA and the GI/LID facilities within it are shown in maps in Appendix 11, Figures App11-1 through App11-19. The Cities of Half Moon Bay and Pacifica drain to the Pacific Ocean and therefore were not included, since this plan is focused on the PCBs and mercury TMDLs for San Francisco Bay.

The estimated mercury loads reduced by San Mateo County Permittees from July 1, 2013 through June 30, 2020 (i.e., FY 2013/14 through FY 2019/20) are shown in Table 11-1. Table 11-2 shows the mercury loads reduced, itemized by control measure category. Supporting data for Tables 11-1 and 11-2 are included in Appendix 11, Table App11-1.

MRP 2.0 requires that an at least 6 grams/year mercury load reduction is achieved in San Mateo County via GI by June 30, 2020. Table 11-2 shows that from FY 2013/14 through FY 2019/20,[1] a 535 grams/year mercury load reduction has been realized via GI (parcel-based GI/LID and green streets) in the County and thus this requirement has been fulfilled.

In addition, the estimated mercury loads reduced to-date by all Permittees during the MRP 2.0 compliance period (FY 2013/14 through FY 2019/20) are described in a document entitled *PCBs and Mercury Regional Loads Reduced during MRP 2.0, September 30, 2020* (included in Appendix 11).

Finally, San Mateo County municipalities participate in San Mateo County Health Department's Household Hazardous Waste (HHW) Program and Very Small Quantity Generator Business Collection (VSQG) Program. The estimated mass of mercury collected in FY 2014/15 through FY 2019/20 via these programs is shown in Table 11-3. It should be noted that these mass estimates are not directly comparable to pollutant load reductions in stormwater runoff discharges. The HHW Program canceled all collections from March 12 through June 3, 2020 due to the COVID-19 Shelter-in-Place order. This resulted in a relatively lower number of devices and associated mass of mercury collected in FY 2019/20.

[1]Based on language in the MRP and discussions with Regional Water Board staff, it is assumed that applicable controls implemented from July 1, 2013 through the end of the permit term should result in credit towards the MRP 2.0 mercury and PCBs load reduction requirements.

Table 11-1. Estimates of mercury loads reduced by San Mateo County Permittees from July 1, 2013 through June 30, 2020 (FY 2013/14 through FY 2019/20).

Permittee	Mercury Loads Reduced (g/year)							
	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	Cumulative Load Reduced
Atherton	0.2	0	0	0	0	0	0.7	**0.9**
Belmont	3.1	0	0.01	0.07	0.8	4	0.08	**9**
Brisbane	16	0	0	0	37	0	0	**54**
Burlingame	0.7	1	0.09	10	0.8	0.5	0.3	**14**
Colma	0.001	0.5	0	0	2	0.4	0	**2**
Daly City	0.6	1	0	3	15	0.6	0	**21**
East Palo Alto	34	4	0.2	5	0	0	0	**43**
Foster City	3	0	0.8	0	0	7	0	**11**
Hillsborough	0	0	0.02	0	0	0	0	**0.02**
Menlo Park	33	2	21	9	56	0.4	5	**128**
Millbrae	4	0	0	0	15	0	0.08	**19**
Portola Valley	0	0	0	0	0.3	0	0	**0.3**
Redwood City	7	14	8	5	6	15	0	**56**
San Bruno	2	0	7	0	0	0	0.3	**10**
San Carlos	30	0	11	0	15	0	3	**60**
San Mateo City	24	7	2	2	0.8	1	18	**56**
San Mateo County	10	5	2	0.4	0.8	0	2	**21**
South San Francisco	67	22	0	4	16	24	28	**160**
Woodside	0	0	0	0	0	0	0	**0**
Total	**236**	**58**	**54**	**39**	**166**	**54**	**57**	**663**

Table 11-2. Estimates of mercury loads reduced in San Mateo County by control measure category from July 1, 2013 through June 30, 2020 (FY 2013/14 through FY 2019/20).

Control Measure Category		Mercury Loads Reduced (g/year)							
		FY 13/14	FY 14/15	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	Cumulative Load Reduced
Source Property Identification and Referral	270 Industrial Road / 495 Bragato Road, San Carlos					4			**4**
	977 and 1007/1011 Bransten Road, San Carlos					1			**1**
GI and Other Stormwater Treatment Controls	Parcel-based GI/LID (i.e., new and redevelopment projects)	136	57	53	31	145	53	55	**530**
	Green Streets	0.08	0.7	0.5	0.1	0.4	0.4	3	**5**
	Large Full Trash Capture Systems[3]	56				15			**71**
Enhanced O&M Measures[4]		44	0.4	0.01	7				**52**
Diversion to POTW[4]									**0**
Total		**236**	**58**	**54**	**39**	**166**	**54**	**57**	**663**

1. Load Reduced = (Source Property Area (acre)) x (1.033 – 0.215 (g/acre/year)).
2. For parcel-based projects, Load Reduced = (Project Area (acre)) x (Existing Yield – 0.033 (g/acre/year)). For green street or regional retrofit projects, Load Reduced = (Project Drainage Area (ac)) x (area-weighted mercury yield (g/acre/year)) x 70% (assumed efficiency factor for green street projects).
3. Load Reduced = (Project Drainage Area (acre)) x (area-weighted mercury yield (g/acre/year)) x 20% (assumed efficiency factor for large full trash capture).
4. Loads reduced = (Project Drainage Area (acres)) X (area-weighted mercury yield (g/acre/year) x 2% (assumed efficiency factor for enhanced inlet cleanouts twice annually).

Table 11.3. Estimated mercury mass collected via the San Mateo County Health Department's Household Hazardous Waste (HHW) and Very Small Quantity Generator Business Collection (VSQG) program.

Mercury Containing Device/Equipment	FY 2014/15		FY 2015/16		FY 2016/17		FY 2017/18		FY 2018/19		FY 2019/20	
	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)	Total Amount of Devices Collected	Estimated Mass of Mercury Collected (kg)
Fluorescent Lamps (linear ft)[1,2]	25,532	0.05	89,662	0.2	93,896	0.2	125,582	0.3	107,269	0.2	77,004	0.2
CFLs (each)[3]	1,881	0.01	17,211	0.08	17,354	0.08	18,689	0.08	18,513	0.08	10,014	0.05
Thermostats (each)[4]	26	0.1	12	0.05	10	0.04	11	0.04	15	0.06	8	0
Thermometers (each)[5]	313	0.2	13	0.01	19	0.01	0	0	25	0.02	6	0
Switches (each)	18	0.05	0	0	0	0	0	0	26	0.07	0	0
Total Mass of Mercury Collected (Kg)		**0.4**		**0.3**		**0.3**		**0.4**		**0.5**		**0.2**

C.11/12.c. Plan and Implement Green Infrastructure to Reduce Mercury/PCBs Loads

Permittees are required to submit in this FY 2019/20 Annual Report an estimate of the amount and characteristics of land area that will be treated through green infrastructure implementation by 2020, 2030, and 2040, including all data used and a full description of models and model inputs relied on to generate this estimate.

Permittees are also required to submit in this FY 2019/20 Annual Report a Reasonable Assurance Analysis (RAA) to demonstrate quantitatively that mercury reductions of at least 10 kg/yr will be realized by 2040 through implementation of green infrastructure projects. The MRP requires this submittal to include all data used and a full description of models and model inputs relied on to make the demonstration and documentation of peer review of the RAA.

San Mateo County Permittees have fulfilled the above MRP requirements via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

C.11/12.d. Prepare Implementation Plan and Schedule to Achieve TMDL Wasteload Allocations

MRP Provisions C.11/12.d require that Permittees prepare a plan and schedule for mercury and PCBs control measure implementation and a corresponding RAA demonstrating quantitatively that sufficient control measures will be implemented to attain the mercury and PCBs TMDL wasteload allocations by 2028 and 2030, respectively. The plan must:

1. Identify all technically and economically feasible mercury and PCBs control measures to be implemented (including green infrastructure projects).
2. Include a schedule according to which these technically and economically feasible control measures will be fully implemented.
3. Provide an evaluation and quantification of the mercury and PCBs load reduction of such measures as well as an evaluation of costs, control measure efficiency and significant environmental impacts resulting from their implementation.

San Mateo County Permittees have fulfilled this requirement via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

C.11.e./C.12.h. Risk Reduction Program

MRP Provisions C.11.e and C.12.h require Permittees to conduct an ongoing risk reduction program to address public health impacts of mercury and PCBs in San Francisco Bay fish. The fish risk reduction program is required to include actions to reduce actual and potential health risks in those people and communities most likely to consume San Francisco Bay-caught fish, such as subsistence fishers and their families. The program is required to have the potential to reach 3,000 individuals annually (Bay Area-wide total for all MRP 2.0 Permittees) who are likely consumers of San Francisco Bay-caught fish. Permittees are required to report on the status of the risk reduction program in each of their Annual Reports, including a brief description of actions taken, an estimate of the number of people reached, and why these people are deemed likely to consume Bay fish.

SMCWPPP is assisting San Mateo County municipalities comply with the risk reduction program requirements by coordinating with and reporting on the Fish Smart program conducted by San Mateo County Environmental Health Services (EHS). Fish Smart builds upon the San Francisco Bay Fish Project (sfei.org/sfbfp#sthash.eOcfwrhA.dpbs), a risk reduction framework developed regionally in the previous permit term. The Fish Project funded Bay Area community-based organizations to develop and deliver appropriate communications to appropriately targeted individuals and communities about how to reduce their exposure to mercury and PCBs from consuming San Francisco Bay fish.

During FY 2019/20, EHS conducted a variety of activities that target at-risk populations (e.g., subsistence fisherman) via the Fish Smart program. These efforts are summarized in the following sections.

Sign Maintenance and Installation

There are currently 16 Fish Smart program signs posted in San Mateo County. In FY 2019/20, EHS staff maintained signs posted along the San Francisco Bay shore (e.g., at fishing piers) in the Cities of Brisbane, South San Francisco, San Mateo, Burlingame, and Redwood City. One sign was replaced at the Brisbane Lagoon due to the previous sign and pole being knocked down (Figure 11-1).

Figure 11-1. Fish Smart Sign replacement at Brisbane Lagoon, installed January 2020.

Community Outreach

In FY 2019/20, EHS continued to promote the Fish Smart program using the California Office of Environmental Health Hazard Assessment's (OEHHA) fish consumption advisories in various languages through flyer distribution at community events, bait and tackle stores, harbormaster offices, and through Women, Infant, and Children (WIC) community offices. EHS also provided flyers to Public Information and

Participation (PIP) members at a SMCWPPP quarterly meeting which had representatives from many cities. There were 1,075 flyers in various languages distributed at 20 locations within the County. In addition to Coast and Bay consumption advisory outreach, EHS continued to promote the Monterey Bay Aquarium's Seafood Watch Guides at community outreach events and through a social media post. The Seafood Watch Guides help consumers and businesses choose seafood that is fished or farmed in ways that support a healthy ocean.

Figure 11-2. Pacifica Fog Fest attendee participating in EHS's interactive fishing game (image posted on Twitter in October 2019).

Due to the COVID-19 pandemic, in person outreach at community events was significantly hindered in FY 2019/20 as many events were canceled. EHS staff was still able to speak with 1,128 residents at 4 events where information on the Fish Smart in San Francisco Bay, California Coast, and Monterey Bay Aquarium's Seafood Watch Programs was provided:

1. Pacifica - Fog Fest (Figure 11-2)
2. San Mateo – City of San Mateo's Health and Wellness Fair
3. Redwood City – Cañada College Wellness Fair
4. Daly City – District 5 Health Fair

Social Media and Website

In FY 2019/20, EHS continued to maintain the smchealth.org/fishsmart website, which had 4,212 page views total, of which 3,270 were new visitors to the page. There were 942 returning page visitors. In February of 2020, EHS added a sign-up form to the website for people to receive email updates on the Program. In four months, through June 30th, 2020, 66 people signed up to receive the updates. The COVID-19 pandemic led to a decrease in social media posts compared to the previous fiscal year as the County's health-related social media pages were restricted for several months to only COVID-19 related content. Before the pandemic, EHS created three social media posts and shared them on both Facebook and Twitter for a total of six posts (see Figure 11-3 for an example post). One of the posts was also shared to over 124,000 households countywide on Nextdoor.com. Posts combined had a reach or impression total of 16,961, depending on the platform. Facebook reach is defined as the number of people who saw

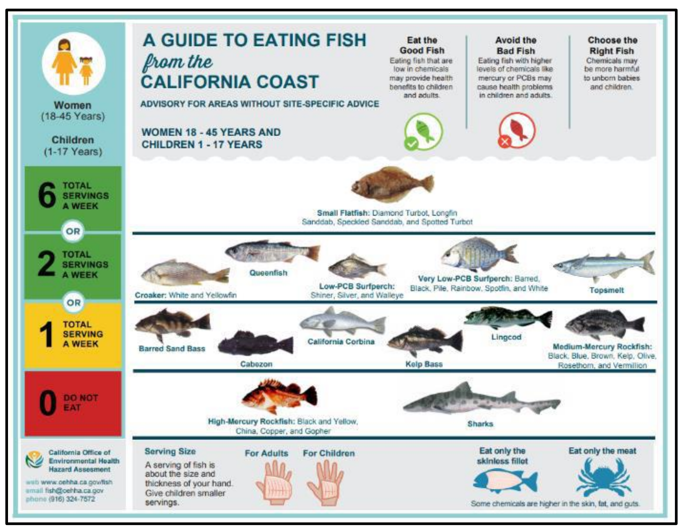


Figure 11-3. Social media post example.

the posts at least once. Twitter impressions are defined as the number of times that a given tweet has been viewed on the Twitter platform. Combined, the posts had 1,250 engagements. Engagements on Facebook are defined as actions such as reacting to, commenting on, or sharing the post, viewing a photo or video, or clicking on a link. Engagements on Twitter are defined as when a link in the post was clicked on, retweeted, replied to, or liked. Engagements on Nextdoor.com are defined as thanks and replies. The Facebook posts were geotargeted to individuals with fishing interests within San Mateo County.

Surveys

On February 13th, 2020, 13 surveys were conducted at the Pacifica Pier to discuss the OEHHA fish consumption guidelines in exchange for a $5 Starbucks gift card. Results showed that 92% of respondents eat the fish they caught and shared at least some types of the fish they caught with their friends or family. Some of the most popular fish respondents eat include California Halibut, Striped Bass, Surfperch, Brown Rockfish, and the Red Rock Crab. When asked if they knew that certain fish were not safe to eat due to high mercury and PCB levels, 84% indicated they knew. Twelve out of the 13 respondents provided their age, gender, ethnicity, and languages spoken. All were male expect for one female. Three out of 12 were in their 20s, one was in their 30s, five in their 40s, 2 in their 50s, and one was in their 60s. Of the 12 that provided demographic information, three self-identified as Caucasian, three Latino, two Asian, one Chinese, one American, and one Jamaican. In addition, there were three people who declined to speak with us, one of which indicated they did not speak English, another because they were busy, and the third person did not respond at all when spoken to. People who took the survey were handed the OEHHA guideline flyer after the survey was complete to review at their leisure. Of the people surveyed, 30% provided their email address to stay updated on new guidelines that come out. From this survey EHS learned that people who fish at the Pacifica Pier have a wide demographic background. Because most who catch fish also feed the fish to friends and families, and because many of the popular fish eaten do have high levels of mercury and PCBs, continued education on this matter is important, especially for the most sensitive population – women of child bearing age and children. Another observation was that many of the fishermen are friends, so word of mouth is suspected to be very helpful when getting the Fish Smart program message out.

Effectiveness Evaluation

Table 11-4 summarizes accomplishments of the Fish Smart program from FY 2015/16 through FY 2019/20. Various quantitative measures of outreach and outcomes are underlined (e.g., numbers of brochures distributed, numbers of people interacted with at outreach events, numbers of people receiving electronic newsletters, and social media postings impressions and reach). The summary illustrates the Fish Smart program's success over the past several years in providing outreach about potential health impacts of consuming certain types of fish caught in San Francisco Bay. It is likely these efforts have led to reduced health risks in those people and communities most likely to consume San Francisco Bay-caught fish, such as subsistence fishers and their families.

In addition, as discussed in the previous section, on February 13th, 2020, 13 surveys were conducted at the Pacifica Pier to discuss the OEHHA fish consumption guidelines. Results showed that 92% of respondents eat the fish they caught and shared at least some types of the fish they caught with their friends or family. When asked if they knew that certain fish were not safe to eat due to high mercury and PCB levels, 84% indicated they were aware of this. This result suggests the Fish Smart program's outreach or other related risk reduction information has reached most members of the small group surveyed. However, the representativeness of the group surveyed and the extent that this result could be extrapolated to a larger population have not been evaluated. EHS plans to continue to conduct surveys in

FY 2020/21 to better understand Bay and Coast fish consumption patterns and consumption advisory knowledge.

Table 11-4. Summary of Fish Smart program accomplishments.

Fiscal Year	Summary of Accomplishments

2015/16	During FY 2015/16, CEH conducted the following activities that target at-risk populations (e.g., subsistence fisherman) via its Fish Smart program:
	▪ Maintained signs that were previously posted by CEH along the Bay's shore (e.g., at fishing piers) in most cities in San Mateo County.
	▪ Continued to distribute educational materials (i.e., a Fish Project brochure entitled "Guide to Eating Fish and Shellfish from San Francisco Bay") at targeted locations:
	    • CEH provided 100 brochures to the San Mateo Medical Center (a county health services clinic).
	    • CEH provided 50 brochures to Save Our Shores, a non-profit that works with boaters.
	    • CEH displayed an example sign and provided brochures at the County Fair and interacted there with about 300 persons regarding Fish Smart and other CEH programs.
	▪ Conducted a "train the trainer" effort by presenting risk reduction information to nurses with the San Mateo County Health System, including nurses who serve appropriate communities.
	▪ Presented risk reduction information and handed out brochures at code enforcement and food inspection team meetings.
	▪ Posted an entry dated June 7, 2016 about Fish Smart on the CEH blog which has been viewed 20 times based on a web page analytic report.

2016/17	During FY 2016/17, CEH conducted the following activities that target at-risk populations (e.g., subsistence fisherman) via its Fish Smart program:
	▪ Maintained signs that were previously posted by CEH at 12 locations along the Bay's shore (e.g., at fishing piers) in the Cities of Brisbane, Burlingame, Redwood City, San Mateo, and South San Francisco.
	▪ Provided new signs to the North Fair Oaks Community Center, Docktown Marina, and 9 fishing supply stores
	▪ Continued to distribute educational materials (i.e., a Fish Project brochure entitled "Guide to Eating Fish and Shellfish from San Francisco Bay") at targeted locations:
	    • CEH provided 50 brochures each to 4 marinas in San Mateo County.
	    • CEH provided 50 brochures to Save Our Shores, a non-profit that works with boaters.
	    • CEH attended 6 community health fairs and the San Mateo County Fair, where brochures were provided and where a spinning wheel game was played. Over 1,500 people were reached regarding Fish Smart and other CEH programs.
	    • CEH provided brochures to 11 fishing supply stores in San Mateo County.
	▪ Included a Fish Smart article in the Pollution Prevention Post Newsletter which was distributed to over 5,000 people electronically, and 800 people via hard copy.
	▪ Presented the Fish Smart program to 14 San Mateo County employees from various departments.
	▪ Posted an entry dated March 28th, 2017 about Fish Smart on the CEH blog which has been viewed 17 times based on a web page analytic report.
	▪ Posted 3 social media posts on the program totaling 16,517 impressions combined.
	▪ Maintained the smchealth.org/fishsmart webpage which received 538 views over a 10-month period

Fiscal Year	Summary of Accomplishments
	Cumulatively, CEH had over 23,000 electronic or in person Fish Smart program impressions for FY 2016-17.

2017/18	During FY 2017/18, CEH conducted the following activities that target at-risk populations (e.g., subsistence fisherman) via its Fish Smart program:
	▪ Maintained signs that were previously posted by CEH at 11 locations along the Bay's shore (e.g., at fishing piers) in the Cities of Brisbane, Burlingame, Redwood City, San Mateo, and South San Francisco.
	▪ Printed Fish Project brochure "Guide to Eating Fish and Shellfish from San Francisco Bay" in English, Spanish, Chinese, and Tagalog.
	▪ Continued to distribute educational materials (i.e., a Fish Project brochure entitled "Guide to Eating Fish and Shellfish from San Francisco Bay") at targeted locations:
	    • CEH provided 50 brochures each to 4 marinas in San Mateo County.
	    • CEH attended 17 community health fairs, events, and the San Mateo County Fair, where brochures were provided and where a spinning wheel game was played. Over 4,000 people were reached regarding Fish Smart and other CEH programs.
	    • CEH created a Fish Smart fishing game where children catch fish with a fishing pole and identify if the fish is safe or not safe to each in exchange for a prize.
	▪ Presented the Fish Smart program to 30 San Mateo County Family Health Division Women, Infant, and Children (WIC) employees and provided brochures to them to distribute to their clients.
	▪ Posted 4 social media posts on the program totaling 4,114 impressions combined.
	▪ Maintained the smchealth.org/fishsmart webpage which received 3,800 views over a 11-month period.
	
	Cumulatively, CEH had nearly 12,000 electronic or in person Fish Smart program impressions for FY 2017/18.

2018/19	During FY 2018/19, CEH conducted the following activities that target at-risk populations (e.g., subsistence fisherman) via its Fish Smart program: ▪ EHS staff maintained signs posted along the San Francisco Bay shore (e.g., at fishing piers) in the Cities of Brisbane, South San Francisco, San Mateo, Burlingame, and Redwood City. In addition, two new Fish Smart in San Francisco Bay signs were installed at locations where fishing has been observed. ▪ The Office of Environmental Health Hazard Assessment (OEHHA) updated its statewide advisory for the California Coast in FY 2018/19. EHS provided signs in English, Spanish, Tagalog, and Chinese to City of Pacifica staff to post at the Pacifica Pier and printed the advisories in four languages to distribute in flyer format. ▪ EHS staff spoke with 2,500 residents at 10 events where information on the Fish Smart in San Francisco Bay, California Coast, and Monterey Bay Aquarium's Seafood Watch Programs was provided. ▪ Maintained the smchealth.org/fishsmart webpage which received over 2,700 views. ▪ EHS created 10 social media posts about safe fish consumption guidelines for the Bay and Ocean. Posts combined totaled over 110,000 impressions (number of times a post was on-screen), and over 9,800 engagements (e.g., a link in the post was clicked on). ▪ One social media post about surfperch reached over 16,000 people and had over 500 shares.

Fiscal Year	Summary of Accomplishments
2019/20	During FY 2019/20, CEH conducted the following activities that target at-risk populations (e.g., subsistence fisherman) via its Fish Smart program: ▪ EHS staff maintained signs posted along the San Francisco Bay shore (e.g., at fishing piers) in the Cities of Brisbane, South San Francisco, San Mateo, Burlingame, and Redwood City. One sign was replaced at the Brisbane Lagoon due to the previous sign and pole being knocked down. ▪ EHS continued to promote the Fish Smart program using the California OEHHA fish consumption advisories in various languages through flyer distribution at community events, bait and tackle stores, harbormaster offices, and WIC community offices. 1,075 flyers in various languages were distributed at 20 locations within the County. ▪ EHS staff spoke with 1,128 residents at 4 events where information on the Fish Smart in San Francisco Bay, California Coast, and Monterey Bay Aquarium's Seafood Watch Programs was provided. ▪ Maintained the smchealth.org/fishsmart webpage which received 4,212 views. ▪ EHS created three social media posts and shared them on both Facebook and Twitter for a total of six posts. One of the posts was also shared to over 124,000 households countywide on Nextdoor.com. Posts combined had a reach or impression total of 16,961, depending on the platform. Combined, the posts had 1,250 engagements. ▪ On February 13th, 2020, 13 surveys were conducted at the Pacifica Pier to discuss the OEHHA fish consumption guidelines. Results showed that 92% of respondents eat the fish they caught and shared at least some types of the fish they caught with their friends or family. When asked if they knew that certain fish were not safe to eat due to high mercury and PCB levels, 84% indicated they were aware of this.

FUTURE ACTIONS

SMCWPPP activities that are planned for FY 2020/21 to assist San Mateo County municipalities comply with MRP requirements in Provisions C.11/12. to reduce mercury and PCBs loads in stormwater runoff and report on the load reductions are described in the separate report mentioned earlier (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

During FY 2020/21, SMCWPPP also plans to continue to assist San Mateo County municipalities comply with the MRP risk reduction program requirements by coordinating with and reporting on the Fish Smart program conducted by EHS:

- EHS will continue to maintain signs and scout new locations to place signs to reach subsistence fishermen. Fish consumption messaging via social media will continue. Discussions with fishermen and their families at local events will continue as well as providing consumption guidelines to marinas and targeted retail and community locations. EHS also plans to continue to conduct surveys in FY 2020/21 to better understand Bay and Coast fish consumption patterns and consumption advisory knowledge.
- SMCWPPP will continue to work with EHS staff to document the risk reduction program and provide an update in the SMCWPPP FY 2020/21 Annual Report.

SECTION 12
C.12 PCBS CONTROLS

INTRODUCTION

MRP 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. SMCWPPP performs a variety of activities to address PCBs in stormwater runoff in compliance with MRP Provision C.12. Many of these activities address mercury in addition to PCBs and are described in the previous chapter (Section 11, Mercury Controls) rather than this section.

IMPLEMENTATION OF MRP PROVISIONS

C.11/12.a. Implement Control Measures to Achieve Mercury/PCBs Load Reductions

Efforts by SMCWPPP and San Mateo County Permittees to address MRP Provisions C.11/12.a., Implement Control Measures to Achieve Mercury/PCBs Load Reductions, are described below and in a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

C.11/12.b. Assess Mercury/PCBs Load Reductions from Stormwater

MRP Provisions C.11/12.b., Assess Mercury/PCBs Load Reductions from Stormwater, required Permittees to submit in their 2015/16 Annual Report for Executive Officer approval an assessment methodology. The purpose of the assessment methodology is to quantify in a technically sound manner mercury and PCBs loads reduced through implementation of a variety of pollutant controls, including pollution prevention, source control, and stormwater runoff treatment measures such as green infrastructure. SMCWPPP and San Mateo County municipalities helped develop the assessment methodology through participation in a BASMAA regional project. The methodology developed via the BASMAA regional project is referred to as the Interim Accounting Methodology and has been approved by the Executive Officer of the Regional Water Board.

Beginning with the FY 2016/17 Annual Report, Permittees are required to report annually the mercury and PCBs loads reduced in stormwater runoff. Permittees are required to use the approved assessment methodology to demonstrate cumulative pollutant loads reduced from each control measure implemented and progress toward achieving the load reductions required this permit term.

SMCWPPP is tracking all existing and planned control measures that should result in pollutant load reduction credits towards meeting the San Mateo County portion of the PCBs and mercury TMDL wasteload allocations and MRP 2.0 load reduction requirements. All existing controls that commenced or were enhanced in about 2005 or later are assumed to reduce stormwater runoff pollutant loads relative to the baseline loads in the TMDLs. This year was selected because load reductions due to controls fully implemented before about 2005 were already accounted for in the TMDL baseline stormwater runoff load estimates.

SMCWPPP has identified selected urban catchments with potential pollutant source areas, which are referred to as Watershed Management Areas (WMAs). The WMAs identified in San Mateo County and the associated control measures currently implemented within these WMAs are described in SMCWPPP's FY 2018/19 Annual Report. An update of this information is summarized in Appendix 11, Table App11-1 (*PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee, September 30, 2020*). In addition, each WMA and the GI/LID facilities within it are shown in maps in Appendix 11, Figures App11-1 through App11-19. The Cities of Half Moon Bay and Pacifica drain to the Pacific Ocean and therefore were not included, since this plan is focused on the PCBs and mercury TMDLs for San Francisco Bay.

The estimated PCBs loads reduced by San Mateo County Permittees via all control measures from July 1, 2013 through June 30, 2020 (i.e., FY 2013/14 through FY 2019/20) are shown in Table 12-1. Table 12-2 shows the PCBs loads reduced, itemized by control measure category. As mentioned in Section 11, supporting data for Tables 12-1 and 12-2 are included in Appendix 11, Table App11-1.

MRP 2.0 requires that an at least 15 grams/year PCBs load reduction is achieved in San Mateo County via GI by June 30, 2020. Table 12-2 shows that from FY 2013/14 through FY 2019/20,1 a 42.5 grams/year PCBs load reduction has been realized via GI (parcel-based GI/LID and green streets) in the County and thus this requirement has been fulfilled.

Finally, the estimated PCBs loads reduced to-date by all Permittees during the MRP 2.0 compliance period (FY 2013/14 through FY 2019/20) are described in a document entitled *PCBs and Mercury Regional Loads Reduced during MRP 2.0, September 30, 2020* (included in Appendix 11). The estimated PCBs load reduction across the permit area over this time period is 3,017 g/yr, indicating that the MRP regional performance criterion of 3,000 grams/year of PCBs load reduced by June 30, 2020 has been achieved.[2]

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[1]Based on language in the MRP and discussions with Regional Water Board staff, it is assumed that applicable controls implemented from July 1, 2013 through the end of the permit term should result in credit towards the MRP 2.0 mercury and PCBs load reduction requirements.

[2]It is important to note that the MRP allows Permittees to meet the regional criterion as a group – criteria for individual counties would only apply when the regional group criterion was not met.

Table 12-1. Preliminary estimates of PCBs loads reduced by San Mateo County Permittees via all control measures from July 1, 2013 through June 30, 2020 (FY 2013/14 through FY 2019/20).

Permittee	PCBs Loads Reduced (g/year)							
	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	Cumulative Load Reduced
Atherton	0.03	0	0	0	0	0	3	**3**
Belmont	0.4	0	0.002	0.01	0.1	0.4	9	**10**
Brisbane	1	0	0	0	2	0	1	**5**
Burlingame	0.08	0.2	0.01	0.7	0.07	0.07	11	**12**
Colma	0.005	0.06	0	0.0009	0.2	0.06	0.5	**0.9**
Daly City	0.08	0.2	0	0.5	2	0.05	39	**42**
East Palo Alto	4	0.2	0.03	0.4	0	0	11	**16**
Foster City	0.3	0	0.1	0.0005	0.001	0.5	11	**12**
Hillsborough	0	0	0.003	0	0.0005	0	4	**4**
Menlo Park	2	0.2	2	0.6	4	0.1	12	**21**
Millbrae	0.5	0	0	0	2	0	8	**10**
Portola Valley	0	0	0	0	0.04	0	2	**2**
Redwood City	0.7	1	0.7	0.5	0.6	1	28	**33**
San Bruno	0.3	0	0.5	0	0	0	15	**16**
San Carlos	2	0	0.7	0	21	0	11	**35**
San Mateo City	3	0.5	0.3	0.2	0.07	0.1	38	**41**
San Mateo County	1	0.4	0.3	0.05	0.09	0	23	**25**
South San Francisco	5	1	0	0.3	1	2	25	**34**
Woodside	0	0	0	0	0	0	2.06	**2**
Total	**21**	**4**	**4**	**3**	**34**	**4**	**253**	**323**

Table 12-2. Preliminary estimates of PCBs loads reduced in San Mateo County by control measure category from July 1, 2013 through June 30, 2020 (FY 2013/14 through FY 2019/20).

Control Measure Category		PCBs Loads Reduced (g/year)							
		FY 13/14	FY 14/15	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	Cumulative Load Reduced
Source Property Identification and Referral[1]	270 Industrial Road / 495 Bragato Road, San Carlos					16			**16**
	977 and 1007/1011 Bransten Road, San Carlos					5			**5**
GI and Other Stormwater Treatment Controls	Parcel-based GI/LID (i.e., new & redevelopment projects)[2]	10	4	4	3	11	4	5	**42**
	Green Streets [2]	0.01	0.1	0.07	0.02	0.05	0.06	0.2	**0.5**
	Large Full Trash Capture Systems[3]	7				2			**9**
Enhanced O&M Measures[4]		4	0.06	0.002	0.6				**5**
Manage PCBs in Building Materials								247	**247**
Manage PCBs in Infrastructure									**0**
Diversion to POTW									**0**
Source Controls / Other									**0**
	Total	**21**	**4**	**4**	**3**	**34**	**4**	**253**	**323**

1. Load Reduced = (Source Property Area (acre)) x (4.065 – 0.0303 (g/acre/year)).
2. For parcel-based projects, Load Reduced = (Project Area (acre)) x (Existing Yield – 0.0035 (g/acre/year)). For green street or regional retrofit projects, Load Reduced = (Project Drainage Area (ac)) x (area-weighted PCBs yield (g/acre/year)) x 70% (assumed efficiency factor for green street projects).
3. Load Reduced = (Project Drainage Area (acre)) x (area-weighted PCBs yield (g/acre/year)) x 20% (assumed efficiency factor for large full trash capture).
4. Loads reduced = (Project Drainage Area (acres)) X (area-weighted PCBs yield (g/acre/year) x 2% (assumed efficiency factor for enhanced inlet cleanouts twice annually).

C.11/12.c. Plan and Implement Green Infrastructure to Reduce Mercury/PCBs Loads

Permittees are required to submit in this FY 2019/20 Annual Report an estimate of the amount and characteristics of land area that will be treated through green infrastructure implementation by 2020, 2030, and 2040, including all data used and a full description of models and model inputs relied on to generate this estimate.

Permittees are also required to submit in this FY 2019/20 Annual Report a Reasonable Assurance Analysis (RAA) to demonstrate quantitatively that PCBs reductions of at least 3 kg/yr will be realized by 2040 through implementation of green infrastructure projects. The MRP requires this submittal to include all data used and a full description of models and model inputs relied on to make the demonstration and documentation of peer review of the RAA.

San Mateo County Permittees have fulfilled the above MRP requirements via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

C.11/12.d. Prepare Implementation Plan and Schedule to Achieve TMDL Wasteload Allocations

As described in more detail in Section 11 (C.11 Mercury Controls), MRP Provisions C.11/12.d require that Permittees prepare a plan and schedule for mercury and PCBs control measure implementation and a corresponding RAA demonstrating quantitatively that sufficient control measures will be implemented to attain the mercury and PCBs TMDL wasteload allocations by 2028 and 2030, respectively. San Mateo County Permittees have fulfilled this requirement via development of a separate report (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report.

C.12.e. Evaluate PCBs Presence in Caulks/Sealants Used in Storm Drain or Roadway Infrastructure in Public Rights-of-Way

MRP 2.0 Provision C.12.e requires that Permittees collect samples of caulk and other sealants used in storm drains and between concrete curbs and street pavement and investigate whether PCBs are present in such material and in what concentrations. BASMAA has completed a regional investigation that addresses this requirement. SMCWPPP reported on the results of the investigation in its FY 2017/18 Annual Report.

C.12.f. Manage PCB-Containing Materials and Wastes during Building Demolition Activities So That PCBs Do Not Enter Municipal Storm Drains

MRP Provision C.12.f. requires that Permittees develop and implement or cause to be developed and implemented an effective protocol for managing materials with PCBs concentrations of 50 parts per million or greater in applicable structures[3] at the time such structures undergo demolition, so that PCBs do not enter municipal storm drain systems. A Permittee is exempt from this requirement if it provided evidence acceptable to the Executive Officer in its FY 2016/17 Annual Report that the only buildings that existed pre-1980 within its jurisdiction were single-family residential and/or wood-frame buildings.[4]

Permittees were required to develop a protocol by June 30, 2019 that includes each of the following components, at a minimum:

- The necessary authority to ensure that PCBs do not enter municipal storm drains from PCBs-containing materials in applicable structures at the time such structures undergo demolition;
- A method for identifying applicable structures prior to their demolition; and,
- Method(s) for ensuring PCBs are not discharged to the municipal storm drain from demolition of applicable structures.

By July 1, 2019 and thereafter, Permittees are required to:

- Implement or cause to be implemented the PCBs management protocol for ensuring PCBs are not discharged to municipal storm drains from demolition of applicable structures via vehicle track-out, airborne releases, soil erosion, or stormwater runoff; and,
- Develop an assessment methodology and data collection program to quantify in a technically sound manner PCBs loads reduced through implementation of the protocol for controlling PCBs during demolition of applicable structures.

On behalf of MRP Permittees, BASMAA conducted a multi-year regional project to assist MRP Permittees to address Provision C.12.f. The BASMAA project, which began in FY 2016/17 and was completed in March 2019, assisted Permittees in developing local programs to manage PCBs-containing materials during building demolition. It developed guidance materials, tools and training materials and conducted outreach. SMCWPPP actively participated in the project, including providing BASMAA's project manager.

At the outset of the project, a BASMAA Steering Committee was convened to provide project oversight and guidance during the project. The Steering Committee included BASMAA Directors, countywide stormwater program staff, and Permittee staff from various relevant municipal departments. The Steering Committee met periodically throughout the project. In addition, a project TAG, a small balanced advisory group formed from industry, regulatory, and Permittee representatives to provide review and input on selected project work products, was convened. The TAG was comprised of representatives from industry and state/federal regulatory agencies, and Permittees. Other efforts to engage key stakeholders included an industry stakeholder roundtable meeting (August 2017) and two larger stakeholder group meetings (December 2017 and May 2018) that included industry, regulatory and municipal representatives. During FY 2018/19, Permittees tailored the BASMAA products for local use, adopted the program (e.g., via local policy or ordinance), and trained local staff to implement the new program starting July 1, 2019.

[3] Applicable structures are buildings built or remodeled from January 1, 1950 through December 31, 1980, with the following exemptions: single-family residential buildings, wood-framed buildings, and partial building demolitions.

[4]The City of Clayton in Contra Costa County provided acceptable evidence and is exempt from this provision.

Key BASMAA project deliverables provided to each Permittee to use as appropriate given local procedures and needs included:

- A protocol for pre-demolition building survey for priority PCBs-containing building materials;
- Model language for municipal adoption (e.g., ordinance) of the new program to manage PCBs materials during building demolition and model supporting staff report and resolution;
- CEQA strategy and model notice of exemption;
- Supplemental demolition permit model application materials, including forms, process flow charts, and applicant instructions; and
- An analysis to assist municipalities that pursue cost recovery.

Other project deliverables included:

- A coordination/communication strategy for the project;
- A technical memorandum summarizing any new information & decisions needed by BASMAA at outset, including an annotated table of regulatory drivers and relevant requirements;
- A technical memorandum with the state of the practice for identifying PCBs-containing building materials (developed to inform development of the pre-demolition building survey protocol listed below);
- Industry stakeholder outreach materials and a fact sheet for municipal staff;
- A spreadsheet tool used to develop the prioritized list of potential PCBs-containing building materials that the demolition program will focus on;
- A conceptual approach for an assessment methodology and data collection program to quantify PCBs loads reduced through managing PCBs-containing materials during building demolition.

During FY 2018/19, the BASMAA project concluded by conducting the following outreach and training tasks:

- Prepared training materials for municipal staff on adoption and implementation of the new program;
- Developed outreach materials and a standard presentation to inform industry stakeholders including developers, planning firms, urban planning non-governmental organizations, demolition firms, property owners, property managers, and realtors about the new program to manage PCBs in building materials during demolition;
- Using the above training materials, conducted training workshops (in-person and a webinar) for key municipal and countywide stormwater program staff;
- Conducted a webinar for industry stakeholders; and
- Developed a list of Bay Area opportunities, including contact information and dates, for municipal and/or stormwater program staff to conduct additional outreach to industry stakeholders using the above industry outreach materials.

In addition, during FY 2018/19 and FY 2019/20, San Mateo County and other MRP Permittees worked together through the BASMAA Monitoring and Pollutants of Concern Committee (MPC) to develop a framework to comply with data collection/evaluation and reporting requirements under Provision

C.12.f. As mentioned previously, these requirements include developing an assessment methodology and data collection program to quantify PCBs loads reduced through implementation of the new program. The regional process developed includes the following steps:

1. The municipality informs demolition permit applicants that their projects are subject to the MRP Provision C.12.f requirements, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.
2. For every demolition project, applicants complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality.
3. The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
4. The municipality then issues the demolition permit or equivalent, according to its procedures.[5]
5. For Applicable Structures only, the municipality submits completed Screening Forms and any supporting documents (consultant's report from PCBs building survey, QA/QC checklist, and lab reports) to its countywide program; forms for exempt sites need not be submitted. Forms should be submitted to the countywide programs electronically if feasible, and at a minimum annually, but quarterly is preferred.
6. The countywide programs compile the completed Screening Forms and any supporting documents. The countywide program then works with the other MRP countywide programs through BASMAA to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

Permittees began implementing the program on or before July 1, 2019. Appendix 12 includes two documents prepared collaboratively by San Mateo County and other MRP Permittees in compliance with MRP reporting requirements in Provision C.12.f. (3) – (5):

1. Documentation of (a) the number of applicable structures that applied for a demolition permit during the reporting year, and (b) a running list of the applicable structures that applied for a demolition permit (since the date the PCBs control protocol was implemented) that had material(s) with PCBs at 50 ppm or greater, with the address, demolition date, and brief description of PCBs control method(s) used (*PCBS in Building Materials Management Program – Regional Data Summary, August 20, 2020*).
2. An assessment methodology and data collection program to quantify PCBs loads reduced through implementation of the protocol for controlling PCBs during building demolition (*Managing PCBs in Building Demolition – Regional Collaboration for a Data Collection and Assessment Program, August 20, 2020*).

[5] Municipalities should require that applicants fill out and certify a Screening Form for every demolition. For non-Applicable Structures, applicants simply check the boxes, certify, and submit to municipality. Then the municipality can authorize the demolition (e.g., issue a demolition permit). In general, municipalities should have a completed and certified Screening Form before authorizing a demolition, unless they are a small community that is exempt or has some other arrangement with Regional Water Board staff. Municipalities do not need to track non-Applicable Structures otherwise.

C.12.g. Fate and Transport Study of PCBs: Urban Runoff Impact on San Francisco Bay Margins

MRP Provision C.12.g requires Permittees to conduct or cause to be conducted studies concerning the fate, transport, and biological uptake of PCBs discharged from urban runoff to San Francisco Bay margin areas. This requirement is being addressed through a multi-year project by the San Francisco Bay Regional Monitoring Program (RMP) to develop a series of conceptual models of PCBs in Priority Margin Units (PMUs). SMCWPPP's FY 2016/17 Annual Report included a workplan developed by BASMAA that describes how these information needs will be accomplished, including the studies to be performed and a preliminary schedule. SMCWPPP's March 30, 2020 Integrated Monitoring Report includes a summary of the findings and results of the studies completed, planned, or in progress and the implications of the studies on potential control measures to be investigated, piloted, or implemented in future permit cycles.

C.12.h. Risk Reduction Program

SMCWPPP is assisting San Mateo County municipalities to comply with the risk reduction program requirements by coordinating with and reporting on the Fish Smart program conducted by San Mateo County Environmental Health Services (EHS). Please see Section 11 for additional details.

FUTURE ACTIONS

SMCWPPP activities that are planned for FY 2020/21 to assist San Mateo County municipalities comply with MRP requirements in Provisions C.11/12. to reduce mercury and PCBs loads in stormwater runoff and report on the load reductions are described in the separate report mentioned earlier (*Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020*). Appendix 11 contains the report. SMCWPPP also plans to:

- Continue to participate in the RMP PCBs Work Group to help oversee RMP studies concerning the fate, transport, and biological uptake of PCBs discharged from urban runoff to San Francisco Bay margin areas. A continued focus will be the conceptual model under development for Steinberger Slough in San Mateo County and associated monitoring fieldwork by the RMP.
- Assist San Mateo County municipalities to implement their programs to manage PCBs during building demolition and compile, evaluate and report the new data generated by the programs.
- Assist San Mateo County municipalities to comply with the risk reduction program requirements by coordinating with and reporting on the Fish Smart program conducted by EHS, and working with EHS to conduct an evaluation of the program (see Section 11).

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). The Regional Water Board has deemed these controls are 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; and
- C.13.c. Industrial Sources.

In FY 2019/20, Permittees and the Countywide Program continued to conduct activities related to complying with Provision C.13. Local actions are documented in each Permittee's individual Annual Report. This section summarizes copper control activities conducted by the Countywide Program.

IMPLEMENTATION OF MRP PROVISIONS

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.

During 2019/20, SMCWPPP continued to train municipal staff on the MRP requirements and BMPs for architectural copper installation, cleaning, and treating. The trainings utilized a SMCWPPP factsheet entitled "Requirements for Architectural Copper: Protect water quality during installation, cleaning, treating, and washing!" which targets suppliers and installers of copper materials and is available on the SMCWPPP website (flowstobay.org). Building inspectors and other municipal staff received the information from a SMCWPPP staff presentation at the California Building Inspectors Group (CALBIG) meeting on November 13, 2019 (see Section 6).

C.13.b. Manage Discharges from Pools, Spas and Fountains

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 are reported on in their Annual Reports. 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. A fact sheet entitled *Best Management*

Practices for Pools, Hot Tubs, and Fountain Water Discharges was developed in FY 2018/19 and includes information on avoiding the use of copper-based algaecides. The fact sheet is available on the SMCWPPP website (flowstobay.org). Section 15 discusses related public outreach by SMCWPPP to promote pool, spa, and fountain discharge BMPs through social media posts.

C.13.c. Industrial Sources

Provision C.13.c 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 San Mateo County municipal agency staff with understanding this MRP requirement and SMCWPPP 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 members only website. Industrial inspectors received information on this topic in a guidance document prepared by SMCWPPP entitled *Stormwater Inspector Guidance on Meeting Annual MRP C.4.d Training Requirements* (June 1, 2019).

FUTURE ACTIONS

FY 2020/21 activities planned by SMCWPPP to assist San Mateo County Permittees comply with MRP requirements in Provision C.13 include the following:

- Continue to provide information on MRP requirements regarding architectural sources of copper to construction site and building inspectors at New Development Subcommittee meetings, SMCWPPP's FY 2020/21 Construction Site Inspector Workshop, and at presentations to CALBIG or other partner organizations;
- Provide guidance to San Mateo County Permittees via SMCWPPP's CII Subcommittee and/or SMCWPPP stormwater business inspector training workshops and materials to assist them with conducting routine industrial facility inspections that ensure proper BMPs are in place at industrial facilities likely to use copper or have sources of copper; and
- Continue to provide outreach material and guidance via SMCWPPP's CII and PIP Subcommittees regarding pool, spa and fountain discharge BMPs.

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 non-stormwater discharges that are potential sources of pollutants. This section describes SMCWPPP's countywide activities conducted to help its member agencies implement this provision. SMCWPPP helps municipal staff understand the MRP's requirements and makes various MRP compliance support materials available for their use. 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.

In addition, during FY 2019/20 SMCWPPP's PIP component conducted selected activities to help San Mateo County Permittees comply with outreach requirements in Provision C.15.b.iv., Individual Residential Car Washing Discharge, C.15.b.v., Swimming Pool, Hot Tub, Spa and Fountain Water, and Provision C.15.b.vi., Irrigation Water, Landscape Irrigation, and Lawn or Garden Watering. These activities are described below.

IMPLEMENTATION OF MRP PROVISIONS

Provision C.15.b.iv. Individual Residential Car Washing

During FY 2019/20, SMCWPPP continued previous years' outreach efforts through social media posts to encourage residents to use professional car wash companies rather than washing their cars at home (Figure 15-1). The practice of using commercial car washes helps keep soaps, automotive pollutants, and environmental toxins from washing into San Mateo County storm drains. SMCWPPP also partnered with a local car wash company to offer an exclusive discount to members in an effort to make professional car wash companies more accessible. SMCWPPP also targeted mobile car wash businesses and residents to educate them on the hazards of dumping their used wash waters down storm drains and about best management practices. The associated mobile business fact sheet (Figure 15-2) was translated into Spanish and Chinese.

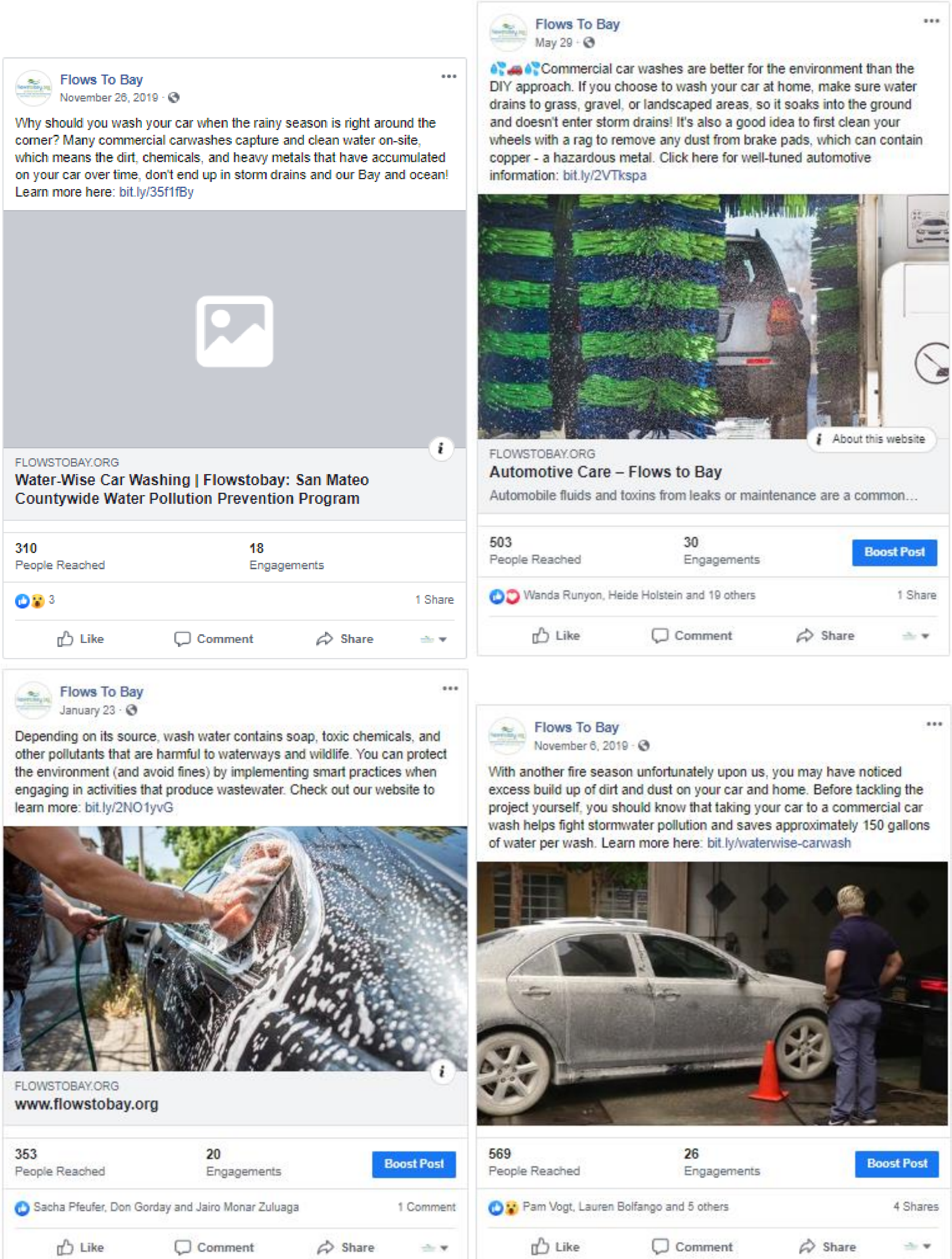


Figure 15-1. Examples of Facebook Posts about Car Washing.

Figure 15-2. Mobile Businesses BMP Fact Sheet in Spanish and Chinese.

Provision C.15.b.v. Swimming Pool, Hot Tub, Spa, and Fountain Water Discharges

During FY 2019/20, SMCWPPP continued public outreach and educational efforts to encourage implementation of the required BMPs in commercial, municipal, and residential facilities. SMCWPPP shared BMP fact sheets with San Mateo County Permittees that are specifically target swimming pools, hot tubs, spas, and fountain water discharges (Figure 15-3), and promoted best practices through social media posts (Figure 15-4).

flowstobay.org
SAN MATEO COUNTYWIDE
WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

BEST MANAGEMENT PRACTICES FOR
SWIMMING POOLS, HOT TUBS & FOUNTAIN WATER DISCHARGES
Homeowners | Landscapers | Swimming Pool/Spa Service Workers | Contractors

Information about using Best Management Practices (BMPs) to prevent swimming pool, hot tub, and fountain waters from entering storm drain systems and polluting local waterways.

WHY SHOULD WE BE CONCERNED WITH POOL, HOT TUBS, AND FOUNTAIN WATER DISPOSAL?

Water from pools, hot tubs, and fountains is NOT just water. It also may potential pollutant sources such as chlorine, copper, algaecides, colored dye, chemicals/salts that are harmful to our creeks and waterways. You may never drain your pool water in the street or storm drain system, even if the water is dechlorinated.

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.

CLEANING

- Never clean a filter in the street, gutter, or storm drain.
- Rinse cartridge filters onto a dirt area and spade filter residue into the soil.
- Keep backwash discharges out of the street and storm drain. Backwash sand and diatomaceous earth filters onto a dirt area. Dispose of spent filter materials in the trash.
- If you don't have a suitable dirt area, contact your wastewater treatment authority listed on the back of this flier for instructions on discharging to the sanitary sewer.

DRAINING

- Never drain into a street, gutter or storm drain.
- Discharge water to a sanitary sewer clean-out.
- If you are on a septic system or have no sanitary sewer clean-out, contact your wastewater treatment authority listed in this brochure for guidance.

MATERIAL STORAGE & HANDLING

- Store chemicals in a clean, dry and covered area.
- If landscaping materials are left outside, cover with a tarp or plastic sheeting to protect from urban runoff.

A PROPERLY MAINTAINED POOL, HOT TUB, AND FOUNTAIN WILL REDUCE THE NEED FOR DRAINING

MAINTAINING

- Clean regularly, maintain proper chlorine levels and maintain water filtration and circulation.
- Manage pH and water hardness to minimize copper pipe corrosion that can stain your pool and end up in our creeks and the Bay.
- Minimize algae buildup to prevent the need for toxic algaecides.
- Ask your pool maintenance service for help resolving persistent algae problems without using copper algaecides.

DID YOU KNOW...?

Copper is a pollutant that threatens aquatic life in our creeks and the Bay. It is used as an algaecide in pools, spas and fountains, and copper pipes are commonly used in pool plumbing.

flowstobay.org
For More Information About Stormwater Pollution Prevention email info@flowstobay.org
UPDATED APRIL 2019

flowstobay.org
SAN MATEO COUNTYWIDE
WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

BEST MANAGEMENT PRACTICES FOR
SWIMMING POOLS, HOT TUBS & FOUNTAIN WATER DISCHARGES
Homeowners | Landscapers | Swimming Pool/Spa Service Workers | Contractors

Protect the Bay, the Ocean, and Yourself! Keep swimming pools, hot tub, and fountain water out of storm drains, creeks, and the Bay.

DOING THE JOB RIGHT: CHECKLIST OF BMPS

- ☐ Never drain your pool water into the street or storm drain system, even if the water is dechlorinated.
- ☐ Always drain your residential pool water into a sewer line. For convenience, use the sewer clean-out connection in your yard.
- ☐ You can also access the sewer system drain in your toilet, bathtub or sink inside your home. Be cautious that you do not flood your home if you use this option.
- ☐ If you are on a septic system or have no sanitary sewer clean-out, contact your wastewater treatment authority listed in this flier for guidance.
- ☐ Filters should be cleaned and rinsed over a dirt area or all rinse water should be captured and filtered to remove any solids prior to being discharged into the sewer system.
- ☐ Keep backwash discharges out of the street and storm drain. Backwash sand and diatomaceous earth filters onto a dirt area. Dispose of spent filter materials in the trash.
- ☐ Rinse cartridge filters onto a dirt area and spade filter residue into the soil.
- ☐ If you don't have a suitable dirt area, contact your wastewater treatment authority listed in this brochure for instructions on discharging to the sanitary sewer.

Wastewater Treatment Plants

Burlingame Waste Water Treatment Facility	(650) 342-3727
Millbrae Water Pollution Control Plant	(650) 259-2388
North San Mateo County Sanitation District	(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	(650) 726-0124
Silicon Valley Clean Water	(650) 832-6243
South San Francisco/San Bruno Water Quality Control Plant	(650) 877-8555

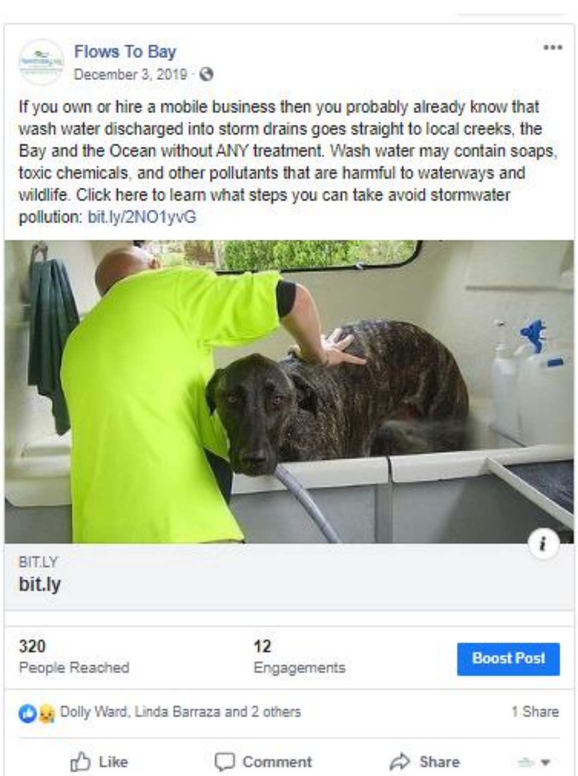
4 TIPS FOR FINDING YOUR CLEAN-OUT

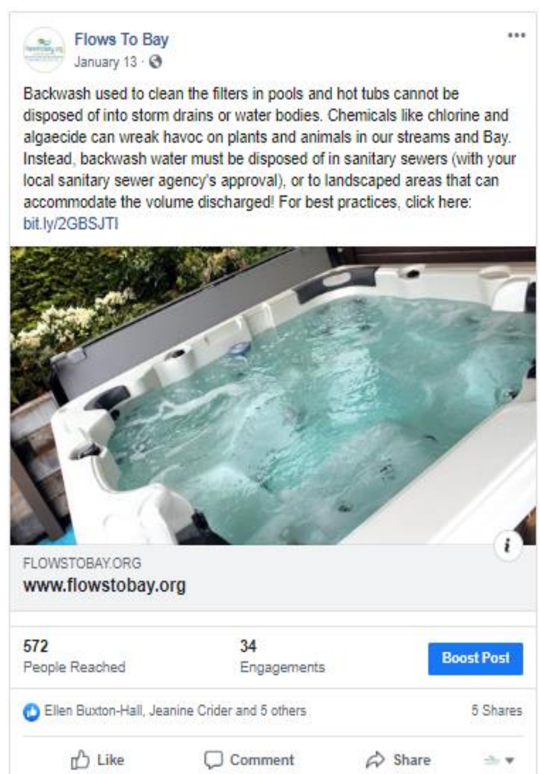
Sanitary sewer clean-outs are most often found along the sewer line, which is usually aligned with the sewer lines for the house. However, not all cities use the same method to mark their sewer systems. If you have trouble locating your clean-out, contact your local wastewater treatment authority. See the "Local Pollution Control Agencies" below.

1. Look for an "S" stamped into the curb or sidewalk near your house. It marks where the sewer line is. Your clean-out may be along it.
2. Look for a slight linear depression in your yard between your house and the street. This is often an indicator of the location of a sewer line, and your clean-out may be on it.
3. If your kitchen or bathroom is on an exterior wall, look outside along that wall for the clean-out.
4. Stand on the sidewalk looking toward your house. Line up the main water sources in your house (bathrooms, kitchens, washers, etc.) The clean-out is often located on that line, in front of or behind your house.

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

Figure 15-3. Swimming Pool, Hot Tub, Spa, and Fountain Water Discharge BMP Fact Sheet.





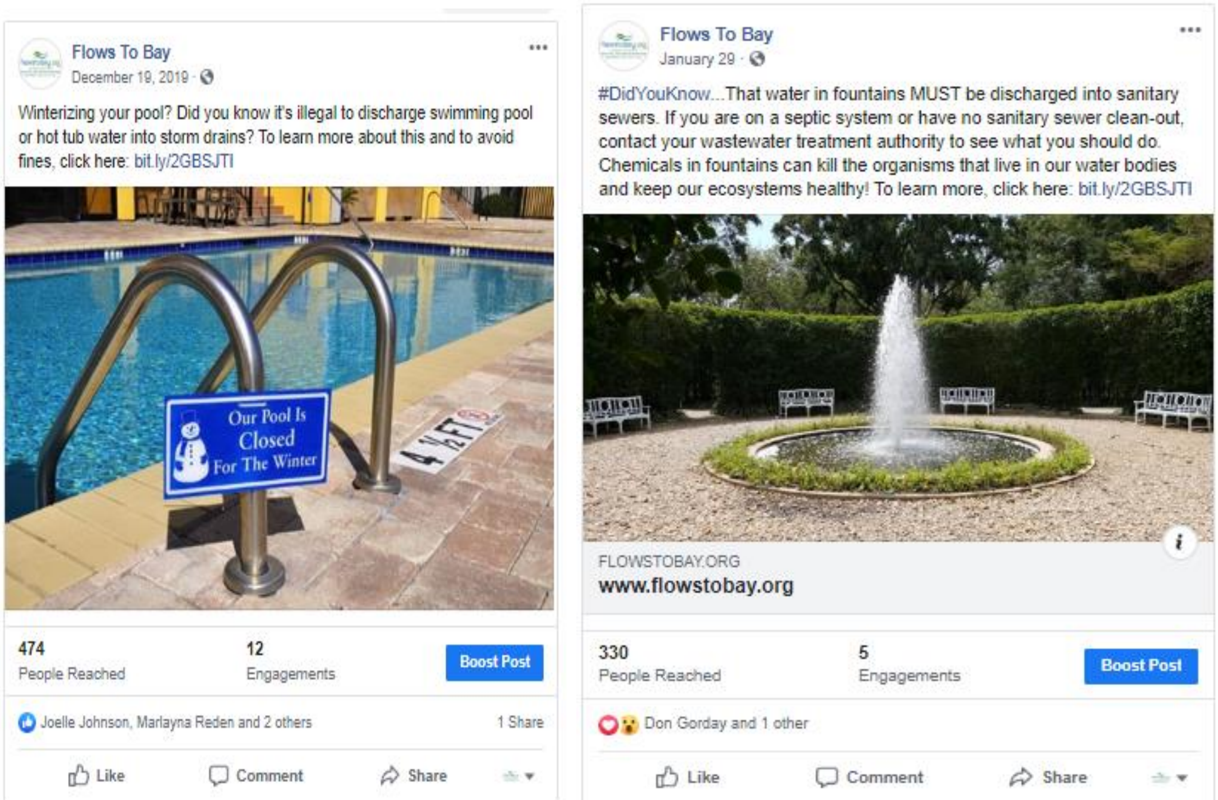


Figure 15-4. Examples of Facebook Posts about Swimming Pool, Hot Tub, Spa, and Fountain Water Discharge.

Provision C.15.b.vi. Irrigation Water, Landscape Irrigation, and Lawn or Garden Watering

In FY 2019/20, SMCWPPP implemented the following outreach activities to promote the use of less-toxic options for pest control and landscape management, and the use of drought tolerant, native vegetation to minimize landscape irrigation demands:

- Conducted outreach to San Mateo County residents to support and promote eco-friendly alternatives to toxic pesticides and help avoid pollutants in groundwater and surface water discharges. This promotion took place on social media and through the SMCWPPP newsletter and blog. Additional messaging was provided through SMCWPPP's point-of-purchase program, where OWOW materials were distributed that educate residents about eco-friendly pesticide alternatives. Example posts are shown in Figure 15-5. Table 15-1 summarizes the reach of Facebook posts made on pesticide pollution prevention.
- Promoted planting of drought tolerant, native vegetation through online media channels, including social media and the SMCWPPP newsletter and blog. Messaging focused on the environmental benefits of planting native plants, including their tolerance to drought. Example posts are shown in Figure 15-6.
- Continued to promote water-saving tips via social media.

- Developed a pilot program for supplementing the BAWSCA *Lawn Be Gone!* lawn replacement program with a new rain garden incentive (the full program starts in FY 2020/21).

Table 15-1. Summary of Facebook Posts on Pesticide Pollution Prevention Topics

Post Focus	Reach	Engagements (likes, comments, and shares)	Clicks
Integrated Pest Management (19 posts)	8,332	200	155
Hiring a Pest Control Operator (6 posts)	2,317	52	38
Promotions of Community Partners (20 posts)	9,927	205	316
Links Between Pesticides & Water Quality (10 posts)	3,723	132	79
Totals:	**24,299**	**589**	**588**

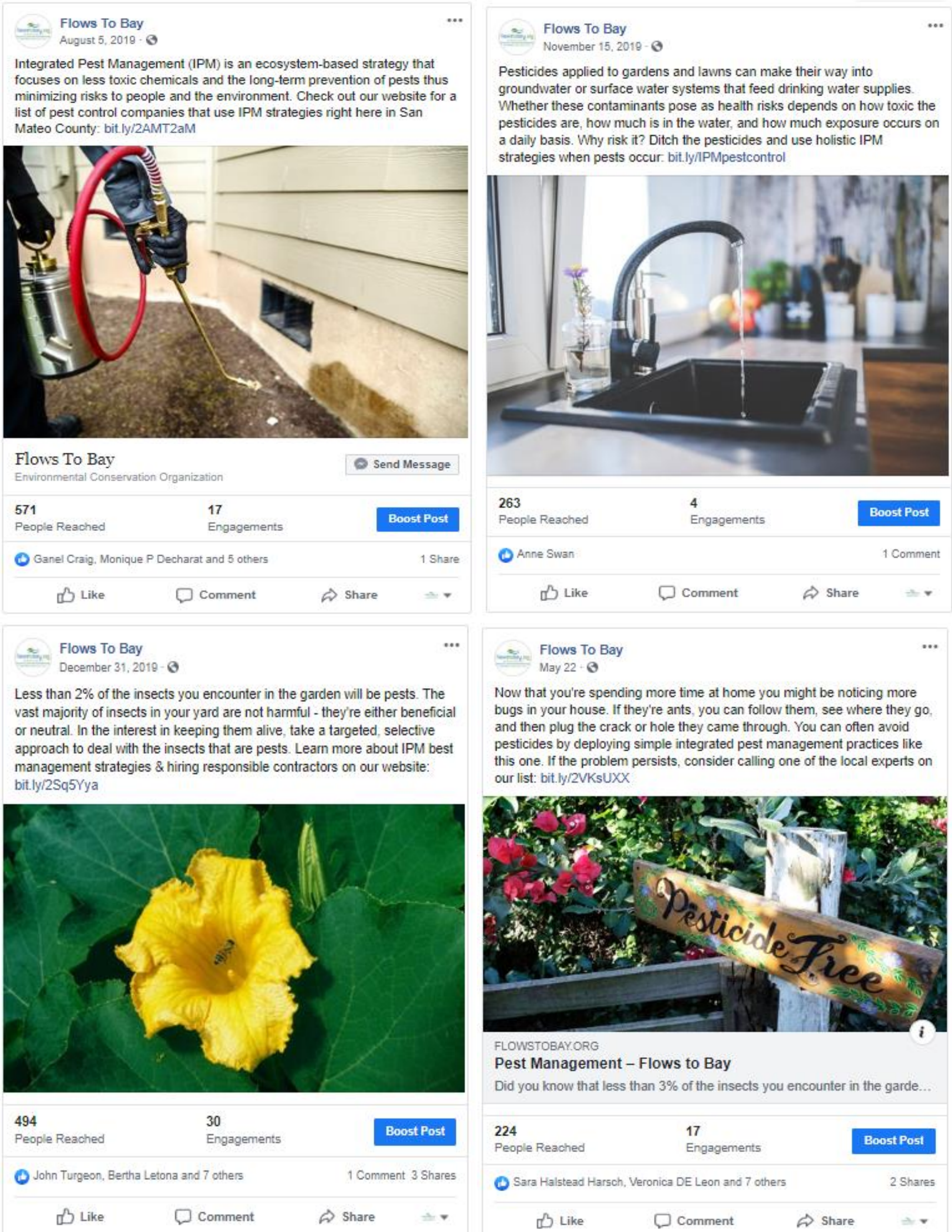


Figure 15-5. Social Media Posts Promoting Eco-Friendly (IPM) Alternatives to Pesticides

Flows To Bay
May 15 ·

With the weather getting warmer as we shelter at home, now is a great time to do that garden or yard project you've been wanting to get to! Some ideas we have that help protect our local waterways include removing plants considered invasive in our local ecosystem and planting drought-resistant species. Check out more ideas on our website: bit.ly/2XW72vp

FLOWSTOBAY.ORG
Lawn & Garden – Flows to Bay
Read on to learn how to protect local creeks, the Bay, and the ocean…

253 People Reached | 2 Engagements

Thurman Wolford

Like Comment Share

Flows To Bay
June 3 ·

Gardening tip: Mulching your garden not only keeps weeds down, but it helps save A LOT of water -- 25% according to a study by Texas Cooperative Extension. Sometimes helping to protect our precious water resources is as simple as adding a layer of decomposing bark to your garden to hold onto moisture and keep the soil around your plants cool. Click here for more gardening tips: bit.ly/2XW72vp

Flows To Bay
Environmental Conservation Organization
Send Message

489 People Reached | 38 Engagements | Boost Post

Bill George, Joanne Lucero and 22 others | 3 Shares

Like Comment Share

Flows To Bay
July 17, 2019 ·

A recent Stanford University study on urban irrigation and vegetation health during extreme drought leaves off with some good tips for residential homeowners interested adopting helpful water management practices: shift to climate-appropriate landscaping, create more shaded areas, implement drip irrigation and nighttime watering. You can read more about the study here: stanford.io/2KOQRtT

WATERINTHEWEST.STANFORD.EDU
Keeping Green During Drought | Water in the West
June 06, 2019 | Water in the West | News By Karly Chin FL_Sprinklers-…

453 People Reached | 18 Engagements | Boost Post

Samantha Spare, Eileen Dion and 3 others | 1 Comment 2 Shares

Like Comment Share

Flows To Bay
August 7, 2019 ·

Live on a hill? Hiring a landscaper might not seem like a big deal, but small decisions about planting and slope can have a big impact on water quality. Native plants with fibrous root structures will slow down water as it moves through the ground, and terracing steep slopes will do wonders to prevent runoff. More resources on our website: bit.ly/2mzYIS

Flows To Bay
Environmental Conservation Organization
Send Message

753 People Reached | 50 Engagements | Boost Post

Anna Radcliffe, Nancy Luck and 14 others | 4 Shares

Like Comment Share

Figure 15-6. Social Media Posts Promoting Landscape Management and the Use of Drought-Tolerant, Native Vegetation

FUTURE ACTIONS

In FY 2020/21, SMCWPPP will continue to assist member agencies to comply with MRP Provision C.15 requirements related to conditionally exempt non-stormwater discharges, including conducting selected types of related outreach.

Appendix 1

- Stormwater Committee – Attendance List for FY 2019/20

2019-20 Stormwater Committee Attendance														
Agency	**Representative**	**Position**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**
Atherton	Robert Ovadia	Public Works Director		X	X		X					X	X	
Belmont	Peter Brown	Public Works Director		X	X		X					X	X	
Brisbane	Randy Breault	Public Works Director/City Engineer		X	X		X					X	X	
Burlingame	Syed Murtuza	Public Works Director		O			O					X	X	
Colma	Brad Donohue	Director of Public Works and Planning	C	X	X	C	X	C	C	C	C	X	O	
Daly City	Richard Chiu	Public Works Director	A	X	X	A	X	A	A	A	A	X	X	
East Palo Alto	Kamal Fallaha	City Engineer	N			N		N	N	N	N			
Foster City	Norm Dorais	Public Works Director	C	X	X	C		C	C	C	C	X	X	
Half Moon Bay	Maziar Bozorginia	City Engineer	E	X		E		E	E	E	E		X	
Hillsborough	Paul Willis	Public Works Director	L	X	X	L		L	L	L	L		X	
Menlo Park	Nikki Nagaya	Public Works Director	E	X	X	E	X	E	E	E	E	X	X	
Millbrae	Andrew Yang	Senior Engineer	D			D		D	D	D	D	X	X	
Pacifica	Sam Bautista	Public Works Director/City Engineer			O							X	X	
Portola Valley	Howard Young	Public Works Director		X								X	X	
Redwood City	Saber Sarwary	Supervising Civil Engineer			O									
San Bruno	Jimmy Tan	City Engineer		X	X							X	X	
San Carlos	Steven Machida	Public Works Director		X	X		X					X	X	
San Mateo	Brad Underwood	Public Works Director		X	X		X					X	X	
South San Francisco	Eunejune Kim	Public Works Director												
Woodside	Sean Rose	Public Works Director										X	X	
San Mateo County	Jim Porter	Public Works Director		X	X		X					X	X	
Regional Water Quality Control Board	Tom Mumley	Assistant Executive Officer												

"X" - Committee Member Attended
"O" - Other Jurisdictional Representative Attended

Appendix 2

- Municipal Maintenance Subcommittee – Attendance List for FY 2019/20

SMCWPPP Municipal Maintenance Subcommittee Attendance FY 2019/20

NAME	MUNICIPALITY	7/25/2019	9/25/2019	6/24/2020
Marcus Escobedo	Belmont	✓		
Rick Locke	Belmont	✓		
Tim Murray	Belmont	✓	✓	
Jennifer Lee	Burlingame	✓	✓	✓
Sven Edlund	City of San Mateo			✓
Louis Gotelli	Colma	✓		
Alan Chu	Daly City	✓		
Jeff Fornesi	Daly City	✓		
Jose Padilla	Daly City	✓	✓	
Jose Rodrigues	Daly City		✓	
Rick Medina	Daly City	✓		
Sibely Calles	Daly City	✓	✓	✓
Lenin Malgar	East Palo Alto		✓	
Allen Smith	Foster City	✓		
Greg Baeza	Foster City	✓		
Todd Seeley	Half Moon Bay			✓
Gary Francis	Hillsborough	✓	✓	
Hugo Torres	Menlo Park	✓		
Christopher Falzon	Millbrae	✓	✓	
Noel Gantley	Millbrae	✓	✓	
Bernie Mau	Pacifica	✓		
Chris Martin	Pacifica		✓	
Paul Lavorini	Pacifica	✓		
Vicki Sherman	Redwood City	✓	✓	✓
Dennis Bosch	San Bruno	✓		
Ed Maxion	San Bruno		✓	✓
Sean Morris	San Bruno	✓		✓
Ted Chapman	San Bruno		✓	
Angel Noriega	San Carlos		✓	
Dempsey Davis	San Carlos	✓		
Ken Tongol	San Carlos		✓	
Ted Rutledge	San Carlos	✓		
John Allan	San Mateo County			✓
Brian Weber	San Mateo County Mosquito & Vector Control District			✓
Casey Stevenson	San Mateo County Mosquito & Vector Control District	✓		✓

NAME	MUNICIPALITY	7/25/2019	9/25/2019	6/24/2020
Reid Bogert	SMCWPPP		✓	✓
Kelly Carroll	CSG for Half Moon Bay/Colma	✓	✓	✓
Nick Zigler	CSG for Half Moon Bay/Colma			✓
Kristin Kerr	EOA, Inc.	✓	✓	

Appendix 3

- New Development Subcommittee – Attendance List for FY 2019/20
- Biotreatment Soil Media Supplier List 1/1/20
- Annual C.3 Workshop: Part 1 – Reviewing C.3 Regulated Projects – June 3, 2020
  - Workshop Agenda
  - Attendance List
  - Evaluations Summary
- Annual C.3 Workshop: Part 2 – Implementing Green Street Projects - June 17, 2020
  - Workshop Agenda
  - Attendance List
  - Evaluations Summary

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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New Development Subcommittee

FY 2019/20 Meeting Attendance

Representing	Name	Phone Number	Meetings Attended			
			Aug	Nov	Feb	May
Atherton	Jake Garcia	650-752-0544		X	X	X
Belmont	Julie Freitas	650-595-7425	X		X	
	Anwar Mirza	650-637-2985	X	X		X
Brisbane	Ken Johnson/ Alberto Viana	415-508-2120	X	X	X	X
Burlingame	Jennifer Lee	650-558-7381	X	X	X	X
Colma	Muneer Ahmed/Michael Laughlin	650-757-8894	X	X	X	X
	Katherine Sheehan/Catherine Chan	650-522-2506				X
County of San Mateo	Camille Leung	650-363-1826	X		X	X
	Susan Wright/Lawrence Truong	650-363-4372	X		X	
	John Allan	650-363-4071	X	X	X	X
	Julie Casagrande/Brian Oh	650-599-1457	X		X	X
	Melody Eldridge	650-363-1812	X		X	X
C/CAG – SMCWPPP	Matt Fabry	650-599-1419		X	X	X
	Reid Bogert	650-599-1433	X		X	X
CD+A, URD	Connie Goldade (CD+A) Kevin Robert Perry (URD)	510-839-4568 x238 503-928-5522		X		X
Daly City	Sibely Calles	650-991-8054	X		X	X
	Carmelisa Morales	650-991-8156	X	X		X
East Palo Alto	Tiffany Deng	650-853-3126				
EOA-SMCWPPP	Jill Bicknell	408-720-8811 x1	X	X		X
	Peter Schultze-Allen	510-832-2852 x128	X	X	X	X
Foster City	Vivian Ma	650-286-3270	X	X		
	Stephanie MacDonald	650-286-3274		X		
Half Moon Bay	Kelly Carroll	650-522-2506	X	X	X	X
	Maziar Bozorgina	650-726-7177				X
Hillsborough	Natalie Gribben/Katherine Sheehan	650-375-7444	X	X	X	X
	Irfan Aziz	650-375-7444				X
Menlo Park	Clarence Li	650-330-6797	X			X
	Rambod Hakhamaneshi	650-330-6740		X		X
Millbrae	Linda Roberson	650-259-2351		X		
	Sam Fielding	650-522-2506		X		
	Kelly Carroll/Andrew Yang	650-522-2506	X			X
Pacifica	Christian Murdock/Helen Gannon	650-738-7444	X	X		X
	Raymond Donguines	650-738-3767	X			
Portola Valley	CheyAnne Brown	650-851-1700		X	X	X
Redwood City	James O'Connell	650-780-5923	X	X	X	X
San Bruno	Matt Neuebaumer/ David Wong	650-616-7042	X	X	X	
	Joanna Kwok	650-616-7052	X	X		X
San Carlos	Kathryn Robertson/Vatsal Patel	650-802-4212	X	X	X	X
San Mateo	Karen Magallanes/Mark Swenson	650-522-7333	X		X	
	Sarah Scheidt/Sven Edlund	650-522-7296	X	X		X
San Mateo County RCD	Noah Katz	650-712-7765 x117			X	
South S.F.	Daniel Garza	650-829-3882		X	X	
	Andrew Wemmer	650-829-3840	X			X
Woodside	Dong Nguyen	650-851-6790	X			

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BIOTREATMENT SOIL MEDIA SUPPLIER LIST

Company	Contact Name	Phone	Address	City	Zip	E-mail	Website
American Soil & Stone Products Inc.	Ryan Hoffman	510-292-3018	Richmond Annex, 2121 San Joaquin Street, Building A	Richmond	94804	ryan@americansoil.com	www.americansoil.com
California Landscape Supply	Ryan Thornberry	209-538-8493	4107 Morgan Road	Ceres	95307	ryan@californialandscapesupply.com	www.californialandscapesupply.com
L.H. Voss Materials, Inc.	Nyoka Corley	925-676-7910 x102	5965 Dougherty Road	Dublin	94568	nyoka.corley@gmail.com	www.lhvoss.com
Lehigh Hanson Aggregates	Chris Stromberg	510-246-0393	4501 Tidewater Avenue	Oakland	94601	chris.stromberg@lehighhanson.com	www.lehighhanson.com
Lyngso Garden Materials, Inc.	Kan Parthiban Erik Aichelen	650-257-9836 650-333-1044	345 Shoreway Road	San Carlos	94070	kparthiban@lyngsogarden.com eaichelen@lyngsogarden.com	www.lyngsogarden.com
Marshall Brothers Enterprises, Inc.	Phillip Marshall	925-449-4020	P.O. Box 2188	Livermore	94551	phillip@mbenterprises.com	www.mbenterprises.com
Pleasanton Trucking Inc.	Tom Bonnell	925-449-5400	P.O. Box 11462	Pleasanton	94588	tom@ptisoils.com	
Recology Blossom Valley Organics	Jake Oosterman	209-872-0734 209-545-7718	6133 Hammett Court	Modesto	95358	joosterman@recology.com	www.recology.com/blossom-valley-organics-modesto
Soiland Company	Willie Leuzinger	707-889-7800	7171 Stony Point Rd.	Cotati	94931	WLeuzinger@SoilandRocks.com	www.SoilandRocks.com
South County Rockery	Todd Quilici	408-842-0022	281 Yamane Dr.	Gilroy	95020	todd@southcountyrockery.net	www.southcountyrockery.net/florite-blend-bioswale
TMT Enterprises, Inc.	Matt Moore	408-432-9040	1996 Oakland Road	San Jose	95131	info@tmtenterprises.net	www.tmtenterprises.net

As of: 1/1/2020

Disclaimer: SMCWPPP provides this list of biotreatment soil media suppliers for the use of its member agencies, contractors, designers and others in finding suppliers for their projects. Suppliers are listed based on a general review of their soil media product including test results, adherence to the BASMAA Biotreatment Soil Media specification (required in the MRP) and knowledge of the specification. Therefore users of this SMCWPPP list must make the final determination as to the products and adherence to the BASMAA specification and the MRP. Users of the list assume all liability directly or indirectly arising from use of this list. The listing of any soil supplier is not be construed as an actual or implied endorsement, recommendation, or warranty of such soil provider or their products, nor is criticism implied of similar soil suppliers that are not listed. This disclaimer is applicable whether the information is obtained in hard copy or downloaded from the Internet. Check the SMCWPPP website for the “Biotreatment Soil Mix Verification Checklist” and “Biotreatment Soil Mix Supplier Verification Statement” for assistance in reviewing and approving soil media submittals. www.flowstobay.org/newdevelopment

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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Annual "C.3" Workshop:

Reviewing C.3 Regulated Projects

Webinar

Wednesday, June 3, 2020 9:00 AM – 12:00 PM

DRAFT AGENDA

Arrival	9:00 am – 9:05 am
Welcome	*Matt Fabry, SMCWPPP* 9:05 am – 9:10 am
1. Basic Training: Stormwater Control Measures Overview of stormwater regulations, Provision C.3 requirements, and stormwater control measures	*Kristin Kerr, EOA* 9:10 am – 9:55 am
BREAK	9:55 am – 10:00 am
2. Advanced Training: C.3 Regulated Project Requirements Sizing and design guidance and available resources	*Jill Bicknell, EOA* 10:00 am – 10:55 am
BREAK	10:55 am – 11:00 am
3. C.3 Regulated Project Compliance Review Process, project submittals, tips for review, example project in Redwood City and resources	*Peter Schultze-Allen, EOA* *James O'Connell, Redwood City* 11:00 am – 12:00 pm
ADJOURN	12:00 pm

	First Name	Last Name	Agency/Company
1	Anwar	Mirza	City of Belmont
2	Julia	Ayres	City of Brisbane
3	Keegan	Black	City of Brisbane
4	Kenneth	Johnson	City of Brisbane
5	Jeremiah	Robbins	City of Brisbane
6	Jennifer	Lee	City of Burlingame
7	Martin	Quan	City of Burlingame
8	Sibely	Calles	City of Daly City
9	Shirley	Chan	City of Daly City
10	Camelisa	Morales	City of Daly City
11	Roland	Yip	City of Daly City
12	Vivian	Ma	City of Foster City
13	Francine	Magno	City of Foster City
14	Lawrence	Tam	City of Foster City
15	Clarence	Li	City of Menlo Park
16	Andy	Wong	City of Millbrae
17	Andrew	Yang	City of Millbrae
18	Helen	Gannon	City of Pacifica
19	Lawrence	Henriquez	City of Pacifica
20	James	O'Connell	City of Redwood City
21	Patti	Schrotenboer	City of Redwood City
22	Vicki	Sherman	City of Redwood City
23	Joanna	Kwok	City of San Bruno
24	Hae Won	Ritchie	City of San Bruno
25	Jason	Tong	City of San Bruno
26	David	Wong	City of San Bruno
27	Evan	Cai	City of San Carlos
28	Justin	Erickson	City of San Carlos
29	Sophia	Lee	City of San Carlos
30	Vatsal	Patel	City of San Carlos

	First Name	Last Name	Agency/Company
31	Leo	Chow	City of San Mateo
32	Sven	Edlund	City of San Mateo
33	Richard	Kraft	City of San Mateo
34	Sarah	Scheidt	City of San Mateo
35	Daniel	Garza	City of South San Francisco
36	Thomas	Siphongsay	City of South San Francisco
37	Christina	Tai	City of South San Francisco
38	Andrew	Wemmer	City of South San Francisco
39	Nelson	Yuk	City of South San Francisco
40	John	Allan	County of San Mateo
41	Olivia	Boo	County of San Mateo
42	Summer	Burlison	County of San Mateo
43	Angela	Chavez	County of San Mateo
44	Melody	Eldridge	County of San Mateo
45	Katie	Faulkner	County of San Mateo
46	Camille	Leung	County of San Mateo
47	Wency	Ng	County of San Mateo
48	Sina	Oshaghi	County of San Mateo
49	John	Schabowski	County of San Mateo
50	Kim	Springer	County of San Mateo
51	Johnson	Young	County of San Mateo
52	Alex	Zhang	County of San Mateo
53	Kareem	Arabi	CSG Engineering
54	Michelle	Bocalan	CSG Engineering
55	Kelly	Carroll	CSG Engineering
56	Catherine	Chan	CSG Engineering
57	Jen	Chen	CSG Engineering
58	Jay	Gonzales	CSG Engineering
59	Rhafael	Herrera	CSG Engineering
60	Babak	Kaderi	CSG Engineering

	First Name	Last Name	Agency/Company
61	Jeffrey	Lee	CSG Engineering
62	Heba	Masri	CSG Engineering
63	Sandra	Meditch	CSG Engineering
64	Frank	Navarro	CSG Engineering
65	Mehdi	Sharifi	CSG Engineering
66	Katherine	Sheehan	CSG Engineering
67	Paramjit	Uppal	CSG Engineering
68	Nick	Zigler	CSG Engineering
69	Robin	Lee	Schaaf and Wheeler
70	Erika	Marshall	Schaaf and Wheeler
71	Cameo	Tsui	Schaaf and Wheeler
72	Matt	Fabry	SMCWPPP
73	David	Wong	Town of Atherton
74	Muneer	Ahmed	Town of Colma
75	Irfan	Aziz	Town of Hillsborough
76	Natalie	Gribben	Town of Hillsborough
77	Dan	Farah	Veolia

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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EVALUATION SUMMARY

Attendance: 77
Evaluations: 30

SMCWPPP C.3 WORKSHOP
Part 1 - Reviewing C.3 Regulated Projects
Tuesday, June 3, 2020
Webex

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1. **Overall, how informative did you find the webinar?**
   Very helpful **25** Somewhat helpful **5** Not helpful **0**

- I imagine there are different levels of knowledge among the audience so the webinar presenters should be more aware of that possibility and try to gauge the presentation to all the audience. In general, the webinar was very good. Looking forward to the next one.
- Mostly review information for me
- It would be great if we could alternate with every other year being totally focused on advanced topics.
- The examples were very helpful.
- Very good presentations

2. **Basic Training: Stormwater Control Measures**
   Kristin Kerr, *EOA*

   Very helpful **25** Somewhat helpful **5** Not helpful **0**

Comments

- This was more to my level of knowledge and understanding.
- I have seen this presentation quite a few times at this point
- Well-presented, but personally a re-hash of a lot of previously known information (which makes sense).
- Thank you for the overview. It was very helpful and simple to understand.
- Mostly review information for me
- For me personally, I know this information already, but Kristin did a great job at presenting it.
- Great speaker

3. **Advanced Training: C.3 Regulated Project Requirements**
   Jill Bicknell, *EOA*

   Very helpful **24** Somewhat helpful **4** Not helpful **1**

   Comments

   - Some parts were a bit more than my exposure, but I imagine I do need to get more knowledge in this department even though I may not directly use it in my work, but the knowledge definitely adds value to my work.
   - I have seen this presentation quite a few times at this point
   - The emphasis on sizing criteria can get a bit dry -- perhaps a little more break-up to that section?
   - The fillable calculation sheet was a good improvement
   - Mostly review information for me
   - Excellent

4. **C.3 Regulated Project Compliance Review**
   Peter Schultze-Allen, *EOA*

   Very helpful **26** Somewhat helpful **4** Not helpful **0**

   Comments

   - This seems to be more in the area that I need knowledge in.
   - I like the way that it showed a lot of examples with dos and don'ts. It is probably a good presentation to guide a designer to.
   - I'm actually still a little perplexed on the "new" impervious surface definition as laid out in the C.3 checklist discussion. The checklist of common pitfalls was helpful.
   - The colored C3/C6 form grid was very helpful
   - Mostly review information for me
   - Great

5. **Redwood City Example Project**
   James O'Connell, *Redwood City*

   Very helpful **27** Somewhat helpful **3** Not helpful **0**

   Comments

   - At this point, part of my plan reviews could be involved with different aspects of stormwater management. Seeing specific examples was great and felt more hands-on.
   - I very much liked the presentation, particularly on the way the project had to be modified to adapt to real-world conditions as design progressed and the introduction/discussion of Silva Cells (and I am always impressed by the high level of requirements Redwood City applies to its projects). I admit I am a little disappointed that the project itself was a "special project" -- with rumors of removal of the category from MRP 3.0 abounding, I

would have liked an example of how C.3 was implemented on a challenging site (though the lessons from the example can obviously be applied to C.3).

- Not helpful for my particular work focus, but thought it was a good presentation.
- Looks like Silva Cells would be more popular. Need more information and guidance (fact sheet) if possible.
- Examples are always helpful
- Very good

6. What did you find most valuable from the webinar/workshop?

Comments

- Specific references to the regulations, calculations and how to use them on specific projects, design or plan review.
- The general introduction of the information - would prefer to have the slides earlier to review ahead of time. Information went pretty fast.
- Putting the presentation together, just because you forget a lot of details over the course of a project.
- More in-depth explanation of the forms since I wasn't too familiar with them.
- Great refresher and nice to see the case study presented as it provided pros and cons, what worked and what didn't.
- Example Reviews
- Basic refresher on C.3 design criteria and the different treatment measures
- The examples provided regarding the worksheets.
- I've been to these previous annual workshops and I always appreciate the basic C3 refreshers. I also think the pictures are very helpful visual aids for this sort of information heavy type of workshop.
- This presentation is much improved from previous workshops. Thank you.
- The updates, examples and the review of the processes
- Applications/examples of pervious areas
- Good refresher on the design criteria and Silva Cell product.
- Real life projects are always helpful case studies!
- Examples of where mistakes are made when filling out forms, etc.
- It's always helpful to be able to ask Peter, Jill, and Kristin questions. Thanks for your help.
- The examples and walking through them
- Example of what Redwood City is doing
- Good refresher and learned a few things.

7. What would you like to see in future workshops/webinars?

Comments

- I wonder if having a pdf of the presentation before the session could add value. That way, the audience might have specific, well-thought-of items that could use clarification. Just an idea.
- Information was great, just seemed to go too fast.
- More Silva Cell (or similar product) examples. I feel like there is still a lot of stuff to learn about newer facilities.
- Updates and new requirements if any; it was helpful to refresh when liner was used in the past and why it was no longer required or installed nowadays.
- Incorrect design of stormwater treatment measures and the fixed design
- I always appreciate lessons learned discussions. Everyone always talks about how filter fabric is bad, but where are the examples of early site implementation that show this failure? Overall presentation comment for webinars: I think adding extra presenters/voices helps improve audience retention for a remote presentation when so much of the experience is auditory.
- Other worksheet samples.
- Much of the same
- Some sort of resource regarding C.6 regulations/inspections
- Design constraints, site issues, conflicts and changes during construction
- Advanced topics
- More C3 regulated projects
- Examples from other cities and how they are complying with C.3 regulations

8. Have you attended previous C.3 in-person workshops?

Yes: **21** No: **6**

9. Do you prefer webinars or in-person workshops?

Webinar: **7** In-person: **7** No choice: **15**

10. How did you view the webinar?

Own my own: **30** In a group: **0**

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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Annual "C.3" Workshop/Webinar

Part 2: Implementing Green Street Projects

Wednesday, June 17, 2020 9:00 AM – 12:30 PM

AGENDA

Arrival	9:00 am – 9:05 am
Welcome and Introduction Update on Green Suite and Flowstobay.org website	*Reid Bogert, SMCWPPP* 9:05 am – 9:30 am
1. Green Street Feasibility: Assessing Public Projects Initial desktop analysis and field assessment approaches	*Peter Schultze-Allen, EOA* 9:30 am – 10:25 am
BREAK	10:25 am – 10:30 am
2. Green Street Project Design Guidelines Key design features for bioretention, lessons learned, examples, and available resources	*Jill Bicknell, EOA* 10:30 am – 11:25 am
BREAK	11:25 am – 11:30 am
3. Green Street Operation and Maintenance Key operation requirements, maintenance practices, plant identification, plant maintenance practices, pervious pavement O&M, and using the GI Design Guide and other resources	*Peter Schultze-Allen, EOA* 11:30 am – 12:30 pm
ADJOURN	12:30 pm

Attendance C.3 Workshop June 17, 2020

	First Name	Last Name	Company
1	Anwarbeg	Mirza	City of Belmont
2	Craig	West	City of Belmont
3	Julia	Ayres	City of Brisbane
4	Keegan	Black	City of Brisbane
5	Ken	Johnson	City of Brisbane
6	Jeremiah	Robbins	City of Brisbane
7	Jennifer	Lee	City of Burlingame
8	Sibely	Calles	City of Daly City
9	Carmelisa	Morales	City of Daly City
10	Theresa	Avedian	City of Menlo Park
11	Eric	Hinkley	City of Menlo Park
12	Esther	Jung	City of Menlo Park
13	Clarence	Li	City of Menlo Park
14	Jason	Santos	City of Menlo Park
15	Jane	Kao	City of Millbrae
16	Helen	Gannon	City of Pacifica
17	James	O'Connell	City of Redwood City
18	Patti	Schrotenboer	City of Redwood City
19	Vicki	Sherman	City of Redwood City
20	Joanna	Kwok	City of San Bruno
21	Jacinta	Liang	City of San Bruno
22	Hae Won	Ritchie	City of San Bruno
23	Evan	Cai	City of San Carlos
24	Justin	Erickson	City of San Carlos
25	Sophia	Lee	City of San Carlos
26	Vatsal	Patel	City of San Carlos
27	Sven	Edlund	City of San Mateo
28	Richard	Kraft	City of San Mateo
29	Andrew	Wemmer	City of South San Francisco
30	Connie	Goldade	Community Design + Architecture

Attendance C.3 Workshop June 17, 2020

	First Name	Last Name	Company
31	John	Allan	County of San Mateo
32	Olivia	Boo	County of San Mateo
33	Summer	Burlison	County of San Mateo
34	Julie	Casagrande	County of San Mateo
35	Melody	Eldridge	County of San Mateo
36	Camille	Leung	County of San Mateo
37	Sina	Oshaghi	County of San Mateo
38	Ruemel	Panglao	County of San Mateo
39	John	Schabowski	County of San Mateo
40	Johnson	Young	County of San Mateo
41	Alex	Zhang	County of San Mateo
42	Kareem	Arabi	CSG Consultants
43	Cesar	Caronongan	CSG Consultants
44	Kelly	Carroll	CSG Consultants
45	Catherine	Chan	CSG Consultants
46	Jen	Chen	CSG Consultants
47	Son	Hoang	CSG Consultants
48	Sandra	Meditch	CSG Consultants
49	David	Seto	CSG Consultants
50	Mehdi	Sharifi	CSG Consultants
51	Katherine	Sheehan	CSG Consultants
52	Stephen	Tovmassian	CSG Consultants
53	Nick	Zigler	CSG Consultants
54	Reid	Bogert	SMCWPPP-C/CAG
55	Matt	Fabry	SMCWPPP-C/CAG
56	Muneer	Ahmed	Town of Colma
57	Irfan	Aziz	Town of Hillsborough
58	Natalie	Gribben	Town of Hillsborough

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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EVALUATION SUMMARY

Attendance: 58
Evaluations: 21

SMCWPPP C.3 WORKSHOP/WEBINAR
Part 2 – Implementing Green Street Projects
Wednesday, June 17, 2020

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1. **Overall, how informative did you find the webinar?**
Very helpful **19** Somewhat helpful **2** Not helpful **0**

Comments
- The pictures were very helpful in showing the items to consider when designing - especially regarding keeping long-term operations and maintenance in mind when designing.
- Very informative and well presented
- Pace of the seminar went well. It felt like the first seminar. I really enjoyed the visuals and thorough explanations of the visuals.
- Well done! Good moderation of muting attendees (few distractions). Good pictures or drawings used as examples. Better in-depth discussion of current issues rather than the basic introductory discussions in the past.
- Having quite a few actual field pictures gave a more complete perspective for the presentation.
- I think this should be a recurring annual webinar, updated to reflect new examples and best practices.
- Thank you for making this presentation smooth and easy to understand!
- Perhaps we could make it a little more interactive instead of solely presentations, like quizzes or polls. Maybe have other guest speakers from cities and how they are implementing some of the requirements.

2. **Green Street Feasibility: Assessing Public Projects**
Peter Schultze-Allen, *EOA*

Very helpful **17** Somewhat helpful **4** Not helpful **0**

Comments

- It was helpful to walk through the feasibility spreadsheet. It may be helpful to do a live example next time.
- Interesting - it shows there has been a lot of thought and effort in beefing up resources with a Green Street focus.
- Would like a link to the curb extension/bulb-out feasibility tool (did not see it in FlowstoBay website).
- Having field pictures/examples was helpful.

3. Green Street Project Design Guidelines
Jill Bicknell, *EOA*

Very helpful **17** Somewhat helpful **4** Not helpful **0**

Comments

- Not a lot of new information for me, but a good refresher.
- Good examples of what not to do and pictures to show. Wish some of the contractors attended.
- Once again, using examples did help.
- Consider splitting this out as it's own presentation and workshop

4. Green Street Operation and Maintenance
Peter Schultze-Allen, *EOA*

Very helpful **19** Somewhat helpful **2** Not helpful **0**

Comments

- The pictures were very helpful in showing the items to consider when designing, especially regarding keeping long-term operations and maintenance in mind when designing.
- It seems like it would be helpful to have yearly trainings that could be held for City arborists and Parks staff if possible, especially since there is more maintenance that may be expected of City staff.
- Might discuss how maintenance can be enforced when not the municipalities' responsibility (O&M Agreements - legal language vs. reality similar to LID when dealing with private owner, HOA, etc.). Maybe just enforcement in general and timeframe for compliance that is appropriate (it's going to be longer than 10 business days).
- Great tips.

5. What did you find most valuable from the webinar/workshop?

Comments

- Going over the assessment tool.
- Picture examples of what works and what does not.
- The photos and documents presented and going through them.

- Reid's introduction presentation as it was the "newest" information for me in terms of familiarity with workshop topics.
- All presentations used references/examples from the Green Suite and reinforced the idea that many answers can be found there. Sometimes that is not my first go-to, but it will be now.
- I have been exposed to a few webinars and the old workshops before. In this one, in addition to covering sources for information, the presentations seemed to have included a lot more field examples that really add value to the whole sessions.
- Love the examples of less than ideal conditions and thoughts on how sites can be improved.
- Picture and design examples are great.

6. **GI What would you like to see in future workshops/webinars?**

Comments

- How to read plans to inspect for stormwater.
- Maybe take the criteria/evaluation process used for the current County RFP to find Regional Projects and train the cities to see if they can use it to develop their own projects.
- Not sure if it was just on my screen, but I think it would be helpful if the mouse pointer arrow on the screen was even a little bigger and maybe a bright fluorescent color. It was hard to follow the arrow on photos that were darker with the black arrow, more helpful with the white outline though.
- Enforcement: how it differs from C.4/C.5 and timelines for compliance.
- Obstacles and methods employed to overcome them.
- Assessing system performance: Are there any techniques to assess LID systems other than visual observations? One example is the "bucket test" (ASTM Method) for permeable pavers that measures the permeability to see if the void space has been filled with sediment and no longer drains. Anything for bioretention or flow through planters other than being present during a steady rainfall to see how it performs.
- Some very basic points such as where you start from, etc.
- Case studies or examples from other cities. Peer to peer learning.

7. **Have you attended previous C.3 in-person workshops?**

Yes: **16** No: **5**

8. **Do you prefer webinars or in-person workshops?**

Webinar: **7** In-person: **3** No Preference: **11**

Appendix 4

- CII Subcommittee – Attendance List for FY 2019/20
- BMP Brochure for Food Service Facilities
- BMP Brochure for Vehicle Service Facilities

SMCWPPP Commercial/Industrial/Illicit Discharge (CII) Subcommittee Attendance – FY 2019/20

Name	Agency	9/18/19	12/18/19	3/3/20	6/2/20
Jake Garcia	City of Atherton				✓
Bozhena Palatnik	City of Belmont		✓		✓
Keegan Black	City of Brisbane		✓		✓
Jennifer Lee	City of Burlingame	✓	✓	✓	✓
Dan Ferah	City of Burlingame (Veolia)	✓	✓	✓	✓
Louis Gotelli	City of Colma				✓
Sibely Calles	City of Daly City			✓	✓
Ward Donnelly	City of Daly City	✓	✓	✓	✓
June Canter	City of East Palo Alto			✓	
Stephanie MacDonald	City of Foster City	✓	✓	✓	
Vivian Ma	City of Foster City	✓		✓	✓
Clarence Li	City of Menlo Park	✓	✓	✓	✓
Cliff Ly	City of Millbrae			✓	
Lawrence Henriquez	City of Pacifica			✓	
Oscar Murillo	City of Redwood City			✓	
Robin Kim	City of Redwood City			✓	
Vicki Sherman	City of Redwood City				✓
Sven Edlund	City of San Mateo	✓		✓	✓
Kathryn Robertson	City San Carlos		✓		
Breann Liebermann	County of San Mateo	✓			
John Allan	County of San Mateo		✓	✓	✓
Pat Ledesma	County of San Mateo	✓	✓	✓	
Susan Hiestand	Silicon Valley Clean Water (SVCW)		✓	✓	✓
Daniel Garza	South San Francisco	✓		✓	✓
Nick Zigler	CSG for Colma/Half Moon Bay				✓
Kelly Carroll	CSG for Colma/Half Moon Bay/Portola Valley	✓		✓	✓
Kristin Kerr	EOA	✓	✓	✓	✓

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BEST MANAGEMENT PRACTICES FOR

FOOD SERVICE FACILITIES

Information for Restaurants | Cafeterias | Grocery Stores | Food Handling Facilities

Storm drains flow directly into creeks, San Francisco Bay and the Pacific Ocean without any treatment. Non-stormwater and other wastes that flow into a storm drain cause pollution. Food handling facilities can cease stormwater pollution through proper cleanup practices that ensure food particles, oil and grease, litter, wash water and cleaning products flow to interior sewer connections, which ensures the water is treated prior to being released.

NEVER RINSE OUTDOOR AREA WITH HOSE

Only rain water is allowed down the storm drains, because storm drains connect directly to local creeks.

It is the responsibility of your business to use appropriate Best Management Practices (BMPs) to keep wind or rain from carrying pollution into the street.

Roofed trash enclosure with doors closed. Bilingual sign reminds staff to keep area tidy.

Dumpster lid is closed, and there is no loose trash on ground.

GENERAL BEST MANAGEMENT PRACTICES

Keep Dumpster Area Clean

- ☐ Close dumpster lids.
- ☐ Routinely inspect dumpster area for cleanliness.
    - If dumpsters overfill, consider having more dumpsters, or increasing trash pick-up service.
    - Replace leaking or cracked dumpsters.
    - If loose waste is on the ground, then sweep up.
- ☐ Educate all staff on keeping dumpster areas tidy. With high rates of employee turnover, or when sharing a dumpster area, post signs or have routine meetings on proper BMPs.

Cooking Oil & Grease

- ☐ Store oil and grease properly in permitted tallow bins; never pour oil or grease in the trash, storm drain, street, sinks or floor drains.
- ☐ Keep tallow bins clean & lids sealed.
- ☐ Have tallow bin collection scheduled to maintain adequate storage capacity.
- ☐ Check rooftop exhaust fans at least monthly. Place tray under exhaust fan shrouds to collect oil; empty weekly at a minimum.
- ☐ Clean up spills right away (See back of this sheet).

Manage Outdoor Areas (Parking Lots, Outdoor Seating, Staff Break Areas, Outdoor Storage)

- ☐ Empty trash bins into dumpster regularly.
- ☐ Sweep frequently in trash-prone places.
- ☐ If frequent litter issues, consider adding trash cans.
- ☐ Place ash trays in cigarette-prone areas.

Outdoor seating area is swept frequently, is covered, and has fencing to keep debris from blowing into the street.

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BEST MANAGEMENT PRACTICES FOR

FOOD SERVICE FACILITIES

Information for Restaurants | Cafeterias | Grocery Stores | Food Handling Facilities

Properly cleaning and disposing of wash waters helps prevent pollution.

CLEANING BEST MANAGEMENT PRACTICES

Use Dry Cleaning Methods

- ☐ Sweep up dust, debris, and trash.
- ☐ Vacuum floor mats. If water is needed, rinse mats in dishwasher or mop utility sink. Never wash floor mats outdoors or allow wash water to flow to outdoor areas.
- ☐ Do not clean equipment outdoors.
- ☐ When hiring cleaning companies (e.g. for cleaning hood/roof equipment), make sure the company uses dry cleaning methods. If wet methods are used, block off gutters & use a pump/wet-vac, so no water spills off roof.

Sweeping is an example of a dry cleaning method.

Contain and Manage Spills Promptly

- ☐ Keep a spill kit near high risk areas (e.g. near oil tallow bins, loading dock). Kit may include: Barrier/Sock, Storm Drain Inlet Protection; Absorbent granules or kitty litter, Towels, Pads; Dustpan, Broom, Gloves, Trash Bags.
- ☐ Contain the spill and protect nearby storm drains immediately.
- ☐ Use absorbents/towels to manage spill. Sweep up and dispose of properly.
- ☐ Make sure staff know spill plan and spill kit location.

Never rinse water down storm drains.

STORM DRAINS VS. SANITARY SEWERS:

Do your employees know the difference?

All **outdoor drains** are storm drains. Pollution that enters storm drains flows directly to creeks and San Francisco Bay or the Ocean, not treated or properly cleaned.

Indoor drains (such as sink, toilet, mop sink, kitchen floor drain) lead to the sanitary sewer system, which is connected to a wastewater treatment plant.

Mop sinks go to the sanitary sewer and wastewater treatment plant.

LOCAL STORMWATER AGENCIES:

Atherton	(650) 752-0555	Foster City	(650) 286-3270	Redwood City	(650) 780-7477
Belmont	(650) 637-2972	Half Moon Bay	(650) 726-7177	San Bruno	(650) 616-7020
Brisbane	(415) 508-2130	Hillsborough	(650) 375-7444	San Carlos	(650) 802-4212
Burlingame	(650) 342-3727	Menlo Park	(650) 330-6750	San Mateo	(650) 522-7349
Colma	(650) 757-8888	Millbrae	(650) 259-2392	San Mateo County	(650) 464-6661
Daly City	(650) 991-8208	Pacifica	(650) 738-3769	South San Francisco	(650) 877-8555
East Palo Alto	(650) 372-3189	Portola Valley	(650) 851-1700	Woodside	(650) 851-6790

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最佳管理办法–

餐饮服务设施

餐厅 | 自助餐厅 | 杂货店 | 食品加工设施相关信息

暴雨排水道的水未经任何处理直接流入小河、旧金山湾和太平洋。非雨水和其他废物排入暴雨排水道会造成污染。食品加工设施可以通过采取适当的清洁措施来阻止雨水污染，确保食物颗粒、油脂、垃圾、洗涤水和清洁产品流向内部下水道，从而确保水在排放前得到处理。

切勿用软管冲洗室外区域

只有雨水才允许流入暴雨排水道，
因为暴雨排水道与当地小河直接相连。

您的企业有责任采取适当的最佳管理办法 (Best Management Practices, BMPs)，防止风或雨水把污染物带到街上。

带盖的垃圾箱，门关闭。
用双语标示牌提醒员工保持区域干净整洁。

盖上垃圾桶盖子，地面无散落的垃圾。

通用最佳管理办法–

保持垃圾桶区域清洁

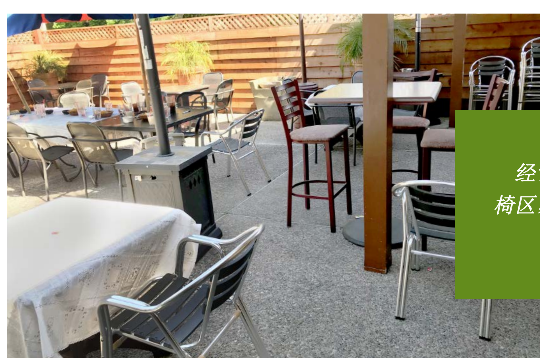
- ☐ 关闭垃圾桶盖子。
- ☐ 定期检查垃圾桶区域是否干净。
  - 如果垃圾桶太满，考虑多放一些垃圾桶，或者增加垃圾回收服务。
  - 更换漏水或破裂的垃圾桶。
  - 如果地上有散落的垃圾，则应打扫干净。
- ☐ 教育所有员工保持垃圾桶区域干净整洁。在员工流动性大，或者在共用垃圾桶的区域，就“最佳管理办法”张贴告示或召开例会。

食用油和油脂

- ☐ 将油和油脂妥善存放在许可的油桶中；切勿将油或油脂倒入垃圾桶、下水道、街道、水槽或地漏。
- ☐ 保持油桶干净，盖好盖子。
- ☐ 定期收集油桶，保持足够的储存容量。
- ☐ 至少每月检查一次屋顶排气扇。将托盘放在排气扇罩下方收集漏油；每周至少清空一次。
- ☐ 立即清理溢出物（见本页背面）。

管理室外区域（停车场、室外座椅、员工休息区、室外仓库）

- ☐ 定期清空垃圾桶，把垃圾倒进垃圾箱。
- ☐ 经常打扫垃圾较多的地方。
- ☐ 如果经常出现乱扔垃圾的问题，考虑添加垃圾桶。
- ☐ 把烟灰缸放在吸烟区。



经常打扫和遮盖室外座椅区，并设围栏，防止碎屑被吹到街上。

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最佳管理办法–

餐饮服务设施

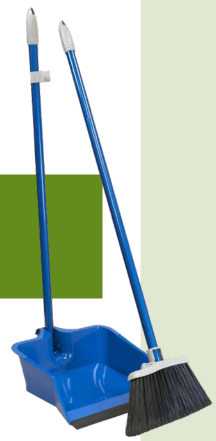
餐厅 | 自助餐厅 | 杂货店 | 食品加工设施相关信息

正确清洁和妥善处理洗涤水，有助于防止污染。

关于清洁的最佳管理办法–

采用干洗法

- ☐ 清扫灰尘、碎屑和垃圾。
- ☐ 用吸尘器吸干净地垫。如需用水，在洗涤槽或拖把公用水槽把垫子洗干净。切勿在室外清洗地垫或让洗涤水流向室外区域。
- ☐ 切勿在室外清洗设备。
- ☐ 在雇用保洁公司时（例如清洗盖子/屋顶设备），确保公司使用干洗法。如果采用湿洗法，请堵住排水沟，并使用泵式/除湿真空吸尘器，以免屋顶漏水。



清扫是其中一种干洗法。

及时控制和管理溢出物

- ☐ 在高风险区域附近（例如，靠近油桶、灌油台）放置一套防溢工具。整套防溢工具包括：屏障/袜子、暴雨排水道进水口保护装置；吸收性颗粒或猫砂、毛巾、垫子；簸箕、扫帚、手套、垃圾袋。
- ☐ 立即盛装溢出物并防止进入周边的防洪排水道。
- ☐ 使用吸收剂/毛巾处理溢出物。擦干净并妥善处理。
- ☐ 确保员工均知晓防溢计划和防溢工具的位置。

切勿将水冲到下水道。

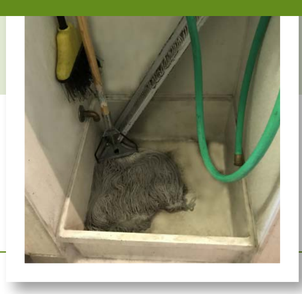
暴雨排水道与生活污水管道：

您的员工知道两者的区别吗？

所有**室外排水道**均为暴雨排水道。进入暴雨排水道的污水未经处理或适当清洁，直接流入小河和旧金山湾或大海。

室内排水道（如水槽、马桶、拖把洗涤槽、厨房地漏）通向与污水处理厂相连的生活污水管道系统。

拖把洗涤槽通往生活污水管道和污水处理厂。



地方雨水管理机构：

Atherton	(650) 752-0555	Foster City	(650) 286-3270	Redwood City	(650) 780-7477
Belmont	(650) 637-2972	Half Moon Bay	(650) 726-7177	San Bruno	(650) 616-7020
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MEJORES PRÁCTICAS DE GESTIÓN PARA

ESTABLECIMIENTOS CON SERVICIO DE COMIDA

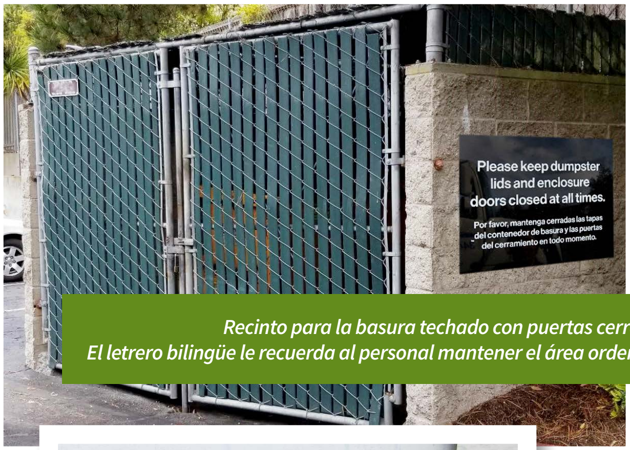
Información para restaurantes | Cafeterías | Tiendas de comestibles | Establecimientos con manipulación de alimentos

Los drenajes pluviales fluyen directamente hacia los arroyos, la bahía de San Francisco y el Océano Pacífico sin ningún tratamiento. Las aguas no pluviales y otros desechos que fluyen hacia un drenaje pluvial causan contaminación. Los establecimientos con manipulación de alimentos pueden terminar con la contaminación de las aguas pluviales mediante prácticas de limpieza adecuadas que garantizan que las partículas de alimentos, el aceite y la grasa, la basura, el agua de lavado y los productos de limpieza fluyan a las conexiones interiores de alcantarillado, lo que garantiza que el agua reciba tratamiento antes de ser liberada.

NUNCA ENJUAGUE EL ÁREA EXTERIOR CON MANGUERA

Solo se permite el agua de lluvia por los drenajes pluviales, ya que los drenajes pluviales se conectan directamente a los arroyos locales.

Es responsabilidad de su empresa utilizar las Mejores Prácticas de Gestión (Best Management Practices, BMPs) apropiadas para evitar que el viento o la lluvia contaminen la calle.



Recinto para la basura techado con puertas cerradas. El letrero bilingüe le recuerda al personal mantener el área ordenada.

La tapa del contenedor está cerrada y no hay basura suelta en el suelo.

MEJORES PRÁCTICAS DE GESTIÓN GENERALES

Mantenga limpia el área del contenedor

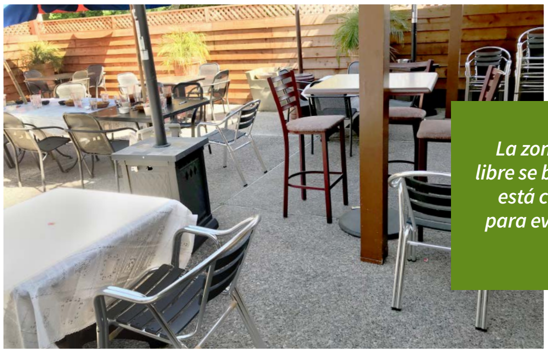
- ☐ Cierre las tapas del contenedor.
- ☐ Inspeccione rutinariamente el área del contenedor para ver si está limpio.
  - Si los contenedores están demasiado llenos, considere tener más contenedores o aumentar el servicio de recolección de residuos.
  - Reemplace los contenedores con fugas o que estén agrietados.
  - Si hay residuos sueltos en el suelo, barra.
- ☐ Capacite a todo el personal sobre mantener las áreas de contenedores ordenados. Con altas tasas de rotación de empleados o cuando comparta un área de contenedores, publique letreros o tenga reuniones rutinarias acerca de las BMP adecuadas.

Aceite de cocina y grasa

- ☐ Almacene el aceite y la grasa correctamente en los recipientes de sebo permitidos; nunca vierta aceite ni grasa en la basura, drenaje pluvial, calle, fregaderos o drenajes de pisos.
- ☐ Mantenga los contenedores de sebo limpios y las tapas selladas.
- ☐ Tenga la recolección de contenedores de sebo programada para mantener una capacidad de almacenamiento adecuada.
- ☐ Revise los ventiladores de extracción en la azotea al menos una vez al mes. Coloque la bandeja debajo de las cubiertas del ventilador de extracción para recoger el aceite; vacíelo al menos una vez por semana.
- ☐ Limpie los derrames de inmediato (consulte la parte posterior de esta hoja).

Control de áreas al aire libre (estacionamientos, asientos al aire libre, áreas de descanso del personal, almacenamiento al aire libre)

- ☐ Vacíe los contenedores de basura en el contenedor de basura periódicamente.
- ☐ Barra con frecuencia en lugares propensos a la basura.
- ☐ Si tiene problemas frecuentes con la basura, considere agregar botes de basura.
- ☐ Coloque ceniceros en áreas propensas a cigarrillos.



La zona de asientos al aire libre se barre con frecuencia, está cubierta y tiene cerca para evitar que los residuos vayan hacia la calle.

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MEJORES PRÁCTICAS DE GESTIÓN PARA

ESTABLECIMIENTOS CON SERVICIO DE COMIDA

Información para restaurantes | Cafeterías | Tiendas de comestibles | Establecimientos con manipulación de alimentos

Limpiar y desechar adecuadamente las aguas de lavado ayuda a prevenir la contaminación.

MEJORES PRÁCTICAS DE CONTROL DE LIMPIEZA

Use métodos de limpieza en seco

- ☐ Barra el polvo, los residuos y la basura.
- ☐ Aspire las alfombras de los pisos. Si se necesita agua, enjuague las alfombras en el lavavajillas o el fregadero de servicio. Nunca lave las alfombras del piso al aire libre ni permita que el agua de lavado se vierta al exterior.
- ☐ No limpie el material al aire libre.
- ☐ Al contratar empresas de limpieza (p. ej., para la limpieza de equipos de campana/techo), asegúrese de que la empresa utilice métodos de limpieza en seco. Si se utilizan métodos húmedos, bloquee las canaletas y utilice una bomba/vacío húmedo, para que no se derrame agua del techo.

Barrer es un ejemplo de un método de limpieza en seco.

Contenga y controle los derrames rápidamente

- ☐ Mantenga un kit de derrames cerca de áreas de alto riesgo (p, ej., cerca de contenedores de sebo de aceite, muelle de carga). El kit puede incluir: Barrera/calcetín, protección de entrada de drenaje de tormenta; gránulos absorbentes o piedras sanitarias, toallas, almohadillas; pala, escoba, guantes, bolsas de basura.
- ☐ Contenga el derrame y proteja inmediatamente los drenajes pluviales cercanos.
- ☐ Use absorbentes/toallas para gestionar el derrame. Barra y deseche correctamente.
- ☐ Asegúrese de que el personal conozca el plan de derrames y la ubicación del kit de derrames.

Nunca enjuague el agua por los drenajes pluviales.

DRENAJES DE TORMENTA COMPARADOS CON ALCANTARILLADOS SANITARIOS:

¿Sus empleados conocen la diferencia?

Todos los **drenajes al aire libre** son drenajes pluviales. La contaminación que entra en los drenajes pluviales fluye directamente a los arroyos y la bahía de San Francisco o al océano sin recibir el tratamiento o la limpieza adecuada.

Los drenajes interiores (como fregadero, inodoro, fregadero, drenaje del piso de la cocina) conducen al sistema de alcantarillados sanitarios, que está conectado a una planta de tratamiento de aguas residuales.

Los fregaderos van a la planta de tratamiento de alcantarillados sanitarios y aguas residuales.

AGENCIAS LOCALES DE AGUAS PLUVIALES:

Atherton	(650) 752-0555	Foster City	(650) 286-3270	Redwood City	(650) 780-7477
Belmont	(650) 637-2972	Half Moon Bay	(650) 726-7177	San Bruno	(650) 616-7020
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BEST MANAGEMENT PRACTICES FOR

VEHICLE SERVICES

Information for Vehicle Repair | Refueling | Washing | Detailing | Automotive Service Facilities

Storm drains flow directly into creeks, San Francisco Bay and the Pacific Ocean without any treatment. Non-stormwater and other wastes that flow into a storm drain cause pollution.

Vehicle service facilities can stop stormwater pollution through proper cleanup, storage and best management practices (BMPs) that ensure oils, antifreeze, soapy water, tires, brake dust and other debris stay out of the streets and local waterways. Help keep our county clean! Use these BMPs to keep wind or rain from carrying pollution into the street.

ONLY RAIN DOWN THE STORM DRAIN

Only rain water is allowed down storm drains, because storm drains connect directly to local creeks, the San Francisco Bay and Ocean

STORAGE AND DISPOSAL

Batteries, antifreeze, oil filters, used tires, new or used car parts, and vehicle waste

- ☐ Store items indoors to keep rainfall from coming into contact with items and carrying pollutants into storm drains.
- ☐ If storing items outdoors, prevent contact with rainwater and runoff by doing ALL of the following:
  1. Cover with a tarp or roofed area;
  2. Elevate on a rack, shelf or pallet; and
  3. Contain fluids or wastes in closed, labeled containers with proper secondary containment.
- ☐ Plan regular waste pick-ups with special haulers (e.g. tire hauler, oil recycler, scrap metal recycler, battery recycler, hazardous waste pick-up).

Good Storage: *Tires are stored indoors, behind roll-down door*

GENERAL BEST MANAGEMENT PRACTICES

Protect outdoor areas from pollution

- ☐ Perform all work indoors liquids or small debris might be spilled (e.g. painting, vehicle repairs, parts changing, brake removal, oil changing, vehicle washing, sanding, metal filing).
- ☐ Store items indoors whenever possible. If unable to store items indoors, then always COVER, ELEVATE and CONTAIN materials to protect from contact with rain.
- ☐ Keep outdoor areas free of prohibited discharges: trash, oil/chemical spills, debris, and hose water.
- ☐ Train all staff on BMPs, and post signs in common areas to remind staff of BMPs (e.g. "Always keep dumpster lids closed" near the dumpster area, and "No washing, flows to bay" near a storm drain inlet).

Routinely clean and maintain your facility

- ☐ Do not discharge wash water or hose sidewalks off into the street, gutters or storm drains.
- ☐ Perform maintenance to prevent storm drain clogging.
- ☐ Parking areas, access roads and fueling areas should be free of trash, oil/ liquid stains and debris.
- ☐ Dumpsters should not be over-filled, and lids should be closed.
- ☐ Waste storage areas should be tidy and well-labeled.
- ☐ Sweep or vacuum up shop floor frequently.

Good Storage: *Items are COVERED and ELEVATED*

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BEST MANAGEMENT PRACTICES FOR

VEHICLE SERVICES

Information for Vehicle Repair | Refueling | Washing | Detailing | Automotive Service Facilities

VEHICLE/EQUIPMENT WASHING

- ☐ Keep vehicle wash/rinse water out of the storm drain.
- ☐ Contain all wash water.
- ☐ Wash vehicles, engines and parts in a designated wash area that is roofed, bermed, and drains to the sanitary sewer through an oil/water separator.
- ☐ Alternatively, take vehicles to a commercial car wash.

SPILL PREVENTION AND CLEAN UP

- ☐ Never let fluids flow into a storm drain or accumulate on surfaces.
- ☐ Inspect vehicles frequently for drips. Drain fluids from leaking or wrecked vehicles immediately.
- ☐ Use drip pans, secondary containment and absorbents to control leaking vehicles and spills.
- ☐ When pouring liquids, use a funnel to prevent drips and spills.
- ☐ Have a labeled spill kit near areas with the potential for spills. Spill kit should include towels/absorbents and instructions.
- ☐ Clean up spills immediately with rags, absorbents, etc. Dispose of used absorbent/rags in appropriate containers.
- ☐ Use dry cleaning practices (e.g. sweep, shop vac).

STORM DRAIN VS. SANITARY SEWERS:

Do your employees know the difference?

All outdoor drains are storm drains. Pollutants that runs off sidewalks, alleys, and street gutters flows into storm drains. This water flows directly to creeks and the San Francisco Bay or Pacific Ocean, not treated or properly cleaned.

Indoor drains (such as sink, toilet, mop sink) lead to the sanitary sewer system, which is connected to a wastewater treatment plant.

Properly cleaning and disposing of wash waters helps prevent pollution.

Good Spill Preparation: *Spill kit with absorbents, towels, berms, storm drain covers and instructions*

Never let fluids flow into a storm drain

LOCAL STORMWATER AGENCIES:

Atherton	(650) 752-0555	Foster City	(650) 286-3270	Redwood City	(650) 780-7477
Belmont	(650) 637-2972	Half Moon Bay	(650) 726-7177	San Bruno	(650) 616-7020
Brisbane	(415) 508-2130	Hillsborough	(650) 375-7444	San Carlos	(650) 802-4212
Burlingame	(650) 342-3727	Menlo Park	(650) 330-6750	San Mateo	(650) 522-7349
Colma	(650) 757-8888	Millbrae	(650) 259-2392	San Mateo County	(650) 372-6200
Daly City	(650) 991-8208	Pacifica	(650) 738-3767	South San Francisco	(650) 877-8555
East Palo Alto	(650) 372-3189	Portola Valley	(650) 851-1700	Woodside	(650) 851-6790

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最佳管理办法–

车辆服务

车辆维修 | 加油 | 清洗 | 彻底清洗 | 汽车服务设施相关信息

暴雨排水道的水未经任何处理直接流入小河、旧金山湾和太平洋。非雨水和其他废物排入暴雨排水道会造成污染。

车辆服务设施可以通过采取适当的清洁、储存和最佳管理办法 (BMPs) 来阻止雨水污染，确保不让机油、防冻液、肥皂水、轮胎、刹车灰尘和其他碎屑进入街道和本地水道。帮助保持我们县城干净整洁！采取这些最佳管理办法，防止让风或雨水把污染物带到街上。

只有雨水
才能进入暴雨排水道

只有雨水才允许流入暴雨排水道，因为暴雨排水道与当地小河、旧金山湾和大海直接相连。

的存放和处置

电池、防冻液、机油滤清器、旧轮胎、新的或旧的汽车零件和车辆废物

- ☐ 将物品存放在室内，防止雨水接触物品并将污染物带入暴雨排水道。
- ☐ 如果将物品存放在室外，请执行以下所有操作来防止接触雨水和径流：
  1. 用防水布**遮盖**或置于有顶棚的地方
  2. 用支架、架子或托盘**支起**；以及
  3. 将液体或废物**盛放**在带有标签并经过适当二次包装的封闭容器中。
- ☐ 计划使用专用运输装置定期收集废物（如轮胎运输车、机油回收装置、废金属回收装置、电池回收装置、危险废物回收装置）。

妥善保存：将轮胎存放在室内和防滚翻门后

通用最佳管理办法

保护室外区域免受污染

- ☐ 在室内进行所有工作，以防液体或小碎屑溢出（例如喷漆、车辆维修、零件更换、制动器拆卸、换机油、车辆清洗、打磨、金属锉削）。
- ☐ 尽可能将物品存放在室内。如果无法将物品存放在室内，则应始终遮盖、支起并包装好材料，以防与雨水接触。
- ☐ 保持室外区域无禁止排放的物品：垃圾、机油/化学品溢出物、碎屑和软管水。
- ☐ 给所有员工进行 BMPs 培训，并在公共区域张贴告示，提醒员工遵守 BMPs（例如“始终保持垃圾桶区域附近的垃圾桶盖关闭”，并且暴雨排水道入水口附近设置“洗涤水不得流入海湾”）。

定期清洁和维护您的设施

- ☐ 切勿将洗涤水或软管从人行道排入街道、排水沟或暴雨排水道。
- ☐ 进行维护，防止暴雨排水道堵塞。
- ☐ 停车场、通道和加油区应无垃圾、油渍/液体污渍和碎屑。
- ☐ 垃圾箱不要装太满，盖子应关闭。
- ☐ 垃圾存放区应保持干净整洁，并贴好标签。
- ☐ 经常清扫或用吸尘器吸干净车间的地面。

妥善保存：将物品遮盖或支起

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最佳管理办法–

车辆服务

车辆维修 | 加油 | 清洗 | 彻底清洗 | 汽车服务设施相关信息

车辆/设备清洗

- ☐ 勿让洗车水流入暴雨排水道。
- ☐ 截留所有洗涤水。
- ☐ 在指定的有顶棚和护道的清洗区域内清洗车辆、发动机和零件，并通过油水分离装置排到生活污水管道。
- ☐ 或者，把车开到洗车店。

防溢和清理

- ☐ 切勿让液体流入暴雨排水道或积聚在表面。
- ☐ 经常检查车辆是否有滴水。立即从漏液或损坏的车辆中排出液体。
- ☐ 使用滴水盘、二次密封和吸收剂来控制漏液车辆和溢出物。
- ☐ 倒液体时，使用漏斗防止滴漏和溢出。
- ☐ 在可能发生漏液的区域附近放置一个贴有标签的防溢工具箱。防溢工具箱应包括毛巾/吸收剂和说明。
- ☐ 立即用抹布、吸收剂等清理溢出物。将用过的吸收剂/抹布放入合适的容器中处理。
- ☐ 使用干洗法（例如清扫、车间吸尘器）。

暴雨排水道与
生活污水管道：

您的员工知道两者的区别吗？

所有室外排水道均为暴雨排水道。污染物流经人行道、小巷和街道排水沟，进入暴雨排水道。这些水未经处理或适当清洁就直接流入小河和旧金山湾或太平洋。

室内排水道（如水槽、马桶、拖把洗涤槽）通向与污水处理厂相连的生活污水管道系统。

正确清洁和妥善处理洗涤水，有助于防止污染。

做好防溢准备：带吸收剂、毛巾、护道、暴雨排水道盖子和说明的防溢工具箱

切勿让液体流入暴雨排水道

地方雨水管理机构：

Atherton .... (650) 752-0555
Belmont .... (650) 637-2972
Brisbane .... (415) 508-2130
Burlingame .... (650) 342-3727
Colma .... (650) 757-8888
Daly City .... (650) 991-8208
East Palo Alto .... (650) 372-3189
Foster City .... (650) 286-3270
Half Moon Bay .... (650) 726-7177
Hillsborough .... (650) 375-7444
Menlo Park .... (650) 330-6750
Millbrae .... (650) 259-2392
Pacifica .... (650) 738-3767
Portola Valley .... (650) 851-1700
Redwood City .... (650) 780-7477
San Bruno .... (650) 616-7020
San Carlos .... (650) 802-4212
San Mateo .... (650) 522-7349
San Mateo County .... (650) 372-6200
South San Francisco .... (650) 877-8555
Woodside .... (650) 851-6790

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MEJORES PRÁCTICAS DE GESTIÓN PARA

SERVICIOS PARA VEHÍCULOS

Información para la reparación de vehículos | Reabastecimiento de combustible | Lavado | Limpieza a fondo | Establecimientos de servicio automotriz

Los drenajes pluviales fluyen directamente hacia los arroyos, la bahía de San Francisco y el Océano Pacífico sin ningún tratamiento. Las aguas no pluviales y otros desechos que fluyen hacia un drenaje pluvial causan contaminación.

Los establecimientos de servicio de vehículos pueden detener la contaminación de las aguas pluviales a través de las adecuadas prácticas de limpieza, almacenamiento y gestión (BMPs) que garantizan que los aceites, el anticongelante, el agua jabonosa, los neumáticos, el polvo de los frenos y otros desechos se mantengan fuera de las calles y las vías fluviales locales. ¡Ayude a mantener nuestro condado limpio! Utilice estas BMP para evitar que el viento o la lluvia lleven contaminación a la calle.

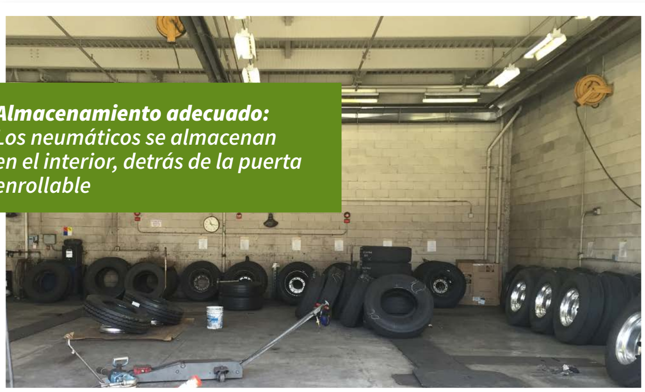
SOLO AGUA DE LLUVIA POR EL DRENAJE PLUVIAL.

Solo el agua de lluvia se permite por los drenajes pluviales porque los drenajes pluviales se conectan directamente a los arroyos locales, la bahía de San Francisco y el océano

ALMACENAMIENTO Y DESECHO

Baterías, anticongelante, filtros de aceite, neumáticos usados, piezas de automóviles nuevas o usadas y residuos de vehículos

- ☐ Almacene los artículos en el interior para evitar que el agua de lluvia entren en contacto con los artículos y lleven los contaminantes a los drenajes pluviales.
- ☐ Si almacena artículos al aire libre, evite el contacto con el agua de lluvia y vertidos mediante TODAS las siguientes acciones:
  1. Cubra con una lona o utilice un área cubierta;
  2. Eleve en una repisa, estante o palet y
  3. Contenga líquidos o desechos en recipientes cerrados y etiquetados con la contención adicional adecuada.
- ☐ Planifique recolecciones regulares de residuos con transportistas especiales (p. ej. transportista de neumáticos, reciclador de aceite, reciclador de chatarra, reciclador de baterías, recolección de residuos peligrosos).



Almacenamiento adecuado: *Los neumáticos se almacenan en el interior, detrás de la puerta enrollable*

MEJORES PRÁCTICAS DE GESTIÓN GENERALES

Proteja las áreas exteriores de la contaminación

- ☐ Realice todo el trabajo en interiores o es posible que los líquidos o pequeños desechos se derramen (p. ej., pintura, reparaciones de vehículos, cambio de piezas, eliminación de frenos, cambio de aceite, lavado de vehículos, lijado, limaduras de metal).
- ☐ Almacene los artículos en el interior siempre que sea posible. Si no puede almacenar los artículos en interiores, siempre CUBRA, ELEVE y CONTENGA materiales para protegerlos del contacto con la lluvia.
- ☐ Mantenga las áreas al aire libre libres de descargas prohibidas: basura, derrames de petróleo/químicos, escombros y agua de manguera.
- ☐ Capacite a todo el personal acerca de las BMPs y disponga letreros en áreas comunes para recordarle al personal las BMPs (p. ej., "Mantenga siempre las tapas de los contenedores cerradas" cerca del área del contenedor de basura y "Prohibido lavar, desagota en la bahía" cerca de una entrada de drenaje pluvial).

Limpie habitualmente y mantenga limpio su establecimiento

- ☐ No descargue el agua de lavado ni de las mangueras de las aceras en la calle, alcantarillas ni drenajes pluviales.
- ☐ Realice el mantenimiento para evitar la obstrucción del drenaje pluvial.
- ☐ Las áreas de estacionamiento, las carreteras de acceso y las áreas de combustible deben estar libres de basura, manchas de aceite/líquido y escombros.
- ☐ Los contenedores no deben llenarse en exceso y las tapas deben cerrarse.
- ☐ Las áreas de almacenamiento de residuos deben estar ordenadas y bien etiquetadas.
- ☐ Barra o aspire el piso de la tienda con frecuencia.

Almacenamiento adecuado: *Los artículos están CUBIERTOS y ELEVADOS*

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MEJORES PRÁCTICAS DE GESTIÓN PARA

SERVICIOS PARA VEHÍCULOS

Información para la reparación de vehículos | Reabastecimiento de combustible | Lavado | Limpieza a fondo | Establecimientos de servicio automotriz

LAVADO DE VEHÍCULOS/EQUIPOS

- ☐ Mantenga el agua del lavado/enjuague de vehículos fuera del drenaje pluvial.
- ☐ Contenga toda el agua de lavado.
- ☐ Lave los vehículos, motores y piezas en un área de lavado designada que esté cubierta, contenida y drene hasta el alcantarillado sanitario a través de un separador de aceite/agua.
- ☐ Como alternativa, lleve vehículos a un lavado de autos comercial.

PREVENCION DE DERRAMES Y LIMPIEZA

- ☐ Nunca permita que los fluidos desemboquen en un drenaje pluvial ni se acumulen en las superficies.
- ☐ Revise los vehículos con frecuencia en busca de goteos. Escurra los fluidos de los vehículos con fugas o rotos inmediatamente.
- ☐ Utilice bandejas de goteo, contenedores adicionales y absorbentes para controlar los vehículos con fugas y derrames.
- ☐ Cuando vierta líquidos, utilice un embudo para evitar goteos y derrames.
- ☐ Tenga un kit de derrames etiquetado cerca de áreas con posibilidad de derrames. El kit de derrames debe incluir toallas/absorbentes e instrucciones.
- ☐ Limpie los derrames inmediatamente con trapos, absorbentes, etc. Deseche los absorbentes/trapos usados en recipientes apropiados.
- ☐ Utilice las prácticas de limpieza en seco (p. ej., escoba, aspiradora de la tienda).

***Buena preparación para derrames:** Kit de derrame con absorbentes, toallas, contenedores, cubiertas de drenaje de tormenta e instrucciones*

DRENAJE DE TORMENTA COMPARADO CON ALCANTARILLADO SANITARIO:

¿Conocen sus empleados la diferencia?

Todos los drenajes al aire libre son drenajes pluviales. Los contaminantes que corren por las aceras, callejones y alcantarillas de las calles fluyen hacia los drenajes pluviales. Esta agua fluye directamente a los arroyos y la Bahía de San Francisco o al Océano Pacífico, sin recibir el tratamiento o la limpieza adecuada.

Los drenajes interiores (como lavabo, inodoro, fregadero) conducen al sistema de alcantarillado sanitario que está conectado a una planta de tratamiento de aguas residuales.

Limpiar y desechar adecuadamente las aguas de lavado ayuda a prevenir la contaminación.

Nunca permita que los fluidos desemboquen en un drenaje pluvial.

AGENCIAS LOCALES DE AGUAS PLUVIALES:

Atherton	(650) 752-0555	Daly City	(650) 286-3270	Redwood City	(650) 780-7477
Belmont	(650) 637-2972	Half Moon Bay	(650) 726-7177	San Bruno	(650) 616-7020
Brisbane	(415) 508-2130	Hillsborough	(650) 375-7444	San Carlos	(650) 802-4212
Burlingame	(650) 342-3727	Menlo Park	(650) 330-6750	San Mateo	(650) 522-7349
Colma	(650) 757-8888	Millbrae	(650) 259-2392	San Mateo County	(650) 372-6200
Daly City	(650) 991-8208	Pacifica	(650) 738-3767	South San Francisco	(650) 877-8555
East Palo Alto	(650) 372-3189	Portola Valley	(650) 851-1700	Woodside	(650) 851-6790

Appendix 5

- BMP Brochure for Mobile Businesses

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BEST MANAGEMENT PRACTICES FOR

MOBILE BUSINESSES

Carpet Cleaners | Vehicle Washers/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, the San Francisco Bay, and the Pacific 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 & 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.

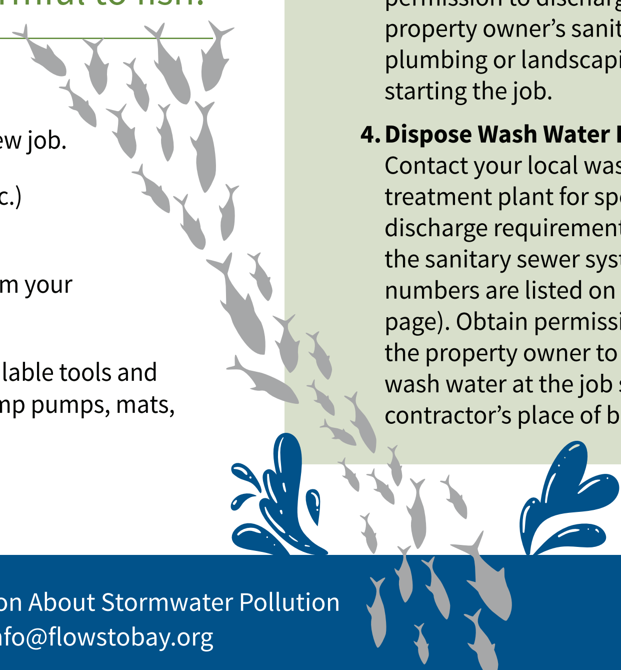
All soaps—even biodegradable ones—are harmful to fish!

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.

4 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. **Identify Storm Drain Locations**
   Walk around the job site and identify where all storm drains are located. Wash water must not be allowed to flow into the storm drains.
3. **Protect Drains and Collect Water**
   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.
4. **Dispose Wash Water Properly**
   Contact your local wastewater treatment plant for specific discharge requirements entering the sanitary sewer system (phone numbers are listed on next page). Obtain permission from the property owner to discharge wash water at the job site or the contractor’s place of business.



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BEST MANAGEMENT PRACTICES FOR

MOBILE BUSINESSES

Carpet Cleaners | Vehicle Washers/Detailers | Power Washers | Pet Care Services | Steam Cleaners

Protect the Bay, the Ocean, and Yourself! When wash water flows into storm drains it goes straight to local creeks and the San Francisco Bay or Pacific Ocean without any cleaning or filtering.

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.

Wastewater Treatment Plants

Burlingame Waste Water Treatment Facility *Burlingame, Burlingame Hills, and Hillsborough*	(650) 342-3727
Millbrae Water Pollution Control Plant	(650) 259-2388
North San Mateo County Sanitation District *Daly City and parts of Westborough*	(650) 991-8200
Pacifica’s Calera Creek Water Recycling Plant	(650) 738-4660
San Mateo Waste Water Treatment Plant *Foster City, Hillsborough, and San Mateo*	(650) 522-7300
Sewer Authority Mid Coastside Wastewater Treatment Facility *Half Moon Bay, El Granada, Miramar, Moss Beach, Montara, Princeton by the Sea*	(650) 726-0124
Silicon Valley Clean Water *Belmont, Redwood City, San Carlos, Woodside, and service area of West Bay Sanitation District*	(650) 832-6243
South San Francisco/San Bruno Water Quality Control Plant *Colma, San Bruno, South San Francisco, and southern Daly City*	(650) 877-8555

OPTIONS FOR DISPOSAL

1. **Never drain wash or rinse water into streets, gutters, parking lots, or storm drains.**
2. 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.
3. Direct water to landscaping or gravel surfaces. Wash water must completely soak into vegetation before you leave the site.

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.

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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 this brochure.

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最佳管理办法–

流动业务

地毯清洗机 | 洗车机/清洁剂 | 电动清洗机 | 宠物护理服务 | 蒸汽清洗机

关于采用最佳管理办法 (Best Management Practices, BMPs) 来防止洗涤水进入暴雨排水系统并污染本地水道、旧金山湾和太平洋的信息。

我们为什么关心洗涤水的处理？

流动清洁洗涤水不仅仅是污垢和水。它还可能含有对我们的小河和水道有害的肥皂、有毒化学品、重金属、油和/或油脂。从流动清洁活动中排出的污染物被冲到街道和暴雨排水系统中，然后在未经清洁或过滤的情况下流向我们的小河、海湾和大海。

联邦、州和地方法规禁止
将雨水以外的任何污水排入暴雨排水道。

正确的最佳管理办法 (BMPs) 便于实施，并且我们必须遵守雨水污染防治条例。

可生物降解和无毒的清洁产品如何？

标有“无毒”和“可生物降解”字样的清洁产品如果进入到暴雨排水系统，仍然会危害野生生物。例如，鱼会受到普通肥皂和可生物降解肥皂的影响！但是，如果在生活污水系统中处理，污水处理厂会优先选用可生物降解的产品，而不是有毒的清洁剂。

所有的肥皂，即使是可生物降解的肥皂，都对鱼有害！

提前计划

- 在开始新的作业之前，先确定污水排放地点。
- 确定有现成的设备（如长软管、污水泵等）可用于将污水排放至生活污水管接入点。
- 确保软管长度足够长，能够到达远离您的收集槽的接入点。
- 联系本地的五金店或建材商店，获取可用于流动业务的工具和材料，包括湿式/干式吸尘器和污水泵、垫子、沙袋或沙砾袋、篱笆等。

4 清洁前要记住的步骤

1. **成为 BASMAA 认可的流动清洁工**
   参加 BASMAA（湾区雨水管理机构协会）提供的在线“流动表面清洁” 培训。本课程将就“如何以可接受的环保方式清洁不同的表面”为您提供培训，并以经训练清洁工这一身份发布您的姓名。访问：www.basmaa.org.
2. **确定暴雨排水道位置**查看施工现场周围，确定所有暴雨排水道的位置。洗涤水不得流入暴雨排水道。
3. **保护排水道和收集水**
   联系本地城市雨水检查员以确定具体的排放要求。在开始作业前，先获得“排入业主的生活污水管道或园林景观”的许可。
4. **正确处理洗涤水**
   联系本地污水处理厂，了解排入生活污水系统的具体排放要求（电话号码见下页）。向业主获取“在作业现场或承包商的营业场所排放洗涤水”的许可。

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最佳管理办法–

流动业务

地毯清洗机 | 洗车机/清洁剂 | 电动清洗机 | 宠物护理服务 | 蒸汽清洗机

保护海湾，保护海洋，保护你自己！洗涤水流入暴雨排水道时，它不经过清洗或过滤，直接流入当地的小河和旧金山湾或太平洋。

做好本职工作：BMP一览表

- ☐ 到该区域走一走，确定是否有暴雨排水道。
- ☐ 清扫清洗区域，清除碎屑。
- ☐ 如果可行，在有植被或砾石的表面冲洗，洗涤水可以渗透到地表而不产生径流。
- ☐ 使用沙袋、塞子、围堵垫或护堤，控制清洗区域，不让洗涤水顺着街道和排水沟流走。
- ☐ 堵塞或密封防洪排水道入水口以及向排水沟排水的斜坡区域，防止洗涤水进入防洪排水道。
- ☐ 在开始清洗前，设置暴雨排水道保护装置，并在离开洗涤区前将其移除。
- ☐ 用吸尘器或抖动地垫，将垃圾收入垃圾桶里。
- ☐ 尽量减少用水；在软管上使用喷嘴。
- ☐ 使用毒性较低的清洁产品（或如果可能的话，不要用肥皂和洗涤剂来清洗）。
- ☐ 使用“湿式真空吸尘器”将其中的洗涤水吸干，以便正确处理。
- ☐ 清除清洗过程中积聚的所有碎屑或沉淀物，并将其置于垃圾桶中；如果是有害物质，则妥善处理。

污水处理厂

Burlingame 污水处理设施 .... (650) 342-3727
Burlingame, Burlingame Hills 和 Hillsborough

Millbrae 污水处理厂 .... (650) 259-2388

San Mateo 县环卫区 .... (650) 991-8200
Daly City 和 Westborough 一些地区

Pacifica’s Calera 溪水回收站 .... (650) 738-4660

San Mateo 县污水处理厂 .... (650) 522-7300
Foster City, Hillsborough 和 San Mateo

Mid Coastside 污水管理局 .... (650) 726-0124
Half Moon Bay, El Granada, Miramar, Moss Beach, Montara, Princeton by the Sea

Silicon Valley 净水厂 .... (650) 832-6243
Belmont, Redwood City, San Carlos, Woodside, 和 West Bay 环卫服务区

South San Francisco/San Bruno 水质控制厂 .... (650) 877-8555
Colma, San Bruno, South San Francisco 和 Daly City 南部

处理方案

1. **切勿将清洗或洗涤水排入街道、排水沟、停车场或暴雨排水道。**
2. 清洗和洗涤水通常可以通过业主家或企业的排水管排放到生活污水管道，如公用水槽、地漏、拖把洗涤槽、清理孔或卫生间。采取预防措施，防止碎屑、危险物质或任何可能引起堵塞的物体进入水槽、厕所或生活污水管道。
3. 将水引至园林景观或砾石表面。离开洗涤区前，洗涤水必须完全被植被吸收。

如果您将流动清洁活动产生的洗涤水排放到暴雨排水道，则违反了市政雨水管理条例，可能会被处以罚款。

San Mateo 县水污染防治计划认可“Santa Clara 河谷城市径流污染防治计划”，并制定本手册，以及与本手册共享该计划的内容。

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MEJORES PRÁCTICAS DE GESTIÓN PARA

NEGOCIOS MÓVILES

Limpiadores de alfombras | Lavadoras/elementos de limpieza de vehículos | Lavadoras de energía | Servicios de cuidado de mascotas | Limpiadores de vapor

Información sobre el uso de las mejores prácticas de gestión (Best Management Practices, BMPs) para evitar que las aguas de lavado y enjuague entren en los sistemas de drenaje pluvial y contaminen las vías fluviales locales, la bahía de San Francisco y el Océano Pacífico.

¿POR QUÉ DEBERÍAMOS PREOCUPARNOS POR LOS DESECHOS DE AGUA DE LAVADO?

El agua de lavado de la limpieza móvil NO es solo suciedad y agua. También puede contener jabones, productos químicos tóxicos, metales pesados, aceite o grasa que son perjudiciales para nuestros arroyos y vías fluviales. Los contaminantes que drenan de las actividades de limpieza móvil se lavan en la calle y en el sistema de drenaje pluvial que luego fluye a nuestros arroyos, bahía y océano sin ninguna limpieza ni filtrado.

Las regulaciones federales, estatales y locales prohíben la descarga de cualquier cosa que no sea agua de lluvia en el drenaje pluvial.

La implementación de las mejores prácticas de gestión (BMPs) adecuadas es fácil y es necesaria para el cumplimiento de las regulaciones de prevención de la contaminación de aguas pluviales.

¿QUÉ PASA CON LOS PRODUCTOS DE LIMPIEZA BIODEGRADABLES Y NO TÓXICOS?

Los productos de limpieza etiquetados como "no tóxicos" y "biodegradables" todavía pueden dañar la vida silvestre si entran en un sistema de drenaje pluvial. ¡Los peces, por ejemplo, se ven afectados por el jabón común y biodegradable! Sin embargo, si se eliminan en el sistema de alcantarillado sanitario, las plantas de tratamiento de aguas residuales prefieren productos biodegradables antes que limpiadores tóxicos.

¡Todos los jabones, incluso los biodegradables, son dañinos para los peces!

PLANIFIQUE CON ANTICIPACIÓN

- Determine dónde descargará las aguas residuales antes de comenzar un nuevo trabajo.
- Asegúrese de tener el equipo a mano (es decir, mangueras largas, bomba de sumidero, etc.) para dirigir la descarga a los puntos de acceso de alcantarillado sanitario.
- Asegúrese de que las mangueras sean lo suficientemente largas como para llegar a los puntos de acceso que estén lejos de su tanque de retención.
- Póngase en contacto con sus ferreterías locales o tiendas de materiales de construcción para conocer las herramientas y materiales disponibles para empresas móviles, incluidas aspiradoras húmedas/secas y bombas de sumidero, esteras, bolsas de arena o grava, cañas, etc.

4 PASOS PARA TENER EN CUENTA ANTES DE LIMPIAR

1. **Sea un limpiador móvil reconocido por BASMAA**
   Realice la capacitación en línea de "limpieza de superficie móvil" de BASMAA (Bay Area Stormwater Management Agencies Association). Este programa lo capacitará sobre cómo limpiar diferentes superficies de una manera aceptable en términos ambientales y publicar su nombre como un limpiador entrenado. Visite www.basmaa.org.
2. **Identificar ubicaciones de drenaje de tormentas**
   Recorra el lugar de trabajo e identifique dónde se encuentran todos los drenajes pluviales. No se debe permitir que el agua de lavado fluya hacia los drenajes pluviales.
3. **Proteja drenajes y recoja agua**
   Póngase en contacto con su inspector de aguas pluviales de la ciudad local para determinar los requisitos específicos de descarga. Obtenga permiso para descargar a la tubería de alcantarillado sanitario o paisajismo del propietario antes de comenzar el trabajo.
4. **Deseche el agua de lavado**
   Póngase en contacto con su planta local de tratamiento de aguas residuales para conocer los requisitos de descarga específicos que ingresan al sistema de alcantarillado sanitario (los números de teléfono se enumeran en la página siguiente). Obtenga permiso del propietario de la propiedad para descargar agua de lavado en el lugar de trabajo o en el lugar de trabajo del contratista.

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MEJORES PRÁCTICAS DE GESTIÓN PARA

NEGOCIOS MÓVILES

Limpiadores de alfombras | Lavadoras/elementos de limpieza de vehículos | Lavadoras de energía | Servicios de cuidado de mascotas | Limpiadores de vapor

¡Proteja la bahía, el océano y a usted! Cuando el agua de lavado fluye hacia los drenajes pluviales, va directamente a los arroyos locales y a la bahía de San Francisco o al Océano Pacífico sin ninguna limpieza ni filtrado.

HACER BIEN EL TRABAJO: LISTA DE VERIFICACIÓN DE LOS BMP

- ☐ Recorra el área para identificar los drenajes pluviales.
- ☐ Barra el área de lavado para eliminar los residuos.
- ☐ Si es posible, lave sobre una superficie con vegetación o de grava donde el agua de lavado pueda infiltrarse en el suelo sin vertidos.
- ☐ Contenga el área de lavado para que el agua no desagote en las calles ni canaletas; utilice bolsas de arena, tapones, alfombras o barreras de contención.
- ☐ Bloquee o cierre las entradas de drenaje pluvial y las áreas inclinadas que liberan agua a la canaleta para evitar que el agua de lavado entre en el drenaje pluvial.
- ☐ Coloque la protección contra drenaje pluvial antes de iniciar el proceso de lavado y retírela antes de salir del lugar.
- ☐ Aspire o sacuda las alfombras de piso en un bote de basura.
- ☐ Minimice el uso de agua; utilice boquillas en las mangueras.
- ☐ Utilice productos de limpieza menos tóxicos (o lave sin jabones ni disolventes, si es posible).
- ☐ Utilice una "aspiradora industrial para líquidos" para aspirar el agua de lavado contenida para su eliminación adecuada.
- ☐ Retire todos los desechos o sedimentos acumulados durante las actividades de lavado y colóquelos en la basura, o si son peligrosos, deséchelos correctamente.

Plantas de tratamiento de aguas residuales

Centro de tratamiento de aguas residuales de Burlingame .... (650) 342-3727
Burlingame, Burlingame Hills, y Hillsborough

Planta de Control de Contaminación del Agua de Millbrae .... (650) 259-2388

Distrito de Saneamiento del Condado de North San Mateo .... (650) 991-8200
Daly City y zonas de Westborough

Planta de Reciclaje de Agua Calera Creek de Pacifica........................ (650) 738-4660

Centro de tratamiento de aguas residuales de San Mateo .... (650) 522-7300
Foster City, Hillsborough y San Mateo

Autoridad de alcantarillado de Mid Coastside .... (650) 726-0124
Half Moon Bay, El Granada, Miramar, Moss Beach, Montara, Princeton by the Sea

Silicon Valley Clean Water .... (650) 832-6243
Belmont, Redwood City, San Carlos, Woodside, y zonas de servicio de West Bay Sanitation District

Planta de Control de Calidad del Agua de South San Francisco/San Bruno .... (650) 877-8555
Colma, San Bruno, South San Francisco, y sur de la Daly City

OPCIONES DE DESECHO

1. **Nunca escurra el agua de lavado o enjuague en calles, alcantarillas, estacionamientos ni drenajes pluviales.**
2. Las aguas de lavado y enjuague generalmente se pueden descargar a la alcantarilla sanitaria a través de un drenaje en la casa o negocio del propietario, como un fregadero de servicio, drenaje del piso, fregadero, limpieza o inodoro. Tome precauciones para evitar que los desechos, materiales peligrosos o cualquier cosa que pueda obstruir entren en fregaderos, inodoros o drenajes sanitarios.
3. Dirija el agua hacia las superficies con pasto o grava. El agua de lavado debe absorberse completamente en la vegetación antes de salir del lugar de trabajo.

SI DESCARGA AGUA DE LAVADO GENERADA POR ACTIVIDADES DE LIMPIEZA MÓVIL AL DRENAJE PLUVIAL, ESTÁ VIOLANDO LAS ORDENANZAS MUNICIPALES DE AGUAS PLUVIALES Y PUEDE ESTAR SUJETO A UNA MULTA.

El Programa de prevención de la contaminación del agua del Condado de San Mateo reconoce el Programa de prevención de la contaminación por vertido del Valle de Santa Clara para desarrollar y compartir el contenido de este folleto.

Appendix 6

- CALBIG Meeting: Construction Site Stormwater Compliance – November 13, 2019
  - Announcement flyer and Agenda
  - Attendance List

CALBIG MEETING ANNOUNCEMENT

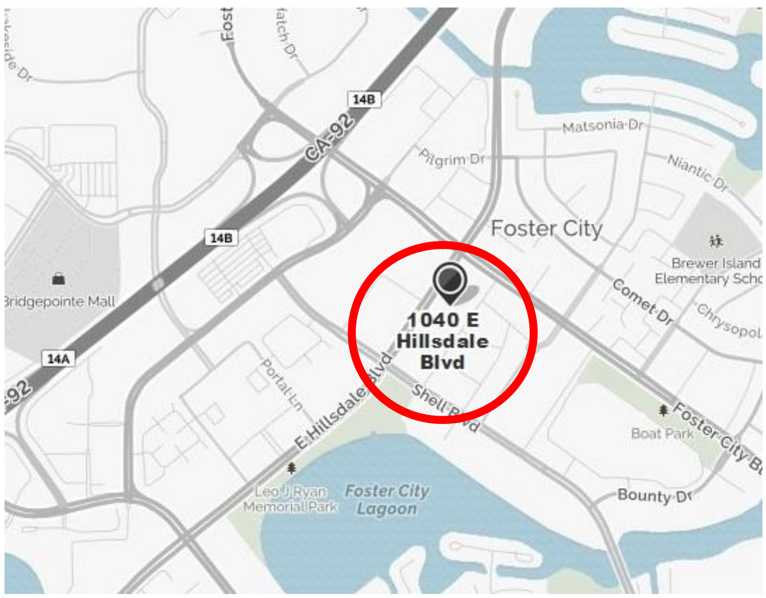
"Stormwater Requirements for Construction Sites"

ICC Preferred Provider Program # 22057

(See Below)

This month's CALBIG meeting will be held on Wednesday, November 13th, 2019 from 11:30am to 1pm at the "EOC" Training Room, of the Foster City Fire Station; 1040-East Hillsdale Blvd.

For directions, see map below.



Directions: Take US 101 to Hwy 92 East. Exit Hwy 92 at Foster City Blvd.. Turn left to Metro Center Blvd. & to Foster City Blvd. Turn right & proceed one block & thru the traffic light @ East Hillsdale Blvd.. Continue on Foster City Blvd. & turn right into the City Hall (600-FC Blvd.) parking lot. The Fire Station's Training Room is on the ground floor, around to the right side, as you face City Hall.

Fee: $20 in cash or check payable to CALBIG … College of San Mateo Students: NO CHARGE!!!

Lunch: A catered lunch will be provided by: "Bay Area Corporate Catering"

Please send your RSVP to the following: Leonard Matchniff (lmatchniff@fostercity.org) & Michael Gorman (thegormanfamily@earthlink.net) by 5-PM; Friday, November 8th. Out of consideration for the catering order, we need an accurate head count.

Thank you!

Hosted By: Peter Schultze-Allen (CPSWQ) at EOA, Inc.

Topic: "Stormwater Requirements for Construction / Demolition Sites"

- **Review of stormwater requirements**
- **Documenting & tracking daily / weekly inspections**
- **Enforcement actions & when to escalate enforcement**
- **PCBs and building demolition**
- **Tips for stormwater program compliance**
- **SMCWPPP guidelines and updates**

"EOC" Training Room

Foster City's Fire Station
1040-East Hillsdale Blvd.
Foster City, CA
November 13th, 2019

Agenda

Registration/Seating	**11:30 - 11:45**
Leonard Matchniff, President – Welcome and Pledge of Allegiance	**11:45 - 11:50**
Joe Rossbach, Secretary - Approval of October 9thth Minutes	**11:50 - 11:51**
Acting Treasurer - Union Bank Balance: October 31st, 2019	**11:51 - 11:52**
Will Racanelli, Vice-President – CALBIG Website Update - 2019	**11:52 - 11:53**
Michael Gorman, Board Director – Upcoming Training Dates - 2019	**11:53 - 11:54**
Leigh Simpson, Bay Area Electric – Electrical Field Inspections	**11:54 – 11:59**
Peter Schultze-Allen (CPSWQ), EOA Inc.	**12:00 - 1:00**
Leonard Matchniff, President - Closing	**1:00**

Please RSVP to following: Leonard Matchniff (lmatchniff@fostercity.org) & Michael Gorman (thegormanfamily@earthlink.net) by 5:00 PM; Friday, November 8th. Out of consideration for the catering order, we need an accurate head count. Thank you for supporting CALBIG.

COMING ATTRACTIONS
(Venue: See Updates @ www.CALBIG.org)
SAVE THESE DATES

2019 – CALBIG's FUTURE EVENTS … COMING TO A VENUE NEAR YOU!!!

CALBIG requests your individual input, as members, in choosing the speakers & topics & venues. If applicable, upcoming dates with your specific suggestions:

- January 9, 2019 / CA Energy Commission (Daniel Wong; Efficiency Division Appliances& Outreach & Education / Daniel.Wong@energy.ca.gov / 1-916-654-4664 … Venue @ Millbrae Main Library
- February 13, 2019 / Energy Code Ace (www.energycodeAce.com) … Venue @ the Fire Station's "EOC" Training Room; 1040-East Hillsdale Blvd.; Foster City
- March 13, 2019 / Open Forum – Open Board Meeting … Venue @ the Redwood Shores Branch Library; Conference Room "A"; 399 – Marine Parkway; Redwood City
- April 10, 2019 / HERS Rater Now (Adam Guzman; Home Energy Rater / Duct Tester / Hersraternow@gmail.com / 1-408-500-7798 … Venue @ the Millbrae Library; 1 – Library Avenue.
- May 8, 2019 / SAFTIFIRST Fire-Rated Glazing / Tim Nass; VP – National Sales (timn@safti.com) … Venue @ the F.C. Fire Station's EOC Training Room; 1040 – East Hillsdale Blvd.; Foster City
- June 12, 2019 / State of California Dept. of Housing & Community Development / "ADU" & Emergency Housing / Stoyan Bumbalov (stoyan.bumbalov@hcd.ca.gov), Div. of Codes & Standards … Venue @ the Fire Station's "EOC" Training Room; 1040-East Hillsdale Blvd.; Foster City
- July 10, 2019 / Architectural Inspection (Patrick Burger, CALBIG Member) / Code Violations @ Decks … Venue @ the RWC Main Library; Second Floor Conference Room; 1044-Middlefield Road; Redwood City
- August 14, 2019 / Michael Stone, NEMA & IAEI / Changes to the 2018-IBC to the 2019-CEC … Venue @ Redwood City Main Library; 2nd Floor Conference Room; 1040 – Middlefield Road; RWC
- September 11, 2019 / Hoover Treated Wood Products, Inc. / Rich Geary; Marketing Consultant / rgeary@frtw.com / 1-706-755-5339 … Venue @ Millbrae Public Library; Conference Room; 1 – Library Ave.; Millbrae
- October 9, 2019 / MiTek / Hardy Frame Moment Frame / Retrofit Guide / David Lopp & Keith Brinkman, Engineering Representatives / 1-800-754-3030 … Venue @ the RWC Main Library; Second Floor Conference Room; 1044-Middlefield Road; Redwood City
- November 13, 2019 / Peter Schultze-Allen (CPSWQ), EOA, Inc. / Stormwater Requirements / pschultze-allen@eoainc.com … Venue @ the Fire Station's "OEC" Training Room; 1040-East Hillsdale Blvd.; Foster City
- December 11, 2019 / Smoke Guard / David A. Howell; Regional Sales Manager-Western US / david.howell@smokeguard.com / 1-208-912-3002 … Venue @ Millbrae Public Library; 1-Library Ave.; Conference Room; Millbrae, CA

As CALBIG celebrates its Twenty-Sixth Anniversary; thank you for the timely participation and continued support.

CALBIG C.6 TRAINING - ATTENDANCE 2019		
	Name	Organization
1	Ferris Hix	4-Leaf
2	Fred Cullum	4-Leaf
3	Leigh Simpson	Bay Area Electric
4	Michael Gorman	CALBIG
5	Chai Lor	CSG Consultants
6	Guest	CSG Consultants
7	Guest	CSG Consultants
8	Guest	CSG Consultants
9	Kelly Carroll	CSG Consultants
10	Rjohn123	CSM Student
11	Gianlorn Camello	Daly City
12	Guest	Daly City
13	Guest	Daly City
14	Joe Travers	Daly City
15	David Hirzel	Designer
16	Juan Martinez	East Palo Alto
17	Francine Magno	Foster City
18	Glen March	Foster City
19	Laura Galli	Foster City
20	Lawrence Tam	Foster City
21	Len Matchniff	Foster City
22	Stephanie MacDonald	Foster City
23	Vivian Ma	Foster City
24	Moreen McCann	Hillsborough
25	Will Racanelli	Hillsborough
26	Andrew Yang	Millbrae
27	Keith Voong	Millbrae
28	Michael Cully	Millbrae
29	David Lynch	Pacifica
30	Joe Rossbach	Redwood City
31	Ahmed Muneer	Woodside
32	Sean Rose	Woodside
33	Sindhi Mekala	Woodside

Appendix 7

- Public Information and Participation Subcommittee – Attendance List– FY 2019/20
- Blog Posts Examples and Metric Analytics
- Rain Barrel Workshop
    - Facebook Event Online Media
    - Facebook Ad
    - Eventbrite page – Bayside - San Carlos
    - Eventbrite page – Ocean side – Half Moon Bay
    - Workshop surveys
- Stormwater & Green Infrastructure Community Survey: Full Survey Report
- Flows to Bay Newsletter Examples
- Flows to Bay Web Page Examples

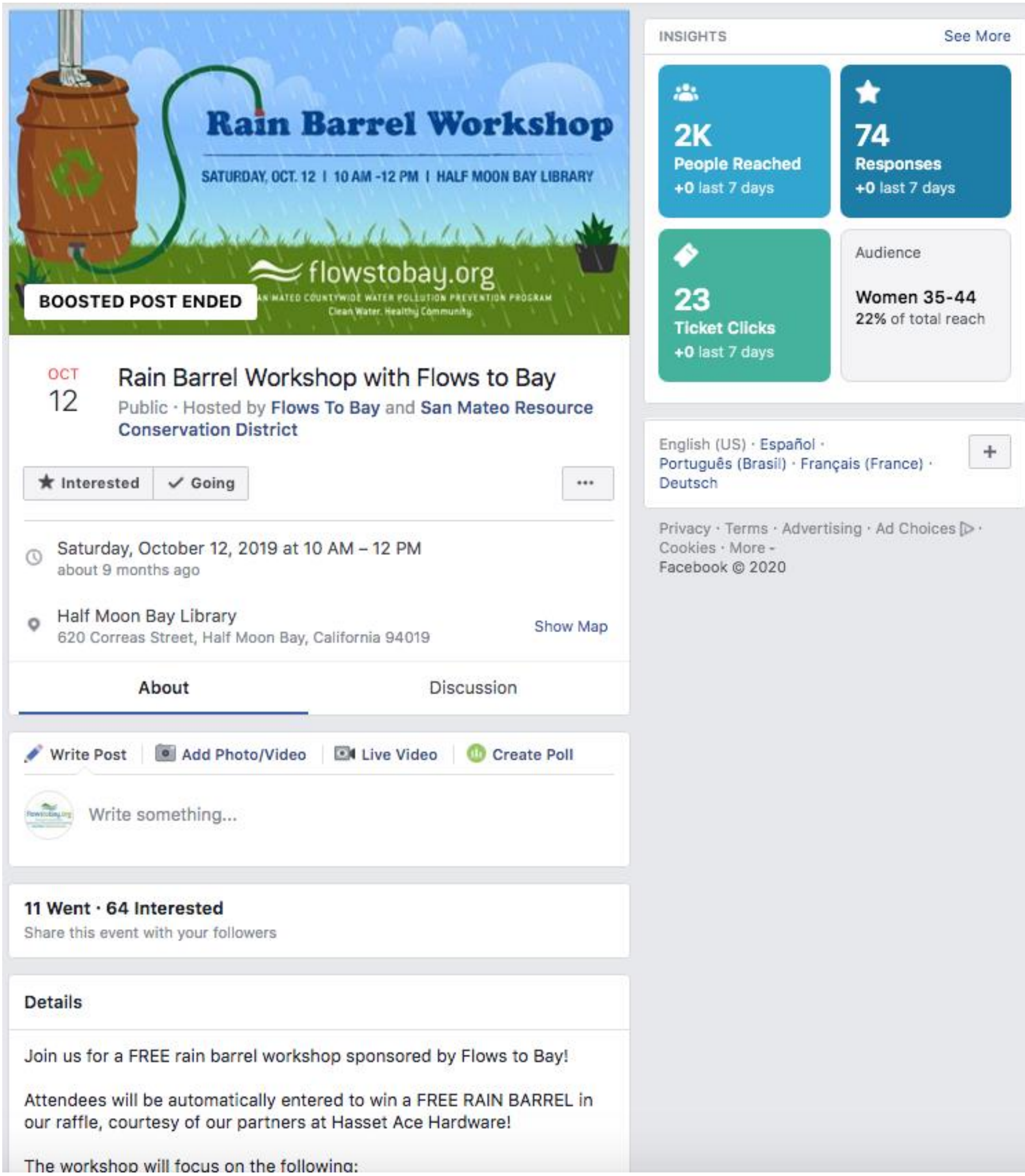
FY 2019/20 PIP Subcommittee Attendance List

Public Information and Participation Subcommittee						FY 19-20	
AGENCY	NAME	ALTERNATE	ALTERNATE	ALTERNATE	PHONE	10/15/2019	3/11/20
C/CAG	Matt Fabry						
C/CAG	Reid Bogert					X	X
Atherton	Nestor Delgado	Stephanie Bertollo-Davis			650-752-0544		
Atherton	Jacob Garcia					X	
Belmont	Diane Lynn				650-595-7425		
Belmont	Julie Freitas						
Brisbane	Shelley Romriell	Keegan Black			415-508-2130		
Burlingame	Jennifer Lee	Carolyn Critz			650-558-7381	X	
Colma	Katherine Sheehan				650-522-2506		
Colma	Muneer Ahmed	Jason Chen			650-757-8888		
Colma	Kelly Carrol						
Daly City	Ward Donnelly				650-991-8200		
Daly City	Sibely Calles						X
Daly City	Stephen Stolte						
East Palo Alto	Michelle Daher				650-853-3197		
East Palo Alto	Jorge Luna					X	
East Palo Alto	June Canter					X	
Foster City	Jack Shulze	Norm Dorais	Jack S. LL		650-286-3543		
Half Moon Bay	Katherine Sheehan				650-522-2506		
Half Moon Bay	Mark Lander				650-522-2562		
Half Moon Bay	Kelly Carrol						
Hillsborough	Sara Bachmann					X	
Menlo Park	Candice Almendral	Rebecca Lucky			650.330.6768		
Menlo Park	Alexandria Skoch						
Menlo Park	Clarence Li					X	X
Millbrae	Shelly Reider				650-259-2444	X	X
Pacifica	Yessika Dominguez	Raymond Donguines			650-738-3767		
Pacifica	Michelle Trayer					X	X
Pacifica	Kevin Sandberg (intern)						
Portola Valley	Ali Taghari				650-851-1700		
Portola Valley	Brandi de Garmeaux	Howard Yound	Adrienne Smith		650-851-1700		
Redwood City	Vicki Sherman				650-780-7472		X
Redwood City	Christopher Fajikos						
Redwood City	Adrian Lee						
San Bruno	Jim Burch	Ted Chapman	William Li				
San Carlos	Kathryn Robertson					X	
San Carlos	Vatsal Patel						X
San Mateo City	Sarah Schedit				650-522-7296		
San Mateo City	Sven Edlund						X
San Mateo City	Mark Swenson					X	
San Mateo City	Kellie Benz (Public Works)					X	
San Mateo Co	Aaron Francis				650-599-1457		X
San Mateo Co	Andrea Chow						
San Mateo Co	Breann Liebermann				650-599-1514	X	
San Mateo Co	Edelzar Garcia						
San Mateo Co	Susan Wright					X	
San Mateo Co	John Allan						X
San Mateo County	Kathryn Cooke						X
So. San Francisco	Daniel Garza				650-829-3880		
So. San Francisco	Andrew Wemmer						
So. San Francisco	Nelson Yuk					X	X
So. San Francisco	Christina Tai						
Woodside	Dong Nguyen				650-851-6790		
SGA	Suzi Senna				415-606-5080	X	
SGA	Sacha Pfeufer				510-224-5086	X	
EOA	Peter Schultz-Allen	Kristin Kerr	Jon Konnan		510-832-2852 x 128		X
CSG Committee	Paramjit Uppal						
CSG Committee	Kelly Carrol						X
CSG Committee (representing Colma & Half Moon Bay)	Catherine Chan					X	
ReScape California	Geneva Gordak					X	

SMCWPPP Blog Analytics

Blog Post Title	Page Views	Page Views (Unique)	Average Time on Page	Bounce Rate
Do SMC Beaches Make The Grade In 2019?	99	87	0:01:21	66.67%
Tips For Responsible (And Eco-Friendly) Car Washing	384	355	0:03:19	71.58%
Clean Waterways Depends on What You Choose to Doo!	251	224	0:03:11	84.97%
Butts, Bottles & Buckets — Coastal Cleanup Day 2019	36	36	0:01:41	80.00%
Oct. 12 Rain Barrel Workshop In Half Moon Bay	100	93	0:03:41	66.67%
Nov. 2 Rain Barrel Installation Workshop In San Carlos	179	173	0:06:10	72.86%
4 Tips to have an Eco-Tastic Halloween!	26	22	0:02:33	66.67%
Rain Rain, Adopt A Drain!	101	87	0:04:54	66.67%
San Mateo County's Rain Barrel Rebate Program	343	328	0:06:10	68.92%
Mastering The Art Of Gardening	66	57	0:02:36	74.29%
How To Get Your Pests To Stop Bugging You	74	72	0:02:00	87.18%
King Tides: What They Are & Why They Matter	73	69	0:02:35	83.33%
Stormwater 101	64	59	0:01:17	75.00%
Don't Keep Rainwater at Bay - Use it!	41	39	0:03:28	78.57%
Storage Do's and Don'ts for Household Hazardous Waste	93	87	0:03:30	68.63%
Sustainable Watersheds Paid Teacher Fellowships – Deadline 6/1/20	252	222	0:03:28	84.21%
5 Water Wise Activities You Can Do from Home	108	101	0:03:32	63.75%
Educational Resources for Learners of All Ages	33	29	0:08:21	84.62%
New Flows To Bay Website & Features	24	22	0:00:26	42.86%
Reusable Bag Ordinance Suspension	10	10	0:13:42	85.71%

Rain Barrel Workshop Facebook Event Pages (4)



NOV
2

Hands-On Rain Barrel Installation Workshop

Public · Hosted by **Flows To Bay**

★ Interested | ✓ Going | ···

Saturday, November 2, 2019 at 9 AM – 1 PM
about 8 months ago

Tierra Linda Middle School, 750 Dartmouth Avenue, San Carlos, CA 94070

About | Discussion

Write Post | Add Photo/Video | Live Video | Create Poll

Write something...

2 Went · 7 Interested
Share this event with your followers

Details

Attendees will be automatically entered to win a FREE RAIN BARREL in our raffle, courtesy of our partners at Hasset Ace Hardware!

The workshop will feature:

INSIGHTS — See More

854
People Reached
+0 last 7 days

9
Responses
+0 last 7 days

8
Ticket Clicks
+0 last 7 days

Audience
Women 35-44
16% of total reach

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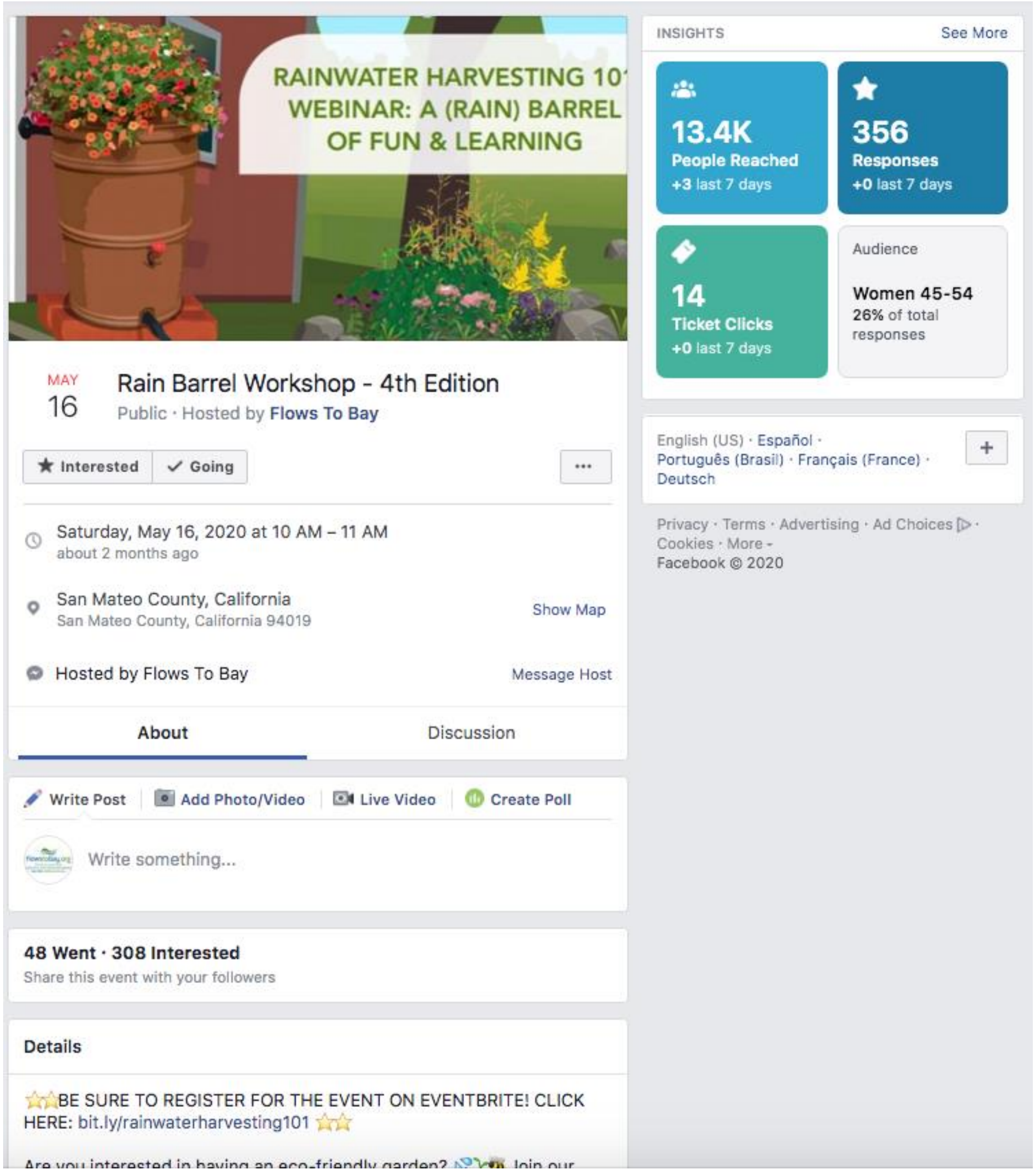
RAINWATER HARVESTING 101 WEBINAR: A (RAIN) BARREL OF FUN & LEARNING
MAY 16
Rain Barrel Workshop - 4th Edition
Public · Hosted by Flows To Bay
Interested
Going
Saturday, May 16, 2020 at 10 AM – 11 AM
about 2 months ago
San Mateo County, California
San Mateo County, California 94019
Show Map
Hosted by Flows To Bay
Message Host
About
Discussion
Write Post
Add Photo/Video
Live Video
Create Poll
Write something...
48 Went · 308 Interested
Share this event with your followers
Details
BE SURE TO REGISTER FOR THE EVENT ON EVENTBRITE! CLICK HERE: bit.ly/rainwaterharvesting101
INSIGHTS
See More
13.4K
People Reached
+3 last 7 days
356
Responses
+0 last 7 days
14
Ticket Clicks
+0 last 7 days
Audience
Women 45-54
26% of total responses
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Facebook © 2020

JUN
13

Ask an Expert!

Public · Hosted by **Flows To Bay** and **UC Master Gardener Program of San Mateo and San Francisco Counties**

★ Interested | ✓ Going | ···

Saturday, June 13, 2020 at 10 AM – 11 AM
about 1 month ago

Online Event

About | Discussion

Write Post | Add Photo/Video | Live Video | Create Poll

Write something...

7 Went · 78 Interested
Share this event with your followers

Details

Register for the event here: bit.ly/AskTheExperts_Register

Do you have questions about gardening, pest problems, or sustainable pest management? Ask a UC Master Gardener at our online panel discussion! On June 13th, 10-11 AM, our experts will give you the advice

INSIGHTS | See More

9.5K
People Reached
+0 last 7 days

85
Responses
+0 last 7 days

14
Ticket Clicks
+0 last 7 days

Audience
Women 35-44
21% of total reach

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Rain Barrel Workshop Facebook Promotional Posts

Flows To Bay
Published by Stephen Groner [?] · October 4, 2019

Need plans next Saturday? Join us in Half Moon Bay from 10-12 for our Rain Barrel Workshop and you just might be the lucky attendee driving home with a brand new rain barrel! Register here: bit.ly/RainBarrelWorkshop2019

EVENTBRITE.COM
Rain Barrel Workshop with Flows to Bay
Join us for the 3rd installment of our Free Rain Barrel Workshop series!

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

271 People Reached	2 Engagements	Boost Post

Kathy Mccauley

Like · Comment · Share

Performance for Your Post

271 People Reached

1 Likes, Comments & Shares

1 Likes	1 On Post	0 On Shares
0 Comments	0 On Post	0 On Shares
0 Shares	0 On Post	0 On Shares

1 Post Clicks

0 Photo Views	1 Link Clicks	0 Other Clicks

NEGATIVE FEEDBACK

0 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts

Flows To Bay
Published by Stephen Groner [?] · October 22, 2019

Want to win a free rain barrel, indulge in a delicious smoothie, or witness and participate in a live rain barrel installation? Join us on November 2nd in San Carlos at the Tierra Linda Middle School! Register here: bit.ly/RainBarrelInstallationDemo

EVENTBRITE.COM
Rain Barrel Installation Workshop
Join us for our free community hands-on installation rain barrel...

Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.

1,249 People Reached	70 Engagements	Boost Post

Anna Quevedo, Raquelina McConn and 8 others · 6 Shares

Like · Comment · Share

Performance for Your Post

1,249 People Reached

34 Reactions, Comments & Shares

21 Like	10 On Post	11 On Shares
6 Love	0 On Post	6 On Shares
1 Comments	0 On Post	1 On Shares
6 Shares	6 On Post	0 On Shares

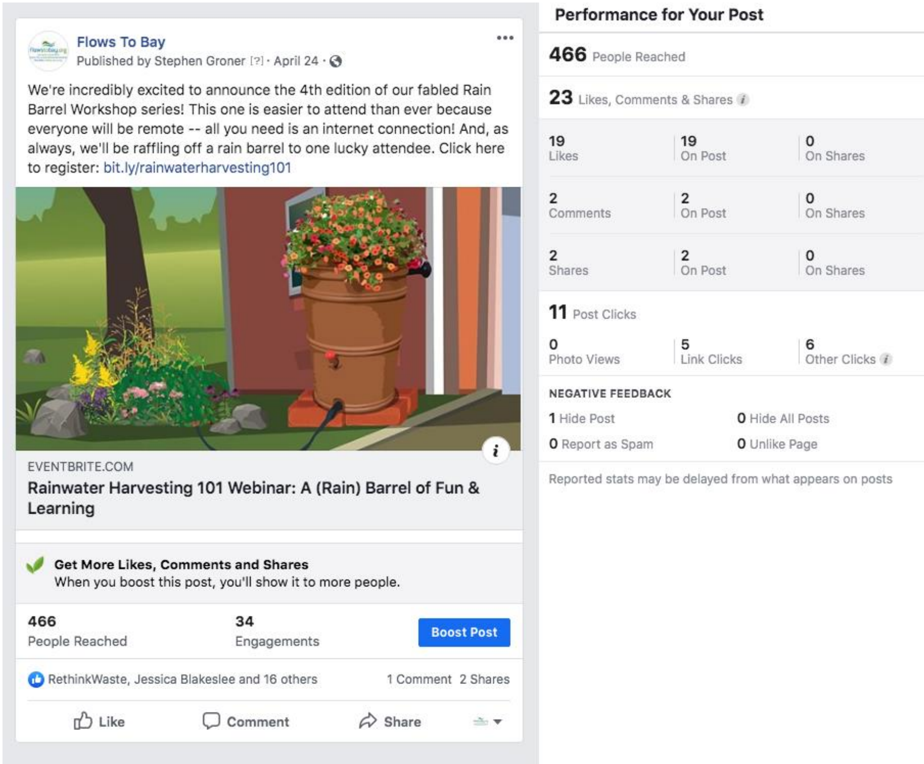
36 Post Clicks

0 Photo Views	6 Link Clicks	30 Other Clicks

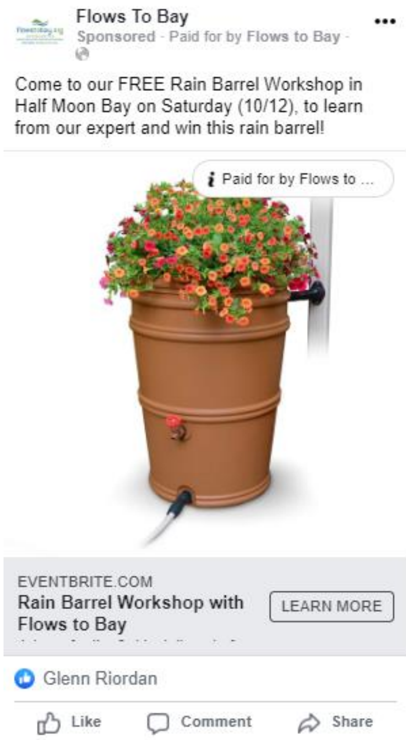
NEGATIVE FEEDBACK

1 Hide Post	**0** Hide All Posts
0 Report as Spam	**0** Unlike Page

Reported stats may be delayed from what appears on posts


Flows To Bay
Published by Stephen Groner [?] · April 24 ·
We're incredibly excited to announce the 4th edition of our fabled Rain Barrel Workshop series! This one is easier to attend than ever because everyone will be remote -- all you need is an internet connection! And, as always, we'll be raffling off a rain barrel to one lucky attendee. Click here to register: bit.ly/rainwaterharvesting101
EVENTBRITE.COM
Rainwater Harvesting 101 Webinar: A (Rain) Barrel of Fun & Learning
Get More Likes, Comments and Shares
When you boost this post, you'll show it to more people.
466 People Reached
34 Engagements
Boost Post
RethinkWaste, Jessica Blakeslee and 16 others
1 Comment 2 Shares
Like
Comment
Share
Performance for Your Post
466 People Reached
23 Likes, Comments & Shares
19 Likes
19 On Post
0 On Shares
2 Comments
2 On Post
0 On Shares
2 Shares
2 On Post
0 On Shares
11 Post Clicks
0 Photo Views
5 Link Clicks
6 Other Clicks
NEGATIVE FEEDBACK
1 Hide Post
0 Hide All Posts
0 Report as Spam
0 Unlike Page
Reported stats may be delayed from what appears on posts

Rain Barrel Workshop Facebook Ad




Flows To Bay
Sponsored · Paid for by Flows To Bay ·
Need a quarantine pick-me-up? Join our free webinar and you'll be entered to win a FREE 50-gallon Rain Barrel! Click here to register.
Rainwater Harvesting 101 Webinar: A (Rain) Barrel of Fun & Learning
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Conserve Water & Prevent Pollution
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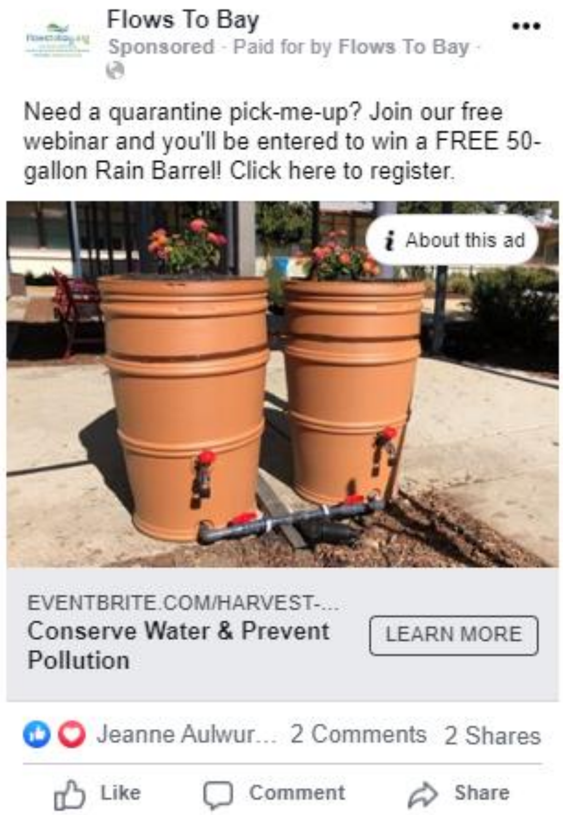
Flows To Bay
Sponsored · Paid for by Flows To Bay ·
Need a quarantine pick-me-up? Join our free webinar and you'll be entered to win a FREE 50-gallon Rain Barrel! Click here to register.
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Comment
Share

Rain Barrel Workshop Eventbrite Event Page, San Carlos (Bayside)

NOV
02

Rain Barrel Installation Workshop

by Flows to Bay Follow

Free

Sales Ended

Details

Join us for our free community hands-on installation rain barrel workshop!

About this Event

Date: Saturday, November 2nd

Time: 9:00am-1:00pm with a Q&A session to follow

Location: Tierra Linda Middle School, Learning Commons in the Administration Building

Presenter/Installer: Chris Corvetti, Rain Barrel Specialist

Join us for a FREE rain barrel installation workshop sponsored by Flows to Bay! Learn the skills needed to install your own rain barrel system in your home! All ages are welcome to participate in the learning and the FUN!

Attendees will be automatically entered to win a FREE RAIN BARREL in our raffle, courtesy of our partners at Hasset Ace Hardware!

The workshop will feature:

- Discussion of the San Mateo County rain barrel rebate program
- Hands-on instruction and installation of a daisy-chained two-barrel system AND drip irrigation system
- Smoothies made by a machine bike blender (by Rock the Bike) and other light refreshments
- The raffle of 1 rain barrel to a lucky attendee

Space is limited, so get your FREE tickets today!

FAQs :

Where can I learn more about the rain barrel rebate?

- The rain barrel rebate program information and online application can be found here: http://www.flowstobay.org/rainbarrel

How can I contact the organizer with any questions?

- Email questions or concerns to info@flowstobay.org.

How can I enter to win the free rain barrel?

- Attendees of the rain barrel workshop will be automatically entered to win a FREE rain barrel provided by Hassett Ace Hardware. Must be present to win.

Tags

United States Events | California Events | Things To Do In San Carlos, CA | San Carlos Classes | San Carlos Home & Lifestyle Classes | #Sustainability | #Home_improvement | #San_mateo | #San_carlos | #Rain_barrel | #Water_capture | #Rainwater_harvesting

Date And Time

Sat, November 2, 2019
9:00 AM – 1:00 PM PDT
Add to Calendar

Location

Tierra Linda Middle School
750 Dartmouth Avenue
Administration Building
San Carlos, CA 94070
View Map

Rain Barrel Workshop Eventbrite Event Page, Half Moon Bay (Ocean Side)

OCT
12

Rain Barrel Workshop with Flows to Bay

by Flows to Bay Follow

Free

Sales Ended

Details

Join us for the 3rd installment of our Free Rain Barrel Workshop series!

About this Event

Date: Saturday, October 12th

Time: 10:00am-12:00pm with a Q&A session to follow

Location: Half Moon Bay Library, Community Room A

Presenter: Chris Corvetti, Rain Barrel Specialist

Join us for a FREE rain barrel workshop sponsored by Flows to Bay!

Attendees will be automatically entered to win a FREE RAIN BARREL in our raffle, courtesy of our partners at Hasset Ace Hardware!

The workshop will focus on the following:

- Discussion of the San Mateo County rain barrel rebate program
- The "why" and the "how" of rainwater harvesting (high level overview and introduction for people who may be totally new to the concept of a rain barrel)
- Some overview of different rain barrel types and approaches to installation
- More detailed DIY options
- Focus on basic designs and uses around the home and garden
- Share photos and details of different barrels and attachment options

Space is limited, so get your FREE tickets today!

FAQs :

Where can I learn more about the rain barrel rebate?

- The rain barrel rebate program information and online application can be found here: http://www.flowstobay.org/rainbarrel

How can I contact the organizer with any questions?

- Email questions or concerns to info@flowstobay.org.

How can I enter to win the free rain barrel?

- Attendees of the rain barrel workshop will be automatically entered to win a FREE rain barrel provided by Hassett Ace Hardware. The winner will receive a certificate for the rain barrel and can pick it up any time from the Hassett Hardware Half Moon Bay location.

Tags

United States Events | California Events | Things To Do In Half Moon Bay, CA | Half Moon Bay Seminars | Half Moon Bay Home & Lifestyle Seminars | #Free_workshop | #Half_moon_bay | #Water_wise_gardening | #Rain_barrel_workshop | #Grassroots_ecology | #Rcd | #Pollution_prevention | #San_mateo_county | #Eco_friendly_gardening

Date And Time

Sat, October 12, 2019
10:00 AM – 12:00 PM PDT
Add to Calendar

Location

Half Moon Bay Library, Community Room A
620 Correas St
Half Moon Bay, CA 94019
View Map

Rain Barrel Workshop Survey (October 12th and November 2nd)

Questions Key:
1. What were you hoping to learn at the workshop today?
2. What was your level of knowledge of rain barrels *prior* to the workshop (circle one)
3. Did the workshop's content help you with the following? (circle all that apply)
4. How would you rate the workshop on the following subjects (1=poor, 5=great)
5. What are areas of improvement or topics you would like to see covered in our next event?
6. What is/was the biggest obstacle you faced when deciding to install a rain barrel? (circle one)
7. Were you aware of the San Mateo County rain barrel rebate before today? (circle one)
8. On a scale from 1 to 5 (1 = not at all likely, 5 = very likely), how likely are you to purchase/use a rain barrel within the next 12 months?

Half Moon Bay Workshop – October 12, 2019

Note: Responses are typed out how they're written (capitalization, spelling, grammar, punctuation)

Question Number	Response	Amount of Respondents who Answered
Q1	*What were you hoping to learn at the workshop today?* • What kind of rain barrel can I use to prevent flooding in my rose garden and by the home • More water conservation info • Will a rain barrel water for me • I know nothing about rain barrels! • Overview; best H2O storage for human consumption • Varieties of rain storage • How to set up a rain barrel • Basics of rainwater harvesting • Exactly what was presented! Thank you all! • Finding out all of the necessary components • How to get a rain barrel in our yard • Benefits of rain barrels + how to set up • Anything about the subject. Trying to figure out if it works for my home. • Basic info • About rain barrels • Basic info about rain barrels • How to install a rain barrel • How to install & use rain barrel • Basic criteria re: rain H2O collection • This workshop answered the questions I've had about rainbarrel systems. • What's involved in setting up a rainbarrel • Everything about rain barrels	26

Question Number	Response	Amount of Respondents who Answered
	• About rain water collection • All about rainbarrels! • Learn about rain gathering, whether it was doable for our house • Though we have a rain barrel, I learned much more about additional equipment	
Q2	*What was your level of knowledge of rain barrels prior to the workshop (circle one)* • No knowledge = 15 • Some knowledge = 9 • Well informed, but haven't installed yet = 1 • Good, I have a rain barrel installed = 2	27
Q3	*Did the workshop's content help you with the following? (circle all that apply)* • Understanding of the functionality of a rain barrel = 23 • Preparing you to install your own rain barrel = 23 • Environmental benefits of utilizing a rain barrel = 21 • Knowledge of local rain barrel rebates = 21	27
Q4	*How would you rate the workshop on the following subjects (1=poor, 5=great)* Environmental information provided: 1 = 0 2 = 0 3 = 1 4 = 5 5 = 20 **Someone didn't answer this but answered the other metrics in this question* Rain barrel installation instructions: 1 = 0 2 = 0 3 = 0 4 = 12 5 = 15 Rain barrel rebate information provided: 1 = 1 *Comment: "Came late"* 2 = 0 3 = 1 4 = 2 5 = 22 **Someone didn't answer this but answered the other metrics in this question* Information was presented in an interesting/fun format:	27

Question Number	Response	Amount of Respondents who Answered
	1 = 0 2 = 0 3 = 0 4 = 5 5 = 22	
Q5	*What are areas of improvement or topics you would like to see covered in our next event?* • X phone number/card for Chris to get an estimate/consult; disregard - I spoke to her • More on rain barrel use on vegetation • Where and when is the next event - interesting workshop • Sources of barrels • Total set up of a rainbarrel with spouts • None • All good. Poeple might benefit from a drawing/sketch of how to install • Show photos of installations • More diagrams of setup • Actual mockup of wall, drain, connections • Rebates • Installation - jumped to topc without intro of a next chapter. Talked too fast at times • This way very thorough! • I understood, thank you • Good info - thanks! • Everything was covered • Great work! • Hands on practice setting up • N/A • Can't think of any additional material	20
Q6	*What is/was the biggest obstacle you faced when deciding to install a rain barrel? (circle one)* • No interest in owning a rain barrel = 0 • The cost of a rain barrel was too high = 2 *Comment: "per quantity"* • I didn't have the room for it in my home = 3 • I didn't want to deal with maintenance/upkeep = 4 Other (please write in answer below): • Need a consult to best evaluate my vision/goals • This is all new to me • None • Just understanding the concept • Just figuring out all of the logistics/materials	23 **1 person selected two responses*

Question Number	Response	Amount of Respondents who Answered
	• Mechanics of setting it up. Where. How to get the water to garden etc. It's cool, but complicated • Deciding to do it - understanding how to set up optimally • How I will use it in my area • Justify use case • I will need to hire someone to install it. Do not hsve the skills myself • None - needed info from other than salesperson • I didn't know where/how to start • NONE • Have not installed one yet, don't know • We have a top-feed 100 gallon barrel. Racoons have taken a liking to leaving scat. Nice to learn about closed feed systems.	
Q7	*Were you aware of the San Mateo County rain barrel rebate before today? (circle one)* • Yes = 5 *Comment: "from this workshop"* • No = 22	27
Q8	*On a scale from 1 to 5 (1 = not at all likely, 5 = very likely), how likely are you to purchase/use a rain barrel <u>within the next 12 months?</u>* • 1 = 1 • 2 = 1 • 3 = 4 • 4 = 9 • 5 = 12	27

Comment at end: "Thanks for coffee + eats!"

<u>San Carlos Installation Workshop – November 2, 2019</u>

Note: Responses are typed out how they're written (capitalization, spelling, grammar, punctuation)

Question Number	Response	Amount of Respondents who Answered
Q1	*What were you hoping to learn at the workshop today?* • How to get started • Basics of rain barrel installation • All about rain barrels • How to install a rain barrel • Rain barrel installation and drip irrigation • How to install a rain barrel - how difficult?	28

Question Number	Response	Amount of Respondents who Answered
	• How to install • How to install and buy a rain barrel • Benefits + how to install rain barrel • Installation how to + tips • All about rain barrels - interested in Grey water reclamation • Rebate information • How to install myself • How to install a rain barrel • How to use a Rain Barrel + drip system • Easy way to install rain barrels • Importance of rain barrel usage and how to install • Ins and outs of installing a rain barrel • How to build/install a rain barrel • How to set up and manage rain collection systems. • To learn about the benefits of rain barrels and how to install a system • To learn about installing rain barrel • Collection techniques, general info • How the rain barrel works • How to install a rain barrel • How to install • How to build a rain barrel and if it makes sense at our home • Hands-on installation - confidence to do it <3	
Q2	*What was your level of knowledge of rain barrels prior to the workshop (circle one)* • No knowledge = 10 • Some knowledge = 13 • Well informed, but haven't installed yet = 4 • Good, I have a rain barrel installed = 1	28
Q3	*Did the workshop's content help you with the following? (circle all that apply)* • Understanding of the functionality of a rain barrel = 24 • Preparing you to install your own rain barrel = 26 • Environmental benefits of utilizing a rain barrel = 24 • Knowledge of local rain barrel rebates = 24	28
Q4	*How would you rate the workshop on the following subjects (1=poor, 5=great)* Environmental information provided: 1 = 0 2 = 0 3 = 0 4 = 7 5 = 22	28 **1 respondent chose two options for the first metric*

Question Number	Response	Amount of Respondents who Answered
	Rain barrel installation instructions: 1 = 0 2 = 0 3 = 0 4 = 5 5 = 23 Rain barrel rebate information provided: 1 = 0 2 = 0 3 = 0 4 = 5 5 = 23 Information was presented in an interesting/fun format: 1 = 0 2 = 0 3 = 0 4 = 7 5 = 21	
Q5	*What are areas of improvement or topics you would like to see covered in our next event?* • More ecologically sound practices • A little chaotic with Rido installing garden and side conversations • Rain gardens • Maybe consider installation instructions ahead of time so notes can be taken • Raingarden • Rain garden • How to estimate size of rain barrel according to water usage • Rain capture irrigation • Laundry water recycling • Info on photos required for rebate • None • Putting a drip system timer • Rain garden installation incorporating permeable paving/products in the landscape • Presenters need to speak loudly and clearly - speak to the back how can hear them. Appropriate clothing • Nothing - just great • Little more about water garden • literature/pictures (diagrams) of info PPT slides? • It was great • None! • ??? • Saving water for dry season	21

Question Number	Response	Amount of Respondents who Answered
Q6	*What is/was the biggest obstacle you faced when deciding to install a rain barrel? (circle one)* • No interest in owning a rain barrel = 0 • The cost of a rain barrel was too high = 5 *Comment: "so rebates are great!"* • I didn't have the room for it in my home = 0 • I didn't want to deal with maintenance/upkeep = 6 Other (please write in answer below): • N/A - just didn't know about them • Physical limits • I didn't know/understand where to put/install the rain barrel • Didn't know how to install • None • **Circled but didn't write a response** • Learning how to do it • Wasn't sure I could do it • Not sure if I can do. Not sure about creating a level area. • Foundation • Knowledge and updated products that are easier than years ago • Renting - working on buying my own place • Basic knowledge on how to install a sys. • Wasn't ready • I am still a kid • No obstacle a same-day project • The installation know how	26 **2 people selected two responses*
Q7	*Were you aware of the San Mateo County rain barrel rebate before today? (circle one)* • Yes = 11 *Comment: "from last workshop"* • No = 17	28
Q8	*On a scale from 1 to 5 (1 = not at all likely, 5 = very likely), how likely are you to purchase/use a rain barrel <u>within the next 12 months?</u>* • 1 = 0 • 2 = 2 *One respondent is the same person who answered the biggest obstacle as "I am still a kid"* • 3 = 2 • 4 = 4 • 5 = 19 *Comment: "the rebates sure help! :)"*	28 **1 respondent circled the phrase "within the next 12 months" instead of a answer choice*

Someone left a comment to collaborate with MRCC

Rain Barrel Webinar Survey (May 16th)

Questions Key:

1. What were your goals for attending this class?
2. The Zoom platform was easy to use: 5 = strongly agree 1 = strongly disagree
3. The instructor demonstrated knowledge of the topic and presented practical information you can use: 5 = strongly agree 1 = strongly disagree
4. The workshop was what you expected: Yes / No
   a. If "No," Why?
5. What did you find most useful about the workshop?
6. What is the biggest obstacle you face when deciding to install a rain barrel?
7. How likely are you to purchase/use a rain barrel in the next 12 months? 5 = very likely 1 = not at all likely
8. What topics would you suggest in the future?
9. What days and times work best for you?
10. Your overall rating of the class: 5 = very satisfied 1 = not at all satisfied
11. How did you learn of the class?
12. Likelihood of attending another webinar: 5 = very likely 1 = not at all likely
13. Your city of residence:
14. Would you like to be considered for the raffle drawing of a 50 gallon rain barrel?
15. Please provide your name for the raffle drawing: (First)
16. Please provide your name for the raffle drawing: (Last)
17. Email

Rain Barrel Webinar – May 16, 2020

Note: Responses are typed out how they're written (capitalization, spelling, grammar, punctuation)

Question Number	Response	Amount of Respondents who Answered
Q1	*What were your goals for attending this class? (circle all that apply)* • To learn how to save money by reducing my water use = 68 • To learn about water efficient practices to protect the environment = 72 • To be better prepared for drought = 43 • To improve my landscaping = 35 Other (please specify below) = • Thinking of buying a rain barrel and wanted to learn more. • to hopefully win the barrel advertised • To learn how to use free rainwater to water my veggies and plants on my apartment balcony. • Work on my GS bronze award	72

<table>
<tr><th>Question Number</th><th>Response</th><th>Amount of Respondents who Answered</th></tr>
<tr><td>Q2</td><td>The Zoom platform was easy to use: (5 = strongly agree 1 = strongly disagree)
1 = 4
2 = 2
3 = 6
4 = 20
5 = 64</td><td>96</td></tr>
<tr><td>Q3</td><td>The instructor demonstrated knowledge of the topic and presented practical information you can use: 5 = strongly agree 1 = strongly disagree
1 = 7
2 = 1
3 = 3
4 = 13
5 = 72</td><td>96</td></tr>
<tr><td>Q4</td><td>The workshop was what you expected:
Yes = 95
No = 1
If "No," Why?
need a simpler and cheaper method</td><td>96</td></tr>
<tr><td>Q5</td><td>What did you find most useful about the workshop?
Actual photos of rain garden and rain barrel set-ups.
actually better than I expected. I have wanted to do this for some time and now feel more confident in making it happen!
All good
All great. Will research for my house.
all the information is good
Assemble the kit Regulations
barrel options and uses
being able to still attend with sip
Comprehensive
Detailed guidance and Q&A
Detailed slides showing construction/installation ideas
Details about installation of rain water barrel
details on barrels and storage options
Diverter parts needed to collect water and using window screen.
End of class that discussed installation details
everything
Everything
Everything !
Everything was useful I am completely new at this so super useful!</td><td>81</td></tr>
</table>

Question Number	Response	Amount of Respondents who Answered
	• everything... except this survey! It kicked me out. • explanation on the different parts and care for a rain barrel • explication of different components • General knowledge • good info about the idea, tips & details about how to install, Q & A • Good starting point • Great information to get me thinking about doing this • Great, practical suggestions and easy to understand. Thank you! • Handouts • Helpful to learn how to install and use the collected water • How to assemble the water barrel from gutter to unit, gauge, filter, and motorized pump. • How to choose the right rain barrel. How to install rain barrel. Brief idea for landscape design • How to connect a rain barrel, specifically the various connectors, valves, gravity flow, etc. • how to get started • How to install a rain barrel • How to keep the bugs away from the water • How to put together a rain barrel • How to put together a rain barrel • how to save natural water • How to setup a system • how to use a rain barrel to water landscaping • I liked the info on the pump. • I've learned additional information through the webinar. The cardboard for mulch layer was great info! • Info on rain garden and rain barrel. • Info on types and options for rain barrels. • Installation guide • Installing and the different kinds of rain barrels. • instructions • Learning about the different rain barrel systems • Learning about the rebate program. • Learning about water catchment in bay area • Learning how to install a rain barrel • Learning that I can not only doing a rain barrel but also having a garden that allows water to drain/soak in to help alleviate moisture near foundation and help ground d water levels. • Need to use time better • photos and labels and arrows used during talk • Practical examples and thorough explanations. I feel like I know a bit about how I could do this small scale at home or a larger scale at work. • Practical installation of rain barrel. Learn the different types of rain barrel • practical tips on set up of barrels • Presenter was knowledgeable.	

Question Number	Response	Amount of Respondents who Answered
	• Q and A, handouts • Rain barrel info was great • Rain barrel options and installation • rain barrels info and installation info • Rain garden • rain garden and barrels • Rain garden info • rain garden info! Pumps to get all the water out of the barrel! • Rebate info • reccos • Slides and the presenter and host did a fantastic job! u guys are pros • speaker was great and gave us a lot of really good information • specific information on rain barrels • The accessories and other types of barrels • The discussion on drip irrigation for gravity systems was very useful to me. Many thanks for this webinar! • The introduction of different types of rain barrel, and how to install the rain barrel • The presentation encouraged me to actually realize this project. A lot of detailed info. • The rain barrel system parts explained • the talk about installation • types of rain barrels..that the kit will have everything • Very informative • Visuals • What to buy •	
Q6	*What is the biggest obstacle you face when deciding to install a rain barrel?* • The cost of a rain barrel was too high = 34 • I didn't have the room for it in my home = 9 • I didn't want to deal with maintenance/upkeep = 17 Other (please write in answer below): • Aesthetics • choosing a rain barrel. There are so many choices • deciding where to locate the rain barrel • Didn't really understand how they work!! • didn't understand the process • Didn't know how to install • Didn't know how to use it • Don't have room and not handy to install • Downspouts flow to pathways and no room for rain barrel unless I can have the barrel around a corner	96

Question Number	Response	Amount of Respondents who Answered
	• Felt I needed more knowledge • Figuring out installation and placement • Having a skilled individual help us with a large size barrel. We have a drain pipe coming off a large, flat roof and water pours out of a roof height pipe • I am not the homeowner and convincing the homeowner to have this system is difficult. • I didn't know enough about it • I haven't yet that's why I took this class • I live in an apartment and can't necessarily tap into the downspout. I'll collect rain in some other manner to fill my rain barrel. • I'll need help! • I'm renting so there are selection area to place the barrel is narrow. I have one spot I think will work well. • installation • installation seems a bit complicated! • Installing • It will be hard to integrate it into my situation • my rain barrels are breaking • Need help installing it • None • none • Not esthetic, fitting modern house • Placement and input routing • Planning so that it works and looks great • Plumbing knowledge • set up of the rain garden • setting it up • the setup effort, especially related to a rain garden • time to get to it • want to re landscape my garden so its a bigger project • Workshop was excellent, will do a rain barrel	
Q7	*How likely are you to purchase/use a rain barrel in the next 12 months? 5 = very likely 1 = not at all likely* • 1 = 1 • 2 = 7 • 3 = 22 • 4 = 20 • 5 = 45	95
Q8	*What topics would you suggest in the future?* • ? • All covered • can't think of any • Design of rain garden • drought tolerant planting	43

Question Number	Response	Amount of Respondents who Answered
	• Edible gardening • gardening • gray water collection and use (in home) • How can I get the barrels for free • I am always interested in better ways to ensure materials I try to recycle are recycled properly. • I would like more information on specific plumbing options for my rain barrels. • IDK • Irrigation options • Local conservation topics and activities we can try at home • Long-term water storage • Low flow water for vegetable garden etc... • Maintenance for barrel options • maybe upkeep • More dry creek ideas to incorporate into a garden plan • more info on connect rain barrel to drip irrigation for landscape / veggie garden • More on gardening aspect • more on materials on rain garden, type of stones etc • More types of barrel installations • More water saving and avoid pollutants to drain • na • Native plant selections and also referrals to link local providers to help install systems • native plants • native plants to use a rain garden • Native plants, low water plants • Not sure • Other water saving devices for your home. • Planning what to plant for raingarden on peninsula • Plant selection based on water volume • same topics but more often. • select Plants for use less water • sheet mulching • Slightly more advanced irrigation system designs would be helpful. Such as, how to set up rainwater irrigation in conjunction with a pressurized drip system in the same vegetable garden, if possible. • Suggestion for the class: Please spend more time on how to set up the rain barrel. Too much time spend on the intro. • This was great. • what type of plants to use in rain gardens • which plants don't need much water for sun and shade areas • worm composting • worm farming	

Question Number	Response	Amount of Respondents who Answered
Q9	*What days and times work best for you?* • Weekdays – Morning = 18 • Weekdays – Afternoon = 12 • Weekdays – Evening = 37 • Saturday – Morning = 73	At least 73
Q10	*Your overall rating of the class: 5 = very satisfied 1 = not at all satisfied* • 1 = 1 • 2 = 2 • 3 = 4 • 4 = 18 • 5 = 71	96
Q8	*How did you learn of the class?* • BAWSCA Newsletter = 10 • Email = 24 • Flows To Bay Website or Social Media Post = 9 • Social Media = 37 • Through a Friend = 5 Other (please write in answer below): • Burlingame newsletter • can't remember • city email • don't remember. maybe an email from Redwood City? • Foothill College Class • Hillsborough Together or NextDoor • IDK Mom just told me to take this. • Nextdoor • public works employee from Belmont • San Mateo RCD • search on rainbarrels	96
Q9	*Likelihood of attending another webinar: 5 = very likely 1 = not at all likely* • 1 = 2 • 2 = 3 • 3 = 5 • 4 = 27 • 5 = 59	96
Q10	*Your city of residence:* • Atherton = 2 • Belmont = 4 • Brisbane = 1 • Burlingame = 7 • Daly City = 9	95

Question Number	Response	Amount of Respondents who Answered
	• East Palo Alto = 1 • Foster City = 1 • Half Moon Bay = 3 • Hillsborough = 5 • Milbrae = 5 • Moss Beach = 1 • Pacifica = 4 • Pittsburg = 1 • Redwood City = 12 • San Bruno = 6 • San Carlos = 1 • San Mateo = 8 • South San Francisco = 6 Non-SMC: • Alameda = 1 • El Granada = 1 • Emerald Hills = 1 • Fremont = 2 • Hayward = 1 • Menlo Park = 1 • Milpitas = 1 • Mountain View = 1 • Palo Alto = 3 • San Francisco = 2 • San Jose = 2 • San Leandro = 1 • Santa Clara = 1 • Sunnyvale = 1	
Q11	*Would you like to be considered for the raffle drawing of a 50 gallon rain barrel?* • *Yes, indeed! = 94* • *No, thank you. = 2*	96

Stormwater & Green Infrastructure Community Survey: Full Survey Report

S.GRONER ASSOCIATES, INC.

Community Stormwater Survey Findings 2019

A survey was conducted among San Mateo County residents in order to better understand (a) how important water pollution is to residents of the County, (b) which types of potential stormwater activities residents engage with the most, (c) which types of events/activities residents engage with the most, and finally (d) to get a sense residents' knowledge of and support for green infrastructure in the County. Overall, 1214 individuals participated in the survey; 208 participated in the intercept survey and 1006 participated in the online survey. Table A provides a detailed summary of the demographic characteristics of these participants.

Participant Demographics

Participants in the intercept survey had a more equal distribution across gender and age and were more likely to live in households that used languages other than English. Online participants tended to be more female (61.9% online v. 42.8% intercept) and older: 61.9% of online participants were female and nearly half (47.6%) of online participants were over age 56.

Overall, 77.1% of households spoke English only, however participants in the intercept survey were more than twice as likely to speak a language other than English at home.

Interestingly, the overall homeownership rate among participants was similar to that of the County's (58.2%).

The most common city of residence among intercept and online participants was Daly City and San Mateo, respectively. Overall, 19.5% of participants lived in San Mateo. The cities of Hillsborough, East Palo Alto and Colma each comprised less than 1% of the total sample and were therefore included in the "Other" category.

One question, "Which race or ethnicity do you associate with?" had a high refusal rate (n=407 or 33.5% of total sample) among survey participants and as such, meaningful insights regarding participants' race could not be made. For this reason, participants' race was omitted from Table A.

Table A. Demographics by survey type

	Intercept n=208	Online n=1006	Combined* n=1214
Gender			
Male	57.2%	29.4%	34.2%
Female	42.8%	62.1%	58.8%
Non-binary	0.0%	0.4%	0.3%
Declined	0.0%	7.2%	5.9%
Age			
18-25	13.5%	1.2%	1.0%
26-35	26.4%	10.1%	8.4%
36-45	16.3%	17.0%	14.1%
46-55	16.3%	17.9%	14.8%
56-65	14.9%	21.7%	18.0%
66+	12.0%	26.1%	21.7%
Declined	0.5%	6.4%	5.3%
Household languages			
English	47.1%	83.3%	77.1%
Bilingual English + Other	39.9%	8.7%	14.1%
Monolingual (non-English)	13.0%	2.3%	4.1%
Declined	0.0%	1.5%	1.2%
Single-family homeowner			
Yes	38.9%	70.3%	58.2%
No	61.1%	25.0%	20.7%
Declined	0.0%	5.2%	4.3%
City of residence			
San Mateo	11.5%	23.6%	19.5%
Redwood City	10.6%	11.9%	9.9%
Pacifica	9.6%	10.2%	8.5%
Half Moon Bay	0.5%	6.7%	5.5%
Daly City	26.0%	5.9%	4.9%
Menlo Park	4.8%	4.6%	3.8%
Belmont	1.0%	4.5%	3.7%
South San Francisco	3.4%	4.1%	3.4%
San Bruno	6.7%	3.7%	3.0%
Burlingame	2.9%	3.5%	2.9%
Foster City	2.9%	2.7%	2.2%
Millbrae	1.9%	2.7%	2.2%
Other	18.3%	7.5%	6.2%

***Combined rates represent the total average across all survey participants (n=1214).**

Table B. Participants' sources for environmental information and social media engagement

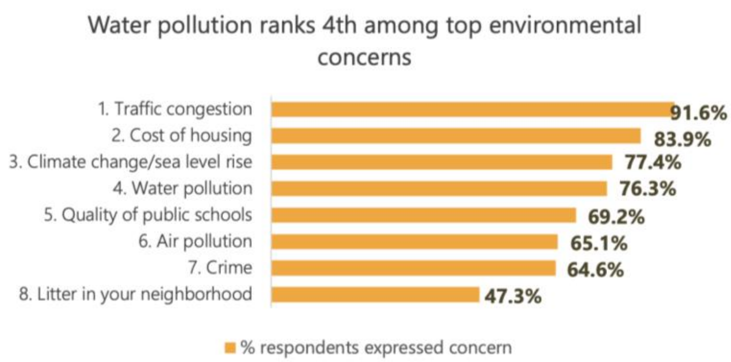
	Intercept n=208	Online n=1006	Combined* n=1214
Most used social networking platform			
Facebook	56.7%	48.4%	49.8%
Instagram	24.5%	21.9%	22.3%
LinkedIn	10.6%	15.6%	14.7%
Twitter	12.0%	11.4%	11.5%
Do not use social media	0.0%	5.7%	4.7%
Nextdoor	0.0%	3.8%	3.1%
Other	24.5%	4.6%	8.0%
Declined	10.6%	18.3%	17.0%
Internet search	63.0%	82.0%	78.7%
Government agency	14.4%	7.3%	8.5%
Social network platform	6.3%	3.3%	3.8%
Friend/family	12.0%	2.0%	3.7%
Radio/newspaper	2.4%	1.5%	1.6%
Don't know	11.1%	1.3%	3.0%
Other	13.0%	2.5%	4.3%
Declined	1.4%	0.6%	0.7%

The most commonly used social networking platform was Facebook (49.8%), followed by Instagram (22.3%) and LinkedIn (14.7%). Notably, 17.0% of online participants declined to respond to the question regarding use of social media platforms. It's possible that this is because they don't use social media and therefore felt the question didn't apply to them (the question didn't have a "Don't use social media" response option). Some stated this by indicating "other" and then explaining that they don't use social media (8.0%).

When asked, "Where would you go if you wanted more information about good environmental practices?" most participants stated that they would use an internet search (68.0%) followed by a government agency (6.0%).

How important is water pollution is to residents of the County?

Most participants expressed concern over water pollution. Overall, 76.3% of participants stated that they were 'moderately' or 'very' concerned'. Concern over water pollution was more prevalent among online participants (79.8%) than intercept participants (59.1%). Water pollution ranked fourth overall among a list of eight environmental concerns (third among online and fifth among intercept participants).



What types of potential stormwater activities residents engage with most?

Overall, most participants (72.7%) have heard, read or seen information about how to minimize or dispose of stormwater pollutants. Participants in the online survey were much more likely than intercept participants to have encountered this information (75.6% versus 58.7%).

Participants were most likely to have spent time working on their lawns (67.8%) or gardening (64.7%) in the past three months. However, online participants were more likely to engage in these activities than intercept participants; 70.0% of online participants worked on their lawns compared to only 54.8% of intercept participants and 66.5% of online participants gardened compared to 56.3% of intercept participants. Overall, about half of participants stated that they had picked up litter (55.6%). Participants were least likely to have spent time walking a dog (43.0%) or working on a vehicle (38.4%) in the past three months.

Regarding car washing behaviors, most participants take their cars to a car wash to get washed (67.2%); the remainder either wash their car at home (24.9%) or don't own a car (4.1%). 4.2% declined to respond to the question or were unsure.

Table C. Participants' engagement in potential stormwater activities

	Intercept n=208	Online n=1006	Combined* n=1214
Have you seen, read or heard about how to dispose of pollutants or minimize what goes into the Bay?			
Have seen	58.7%	75.6%	72.7%
Have not seen	36.5%	11.8%	16.1%
Unsure	4.8%	11.6%	10.5%
Declined	0.0%	0.9%	0.7%
Which of the following have you or someone in your household done in the last 3 months?			
Worked on lawn/yard	54.8%	70.0%	67.4%
Gardened	56.3%	66.5%	64.7%
Picked up litter	61.1%	54.5%	55.6%
Walked a dog	44.7%	42.6%	43.0%
Worked on vehicle	45.7%	36.9%	38.4%
Declined	5.3%	2.5%	3.0%
Do you wash your car yourself or take it to a car wash?			
Take to car wash	53.4%	70.1%	67.2%
Wash at home	28.4%	24.2%	24.9%
Do not own a car	13.5%	2.2%	4.1%
Unsure	1.9%	2.7%	2.6%
Declined	4.8%	0.9%	1.6%

Regarding pesticide use, most participants reported not using pesticides in their home and garden; only 11% of participants stated used pesticides. Pesticide use was equal across intercept and online survey types (11.1% and 11.2%, respectively).

What types of events and activities do residents engage with most?

Table D. Participant engagement in community organizations and events

	Intercept n=208	Online n=1006	Combined* n=1214
Participation by organization type			
Environmental organization	5.8%	21.8%	19.0%
Sierra Club	2.9%	7.7%	6.8%
Greenpeace	1.0%	0.9%	0.9%
Audubon	0.0%	0.9%	0.7%
Nature Conservancy	0.5%	2.0%	1.7%
Other	1.4%	12.0%	10.2%
Religious organization	21.2%	19.7%	19.6%
Christian	9.6%	8.4%	8.6%
Catholic	4.8%	5.1%	5.0%
Jewish	0.0%	1.0%	0.8%
Other	4.8%	5.2%	5.1%
Business group	8.2%	8.7%	8.1%
Chamber of Commerce	1.4%	1.3%	1.3%
Other organization type	6.7%	6.8%	6.8%
Local civic organization	5.3%	13.3%	11.9%
Other organization type	16.8%	25.0%	23.6%
Participation by event type			
Outdoor recreation	71.2%	83.5%	81.4%
Music event	55.8%	54.5%	54.7%
Sporting event	49.0%	39.4%	41.0%
City Council, County Board or other govt. mtg.	17.8%	27.7%	26.0%
Neighborhood, homeowner or resident's mtg.	16.8%	27.9%	26.0%
Parent-Teacher Organization mtg.	24.5%	20.5%	21.2%
Community stakeholder mtg.	17.3%	21.7%	20.9%
Community workshop	20.7%	20.5%	20.5%

Engagement in community organizations and events was similar across survey types. As such, only the combined totals are shown. Participants were equally as likely to participate in a religious organization in the past year as they were to participate in an environmental one (19.6% and 19.0%, respectively).

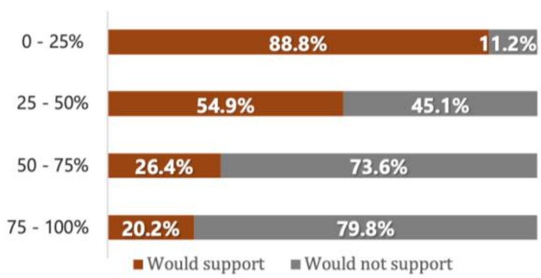
Most participants had engaged in some type of outdoor recreation in the past year (81.4%). Approximately half of participants also attended music events (54.7%) and sporting events (41.0%). Participants were least likely to have attended a community stakeholder meeting (20.9%) or community workshop (20.5%).

Do residents understand what is meant by "green infrastructure"? To what extent do they support government investment in green infrastructure?

Most participants recognized the term "green infrastructure" (60.6%) and showed strong support for spending on green infrastructure if it cost 0-25% more than traditional infrastructure (88.8%). Intercept participants were less likely than online participants to support green infrastructure if it cost 75-100% more than conventional infrastructure (13.0% intercept versus 21.7% online).

There was not a significant difference in support for green infrastructure across survey groups and, in fact, intercept survey participants were slightly more likely than online participants to support green infrastructure if they know that it reduces pollution in neighborhoods (+6.7%) and makes communities greener (+10.0%) and safer (+12.1%).

As cost increases, support for green infrastructure declines



Participants are most likely to support green infrastructure if they know that it reduces pollution

INTERCEPT

1. Reduces **pollution** in waterways and ocean (83.7%)
2. Makes communities greener (81.7%)
3. Reduces **pollution** in neighborhood (81.3%)
4. Makes communities safer (80.8%)
5. More resilience to climate change/sea level rise (68.8%)
6. Less prone to flooding (64.9%)

ONLINE

1. Reduces **pollution** in waterways and ocean (79.8%)
2. Reduces **pollution** in neighborhood (74.6%)
3. Makes communities greener (71.8%)
4. Less prone to flooding (71.6%)
5. More resilience to climate change/sea level rise (69.7%)
6. Makes communities safer (68.7%)

Limitations

Given that participants in the online survey were recruited via member agency and agency partner social media accounts or email newsletters, and that they opted to participate (as opposed to being randomly selected), there is an inherent degree of selection bias which resulted in a higher rates of pro-environmental responses among this sample. Specifically, online survey participants expressed greater familiarity with the subject matter and reported higher levels of concern over water pollution and water quality. Online survey participants were also more likely to belong to environmental organizations like the Sierra Club and Nature Conservancy. Additionally, because the intercept surveys were conducted in-person, it's possible that favorable responses are slightly inflated due to social desirability bias – or the tendency of some participants to report and answer in a way they deem to be more socially acceptable than would be their "true" answer.

Key Takeaways

- ✓ Most residents are concerned about water pollution; it ranked as the fourth greatest concern among participants, just after "climate change/sea level rise".
- ✓ Most participants (72.7%) have heard, read or seen information about how to minimize or dispose of stormwater pollutants.
- ✓ Pesticide use has declined in the last 10 years based on the 2009 "Attitudes Towards Stormwater Pollution", from 15% in 2009 to 11% in 2019.
- ✓ There appears to be somewhat strong support for green infrastructure, especially when it addresses residents' concerns about pollution. It should be noted that climate change was listed as a top environmental concern but was not indicated as a popular reason for supporting G.I., suggesting that while residents may be concerned about climate change from a broad/global point of view, they do not necessarily support or believe that local green infrastructure is the answer.

Recommendations

- ✓ Residents of San Mateo County are engaged in their community and active in environmental organizations. It is likely that residents would be receptive a community-wide call to action or community goals around stormwater. When possible, provide feedback to the community about the impact of their behavior or progress towards a community-goal.
- ✓ Facebook Ads and Google Ads may be an effective outreach tactic given that Facebook was the most popular social networking platform (49.8% engagement overall) and 78.7% of respondents were most likely to use an internet search to learn about good environmental practices.
- ✓ With a 24.5% usage of Instagram among residents, ramping up posts and advertisements on that platform should be an area of focus for internet-based education for the upcoming fiscal year.
- ✓ Residents report high levels of engagement in outdoor recreation and gardening. Partnerships with local outdoor recreation retailers such as R.E.I. and/or nurseries may be an effective way to reach residents likely to engage in potential stormwater activities.
- ✓ Residents are about equally as concerned about water pollution as they are about climate change. Messaging that includes climate change is likely to engage residents.

- ✓ Efforts should be made to spread awareness of green infrastructure and its benefits. Even with only 60.6% of respondents saying they've heard the term, there was still strong support for it. This suggests that if residents know that green infrastructure can effectively address their concerns about pollution and improving communities (i.e. making them more "green" and safer), they are likely to support it. Additionally, GI messaging that includes reducing pollution in waterways, ocean, and neighborhoods seems to be the one that resonates most with residents.

CCAG Survey Questionnaire

Introduction: Hello! My name is _____. I'm conducting a brief 5-7 minute survey on behalf of the County. We're interested in hearing residents' opinions about issues that we're facing. In exchange for your time, you can choose 1 of 3 items which include a reusable tote bag, a reusable metal straw, or a pet waste canister. Are you 18 years or older and willing to take this survey?
(If not 18 years or older, please thank them for their time and move on)

1. If yes, which city within San Mateo County do you reside in? *(Circle one)*

Atherton	Belmont	Brisbane	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	San Mateo	South San Francisco	Woodside

Other unincorporated area:____

If not a resident of San Mateo County, please thank them for their time and move on.

2. I'm going to read a list of issues that some people say we are facing in San Mateo County. From a scale from 1 to 4, 1 being "not at all concerned" and 4 being "very concerned," how would you rate your concern about *{ insert issue here}*? The next issue is __________(INSERT ISSUE)...

(ROTATE ORDER ASKED)

	Not at all Concerned			Very Concerned
	1	2	3	4
Air pollution				
Traffic congestion				
Crime				
Water pollution (Ocean, Bay, creeks, etc)				
Quality of public schools				
Litter in your neighborhood				
Cost of housing				
Climate change/sea level rise				

3. Which of the following have you or someone in your household done in the last **3 months**? *(Read list, record all that apply)*

A. Worked on your vehicle (for example washing your car at home, changing oil, etc.)
B. Worked on your lawn or yard
C. Planted or maintained a garden
D. Walked a dog
E. Picked up litter in your neighborhood or community

4. In the last year, have you participated or attended any of the following:

	Yes	No
Community stakeholder meeting?		
Music event		
Neighborhood/homeowner/resident's meeting?		
Parent/Teacher Organization meeting?		
Sporting event		
City Council, County Board or another official government meeting?		
Community workshop?		
Outdoor recreation		

5. Have you heard of the term Green Infrastructure?

A. Yes
B. No

6. Green infrastructure is a way of building traditional infrastructure (such as roads, buildings, schools, and parks) that reduces the negative impacts those facilities have on our natural environment.

With that definition would you support your local government building green infrastructure if it costs...
(Read each percentage range):

	Yes	No
0 - 25% more than traditional infrastructure		
25 - 50% more		
50 - 75% more		
75 - 100% more		

7. If I told you that Green Infrastructure helps the following issues, how likely would that further increase your support on a scale from 1 to 4—1 being not all likely and 4 being very likely?

	Not at all Likely			Very likely
	1	2	3	4
Makes San Mateo more resilient to the effects of climate change/sea level rise				
Makes San Mateo less prone to flooding				
Reduces the pollution that enters our creeks, Bay and Ocean				
Reduces pollution in our neighborhoods				
Making communities safer (such as protected bike lanes)				
Making communities greener				

8. Are you a part of one of the following groups:

A. Member of an environmental organization
   a. No
   b. If so, name ______________________________

B. Member of a local civic organization
   a. No
   b. If so, name ______________________________

C. Member of a religious organization
   a. No
   b. If so, name ______________________________

D. Member of a business group
   a. No
   b. If so, name ______________________________

E. Member of another type of organization (not mentioned above)
   a. No
   b. If so, name ______________________________

9. Have you seen, read, or heard about how to dispose of pollutants or minimize what gets into the Bay, Oceans, or creeks?

A. Have seen
B. Have not seen
C. Unsure

10. Do you use pesticides in your home or garden?
    A. Yes
    B. No

11. Do you wash your car yourself or take it to a car wash?
    A. Wash at home
    B. Take to car wash
    C. Do not own a car
    D. Unsure

Demographic Information

I'd like to ask you a few final questions for research purposes only. Again, all your answers are confidential. You can decline to answer any of these questions by saying "decline."

12. Where would you go if you wanted more information about good environmental practices?
    A. Internet search
    B. Social network platform
    C. Radio/newspaper
    D. Friend or Family
    E. Government agency
    F. Don't know
    G. Other answer not listed:____________________________
    H. Declined to answer

13. What social networking platform do you use most? (select all that apply)
    A. Facebook
    B. Twitter
    C. Instagram
    D. LinkedIn
    E. Other______________________________________
    F. Declined to answer

14. What languages are spoken are home? (select all that apply)
    A . English
    B. Spanish
    C. Chinese (Manderin & Cantonese)
    D. Tagalog
    E. Other____
    F. Declined to answer

15. Which age category do you belong to?
    A. 18-24
    B. 25-34
    C. 35-44
    D. 45-54
    E. 55-65
    F. 65 and over
    G. Declined to answer

16. Which race or ethnicity do you associate with?
    A. Specify____
    B. Declined to answer

17. Do you own a detached, single-family home?
    A. Yes
    B. No
    C. Declined to answer

18. Perceived gender expression (self-report, do not ask out loud)
    A. Male
    B. Female

e-Newsletter: Master Gardener Webinar Announcement

flowstobay.org

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

Clean Water. Healthy Community.

Do you have questions about gardening, pest problems, or sustainable pest management? Ask a UC Master Gardener at our online panel discussion this Saturday, June 13th from 10-11AM!

Register for the free webinar

If you have any questions you know you'll want to ask, submit them in advance to have them answered FIRST, **click here**!

All San Mateo County residents who take a short 3-minute survey after the webinar will be entered into our raffle. You'll have a chance to win a $100 gift card to your choice of either Hassett Ace Hardware, Home Depot, or Lyngso Garden Materials!

Learn more about the webinar

We look forward to hearing your questions and having you in attendance at this insightful and free webinar!

e-Newsletter: Rain Barrel Webinar and SMELC Fellowship

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Educational Opportunities for Water Pollution Prevention

Are you interested in having an eco-friendly garden? Join the City of Burlingame, the Bay Area Water Supply & Conservation Agency, and Flows To Bay for a one hour webinar as we learn how to capture and harvest rainwater from rooftops with the help of rain barrels and rain gardens. **One lucky attendee will win a FREE 50-gallon rain barrel!**

LEARN MORE & REGISTER HERE!

Paid Fellowship for Enhancing Students' Environmental Literacy

Are you, or do you know, a teacher who might be interested in learning, designing and delivering curriculum about sustainable watersheds? The San Mateo Environmental Learning Collaborative offers a fellowship for teachers looking to bolster the environmental literacy of their students!

San Mateo County teachers who complete the 6-month fellowship program are awarded a $500 stipend funded by Flows To Bay. Teachers from any K-12 grade level in all subject areas are invited to apply today. **Applications are due by June 1.**

Click here to learn more

eNewsletter: New Website and T-Shirt Design Contest

flowstobay.org

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

Clean Water. Healthy Community.

Two Exciting Announcements

Our New Website | T-Shirt Design Contest

We've been hard at work at revamping the **flowstobay.org** website to provide you more content and resources!

Some of the many features include a filterable **events calendar** (search by event category, city, and event organizer) and webpages to **nominate a Community Champion**, find **water wise home projects**, learn how to **prevent stormwater pollution**, and view new **stormwater related data & resources** and **educational materials**.

That's just a sample of what's new—there's plenty more to see!

Learn more about our new website here

Announcing our First-Ever T-Shirt Design Contest

Calling artists of all ages! We're launching a T-Shirt Design Contest and we're looking for ideas on what clean water and water pollution prevention look like to you! With a t-shirt as your canvas, Flows To Bay wants to see you express yourself. The winner will receive:

- 55-gallon rain barrel
- 100 gift card of their choice to either Hassett ACE Hardware, Home Depot, Amazon, or Grubhub
- T-shirt with your winning design

Deadline: May 25, 2020 by 11:59PM PST

Read the contest rules, how to submit, and additional information here

eNewsletter: Water Wise Activities from Home

flowstobay.org
SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM
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Preventing Stormwater Pollution at Home

5 Water Wise Activities | Household Hazardous Waste Facility Closure | Online Events

Happy Earth Day, San Mateo County residents! As we all continue to do our part to prevent the spread of COVID-19, there are still plenty of ways to celebrate Earth Day from home and make a difference to protect our local creeks, the San Francisco Bay, and the Pacific Ocean. We have 5 pollution prevention suggestions that include individual and family activities both inside and outside your home.

Read 5 Water Wise Activities You Can Do From Home

Household Hazardous Waste Facility Closure and Safe Storage

Household Hazardous Waste (HHW), which are common household items such as automotive fluids, batteries, cooking oil, cosmetics, e-waste, fertilizers, pesticides, household cleaners, and medicines, CAN'T be disposed of in the landfill —they must be given to HHW collection services to protect public health and the environment. Currently, all HHW collection events have been canceled for the duration of the **Health Officer's Order**. For now, **it is critical that we safely store HHW** we're no longer using until we can properly dispose of these items.

Learn About HHW Storage DO's & DON'Ts

Online Event Opportunities

Although in-person events have been postponed for the time being, there are plenty of events happening online! Learning is a powerful tool to prevent stormwater pollution and you can do this right from the comfort of your home.

View Our Events Calendar To Find Online Events

eNewsletter: Community Champion E-Newsletter

flowstobay.org

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

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Are You a Community Champion?

Nomination Form | 3 Featured Community Champions

Do you pick up trash on the sidewalk? Have a drought-tolerant yard? Use a rain barrel at home? Pick up after your pet?

Congratulations! You're a San Mateo County Community Champion and we want to celebrate YOU!

Flows to Bay Community Champions are residents who care enough to take big and little actions at home or in the community to prevent water pollution. Every action makes a difference for our local creeks, the San Francisco Bay, and the Pacific Ocean!

Nominate a community champion you know (or self-nominate!) by clicking the button below and filling out a short form so we can spotlight our county's water pollution prevention actions. All nominations will get a Flows to Bay goodie bag with a reusable tote, reusable stainless steel straw, and a dog waste bag canister.

Nominate A Community Champion Today!

Looking for inspiration?
Read below about 3 different community champions who have gone above and beyond for our waterways! You'll also learn tips from them on different actions you can do to prevent stormwater pollution.

Hendrick Wong uses natural and effective alternatives to conventional pest control methods

Erika Richer takes action through sustainable gardening and shares her knowledge

Dee Harley conserves water by collecting rainwater for Harley Farms Goat Dairy in Pescadero

eNewsletter: Q2 Winter E-Newsletter

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Building Eco-Resilience During the Rains
Join the Rain Barrel Movement | Adopt a Drain

The rain is here and our local waterways need your help to ensure that they are not impacted by everything that washes off of the urban landscape. When the rainy season starts, the rainwater washes off anything that it comes into contact with, including roofs, driveways, sidewalks and lawns. As the water flows off these surfaces, it can pick up and carry various pollutants such as bacteria from animal waste, automobile fluids, trash, fertilizers and pesticides. This water then flows into storm drains and, ultimately, into our local waterways.

Since stormwater goes untreated into local waterways, it can adversely affect water quality and aquatic life once it gets into the creeks, the San Francisco Bay, and Pacific Ocean.

San Mateo County residents can become empowered to build resilience against water pollution to maintain the beauty of our waterways. Read below to learn two actions we can take.

San Mateo County's Rain Barrel Movement
As we head into the rainy season, we'll be getting opportunities to harvest the bounty of rainwater. Although the average rain barrel may only be able to store a fraction of the water that runs off your roof in a heavy storm, they are part of a movement that we see as critical to make San Mateo County resilient in the face of climate change.

CLAIM MY WATER SAVING REBATE

Rain, Rain, Adopt a Drain!
Rain can bring us a sense of relief and revitalization throughout our California landscape. Rain can also bring up feelings of concern over the risk of flooding and water pollution. Luckily for residents of San Mateo County, one of the easiest actions we can take is just around the corner.

LET'S STOP WATER POLLUTION

eNewsletter: November 2nd Rain Barrel Workshop

flowstobay.org
SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

Saturday, November 2, 2019 | 9AM - 1PM
Hands-On Rain Barrel Installation Workshop
Tierra Linda Middle School, San Carlos

Are you interested in rainwater harvesting to conserve water and prevent stormwater pollution, but not sure how or where to start? Join our rain barrel expert on Nov. 2 as she takes you through the steps needed to install your own system at home. All ages are welcome to participate in the learning and the fun!

This FREE workshop will feature:

- Hands-on instruction and installation of a daisy-chained two-barrel system AND drip irrigation system
- Smoothies made by a Machine Bike Blender (by Rock the Bike) and other light refreshments
- Information on our ongoing Rain Barrel Rebate Program for San Mateo County residents
- PRIZE DRAWING: One lucky attendee will take home a FREE 50 gallon rain barrel (the same which will be used for the workshop installation)

WHEN:
November 2, 2019
9:00AM - 1:00PM
Light refreshments will be provided

WHERE:
Tierra Linda Middle School
Administration Building
750 Dartmouth Ave

SPACE IS LIMITED - RESERVE YOUR SPOT TODAY!

WHY SHOULD YOU INSTALL AND OWN A RAIN BARREL?

- Rain barrels aid in protecting local creeks and waterways, like the San Francisco Bay and Pacific Ocean, by reducing runoff that transports litter, chemicals, and other pollutants from entering storm drains.
- During the rainy winter season, rain barrels can help capture and store water. They can also prevent excessive moisture from effecting your home's foundation.
- 1,000 square feet of roof surface can capture over 600 gallons of water for every 1" of rainfall! Just think of the different ways you can use that water.

eNewsletter: October 12th Rain Barrel Workshop

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SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM
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Oct. 12 Rain Barrel Workshop in Half Moon Bay

Half Moon Bay Library, Community Room A | 10am - 12pm

WHY SHOULD YOU INSTALL AND OWN A RAIN BARREL?

- Rain barrels aid in protecting local creeks and waterways, like the San Francisco Bay and Pacific Ocean, by reducing runoff that transports litter, chemicals, and other pollutants from entering storm drains.
- During the rainy winter season, rain barrels can help capture and store water. They can also prevent excessive moisture from effecting your home's foundation.
- 1,000 square feet of roof surface can capture over 600 gallons of water for every 1" of rainfall! Just think of the different ways you can use that water.

In our workshop you will learn about:

- The rain barrel rebate program in San Mateo County
- The "why" and "how" of rainwater harvesting including a demonstration
- Different types of rain barrels
- Uses around the home and garden

PRIZE DRAWING: One lucky participant will go home with a FREE 50-gallon rain barrel!

WHEN:
October 12, 2019
10:00AM - 12:00PM
Light refreshments will be provided

WHERE:
Half Moon Bay Library
Community Room A
620 Correas Street

SPACE IS LIMITED - RESERVE YOUR SPOT TODAY!

eNewsletter: September Volunteer Opportunities

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SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

September Volunteer Opportunities

First Flush Training (9/10) | Coastal & Bay Cleanup Day (9/21)

BE A LOCAL WATER PROTECTOR!
ONE-TIME COMMITMENT | NO EXPERIENCE REQUIRED
SEPTEMBER 10 | 6:30PM

Join the San Mateo Resource Conservation District as they gear up for their biggest volunteer and water quality sampling event — First Flush!

First Flush is the first big rain of the year where runoff enters the creeks and storm drains and flows into the ocean. During this event, volunteers collect data and water samples between Montara and Half Moon Bay to help us better understand pollution that can negatively impact humans and wildlife.

TRAINING:
September 10, 2019 | 6:30 PM
80 Stone Pine Road, Suite 100
Half Moon Bay, CA 94019

TO SIGN UP:
Contact Noah Katz
noah@sanmateoRCD.org
(650) 712-7765 x119

CLEAN WATER CHAMPIONS NEEDED!
SEPTEMBER 21 | 9AM TO NOON

It's almost time for the annual California Coastal Cleanup Day! This event not only removes huge amounts of trash from our creeks and waterfronts, but it also empowers YOU to become a part of the solution. Families are encouraged to bring their children, as this family-friendly event is a great opportunity to learn about litter and how to prevent pollution from ending up in our local streets and waterways.

This year there are over 40 sites throughout San Mateo County. Click below for a list of locations and to find out how you can volunteer!

CLICK TO LEARN MORE

eNewsletter: Pet Waste E-Blast Summer

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The Truth About Pet Waste!

Reasons Why Picking Up After Your Pet Matters | DoodyCalls Coupon

Clean Waters Depends On What You Choose To Doo!

Dogs are undeniably great: they're cute, they love us unconditionally, and they get us out of the house. And while some dogs are smart enough to learn remarkable commands and do amazing tricks, they rely on responsible pet owners to make sure their waste gets properly cleaned up and disposed of.

Read about the top 3 problems stemming from leaving pet poop unscooped and what you can do to be part of the solution!

CLICK TO LEARN MORE

Exclusive Flows To Bay Email Subscriber Discount
As thanks for being a subscriber, here is your exclusive Flows To Bay discount for services with DoodyCalls San Mateo County. Click below to download a PDF of the coupon.

eNewsletter: July Survey

flowstobay.org

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

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Which issues in San Mateo County matter most to you?

Take this 5-minute survey and tell us what's on your mind

We want to hear from you! Share your thoughts and opinions in this quick, 5-minute survey and let your voice be heard. All people who complete this survey by August 31 will be entered to win a $50 Amazon gift card.

If you're a San Mateo County resident 18 years or older, please click below to get started.

SHARE YOUR THOUGHTS

This survey is open only to San Mateo County residents, 18 years or older. Survey closes at 11:50PM on August 31, 2019. Amazon gift card winner will be notified by September 6, 2019.

eNewsletter: Car Wash - Summer 2019

flowstobay.org
SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM
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Car Washing Season in San Mateo County

Responsible (And Eco-Friendly) Car Washing | Ducky's Car Wash Coupon

Tips For Responsible (And Eco-Friendly) Car Washing

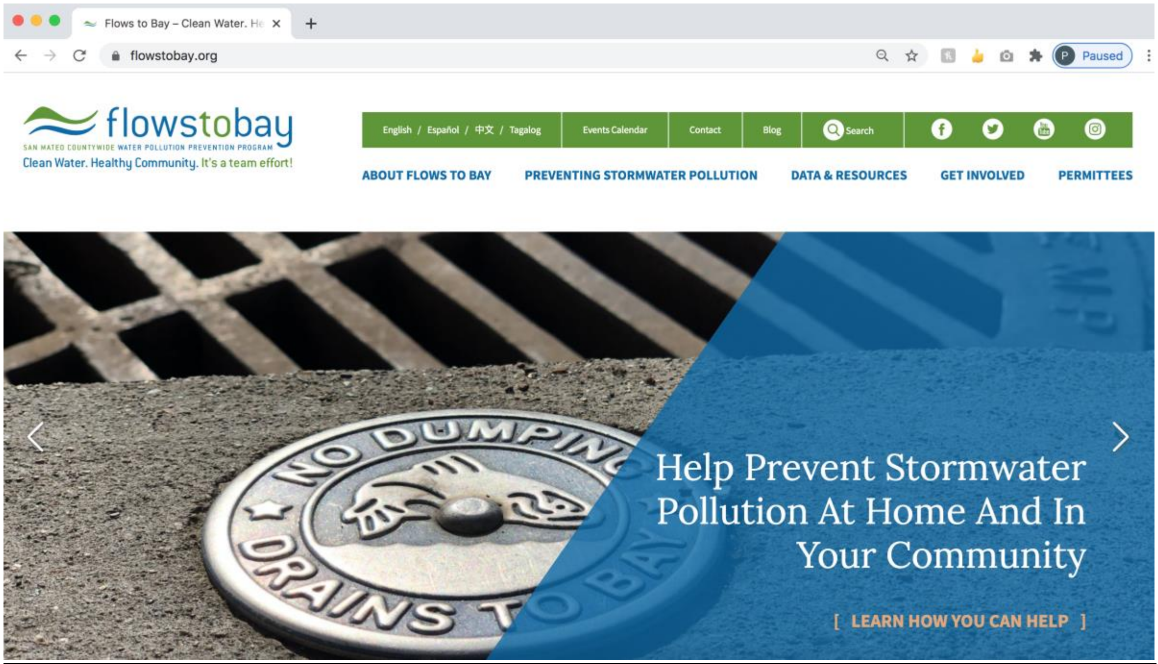
Sometimes doing things ourselves means we can be more creative, efficient, and smarter with our resources. For example, making food at home rather than getting takeout can reduce waste by eliminating unnecessary driving and the need for single-use packaging. But when it comes to washing your car at home, this weekend chore can actually become a huge source of water waste and contribute to water pollution. What's the wiser choice?

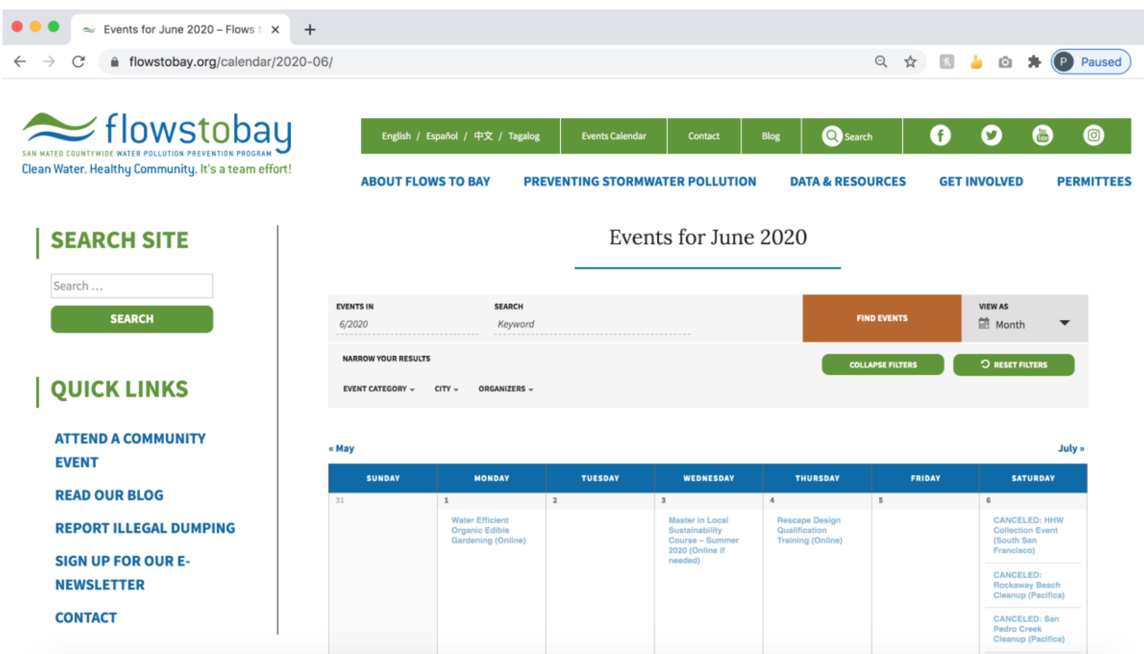
CLICK TO SEE THE ANSWER

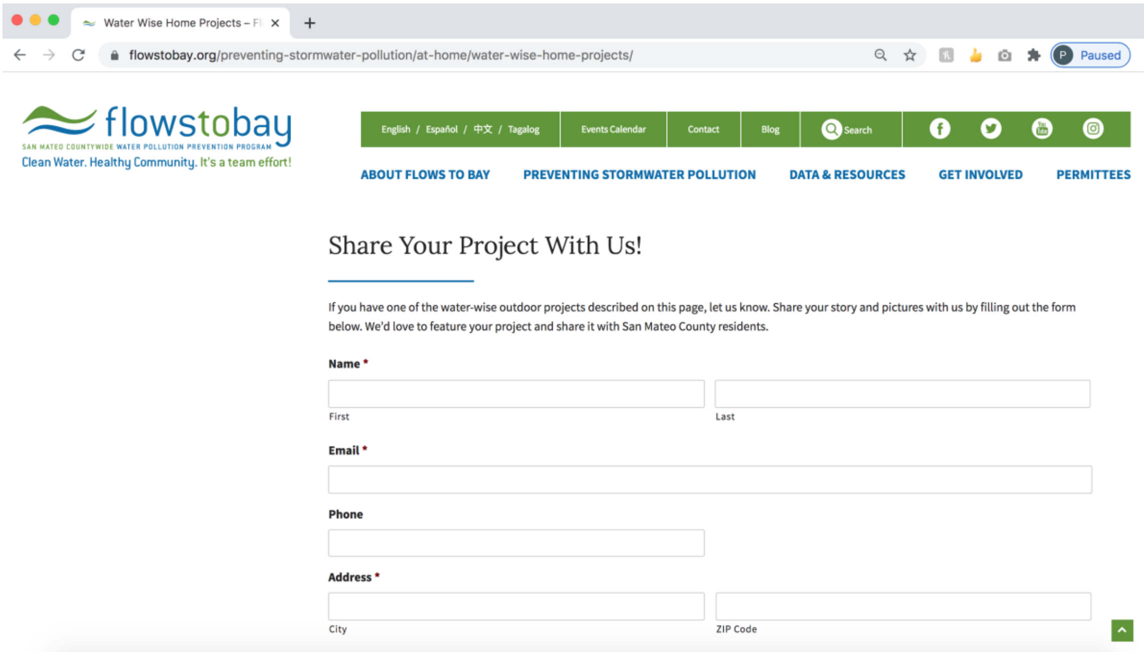
Flows to Bay Subscriber Coupon

As thanks for being a subscriber, here is your exclusive Flows To Bay discount with Ducky's Car Wash. Click below to download a PDF of the coupon.

Examples of Webpages from the Updated SMCWPPP Website






Water Wise Home Projects – Fl
flowstobay.org/preventing-stormwater-pollution/at-home/water-wise-home-projects/
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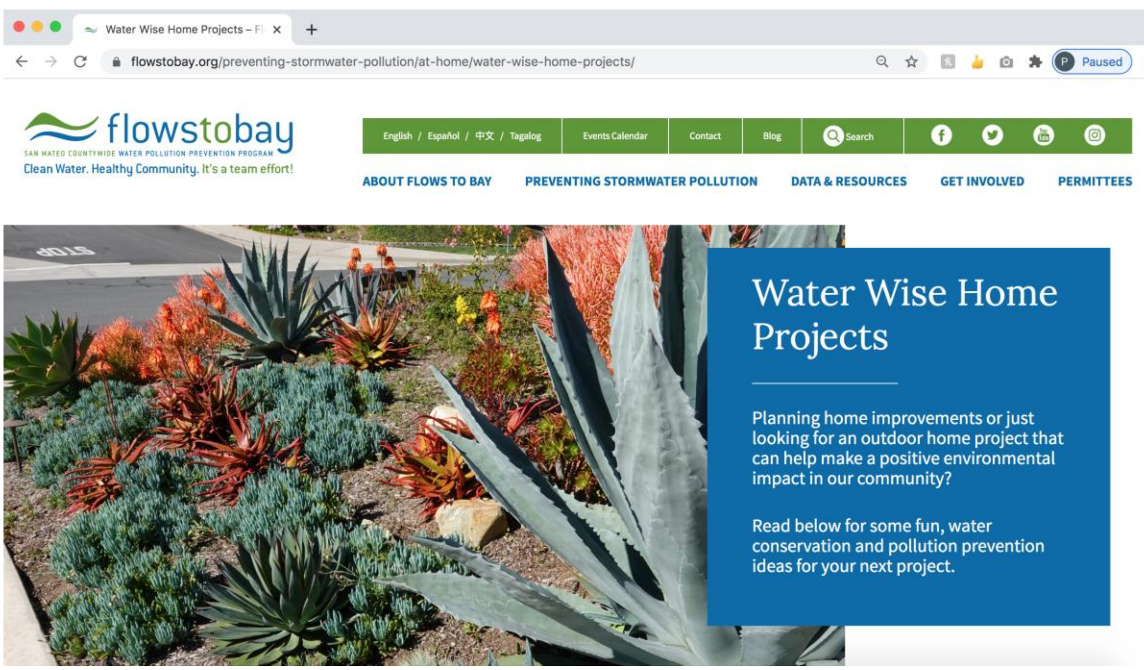
Share Your Project With Us!
If you have one of the water-wise outdoor projects described on this page, let us know. Share your story and pictures with us by filling out the form below. We'd love to feature your project and share it with San Mateo County residents.
Name *
First
Last
Email *
Phone
Address *
City
ZIP Code


Water Wise Home Projects – Fl
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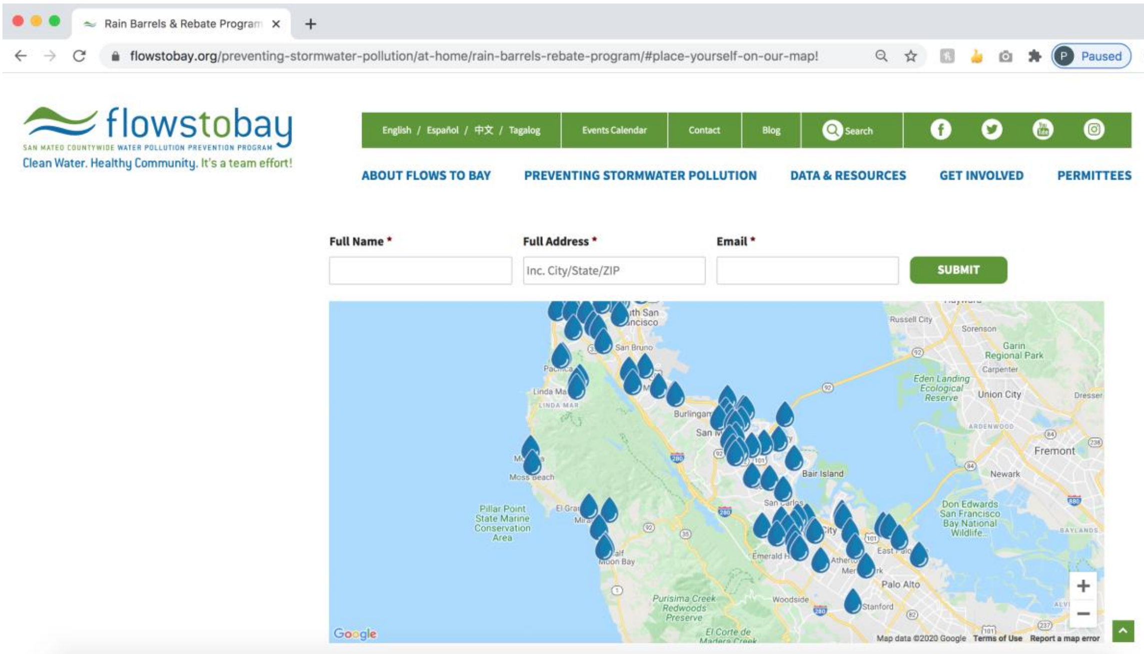
Water Wise Home Projects
Planning home improvements or just looking for an outdoor home project that can help make a positive environmental impact in our community?
Read below for some fun, water conservation and pollution prevention ideas for your next project.


Rain Barrels & Rebate Program
flowstobay.org/preventing-stormwater-pollution/at-home/rain-barrels-rebate-program/#place-yourself-on-our-map!
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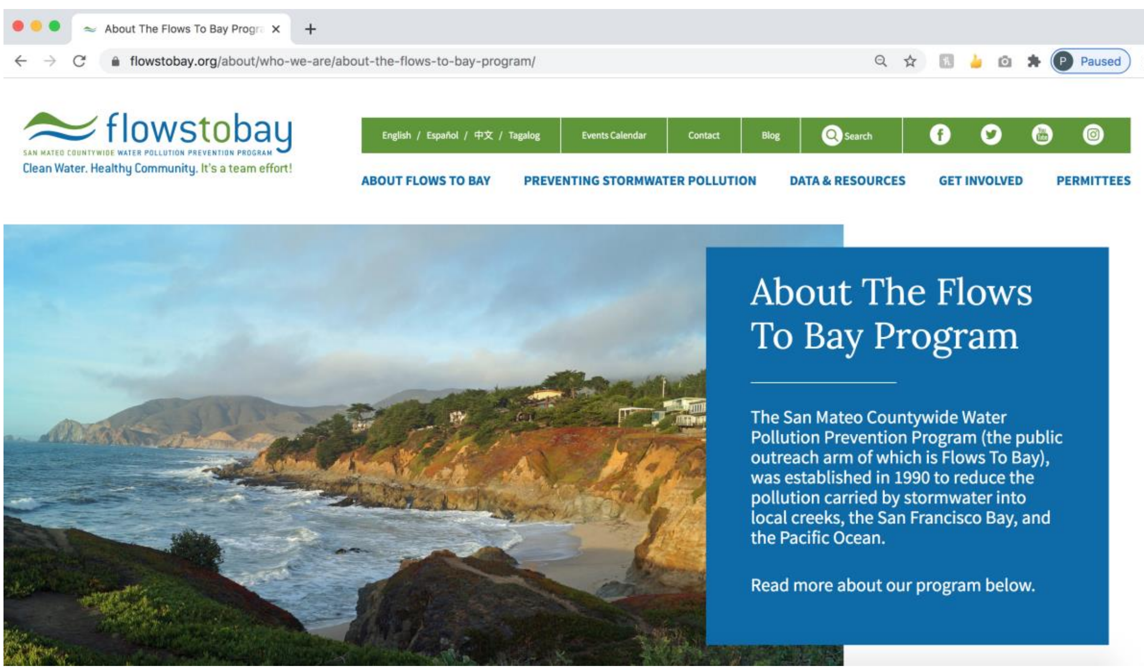
Email *
SUBMIT
San Bruno
Burlingame
Bair Island
Union City
Fremont
Newark
Palo Alto
Stanford
Woodside
Moss Beach
Pillar Point State Marine Conservation Area
Purisima Creek Redwoods Preserve
Eden Landing Ecological Reserve
Don Edwards San Francisco Bay National Wildlife...
Garin Regional Park
Google
Map data ©2020 Google Terms of Use Report a map error


About The Flows To Bay Program
flowstobay.org/about/who-we-are/about-the-flows-to-bay-program/
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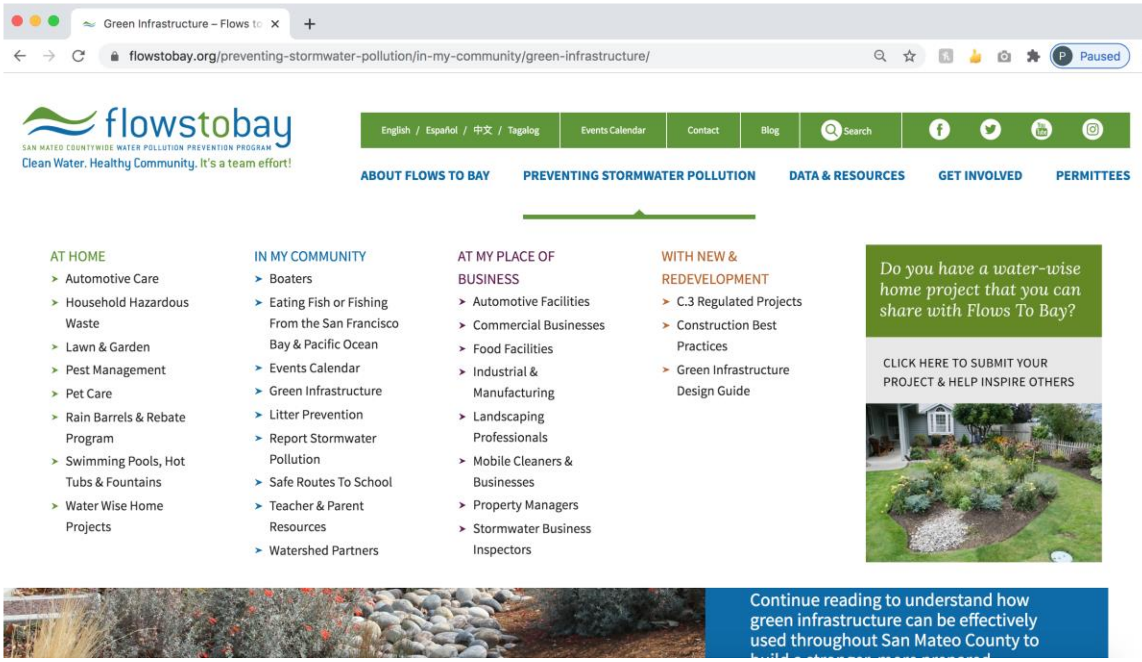
About The Flows To Bay Program
The San Mateo Countywide Water Pollution Prevention Program (the public outreach arm of which is Flows To Bay), was established in 1990 to reduce the pollution carried by stormwater into local creeks, the San Francisco Bay, and the Pacific Ocean.
Read more about our program below.


Green Infrastructure – Flows to
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Pest Management
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Swimming Pools, Hot Tubs & Fountains
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Report Stormwater Pollution
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Teacher & Parent Resources
Watershed Partners
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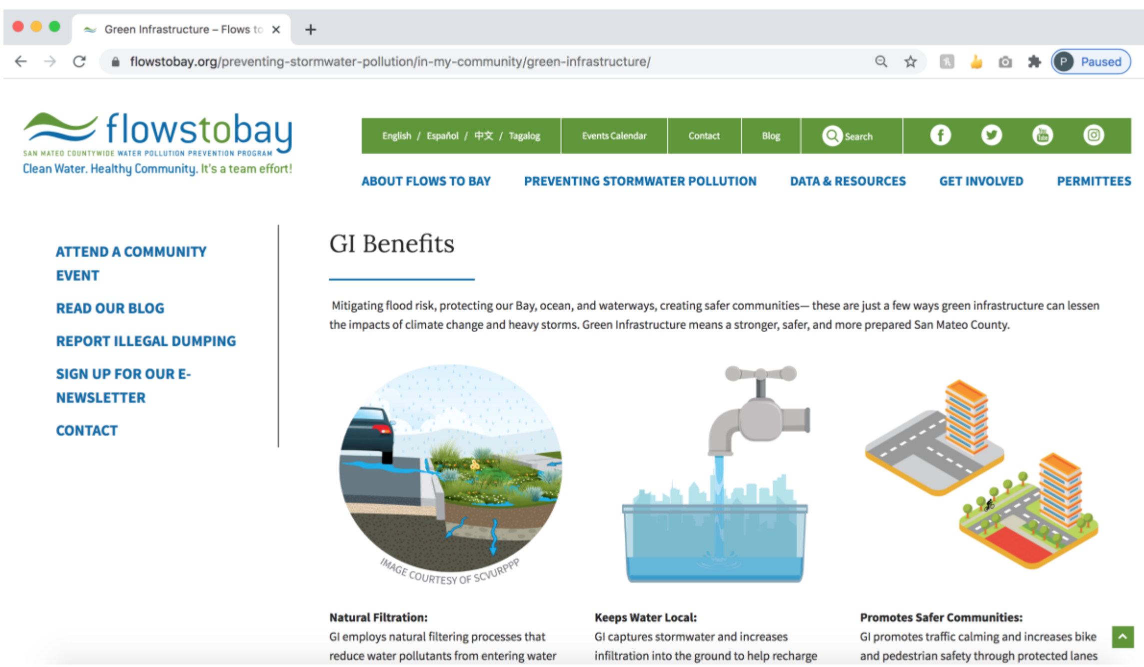
Automotive Facilities
Commercial Businesses
Food Facilities
Industrial & Manufacturing
Landscaping Professionals
Mobile Cleaners & Businesses
Property Managers
Stormwater Business Inspectors
WITH NEW & REDEVELOPMENT
C.3 Regulated Projects
Construction Best Practices
Green Infrastructure Design Guide
Do you have a water-wise home project that you can share with Flows To Bay?
CLICK HERE TO SUBMIT YOUR PROJECT & HELP INSPIRE OTHERS
Continue reading to understand how green infrastructure can be effectively used throughout San Mateo County to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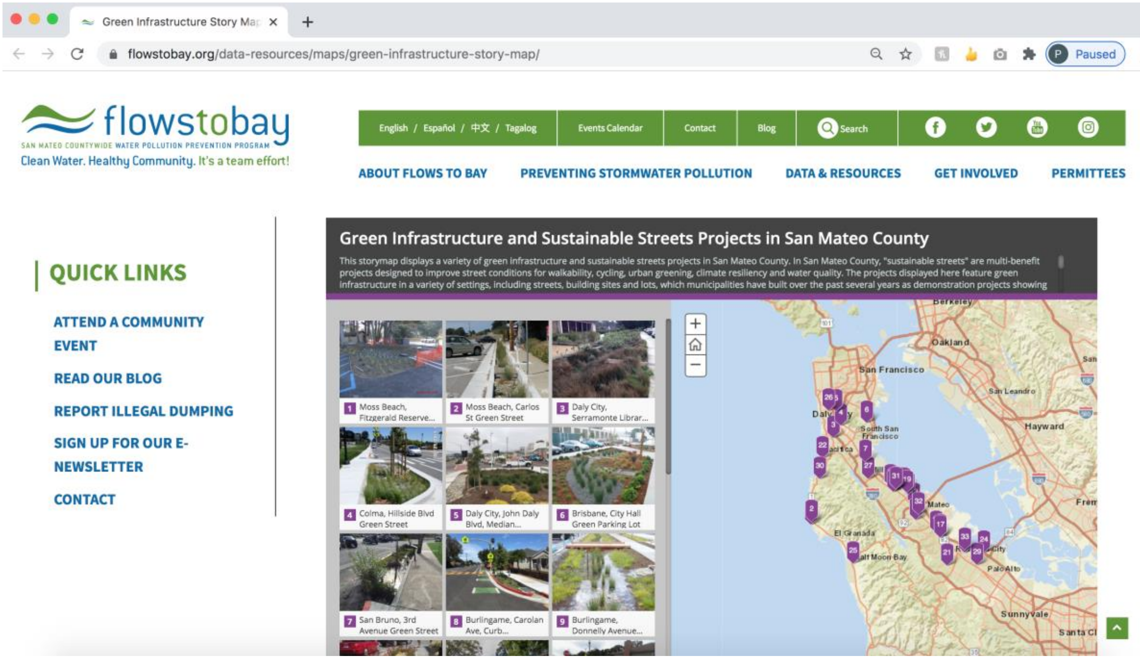
GI Benefits
Mitigating flood risk, protecting our Bay, ocean, and waterways, creating safer communities— these are just a few ways green infrastructure can lessen the impacts of climate change and heavy storms. Green Infrastructure means a stronger, safer, and more prepared San Mateo County.
IMAGE COURTESY OF SCVURPPP
Natural Filtration:
GI employs natural filtering processes that reduce water pollutants from entering water
Keeps Water Local:
GI captures stormwater and increases infiltration into the ground to help recharge
Promotes Safer Communities:
GI promotes traffic calming and increases bike and pedestrian safety through protected lanes


Green Infrastructure Story Map
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PERMITTEES
QUICK LINKS
ATTEND A COMMUNITY EVENT
READ OUR BLOG
REPORT ILLEGAL DUMPING
SIGN UP FOR OUR E-NEWSLETTER
CONTACT
Green Infrastructure and Sustainable Streets Projects in San Mateo County
This storymap displays a variety of green infrastructure and sustainable streets projects in San Mateo County. In San Mateo County, "sustainable streets" are multi-benefit projects designed to improve street conditions for walkability, cycling, urban greening, climate resiliency and water quality. The projects displayed here feature green infrastructure in a variety of settings, including streets, building sites and lots, which municipalities have built over the past several years as demonstration projects showing
1 Moss Beach, Fitzgerald Reserve...
2 Moss Beach, Carlos St Green Street
3 Daly City, Serramonte Librar...
4 Colma, Hillside Blvd Green Street
5 Daly City, John Daly Blvd, Median...
6 Brisbane, City Hall Green Parking Lot
7 San Bruno, 3rd Avenue Green Street
8 Burlingame, Carolan Ave, Curb...
9 Burlingame, Donnelly Avenue...
Berkeley
Oakland
San Francisco
San Leandro
Hayward
South San Francisco
El Granada
Half Moon Bay
Palo Alto
Sunnyvale

Appendix 9

- Parks Maintenance & IPM Work Group Attendance List FY 2019/20
- Landscape Integrated Pest Management (IPM) Workshop – March 3, 2020
    - Workshop Agenda
    - Attendance List
    - Evaluations Summary
- Pest Control Contracting Outreach

San Mateo Countywide Water Pollution Prevention Program
Parks Maintenance IPM Work Group Attendance List - FY 2019/20

Contact Information			Attendance
MUNICIPALITY	**REPRESENTATIVE**	**EMAIL**	**11/19/2019**
Atherton	Sally Bentz-Dalton	sbentz@ci.atherton.ca.us	
Belmont	Daniel Ourtiague	dourtiague@belmont.gov	
	Matt Ward	mward@belmont.gov	
Brisbane	Keegan Black	kblack@ci.brisbane.ca.us	
Burlingame	Rich Holtz	Rholtz@burlingame.org	X
	Bob Disco	bdisco@burlingame.org	
Colma	Louis Gotelli	Louis.Gotelli@colma.ca.gov	
	Brian Dossey	brian.dossey@colma.ca.gov	
Daly City	Chris Caliendo	ccaliendo@dalycity.org	X
	Jeff Fornesi	jfornesi@dalycity.org	
	Sibely Calles	scalles@dalycity.org	X
	Dennis Bray	dbray@dalycity.org	
	Nicholas Crescenzi	ncrescenzi@dalycity.org	
	Jeff Templin	jtemplin@dalycity.org	X
	Fernando Barron		
East Palo Alto	Jay Farr	jfarr@cityofepa.org	
	Lenin Mecgar	lmelgar@cityofepa.org	
	Mario Pulido	pulidomario@sbcglobal.net	
	Michelle Daher	mdaher@cityofepa.org	
Foster City	P Chiamos	pchiamos@fostercity.org	
	Frank Fanara	Ffanara@fostercity.org	
Half Moon Bay	Katherine Sheehan	katherines@csgengr.com	
	Maziar Bozorginia	MBozorginia@hmbcity.com	
Hillsborough	Garry Francis	gfrancis@hillsca.org	
	Natalie Asai	nasai@HILLSBOROUGH.NET	
Menlo Park	Sheena Ignacio	smignacio@menlopark.org	
Millbrae	Ken Crosetti	kcrosetti@ci.millbrae.ca.us	
	John Gianoli	jgianoli@ci.millbrae.ca.us	
Pacifica	A. Clark	clarka@ci.pacifica.ca.us	
	Estevan Renteria	Lavorinip@ci.pacifica.ca.us	
	Raymond Donguines	donguinesr@ci.pacifica.ca.us	
Portola Valley	Howard Young	hyoung@portolavalley.net	
Redwood City	Lucas Wilder	LWilder@redwoodcity.org	X
	Terence Kyaw	TKyaw@redwoodcity.org	
	Francisco Espinoza	fespinoza@redwoodcity.org	
San Bruno	Rene Walsh	rwalsh@ci.sanbruno.ca.us	
	Danielle Brewer	DBrewer@sanbruno.ca.gov	
	Dan Venezia	Dvenezia@sanbruno.ca.gov	

San Mateo Countywide Water Pollution Prevention Program
Parks Maintenance IPM Work Group Attendance List - FY 2019/20

Contact Information			Attendance
MUNICIPALITY	**REPRESENTATIVE**	**EMAIL**	**11/19/2019**
San Carlos	Arturo Burgueno	aburgueno@cityofsancarlos.org	
	Chris Zanoni	czanoni@cityofsancarlos.org	
	Jean St. Martin	jsaintmartin@cityofsancarlos.org	
	Luis Estrada	lestrada@cityofsancarlos.org	
	Kathryn Robertson	krobertson@cityofsancarlos.org	
City of San Mateo	Mark Hulett	mhulett@cityofsanmateo.org	
	Sarah Scheidt	sscheidt@cityofsanmateo.org	
	Jim Burch	JBurch@sanbruno.ca.gov	
	Dennis Pawl	dpawl@cityofsanmateo.org	
	Sven Edlund	sedlund@cityofsanmateo.org	X
San Mateo Co. Parks	Sam Herzberg	SHerzberg@co.sanmateo.ca.us	
	Scott Lombardi	slombardi@co.sanmateo.ca.us	
	Julie Casagrande	jcasagrande@co.sanmateo.ca.us	
	Kim Springer	kspringer@smcgov.org	
	John Allan		
	Dan Krug	dkrug@smcgov.org	
San Mateo Co. Office of Sustainability	John Allan	jallan@smcgov.org	X
SM County PW	Jeff Pacini	JPacini@co.sanmateo.ca.us	
	Kevin Lu	khlu@smcgov.org	
County Agriculture Weights and Measures	Richard Garcia	rgarcia@co.sanmateo.ca.us	
	Jeremy Wagner	JWagner@smcgov.org	
	M Marelich	mmarelich@smcgov.org	
	Fred Crowder	fcrowder@co.sanmateo.ca.us	
	Ione Yuen	IYuen@smcgov.org	X
	Jenny Gossett		
	Avneet Kakkar	akakkar@smcgov.org	
SSF	Donald Louie	donald.louie@ssf.net	X
	Greg Mediati	Greg.Mediati@ssf.net	
Woodside	Dong Nguyen		
	Sean Rose	srose@woodsidetown.org	
UCCE/UC IPM	Andrew Sutherland	amsutherland@ucanr.edu	
EOA	Jon Konnan	jkonnan@eoainc.com	
	Vishakha Atre	vatre@eoainc.com	
SMCWPPP	Matt Fabry	mfabry@smcgov.org	
	Reid Bogert	rbogert@smcgov.org	
Other Attendees			
	Dorte Drastrup	dortedrastrup@gmail.com	
Kelly Carrol	CSG/Half Moon Bay/Colma	kellyc@csgengr.com	X

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

AGENDA

Landscape Integrated Pest Management (IPM) Workshop

(Sponsored by SMCWPPP Parks Maintenance and IPM Workgroup)
Wind Room, Library Community Center
1000 E. Hillsdale Blvd.
Foster City, CA 94404
Tuesday, March 3, 2020
10:30 a.m. – 3:00 p.m.

Registration and Lunch	10:30 am – 11:00 am
Welcoming Remarks Richard Holtz, *City of Burlingame*	11:00 am – 11:05 am
Pesticides Toxicity Control Requirements in the Municipal Stormwater Regional Permit Vishakha Atre, *EOA*	11:05 am – 11:20 am
Soil Management for Weed Control Dr. Igor Lacan, *UC Cooperative Extension*	11:20 am – 12:20 pm
Using Goats for Vegetation Management in Urban Landscapes Kirk Gharda, *City of Redwood City*	12:20 pm – 12:50 pm
Break	12:50 pm – 1:00 pm
Spring Applications for Landscape & Tree Care Eric Carlson**,** *Target Specialty*	1:00 pm – 2:00 pm
Regulatory Update, Common Violations Joseph Hannen, *San Mateo County Agriculture/Weights and Measures*	2:00 pm – 3:00 pm
Adjourn	3:00 pm

SMCWPPP Landscape IPM Workshop
Attendance List
March 3, 2020

	LAST NAME	FIRST NAME	AGENCY
1	Mayeda	Walter	SMC - Dept of Ag
2	Acevedo	Salvador	Foster City
3	Aizawa	Brian	Redwood City
4	Allan	John	County of San Mateo
5	Barron	Fernando	Daly City
6	Bentz-Dalton	Sally	Atherton
7	Bergstrom	Paul	Loral Landscaping
8	Bixby	Justin	Portola Valley
9	Bravo	Tony	Redwood City
10	Brosnan	Cornelius	Burlingame
11	Caliendo	Chris	Daly City
12	Caravalho	Nate	Half Moon Bay
13	Cardenas	Jorge	Loral Landscaping
14	Carroll	Kelly	Redwood City
15	Castro	Carlos	Hillsborough
16	Chiamos	Peter	Foster City
17	Coldrick	James	Burlingame
18	Cooney	Edmund	Hillsborough
19	Correa	Sean	County of San Mateo
20	Delaney	James	Burlingame
21	Deraz	Miguel	Redwood City
22	Diaz	Jose	Redwood City
23	Echeverria	James	Foster City
24	Espinoza	Jesus	Redwood City
25	Friars	Joe	Brisbane
26	Fukudome	Glenn	Redwood City
27	Garcia	Manuel	Foster City
28	Garcia	Luis	Redwood City
29	Garcia	Richard	SMC - Dept of Ag
30	Gonzales	Rosalia	Redwood City

SMCWPPP Landscape IPM Workshop
Attendance List
March 3, 2020

	LAST NAME	FIRST NAME	AGENCY
31	Gossett	Jenny	SMC - Dept of Ag
32	Gotthardt	Garrett	Foster City
33	Hannen	Joseph	SMC - Dept of Ag
34	Herbert	Dominique	Redwood City
35	Holtz	Richard	Burlingame
36	Jimenez	Abel	Foster City
37	Jimenez	Miguel	Redwood City
38	Kakkar	Avneet	SMC - Dept of Ag
39	Krug	Daniel	County of San Mateo
40	Louie	Donald	South San Francisco
41	Moreno	Leopnardo	Redwood City
42	Mungia	Carlos	Foster City
43	Munguia	Armando	Half Moon Bay
44	Munoz	Genaro	Foster City
45	Orlando	Daniel	East Palo Alto
46	Padilla	Lydia	Rudy's Greenhouses
47	Pappas	Stephen	Burlingame
48	Pedalino	Michael	Half Moon Bay
49	Penisini	Sharona	Redwood City
50	Pulido	Mario	East Palo Alto
51	Rancatore	Michael	Burlingame
52	Renteria	Estevan	Pacifica
53	Ryan	Matthew	Foster City
54	Salazar	Raul	Foster City
55	Schroder	Nazmeen	Foster City
56	Tagle	Jason	Hillsborough
57	Templin	Jeffrey	Daly City
58	Thomas	Randy	Brisbane
59	Tschierschky	Zack	Burlingame
60	Valencia	Alex	East Palo Alto

SMCWPPP Landscape IPM Workshop
Attendance List
March 3, 2020

	LAST NAME	FIRST NAME	AGENCY
61	Ventura	Wilber	Foster City
62	Weber	Daniel	Foster City
63	Wheeler	Howard	Loral Landscaping
64	Wilder	Lucas	Redwood City

64 Attendees
23 Evaluations

Evaluation Form

Landscape Integrated Pest Management (IPM) Workshop
(Sponsored by SMCWPPP Parks Maintenance and IPM Workgroup)
Wind Room, Library Community Center
1000 E. Hillsdale Blvd.
Foster City, CA 94404
Tuesday, March 3, 2020
10:30 a.m. – 3:00 p.m.

What Did You Think of the Following Presentations?

1. **Pesticides Toxicity Control Requirements in the Municipal Regional Permit -** Vishakha Atre, *EOA*

   14 very helpful **9** somewhat helpful **0** not helpful

2. **Soil Management for Weed Control -** Dr. Igor Lacan, *UC Cooperative Extension*

   20 very helpful **3** somewhat helpful **0** not helpful

3. **Using Goats for Vegetation Management in Urban Landscapes -** Kirk Gharda, *Redwood City*

   13 very helpful **7** somewhat helpful **0** not helpful

4. **Spring Applications for Landscape & Tree Care -** Eric Carlson, *Target Specialty*

   17 very helpful **3** somewhat helpful **1** not helpful

5. **Regulatory Update, Common Violations –** Joseph Hannen, *San Mateo County Agriculture/Weights and Measures*

   14 very helpful **5** somewhat helpful **0** not helpful

Did this workshop meet your expectations? **20** Yes **0** No

Suggestions for future workshop topics:

- More specific info on techniques for weed control
- All day for more hours (8:00am-3:00pm)
- Microbial science of soil
- How treated drinking water and recycled water affects soil health, compared to rainwater and well water
- More detail of making mulch - what type of wood chips or leaf species.
- Fire safe landscaping
- Roadside applications for fire control
- More topics on wildland applications
- Bring examples of personal protective equipment - gloves, overalls, etc.

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

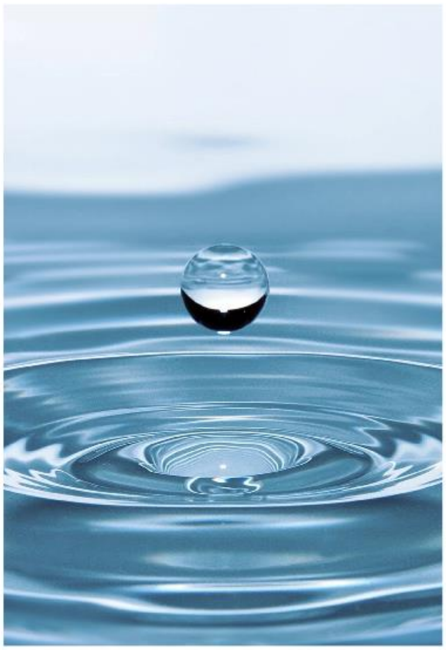
General Comments:

- Great (5)
- Very Good (1)
- Thank you (1)
- Thanks for providing tables
- You ran a great event
- The course was great at providing up to date information on recent changes to local regulations

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

Pest Control Contracting Outreach

Pledge



flowstobay.org
SAN MATEO COUNTYWIDE
WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

I pledge to reduce pesticide usage to protect the health of my community and our waterways.

Business: ______________________

Name: ______________________

Signature: ______________________

Date: ______________________

Partial Database of Pest Control Operators

Name	License #	License Status	Issuance Date	Expiration Date	Business Name	Address	City
CHUNG, JOHN	13395 and 12432	Clear	8/14/2018	6/30/2021	BLUEBIRD TERMITE	533 AIRPORT BLVD #400 BURLINGAME CA 94010 SAN MATEO COUNTY	Burlingame
DIODATI, ARMANDO G	5237	Clear	1/1/1976	6/30/2021	GOLDEN GATE TERMITE CONTROL INC	328 LANG ROAD BURLINGAME CA 94010 SAN MATEO COUNTY	Burlingame
COURTEMANCHE, CARL OVIDE	10108	Clear	11/12/1999	6/30/2020	CAM AM PEST CONTROL	332 POPLAR AVENUE REDWOOD CITY CA 94061 SAN MATEO COUNTY	Redwood City
CRUMPTON, RICHARD EARL	8946	Clear	4/21/1992	6/30/2021	POWER PEST CONTROL	P O BOX 451 BELMONT CA 94002 SAN MATEO COUNTY	Belmont
FUSON, KENNETH JACOB	9794	Clear	12/3/1997	6/30/2021	KEN FUSON PEST MANAGEMENT SERVICES	111 ELM STREET MENLO PARK CA 94025 SAN MATEO COUNTY	Menlo Park

Name	License #	License Status	Issuance Date	Expiration Date	Business Name	Address	City
HASTIE, HARRY H JR	4704	Clear	1/1/1973	6/30/2022	HASTIE TERMITE COMPANY THE	701 CHESTER WAY HILLSBOROUGH CA 94010 SAN MATEO COUNTY	Hillsborough
HUSTED, BRET DENNING	11737	Clear	8/4/2008	6/30/2020	PREVENTION INSPECTION SERVICES	1748 SWEETWOOD DRIVE DALY CITY CA 94015 SAN MATEO COUNTY	Daly City
DONOVAN, JAMES EDWARD	9728	Clear	7/7/1997	6/30/2021	DONOVANS PEST CONTROL INC	PO BOX 6910 SAN MATEO CA 94403 SAN MATEO COUNTY	San Mateo
GOSS, JEFFREY R	12632	Clear	12/27/2013	6/30/2022	DONOVANS PEST CONTROL INC	PO BOX 6910 SAN MATEO CA 94403 SAN MATEO COUNTY	San Mateo
IACOPI, PETER MICHAEL	9433	Clear	7/31/1995	6/30/2022	COASTSIDE TERMITE	P O BOX 116 HALF MOON BAY CA 94019 SAN MATEO COUNTY	Half Moon Bay
JAURIGUI, DAVID JOSEPH	10739	Clear	6/6/2003	6/30/2020	ALERT PEST CONTROL CO INC	182 SCHOOL STREET DALY CITY CA 94014 SAN MATEO COUNTY	Daly City
JAURIGUI, JOHN J	6999	Clear	1/1/1984	6/30/2022	ALERT PEST CONTROL CO INC	182 SCHOOL STREET DALY CITY CA 94014 SAN MATEO COUNTY	Daly City
JAURIGUI, MICHAEL JOHN	10723	Clear	5/9/2003	6/30/2020	ALERT PEST CONTROL CO INC PICK A PRO NOW	182 SCHOOL STREET DALY CITY CA 94014 SAN MATEO COUNTY 950 COMMERCIAL AVE SOUTH SAN FRANCISCO CA 94080 SAN MATEO COUNTY	Daly City South San Francisco
NG, PUI KWONG	9355	Clear	1/11/1995	6/30/2021	TERMITE EXTERMINATOR	1602 ROBERTA DRIVE SAN MATEO CA 94403 SAN MATEO COUNTY	San Mateo
O'HARA, TIMOTHY DAVID	8185	Clear	1/1/1988	6/30/2021	O HARAS PEST CONTROL	P O BOX 6 SAN GREGORIO CA 94074 SAN MATEO COUNTY	San Gregorio
OUTMAN, MATTHEW ROBERT	9048	Clear	10/29/1992	6/30/2022	MATT OUTMAN	108 SCENIC DRIVE REDWOOD CITY CA 94062 SAN MATEO COUNTY	Redwood City
PALMER, KEVIN JAMES	8400	Clear	7/10/1989	6/30/2022	PREMIER TERMITE INC	PO BOX 266/ 116 N CABRILLO HWY HALF MOON BAY CA 94019 SAN MATEO COUNTY	Half Moon Bay
POWELL, BRIAN K	11765	Clear	10/20/2008	6/30/2020	BEST PEST SERVICE INC	218 SHAW ROAD STE G SOUTH SAN FRANCISCO CA 94080 SAN MATEO COUNTY	South San Francisco

Name	License #	License Status	Issuance Date	Expiration Date	Business Name	Address	City
SILVA, ARMANDO	11539	Clear	7/3/2007	6/30/2022	MARINA PEST CONTROL CORPORATION	150 S SPRUCE S SAN FRANCISCO CA 94080 SAN MATEO COUNTY	South San Francisco
SU, DAN NOEL	12289	Clear	12/7/2011	6/30/2020	PACIFIC PEST MANAGEMENT	3917 BERESFORD ST #5 SAN MATEO CA 94403 SAN MATEO COUNTY	San Mateo
WONG, HENDRICK	8468	Clear	11/22/1989	6/30/2022	ONE SOURCE TERMITE CONTROL TEAM PEST SOLUTIONS	8 WESTPARK DRIVE DALY CITY CA 94015 SAN MATEO COUNTY	Daly City
RETTKE, MONTE JOSEPH	9419	Clear	7/1/1995	6/30/2022	J K CONTROL INC	200 VALLEY DRIVE #35 BRISBANE CA 94005 SAN MATEO COUNTY	Brisbane
HOWLETT, STEVEN JEFFERY	8194	Clear	1/1/1988	6/30/2021	EVEN STEVENS PEST CONTROL	1612 EL VERANO WAY BELMONT CA 94002 SAN MATEO COUNTY	Belmont
BOYNTON, WILLIAM R	13234	Clear	9/20/2017	6/30/2020	Cook and Associates - Cookton Enterprises Inc DBA	1101 JUDSON STREET BELMONT CA 94002 SAN MATEO COUNTY	Belmont
NEUMANN, ROBERT HEINZ	7622	Clear	1/1/1986	6/30/2022	KAPTO TERMITE CONTROL	1530 ARROYO AVENUE SAN CARLOS CA 94070 SAN MATEO COUNTY	San Carlos
FLETCHER, JAMES ROBERT	10634	Clear	9/23/2002	6/30/2020	COMPLETE PEST CONTROL	PO BOX 315 REDWOOD CITY CA 94064-0315 SAN MATEO COUNTY	Redwood City
PALMIERI, JOSEPH	9912	Clear	7/29/1998	6/30/2022	PALMIERI PEST CONTROL	208 FIRST AVENUE REDWOOD CITY CA 94063 SAN MATEO COUNTY	Redwood City
RUBINA, JOSE LUIS	5734	Clear	1/1/1978	6/30/2020	X PEST EXTERMINATORS	100 NORTH HILL DRIVE #40 BRISBANE CA 94005 SAN MATEO COUNTY	Brisbane
RUSH, MARK STEVEN	10066	Clear	7/28/1999	6/30/2020	ON SITE INSPECTIONS INC	461 ALTA VISTA DRIVE SOUTH SAN FRANCISCO CA 94080 SAN MATEO COUNTY	South San Francisco
SANCHEZ, ANDY WILLIAMS	13416	Clear	9/13/2018	6/30/2021	GENESIS BUILDING SERVICES INC	P O BOX 25360 SAN MATEO CA 94402 SAN MATEO COUNTY	San Mateo
STEWART, RICHARD NORMAN	8381	Clear	1/1/1989	6/30/2021	CHIEF STEWARTS PEST CONTROL INC	139 SANTIAGO AVENUE REDWOOD CITY CA 94061 SAN MATEO COUNTY	Redwood City
WALKER, KEVIN T	13316	Clear	3/12/2018	6/30/2020	CRANE PEST CONTROL	2700 GEARY BOULEVARD SAN FRANCISCO CA 94118 SAN FRANCISCO COUNTY	San Francisco

Name	License #	License Status	Issuance Date	Expiration Date	Business Name	Address	City
DIODATI, GIOVACCHINO	5272	Clear	1/1/1976	6/30/2021	GOLDEN GATE TERMITE CONTROL INC	328 LANG ROAD BURLINGAME CA 94010 SAN MATEO COUNTY	Burlingame
CARR, JAMES PATRICK	10446	Clear	6/13/2001	6/30/2021	EUREKA VALLEY PEST EXCLUSION INC	P O BOX 1896 PACIFICA CA 94044-6896 SAN MATEO COUNTY	Pacifica
MARKOFF, PAUL LINDEN	4739	Clear	1/1/1973	6/30/2022	MARKOFF STRUCTURAL PEST CONTROL CO	6018 MISSION STREET DALY CITY CA 94014 SAN MATEO COUNTY	Daly City
CHU, ZON K	11614	Clear	11/28/2007	6/30/2022	ZC & ASSOCIATES PEST CONTROL	235 WESTLAKE CENTER #381 DALY CITY CA 94015 SAN MATEO COUNTY	Daly City
GAVARRETE, CHESTER R	9505	Clear	3/15/1996	6/30/2022	WEST VALLEY STRUCTURAL CO	PO BOX 2 SOUTH SAN FRANCISCO CA 94083 SAN MATEO COUNTY	South San Francisco
GIORGI, DAVID JOHN	9288	Clear	7/7/1994	6/30/2021	ECOTECH PEST ELIMINATION	P O BOX 1418 MILLBRAE CA 94030 SAN MATEO COUNTY	Millbrae
GURNEY, CHARLES LEE	5315	Clear	9/15/1976	6/30/2021	A & R TERMITE CONTROL INC	1118 EAST 5TH AVE SAN MATEO CA 94402 SAN MATEO COUNTY	San Mateo
HA, QUANG N	11762	Clear	10/17/2008	6/30/2020	BAY AREA PEST CONTROL	110 GLENN WAY #13 SAN CARLOS CA 94070 SAN MATEO COUNTY	San Carlos

Appendix 10

- Trash Subcommittee Attendance List – FY 2019/20
- Litter Work Group – Attendance List – FY 2019/20
- Litter Work Group – Litter Reduction Fact Sheet
- Litter Work Group – FY 2020/21 Work Plan

Trash Subcommittee Meeting Attendance – FY 2019/20

Name	Agency	Phone	E-Mail	07/22/19	10/03/19	12/05/19	03/25/20	06/04/20
Tim Murray	City of Belmont	(650) 222-6460	tmurray@belmont.gov	X		X		
Rick Locke	City of Belmont	(650) 222-6401	rlocke@belmont.gov					
Marcus Escobedo	City of Belmont	(650) 222- 6459	mescobedo@belmont.gov	X	X	X		
Matt Fabry	SMCWPPP Program Manager	(650) 599-1410	mfabry@co.sanmateo.ca.us					
Reid Bogert	C/CAG	(650) 599-1433	rbogert@smcgov.org	X	X	X		X
Keegan Black	City of Brisbane	(415) 728-7986	kblack@ci.brisbane.ca.us		X	X	X	X
Randy Breault	City of Brisbane	(415) 508-2131	rbreault@ci.brisbane.ca.us					
Rob Mallick	City of Burlingame	(650) 558-7673	rmallick@burlingame.org					
Rick Horne	City of Burlingame	(650) 558-7672	rhorne@burlingame.org					
Mike Heathcote	City of Burlingame	(650) 558-7679	mheathcote@burlingame.org				X	
Jennifer Lee	City of Burlingame	(650) 558-7381	jlee@burlingame.org	X	X	X	X	X
Louis Gotelli	Town of Colma	(650) 333-0295	louis.gotelli@colma.ca.gov					
Muneer Ahmed	Town of Colma	(650) 757-8894	Muneer.ahmed@colma.ca.gov					X
Kelly Carroll	Town of Colma	(408) 921-4480	kellyc@csgengr.com	X			X	X
Jeff Fornesi	City of Daly City	(650) 991-5752	jfornesi@dalycity.org					
John Sanchez	City of Daly City	(650) 991-8265	jsanchez@dalycity.org	X		X	X	X
Sibely Calles	City of Daly City	(650) 991-8054	scalles@dalycity.org		X	X		
Michelle Daher	City of East Palo Alto	(650) 853-3197	mdaher@cityofepa.org	X				
Norm Dorais	City of Foster City	(650) 286-3279	ndorais@fostercity.org			X		
Vivian Ma	City of Foster City	(650) 286-3270	vma@fostercity.org	X	X		X	X
Mark Lander	City of Half Moon Bay	(650) 522-2500	markl@csgengr.com	X	X	X	X	
Nick Zigler	City of Half Moon Bay	(650) 522-2500	nickz@csgengr.com					X
Brian Henry	City of Menlo Park	(650) 330-6799	bphenry@menlopark.org					
Hugo Tores	City of Menlo Park		hatorres@menlopark.org	X			X	
Clarence Li	City of Menlo Park		clli@menlopark.org	X	X		X	X
Mike Killigrew	City of Millbrae	(650) 259-2374	mkilligrew@ci.millbrae.ca.us				X	X
Raymund Donguines	City of Pacifica	(650) 738-3767	donguinesr@ci.pacifica.ca.us					
Bernie Mau	City of Pacifica	(650) 438-5416	Maub@ci.pacifica.ca.us					
Howard Young	Town of Portola Valley	(650) 851-1700 X214	hyoung@portolavalley.net					
Terrance Kyaw	City of Redwood City	(650) 780-7466	TKyaw@redwoodcity.org					
Vicki Sherman	City of Redwood City	(650) 780-7472	vsherman@redwoodcity.org	X	X		X	X
Dennis Bosch	City of San Bruno		dbosch@sanbruno.ca.gov	X				

Trash Subcommittee Meeting Attendance – FY 2019/20

Name	Agency	Phone	E-Mail	07/22/19	10/03/19	12/05/19	03/25/20	06/04/20
Robert Wood	City of San Bruno	(650) 616-7046	rwood@sanbruno.ca.gov					
Ted Chapman	City of San Bruno	(650) 616-7169	TChapman@sanbruno.ca.gov		X	X	X	X
Sean Morris	City of San Bruno	(650) 616-7160	smorris@sanbruno.ca.gov	X				
Kathryn Robertson	City of San Carlos	(650) 802-4212	KRobertson@cityofsancarlos.org		X	X		
Vatsal Patel	City of San Carlos		vpatel@cityofsancarlos.org				X	X
Sarah Scheidt	City of San Mateo	(650) 522-7385	sscheidt@cityofsanmateo.org	X	X			X
Roxanne Murray	City of San Mateo	(650) 522-7346	rmurray@cityofsanmateo.org	X				
Rick Pina	City of San Mateo	(650) 522-7373	rpina@cityofsanmateo.org					
Sven Edlund	City of San Mateo	(650) 522-7342	sedlund@cityofsanmateo.org			X	X	X
Mark Swenson	City of San Mateo	(650) 522-7349	mswenson@cityofsanmateo.org		X			
Richard Kraft	City of San Mateo							X
Andrew Wemmer	City of So. San Francisco	(650) 829-3883	andrew.wemmer@ssf.net	X		X	X	X
Thomas Siphongsay	City of So. San Francisco	(650) 829-3882	thomas.siphongsay@ssf.net		X			
Daniel Garza	City of So. San Francisco	(650) 829-3880	daniel.garza@ssf.net					
Julie Casagrande	County of San Mateo - DPW	(650) 599-1457	jcasagrande@co.sanmateo.ca.us	X	X			X
Breann Liebermann	County of San Mateo		bliebermann@smcgov.org	X	X			
John Allan	County of San Mateo	(650) 363-4071	jallan@smcgov.org			X	X	
Diana Shu	County of San Mateo		dshu@co.sanmateo.ca.us					
Lillian Clark	County of San Mateo		lclark@co.sanmateo.ca.us					X
Kim Springer	County of San Mateo		kspringer@smcgov.org					X
Kevin Lu	County of San Mateo	(650) 363-4698	khlu@smcgov.org					X
Katherine Sheehan	CSG Consultants	(650) 522-2506	katherines@csgengr.com		X		X	
Peniel Ng	CSG Consultants	(650) 522-2500	penieln@csgengr.com	X				
Ian Hull	ERM	(925) 708-0650	hulli@samtrans.com		X			
Chris Sommers	EOA, Inc.	(510) 832-2852 X109	csommers@eoainc.com	X	X	X	X	X
John Fusco	EOA, Inc.	(510) 832-2852 X130	jrfusco@eoainc.com	X	X	X	X	X
Peter Schultze-Allen	EOA, Inc.	(510) 832-2852 X128	pschultze-allen@eoainc.com				X	
No. Attending				**22**	**20**	**16**	**20**	**23**

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) Litter Work Group - 2019/20 - Attendance Record			
Name (e-mail)	**Phone**	**Agency**	**4/27/20**
Matt Fabry mfabry@smcgov.org Reid Bogert rbogert@smcgov.org	650-599-1419	CCAG/SMCWPP	X X
Diane Lynn dlynn@belmont.gov	650-595-7425	City of Belmont	
Julie Freitas jfreitas@belmont.gov	650-595-7425	City of Belmont	
Keegan Black kblack@ci.brisbane.ca.gov	415-508-2131	City of Brisbane	X
Jennifer Lee jlee@burlingame.org Rick Horne rhorne@burlingame.org Michael Heathcote mheathcote@burlingame.org	650-558-7381 650-558-7672	City of Burlingame	X X
Louis Gotelli lgotelli@colma.ca.gov Nick Zigler ziglern@csgengr.com Kelly Carroll kellyc@csgengr.com	 650-522-2538 408-921-4480	Town of Colma Half Moon Bay and Colma Half Moon Bay and Colma	 X X
Stephen Stolte sstolte@dalycity.org	650-991-8126	City of Daly City	
Michelle Daher mdaher@cityofepa.org	650-853-3197	City of East Palo Alto	
Norm Dorais ndorais@fostercity.org		City of Foster City	
Gary Francis gfrancis@hillsborough.net		Town of Hillsborough	
Clarence Li clli@menlopark.org	650-330-6797	City of Menlo Park	X
Shelly Reider sreider@ci.millbrae.ca.us	650-259-2444	City of Millbrae	X
Vicki Sherman vsherman@redwoodcity.ca.us		City of Redwood City	X
Ted Chapman tchapman@sanbruno.ca.gov		City of San Bruno	X
Vatsal Patel VPatel@cityofsancarlos.org		City of San Carlos	X
Roxanne Murray rmurray@cityofsanmateo.org Sarah Scheidt sscheidt@cityofsanmateo.org	650-522-7346	City of San Mateo	X X

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)
Litter Work Group - 2019/20 - Attendance Record

Name (e-mail)	Phone	Agency	4/27/20
Andrew Wemmer Andrew.Wemmer@ssf.net Daniel Garza Daniel.Garza@ssf.net	650-829-3883	City of South SF	X
John Allan jallan@smcgov.org Eun-Soo Lim eulim@smcgov.org Kevin Lu klu@smcgov.org		County of San Mateo Office of Sustainability	X
Lillian Clark lclark@smcgov.org Prabhyot Khangura pkhangura@smcgov.org	650-599-1447	County of San Mateo	X
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Julie Casagrande jcasagrande@smcgov.org	650-599-1457	County of San Mateo Public Works	
Julia Au jau@rethinkwaste.org Shirley Ng Joanna Rosales Joe La Mariana jlamariana@rethinkwaste.org	650-802-3509	Rethink Waste	X
Mia Rossi mrossi@recology.com		Recology-SM County	
Yvette Madera ymadera@recology.com	650-598-8242		X
Monica Devincenzi MDevincenzi@republicservices.com Nicole Lee nlee@republicservices.com	650-756-1130 x224	Republic Services	
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Susan Kennedy susan@ssfscavenger.com	925-437-2510	South SF Scavenger	
Teresa Montgomery teresa@ssfscavenger.com	650-589-4020		X
Chris Sommers csommers@eoainc.com	510-832-2852 x 109	EOA Inc.	X
Peter Schultze-Allen pschultze-allen@eoainc.com	510-832-2852 x 128		X

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SAN MATEO COUNTYWIDE
WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

NEW DEVELOPMENT PROJECTS
LITTER REDUCTION FACT SHEET

▪ Architects ▪ Engineers ▪ Developers

Learn how to incorporate litter reduction design concepts into your project to help protect our local creeks, the San Francisco Bay and the Ocean.

WHY CONSIDER LITTER IN YOUR BUILDING DESIGN?

Neighborhoods and streets are connected to creeks, the San Francisco Bay and the Ocean via surface flow and storm drain systems. Improperly managed waste from new buildings can litter the street and flow to our waterways without any cleaning or filtering. Municipalities in San Mateo County are required to significantly reduce the amount of litter entering the Bay and Ocean.

Incorporating the design concepts in this factsheet will help you meet local and State litter reduction goals. This includes considering different types of waste materials (i.e. compost, recycling and special materials) and building operations during the design phase of new buildings.

To protect our waterways and beaches, State and local water quality regulations require a significant reduction in litter.

HOW CAN YOUR BUILDING DESIGN INCORPORATE LITTER MANAGEMENT?

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) has created guidance to assist architects, engineers, and developers with incorporating litter management practices into their designs.

Follow these Steps for Reducing Litter and Waste in Your Building Design and Operation

1. Comply with litter-related *Conditions of Approval* issued by your municipality.
2. Create a Discard Collection Plan (See back for details). Review Plan with *hauler and municipal staff.*
3. Work with municipality and hauler at occupancy stage, to achieve *"Right Size, Right Service."*

Conditions of Approval

Both the design phase and occupancy phase of a new development project should meet Conditions of Approval. For instance: trash, recycling and compost facilities should be large enough for building activities; and discard storage and collection areas should be accessible and convenient for building users, as well as collection vehicles.

Work with Hauler and Municipal Staff

Go to Collection Services Map to find your Hauler

San Mateo County, Office of Sustainability

smcsustainability.org/waste-reduction/curbside-collection

To reduce litter when designing your building, coordinate early and often with hauler and municipal staff. Staff can inform you of access needs, zoning and other requirements.

"Right Size, Right Service"

Building owners and designers must work together with municipal staff and haulers to determine the right size, type, and number of containers, as well as the right service frequency, to meet litter and waste reduction goals.

Litter Reduction Toolkit

SMCWPPP | flowstobay.org/node/1974

Example design scenarios and other resources for Multi-Family Dwellings and new development projects.

WHAT ARE THE KEY ELEMENTS OF A DISCARD COLLECTION PLAN?

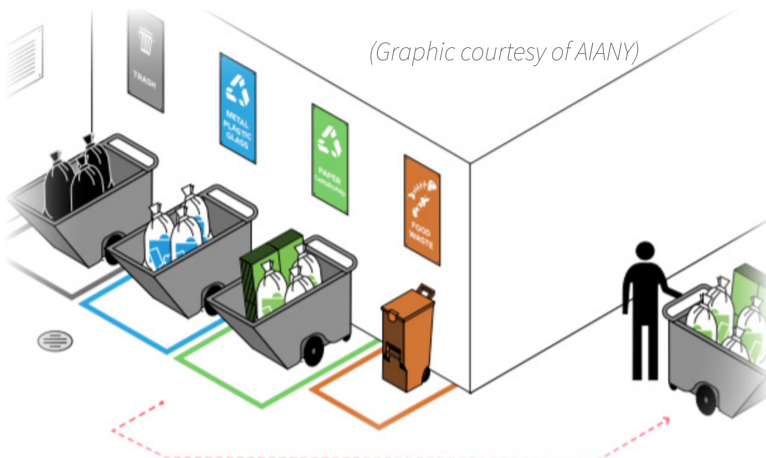
- Property map and hauler access
- Indoor collection system (in-unit areas, chutes/rooms)
- Special material collection areas
- Discard area enclosure design

Litter Reduction Toolkit

See the Toolkit for more details on Discard Collection Plans, example design scenarios, and litter management practices for Multi-Family Dwellings and other new development projects.

Internal Operations

- Chutes can be used to collect materials internally.
- Staff can collect discards from private, common and public spaces.
- On service day(s), materials are brought out.



(Graphic courtesy of AIANY)

External Collection Service

- Staging area must be set-up to reduce litter (e.g. enclosed, away from storm drains, accessible to hauler vehicles).
- Plan for different vehicle and container types.

ADDITIONAL RESOURCES AND GUIDANCE DOCUMENTS

AIANY Zero Waste Design Guidelines | *Center for Architecture* | zerowastedesign.org
Franchise Agreement Litter Practices Recommendations | *SMCWPPP* | flowstobay.org/studiesresearch
New Development Guidelines | *Recology San Mateo County* | recology.com/recology-san-mateo-county/new-development-projects
Waste Enclosure Guidelines | *South San Francisco Scavenger* | ssfscavenger.com/guidelines
Space Guidelines for Refuse Services | *StopWaste* | stopwaste.org/resource/space-guidelines-recycling-organics-and-refuse-services
Waste Handling Guidelines | *City of Fremont* | fremont.gov/DocumentCenter/View/1528

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

SMCWPPP
Litter Work Group

FY 2020-21 Work Plan

Final

April 23, 2020

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INTRODUCTION AND BACKGROUND

Trash Impacts on Water Bodies and Regulatory Responses

Trash (i.e., litter, floatables, gross pollutants, or solid waste) is a serious problem for watersheds where it presents an aesthetic nuisance, and a serious threat to aquatic life in creeks and the oceans. Data suggest that plastic trash in particular persists for hundreds of years in the environment and can pose a threat to wildlife through ingestion, entrapment, as well as harboring chemicals potentially harmful to the aquatic environment. Types of trash commonly observed in watersheds and water bodies include food and beverage containers (e.g., plastic bags and bottles) and packaging, cigarette butts, food waste, construction and landscaping materials, furniture, electronics, tires, and hazardous materials (e.g., paint and batteries). The San Francisco Bay Regional Water Quality Control Board (Water Board) has listed multiple tributaries and shorelines as being impaired for trash.

In response to concerns about urban trash impacts on receiving water bodies in the San Francisco Bay area, in 2009 the Water Board included trash reduction requirements in the Municipal Regional Stormwater (MRP) National Pollutant Discharge Elimination System (NPDES) Permit for Phase I communities in the Bay area (Order R2-2009-0074.) These provisions require applicable Bay Area municipalities (Permittees) to reduce trash from their Municipal Separate Storm Sewer Systems (MS4s) by, 70% by 2017, 80% by 2019, and to a point of “no adverse impacts” to water bodies by 2022.

Trash Sources and Pathways

Trash in San Francisco Bay Area creeks and shorelines originates from a variety of sources: pedestrian litter, waste containers, illegal dumping on land areas, and litter from vehicles. Pedestrian litter includes trash sources from high traffic areas near businesses and schools, transitional areas where food/drinks are not permitted (e.g. bus stops), and from public or private special events with high volumes of people. Inadequate waste container management includes sources such as overflowing or uncovered containers and dumpsters as well as the dispersion of household and business-related trash and recycling materials before, during, and after collection. On-land illegal dumping of trash is related to a variety of societal issues including construction activity, inadequate collection services and homeless encampments. Trash from vehicles occurs due to littering from automobiles and uncovered loads of material being transported to transfer stations, processing facilities and landfills.

Types of Trash Control Measures

SMCWPPP Permittees are attempting to address trash load reduction requirements outlined in the MRP by implementing a number of control measures designed to significantly reduce trash in local creeks and the Bay. Control measures implemented to-date include:

- Installation and maintenance of trash capture devices that intercept trash once in the storm drain system;
- Adoption and enforcement of product-related ordinances, such as single-use plastic bag bans;
- Enhanced street sweeping;
- Strategic placement and selection of public trash containers;
- Improvements to inadequately-sized or serviced private containers/bins;
- Public outreach and education campaigns;
- On-land cleanups and illegal dumping prevention;
- Enhanced storm drain inlet maintenance; and,
- Creek and shoreline cleanups and prevention programs.
- Improved review of new and redevelopment projects for litter-reduction design and operation
- Enhanced franchised waste hauler contract language and coordination
- Enforcement of existing and new trash and litter related municipal codes

SMCWPPP Trash Subcommittee and Litter Work Group

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) was established in 1990 to reduce the pollution carried by stormwater into local creeks, the San Francisco Bay, and the Pacific Ocean. The program is a partnership of the City/County Association of Governments (C/CAG), each incorporated city and town in the county, and the County of San Mateo, which share a common municipal stormwater NPDES permit. The SMCWPPP Technical Advisory Committee (TAC) functions as the decision-making body for routine program activities and provides oversight and guidance to five subcommittees.

The SMCWPPP Trash Subcommittee assists member agencies with the implementation of new or enhanced trash control measures and actions required by the MRP. The Trash Subcommittee generally meets four to six times a year. In FY 2013-14, the Subcommittee recommended that a work group be formed to enhance coordination between representatives from the local hauling community and municipal staff focused on stormwater and trash management.

In response, the SMCWPPP Litter Work Group began meeting on regular basis in March of 2014. The meetings are attended by representatives from: Recology San Mateo, South San Francisco Scavenger Company; Rethink Waste (the South Bayside Waste Management Authority); and stormwater and trash program municipal staff from jurisdictions in San Mateo County. The goals of the Litter Work Group are to collectively identify opportunities to reduce the contributions of litter generated from disposal, collection-associated sources and illegal dumping; educate the public and those involved with litter control efforts; and to coordinate and share information with the Zero Litter Initiative (ZLI) in Santa Clara County.

This Work Plan was developed through the SMCWPPP Litter Work Group. The Work Group provided input on the highest priority tasks included in this Work Plan and commented on the Draft version.

Work Group Tasks from 2014 through June of 2020

The Litter Work Group has completed many tasks in previous fiscal years including the following:

- Roundtable events on:
    - "Right Size – Right Service" campaign for businesses
    - Container overage and illegal dumping data and mapping
    - Illegal dumping and enforcement strategies
    - Improving development project design review to reduce litter and waste
    - Coordination with Transportation Agencies
- Products and reports such as:
    - Litter Practices Recommendations for Solid Waste Franchise Agreements
    - Recommendations to Rethink Waste for the Recology San Mateo Contract Extension
    - Litter Reduction Toolkit for Multi-Family Dwellings
    - New Development Projects Litter Reduction Fact Sheet
- Maps on:
    - Illegal dumping and container overages
- Coordination with:
    - The Zero Litter Initiative in Santa Clara County
    - Caltrans and Caltrain
    - The San Mateo Countywide Recycling Committee
    - The Santa Clara County Waste Reduction Commission

WORK PLAN OBJECTIVES

To assist municipalities with achieving future trash/litter reduction goals outlined the MRP, the SMCWPPP Trash Committee and Litter Work Group developed this work plan to achieve the following objectives:

- **Continue to Work with the California Department of Transportation (Caltrans) and other transportation agencies to coordinate trash control measure implementation, including the siting and installation of trash full capture systems** – Litter in San Mateo County can be generated on city/county jurisdictional areas or within the right-of-way (ROW) of transportation agencies that transverse through these areas. Regardless of where litter is generated, it can affect adjacent areas and therefore collaboration on trash control actions between San Mateo cities/county and transportation agencies can have mutually-beneficial litter reduction outcomes. Similar to San Mateo MRP Permittees, Caltrans is required by the Water Board to implement trash controls actions to address specific area targets outline in their NDPES permit. Additionally, Caltrain, BART and other transportation agencies in San Mateo County are required to address the trash reduction requirements in the statewide Trash Amendments, which will be incorporated into the statewide Phase II NPDES permit that these agencies must comply with. This task will support the collaboration between San Mateo MRP Permittees, and Caltrans and other transportation agencies on educating the public about litter reduction, enhancing street sweeping, conducting litter removal (on-land cleanups), improving trash bin/container management programs, and siting, designing, installing and maintaining trash full capture systems.

Objective: *Enhance coordination with Caltrans and other transportation agencies in San Mateo County to improve litter prevention and reduction actions, including the siting, design, installation and maintenance of trash full capture systems within the County in prioritized locations.*

- **Evaluate the Effectiveness of Source Control Actions and Characterize the Types of Trash in San Mateo County stormwater** – Source controls are effective actions to prevent the generation of litter. Source control actions have been implemented by many Permittees in San Mateo County for specific litter-prone items (i.e., single use plastic carryout bags and expanded polystyrene carryout food-ware) via local ordinances and policies. The effectiveness of these actions has not been fully evaluated in San Mateo County. Additionally, there are remaining information gaps on the dominant types of trash in stormwater in San Mateo. Filling these information gaps could assist San Mateo Permittees by developing information that will support the continuation of load reduction credits for source control actions in MRP 3.0 and identify the dominant litter-prone items found in stormwater that should be considered for further local regulatory actions as was done with previous efforts related to plastic shopping bags and expanded polystyrene food-ware.

  Objective*: Provide additional information on the effectiveness of existing source control actions and identify litter-prone items in stormwater that should be considered for future actions.*

- **Educate Targeted Sectors of the Community on these Issues** – The SMCWPPP Public Information and Participation (PIP) Subcommittee is conducting outreach of various types to the community in San Mateo County. In the past the Litter Work Group has coordinated with the PIP Subcommittee on efforts related to litter reduction, such as Adopt-a-Block and School outreach efforts. The Work Group can contribute knowledge and resources from municipal staff who coordinate waste reduction and recycling efforts within their jurisdictions and from waste hauler staff operating in the jurisdiction. Leveraging the efforts and resources of multiple programs and franchised companies can increase effectiveness.

  Objective*: Continue to coordinate with the SMCWPPP PIP Subcommittee on the investigation of potential enhanced outreach efforts at schools, multi-family homes, and business communities.*

- **Share Information with the Countywide Recycling Committee Members on these Issues** – The San Mateo Countywide Recycling Committee (CWRC) meets quarterly and is conducting outreach of various types to the community in San Mateo County. In the past the Litter Work Group has coordinated with the CWRC on efforts related to litter reduction and reducing waste. Leveraging the efforts and resources of multiple programs and franchised companies can increase effectiveness.

  Objective*: Continue to coordinate with the Countywide Recycling Committee.*

- **Coordinate with Litter Reduction Partners –** The Santa Clara Valley Zero Litter Initiative (ZLI) was formed in 2010 to bring together stakeholders interested in eliminating litter and its impacts throughout the Santa Clara Valley. The ZLI combats this multi-faceted problem by bringing stakeholders together to identify collaborative solutions. Since forming, ZLI has conducted roundtables about litter associated with garbage/recycling collection including a Right-Size Right-Service campaign for locations where dumpsters are contributing litter to the storm drain, transport and disposal pathways. Other topics of interest identified by ZLI stakeholders include litter reduction solutions via business engagement, law/code enforcement and highway/freeway controls. SMCWPPP agencies can increase the effectiveness of their litter reduction efforts by sharing resources with Caltrans and the ZLI.

Objective: *Continue to coordinate efforts and share information with the Zero Litter Initiative in Santa Clara County to further reduce litter.*

PROPOSED TASKS FOR FY 2020-21

For FY 2020-21, the Litter Work Group proposes to conduct the following tasks:

1. **Phase II of the San Mateo Stormwater Trash Characterization Study** – In Phase I, the Litter Work Group developed a sampling and analysis plan (SAP) for conducting the trash characterization study, which focused on evaluating the effectiveness of existing trash source control actions and filling information gaps on the dominant types of trash in stormwater in San Mateo to inform future source control measures in San Mateo County. The Trash Characterization Study (TCS) will use the SAP to sample, characterize and measure trash types and volumes in stormwater. The anticipated outcome of this task is a completed study with recommended Permittee actions steps.
2. **Plan and Coordinate a 5th Roundtable Event Focusing on the Results of the San Mateo Stormwater Trash Characterization Study and Potential Next Steps on Source Controls -** The Litter Work Group will develop and hold one roundtable event for San Mateo Permittees, waste haulers and transportation agencies. The roundtable event will be conducted to present and discuss the results of the trash characterization study and discuss potential coordinated actions on source controls. The roundtable will include discussions on the identified trash types and sources, potential mutually-beneficial projects, cost-sharing mechanisms, and on-going collaboration. The anticipated outcome of the roundtable is a list of potential action steps for San Mateo Permittees and stakeholders. All communications and outreach regarding the roundtable event will be handled through this task, including agenda preparation, speaker identification and coordination, and facility and food/beverage coordination.
3. **Education, Communication and Outreach**

   A. **Coordinate with the PIP Subcommittee –** The Program will continue to coordinate with the PIP Subcommittee on a campaign focusing on the commercial building sector in FY 2020-21. As requested and within the budget allotted, the Program will attend meetings/calls, provide feedback on draft materials, and respond to inquiries from PIP consultants.

   B. **Coordinate with the San Mateo Countywide Recycling Committee -** The Program will continue to share information with the CWRC in FY 2020-21. As requested and within the budget allotted, the Program will attend quarterly meetings, provide feedback on draft outreach materials, and coordinate with the County Office of Sustainability.

   C. **Coordinate with ZLI –** The Program will continue to share information and best practices with the Santa Clara Valley Zero Litter Initiative (ZLI) during FY 2020-21. As requested and within the budget allotted, the Program will attend ZLI meetings and webinars.

4. **Litter Work Group Facilitation -** To support Tasks 1, 2 and 3, the Program will convene up to two meetings of the Litter Work Group. Meeting material preparation, including agendas, and follow up activities (e.g., summaries and action items) will be conducted as part of this task.

Estimated Costs and Schedule

The proposed work plan schedule and associated cost estimates for FY 2020-21 are included in Table 1. Depending on the complexities and challenges associated with implementation of the tasks described in the work plan, the proposed schedule may be revised. Costs associated with each task are estimates. More definition of each task will be necessary once the work plan or a portion thereof is approved by the SMCWPPP TAC.

Table 1. SMCWPPP Trash Committee and Litter Work Group Proposed FY 19-20 Tasks, Schedule and Estimated Costs.

Task #	Task	Description	Start Date	Complete Date	Estimated Program Cost
1.	Stormwater Trash Characterization Study	Phase 2 – Implement the Sampling and Analysis Plan and complete the study at the determined monitoring sites.	July 2020	June 2021	$35,000
2.	Roundtable Event #5	Coordinate and facilitate a 5th Litter Roundtable on the results of the trash characterization study and coordination with franchised waste haulers and transportation agencies.	March 2021	June 2021	$7,000
3.A	Coordinate with the PIP Subcommittee	Attend meetings/calls, provide feedback on draft materials, and respond to inquiries from PIP consultants.	July 2020	June 2021	$1,000
3.B	Coordinate with the San Mateo Countywide Recycling Committee	Share information and best practices at the quarterly San Mateo Countywide Recycling Committee via CWRC meetings.	July 2020	June 2021	$1,000
3.C	Coordinate with Santa Clara ZLI	Share information and best practices with the Santa Clara Valley Zero Litter Initiative (ZLI) via ZLI meetings and webinars.	July 2020	June 2021	$1,000
4.	Litter Work Group Facilitation	Convene two Litter Work Group meetings/calls, provide agendas and summaries.	July 2020	June 2021	$7,000
			Total Cost	$52,000	

Appendix 11

- Maps for each San Mateo County Permittee showing WMAs and GI/LID facilities
- PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee
- PCBs and Mercury Regional Loads Reduced during MRP 2.0
- Pollutant Control Measures Implementation Plan and Reasonable Assurance Analysis for San Mateo County, California, Scenarios to Achieve PCBs and Mercury San Francisco Bay TMDL Wasteload Allocations, September 30, 2020

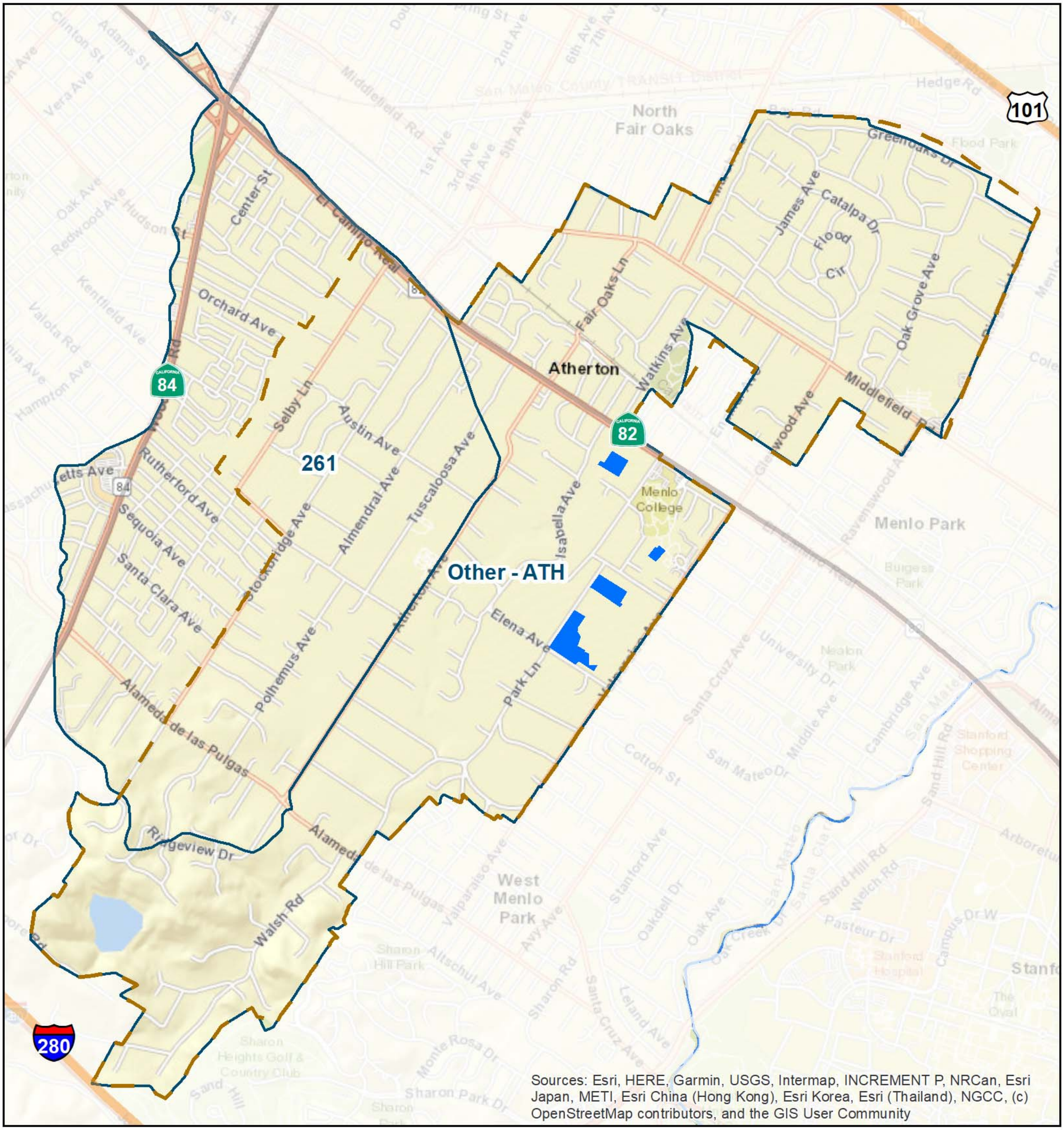


Figure App11-1. WMAs and GI/LID in Atherton

Atherton Watershed Management Area Map

- Green Street Project
- Old Industrial Land Use
- GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)
- Watershed Management Area (WMA)
- Permittee Boundary

N

0 0.25 0.5 1 Miles

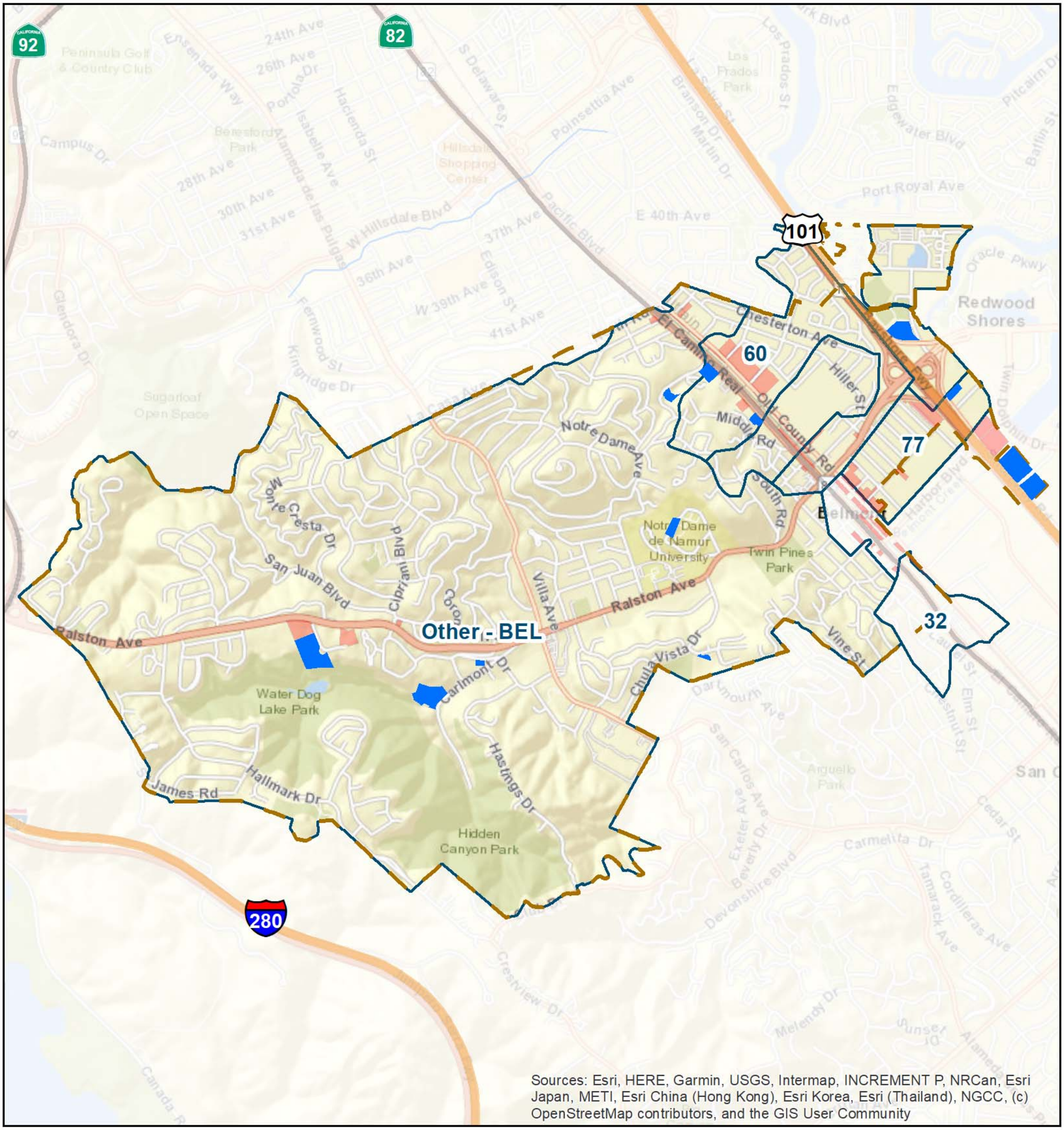


Figure App11-2. WMAs and GI/LID in Belmont

Belmont Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

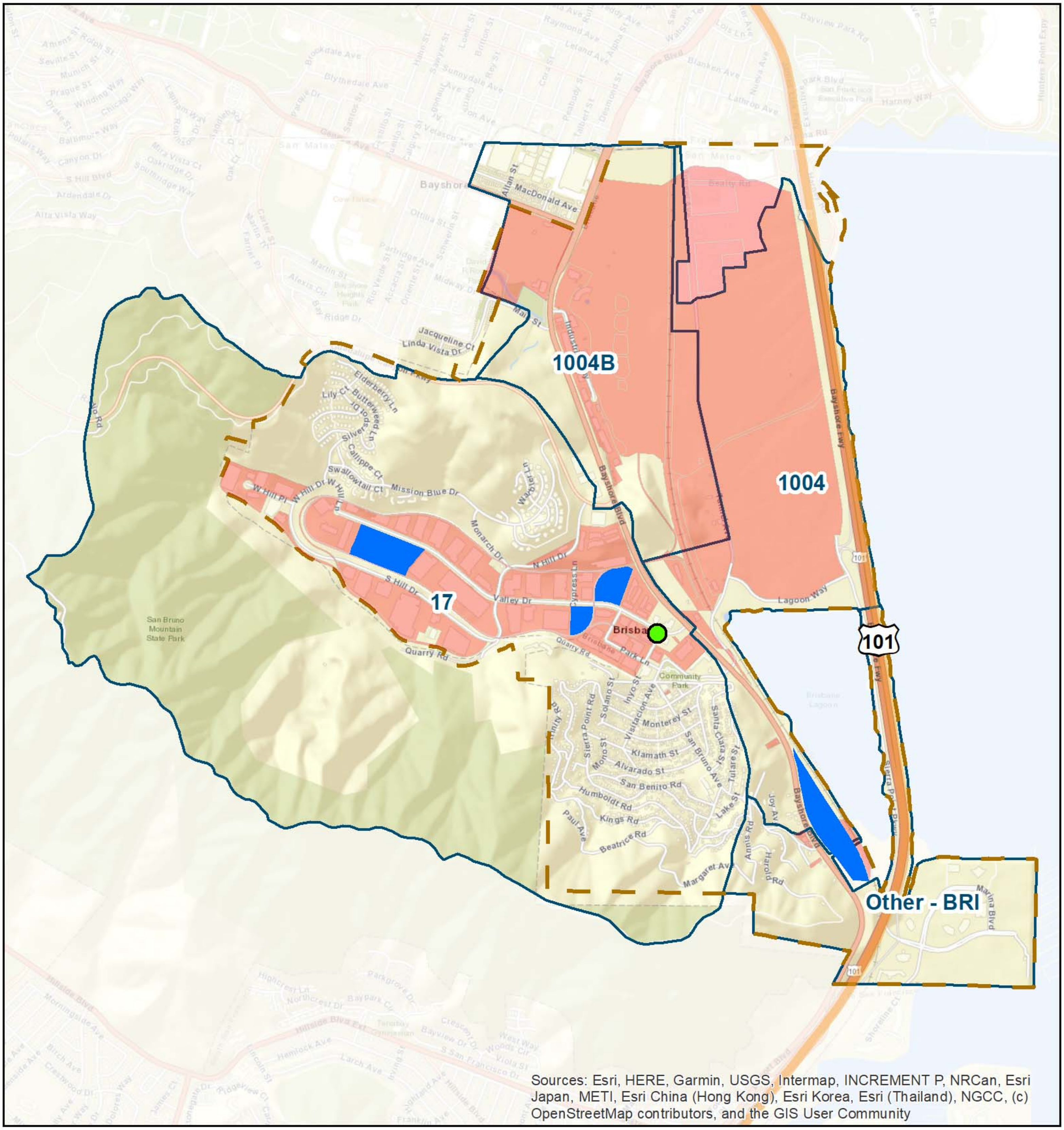


Figure App11-3. WMAs and GI/LID in Brisbane

Brisbane Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.2 0.4 0.8 Miles

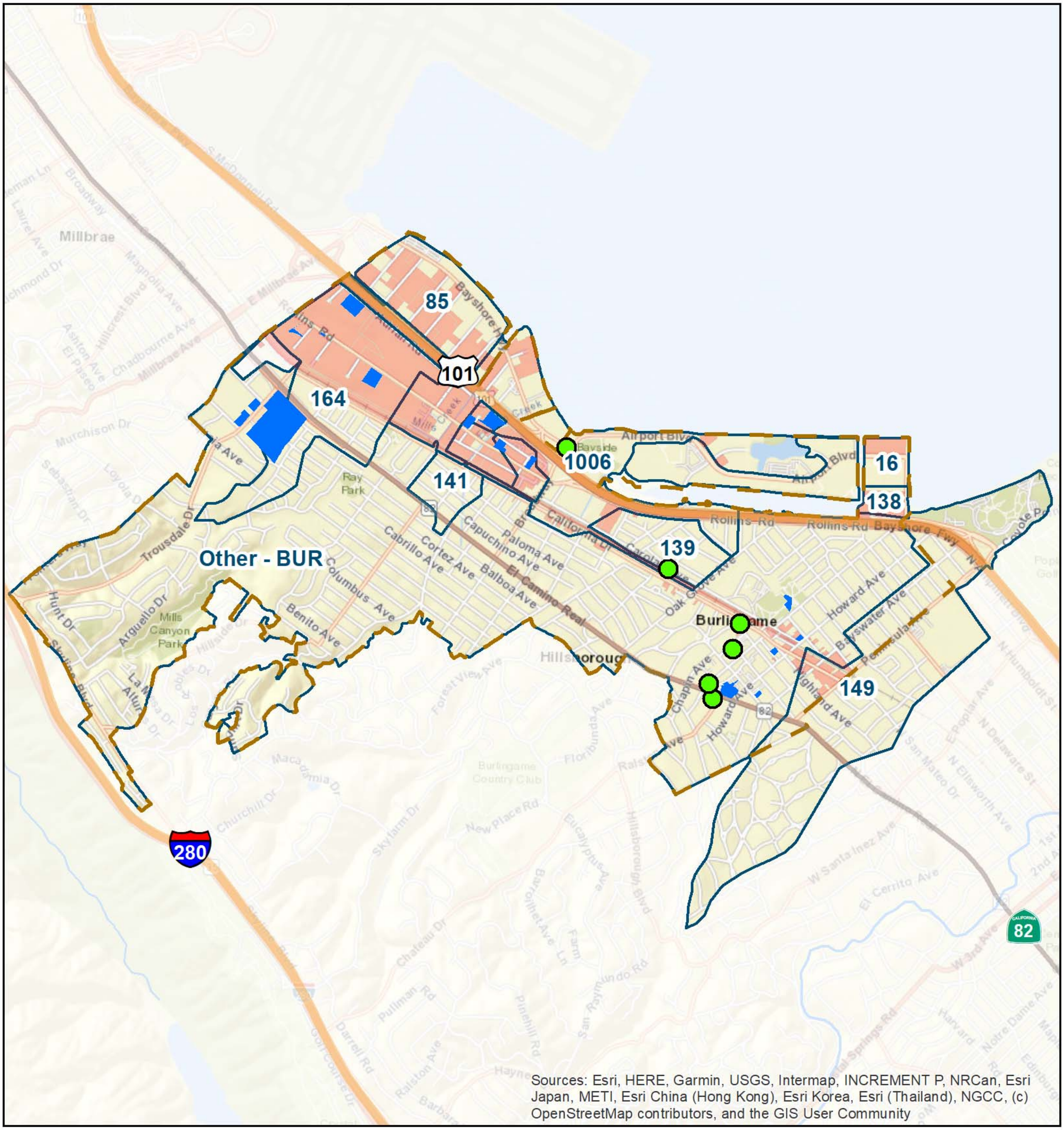


Figure App11-4. WMAs and GI/LID in Burlingame

Burlingame Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

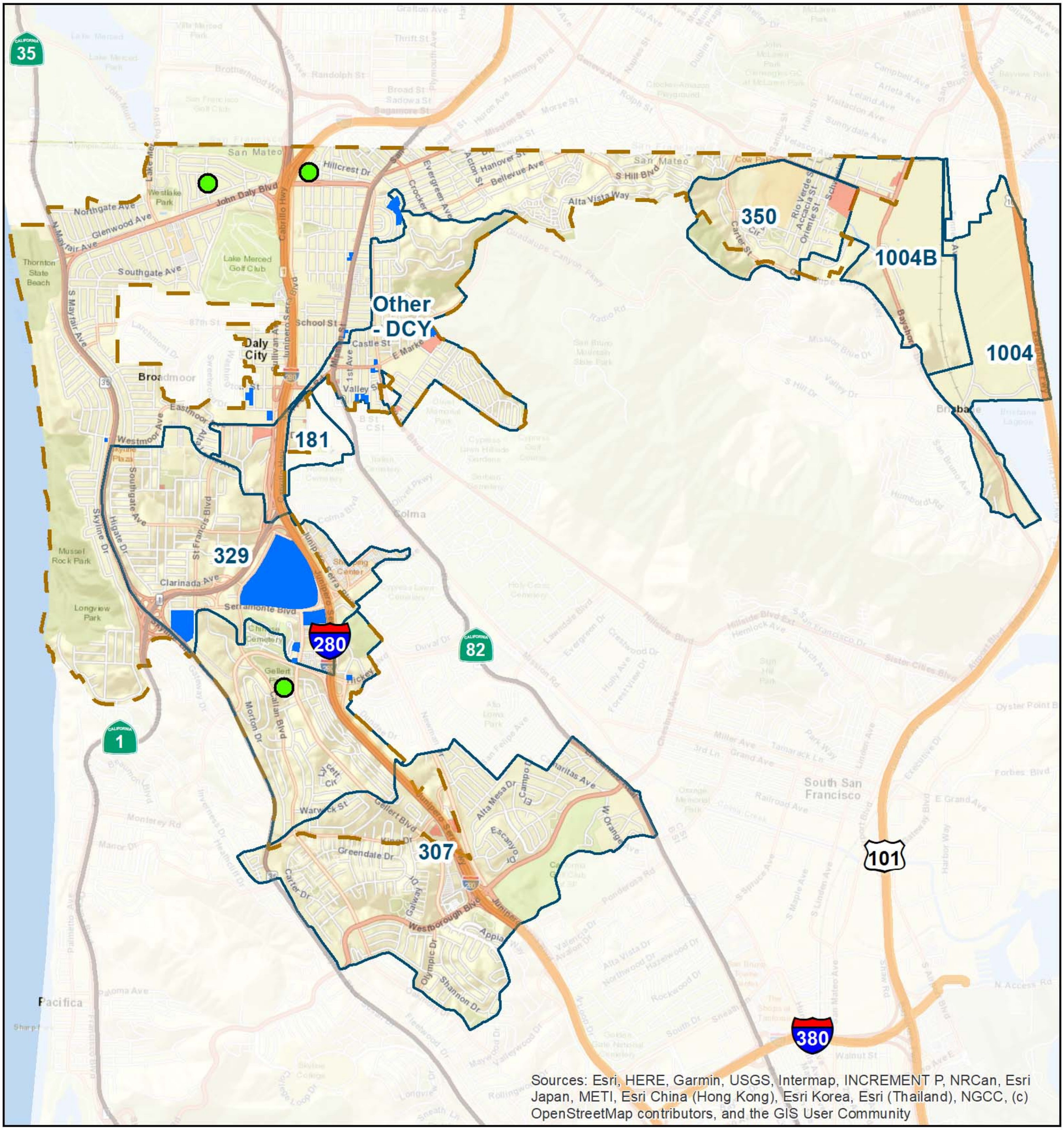


Figure App11-6. WMAs and GI/LID in Daly City

Daly City Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

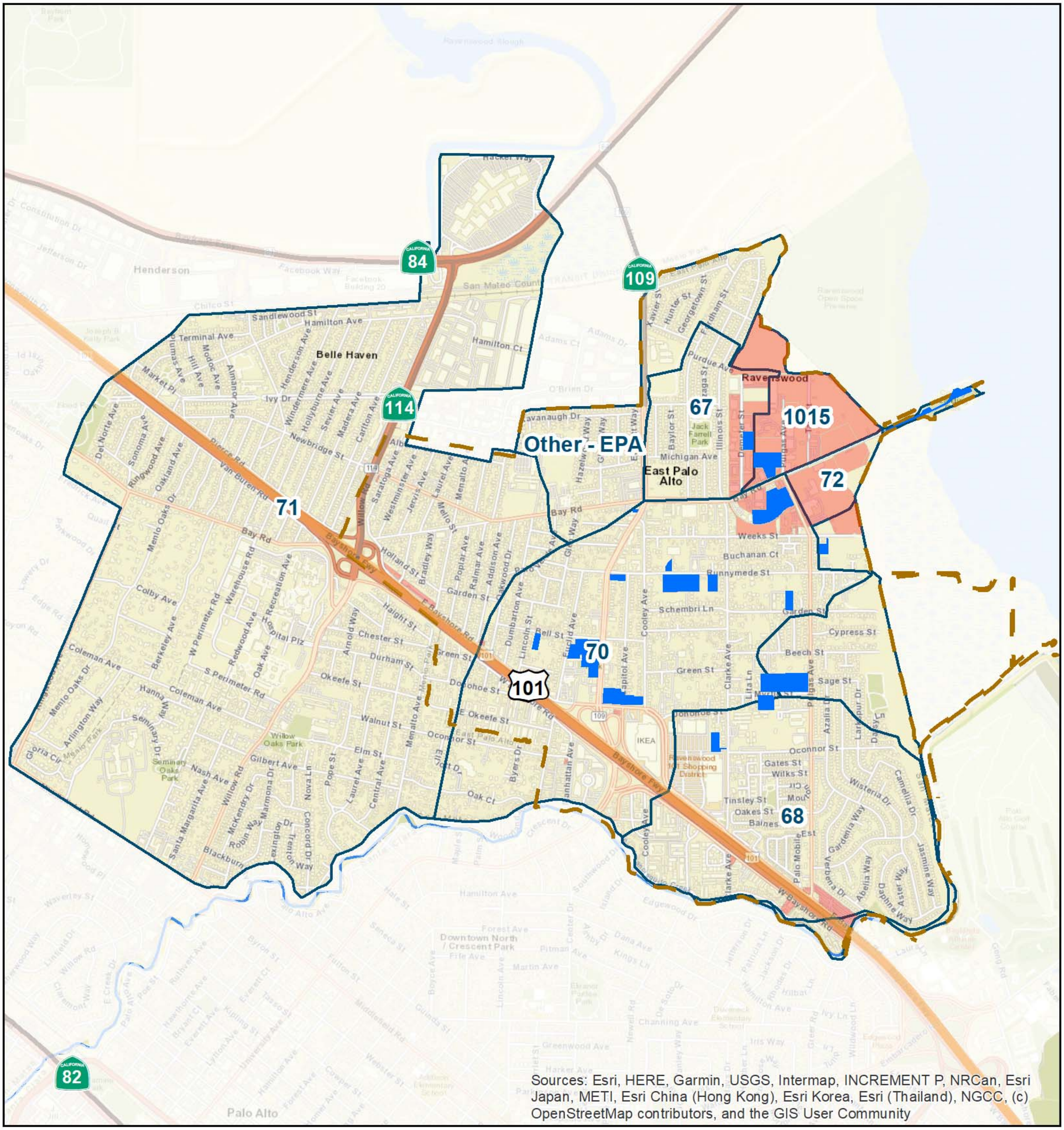


Figure App11-7. WMAs and GI/LID in East Palo Alto

East Palo Alto Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.2 0.4 0.8 Miles

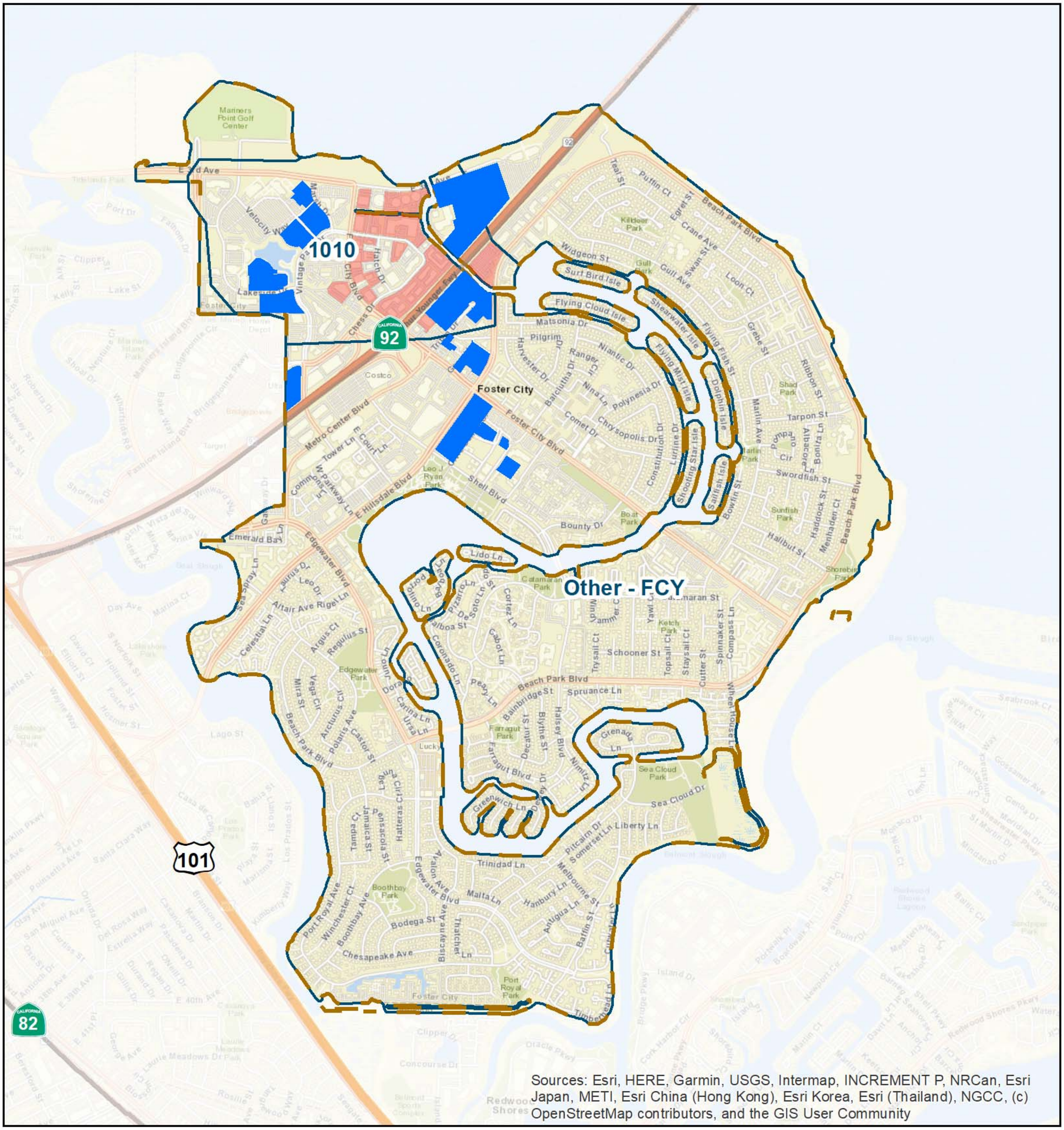


Figure App11-8. WMAs and GI/LID in Foster City

Foster City Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.2 0.4 0.8 Miles

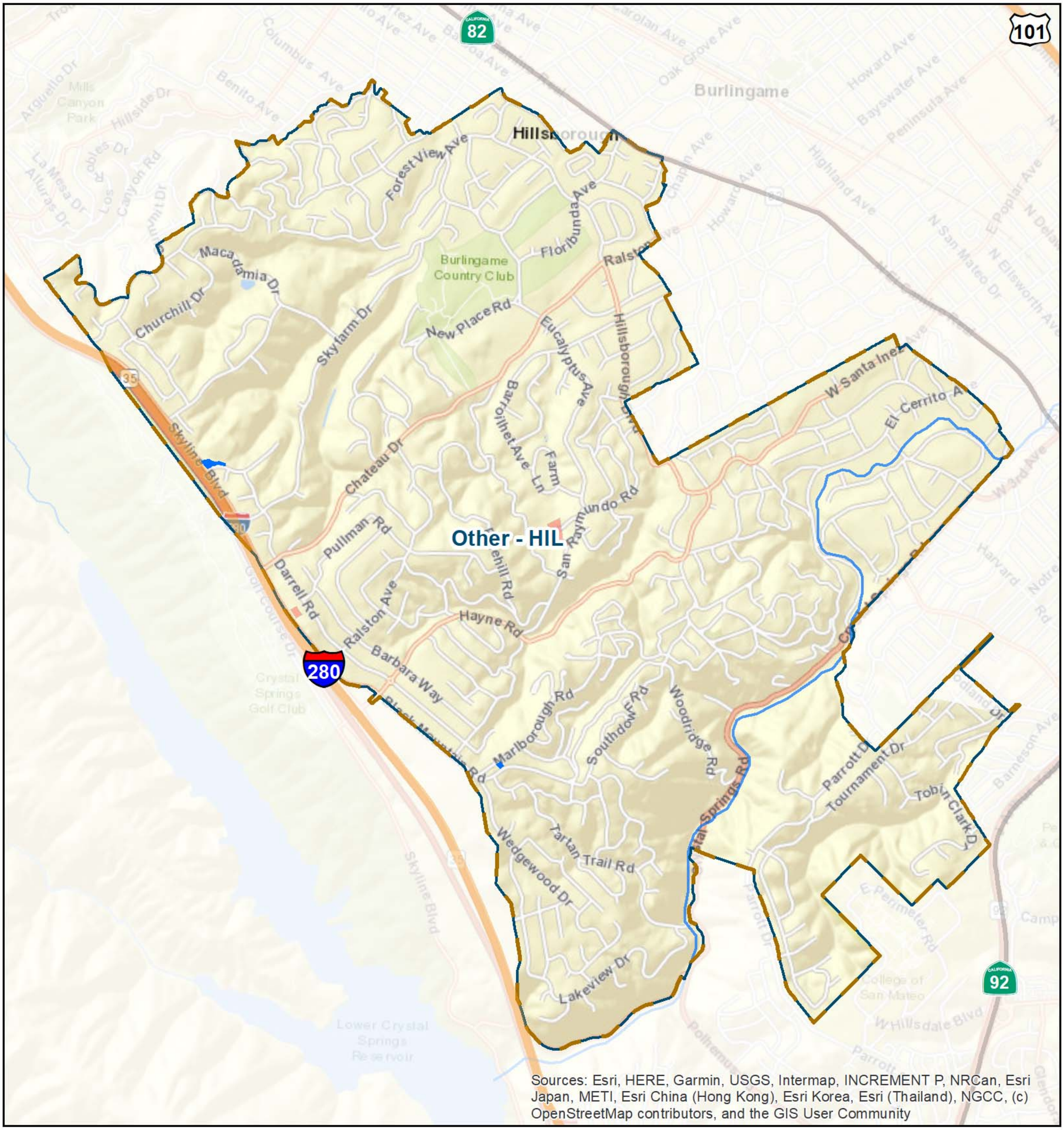
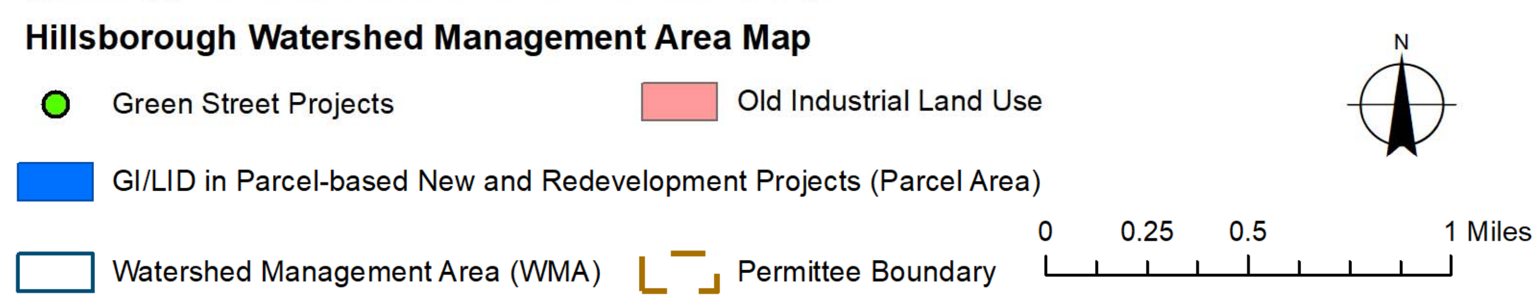


Figure App11-9. WMAs and GI/LID in Hillsborough



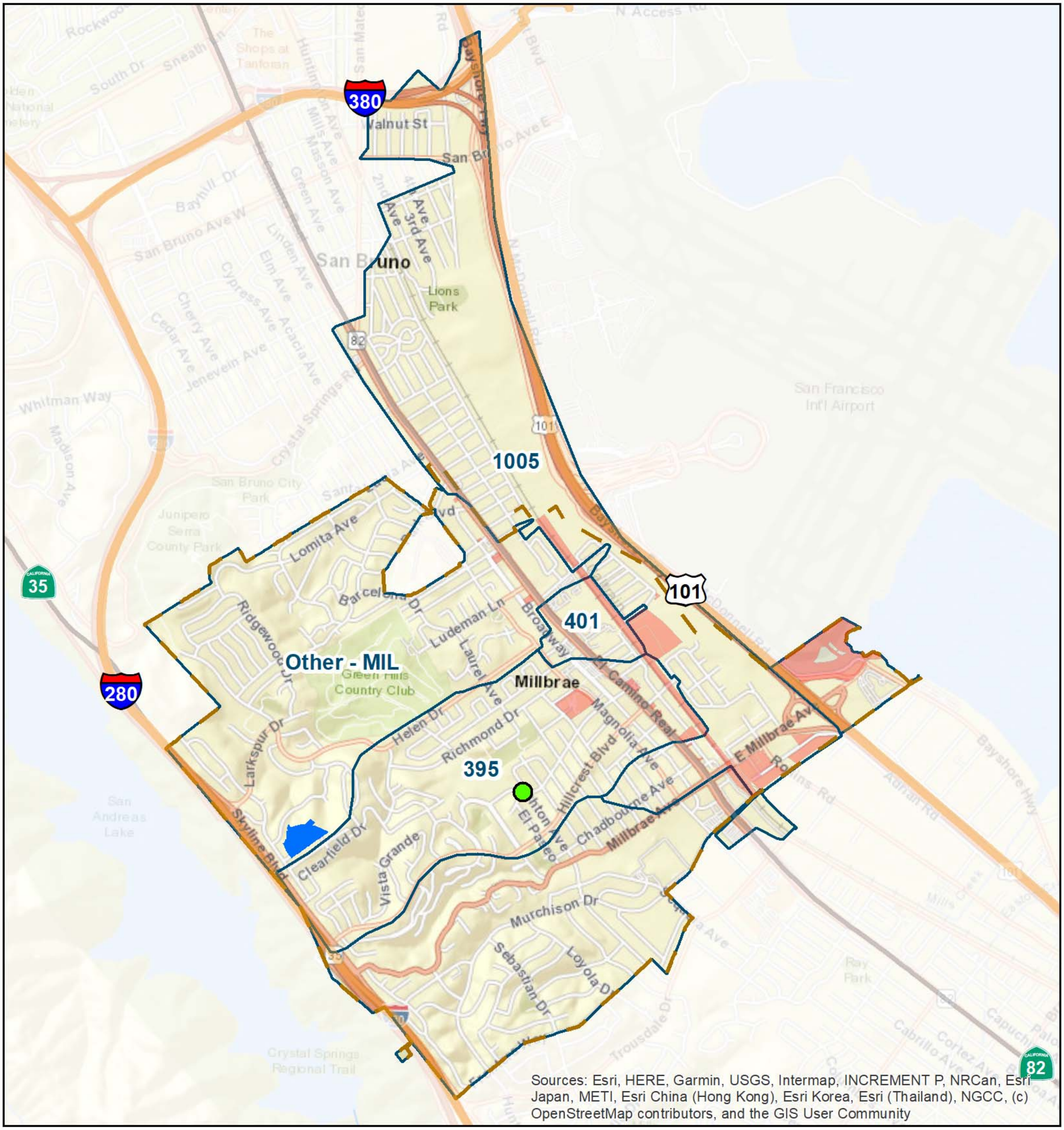


Figure App11-11. WMAs and GI/LID in Millbrae

Millbrae Watershed Management Area Map

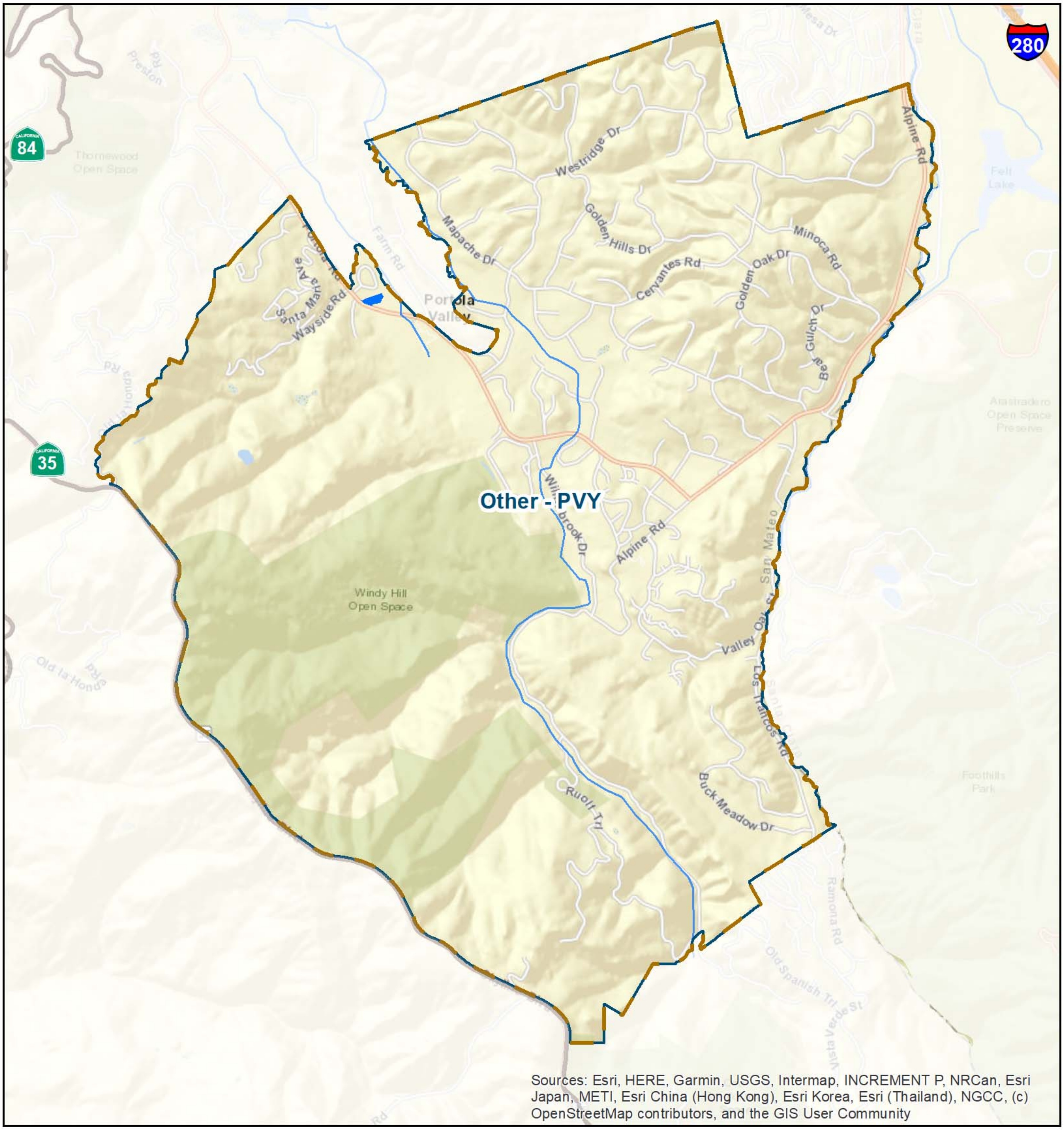


Figure App11-12. WMAs and GI/LID in Portola Valley

Portola Valley Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

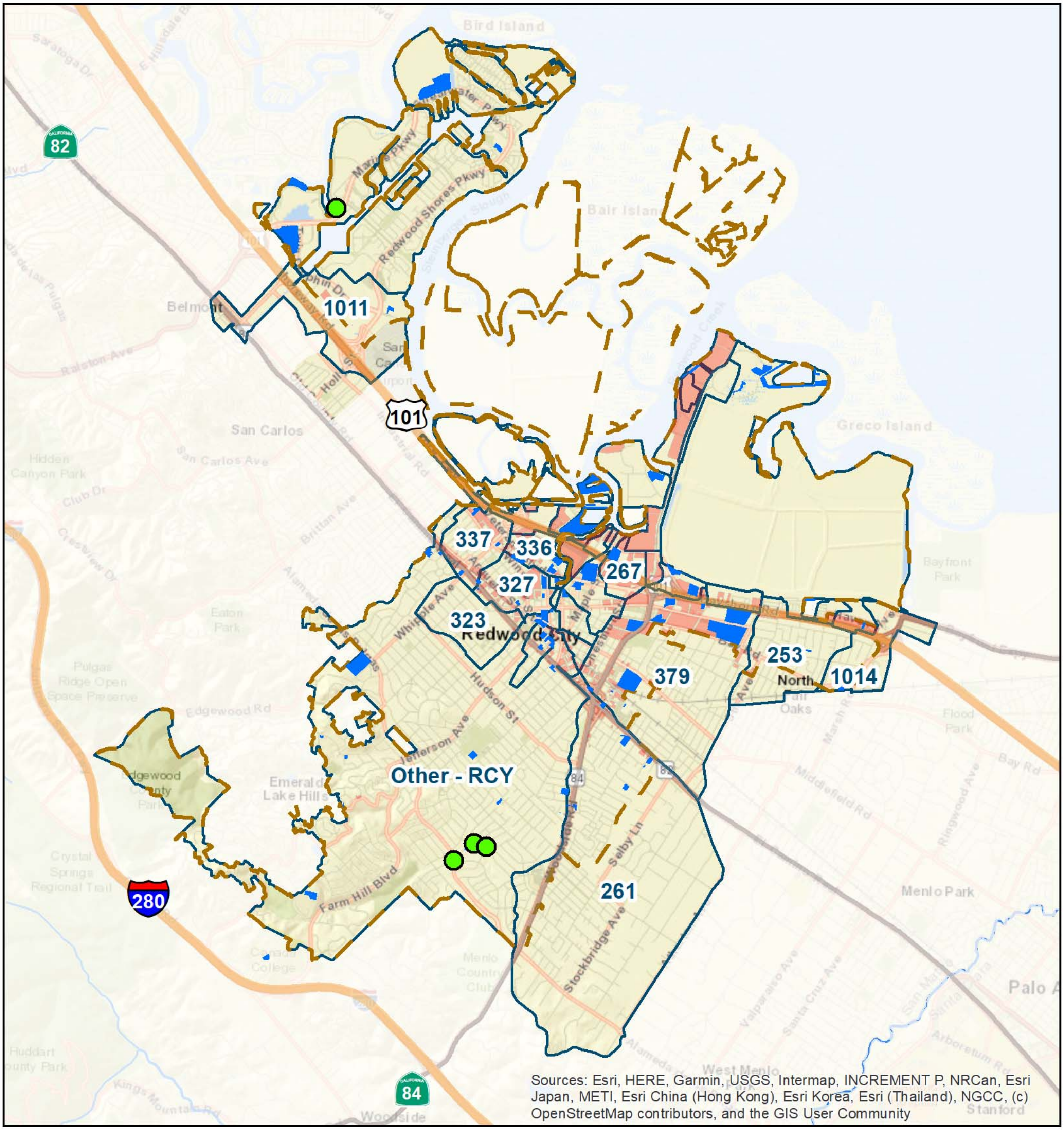


Figure App11-13. WMAs and GI/LID in Redwood City

Redwood City Watershed Management Area Map

Green Street Project

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.5 1 2 Miles

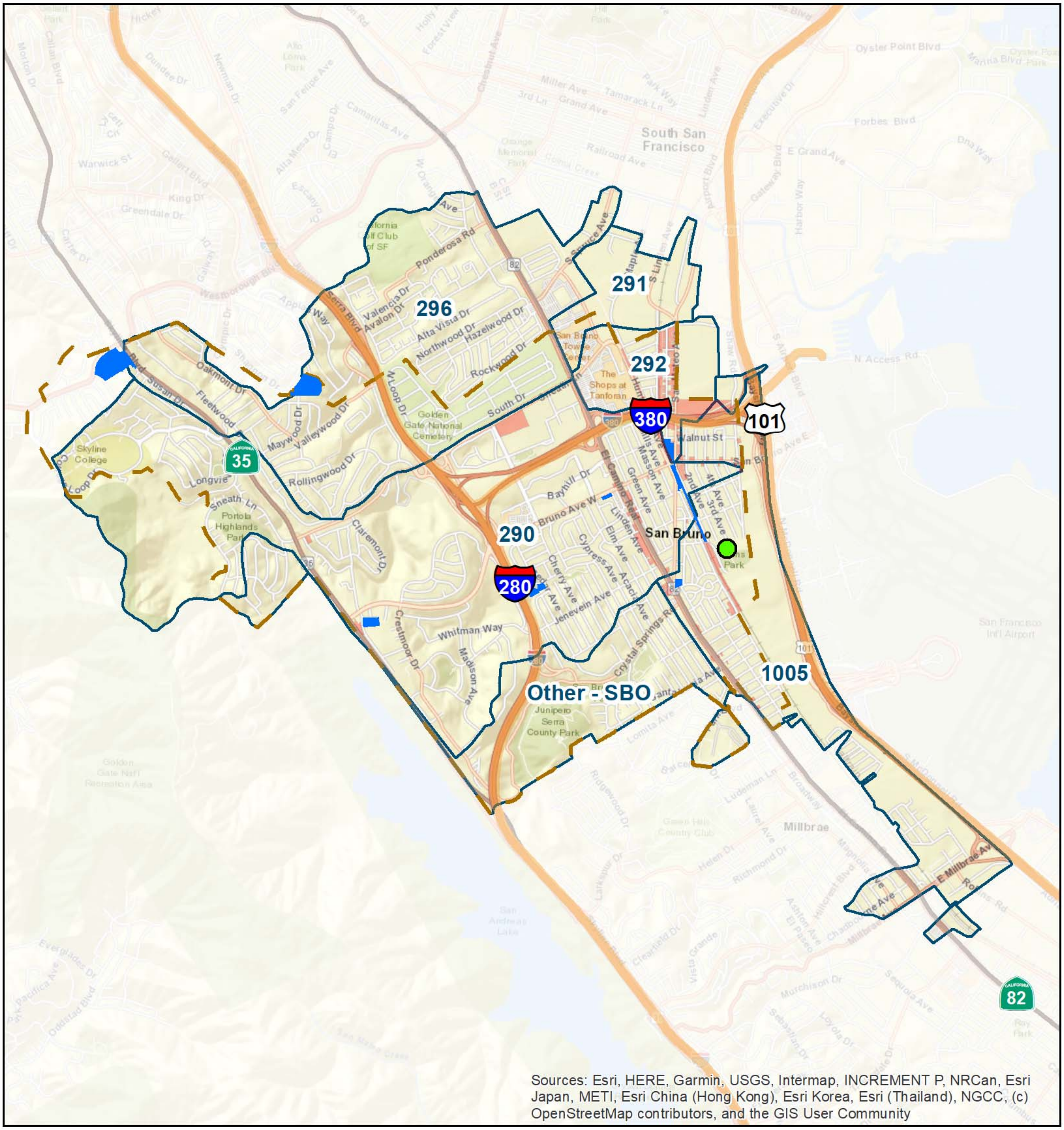


Figure App11-14. WMAs and GI/LID in San Bruno

San Bruno Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

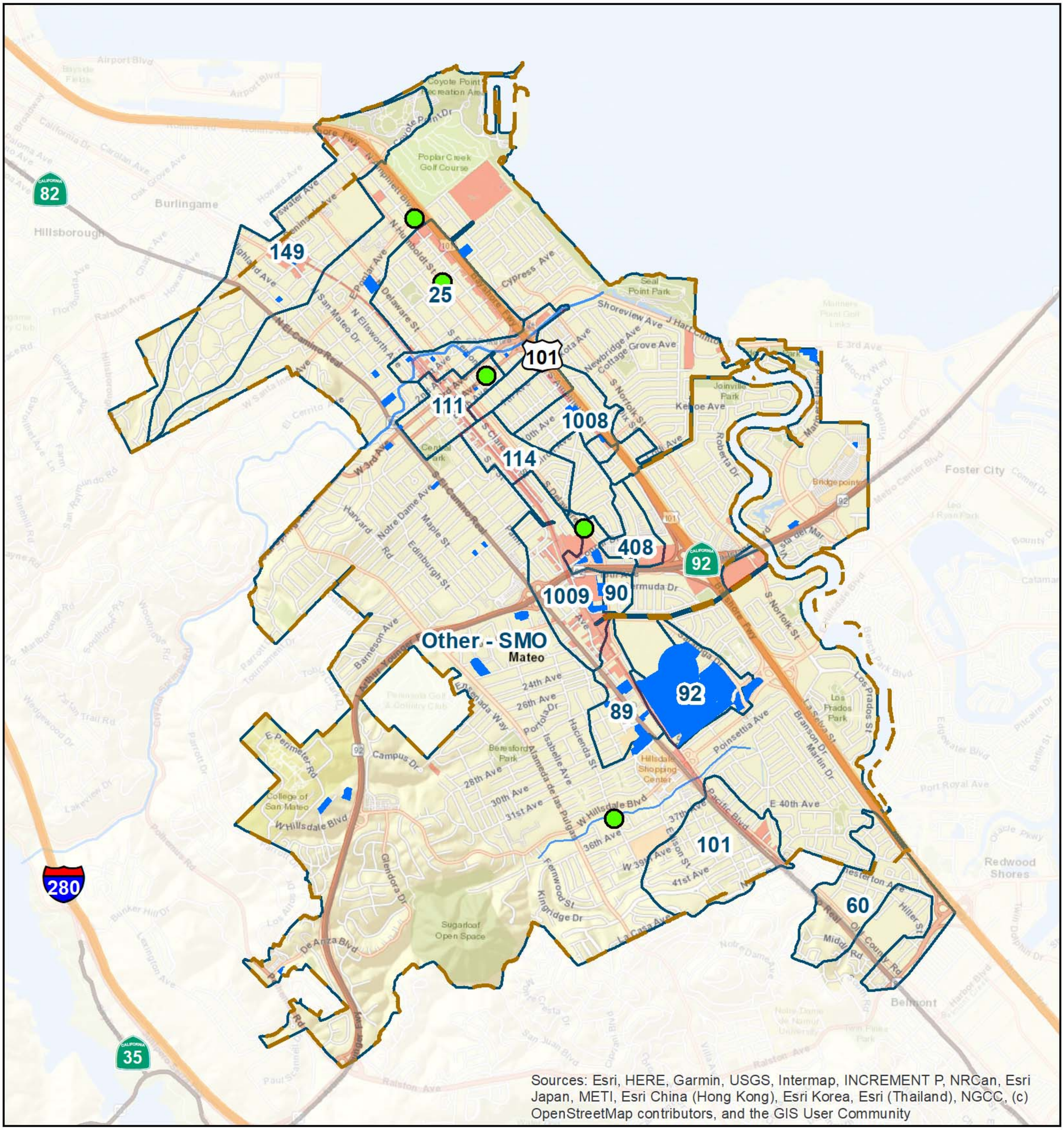


Figure App11-16. WMAs and GI/LID in San Mateo

San Mateo City Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

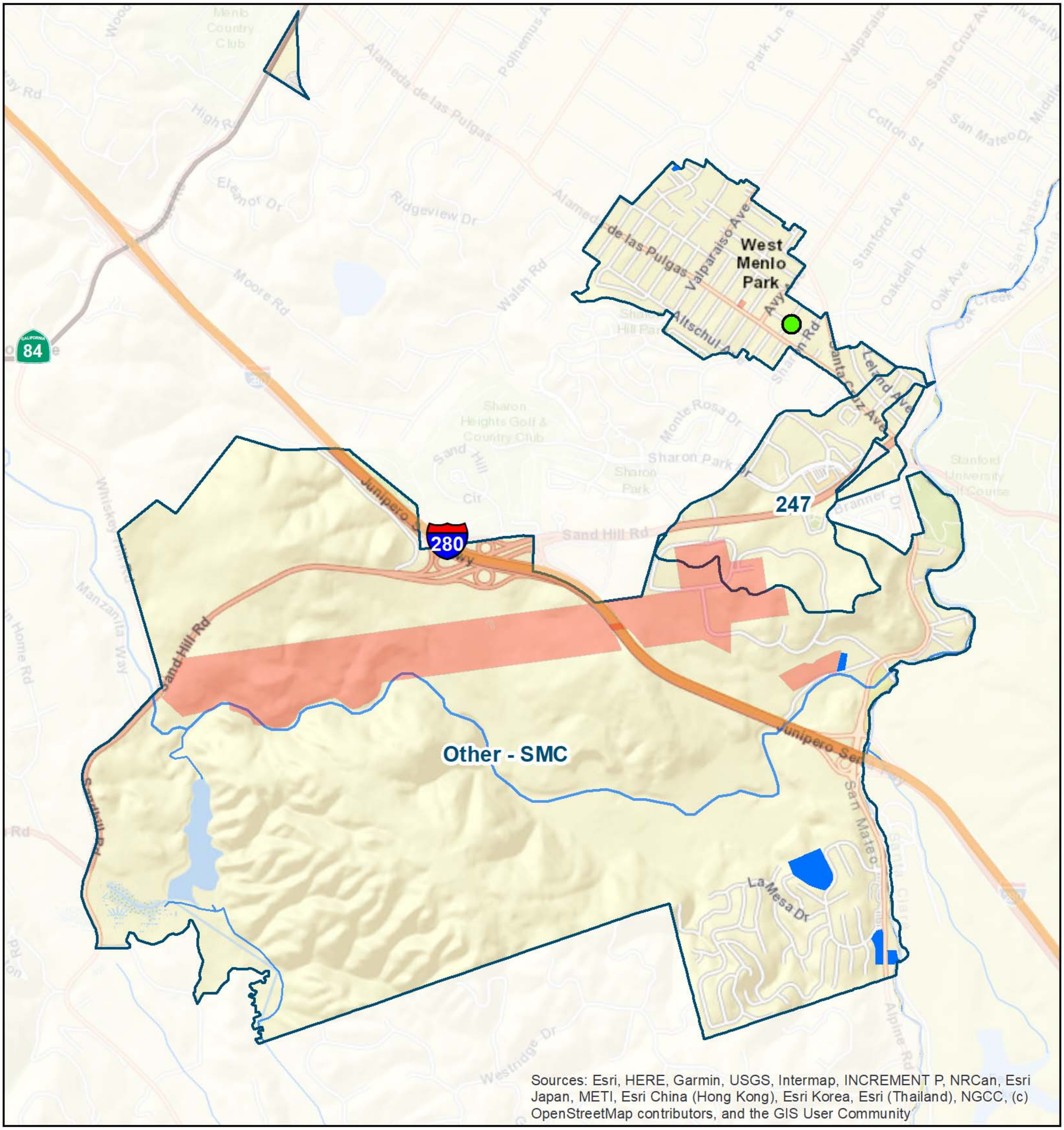


Figure App11-17a. WMAs and GI/LID in Unincorporated San Mateo County

Unincorporated San Mateo County Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.25 0.5 1 Miles

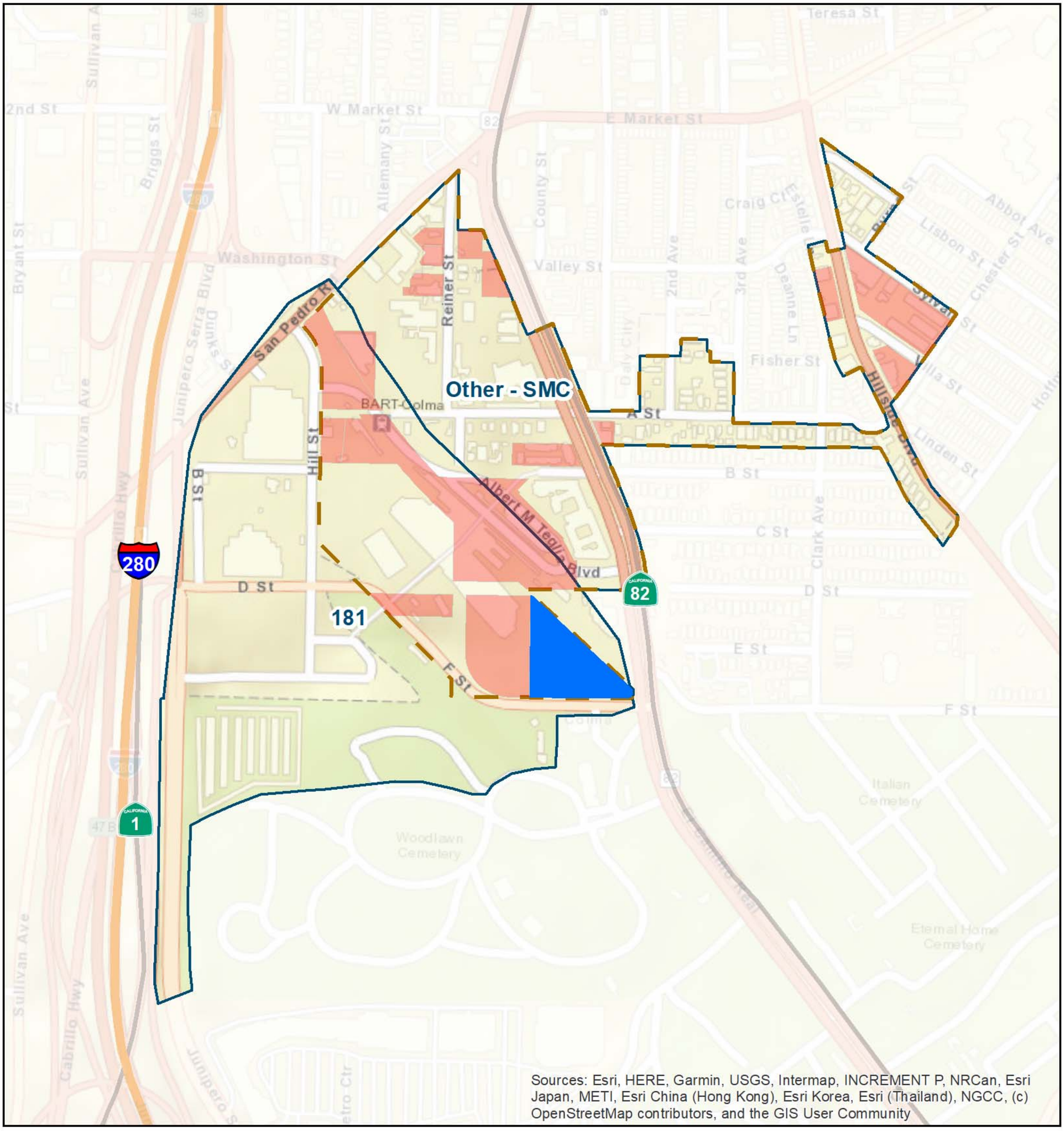


Figure App11-17b. WMAs and GI/LID in Unincorporated San Mateo County

Unincorporated San Mateo County Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.05 0.1 0.2 Miles

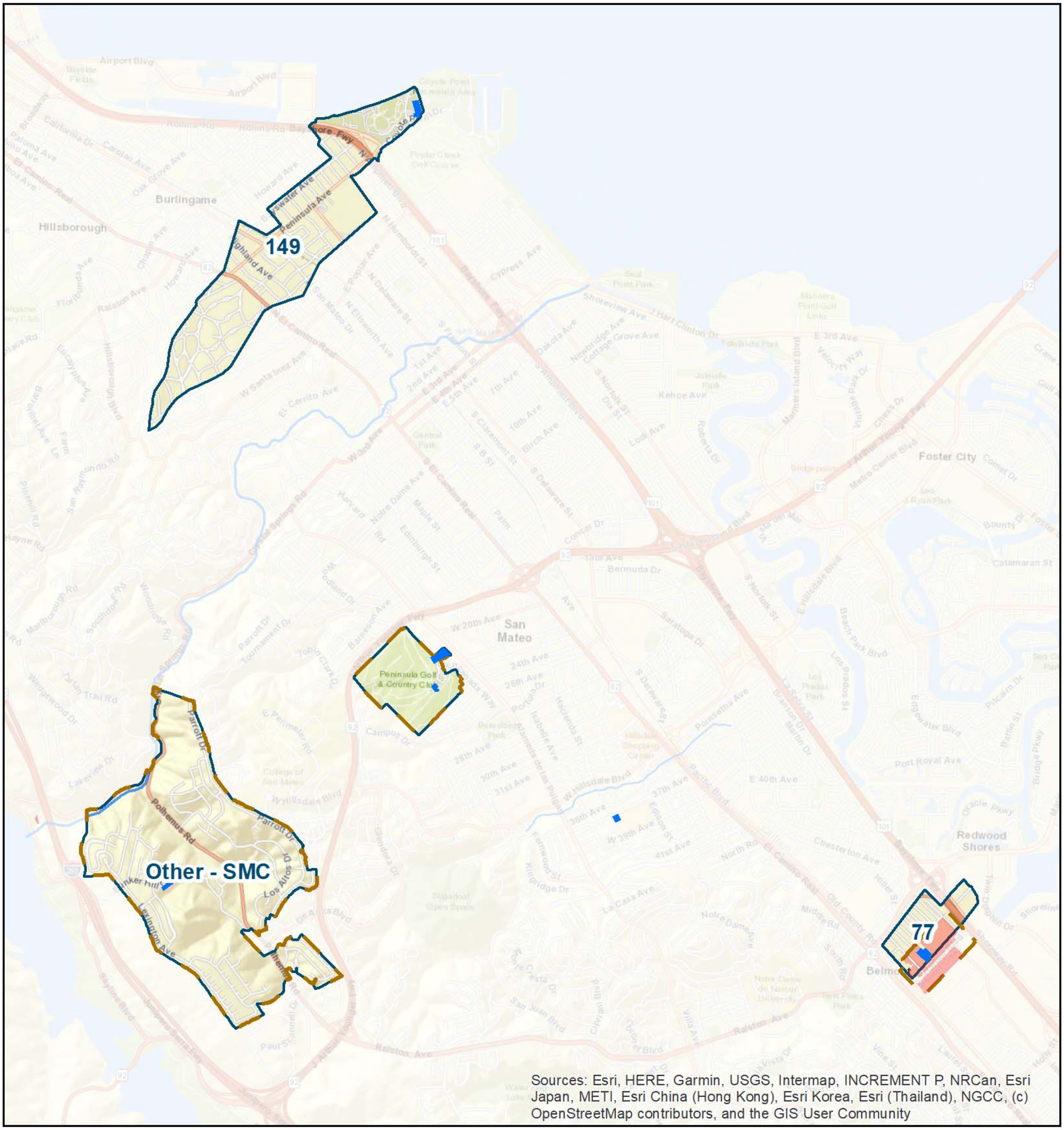


Figure App11-17c. WMAs and GI/LID in Unincorporated San Mateo County

Unincorporated San Mateo County Watershed Management Area Map

- Green Street Projects
- Old Industrial Land Use
- GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)
- Watershed Management Area (WMA)
- Permittee Boundary

N

0 0.375 0.75 1.5 Miles

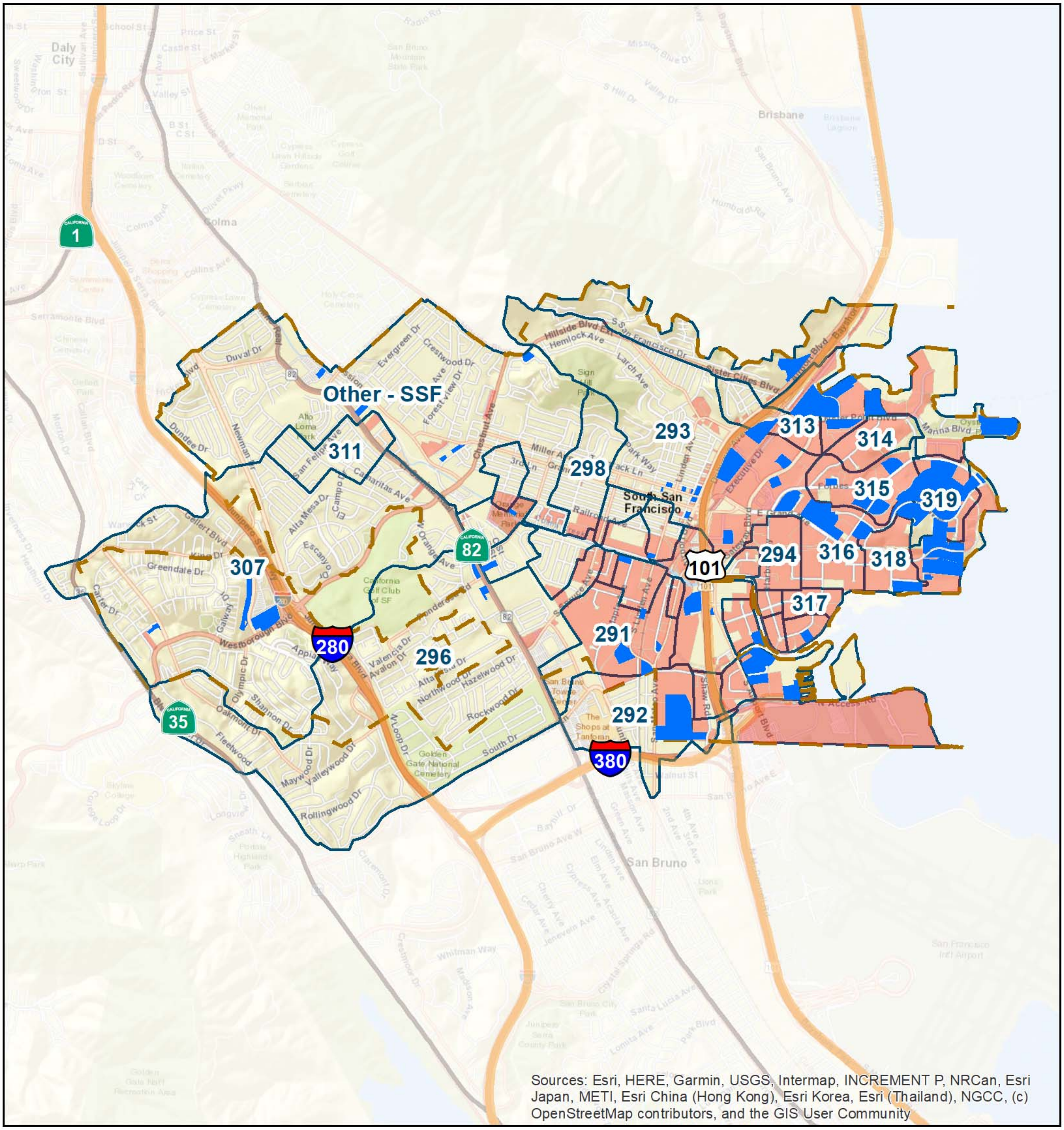


Figure App11-18. WMAs and GI/LID in South San Francisco

South San Francisco Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.375 0.75 1.5 Miles

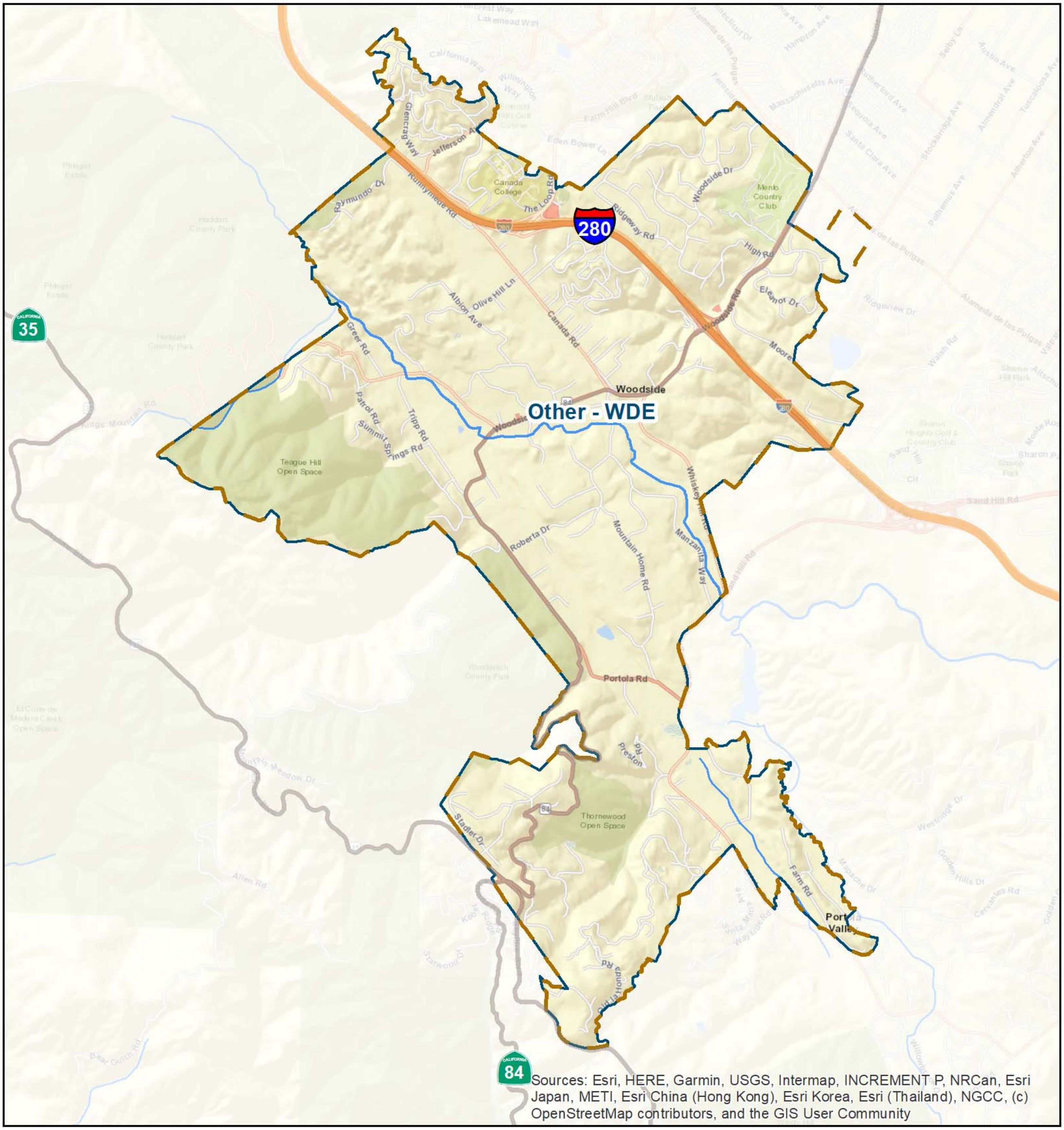


Figure App11-19. WMAs and GI/LID in Woodside

Woodside Watershed Management Area Map

Green Street Projects

Old Industrial Land Use

GI/LID in Parcel-based New and Redevelopment Projects (Parcel Area)

Watershed Management Area (WMA)

Permittee Boundary

N

0 0.375 0.75 1.5 Miles

Permittee	Control Measure	Project Type or Device Type	WMA ID	Total Area (Acres)	Land Use Category (Acres)				
					Old Industrial	Old Urban - Commercial	Old Residentail	New Urban	Ag/Open Space
Atherton	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	ATH	5.07	--	0.01	5.06	--	--
			Subtotal	**5.07**	--	**0.01**	**5.06**	--	--
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	261	0.09	--	--	0.09	--	--
			Other - ATH	0.42	--	0.42	--	--	--
			Subtotal	**0.51**	**--**	**0.42**	**0.09**	**--**	**--**
	Total - All Controls			**5.58**	**--**	**0.42**	**5.15**	**--**	**--**
Belmont	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	60	2.74	--	0.25	2.11	--	0.38
			77	1.00	1.00	--	0.002	--	--
			1011	3.39	0.0003	--	0.002	0.0005	3.39
			BEL	12.12	1.47	0.96	9.69	--	--
			Subtotal	**19.25**	**2.52**	**1.21**	**11.80**	**0.0005**	**3.72**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	101	2.89	--	0.13	2.76	--	--
			1011	19.82	8.59	3.75	0.75	3.93	2.81
			32	24.60	--	6.17	18.19	--	0.24
			60	102.22	12.77	38.86	50.19	--	0.41
			60B	41.30	0.77	15.04	25.48	--	--
			77	17.91	4.20	6.05	7.65	0.01	--
			Other - BEL	365.97	7.14	71.46	282.96	--	4.41
			Subtotal	**574.70**	**33.47**	**141.46**	**387.97**	**3.93**	**7.86**
	Total - All Controls			**593.95**	**35.99**	**142.67**	**399.77**	**3.93**	**11.58**
Brisbane	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	17	21.02	21.02	--	--	--	--
			1004	17.41	17.37	--	0.04	--	--
			Subtotal	**38.43**	**38.39**	--	**0.04**	--	--
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1004	48.30	6.10	5.82	11.58	--	24.79
			1004B	59.11	22.72	11.88	--	--	24.50
			17	289.55	129.07	62.09	52.48	--	45.90
			Other - BRI	122.07	1.12	3.30	14.55	31.20	71.91
			Subtotal	**519.01**	**159.02**	**83.09**	**78.61**	**31.20**	**167.10**
	Total - All Controls			**557.44**	**197.41**	**83.09**	**78.65**	**31.20**	**167.10**
Burlingame	Green Stromwater Infrastructure	Green Street or Regional Retrofit	139	0.04	0.001	0.03	0.01	--	--
			164	0.81	--	0.01	0.80	--	0.01
			BUR	1.52	--	0.06	1.46	--	--
			Subtotal	**2.37**	**0.02**	**1.02**	**1.33**	--	**0.005**
		Parcel-based New & Redevelopment or Retrofit	164	4.70	2.75	--	1.95	--	--
			1006	2.79	--	--	2.79	--	--
			BUR	3.59	--	--	3.59	--	--
			Other - BUR	1.05	--	1.05	--	--	--
			Subtotal	**12.13**	**3.32**	**0.85**	**7.96**	--	--
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1005	5.46	0.16	5.30	--	--	0.00
			1006	96.62	38.86	43.97	13.35	--	0.44
			1006A	4.96	1.97	2.99	--	--	--
			139	11.44	4.15	0.34	6.95	--	--
			141	21.53	15.25	6.01	--	--	0.27
			142	13.44	10.21	3.23	--	--	--
			149	14.97	5.23	4.69	5.05	--	--
			164	97.47	83.09	13.27	1.11	--	--
			85	93.90	53.87	39.63	--	--	0.40
			Other - BUR	150.07	4.93	97.09	46.35	--	1.70
			Subtotal	**509.85**	**217.71**	**216.52**	**72.81**	--	**2.81**
	Total - All Controls			**524.35**	**221.05**	**218.39**	**82.10**	--	**2.81**
Colma	Green Stromwater Infrastructure	Green Street or Regional Retrofit	COL	0.93	--	--	0.01	--	0.92
			Subtotal	**0.93**	--	--	**0.01**	--	**0.92**
		Parcel-based New & Redevelopment or Retrofit	COL	21.35	--	0.76	9.50	--	11.08
			Other - COL	0.17	--	--	--	--	0.17
			Other - DCY	0.25	--	--	--	--	0.25
			Subtotal	**21.77**	--	**0.75**	**9.35**	--	**11.67**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	181	0.19	--	0.09	--	--	0.10
			329	46.36	--	46.36	--	--	0.00
			Other - COL	58.26	0.005	55.52	0.10	--	2.63
			Subtotal	**104.80**	**0.005**	**101.97**	**0.10**	--	**2.73**
	Total - All Controls			**127.50**	**0.005**	**102.72**	**9.46**	--	**15.32**

Table App11-1. PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee. 9-30-2020

Permittee	Control Measure	Project Type or Device Type	WMA ID	Total Area (Acres)	Land Use Category (Acres)				
					Old Industrial	Old Urban - Commercial	Old Residentail	New Urban	Ag/Open Space
Daly City	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	329	103.24	--	0.005	103.24	--	--
			DCY	4.52	0.34	2.45	1.73	--	--
			Subtotal	**107.76**	**0.33**	**2.34**	**105.09**	--	--
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1004B	0.03	0.0004	0.00	0.02	--	0.00
			181	0.32	--	0.20	--	--	0.11
			307	6.23	--	3.20	2.57	--	0.46
			329	94.45	0.25	36.26	28.24	--	29.70
			Other - DCY	135.53	2.14	24.80	103.45	--	5.14
			Subtotal	**236.56**	**2.38**	**64.46**	**134.29**	--	**35.42**
	Total - All Controls			**344.32**	**2.71**	**66.81**	**239.38**	--	**35.42**
East Palo Alto	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	67	1.20	1.20	--	--	--	--
			68	1.77	--	1.19	--	--	0.58
			70	9.48	3.89	0.76	0.90	--	3.94
			1015	2.70	2.70	--	--	--	--
			EPA	2.62	--	0.64	--	--	1.98
			Subtotal	**17.77**	**8.16**	**2.36**	**0.89**	--	**6.35**
	Stormwater Treatment - Trash Controls	Large Full Trash Capture	1015	3.93	3.30	0.61	--	--	0.02
			67	5.11	2.23	0.43	1.44	--	1.02
			68	307.14	4.23	76.52	222.14	--	4.24
			70	433.79	18.90	105.93	294.98	--	13.97
			71	2.51	--	0.07	2.44	--	--
			72	14.27	13.61	0.59	0.04	--	0.03
			Other - EPA	103.33	4.53	15.05	61.88	--	21.86
			Subtotal	**870.08**	**46.81**	**199.20**	**582.93**	--	**41.14**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	71	0.86	--	0.74	0.12	--	--
			Subtotal	**0.86**	--	**0.74**	**0.12**	--	--
	Total - All Controls			**888.71**	**54.98**	**202.30**	**583.94**	--	**47.49**
Foster City	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	1010	43.89	7.61	--	2.07	34.21	0.002
			FCY	11.46	--	--	6.06	3.36	2.04
			Subtotal	**55.35**	**7.81**	--	**7.58**	**38.13**	**1.84**
	Stormwater Treatment - Trash Controls	Large Full Trash Capture	1010	156.80	14.39	16.13	--	117.00	9.28
			Other - FCY	31.05	--	7.13	0.08	23.84	--
			Subtotal	**187.85**	**14.39**	**23.26**	**0.08**	**140.85**	**9.28**
	Total - All Controls			**243.20**	**22.20**	**23.26**	**7.65**	**178.97**	**11.11**
Hillsborough	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	HIL	0.12	--	0.0004	0.12	--	--
			Total	**0.12**	--	**0.0004**	**0.12**	--	--
Menlo Park	Green Stromwater Infrastructure	Green Street or Regional Retrofit	238	2.44	1.95	0.49	--	--	--
			MPK	1.62	--	0.37	1.25	--	--
			Subtotal	**4.06**	**1.91**	**0.86**	**1.30**	--	--
		Parcel-based New & Redevelopment or Retrofit	66	15.06	3.70	--	--	11.36	--
			71	10.96	6.48	2.95	1.53	--	--
			238	20.30	16.19	--	4.11	--	--
			239	9.69	9.69	--	--	--	--
			247	12.99	--	1.57	11.42	--	--
			252	3.80	1.54	--	2.26	--	--
			1012	47.35	47.19	--	0.16	--	--
			1014	9.12	4.90	--	4.22	--	--
			MPK	8.21	--	0.70	4.89	2.63	--
			Other - MPK	2.09	2.08	--	0.01	--	--
			Other - SMC	0.66	--	--	0.66	--	--
			Subtotal	**140.23**	**93.41**	**5.17**	**30.19**	**11.46**	--
	Stormwater Treatment - Trash Controls	Large Full Trash Capture	70	43.58	--	6.36	36.79	--	0.43
			71	0.01	--	--	0.01	--	--
			Other - MPK	2.40	--	--	2.37	--	0.03
			Subtotal	**45.99**	--	**6.36**	**39.17**	--	**0.46**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	252	21.65	2.45	11.42	7.41	--	0.38
			378	12.77	--	--	12.74	--	0.03
			71	65.22	--	5.47	59.61	--	0.14
			Other - MPK	165.86	5.45	75.12	85.29	--	--
			Subtotal	**265.50**	**7.90**	**92.00**	**165.05**	--	**0.55**
	Total - All Controls			**455.78**	**103.22**	**104.39**	**235.70**	**11.46**	**1.01**

Table App11-1. PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee. 9-30-2020

Permittee	Control Measure	Project Type or Device Type	WMA ID	Total Area (Acres)	Land Use Category (Acres)				
					Old Industrial	Old Urban - Commercial	Old Residentail	New Urban	Ag/Open Space
Millbrae	Green Stromwater Infrastructure	Green Street or Regional Retrofit	238	0.50	--	0.48	0.02	--	--
			Subtotal	**0.50**	--	**0.48**	**0.02**	--	--
	Stormwater Treatment - Trash Controls	Large Full Trash Capture	1005	29.19	0.08	8.96	19.32	--	0.83
			395	434.04	7.84	64.89	341.63	--	19.68
			401	18.68	0.25	16.78	1.65	--	--
			Other - MIL	115.05	1.27	33.01	78.13	--	2.64
			Subtotal	**596.96**	**9.45**	**123.64**	**440.73**	--	**23.15**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1005	19.68	7.96	11.08	0.20	--	0.44
			395	15.08	1.23	3.55	10.08	--	0.22
			401	12.85	0.19	5.30	6.25	--	1.11
			Other - MIL	16.84	0.003	13.87	2.72	--	0.25
			Subtotal	**64.45**	**9.39**	**33.80**	**19.24**	--	**2.02**
			Total - All Controls	**661.91**	**18.84**	**157.91**	**459.99**	--	**25.17**
Portola Valley	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	PVY	1.67	--	--	1.67	--	--
			Total	**1.67**	--	--	**1.67**	--	--
Redwood City	Green Stromwater Infrastructure	Green Street or Regional Retrofit	RCY	1.17	--	0.94	0.23	--	--
			Subtotal	**1.17**	--	**0.94**	**0.23**	--	--
		Parcel-based New & Redevelopment or Retrofit	239	0.70	0.70	--	0.001	--	--
			253	0.50	--	0.50	--	--	--
			254	3.91	3.91	--	--	--	--
			261	7.04	0.49	1.51	4.79	--	0.25
			266	7.17	3.87	--	2.43	0.87	--
			324	4.10	1.78	0.74	1.27	--	0.31
			327	11.05	--	1.03	3.91	5.67	0.43
			336	7.02	--	5.87	1.15	--	--
			337	0.61	--	--	0.61	--	--
			379	28.55	18.46	0.005	10.09	--	--
			388	1.19	0.55	--	0.64	--	--
			1000	1.66	1.66	--	--	--	--
			1009	0.14	--	--	0.14	--	--
			1014	1.09	0.12	--	0.97	--	--
			RCY	33.36	0.94	4.40	6.13	19.59	2.31
			Subtotal	**108.10**	**27.89**	**13.69**	**29.93**	**32.57**	**4.02**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1000	9.50	9.50	--	--	--	--
			1011	0.01	--	--	--	--	0.01
			253	12.62	1.58	4.15	6.88	--	--
			261	67.95	1.47	24.70	40.65	--	1.13
			266	43.13	4.49	19.53	18.33	0.79	--
			267	23.15	10.17	8.17	2.70	2.08	0.04
			323	12.25	0.001	9.64	2.61	--	--
			324	12.74	0.99	4.83	6.93	--	--
			325	11.40	1.22	2.68	7.50	--	--
			327	83.68	16.49	42.14	24.68	--	0.37
			336	49.34	13.86	32.38	2.67	--	0.44
			337	38.03	8.38	15.96	13.69	--	--
			379	145.71	45.09	57.93	42.34	--	0.35
			388	27.66	0.62	15.08	11.94	--	0.03
			407	0.64	0.44	--	--	0.20	--
			77	0.00	--	--	--	--	0.00
			Other - RCY	241.17	8.07	32.41	198.83	--	1.87
			Subtotal	**779.00**	**122.38**	**269.59**	**379.74**	**3.06**	**4.23**
			Total - All Controls	**888.27**	**150.27**	**284.22**	**409.90**	**35.63**	**8.25**
San Bruno	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	290	12.25	5.32	2.99	2.89	--	1.04
			1005	0.95	--	--	0.95	--	--
			Subtotal	**13.20**	**5.30**	**2.98**	**3.88**	--	**1.04**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1005	170.85	5.54	20.36	142.84	--	2.10
			290	71.35	2.16	33.00	35.19	--	1.00
			291	0.40	--	0.40	--	--	--
			292	74.92	20.94	22.87	31.11	--	--
			296	0.35	--	--	0.35	--	--
			Subtotal	**317.88**	**28.64**	**76.64**	**209.49**	--	**3.10**
			Total - All Controls	**331.07**	**33.94**	**79.62**	**213.37**	--	**4.14**

Table App11-1. PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee. 9-30-2020

Permittee	Control Measure	Project Type or Device Type	WMA ID	Total Area (Acres)	Land Use Category (Acres)				
					Old Industrial	Old Urban - Commercial	Old Residentail	New Urban	Ag/Open Space
San Carlos	Green Stromwater Infrastructure	Green Street or Regional Retrofit	31	0.54	--	--	0.54	--	--
			Subtotal	**0.54**	--	--	**0.54**	--	--
		Parcel-based New & Redevelopment or Retrofit	57	2.51	--	0.46	2.05	--	--
			59	18.22	18.22	--	--	--	--
			1011	13.39	13.39	0.0002	--	--	--
			1016	2.62	2.62	--	--	--	--
			SCS	11.50	--	8.95	2.30	--	0.25
			Subtotal	**48.24**	**34.83**	**9.23**	**3.94**	--	**0.25**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1011	5.17	2.63	2.54	--	--	--
			1011C	2.02	0.06	1.96	--	--	--
			1011D	31.29	5.38	4.93	20.98	--	--
			1016	19.15	6.95	11.84	0.31	--	0.05
			207	42.05	2.05	16.41	23.02	--	0.57
			210	91.21	59.57	31.58	0.07	--	--
			31	71.30	41.10	14.00	15.89	--	0.31
			32	21.13	5.77	13.19	2.17	--	--
			57	57.52	0.85	35.80	19.98	--	0.89
			59	6.04	3.06	2.98	--	--	--
			75	38.81	31.17	7.63	--	--	--
			80	15.48	0.49	12.95	2.04	--	--
			Other - SCS	75.53	2.14	29.36	44.01	--	0.02
			Subtotal	**476.69**	**161.21**	**185.16**	**128.48**	--	**1.84**
			Total - All Controls	**525.47**	**196.04**	**194.39**	**132.96**	**--**	**2.08**
San Mateo City	Green Stromwater Infrastructure	Green Street or Regional Retrofit	111	0.44	--	0.29	0.15	--	--
			156	2.11	--	1.35	0.66	--	0.10
			SMO	5.06	--	2.25	2.81	--	--
			Subtotal	**7.61**	--	**4.14**	**3.33**	--	**0.13**
		Parcel-based New & Redevelopment or Retrofit	90	1.12	1.12	--	--	--	--
			92	83.00	0.003	66.93	15.87	--	0.20
			111	0.28	--	--	--	--	0.28
			149	3.08	3.08	--	--	--	--
			156	3.31	--	--	3.31	--	--
			379	0.37	0.37	--	--	--	--
			395	3.21	--	--	3.21	--	--
			1007	0.29	0.29	--	--	--	--
			1008	3.20	3.20	0.0001	--	--	--
			1009	3.35	3.35	--	--	--	--
			Other - RCY	0.51	0.51	--	--	--	--
			Other - SMO	10.00	--	0.11	9.89	--	--
			SMO	22.92	0.42	4.28	14.28	3.95	0.001
			Subtotal	**134.64**	**11.39**	**68.23**	**50.98**	**3.58**	**0.47**
	Stormwater Treatment - Trash Controls	Large Full Trash Capture	1007	8.58	0.39	2.43	5.76	--	--
			1010	0.04	--	--	--	0.04	--
			25	187.34	13.13	29.69	144.51	--	--
			Other - SMO	94.63	3.10	26.04	65.37	0.11	--
			Subtotal	**290.58**	**16.62**	**58.16**	**215.65**	**0.15**	--
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1007	9.55	2.49	3.59	3.48	--	--
			1008	42.89	5.12	2.22	35.54	--	--
			1009	5.02	2.18	2.38	0.47	--	--
			101	2.51	--	2.51	0.00	--	--
			111	61.26	5.19	45.81	9.37	--	0.89
			114	6.49	1.57	0.70	4.22	--	--
			120	7.50	0.58	0.71	6.21	--	--
			149	5.67	1.00	1.59	3.08	--	--
			156	1.65	0.29	1.29	0.00	--	0.07
			25	1.29	0.01	0.18	1.11	--	--
			399	19.84	1.64	1.73	16.42	--	0.04
			403	40.36	1.26	1.74	37.36	--	--
			408	0.86	--	0.55	--	--	0.31
			Other - SMO	50.57	--	17.69	32.58	--	0.30
			Subtotal	**255.47**	**21.32**	**82.69**	**149.85**	--	**1.61**
			Total - All Controls	**688.30**	**49.32**	**213.23**	**419.80**	**3.73**	**2.21**

Table App11-1. PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee. **9-30-2020**

Permittee	Control Measure	Project Type or Device Type	WMA ID	Total Area (Acres)	Land Use Category (Acres)				
					Old Industrial	Old Urban - Commercial	Old Residentail	New Urban	Ag/Open Space
San Mateo County	Green Stromwater Infrastructure	Green Street or Regional Retrofit	1007	2.07	--	1.88	0.11	--	0.08
			SMC	3.30	--	3.22	0.08	--	--
			Subtotal	**5.37**	--	**5.07**	**0.20**	--	**0.10**
		Parcel-based New & Redevelopment or Retrofit	71	9.46	--	2.72	6.74	--	--
			77	2.19	2.19	--	--	--	--
			92	1.26	--	1.26	--	--	--
			111	1.20	1.02	--	0.17	--	0.01
			149	2.00	--	2.00	--	--	--
			181	0.99	--	--	0.99	--	--
			379	8.22	2.91	0.001	5.13	--	0.18
			SMC	118.87	0.11	22.04	79.94	0.11	16.67
			SMO	0.81	--	--	0.81	--	--
			Subtotal	**145.00**	**18.65**	**30.00**	**86.41**	**0.06**	**9.87**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1005	2.75	0.31	0.03	--	--	2.40
			1011	0.73	0.03	0.70	--	--	--
			17	26.80	--	--	--	--	26.80
			181	0.12	0.01	0.12	--	--	--
			253	6.63	2.71	0.36	3.53	--	0.03
			261	3.41	0.12	3.06	0.23	--	--
			296	0.39	--	--	--	--	0.39
			307	0.06	--	--	--	--	0.06
			379	273.81	59.14	54.40	156.41	--	3.85
			77	0.01	0.01	0.00	--	--	--
			Other - SMC	94.62	3.29	35.63	51.44	--	4.25
			Other - SSF	0.00	--	--	--	--	0.00
			Subtotal	**409.33**	**65.62**	**94.30**	**211.62**	--	**37.79**
	Total - All Controls			**559.70**	**84.27**	**129.38**	**298.23**	**0.06**	**47.76**

Table App11-1. PCBs and Mercury Control Measures and Land Use Areas Treated for Each San Mateo County Permittee. 9-30-2020

Permittee	Control Measure	Project Type or Device Type	WMA ID	Total Area (Acres)	Land Use Category (Acres)				
					Old Industrial	Old Urban - Commercial	Old Residentail	New Urban	Ag/Open Space
South San Francisco	Green Stromwater Infrastructure	Parcel-based New & Redevelopment or Retrofit	291	5.32	5.32	--	--	--	--
			292	26.49	26.49	--	--	--	--
			293	15.28	13.21	0.17	1.90	--	--
			307	10.02	--	--	10.02	--	--
			313	27.63	27.63	--	--	--	--
			314	3.63	--	3.63	--	--	--
			316	14.03	14.02	--	0.01	--	--
			318	4.80	4.80	--	0.002	--	--
			319	5.00	5.00	--	--	--	--
			359	3.36	3.35	--	0.01	--	--
			1001	15.11	9.82	--	5.24	--	0.05
			1002	0.85	0.85	--	--	--	--
			SSF	4.09	--	2.05	2.04	--	--
			Subtotal	**135.61**	**111.83**	**5.18**	**18.56**	--	**0.04**
	Enhanced O&M - Increased Storm Drain Inlet Cleanouts	Small Full Trash Capture (Inlet-based devices)	1001	81.48	45.55	30.37	5.48	--	0.08
			1001B	9.57	6.39	3.19	--	--	--
			1001C	12.00	10.37	1.62	--	--	0.01
			1001D	28.44	22.57	5.85	--	--	0.02
			1002	5.58	4.28	0.95	--	--	0.35
			291	97.76	79.58	17.76	--	--	0.42
			292	12.04	10.32	1.29	--	--	0.43
			293	229.09	87.02	78.85	59.57	--	3.66
			294	39.63	34.75	4.84	--	--	0.05
			295	18.00	13.48	4.31	--	--	0.21
			296	84.14	4.45	16.85	62.75	--	0.09
			297	25.81	0.63	4.19	20.99	--	--
			298	79.64	5.71	9.53	64.21	--	0.20
			306	24.97	4.43	6.74	13.80	--	--
			307	156.81	--	10.52	146.20	--	0.09
			311	59.03	--	2.94	56.09	--	--
			313	34.33	4.14	3.25	26.10	--	0.85
			314	9.16	6.86	2.29	--	--	--
			315	9.38	6.47	2.91	--	--	--
			316	58.07	46.47	11.58	--	--	0.02
			317	31.23	27.78	3.44	--	--	0.01
			318	12.18	9.88	2.30	--	--	--
			319	3.36	2.74	0.62	--	--	--
			352	0.23	--	0.01	0.22	--	--
			354	5.23	4.42	0.80	--	--	0
			356	10.22	8.17	2.04	--	--	0.01
			357	14.87	9.17	5.45	--	--	0.25
			358	19.71	16.29	3.36	--	--	0.06
			359	16.42	15.00	1.41	--	--	0.004
			Other - SMC	0.00	--	--	0.002	--	--
			Other - SSF	139.98	0.51	7.15	128.51	0.001	3.82
			Subtotal	**1328.38**	**487.44**	**246.42**	**583.90**	**0.001**	**10.63**
	Total - All Controls			**1463.99**	**599.26**	**251.59**	**602.47**	**0.00**	**10.67**

1 – Preliminary - may not include all acres currently treated by GI and treatment controls.

2 – GI includes (1) parcel-based new development, redevelopment, or retrofit projects; and (2) green street projects or regional retrofit projects.

3 – GI and treatment controls may include proprietary vault-based systems.

4 - Large Full Trash Capture devices include: Hydrodynamic Separator Units (HDS); Gross Solids Removal Devices (GSRD); and Debris Separating Baffle Boxes (DSBB).

PCBs and Mercury Regional Loads Reduced during MRP 2.0

Introduction

MRP 2.0 requires Permittees to develop and implement control measures to reduce PCBs and mercury in stormwater runoff to the San Francisco Bay throughout the permit area (Table 1). For PCBs, Permittees are collectively required to reduce loads by a minimum of 500 grams per year (g/yr) by June 30, 2018, and 3,000 g/yr by June 30, 2020. At least 120 g/yr of PCBs load reduction must be achieved through implementation of green stormwater infrastructure (GSI) projects on public and private lands. The June 30, 2020 date may be extended to December 31, 2020 if Permittees provide documentation that control measures that will attain the load reduction will be implemented by that date. For mercury, Permittees are collectively required to reduce stormwater loads by 48 g/yr by June 30, 2020 through implementation of GSI projects on public and private lands. These load reduction performance criteria may be met regionally. However, should regional load reductions not be achieved, MRP 2.0 requires each Permittee to achieve load reductions on a county-wide basis.

Table 1. PCBs and Mercury Load Reductions Required by MRP 2.0 in 2018 and 2020.

PCBs (g/year)			Mercury (g/yr)
By July 2018	By July 2020		By July 2020
All Control Measures	All Control Measures	Green Stormwater Infrastructure	Green Stormwater Infrastructure
500	3,000	120	48

The PCBs and mercury performance criteria in Table 1 can be achieved through implementation of the following control measures:

1. Source property ID and Abatement
2. Green Stormwater Infrastructure and Treatment Controls, including:
   - Parcel-based new/re-development/Green Streets/Regional Retrofits
   - Public hydrodynamic separator Units (trash full capture)
3. Enhanced Operation and Maintenance (O&M) Measures, including:
   - Street Sweeping or Flushing
   - Inlet-based trash full capture devices
   - Other MS4 Cleaning
4. Managing PCBs in Building Materials
5. Managing PCBs in Infrastructure
6. Diversions to Publicly Owned Treatment Works (POTWs)

The control measures implemented to-date are described in more detail in “Control Measures Plans” prepared by individual Bay Area countywide stormwater programs or Permittees. The PCBs and mercury load reductions that have been achieved to date were calculated using the methodologies presented in the *Interim Accounting Methodology for PCBs and Mercury Loads Reduced Report* (BASMAA 2017), which was developed by BASMAA and approved by the Regional Water Board's Executive Officer in March 2017. The data reported here on regional PCBs and mercury loads reduced by all Permittees were provided by the following countywide stormwater programs and municipal agencies:

- Alameda Countywide Clean Water Program
- Contra Costa Clean Water Program
- Santa Clara Valley Urban Runoff Pollution Prevention Program
- San Mateo Countywide Water Pollution Prevention Program
- Fairfield-Suisun Urban Runoff Management Program
- City of Vallejo and the Vallejo Flood and Wastewater District

The load reductions reported here are based on the best available information at the time this report was written and may not reflect the most up-to-date accounting of all reductions achieved through all control measures that have been implemented in the region.

Regional PCBs Loads Reduced

The cumulative PCBs loads reduced to date by all Permittees during the MRP compliance period (FY 13-14 through FY 19-20) are presented in Table 2. A total of 3,017 g/yr of PCBs were reduced across the permit area over that time period, demonstrating that the MRP performance criterion of 3,000 g/yr of PCBs loads reduced by July 2020 has been achieved at the regional level.

Table 2. PCBs loads reduced by MRP Permittees (FY13-14 – FY19-20).[1]

Control Measure Category	PCB Load Reductions (g/yr)
Source Property Identification and Abatement	610
Green Stormwater Infrastructure (i.e., Parcel-Based New/Re-Development or Green Street/Regional Retrofit)	231
Large Full Trash Capture (i.e. HDS Units)	157
Enhanced O&M Measures	18
PCBs in Building Materials	2,000
Stormwater Diversion to Sanitary Sewer	1
TOTAL - All Control Measures	**3,017**

1 - Loads reduced reported for each control measure are based on the available information provided by the stormwater programs and municipal agencies at the time this report was written; updates and corrections (if needed) will be provided in future annual reports.

The PCBs loads reduced by control measure category each fiscal year and the cumulative total for the region are presented in Figure 1. The PCBs in building materials program achieved the MRP-stipulated 2,000 g/yr (66%) because all Permittees successfully implemented the program by July 1, 2019. This load reduction accounts for 66%of the total PCBs loads reduced during MRP 2.0. The remaining 1,017 g/yr was achieved through all other control measures. Of these, source property identification and abatement accounts for 20% of the total PCBs load reduction during MRP 2.0. Next to managing PCBs in building materials, source property identification and abatement remains the most effective control measure currently available for reducing PCBs loads to the Bay (BASMAA 2017). GSI has been the third largest contributor to load reductions, providing 231 g/yr of PCBs loads reduced and accounting for 8% of the total PCBs loads reduced to-date. These data demonstrate the MRP performance criterion of 120 g/yr of PCBs loads reduced through GSI has been met across the region. An additional 157 g/yr have been reduced by large, full trash capture devices (i.e., HDS Units), accounting for 5% of the total PCBs loads reduced. The remaining < 1% of the regional PCBs loads reduced during the permit have come from enhanced O&M practices and stormwater diversions.

Regional Mercury Loads Reduced

The cumulative mercury loads reduced by MRP Permittees from FY13-14 through FY 19-20 are presented in Table 3. An estimated total of 4,394 g/yr of mercury were reduced across the permit area over that time period. The mercury loads reduced by control measure category each fiscal year and the cumulative total for the region are presented in Figure 2. GSI has been the largest contributor to mercury load reductions during the permit term. Total mercury loads have been reduced by 2,759 g/yr through GSI, accounting for 63% of the total loads reduced. These data demonstrate the MRP performance criterion of 48 g/yr of mercury loads reduced through GSI by 2020 has been met across the region. An additional 1,348 g/yr of mercury have been reduced by large, full trash capture devices (i.e., HDS Units), accounting for 31% of the total loads reduced. Source property identification and abatement has reduced mercury loads by 120 g/yr, accounting for only 4% of the total mercury loads reduced to date. The remaining 4% of the regional mercury loads reduced during the permit have come from enhanced operation and maintenance practices and stormwater diversions.

September 30, 2020

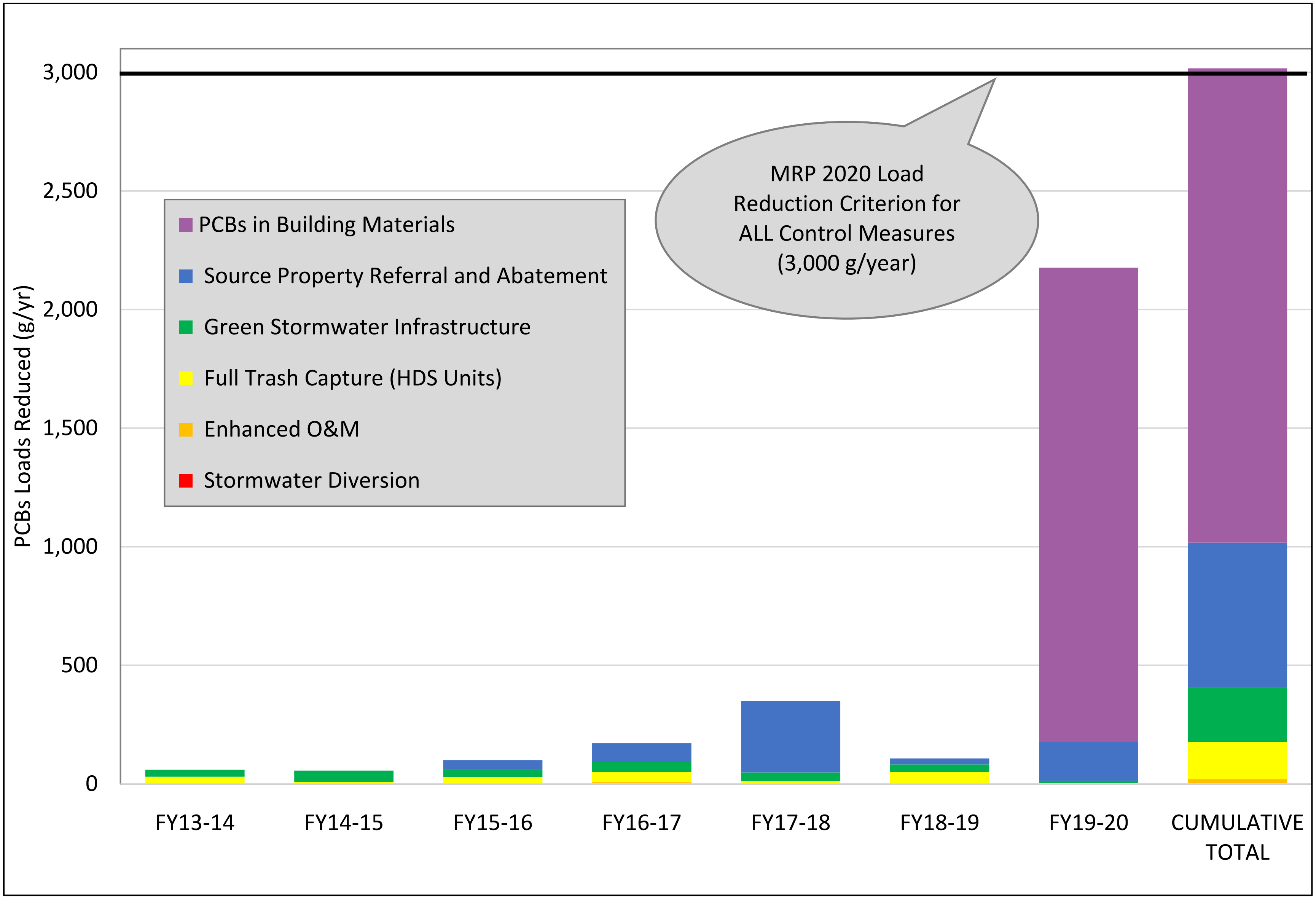


Figure 1. PCBs loads reduced by MRP Permittees by fiscal year and the cumulative totals (FY13-14 through FY19-20).

Table 3. Mercury loads reduced by MRP Permittees (FY13-14 – FY19-20).[1]

Control Measure Category	Mercury Load Reductions (g/yr)
Source Property Identification and Abatement	120
Green Stormwater Infrastructure (i.e., Parcel-Based New/Re-Development or Green Street/Regional Retrofit)	2,759
Large Full Trash Capture (i.e. HDS Units)	1,348
Enhanced O&M Measures	163
Stormwater Diversion to Sanitary Sewer	3
TOTAL - All Control Measures	**4,394**

1 - Loads reduced reported for each control measure are based on the available information provided by the stormwater programs and municipal agencies at the time this report was written; updates and corrections (if needed) will be provided in future annual reports.

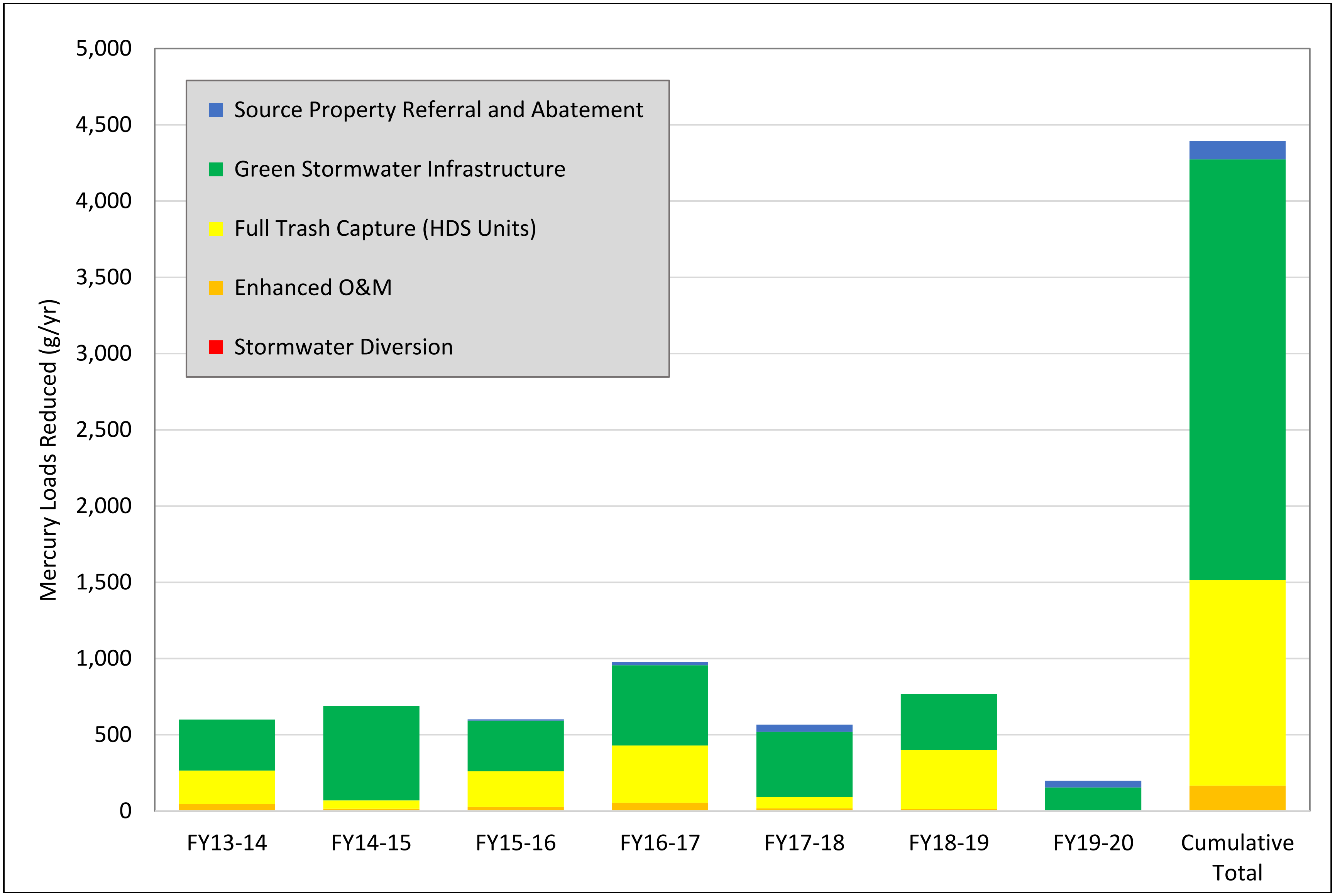
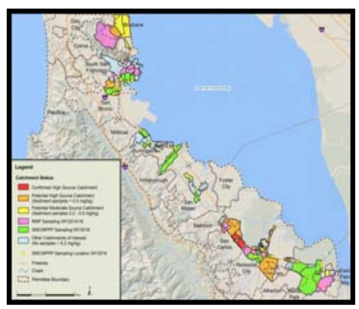


Figure 2. Mercury loads reduced by MRP Permittees by fiscal year and the cumulative totals (FY13-14 through FY19-20).

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

POLLUTANT CONTROL MEASURES IMPLEMENTATION PLAN AND REASONABLE ASSURANCE ANALYSIS FOR SAN MATEO COUNTY, CALIFORNIA

SCENARIOS TO ACHIEVE PCBs AND MERCURY SAN FRANCISCO BAY TMDL WASTELOAD ALLOCATIONS



Submitted by the San Mateo Countywide Water Pollution Prevention Program in compliance with NPDES Permit No. CAS612008 (Order No. R2 2015-0049) Provisions C.11/12.c.ii(2) and C.11/12.d.iii

SEPTEMBER 30, 2020

CREDITS

This report is submitted by the participating agencies in the

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

Prepared for:
San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)
555 County Center, Redwood City, CA 94063
A Program of the City/County Association of Governments (C/CAG)

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EOA inc.

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APPENDICES

LIST OF ABBREVIATIONS

ABAG	Association of Bay Area Governments
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
CW4CB	Clean Watersheds for a Clean Bay
CWA	Clean Water Act
FTC	Full Trash Capture
FY	Fiscal Year
GE	General Electric
GIS	Geographic Information System
GI	Green Stormwater Infrastructure
GSRD	Gross Solids Removal Device
HDS	Hydrodynamic Separator Unit
HHW	Household Hazardous Waste
HRU	Hydrologic Response Unit
HSPF	Hydrologic Simulation Program FORTRAN
LID	Low Impact Development
LSPC	Loading Simulation Program in C++
MIP	Model Implementation Process
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NLDAS2	North American Land Data Assimilation System
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
OFEE	Oil-Filled Electrical Equipment
PPM	Parts Per Million
PRISM	Parameter-elevation Regressions on Independent Slopes Model
PCBs	Polychlorinated Biphenyls
PG&E	Pacific Gas and Electric
POC	Pollutant of Concern
POTW	Publicly Owned Treatment Works
Program	San Mateo Countywide Water Pollution Prevention Program
RAA	Reasonable Assurance Analysis
ROW	Right-of-Way
RWSM	Regional Watershed Spreadsheet Model
SAP	Sampling and Analysis Plan
SFEP	San Francisco Estuary Partnership
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SSID	Stressor/Source Identification
SUSTAIN	System for Urban Stormwater Treatment & Analysis Integration
SWRP	Stormwater Resource Plan
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	Wasteload Allocation
WMA	Watershed Management Area

1 INTRODUCTION

This Control Measure Implementation Plan (Control Measures Plan) and Reasonable Assurance Analysis (RAA) describes implementation actions and associated potential schedules for achieving the Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for polychlorinated biphenyls (PCBs) and mercury in San Mateo County stormwater runoff. This Control Measures Plan was developed by San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) in compliance with Provisions C.11/12.c. and C.11/12.d. of the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (Order No. R2-2015-004; Permit No. CAS612008), also known as the Municipal Regional Permit (MRP). It was developed by SMCWPPP on behalf of all San Mateo County MRP Permittees. It builds upon the foundational program of actions to address PCBs and mercury that have been implemented by SMCWPPP and San Mateo County Permittees over the past two decades. These actions include both the collection and analysis of hundreds of sediment and stormwater runoff samples, the investigation of sources and source areas, and the development and implementation of control measures to reduce the level of PCBs and mercury in urban stormwater runoff in San Mateo County (BASMAA 2014, BASMAA 2017b, SMSTOPPP 2002, 2003, and 2004, Yee and McKee 2010, SMCWPPP 2014, SMCWPPP 2015, and CW4CB 2017a, SMCWPPP 2016a and b, SMCWPPP 2017a and b, SMCWPPP 2018a and b, SMCWPPP 2019b, SMCWPPP 2020).

This document is organized as follows:

- **<u>Control Measures Plan and RAA (Main Report)</u>** – Describes implementation actions to address PCBs and mercury TMDL WLAs assigned to San Mateo County. In compliance with MRP provisions C.11/12.d., quantitatively demonstrates implementation actions that would achieve TMDL WLAs, based on modeling and load reduction quantification methods described in Appendices A, B and C.
- **<u>Phase I RAA - Baseline Modeling Report (Appendix A)</u>** – Describes the baseline pollutant modeling used to establish the starting point for measuring progress towards TMDL WLAs.
- **<u>Phase II RAA - Green Infrastructure (GI) Modeling Report (Appendix B)</u>** – Describes the modeling conducted to identify the extent of GI needed to achieve PCBs/mercury load reductions that are required to be met by 2040 by MRP Provisions C.11/12.c.ii(2).
- **<u>Phase III RAA - Source Control Load Reduction Accounting Report (Appendix C)</u>** – Describes the revised methods used to account for PCBs/mercury load reductions associated with the implementation of source controls and non-GI stormwater runoff treatment.

SMCWPPP has previously provided descriptions of PCBs and mercury control measures at San Mateo County Permittee and Watershed Management Area (WMA) scales (SMCWPPP 2014, SMCWPPP 2016a and b, SMCWPPP 2017b, SMCWPPP 2018b, SMCWPPP 2019b). For the purpose of this Control Measures Plan, controls are presented at the countywide scale. Tracking and reporting of control measure implementation will continue to be conducted at the appropriate geographical scales needed to demonstrate progress towards the TMDL WLAs.

1.1 Regulatory Background

Fish tissue monitoring in San Francisco Bay (Bay) has revealed the bioaccumulation of PCBs, mercury, and other pollutants in Bay sportfish. The levels found are thought to pose a health risk to people consuming these fish and as a result, an interim advisory has been issued on the consumption of sportfish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act (CWA) "Section 303(d) list" due to elevated levels of PCBs and mercury. In response, the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) has developed TMDL water quality restoration programs targeting PCBs and mercury in the Bay. The general goals of the TMDLs are to identify sources of PCBs and mercury to the Bay and implement actions to control the sources of these pollutants in order to achieve water quality standards and restore beneficial uses (SFBRWQCB 2006, 2008).

The stormwater runoff requirements of the mercury and PCBs TMDLs are being implemented through Provisions C.11. and C.12. of the MRP, respectively. The mercury TMDL requires a regionwide stormwater runoff WLA of 82 kg/yr to be achieved by February 2028. The PCBs TMDL requires a regionwide stormwater runoff WLA of 2 kg/yr, with 1.6 kg/yr allocated to MRP Permittees, to be achieved by March 2030. San Mateo County Permittee's population-based proportions of the TMDL WLAs are 8.4 kg/yr for mercury and 0.2 kg/yr for PCBs. The primary goal for this Control Measures Plan is to identify scenarios for a program of actions that would result in the achievement of these WLAs.

The first MRP issued in 2009 (MRP 1.0; Order R2-2009-0074) required Permittees to implement pilot-scale control measures during the permit term to reduce PCBs and mercury discharges from Municipal Separate Storm Sewer Systems (MS4s). These pilot studies were intended to enhance our collective knowledge about the costs and benefits of different control measures to reduce the levels of PCBs and mercury in urban stormwater runoff. The reissued MRP (MRP 2.0, Order R2-2015-0049) requires Permittees to move from pilot-scale work to focused implementation in areas where benefits are most likely to occur, and to achieve a regionwide interim PCBs load reduction goal of 3 kg/year by 2020. Progress made by San Mateo County Permittees towards this interim load reduction goal is described in the SMCWPPP FY 2019/20 Annual Report.

In addition to the interim load reduction goal for PCBs, MRP 2.0 also requires the following:

- <u>Provisions C.11/12.c. - Plan and Implement Green Infrastructure to Reduce Mercury/PCBs Loads</u>:

  ii(2). Permittees shall prepare a reasonable assurance analysis of future mercury/PCBs load reductions by doing the following:

  a. Quantify the relationship between areal extent of green infrastructure implementation and mercury/PCBs load reductions. This quantification should take into consideration the scale of contamination of the treated area as well as the pollutant removal effectiveness of likely green infrastructure strategies.

  b. Estimate the amount and characteristics of land area that will be treated through green infrastructure by 2020, 2030, and 2040.

  c. Estimate the amount of mercury/PCBs load reductions that will result from green infrastructure implementation by 2020, 2030, and 2040.

  d. Quantitatively demonstrate that mercury reductions of at least 10 kg/yr and PCBs reductions of at least 3 kg/yr will be realized by 2040 through implementation of green infrastructure projects.

  e. Ensure that the calculation methods, models, model inputs, and modeling assumptions used to fulfill C.11.c.ii(2)(a.-d.) have been validated through a peer review process.

- Provisions C.11/12.d. - Prepare Implementation Plan and Schedule to Achieve TMDL Allocations:

    i. Permittees shall prepare a plan and schedule for mercury/PCBs control measure implementation and reasonable assurance analysis demonstrating that sufficient control measures will be implemented to attain the TMDL wasteload allocations by 2028 (mercury) and 2030 (PCBs).

    ii. The plan must:

    (1) Identify all technically and economically feasible mercury/PCBs control measures (including green infrastructure projects) to be implemented;

    (2) Include a schedule according to which these technically and economically feasible control measures will be fully implemented; and

    (3) Provide an evaluation and quantification of the mercury/PCBs load reduction of such measures as well as an evaluation of costs, control measure efficiency and significant environmental impacts resulting from their implementation.

1.2 Types of Control Measures

San Mateo County Permittees have implemented a variety of pollutant control measures since the development and adoption of PCBs and mercury TMDLs by the Regional Water Board. Control measures are implemented to reduce PCBs and/or mercury in urban stormwater runoff and improve the overall quality of stormwater runoff in San Mateo County. These control measures have a direct benefit in reducing PCBs and mercury impacts to the Bay.

The types of control measures implemented to control PCBs and mercury in stormwater runoff generally fall into two categories:

- **Source Controls (Load Avoidance and Reduction)** – Source controls is a broad term used to describe actions designed to reduce the potential for pollutants to enter the environment (load avoidance) or actions that intercept pollutants once available for transport to waterways via stormwater runoff (load reduction). For the purpose of this Control Measure Plan, source controls include stormwater treatment systems except Green Infrastructure (GI).
- **Green Infrastructure (Load Reduction)** – GI is engineered infrastructure that uses natural processes in vegetation and soils to remove pollutants from stormwater runoff. Other benefits include reducing runoff peak flows and volumes and providing flood protection. GI systems mimic nature by soaking up, storing, and infiltrating stormwater runoff into the ground.

The selection of stormwater runoff control measures needed to achieve the PCBs and mercury TMDL WLAs is informed by ongoing evaluations of sources of these pollutants and estimated load reduction benefits. Source controls and GI implemented to-date and planned for future implementation within San Mateo County are summarized in Sections 3 and 4 of this Control Measures Plan.

1.3 Approach to Control Measure Planning and Organization of Control Measures Plan

A stepwise approach was used to develop this Control Measures Plan. The approach builds upon successful implementation of control measures to-date by SMCWPPP and San Mateo County Permittees. It incorporates the lessons learned over the past two decades about both the sources of PCBs and mercury and the most cost-effective approaches to managing and reducing these pollutants in stormwater runoff. The approach maximizes the use of source controls to manage these pollutants, and then evaluates the costs and benefits of further implementing GI to address the remaining load reductions needed to achieve TMDL WLAs.

The approach follows the guidance provided in the Bay Area RAA Guidance Document (BASMAA 2017c), which established a regional framework for conducting Bay Area RAAs. The RAA Guidance Document describes the types of modeling and data inputs that may be used by Permittees to calculate baseline loading and load reduction targets and estimate loads reduced by current and projected future GI. It states that load reductions by non-GI source control measures should be calculated based on methods provided in an approved refinement of the Interim Accounting Methodology (BASMAA 2017a), which was developed by BASMAA and approved by the Regional Water Board's Executive Officer in 2017. The refined source control measures load reduction quantification methods are fully described in Appendix C. The remaining sections of this Control Measures Plan are organized as follows:

- **Section 2. Refinements to Baseline PCBs & Mercury Loading Estimates and Establishing Load Reduction Targets.** This section presents the modeled baseline loads of PCBs and mercury in San Mateo County stormwater runoff discharged to the Bay[1] that were modeled as part of the RAA process. The modeled baseline loads define the starting point for quantifying PCBs and mercury load reductions needed to attain TMDL WLAs. The modeled baseline loads of PCBs and mercury presented in this section are based on the modeling presented in SMCWPPP's Phase I RAA Report (Appendix A).
- **Section 3. Control Measure Implementation.** This section describes existing and potential future control measures to achieve San Mateo County PCBs and mercury TMDL WLAs. Estimated PCBs and mercury load reductions achieved to-date and associated with the implementation of future potential source controls and GI by San Mateo County Permittees (or other permitted entities with land areas contributing PCBs to stormwater runoff in San Mateo County such as Caltrans) are included. The evaluation includes implementation scenarios for achieving the PCBs TMDL WLA based on three different timelines (by 2030, 2040, and 2080).
- **Section 4. Economic and Technical Feasibility Evaluation.** This section discusses the economic and technical feasibility of each implementation scenario included in Section 3. Potential environmental impacts associated with the implementation scenarios are also described.
- **Section 5. Tracking and Reporting Control Measure Implementation and Progress Towards Load Reduction Goals.** This section describes the tracking and reporting methods and tools that will be used by San Mateo County Permittees to demonstrate the extent and magnitude of control measure implementation, and the associated pollutant load reductions.
- **Section 6. Conclusions and Planned Next Steps.** This section describes the conclusions from the evaluation, and next steps that San Mateo County Permittees plan to conduct to continue attempting to identify additional pollutant sources and implementing and enhancing cost-effective PCBs and mercury control measures. This includes describing the current countywide focus on collaborative efforts to advance GI projects in San Mateo County, including green streets and regional stormwater capture projects. Also discussed is the role in control measure implementation of other permitted entities with land areas that contribute PCBs to stormwater runoff in San Mateo County.

[1] Discharges to the Pacific Ocean are not relevant to these Bay TMDLs and are not included.

2 REFINEMENTS TO BASELINE PCBS AND MERCURY LOADING ESTIMATES AND ESTABLISHING LOAD REDUCTION TARGETS

This section presents the modeled baseline loading estimates of PCBs and mercury in San Mateo County stormwater runoff discharging to the Bay. The modeled baseline loads were developed via modeling conducted as part of SMCWPPP's RAA process, which is described in full detail in the Phase I RAA Report (Appendix A). The modeled baseline loads define the starting point for load reduction accounting towards attainment of the TMDL WLAs. Load reduction targets for PCBs and mercury based on a comparison of the baseline loads and the WLAs are also discussed.

2.1 RAA Process and Modeling Results

Hydrologic, sediment and pollutant modeling was conducted as part of the RAA process to refine the 2002 baseline loads of PCBs and mercury in urban stormwater runoff from San Mateo County. Baseline loads were modeled for all areas within San Mateo County that drain to the Bay, including land areas not subject to MRP requirements but contributing pollutant loads to stormwater in the County (e.g., Caltrans properties, Industrial General Permit facilities). Refinement of baseline loading was the first step in the RAA process. The modeled baseline loads are the starting point for calculating the total load reduction that is needed to achieve TMDL WLAs. The load reduction targets described in this section are the basis for the control measures implementation plan presented in Section 3.

2.1.1 Regional RAA Guidance Document

In order to ensure comparable results across the region, MRP Permittees participated in a regional project to establish criteria for RAA modeling. The Bay Area RAA Guidance Document (BASMAA 2017c) was developed out of this project and establishes specific methodologies to calculate baseline PCBs and mercury loading and load reduction targets. It also recommends methods for evaluating the type, size, number, location, and phasing of GI measures needed to comply with the GI load reduction targets defined in MRP 2.0 (see Appendix B). The Bay Area RAA Guidance Document was built upon guidance from the Los Angeles Regional Water Quality Control Board (LARWQCB 2014) and the United States Environmental Protection Agency (USEPA 2017), particularly in terms of the mechanics of the analysis, control measure identification, critical condition selection, choice of models, model calibration criteria, modeling inputs, and model outputs. San Mateo County RAA process was conducted according to the Bay Area RAA Guidance Document.

2.1.2 Regional Watershed Spreadsheet Model

The Regional Watershed Spreadsheet Model (RWSM) was developed as part of the San Francisco Bay Regional Monitoring Program's Small Tributaries Loading Strategy. The RWSM was developed as a planning tool, primarily for the purpose of estimating long-term average annual loads from the small tributaries draining to the Bay, and secondarily to provide supporting information for prioritizing watersheds or areas within watersheds for management actions (Wu et al. 2017). The RWSM is structured with three stand-alone empirical models: the hydrology model, sediment model, and pollutant model(s). The hydrology model uses runoff coefficients based on land use-soil-slope combinations to estimate annual runoff from a watershed. The sediment model uses a function of geology, slope, and land use to simulate suspended sediment transport in the landscape while adjusting for watershed storage factors. The pollutant model is essentially a "concentration map" that can be driven by either the hydrology model (for pollutant concentrations in water) or the sediment model (for pollutant concentrations on fine sediment particles as particle ratios[2] for specific land use or source areas). Starting in 2010, a multi-year effort was undertaken to systematically develop and calibrate the RWSM. Calibration was completed[3] and the model was released in 2018.

2.1.3 RAA Baseline Model Summary

The RAA Phase I Report (Appendix A) documents the development and calibration of the hydrologic and water quality model that was used to refine San Mateo County baseline loads of PCBs and mercury discharged to the Bay. For the purpose of the model, baseline conditions were defined as the average water year (2002) conditions. The baseline hydrology and pollutant loading model achieved the criteria established in the Bay Area RAA Guidance Document (BASMAA 2017c) for acceptable calibration and validation sufficient to estimate existing loads of mercury and PCBs, to compare to TMDL WLAs, and to determine necessary load reductions to support control measure planning. The model and the model results are summarized in the following sections. A full description of the model and model results are described in Appendix A.

Modeling System

The watershed modeling system selected by SMCWPPP was the Loading Simulation Program in C++ (LSPC), a watershed modeling system that includes Hydrologic Simulation Program FORTRAN (HSPF) algorithms to simulate watershed hydrology, erosion, water quality processes, and in-stream fate and transport processes. The model simulated upland loading and transport of sediment, in combination with methods developed for the RWSM for assigning PCBs and mercury runoff concentrations, to estimate PCBs and mercury loads associated with various land uses. Model inputs included available spatial and monitoring datasets to represent the land, meteorological, hydrological, and pollutant loading characteristics of San Mateo County watersheds.

Land Use Characteristics

The model relies on hydrologic response units (HRUs) to represent areas of similar physical characteristics and processes. HRUs are typically defined by soils, slope, land cover, and land use. Various data sets were layered in order to create HRUs in the model, including:

- Slope (USGS)
- Soil Groups (USDA SSURGO 2016)
- Imperviousness (NLCD 2011)
- Land Cover (NLCD 2011)
- Land Use (ABAG 2005, modified by SFEI for the RWSM)

Within the model, the Association of Bay Area Governments (ABAG) land use layer (modified by the San Francisco Estuary Institute as part of the RWSM development) was the main source of information for representing land areas associated with PCBs and mercury (Table 2-1). This GIS layer includes five land uses categories that are consistent with those used in the RWSM. Although hydrology and sediment were initially modeled at higher HRU resolution (using a different land use data set), the ABAG/SFEI layer was intersected during water quality model development. This allowed for PCBs and mercury

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[2] Particle ratio is pollutant concentration in water divided by suspended sediment concentration in water.

[3] The calibration for PCBs is "reasonable" but there remains a lower confidence in the calibration for mercury (Wu et. al. 2017).

sediment concentrations to be assigned spatially, under the assumption that the ABAG/SFEI land use categories reflect the spatial distribution of pollutant contributions from San Mateo County watersheds, which includes contributions from land areas upstream and downstream of impoundments (e.g., reservoirs). Based on the data inputs described above, a set of representative HRUs were developed for use in the watershed model to reflect key land characteristics of San Mateo County watersheds draining to the Bay.

Table 2-1. San Mateo County land use areas that drain to the Bay established through the RWSM and used for modeling PCBs and mercury loads to the Bay from stormwater runoff.

Land Use Category	Area (acres)
Agriculture/Open	37,203
New (post-1980) Urban	13,807
Old (pre-1980) Industrial/Source Areas	3,913
Old (pre-1980) Urban - Other	23,833
Old (pre-1980) Urban – Residential	33,261
Total	**112,017**

Meteorological Conditions

Hydrologic models are highly dependent on the quantity and quality of meteorological forcing data, such as precipitation. Actual rainfall gauge data in San Mateo County has a number of common issues, such as intervals of missing data. Furthermore, the network of local gauges does not represent the full range of conditions in San Mateo County which are heavily influenced by orographic effects. Therefore, the model used monthly precipitation totals from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) and hourly precipitation distributions and potential evapotranspiration (ET) estimates from the North American Land Data Assimilation System (NLDAS2). The resultant meteorological timeseries covered the period between 1981 and 2015 at an hourly timestep (i.e., inclusive of the baseline year of 2002). Meteorological data were assigned to each model subwatershed based on location, elevation, and hillslope aspect.

Hydrology Model Calibration

A two-phase weight-of-evidence approach was used for hydrology calibration. The Bay Area RAA Guidance Document (BASMAA 2017c) specifies annual percent difference calibration metrics, which aligns with the spatial and temporal scales of the Bay TMDLs. For additional resolution regarding the timing of flow and pollutant loads, monthly and seasonal model hydrology performance were also evaluated as part of the calibration effort. Model output was compared to local flow monitoring gages. When model results diverged from observed data, Google Earth was used to investigate and identify unrepresented hydraulic features which were then added to the model whenever possible. Model parameters were fine-tuned so that the calculated error statistics fell within the targeted model performance ranges.

Baseline Sediment Loading/Calibration

Because of the close association of PCBs and mercury with suspended sediment, the Phase I RAA model simulated erosion and suspended sediment mobilization as the next step in the weight of evidence-based approach for hydrology model calibration. A soil erodibility K-factor was assigned to each HRU based on soil type, slope, and meteorological conditions to estimate the amount of sediment generated from land. Modeled sediment loads from the land surface were partitioned into sand, silt, and clay (i.e., suspended sediment) before being routed to stream segments and "transported" downstream using the LSPC sediment transport processes. To calibrate and validate suspended sediment transport, modeled results were compared to suspended sediment concentration and discharge data measured at the United States Geological Survey (USGS) gaging station on Guadalupe River at Highway 101 (USGS Station 11169025).[4]

PCBs and Mercury Loading

Land-used based runoff concentrations from the RWSM (Wu et. al. 2017, Table 2-2) were used in combination with the HRU-based LSPC hydrology model to estimate baseline PCBs and mercury loads for San Mateo County. This method is consistent with the Bay Area RAA Guidance Document (BASMAA 2017c).

Table 2-2. Average runoff concentrations for PCBs and mercury land use categories as established through the RWSM and used for modeling pollutant loads to the Bay from stormwater runoff.[a]

Land Use Category	PCBs (ng/L)	Mercury (ng/L)
Agriculture/Open	0.2	80.0
New (post-1980) Urban	0.2	3.0
Old (pre-1980) Industrial/Source Areas	204.0	40.0
Old (pre-1980) Urban - Other	40.0	63.0
Old (pre-1980) Urban – Residential	4.0	63.0

[a]Land use based PCBs and mercury concentration data modeled by the RWSM (Wu et. al. 2017).

2.1.4 Modeled Baseline Loads

The RAA quantitatively demonstrates that implementation of hypothetical control measure programs would achieve the PCBs and mercury TMDL WLAs for stormwater runoff. The first step in preparation of an RAA is to establish the baseline loads of PCBs and mercury in stormwater runoff to the Bay. Baseline load estimates are used to determine the load reductions that are needed to achieve TMDL WLAs. The difference between the baseline loads and the TMDL WLA is the load reduction target, or the amount of load reduction that must be achieved to attain the TMDL WLAs. This section presents the modeled

[4] Long-term suspended sediment monitoring datasets were not available for San Mateo County watersheds. Therefore, the model was configured for the Guadalupe River watershed to enable calibration of modeling parameters that were applied to San Mateo County watersheds.

baseline loads for PCBs and mercury in stormwater runoff from San Mateo County watersheds draining to the Bay, and the associated load reduction targets that need to be achieved.

The Phase I RAA model estimated a total baseline annual PCBs load of 1.7 kg/yr from stormwater runoff in San Mateo County watersheds draining to the Bay (Table 2-3). Of this PCBs load, approximately 1.3 kg/yr (76.5%) is associated with the land areas within San Mateo County that are under the jurisdiction of San Mateo County MRP Permittees. The remaining 0.4 kg/yr (23.5%) is associated with stormwater runoff from land areas associated with other entities that are currently or expected to be subject to NPDES permits and/or Waste Discharge Requirements (WDRs) issued by the Regional or State Water Boards. These entities include the California Department of Transportation (Caltrans) and facilities subject to individual NPDES permits (e.g., the San Francisco International Airport) or the State of California's Industrial General Permit (IGP). These areas are generally considered outside the jurisdiction of San Mateo County Permittees. Although stormwater runoff pollutant control measures implemented by Permittees may address a portion of any PCBs and mercury in stormwater runoff discharged from these areas, the property owners/operators themselves are ultimately responsible for pollutants from these areas.

The Phase I RAA model also estimated a baseline annual mercury load of 2.4 kg/yr from stormwater runoff in San Mateo County watersheds draining to the Bay (Table 2-3). Of this mercury load, approximately 1.6 kg/yr is associated with the land areas within San Mateo County that are associated with MRP Permittees. The remaining 0.7 kg/yr is associated with stormwater runoff from open space or covered by separate NPDES permits.

Table 2-3. Summary of modeled baseline annual PCBs and mercury loading from Phase I RAA model (Appendix A) by entity.

Entity/Area	PCBs (kg/yr)	Mercury (kg/yr)
San Mateo County MRP Permittees	**1.3**	**1.63**
Other NPDES Permitted and Open Space	**0.4**	**0.73**
Open Space	0.001	0.56
Caltrans NPDES	0.08	0.08
Individual NPDES Permittees	0.225	0.07
Industrial General Permittees	0.09	0.02
Total	**1.7**	**2.4**

Figure 2-1 shows the proportion of the baseline PCBs stormwater runoff load associated with each land use category presented in Section 2.1.3 and Table 2-1. Roughly 95% of the load is associated with two land use categories – Old (pre-1980) Industrial and Old (pre-1980) Urban – Other (the latter includes older commercial and transportation land uses). This suggests that PCBs are found mostly and widely distributed in non-residential older urban areas.

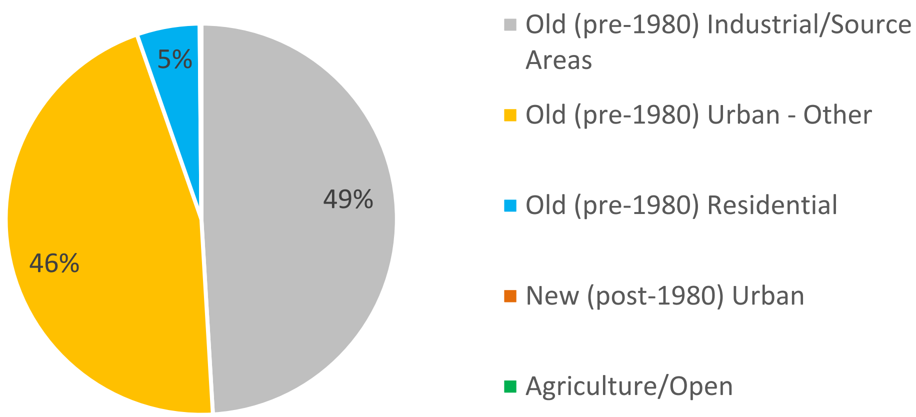

Figure 2-1. Proportion of San Mateo County PCBs and mercury baseline load associated with each land use category established through the RWSM and used for modeling pollutant loads to the Bay from stormwater runoff.

2.1.5 PCBs and Mercury Load Reduction Targets

Mercury and PCBs load reduction targets were developed by comparing the modeled baseline loads for San Mateo County to the County's WLAs established by the TMDLs (SFBRWQCB 2006, 2008). The WLAs and the calculated load reduction targets for PCBs and mercury are listed in Table 2-4. These load reduction targets form the goals for control measure implementation described in Section 3.

The calculated target for reduction of PCBs in stormwater runoff discharged from San Mateo County to the Bay is 1.5 kg/yr. For mercury, the modeled baseline load for San Mateo County is less than the mercury WLA established through the mercury TMDL, suggesting that the mercury WLA for stormwater in San Mateo County has already been achieved. That said, there is uncertainty in mercury baseline loads due to a relatively low level of confidence in the average stormwater runoff mercury concentrations developed via the RWSM (Wu et. al. 2017). Until more data are available, SMCWPPP and San Mateo County Permittees will continue to assume that control measures implemented to address PCBs in stormwater runoff are also sufficient to address mercury.

Table 2-4. PCB and Mercury Load Reduction Targets for San Mateo County.

	PCBs (kg/yr)	Mercury (kg/yr)
A. Baseline Load for San Mateo County (2002)	1.7	2.4
B. TMDL Waste Load Allocation	0.2	8.4
C. Load Reduction Target (A – B)	**1.5**	**NA**

3 CONTROL MEASURE IMPLEMENTATION

This section describes existing and potential future control measures that would achieve San Mateo County PCBs and mercury TMDL WLAs. Estimated PCBs and mercury load reductions achieved to-date and associated with the implementation of future potential source controls and GI by San Mateo County Permittees (or other permitted entities with land areas contributing PCBs to stormwater runoff in San Mateo County such as Caltrans) are included. The evaluation includes implementation scenarios for achieving the PCBs TMDL WLA based on three different timelines (through 2030, 2040, and 2080). Methods used to quantify load reductions for GI and source controls are described in detail in Appendix B and Appendix C, respectively.

Future actions that are assumed to be implemented by other entities are included in this Control Measures Plan because (as described in both the PCBs and mercury TMDLs) baseline loads and TMDL WLAs implicitly include loads and required load reductions from all permitted and non-permitted stormwater dischargers in the geographic area covered by the TMDL. Some, but not all, entities discharging stormwater in San Mateo County currently have NPDES permits or WDRs. Permits and WDRs other than the MRP, however, may not currently include specific PCBs and/or mercury control measure implementation requirements. Because land areas managed by these permitted and unpermitted entities contribute significant loads of PCBs to the Bay (see Section 2), load reductions in stormwater runoff associated with land areas owned, managed or impacted by these entities will be necessary to achieve the PCBs TMDL WLA for San Mateo County in an equitable manner. As such, these other entities that should participate in the implementation of PCBs control measures in San Mateo County are important partners in implementing the PCBs TMDL. Therefore, additional regulatory actions will likely be needed from the State and Regional Water Boards to mandate specific load reductions from all relevant entities in the County.

As described in Section 2, the baseline load for mercury appears to be lower than the TMDL WLA for San Mateo County. Therefore, control measures described in this section primarily focus on PCBs. To achieve the PCBs TMDL WLA, the overall target for reduction in the load of PCBs in stormwater runoff discharged from San Mateo County to the Bay is 1.5 kg/yr (Table 2-4). Estimated load reductions for each type of control measure and progress towards this overall PCBs load reduction goal are described below. The levels of control measure implementation described in this section are consistent with recent discussions with Regional Water Board staff regarding future MRP requirements.

3.1 Control Measure Categories and Overall Implementation Approach

As described in Section 1 and illustrated in Figure 2-1, PCBs are legacy pollutants that are largely associated with older (pre-1980) non-residential urban areas. Control measures that reduce PCBs in urban stormwater runoff that San Mateo County MRP Permittees have implemented to-date and plan to continue implementing can be organized into the following broad categories:

1) **Source Identification** - Identify PCBs sources (e.g., oil-filled electrical equipment) and source areas (e.g., historically contaminated old industrial properties) that release PCBs to urban stormwater runoff;
2) **Source Controls** - Implement source control measures focused on addressing PCBs from high priority sources (e.g., demolition of certain buildings) and source areas to prevent the release of PCBs to urban stormwater runoff;

3) **Treatment Controls** - Implement stormwater treatment controls (e.g., trash full capture systems). Track and account for the PCBs load reductions associated with the implementation of these measures and other treatment measures implemented as a result of new and redevelopment requirements in MRP Provision C.3; and
4) **GI Projects in the Public Right-of-Way (ROW)** - Where appropriate and cost-effective, use public resources to implement GI projects (i.e., regional stormwater capture, green streets) that generally have multiple benefits including addressing PCBs that are more widely distributed throughout the urban environment at relatively moderate levels and other pollutants.

Following this strategy, San Mateo County Permittees have made substantial progress to-date in reducing PCBs (and mercury) in stormwater runoff. The approach is consistent with the findings of the *Clean Watersheds for a Clean Bay* project (BASMAA 2017b), which was funded by the USEPA and MRP Permittees and documented the costs and benefits of implementing several different types of PCBs control measures.

3.2 Control Measure Implementation Overview

The remainder of Section 3 describes the suite of control measures included in each of this Control Measure Plan's three scenarios. The scenarios present actions for achieving the TMDL target by reducing the PCBs load in stormwater runoff from San Mateo County by 1.5 kg/yr by 2030, 2040, or 2080. Existing and planned PCBs source control measures, including non-GI treatment controls, are described in Section 3.3. Included are source control actions that will be implemented by San Mateo County Permittees and other entities that directly manage PCBs sources or source areas. It is important to note that San Mateo County Permittees do not have the authority to require implementation of control measures by these entities. PCBs load reduction estimates are included for each source control, along with a summary of the method used to quantify the load reduction (the methods are described in detail in Appendix C).

Section 3.4 describes the extent of GI that has been implemented to-date in San Mateo County and the level of GI that is anticipated to be implemented via new and redevelopment requirements in the future. Section 3.4 also includes associated PCBs load reductions via GI that were derived via methods described in the Phase II RAA Report (Appendix B).

Section 3.5 provides a summary of the progress made to-date and the anticipated PCBs load reductions through the implementation of the control measures described in Sections 3.3 and 3.4. For each of the three implementation scenarios, Section 4 discusses the economic and technical feasibility of implementing sufficient additional GI projects in the public ROW to achieve the PCBs TMDL WLA. As described in Section 4, source controls, including non-GI treatment controls, are the most cost-effective control measure that Permittees implement to reduce PCBs in urban stormwater runoff.

3.3 Source Controls Including Non-GI Treatment Controls

This section describes each type of source control measure, including non-GI treatment controls, that San Mateo County Permittees currently implement and/or plan to implement in the future to reduce PCBs (and mercury) in San Mateo County stormwater runoff. The extent of implementation and associated load reductions are also provided. The source control programs include the following:

1. Source Area Identification and Abatement
2. Management of PCBs during Building Demolition
3. Management of PCBs in Electrical Utilities
4. Management of PCBs in Roadway and Storm Drain Infrastructure Caulk
5. High Flow Capacity (Large) Trash Full Capture Systems
6. Enhanced Municipal Operation and Maintenance (O&M)
7. Mercury Load Avoidance

These controls may be implemented directly by San Mateo County Permittees and/or by other entities. Future Permittee actions include those included in current Permittee planning efforts and/or expectations about likely requirements in future iterations of the MRP. The estimated load reductions assume each program is fully implemented as described with the maximum load reductions realized.

Accounting methodologies were developed for each source control program to calculate the PCBs and mercury load reductions achieved for a given unit of implementation. The basis for a number of the source control load reduction accounting methodologies is the mercury and PCBs land use pollutant yields derived via the RWSM. As described in the MRP 2.0 Fact Sheet, a land use-based yield is an estimate of the mass of a contaminant contributed by an area of a particular land use per unit time. Yields vary among land uses for a number of reasons, including because land uses differ in their degree of contamination resulting from varying intensities of historic or ongoing use and/or release of pollutants to the environment. Because PCBs were used more heavily in older industrial areas, old industrial land use areas yield a relatively high mass of PCBs per unit area compared to other old urban areas and newer urban land use areas.

The average PCBs and mercury land use-based yields used to calculate load reductions for some source controls presented in this section are provided in Table 3-1 (Wu et. al. 2017). Details on the derivation of the yields are provided in Appendix C. The yield values presented in Table 3-1 were developed using the best readily available data and technical approach at this time. Permittees may re-evaluate these yields in the future as more information becomes available.

Table 3-1. Average PCBs and mercury land use yields established through the RWSM.[a]

Land Use Category	PCBs Yield (mg/ac-yr)[b]	Mercury Yield (mg/ac-yr)
Source Property	5,031	53
Old Industrial	259	53
Old Commercial / Old Transportation	49	57
Old Residential	2.8	57
New Urban	0.4	4
Agriculture/Open Space	0.4	81

[a]Source: Wu et. al. (2017), RWSM Toolbox v1.0 Pollutant Model, Pollutant Spreadsheet Model Calculations – Region. Spreadsheet dated 6/9/2017.

[b]mg/ac-yr – milligrams per acre per year

3.3.1 Source Area Identification and Abatement

Control Measure Description

The Source Area Identification and Abatement control measure focuses on old industrial land use areas or individual properties that contribute relatively high loads of PCBs to MS4s. Identification and subsequent abatement of these properties and/or focused control measure implementation in the public ROW adjacent to these source areas/properties can provide significant PCBs load reductions. Reductions mainly occur through the abatement of these areas/properties via referrals to the Regional Water Board leading to enforcement actions brought against property owners by the Regional Water Board or other regulatory agencies (e.g., USEPA).

To identify PCBs source areas, investigations are typically conducted in areas with historical (pre-1980) industrial land uses (i.e., old industrial land use) or other areas where PCBs were used, released, and/or disposed of and/or where sediment concentrations are elevated above urban background levels.[5] The source area investigation process includes the following steps:

1) **Screening to Identify High-Priority Catchments or Areas** (e.g., catchments that have elevated MS4 sediment and/or stormwater concentrations). Screening may involve visual inspections and review of land-use classifications and aerial photography followed up with surface soil/sediment sampling or stormwater sampling in public ROWs or from catchment outfalls.
2) **Targeted Investigation of High-Priority Catchments**. to identify specific source areas and/or individual properties. Targeted investigations generally include records review, public ROW surveys, property inspections, and sampling in public ROW areas and on private properties.

[5] See Appendix C for a statistical summary of urban sediment concentrations.

3) **Confirm source areas or properties**. Sources are confirmed if significantly elevated concentrations (e.g., a sediment PCBs concentration equal to or greater than 1.0 mg/kg, a sediment PCBs concentration equal to or greater than 0.5 mg/kg and other lines of evidence, or a particle concentration in stormwater greater than 0.5 mg/kg) are present in soil/sediment or stormwater from a property or adjacent public ROW.
4) **Determine next steps for confirmed source areas or properties**. Once a source area or property is confirmed, the Permittee may take actions to cause the property to be abated or may refer that property to the Regional Water Board to facilitate the issuance of orders for further investigation and remediation of the subject property.

For each referred source property, the applicable Permittee will implement or cause to be implemented one or a combination of interim enhanced operation and maintenance (O&M) measures in the street or storm drain infrastructure adjacent to the source area during the abatement process, or will implement a stormwater treatment system downstream of the source area to intercept historically deposited sediment. The intent is to prevent further contaminated sediment from being discharged from the storm drain system.

Source properties may also include industrial facilities with ongoing industrial activities that are covered under the General Permit for Stormwater Discharges Associated with Industrial Activities (Industrial General Permit) or another NPDES permit.

<u>Load Reduction Accounting Method</u>

The amount of PCBs loads (i.e., annual mass or mg/yr) reduced for source property identification and abatement is calculated as the difference between the source property yield of 5,031 mg/ac/yr and the old commercial/old transportation land use yield of 49 mg/acre/yr multiplied by the source property acres. (i.e., 5,031 – 49 mg/ac/yr). This method assumes that upon full abatement of the source property, the PCBs yield for that property will be reduced to the average old commercial/old transportation land use yield. In other words, abatement will reduce the PCBs yield by nearly 5,000 mg/yr for every acre that is abated.

Fifty percent (50%) of this load reduction will be credited to the Permittee for properties that are referred to the Regional Water Board for abatement at the time of referral provided that enhanced O&M measures or stormwater treatment are implemented or caused to be implemented in the vicinity of the source property to prevent further contaminated sediment from being discharged from the storm drain system. The remaining 50% load reduction will be credited to the Permittee upon completion of the abatement process or at ten years, whichever occurs first. The Regional Water Board will notify the Permittee when the abatement process is complete.

If a source property has been abated without referral to the Regional Water Board, either through voluntary actions by the property owner or using municipal enforcement powers, then 100% of the load reduction will be credited to the Permittee at the time that the abatement is complete.

There is no mercury load reduction credit given to PCBs source property referrals, as there is not a significant difference between the estimated mercury yield values for source property, old industrial, old residential, and old commercial/old transportation land use classes.

Estimated Load Reductions

Since about 2012, SMCWPPP and Permittees have identified and referred about 10 acres of source properties to the Regional Water Board for further investigation and abatement (Figure 3-1, Table 3-2). Fifty percent (50%) of the load reduction associated with abatement of these properties is currently reported as credited by San Mateo County Permittees. For all of these properties, the remaining 50% of the load reduction credit will be realized by 2030.

Areas in the City of San Carlos referred to as the Pulgas Creek pump station north and south drainages have been a particular focus for source property investigation work over the past 15 years. These primarily old industrial catchments have the most elevated concentrations of PCBs in MS4 sediment and stormwater runoff samples collected to-date in San Mateo County. Collectively they were designated as a “pilot watershed” for the grant funded Clean Watershed for a Clean Bay (CW4CB) project (CW4CB 2017a). Two potential source properties that have been identified in these drainages to-date are: (1) 977 and 1007/1011 Bransten Road and (2) 1411 Industrial Road. SMCWPPP and the City of San Carlos have referred the 977 and 1007/1011 Bransten Road Bransten Road property to the Regional Water Board and are working with the property owner on next steps at the 1411 Industrial Road property. The property owner is working with Regional Water Board staff and has retained a consultant to investigate potential sources of PCBs associated with the property.

Table 3-2. PCBs load reductions to-date in San Mateo County and potential future load reductions based on planned implementation.

Status of Source Areas	Source Area Identified (acres)	Cumulative PCBs Load Reduction (g/yr)			
		By 2020	By 2030	By 2040	By 2080
Referred by 2020; abated by 2030	10.1	25	50	50	50
Referred by 2030; abated by 2040	4.8	--	12	24	24
Referred by 2040; abated by 2050	5.3	--	--	13	26
Totals	**20.2**	**25**	**62**	**88**	**101**

Prior to WY 2017, PCBs were found in sediments from inlets and manholes in the vicinity of Center, Washington and Varian Streets and Bayport Avenue in the Pulgas Creek pump station south drainage in San Carlos. The PCBs in these samples could have originated from any of about 20 small industrial properties in the area. During WY 2017, seven additional samples were collected in this area. The results suggested that three small properties could be PCBs sources. Two samples collected from the driveways of 1030 Washington Street, a construction business, had elevated PCBs (1.29 and 3.73 mg/kg). A sample from the driveway of 1029 Washington Street was also elevated with a concentration of 5.64 mg/kg. In addition, samples from the driveway of 1030 Varian Street, an unpaved lot used for storage, had an elevated PCBs concentration of 1.84 mg/kg. It should be noted that all of the buildings in this area appear to be of the type and age that may have PCBs in building materials. SMCWPPP plans to collect additional sediment samples in the vicinity of these properties during September 2020.

Another source property identified through SMCWPPP's investigations is located at 270 Industrial Road / 495 Bragato Road in San Carlos. 270 Industrial Road is occupied by the Delta Star facility where transformers are manufactured, including transformers with PCBs historically (from 1961 to 1974). Adjacent to 270 Industrial Road is 495 Bragato Road (Tiegel Manufacturing), a roughly three-acre site that is largely unpaved. PCBs appear to have migrated to this property from the Delta Star property.

In October 2018, SMCWPPP and the City of San Carlos worked together to submit two source property referrals (both in San Carlos) to the Regional Water Board:

- 270 Industrial Road / 495 Bragato Road, San Carlos (Delta Star / Tiegel)
- 977 and 1007/1011 Bransten Road, San Carlos

It should be noted that the PCBs load reduction credited when a source property is referred to the Regional Water Board is directly proportional to the area of the referred property (acres is the unit used in the load reduction calculation). In September 2018, SMCWPPP conducted an analysis of total industrial area and average industrial parcel size among the four most populous counties in the MRP area, based on county assessor parcel data. Table 3-3 and Figure 3-2 show the results (it is important to note that the y-axis of Figure 3-2 is on a log scale). The total industrial acreage and average industrial parcel size are much lower in San Mateo County relative to the other counties, illustrating the challenge for San Mateo County Permittees to achieve PCBs load reductions via source property referrals compared to the other counties. In particular, even though the total population of Contra Costa County is roughly only 50% greater than San Mateo County, the total industrial acreage and average industrial parcel size in Contra Costa County exceeds San Mateo County by roughly a factor of four and six, respectively.

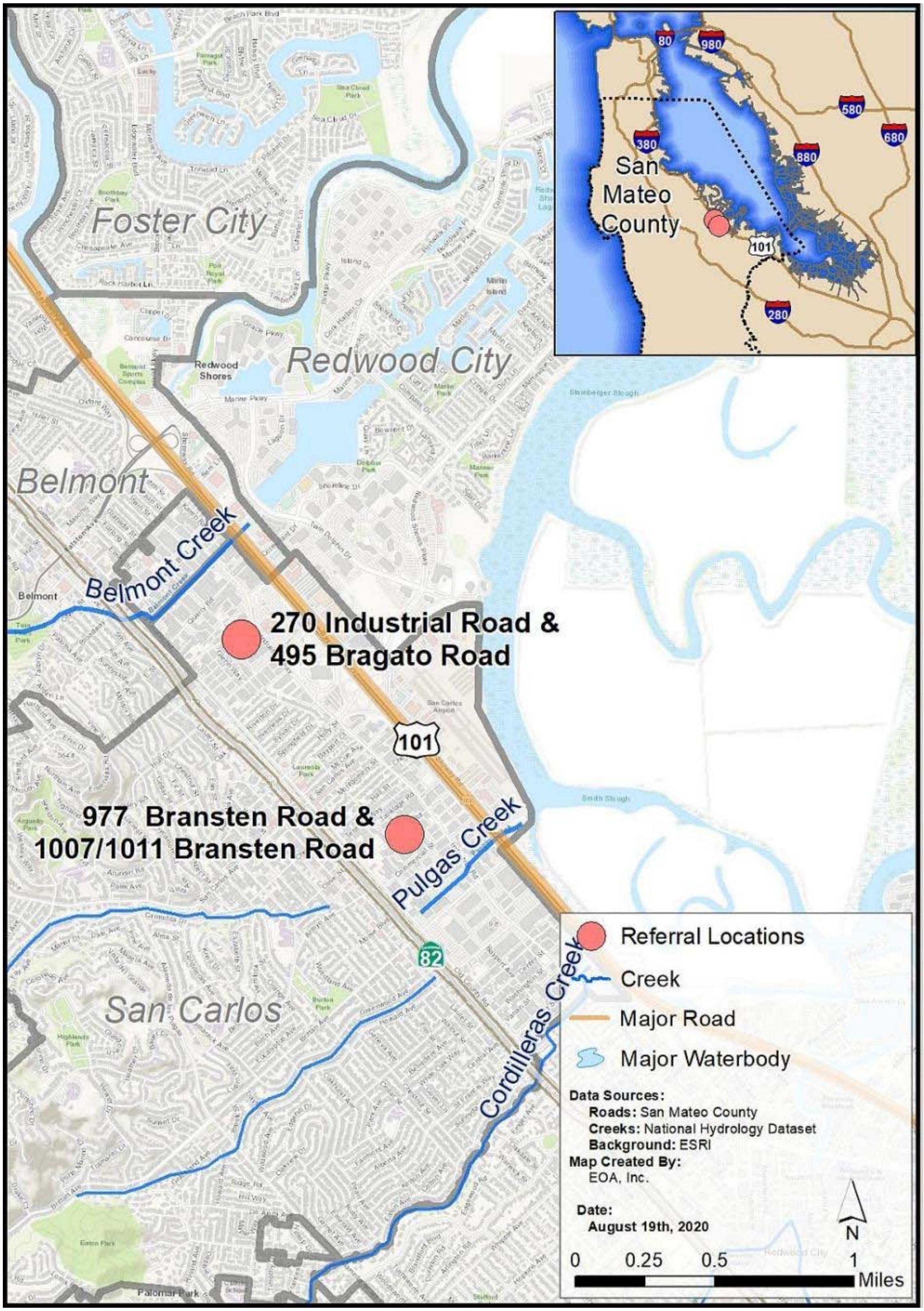

Figure 3-1. Locations of source properties referred to-date to the Regional Water Board for follow-up investigation and abatement.

Table 3-3. Total Industrial Acreage and Average Industrial Parcel Size in Most Populous MRP Counties

	San Mateo County	Alameda County	Contra Costa County	Santa Clara County
Total Industrial Area (acres)	3,043	14,034	12,833	16,039
Average Industrial Parcel Size (acres)	1.25	2.03	7.55	3.00

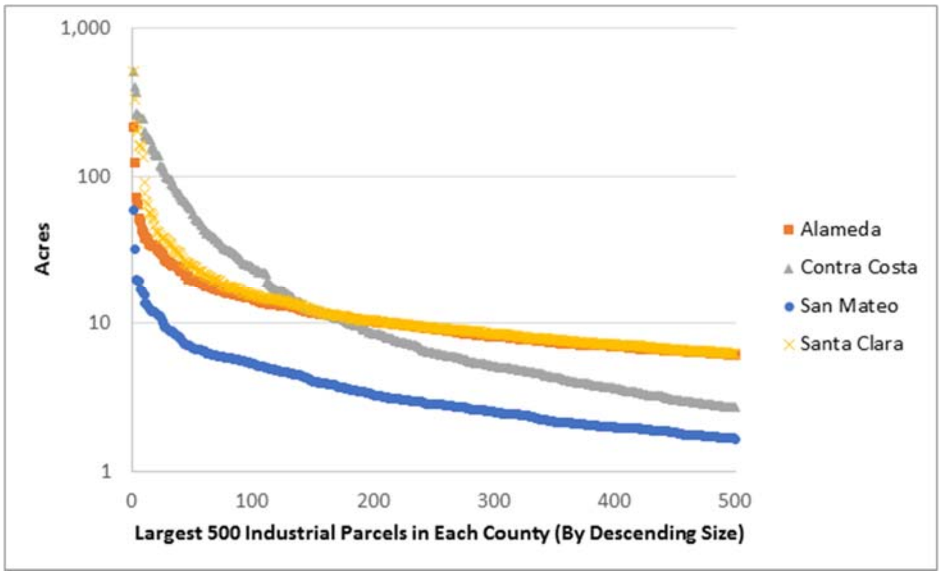

Figure 3-2. Area of 500 Largest Industrial Parcels in Most Populous MRP Counties

San Mateo County Permittees are planning to continue investigating old industrial land-use areas to identify additional source areas. Full implementation of this control measure entails investigation of all remaining old industrial areas that have not yet been investigated, and identification, referral and abatement of any source properties or source areas identified through these investigations. The potential future load reductions based on full implementation of this control measure were estimated using the following assumptions:

- Based on the rate of investigation to-date, SMCWPPP estimates it could take 10 to 20 years to investigate all of the remaining old-industrial areas that have not yet been screened or investigated.
- Assumed rates of source area identification per acre of old industrial land use area investigated were developed to estimate the potential future source area acres identified and abated through this program. The rate of acres of source property identified per acre of old-industrial land-use investigated to date is approximately 2.5%. Acknowledging that the efforts conducted to-date have focused on the most likely candidates for containing source areas, the rate of source area identification may go down in the future. A 1% source area identification rate for 25% of the remaining old industrial area and a 0.5% source area identification rate for the rest of the remaining old industrial area was assumed.

Based on these assumptions, SMCWPPP estimates that an additional 10 acres of source areas will be identified once investigations of the remaining old-industrial areas that have not yet been screened or investigated are complete. This value is equal to acreage that has been identified to-date (Table 3-2). The timing of when the full load reduction credit will be granted depends on when the investigations are completed and when all referrals are submitted to the Regional Water Board. The anticipated cumulative load reduction associated with this control measure by 2030, 2040 and 2080 is presented in Table 3-2. All source properties are assumed to be abated within 10 years of referral.

3.3.2 Management of PCBs during Building Demolition

Control Measure Description

MRP Permittees have developed and implemented a process, beginning in July 2019, for managing materials with PCBs concentrations of 50 ppm or greater in applicable structures at the time such structures undergo demolition. Applicable structures include commercial, public, institutional, and industrial buildings constructed or remodeled between the years 1950 and 1980 undergoing full-building demolition (Figure 3-3). Single-family residential and wood frame structures are exempt.

Figure 3-3. Demolition of a concrete slab building.

San Mateo County Permittees participated in a BASMAA regional project conducted over the past several years that developed regionally consistent model tools and guidance in order to assist Permittees in developing and implementing programs to control PCBs in building materials. All San Mateo County Permittees implemented this new program by July 1, 2019, as required by MRP Provision C.12.f. The programs generally follow the following process:

- Municipalities inform applicable demolition permit applicants that their projects are subject to the program for managing materials with PCBs, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.
- For every applicable demolition project, applicants implement the BASMAA protocol for identifying building materials with PCBs concentrations of 50 ppm and then complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality.
- The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
- The municipality then issues the demolition permit or equivalent, according to its procedures.
- The municipality sends each completed Screening Form for applicable structures and any supporting documents to its countywide program. The countywide program compiles the forms and works with the other MRP countywide programs to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

Load Reduction Accounting Method

Per the MRP 2.0 Fact Sheet, the regional load of PCBs reduced through implementation of the new program to manage PCBs during building demolition is 2 kg/yr beginning in July 2019. This value is based on assumptions about the number of applicable buildings demolished each year, the mass of PCBs per building, the fraction of PCBs that enters the MS4 during demolition without controls, and the fraction of PCBs prevented from entering the MS4 as a result of the program. The 2 kg/yr PCBs load reduction stipulated during MRP 2.0 will initially be retained during the MRP 3.0 permit term. As new data are generated by the new management program, the value of this load reduction will be evaluated and potentially revised.

Estimated Load Reductions

The PCBs load reductions due to implementation of the building materials management program beginning in July 2019 are based on a population-based proportion of the 2 kg/yr stipulated by MRP 2.0. This amounts to 247 g/yr of PCBs load reduction in San Mateo County.

3.3.3 PCBs in Electrical Utilities Management

Control Measure Description

PCBs are present in some electrical equipment still in service in San Mateo County and through on-going efforts the equipment and/or PCBs are being replaced. For example, Figure 3-4 shows pole-mounted electrical transformers with PCBs-containing oils that should be replaced. San Mateo County Permittees plan to participate in a PCBs in Electrical Utilities Management Program that will include improved practices and procedures for documenting removal and disposal of PCBs-containing oil-filled electrical equipment (OFEE). As part of this program, Permittee operated electrical utilities plan to document the removal of PCBs-containing OFEE since the start of the TMDL and in the future continue to remove PCBs in OFEE and provide data to support calculations of the associated stormwater load reductions due to these efforts. Additionally, it is anticipated that larger regional electrical utility (i.e., Pacific Gas and Electric Company) that is not currently subject to PCBs load reduction requirements will also remove PCBs in OFEE and document these efforts, consistent with methods used by applicable MRP Permittees. Because there are no Permittee-operated electrical utilities in San Mateo County, San Mateo County Permittee actions under this control measure will be limited to documenting anticipated load reductions due to an assumed level of effort implemented by PG&E to remove PCBs-containing OFEE in the County.

Figure 3-4. Pole-mounted electrical transformers with PCBs-containing oils.

Load Reduction Accounting Method

PCBs load reductions documented through implementation of this program will be calculated based on an assumed equipment removal rate (based on information provided by municipal electrical utilities in the Bay Area on equipment removals since 2002), and an assumed PCBs load to stormwater from electrical utility equipment at the start of the PCBs TMDL. These methods are fully described in the Phase III RAA Report (Appendix C).

Estimated Load Reductions

Electrical utilities in the Bay Area have removed PCBs-containing OFEE from active service since 2002, as documented in the Regional Stressor/Source Identification (SSID) project report that is included as an appendix to the Phase III RAA Report (Appendix C). Removal of PCBs-containing equipment stops any active PCBs releases and prevents future PCBs releases from occurring. Therefore, each piece of PCBs-containing OFEE that is removed from service and disposed of property represents an additional mass of PCBs that is prevented from potential future release to the MS4. Based on the equipment removal rates documented in Appendix C, approximately 26 g/yr of PCBs have been prevented from release to the MS4 in San Mateo County through 2020 (Table 3-4). All of these load reductions are assumed to result from PCBs-containing OFEE removal by PG&E.

Electrical utility equipment removals are expected to continue at a similar rate in the future, providing an additional 136 g/yr of potential future load reductions within San Mateo County once all PCBs-containing OFEE have been removed from active service. Equipment removals are expected to occur gradually over time. The resultant estimated load reductions are shown in Table 3-4. Based on current removal rates, all PCBs-containing OFEE will be removed from active service by approximately 2080.

Table 3-4. Estimated PCBs load reductions in San Mateo County via the implementation of the electrical utilities' management program.[1]

Control Measure	Cumulative PCBs Load Reduced (g/yr)			
	By 2020	By 2030	By 2040	By 2080
PCBs-Containing OFEE Removal	26	44	62	136

[1]All PCBs loads reduced in San Mateo County due to the PCBs in Electrical Utilities Management Program are assumed to result from past and future equipment removal activities conducted by PG&E.

3.3.4 PCBs in Roadway and Storm Drain Infrastructure Caulk Management

Control Measure Description

The PCBs in Roadway and Storm Drain Infrastructure Caulk Management Program was developed to reduce the release of PCBs during demolition of bridges and overpasses. For this control measure, Permittees will track the development of a Caltrans specification for managing PCBs-containing caulks and sealants on bridges and roadway overpasses during bridge replacement or joint maintenance (Figure 3-5). The new Caltrans standard specification for removal, handling, and disposal of caulk or sealant materials during infrastructure replacement or joint maintenance projects will be used to prevent the release of PCBs to stormwater. Applicable structures include those built between 1950 and 1980 when PCBs-containing joint sealants and caulk were available. As part of this program, Permittees will maintain lists of applicable bridges and overpasses within their jurisdiction that are scheduled for replacement or joint maintenance, and track and report on the use of the new Caltrans specification. Additional details about the PCBs in Roadway and Storm Drain Infrastructure Caulk Management Program are provided in Appendix C.

Figure 3-5. PCBs-containing black caulk materials on a roadway overpass structure.

Load Reduction Accounting Method

In order to estimate the load reduction that will be realized through implementation of the PCBs in Roadway and Infrastructure Caulk Management Program, Permittees identified the number of applicable bridges and overpasses within their jurisdictions that are expected to undergo replacement or joint maintenance. Estimates were made to quantify the average mass of PCBs potentially contained in these structures, combined with estimates of the ongoing PCBs release rate from bridge joints that would be prevented during replacement or joint maintenance due to implementation of the new Caltrans specification. The load reduction estimate is based on the assumption that PCBs in caulk are leaching from bridge joints and longitudinal seals over their lifetime. When that PCBs-containing caulk is replaced or removed through maintenance or replacement projects, the source of PCBs release is removed, and the associated annual load is also removed. This is based on the assumption that ongoing leaching of PCBs from the material could occur through incremental wear or through larger damage (e.g., pieces of caulk torn out) over the lifetime of the caulk.

An average annual release rate (i.e., average over the life of the seal) of 0.5% was assumed to calculate the estimated load reduction from removing the joint seal. This average annual release rate was applied to the estimated mass for all bridges in San Mateo County that meet the identified age criteria. These releases would be eliminated through joint or bridge replacement.

Estimated Load Reductions

This control measure program has not yet been implemented in San Mateo County. The potential PCBs load reduction that can be achieved through full implementation of the PCBs in Roadway and Storm Drain Infrastructure Caulk Management Program in San Mateo County is 36 g/yr. This is the total amount of PCBs load reduction that is assumed to be realized once the program has been fully implemented by Permittees and other non-MRP entities, and all applicable structures have been replaced and/or maintained. This load reduction is expected to occur gradually over the next 60 years under the assumption that all older joints will be removed or replaced within 100 years of installation (i.e., by 2080). Table 3-5 identifies the assumed future load reductions to be realized by 2030, 2040, and 2080.

Table 3-5. Estimated PCBs load reductions in San Mateo County via the implementation of the PCBs in roadway and storm drain infrastructure caulk management program post-2020.

Control Measure	Cumulative PCBs Load Reduction (g/yr)		
	By 2030	By 2040	By 2080
Use of Caltrans specification during applicable bridge replacement or joint maintenance	6	12	36

3.3.5 High Flow Capacity (Large) Trash Full Capture Systems

Control Measure Description

This control measure includes the implementation of high flow capacity (large) trash full capture systems, including hydrodynamic separator (HDS) units, gross solids removal devices (GSRDs), and baffle boxes (Figure 3-6). These types of systems have been installed in urban areas for the purposes of MRP Provision C.10 compliance. These devices trap all particles retained by a 5 mm mesh screen and have a design treatment capacity of not less than the peak flow rate resulting from a one-year, one-hour, storm. Large full trash capture devices typically treat large drainage areas (tens to hundreds of acres).

Figure 3-6. Two types of high-capacity trash full capture systems (HDS above, baffle box below).

Load Reduction Accounting Method

The load of PCBs or mercury in stormwater that is reduced by High Flow Capacity Trash Full Capture Systems is calculated by multiplying the drainage area treated by the system by the PCBs or mercury yield of the drainage area, and an assumed load reduction efficiency factor for the system. The drainage area PCBs and mercury yields are calculated as an area-weighted yield based on the acres of each land use class within the drainage area. Load reduction efficiency factors for each type of device were developed using the best available data, as reported in detail in Appendix C. For both HDS units and baffle boxes, the assumed load reduction efficiency factor is 20%. For GSRDs, the assumed load reduction efficiency factor is 14%. This methodology indicates that these systems reduce the PCBs and mercury loads from the drainage area by 14% to 20%.

Estimated Load Reductions

A total of 75 High Flow Capacity Trash Full Capture Systems have been installed to-date in San Mateo County. These devices treat about 1,836 acres of land area, including 80 acres of old industrial and 406 acres of old urban – other (commercial/transportation) land uses (Table 3-6). The land-use classifications of the drainage areas treated by these systems that have been installed since 2002 are shown in Table 3-6, along with the count of each system type and the total PCBs load reductions achieved through 2020. In total, these systems have reduced 7 g/yr of PCBs. For PCBs and mercury control measures planning purposes, no additional High Flow Capacity Trash Full Capture Systems are included in load reduction estimates post-2020; however, additional systems may be implemented to further address trash load reduction requirements.

Table 3-6. Summary of High Flow Capacity (Large) Trash Full Capture Systems in San Mateo County that drain to the Bay and associated load reductions by 2020.

Device Type	Number of Devices	Area Treated (acres)	Area Treated by Land Use (acres)					PCBs Loads Reduced by 2020 (g/yr)
			Old Industrial	Old Urban-Other	Old Urban - Residential	New Urban	Ag/ Open	
Baffle Boxes	1	290	17	58	216	--	--	1.6
GSRD	3	1,521	56	330	1,064	--	71	4.7
HDS	1	25	7	18	--	--	--	0.5
Totals	**5**	**1,836**	**80**	**406**	**1,280**	**0**	**71**	**7**

3.3.6 Enhanced Operations and Maintenance Controls

Control Measure Description

All San Mateo County Permittees conduct routine O&M activities to ensure the proper functioning of their stormwater conveyance systems. Operation and maintenance activities include street sweeping, storm drain inlet cleaning, and pump station maintenance. In addition, culverts and channels are maintained (e.g., desilted) as needed. Through these efforts, sediment and organic material (and associated pollutants) are removed from the stormwater conveyance system. This control measure includes any enhancements to routine O&M and new actions such as storm drain line and street flushing.

Figure 3-7. Operation and maintenance of an inlet-based trash control measure.

Inlet-based (small) trash full capture systems are devices or series of devices that trap all particles retained by a 5 mm mesh screen and have a design treatment capacity of not less than the peak flow rate resulting from a one-year, one-hour, storm in the tributary drainage catchment area. Inlet-based systems typically treat one acre or less and generally consist of screens or baskets that are installed in storm drain inlets. These devices may be installed in series to cumulatively treat larger areas. In recent years, many San Mateo County Permittees have increased cleaning frequencies due to additional maintenance requirements for newly installed inlet-based devices (Figure 3-7).

Other types of enhanced O&M are not discussed further in this report because no other enhancements are ongoing in the County and none is currently planned for future implementation on a regular basis. However, if other types of enhanced O&M occur in the future, they will be tracked and load reductions will be calculated per the methods described in Appendix C.

Load Reduction Accounting Method

To account for PCBs and mercury load reductions from enhanced cleaning of inlet-based devices, the area-weighted PCBs or mercury land-use based yield is calculated for the appropriate drainage area and multiplied by an assumed efficiency factor of 18%. This efficiency factor was developed based on available data on sediment removal efficiencies for twice annual cleanout of inlets that have devices. Additional details on the accounting methodology and the data used to develop the efficiency factor is provided in Appendix C.

Estimated Load Reductions

To date, 3,571 inlet-based devices that are treating almost 5,800 acres have been installed within San Mateo County. Enhanced cleaning combined with the additional sediment removal associated with these devices is currently providing 76 g/yr of PCBs load reductions (Table 3-7).

Table 3-7. Summary of enhanced operations and maintenance program implementation in San Mateo County and associated load reductions by 2020 and 2030.

Status	Number of Devices	Total Acres Treated	Area Treated by Land Use (acres)					PCBs Loads Reduced (g/yr)
			Old Industrial	Old Urban-Other	Old Urban - Residential	New Urban	Ag/ Open	
Existing (2020)	2,247	5,754	1,299	1,656	2,481	38	278	76

3.3.7 Mercury Load Avoidance and Reduction Program

Control Measure Description

Mercury load avoidance and reduction includes a number of true source control measures listed in the California Mercury Reduction Act which was adopted by the State of California in 2001. These source controls include material bans, reductions of the amount of mercury allowable for use in products, and requirements for mercury-containing device recycling (Figure 3-8). The following source control bans are included:

- Sale of cars that have light switches containing mercury;

- Sale or distribution of fever thermometers containing mercury without a prescription;
- Sale of mercury thermostats; and,
- Manufacturing, sale, or distribution of mercury-added novelty items.

Figure 3-8. Fluorescent lightbulbs recycled via the countywide Household Hazardous Waste (HHW) Program.

In addition, fluorescent lamp manufacturers continue to reduce the amount of mercury in lamps sold in the U.S. Manufactures have significantly reduced the amount of mercury in fluorescent linear tube lamps and streetlamps. The use of mercury containing bulbs has also decreased through replacement of these bulbs with LED bulbs.

Mercury device recycling programs resulting in mercury load reduction generally include three types of programs that promote and facilitate the collection and recycling of mercury–containing devices and products:

1. Permittee-managed household hazardous waste (HHW) drop-off facilities and curbside or door-to-door pickup;
2. Private business take-back and recycling programs (e.g., Home Depot); and,
3. Private waste management services for small and large businesses.

<u>Load Reduction Accounting Method</u>

To account for the current level of load reduction achieved through recycling of mercury-containing lamps, switches and thermostats, data collected by the San Mateo County Environmental Health HHW Program are compiled annually. These data provide the total mass of mercury that is collected through the program each year. To estimate the load avoided by collection and proper recycling, it is assumed that 4.8% of the mercury contained in these devices would have been transported to the Bay via urban stormwater if improperly discarded. Appendix C provides additional details on the methodology and data inputs used to calculate the mercury load avoided due to the HHW recycling program.

<u>Estimated Loads Avoided</u>

Based on the annual average mass of mercury collected by the San Mateo HHW program during recent years, the total annual load of mercury avoided is estimated to be about 50 g/yr. The mass of mercury recycled each year is expected to decrease over time as less mercury is used in household products.

3.4 Green Infrastructure

This section provides an overview of the different types of GI projects that remove pollutants in stormwater runoff from San Mateo County watersheds draining to the Bay, and documents the magnitude and extent of implementation and the associated load reductions achieved to date (2002 to 2020). GI implementation projected to occur in the future as a result of MRP Provision C.3 new and redevelopment requirements and associated load reductions over time are also summarized.

The construction of GI facilities in San Mateo County has and will continue to provide significant benefits to stormwater quality and support reductions of PCBs and mercury loads to the Bay. GI facilities include infrastructure that uses vegetation, soils, and natural processes to improve water quality.

There are three main categories of GI facilities, which are largely based on their location and extent of upstream catchment area:

1. **Parcel-based New and Redevelopment Projects**. These projects include Low Impact Development (LID) treatment measures that are designed to capture/treat runoff generated on a parcel. LID measures are implemented during development or re-development of a parcel and are currently required by the MRP for any project creating or replacing greater than 10,000 square feet[6] of impervious area. These projects can be located on either publicly- or privately-owned parcels.
2. **Green Street Projects in the Public ROW**. These projects include GI facilities that are located along or within a street or public ROW. They are typically designed to capture and treat runoff from the street and possibly portions of adjacent parcels.
3. **Regional Stormwater Capture Projects**. These projects include GI measures that capture runoff from off-site areas. Typically located on publicly owned lands, development and implementation of regional stormwater capture projects may involve collaboration among multiple municipalities and/or public agencies to construct large facilities that capture and treat stormwater from large drainage areas. Collaboration among multiple jurisdictions may allow for larger projects with greater economies of scale, specifically cost-sharing opportunities and greater flood control and pollutant reduction capacity.

The most common types of GI facilities that are constructed in urban areas include bioretention, tree well filters, pervious pavement, infiltration facilities, green roofs, and rainwater harvesting and use facilities.

3.4.1 Existing GI Projects

As described in previous Control Measure Plans submitted during MRP 2.0 and Section 5, numerous GI facilities treating thousands of acres of land in San Mateo County have been implemented on public and private properties as a result of new and redevelopment stormwater requirements in MRP Provision C.3 (C.3 requirements). Permittees have little control over the pace and extent to which private redevelopment occurs, however, as redevelopment projects are permitted, Permittees ensure that stormwater treatment controls are incorporated into those projects per C.3 requirements. Permittees currently track the installation of these projects to ensure proper maintenance and operation and to demonstrate pollutant load reductions and will continue to do so in the future.

Figure 3-9. Hillside Boulevard green street project, Colma, CA.

In addition to parcel-based new and redevelopment GI projects, a number of other GI facilities have been implemented by San Mateo County Permittees on public property or within the public ROW (Figure 3-9). Similar to GI facilities on

[6] Per MRP Provision C.3 requirements.

private property, Permittees currently track the installation of public GI facilities to ensure proper operation and maintenance, and to assist with demonstrating pollutant load reductions.

The Phase II RAA model (Appendix B) estimates the PCBs and mercury load reductions that have been achieved since the start of the TMDLs (i.e. between 2002 and 2020) due to all existing GI projects in San Mateo County.

3.4.2 Projected Future GI Associated with New and Redevelopment

Based on projected levels of redevelopment in San Mateo County, SMCWPPP anticipates that the number of parcel-based GI facilities will continue to grow in San Mateo County in future decades. The load reduction predicted for San Mateo County by 2030 and by 2040 through future parcel-based new and redevelopment projects is based on an analysis of projected development rates across the county that is described in Appendix B. The average rate of redevelopment from 2020-2040 was used to estimate future PCBs load reductions through 2080 as a result of GI implementation (Table 3-8).

Table 3-8. PCBs loads reduced due to GI implementation to-date and projected future GI implementation associated with new and redevelopment in San Mateo County.[1]

Pollutant	GI Type	Cumulative Load Reduction (g/yr)			
		By 2020	By 2030	By 2040	By 2080
PCBs	Existing GI Projects (includes both public and private projects)	65	65	65	65
	Anticipated Future Parcel-based GI via New and Redevelopment Projects (includes both public and private projects)	--	40	69	208

[1] Load reductions due to anticipated future parcel-based GI facilities occurring via new and redevelopment projects are based on projected development rates San Mateo County described in Appendix B.

3.5 Summary of PCBs Load Reductions via Existing and Planned Control Measures

As presented in this section under each control measure, San Mateo County Permittees have made substantial progress in reducing the loads of PCBs and mercury in stormwater since the TMDLs were established in the early 2000s. Table 3-9 summarizes all PCBs load reductions achieved to-date (through 2020) and the load reductions anticipated to occur over time as a result of future GI and source control measure implementation documented in Sections 3.3 and 3.4. Load reductions associated with future GI (i.e., beyond 2020) in the public ROW (e.g., green streets and regional stormwater capture projects) are not included in Table 3-9. Through the implementation of source control programs and GI, about 30% of the load reduction needed to achieve PCBs TMDL WLA for San Mateo County stormwater has been achieved to-date. For mercury, the modeled baseline load in San Mateo County is less than the TMDL WLA, suggesting that the WLA for mercury has been achieved, though there are uncertainties around this conclusion. GI and many of the source controls documented in Sections 3.3 and 3.4 and those discussed later in Section 4 have (or will have) further mercury load benefits.

Permittees anticipate continuing and expanding the implementation of mercury and PCBs controls measures over time, consistent with requirements included in future iterations of the MRP. These Permittee actions, in concert with actions taken by other entities in San Mateo County, are anticipated to address a portion of the PCBs load reduction target of 1.5 kg/yr. Based on load reductions anticipated to occur over time, a load reduction gap will likely remain for the 2030, 2040, and 2080 implementation timelines, once existing and planned control measure are accounted for. These predicted load reduction gaps are further described in Section 4 along with the technical and economic feasibility of three control measure implementation scenarios designed to address these gaps.

Table 3-9. Summary of existing (2002-2020) and projected future PCBs load reductions as a result of stormwater control measure implementation (excluding future GI in the public ROW) in San Mateo County over three implementation timeframes (through 2030, 2040 and 2080).

Control Measure		Estimated PCBs Load Reduction (g/yr)			
		By 2020	**By 2030**	**By 2040**	**By 2080**
Source Area Identification, Referral, and Abatement		25	62	88	101
PCBs Management during Building Demolition		247	247	247	247
High Flow Capacity (Large) Trash Capture Systems		7	7	7	7
Enhanced O& M - Enhanced Cleaning of Inlet-based Trash Full Capture Systems		76	76	76	76
PCBs in Electrical Utilities Management		26	44	62	136
PCBs in Roadway and Storm Drain Infrastructure Caulk Management		--	6	12	36
Green Stormwater Infrastructure (GI)[1]	Existing Projects (public and private)	65	65	65	65
	Future Parcel-based GI via New and Redevelopment (public and private)	--	40	69	208
	Totals	**447**	**548**	**625**	**875**
Load Reduction Needed to Achieve TMDL WLA		*1,500*			
Percent of Load Reduction Needed to Achieve TMDL WLA		**30%**	**37%**	**42%**	**58%**

[1]Load reductions associated with future anticipated GI (i.e., beyond 2020) in the public ROW (i.e., numerous green streets and regional stormwater capture projects currently under various stages of planning or development, see Section 6.2) are not included in this table.

4 ECONOMIC AND TECHNICAL FEASIBILITY OF ACHIEVING THE PCBs TMDL LOAD REDUCTION TARGET

This section evaluates the economic and technical feasibility of attaining the PCBs TMDL load reduction target for San Mateo County (i.e., 1.5 kg/yr), including the load reduction gap anticipated to occur after the existing and projected control measures in Section 3 are implemented (Table 4-1). Three control measure implementation scenario timelines (i.e., 2030, 2040 and 2080) are evaluated. Including three implementation scenarios, rather than just the current PCBs TMDL timeline (i.e., achieve PCBs TMDL WLA by 2030), allowed for a consideration of a range of implementation timeframes. In addition, including the 2080 scenario allowed for a better evaluation of certain source controls that are mainly implemented by entities other than San Mateo County Permittees: (1) Management of PCBs in Electrical Utilities, and (2) Management of PCBs in Roadway and Storm Drain Infrastructure Caulk. These measures are outside of Permittees' control and their timelines for implementation are anticipated to occur beyond the current TMDL target date. It is anticipated that complete implementation of these measures will take many decades, as detailed Appendix C. All PCBs-containing OFEE will be removed from active service and PCBs caulks will be removed from bridges/overpasses infrastructure by approximately 2080. Thus, the approximate date by which these source controls will achieve their maximum load reduction potential is 2080 and this timeline was included in an implementation scenario.

Table 4-1. Summary of existing (2002-2020) and future estimated PCBs load reductions as a result of stormwater control measure implementation in San Mateo County and the resulting load reduction gaps for three implementation scenarios timeframes (through 2030, 2040 and 2080).

	Estimated Cumulative PCBs Load Reduction (g/yr)			
	By 2020	By 2030	By 2040	By 2080
Existing and Planned Control Measures	**447**	**548**	**625**	**875**
Load Reduction Needed to Achieve TMDL WLA	***1,500***			
Load Reduction Gap	***1,053***	***952***	***875***	***625***

Each implementation scenario described in this section largely relies on the expanded implementation of GI projects in the public ROW. The economic feasibility of each scenario was evaluated based on a comparison of current and estimated future costs to San Mateo County Permittees to implement sufficient source controls and GI to address the PCBs load reduction gap. Technical feasibility was primarily evaluated based on the feasibility of planning, siting, designing, and constructing sufficient GI projects in the public ROW to bridge the PCBs load reduction gap within the scenario timeframes. Potential environmental impacts associated with this plan and the implementation timelines are also described.

4.1 Potential Additional Load Reductions via GI Projects in the Public ROW

The PCBs load reduction scenarios were developed in part to evaluate the feasibility of filling the load reduction gaps identified in Table 4-1 via public GI projects. The number of additional GI projects are anticipated to increase in the future in San Mateo County as a result of the development of Permittee GI plans under MRP 2.0. Project prioritization will likely be based on a number of factors, which may include PCBs and mercury load reduction potential. Modeling conducted as part of the Phase II RAA for GI (see Appendix B) was utilized to identify the extent of GI projects that would be needed to address the load reduction gaps listed in Table 4-1. The GI model builds on the baseline RAA model summarized in Section 2 and detailed in the Phase I RAA Report (Appendix A) to estimate loads reduced by current and potential future GI and demonstrate the amount of GI needed to achieve MRP 2.0 load reduction targets. The GI load reduction targets under MRP 2.0 and the model and model outputs are summarized below and detailed in the Phase II RAA Report (Appendix B). See Section 6.2 for a summary of C/CAG and San Mateo County Permittee efforts to advance GI projects in the County.

4.1.1 GI Load Reduction Targets in MRP 2.0

MRP 2.0 identifies a regionwide load reduction target via GI of 3.0 kg/yr PCBs by 2040. This represents approximately 20.8% of the total PCBs TMDL stormwater load reduction target of 14.4 kg/yr. The San Mateo County Permittee portion of the GI load reduction goal was calculated to be 0.23 kg/yr (Appendix A). Thus, San Mateo County Permittees have identified the level of GI implementation that would collectively need to be implemented to demonstrate a PCBs load reduction of 0.23 kg/yr by 2040. A GI model was developed to estimate the type and amount of GI projects that would provide this level of PCBs load reduction by 2040, as required by the MRP 2.0 (Appendix B).

4.1.2 GI Model Methods and Outputs

As described in Section 2, the refined baseline model uses LSPC to provide hourly simulation of historical hydrology and pollutant loads for San Mateo County watersheds discharging to the Bay. The GI modeling approach for conducting the RAA builds on the baseline model to quantify the load reductions associated with existing, planned, and potential future GI projects. The RAA model for GI links the baseline model with a GI performance model based on the System for Urban Stormwater Treatment & Analysis Integration (SUSTAIN). SUSTAIN simulates flow and pollutant transport routing through various types of GI projects and includes a cost-benefit optimization model to quantify the implementation costs associated with various types of GI projects (USEPA 2009, Riverson et al. 2014).

GI projects were represented in the model based on the best available information about existing, planned, and potential future GI implementation in San Mateo County at the time of model development (2017-2018). Each type of project included in the model and the source of information for that project type are identified here:

- **Existing Projects.** SMCWPPP compiled a dataset of GI projects that were constructed in San Mateo County between 2002 and 2018 (see Section 5.2). These projects include both public green street projects and GI associated with new/redevelopment projects.
- **Future New and Redevelopment.** SMCWPPP conducted an analysis that projected acres addressed by future new and redevelopment on private parcels in San Mateo County subject to MRP Provision C.3 regulations between 2018 and 2040.

- **Regional Projects.** SMCWPPP's Stormwater Resources Plan (SWRP) (SMCWPPP 2017c) and subsequent planning efforts by SMCWPPP identified five initial opportunities for regional stormwater capture projects in San Mateo County. Conceptual designs were developed for each project, which aided in model setup to represent the stormwater capture and treatment processes unique to each project. All five of these initial regional project opportunities were included in the GI RAA model. Due to various project-specific barriers, some of these projects may be substantially modified or never built. However, as discussed later, SMCWPPP and San Mateo County Permittees are exploring many other opportunities to advance GI in the County, including potential additional regional stormwater capture projects (see Section 5).
- **Green Streets.** The SWRP prioritized green street opportunities in San Mateo County as "Low," "Medium," and "High." Each of these categories of prioritized green street opportunities were included separately in the GI RAA model.
- **Other GI Projects.** This category is a placeholder in case the above projects are inadequate to achieve needed load reductions. This category can include all of the GI project types and other project opportunities that have not yet been identified.

For each project category (e.g., parcel-based, green streets, regional stormwater capture projects), the GI RAA model applied a set of assumptions to evaluate treatment and stormwater management effectiveness. Both parcel-based new and re-development projects (i.e., LID) and green streets were represented in the model as bioretention (with and without underdrains as appropriate). For the five Regional Projects, the modeling assumptions were based on configurations outlined in each project's conceptual design.

The GI RAA model estimated the most cost-effective amount and types of GI that will need to be implemented by 2020, 2030, and 2040 to achieve the MRP 2.0 GI load reduction goal of 0.23 kg/yr by 2040 (Figure 4-1). The model-predicted sediment load reductions were used as a surrogate for PCBs load reductions associated with GI implementation.

The relative amount of GI needed spatially to meet the PCBs load reduction required by 2040 is discussed in the RAA Phase II Report included in Appendix B. That report includes maps for each municipal jurisdiction that shows the capacity of GI needed within each model subwatershed, with corresponding tables that outline the amount of each type of GI needed to cost-effectively meet those capacities.

Additional information on the GI RAA model development and results, including the Permittee specific load reduction targets for the amount and type of GI, are detailed in the Phase II RAA Report (Appendix B).

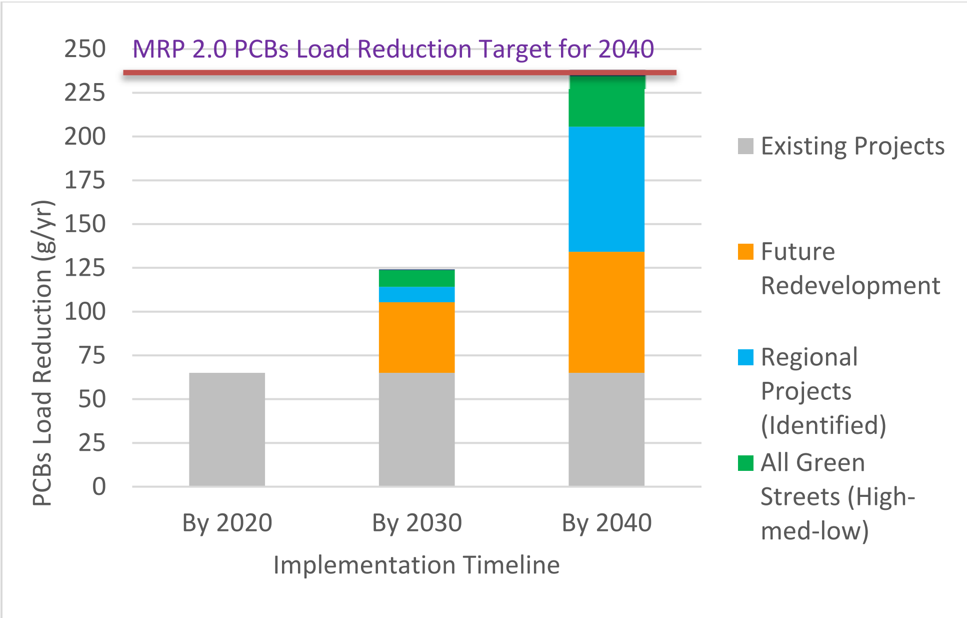

Figure 4-1. Combination of GI project types predicted to address the MRP 2.0 GI load reduction target (0.23 kg/yr) for San Mateo County.

4.2 Implementation Scenarios for Additional Control Measures

The GI RAA modeling described in Section 4.1 was primarily conducted to identify the level of GI implementation that would be needed to achieve the MRP 2.0 GI load reduction target for San Mateo County (i.e., 0.23 kg/yr). The GI modeling was extended beyond the MRP 2.0 target to estimate the extent of additional public GI projects that would be needed to address the load reduction gaps shown in Table 4-1, which would address the overall PCBs load reduction target (i.e., 1.5 kg/yr) within the 2030, 2040 and 2080 implementation timelines. The results of the extended modeling are presented below within the context of three conceptual public GI implementation scenarios. The control measure implementation for the three scenarios and the associated load reductions for each type of control measure are shown in Figure 4-2 and discussed in the following sections.

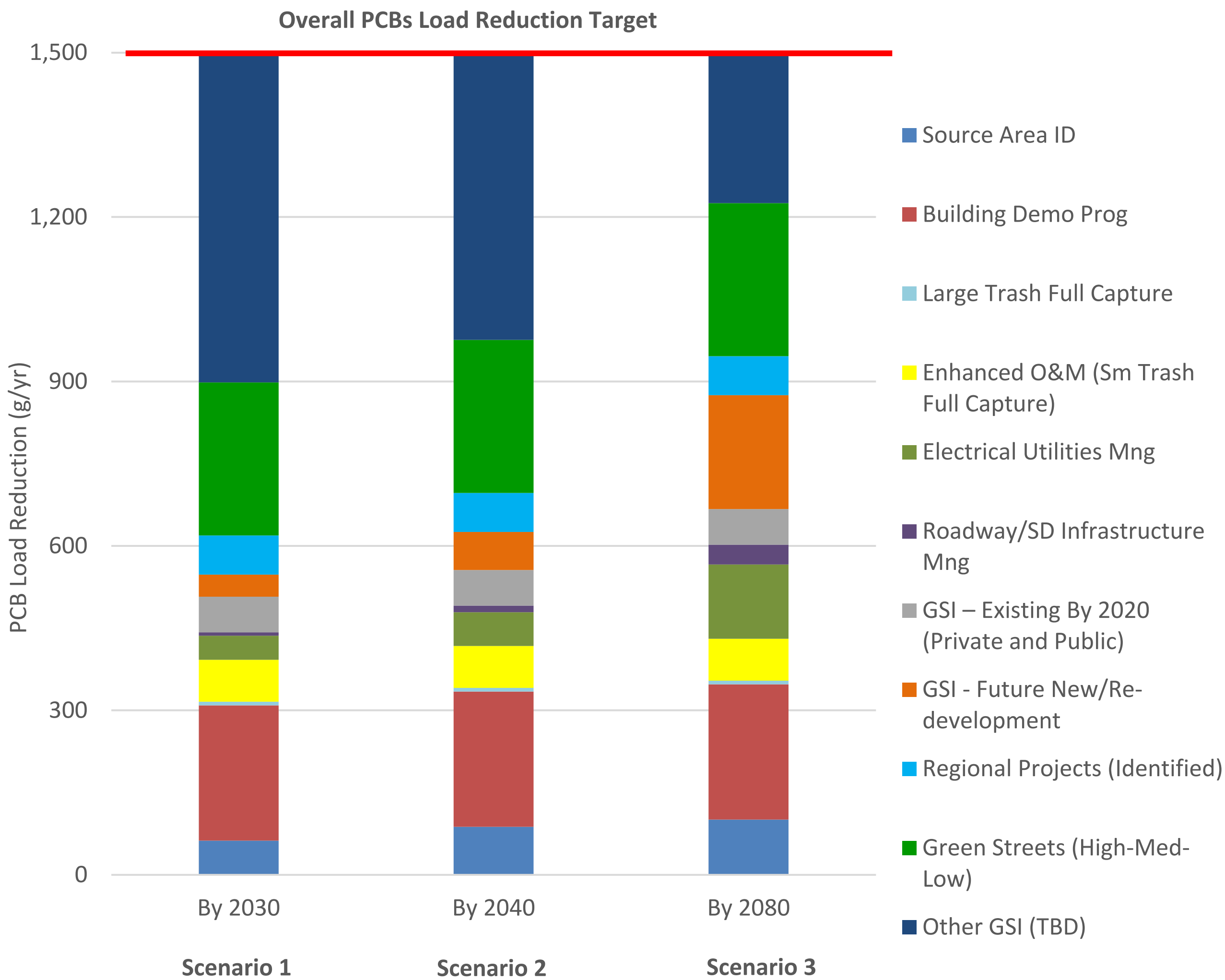

Figure 4-2. Scenarios for combinations of control measures projected to achieve San Mateo County PCBs TMDL load reduction target (i.e., 1.5 kg/yr) by 2030, 2040 and 2080.

4.2.1 Scenario No. 1 – Achieve TMDL Load Reduction Target by 2030

For this implementation scenario (Table 4-4), the PCBs TMDL WLA would conceptually be achieved by 2030 under the following assumptions regarding the implementation of control measures in San Mateo County:

1. All source control measures are implemented, and load reductions are realized as described in Section 3. Only the source controls that are scheduled for implementation by 2030 are included.
2. The construction of GI facilities due to new and redevelopment by 2030 will occur as projected in the Phase II RAA Report (Appendix B) and the load reductions described in Section 3.4, Table 3-8 will be realized.
3. After accounting for all load reductions described in No. 1 and No. 2 above, the remaining load reduction gap will be addressed via public GI projects projected by the GI RAA model.

The control measure implementation for this scenario and the associated load reductions for each type of control measure are presented in Table 3-9. Under this scenario, the total PCBs load reduction achieved by 2030 through source controls that could be implemented within that timeframe, existing GI, and future new and redevelopment, is 0.5 g/yr. The remaining PCBs load reduction gap of 1 kg/yr would need to be addressed by some combination of public green streets and public regional projects that would treat stormwater from 8,341 acres of impervious surface. This level of GI implementation between 2020 and 2030 (10 years) would be roughly 9X the amount of GI implementation that occurred in San Mateo County between 2002 and 2020 (19 years), which was nearly all a result of new/redevelopment.

4.2.2 Scenario No. 2 – Achieve TMDL Load Reduction Target by 2040

For this implementation scenario (Table 4-5), the PCBs TMDL WLA is conceptually achieved by 2040 under the following assumptions regarding the implementation of control measures in San Mateo County:

1. All source control measures are implemented, and load reductions are realized as described in Section 3. Only the source controls that are scheduled for implementation by 2040 are included.
2. The construction of GI facilities due to new and redevelopment by 2040 will occur as projected in the Phase II RAA Report (Appendix B) and the load reductions described in Section 3.4, Table 3-8 will be realized.
3. After accounting for all load reductions described in No. 1 and No. 2 above, the remaining load reduction gap will be addressed via public GI projects estimated by the GI RAA model.

The control measure implementation for this scenario and the associated load reductions for each type of control measure are presented in Table 3-9. Under this scenario, the total PCBs load reduction achieved by 2040 through source controls, existing GI, and future new and redevelopment is 0.6 kg/yr. The remaining PCBs load reduction gap is 0.9 kg/yr. The total amount of public GI that would be needed by 2040 to fill this load reduction gap would involve the treatment of 7,930 acres of impervious surfaces via some combination of public green streets and regional projects. This level of GI implementation that would need to occur between 2020 and 2040 would be roughly 9X the amount of GI implementation that occurred between 2002 and 2020 in San Mateo County. As in Scenario 1, most of the existing GI is due to LID on private parcels, not GI projects in the public ROW.

4.2.3 Scenario No. 3 – Achieve TMDL Load Reduction Target by 2080

For this implementation scenario (Table 4-6), the PCBs TMDL WLA is achieved by 2080 under the following assumptions regarding the implementation of control measures in San Mateo County:

1. All source control measures are implemented, and load reductions are realized as described in Section 3. Only the source controls that can be implemented by 2080 are included in this scenario.
2. GI due to new and redevelopment by 2080 occurs as projected in the Phase II RAA Report (Appendix B) and load reductions described in Section 3.4, Table 3-7 are realized.
3. After accounting for all load reductions described in No. 1 and No. 2 above, the remaining load reduction gap would be addressed via public GI projects estimated by the GI RAA model (Appendix B), extended through 2080.

The control measure implementation for this scenario and the associated load reductions for each type of control measure are presented in Table 3-9. Under this scenario, the total PCBs load reduction achieved by 2080 through source controls, existing GI, and future new and redevelopment is 0.9 kg/yr. The remaining load reduction gap is 0.6 kg/yr. The total amount of public GI that would be needed by 2080 to address this load reduction gap would involve the treatment of 4,563 acres of impervious surfaces via some combination of public green streets and regional projects. This level of GI implementation that would need to occur between 2020 and 2080 is roughly 5x the amount of GI implementation that occurred between 2002 and 2020 in San Mateo County. As in Scenarios 1 and 2, most of the existing GI is due to LID on private parcels, not public GI projects.

4.2.4 Economic and Technical Feasibility of 2030, 2040 and 2080 Scenarios

The MRP requires that Permittees identify all technically and economically feasible control measures (including GI) to attain the TMDL WLAs for stormwater runoff. The technical and economic feasibility of the three implementation scenarios is discussed below, primarily by evaluating key features of each scenario, including the total acres treated or addressed by different types of control measures, the timeline for control measure implementation, and the costs associated with the projected level of implementation.

Approach to Cost Estimating

Preliminary cost estimates were developed for each of the control measure scenarios presented in Section 4.2.3. The primary data inputs used include unit costs for each type of control measure presented in Table 4-2, which were based on Bay Area-wide regional averages that were developed collaboratively by SMCWPPP and other Bay Area countywide stormwater management programs. These average unit costs were used to estimate the costs for all control measures, with the exception of regional stormwater capture projects identified through SMCWPPP’s SWRP. For those regional projects, cost estimates were provided in conceptual plans that were developed as part of the SWRP or via Permittees’ GI Plans. Regional stormwater capture project cost assumptions are provided in Table 4-3.

A number of assumptions were applied to the unit and regional project-specific costs for each type of PCBs control measure. First, the capital or initial costs for all GI projects and source controls are calculated as upfront costs in current (2020) dollars. In reality, these projects will be constructed gradually, over the timeframe specified by each scenario for achievement of the TMDL WLA (i.e., by 2030, 2040 or 2080). Therefore, the total initial/capital costs to construct all GI projects within a given scenario can be divided by the number of years in each scenario's timeframe to provide the rough annual average cost for GI project construction for each scenario. The current (2020) annual cost for the O&M that will be required once all GI projects are fully constructed and operational is also provided for comparison across scenarios. These costs do not account for future inflation or replacement costs for capital projects that have finite lifespans of approximately 20 to 30 years. The average regional unit costs (see Table 4-2) do not necessarily represent the actual costs of implementing PCBs control measures. Finally, these estimates do not include any administrative costs associated with municipal staff time for tracking and reporting control measure implementation and associated load reduction accounting. In summary, the cost estimates provided in this section are preliminary, approximate, and planning level.

Table 4-2. Regional Average Unit Implementation Costs by Control Measure.

Control Measure Category	Control Measure	Unit of Implementation	Estimated Unit Costs[1]				Reference
			Initial/Capital[2]		Annual Ongoing[3]		
			Cost	Unit	Cost	Unit	
Source Area Identification and Referral	Identify and Refer Source Properties	Acres of old industrial land use area investigated	$382	$/acre	NA	NA	BASMAA 2017b
Green Stormwater Infrastructure (GI)	GI - Private/Parcel-based Redevelopment	Acres treated	$153,000	$/acre	$6,120	$ per acre treated per year	Average value for parcel-based (distributed GI) from Geosyntec 2018
	GI - Public ROW Retrofits (Green Streets)	Acres treated	$213,000	$/acre	$8,520	$ per acre treated per year	Geosyntec 2018
	GI - Regional Projects	Acres treated	$101,000	$/acre	$4,040	$ per project per year	Geosyntec 2018
Full Trash Capture (FTC)	FTC Implementation - Large Devices	Acres treated	$4,500	$/acre	$6,000	$ per device per year	CASQA 2020, City of San Mateo 2019, City of Oakland 2018
	FTC Implementation - Small Devices	Acres treated	$1,000	$/acre	$400	$ per device per year	CASQA 2020, City of San Mateo 2019, City of Oakland 2018
Managing PCBs-containing Materials during Building Demolition		Annual cost			$400	$ per application	BASMAA 2018. Costs are likely recovered through permit fees
PCBs in Infrastructure Management Program		Annual cost	Annual costs to municipalities assumed to be negligible compared with other control measure costs.				
Management of PCBs in Electrical Utility Equipment		Annual cost					

[1]The unit costs are rough planning level estimates that do not consider net present worth cost adjustments or other complexities.

[2]Initial costs generally include planning, design, capital, and other initial one-time costs.

[3]Ongoing costs include operation & maintenance and other ongoing costs.

Table 4-3. Estimated regional stormwater capture project costs.

Regional Project Description	Effective Impervious Area (acres)	Estimated Costs[1]		
		Initial/Capital[2]		Annual Ongoing[3]
		$/acre treated	Total Initial	
Orange Memorial Park (Project 1 & 2), South San Francisco CA	2,394	$14,500	$34,712,000	$1,388,480
Holbrook-Palmer Park, Atherton CA[4]	546	$34,069	$18,610,000	$744,400
Twin Pines Park, Belmont CA	8	$96,049	$778,000	$31,120
Caltrans I-280 @ I-380, San Bruno CA	254	$77,121	$19,615,000	$784,600
Red Morton Park (Phase I & II), Redwood City CA	561	$73,312	$41,128,000	$1,645,120

[1]The projects identified in this table are potential projects. The information provided in this table is based on preliminary designs presented in the SWRP (SMCWPPP 2017c). These projects may not have been approved and may not be implemented as described in the SWRP. All project costs are provided in 2020 dollars and do not account for future inflation.

[2]Initial costs include planning level costs for design and construction.

[3]O&M costs were calculated based on 4% of initial costs.

[4]This project concept for a regional project in Atherton was replaced with an alternative regional project in Atherton located at Cartan Field.

Scenario No. 1 – Achievement of Load Reduction Target by 2030

Table 4-4 summarizes the extent of land area in San Mateo County addressed by the combination of control measures and the associated costs for implementation of Scenario No. 1. Of the three conceptual scenarios evaluated, Scenario No. 1 would require the largest expenditure of public resources over the shortest implementation timeframe (10 years). Stormwater runoff from more than 8,000 acres of impervious surfaces would need to be treated via new public GI projects. The initial capital cost associated with this level of new public GI over the next ten years would be approximately $1.14 billion (in 2020 dollars). This equates to roughly $114 million dollars per year over the 10-year timeframe. In addition to capital costs, this level of public GI implementation would also require the additional expenditure of approximately $46 million annually for the ongoing O&M of these GI facilities, once fully implemented.

Planning, siting, designing, and constructing this additional level of GI in the public ROW within this scenario's 10-year timeframe would be technically infeasible. In addition, the initial capital expenditure of an estimated $1.14 billion, or the equivalent of $114 million dollars each year for the next 10 years, along with the projected $46 million annual O&M costs, make this scenario economically infeasible to implement.

Table 4-4. Scenario No. 1 - Estimated SMCWPPP Permittee costs to achieve PCBs TMDL WLA by 2030.[1]

Control Measure	Area[2] (acres)	PCBs Loads Reduced by 2030 (kg/yr)	Cost Estimates			
			Initial/Capital		Annual Ongoing	
			Existing (pre-2020)	Future	Existing (pre-2020)	Future
Source Controls	14,252	0.44	$16 Million	$0.5 Million	$2.3 Million	$2.3 Million
Existing (pre-2020) GI[3]	916	0.03	$7.5 Million		$0.3 Million	$0.3 Million
Anticipated GI via New and Redevelopment[3]	203	0.04				
Additional Public GI[4]	8,341	0.95		$1.14 Billion		$46 Million
TOTAL	**23,712**	**1.5**	**$24 Million**	**$1.14 Billion**	**$2.6 Million**	**$49 Million**

[1]The costs presented are based on average unit costs presented in Tables 4-2 and 4-3 and may not represent actual implementation costs expended by San Mateo County Permittees.

[2]Source controls include all measures projected in Section 3.3 and GI includes actions described in Section 3.4. The area addressed by 1) source area investigations includes the total area of old industrial land use that was investigated; 2) trash full capture area treated includes the entire area that drains to a system; 3) GI projects only includes the impervious area treated.

[3]Costs to San Mateo County Permittees associated with the development or redevelopment of private parcels are assumed to be relatively small and are therefore not included.

[4]Cost estimates include future projected green streets and regional projects in the public ROW.

Scenario No. 2 – Achievement of Load Reduction Target by 2040

Table 4-5 summarizes the extent of land area in San Mateo County addressed by the combination of control measures and the associated costs for implementation of Scenario No. 2., which has a 20-year implementation timeframe. Stormwater runoff from almost 8,000 acres of impervious surfaces would need to be treated via new public GI projects. The initial capital cost associated with this level of new public GI over the next 20 years would be roughly $1.1 billion (in 2020 dollars). This equates to approximately $55 million dollars per year over the 20-year timeframe. In addition to capital costs, this level of public GI implementation would also require the additional expenditure of approximately $46 million annually for the ongoing O&M of these GI facilities.

Planning, siting, designing, and constructing this additional level of GI in the public ROW within this scenario's 20-year timeframe would be technically infeasible. In addition, the initial capital expenditure of an estimated $1.1 billion, or the equivalent of $55 million dollars each year for the next 20 years, along with the projected $44 million annual O&M costs, make this scenario economically infeasible to implement.

Table 4-5. Scenario No. 2 - Estimated SMCWPPP Permittee costs to achieve PCBs TMDL WLA by 2040.[1]

Control Measure	Area[2] (acres)	PCBs Loads Reduced by 2040 (kg/yr)	Cost Estimates			
			Initial/Capital		Annual Ongoing	
			Existing (pre-2020)	Future	Existing (pre-2020)	Future
Source Controls	14,252	0.49	$16 Million	$0.5 Million	$2.3 Million	$2.3 Million
Existing (pre-2020) GI[3]	916	0.065	$7.5 Million		$0.3 Million	$0.3 Million
Anticipated GI via New and Redevelopment[3]	668	0.07				
Additional Public GI[4]	7,930	0.87		$1.1 Billion		$44 Million
TOTAL	**23,766**	**1.5**	**$24 Million**	**$1.1 Billion**	**$2.6 Million**	**$47 Million**

[1]The costs presented are based on average unit costs presented in Tables 4-2 and 4-3 and may not represent actual implementation costs expended by San Mateo County Permittees.

[2]Source controls include all measures projected in Section 3.3 and GI includes actions described in Section 3.4. The area addressed by 1) source area investigations includes the total area of old industrial land use that was investigated; 2) trash full capture area treated includes the entire area that drains to a system; 3) GI projects only includes the impervious area treated.

[3]Costs to San Mateo County Permittees associated with the development or redevelopment of private parcels are assumed to be relatively small and are therefore not included.

[4]Cost estimates include future projected green streets and regional projects in the public ROW.

Scenario No. 3 – Achievement of Load Reduction Target by 2080

Table 4-6 summarizes the extent of land area in San Mateo County addressed by the combination of control measures and the associated costs for implementation of Scenario No. 3., which has the longest implementation timeframe (60 years) among the scenarios considered. As described previously, including this scenario allowed for a better evaluation of certain source controls that are mainly implemented by entities other than San Mateo County Permittees and are anticipated to achieve their maximum load reduction potential by roughly 2080: (1) Management of PCBs in Electrical Utilities, and (2) Management of PCBs in Roadway and Storm Drain Infrastructure Caulk.

Stormwater runoff from about 4,600 acres of impervious surfaces would need to be treated via new public GI projects under this scenario. The initial capital cost associated with this level of new public GI over the next 60 years would be roughly $760 million (in 2020 dollars). This equates to approximately $13 million dollars per year over the 60-year timeframe. In addition to capital costs, this level of public GI implementation would also require the additional expenditure of approximately $30 million annually for the ongoing O&M of these GI facilities.

The technical feasibility of planning, siting, designing, and constructing this additional level of GI in the public ROW within this scenario's 60-year timeframe would need further evaluation. However, the initial capital expenditure of an estimated $760 million, or the equivalent of $13 million dollars each year for the next 60 years, along with the projected $30 million annual O&M costs, likely make this scenario economically infeasible to implement. However, additional control measures not currently identified could be developed and implemented over the course of this longer timeframe.

Table 4-6. Scenario No. 3 - Estimated SMCWPPP Permittee costs to achieve PCBs TMDL WLA by 2080.[1]

Control Measure	Area[2] (acres)	PCBs Loads Reduced by 2080 (kg/yr)	Cost Estimates			
			Initial/Capital		Annual Ongoing	
			Existing (pre-2020)	Future	Existing (pre-2020)	Future
Source Controls	14,252	0.60	$16 Million	$0.5 Million	$2.3 Million	$2.3 Million
Existing (pre-2020) GI[3]	916	0.065	$7.5 Million		$0.3 Million	$0.3 Million
Anticipated GI via New and Redevelopment[3]	2,081	0.21				
Additional Public GI[4]	4,563	0.62		$760 Million		$30 Million
TOTAL	**21,812**	**1.5**	**$24 Million**	**$760 Million**	**$2.6 Million**	**$33 Million**

[1]The costs presented are based on average unit costs presented in Tables 4-2 and 4-3 and may not represent actual implementation costs expended by San Mateo County Permittees.

[2]Source controls include all measures projected in Section 3.3 and GI includes actions described in Section 3.4. The area addressed by 1) source area investigations includes the total area of old industrial land use that was investigated; 2) trash full capture area treated includes the entire area that drains to a system; 3) GI projects only includes the impervious area treated.

[3]Costs to San Mateo County Permittees associated with the development or redevelopment of private parcels are assumed to be relatively small and are therefore not included.

[4]Cost estimates include future projected green streets and regional projects in the public ROW.

<u>Comparison of 2030, 2040 and 2080 Implementation Scenarios</u>

Each implementation scenario described in this section would conceptually address the PCBs load reduction gap to achieve the PCBs TMDL WLA for San Mateo County, but would require a substantial increase to current funding levels to support the construction and O&M of public GI in San Mateo County.

Scenario No. 1 has the shortest implementation timeframe (10 years) among the three scenarios, resulting in the largest PCBs load reduction gap (0.95 kg/yr) and highest associated implementation costs. To fill the load reduction gap under Scenario No. 1 with GI projects in the public ROW, more than 8,000 acres of impervious land area would need to be treated, which is more than three orders-of-magnitude greater than the area currently treated by public GI in San Mateo County (about 35 acres). Planning, siting, designing, and constructing this additional level of GI in the public ROW within this scenario's 10-year timeframe would be technically infeasible. In addition, the initial capital expenditure of an estimated $1.14 billion, or the equivalent of $114 million dollars each year for the next ten years, along with the projected $46 million annual O&M costs, make this scenario economically infeasible to implement. In summary, Scenario No. 1 is neither technically nor economically feasible.

Compared with scenario No. 1, scenario No. 2 has a slightly smaller load reduction gap of 0.87 kg/yr due to the additional load reduction achieved via source controls and an additional 10 years of GI implementation through private redevelopment. That said, stormwater runoff from almost 8,000 acres of impervious surfaces would need to be treated via new public GI projects. The initial capital cost associated with this level of new public GI over the next 20 years would be roughly $1.1 billion (in 2020 dollars). This equates to approximately $55 million dollars per year over the 20-year timeframe. In addition to capital costs, this level of public GI implementation would also require the additional expenditure of approximately $46 million annually for the ongoing O&M of these GI facilities. Planning, siting, designing, and constructing this additional level of GI in the public ROW within this scenario's 20-year timeframe would be technically infeasible. In addition, the initial capital expenditure of an estimated $1.1 billion, or the equivalent of $55 million dollars each year for the next 20 years, along with the projected $44 million annual O&M costs, make this scenario economically infeasible to implement.

Scenario No. 3 has the smallest load reduction gap across the three (3) scenarios, at 0.45 kg/yr. The main advantages of this scenario are that (1) all of the source control programs identified in Section 3.3 are expected to reach their full maturity (i.e., maximum load reduction potential) by 2080; (2) 60 years of GI implemented via private redevelopment contributes substantial load reduction; and (3) the extended timeline provides additional time needed to further identify PCB source areas and identify, plan, design and construct multi-beneficial public GI projects that are not only focused on PCBs (and mercury) but provide other environmental benefits as well. Stormwater runoff from about 4,600 acres of impervious surfaces would need to be treated via new public GI projects under this scenario. The initial capital cost associated with this level of new public GI over the next 60 years would be roughly $760 million (in 2020 dollars). This equates to approximately $13 million dollars per year over the 60-year timeframe. In addition to capital costs, this level of public GI implementation would also require the additional expenditure of approximately $30 million annually for the ongoing O&M of these GI facilities. The technical feasibility of planning, siting, designing, and constructing this additional level of GI in the public ROW within this scenario's 60-year timeframe would need further evaluation. However, the initial capital expenditure of an estimated $760 million, or the equivalent of $13 million dollars each year for the next 60 years, along with the projected $30 million annual O&M costs, likely make this scenario economically infeasible to implement.

Projections for a time period that extends so far into the future are inherently highly uncertain. However, the additional decades of time under the 2080 scenario compared to the 2030 and 2040 scenarios could lead to increased overall feasibility. Additional control measures not currently identified could be developed and implemented over the course of this longer timeframe. In addition, the longer period of time potentially aligns better with integrating pollutant control efforts with future efforts to increase San Mateo County's resiliency to climate change and sea level rise. For example, green infrastructure will likely play an important role in these long-term resiliency efforts.

It should also be noted that under any of the three scenarios, there are many other technical barriers to extensive implementation of GI in the urbanized areas of San Mateo County and other parts of the Bay Area, even if the needed funding was available. These include high groundwater levels near the Bay, periodic flooding, conflicts with existing underground utilities, and a lack of physical space to construct GI in some highly urbanized areas. In the future, climate change and associated sea level rise may exacerbate some of these issues.

4.3 Potential Significant Environmental Impacts of Control Measure Implementation

The California Environmental Quality Act (CEQA) establishes requirements and procedures for state and local agency review of the environmental effects of projects proposed within their jurisdictions. It further requires that agencies, when feasible, avoid or reduce the significant environmental impacts of their decisions. The applicable statutes are contained in California Public Resources Code, Sections 21000 - 21189, and Title 14 CCR, Division 6, Chapter 3, Sections 15000 – 15387.

CEQA applies to all California public agencies that carry out or approve projects. CEQA compliance is only required if a lead agency is considering approval of a proposed "project." The distinction between the normal and the specific CEQA meaning of "project" is very important, as it can determine whether an action is subject to CEQA compliance or not. Section 15378 of the State CEQA Guidelines provides the following definition of a project:

- "Project" means the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and that is any of the following:
    a. An activity directly undertaken by a public agency including but not limited to public works construction and related activities clearing or grading of land, improvement to existing public structures, enactment and amendment of zoning ordinances, and the adoption and amendment of local General Plans or elements thereof pursuant to Government Code Sections 65100-65700.
    b. An activity undertaken by a person which is supported in whole or in part through public agency contacts, grants subsidies, or other forms of assistance from one or more public agencies.
    c. An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

CEQA requires the preparation of an Initial Study to determine if a project may result in significant effects on the environment. If there is substantial evidence in the record that supports a fair argument that significant effects may occur, an Environmental Impact Report will be prepared. A Negative Declaration or Mitigated Negative Declaration must be prepared if there is no substantial evidence that the project may have a significant effect on the environment, or if revisions to the project would avoid or mitigate the effects that would result in no significant effects.

The CEQA Guidelines stipulate that a public agency shall prepare or have prepared a proposed Negative Declaration or Mitigated Negative Declaration for a project subject to CEQA when:

- The initial study shows that there is no substantial evidence, in light of the whole record before the agency, that the project may have a significant effect on the environment, or
- The initial study identifies potentially significant effects, but:
    - Revisions in the project plans or proposals made by, or agreed to by the applicant before a proposed mitigated negative declaration and initial study are released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur; and
    - There is no substantial evidence, in light of the whole record before the agency, that the project as revised may have a significant effect on the environment.

CEQA requires that reasonable alternatives to implement a proposed project should be considered during the planning process and potential environmental effects should be included in the evaluation of the project. CEQA also requires state and local agencies to disclose and consider the environmental impacts of their actions. It further requires that agencies, when feasible, avoid or reduce the significant environmental impacts of the implementation of their action.

This Control Measure Plan is statutorily exempted under Public Resources Code (California Administrative Code Sec. 15262 et seq.) because it involves feasibility or planning studies for possible future actions that the Permittees have not approved or adopted. Any future projects that are to be constructed as recommended by this plan will either be determined to be exempt from CEQA or an initial study to determine potential environmental impacts will be prepared. In general, this Control Measure Plan has been determined to have no potential to generate significant adverse impacts to the environment, but instead will lessen adverse water quality impacts through reducing loads of PCBs and mercury into the Bay.

5 CONTROL MEASURE TRACKING AND REPORTING

Tracking and reporting on PCBs and mercury control measure implementation in San Mateo County is an important component of demonstrating progress towards the achievement of TMDL WLAs over time. SMCWPPP has developed a tracking and reporting process which is updated and refined at least annually. Annual updates are provided by San Mateo County Permittees on control measures that began or were enhanced starting from 2002 onward (i.e., the baseline year for the mercury and PCBs TMDLs) and are compiled at the countywide level, via spreadsheets. SMCWPPP used this information to geo-locate any GI projects or location-specific controls (e.g., trash full capture systems) and created geographic information system (GIS) files to display the GI projects and/or locations of other control measures on maps. SMCWPPP also used this information to calculate PCBs and mercury load reductions, consistent with the Interim Accounting Methodology for TMDL Loads Reduced, per MRP 2.0 requirements (BASMAA 2017a).

5.1 Previous PCBs and Mercury Control Measures Plans

Beginning with the FY 2016/17 Annual Report and continuing through FY 2018/19, SMCWPPP prepared a PCBs and mercury Control Measures Plan that was submitted each year as an attachment to SMCWPPP's Annual Report (SMCWPPP 2016b, SMCWPPP 2017b, SMCWPPP 2018b, SMCWPPP 2019b). The Control Measures Plans reported information on the extent of implementation throughout the County and the associated PCBs and mercury load reductions achieved to-date during the permit term. The information reported included the extent of current and planned GI facilities and other PCBs and mercury control measures in San Mateo County and the associated load reductions achieved to-date.

5.2 GI Spreadsheet Database

For the purposes of tracking and crediting pollutant load reductions achieved through GI and stormwater treatment, During FY 2015/16, SMCWPPP staff worked with San Mateo County MRP Permittee staff to develop a spreadsheet database of existing and planned public and private GI and stormwater treatment projects in San Mateo County, including GI/LID measures at redevelopment sites and GI installed in the public ROW during infrastructure projects (SMCWPPP 2016b). The database includes existing and planned GI and treatment facilities constructed in 2005 or later since these facilities are assumed to reduce stormwater runoff pollutant loads relative to the PCBs TMDL target. In addition, 2005 was the year that San Mateo County's municipal stormwater permit was amended to include more stringent Provision C. 3 requirements; thus, most new or redevelopment projects constructed in 2005 or later include stormwater treatment.

The types of information in the database of existing and planned public and private GI and stormwater treatment projects in San Mateo County include the following:

- Project name
- Description of GI and stormwater treatment system(s)
- Location - street address or location description and coordinates
- Whether the facility is located on private property or in public ROW
- Area treated by facility (acres)
    - For GI/LID at redevelopment or new developments sites, this is generally assumed to be the project area

- For Green Street or other retrofits in public ROW, estimated drainage area to facility
- Hydraulic sizing criteria
- Date of construction
  - Existing facilities: date of construction completion (e.g., initial inspection sign-off)
  - Planned facilities: estimated construction completion date

From FY 2016/17 until the present, SMCWPPP staff has worked with municipal staff to update the GI database with available new or revised information.

5.3 Green Infrastructure Story Map

SMCWPPP has developed a web-based Story Map that displays a variety of GI and Sustainable Streets projects located in San Mateo County (www.flowstobay.org/data-resources/maps/green-infrastructure-story-map/). Sustainable Streets are multi-benefit projects designed to improve street conditions for walkability, cycling, urban greening, climate resiliency and water quality. The projects displayed feature green infrastructure in a variety of settings, including streets, building sites and lots. Many are demonstration projects built by Permittees to show progress toward integrating infrastructure enhancements and shifting stormwater infrastructure from "gray" to "green." Included are Safe Routes to School (SRTS) and Green Streets Infrastructure Pilot Projects, which were developed through a pilot program funded by the San Mateo County City/County Association of Governments (C/CAG). These projects help show the cost efficiencies and multiple community benefits of integrating bike and pedestrian improvements with green stormwater infrastructure. Figure 5-1 shows an example screenshot of the story map on the SMCWPPP website.

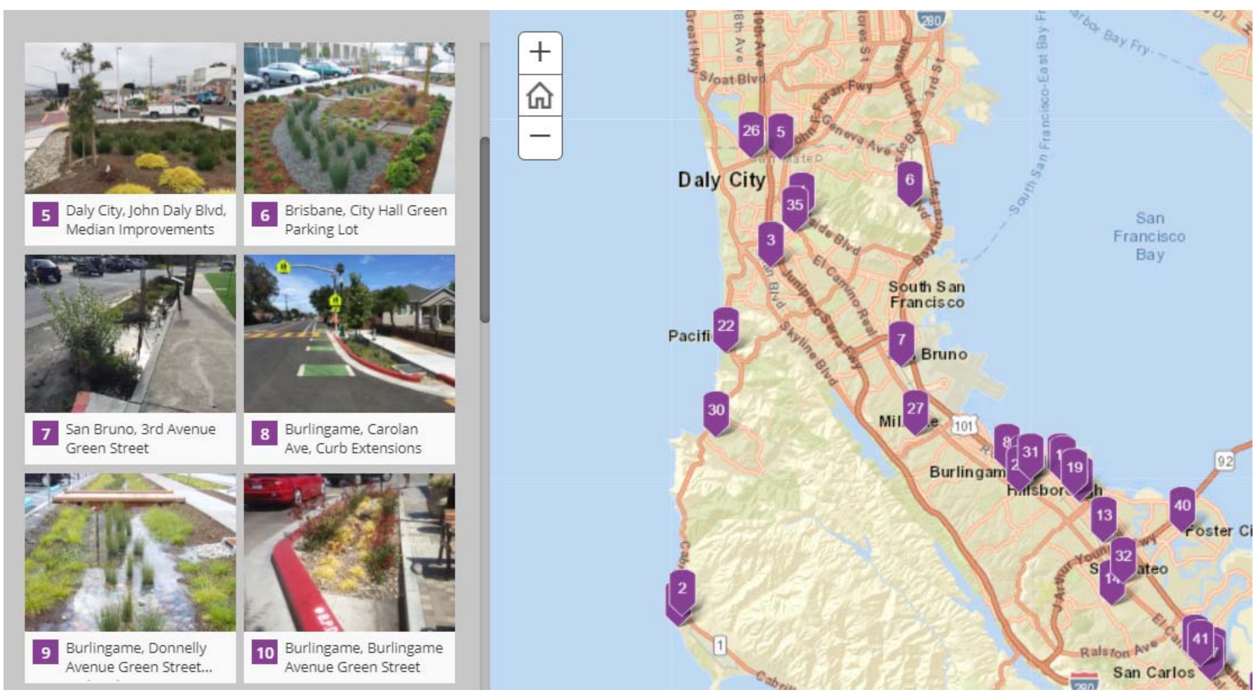

Figure 5-1. Example screenshot of the Story Map on the SMCWPPP website (www.flowstobay.org/data-resources/maps/green-infrastructure-story-map/).

5.4 San Mateo Countywide Sustainable Streets Master Plan

SMCWPPP is also working with San Mateo County Permittees to develop a more comprehensive mechanism for tracking and mapping existing GI facilities and other stormwater treatment measures in San Mateo County. This work is one task under the San Mateo Countywide Sustainable Streets Master Plan project, which is funded via a Caltrans Adaptation Planning Grant (see Section 6.2 for more details about this project). Overall, this project will provide an implementation-level approach to achieving water quality goals in the MRP and other community benefits associated with green infrastructure. It will include a web-based data management system that is connected to GIS platforms for tracking and mapping the extent of GI and other stormwater treatment implementation in San Mateo County. The GI tracking system will provide a centralized, accessible platform for Permittee staff to efficiently collect, upload, and store data associated with GI and other stormwater treatment facilities, assist with the tracking and mapping of all completed GI projects in San Mateo County, and allow information about GI facilities and other stormwater treatment controls to be publicly available in a more user-friendly manner. The project will also support local GI Plans by providing enhanced detail on green street priorities, higher-resolution drainage mapping, and an updated tracking tool consistent with the requirements in MRP Provision C.3.j.

6 SUMMARY OF FINDINGS AND ADAPTIVE MANAGEMENT

6.1 Summary of Planned Control Measure Implementation

In compliance with MRP Provisions C.11/12.c. and C.11/12.d., this Control Measures Plan and RAA describes implementation actions and schedules for achieving the PCBs and mercury TMDL WLAs for stormwater runoff in San Mateo County. The control measures described build upon the foundational program of actions that have been implemented by SMCWPPP and San Mateo County Permittees over the past two decades to reduce the impacts of these legacy pollutants on the Bay.

Baseline modeling described in Section 2 and Appendix A indicates that a PCBs load reduction of 1.5 kg/yr in stormwater runoff discharged from San Mateo County to the Bay is needed to achieve the PCBs TMDL WLA. The modeled mercury baseline load for San Mateo County is less than the mercury WLA established through the mercury TMDL, suggesting that the mercury WLA for stormwater in San Mateo County has already been achieved. However, there is uncertainty in mercury baseline loads due to a relatively low level of confidence in the average stormwater runoff mercury concentrations developed via the RWSM.

San Mateo County Permittees are committed to implementing a program of scientifically sound and technically and economically feasible control measures to address PCBs and mercury in San Mateo County stormwater runoff. The source control measures (which mostly focus on PCBs) that San Mateo County Permittees have implemented and/or will continue to implement in the future to address the PCBs and mercury TMDLs include:

- Source Area Identification and Abatement
- Management of PCBs during Building Demolition
- PCBs in Electrical Utilities Management
- PCBs in Roadway and Storm Drain Infrastructure Caulk Management
- High Flow Capacity (Large) Trash Full Capture Systems
- Enhanced Operation and Maintenance Controls
- Mercury Load Avoidance

This set of source controls is consistent with the expectations recently discussed with Regional Water Board staff for source control implementation via the MRP when reissued in 2021. The source controls will be coupled with the implementation of GI via requirements for new/redevelopment projects described in MRP Provision C.3, and the ongoing implementation of each Permittee's GI Plan, which were submitted to the Regional Water Board in 2019 and are intended to guide public GI implementation in San Mateo County over time. Together, source controls and GI have and will continue to significantly reduce the levels of PCBs (and mercury) entering the Bay from stormwater runoff in San Mateo County. Although there is inherent uncertainty in predicting load reductions, the level and pace of progress towards reaching the PCBs load reduction target (i.e., 1.5 kg/yr) as a result of implementing a comprehensive set of source control measures, existing GI (as of 2020), and future GI associated with new and redevelopment, was estimated in Section 3.5 (Table 3-9). Load reductions associated with future GI (i.e., beyond 2020) in the public ROW (e.g., green streets and regional stormwater capture projects) are not included. The projected percent of PCBs TMDL WLA achieved is as follows:

- 37% by 2030
- 42% by 2040
- 58% by 2080

Thus, based on the modeling and control measure scenarios described in this Control Measures Plan, additional actions to reduce PCBs will be needed to achieve the WLA. Such actions may include the construction of additional green infrastructure facilities in the public ROW, since alternative additional control measures that are practicable and cost-effective have not been identified at this time. However, planning level cost estimation of the scenarios evaluated (Section 4), reveals that solely relying on green infrastructure facilities in the public ROW to address the remaining load reduction needed to achieve the PCBs WLA by 2030, 2040, or 2080 is neither technically nor economically feasible.

6.2 Advancing Green Infrastructure in San Mateo County

Meeting the PCBs TMDL WLA for San Mateo County will be extremely challenging, as described above. However, San Mateo County Permittees remain committed to the continued identification and implementation of cost-effective GI projects in the public ROW that are focused on achieving multiple benefits, including improving stormwater quality. As demonstrated in the San Mateo County SWRP developed by C/CAG and the GI plans developed by San Mateo County Permittees, C/CAG and the local jurisdictions are working diligently towards “greening” the urban landscape across the County over time. These efforts will supplement the PCBs and mercury load reductions as a result of the implementation of source controls and the construction of GI facilities via MRP Provision C.3 new/redevelopment requirements. The pollutant control measures planning is integrated with ongoing efforts by C/CAG to assist San Mateo County municipalities to obtain grant funding for planning and building public GI projects, and to coordinate and track GI countywide. Such efforts include the SWRP, the San Mateo Countywide Sustainable Streets Master Plan project, the Safe Routes to School / Green Streets Infrastructure Pilot Projects, and several regional stormwater capture projects. In addition, the control measures plan could help inform GI investment planning through the new Flood and Sea Level Rise Resiliency District in San Mateo County. All of these efforts are described further below.

6.2.1 Conceptual Approaches to Broader GI Implementation

Figure 6-1 conceptually illustrates the different approaches C/CAG and San Mateo County MRP Permittees are taking to achieve broader green infrastructure implementation, with an overall goal of reducing the overall implementation and O&M costs to municipalities for public features. The approaches, moving left to right, include 1) shifting from proportional implementation where each Permittee achieves load reductions proportional to its population to a countywide approach under which jurisdictional boundaries are disregarded and the most cost-effective solutions are implemented in optimal locations, 2) building more regional-scale stormwater runoff capture projects in conjunction with the new Flood and Sea Level Rise Resiliency District, 3) requiring that more development projects implement stormwater runoff treatment requirements beyond MRP Provision C.3 mandates, and 4) requiring development projects to build and maintain green infrastructure in the adjacent public ROW, thereby increasing the footprint of treated areas associated with new and redevelopment. Efforts underway by C/CAG and San Mateo County MRP Permittees to implement each of these approaches are discussed in the following subsections.

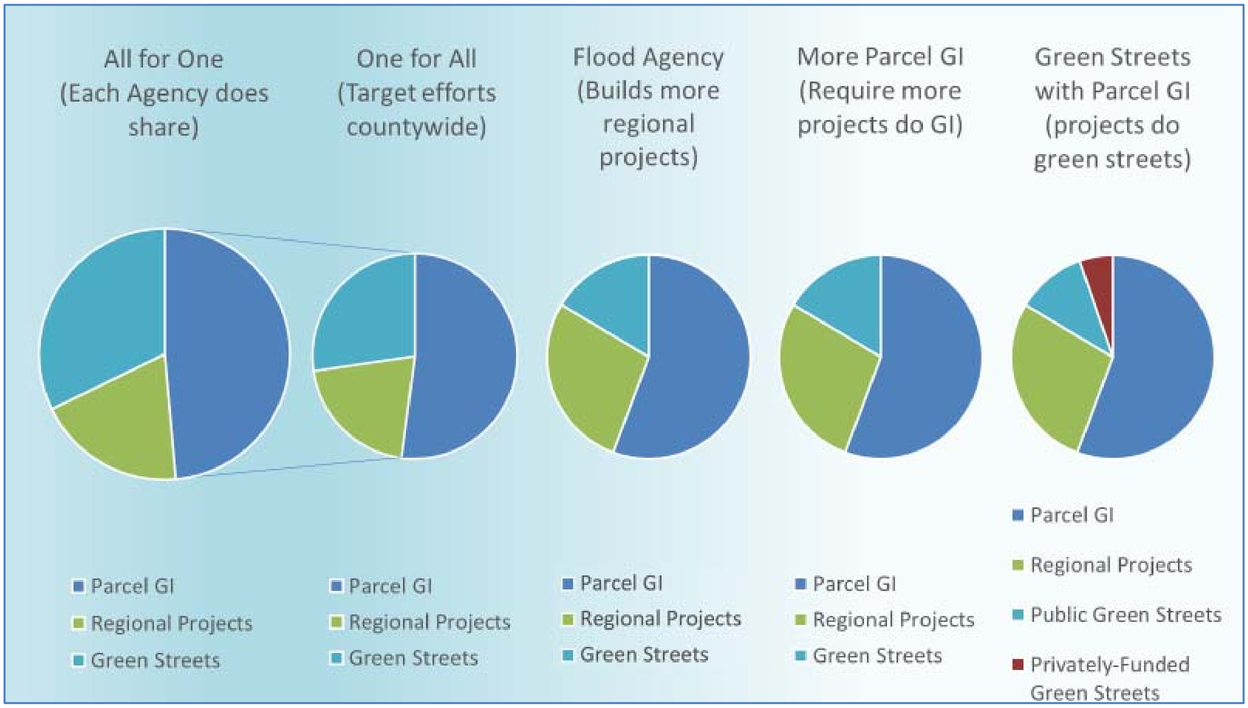

Figure 6-1. Conceptual Approaches to Broader GI Implementation

Jurisdictional vs. Countywide Implementation

C/CAG's RAA modeling was performed at both the jurisdictional and countywide scales to show potential reductions in modeled costs if Permittees were able to work together to implement GI at a countywide scale to meet target pollutant load reductions. The results of the modeling included in the RAA Phase II report (Appendix B) show that such a countywide approach would result in 34% savings in modeled costs (when applying the reduction target to cohesive sediment), resulting from the overall reduction in the amount of GI that would need to be implemented to achieve the PCBs load reductions mandated by 2040 in MRP 2.0. It essentially decreases the size of the total "pie" in Figure 6-1. This is due, in part, to modeled pollutant reduction benefits of regional projects being shared beyond just the upstream jurisdictions, as well as the model being able to select more cost-effective green street opportunities, even if that leads to greater effort in one jurisdiction and less in another. Existing GI projects and projected new/redevelopment GI implementation via Provision C.3 requirements don't change under these scenarios.

To support San Mateo County Permittees in pursuing a countywide implementation approach, C/CAG is collaborating with the Flood and Sea Level Rise Resiliency District to develop a "business case" for countywide collaboration on stormwater management, both for water quality outcomes and resiliency purposes. C/CAG allocated $100K from a $2.94M state budget allocation for advancing regional stormwater management in San Mateo County toward developing supporting materials to help San Mateo County Permittees work collaboratively across jurisdictional lines to achieve more cost-effective pollutant load reduction. This work will include an evaluation of whether the grant-funded Contra Costa County alternative compliance framework can be brought to San Mateo County, development of model documents such as cost-sharing agreements or Memoranda of Agreement/Understanding, and further quantification of potential benefits of countywide collaboration. This work is scheduled to occur during calendar year 2021.

Building More Regional Projects

C/CAG's RAA modeled five regional-scale stormwater runoff capture projects. Three of the five originally were conceptualized in the countywide SWRP. All five projects have secured some level of funding and are at different stages of progress. Details on each of these projects are provided below:

- **South San Francisco (Orange Memorial Park):** This project will provide water quality improvements to help meet the MRP requirements related to mercury, PCBs, and trash. The project includes an instream diversion and pre-treatment structure (trash screen and sediment removal chamber) in the upper end of the Colma Creek flood control channel within Orange Memorial Park. Pretreated water gravity drains to an underground stormwater reservoir where it is stored until either infiltrating or being further treated for non-potable reuse. When storage capacity is exceeded, treated overflow is discharged back into the channel. The Project would capture and treat approximately 16 percent of the annual drainage from approximately 6,500 acres of land in the City of South San Francisco, Town of Colma, the City of Daly City, and a portion of unincorporated San Mateo County. The project is funded through a $15.5M cooperation implementation agreement with Caltrans to help satisfy its pollutant load reduction and construction is anticipated to begin early 2021.
- **Atherton Project (Menlo College):** The Atherton project, as conceptualized in the SWRP, was to be sited at Holbrook-Palmer Park. However, the Town faced strong public opposition to that location as the one public park in Atherton, leading to the project being moved upstream within the watershed to the athletic fields at Menlo College. Unfortunately, after doing preliminary design and environmental review, the College recently canceled the project due revised financial priorities resulting from the coronavirus pandemic. The project had received $13.5 million in cooperative implementation grant funding from Caltrans for design and construction.
- **Belmont Project (Twin Pines Park):** The Belmont project was originally conceptualized and modeled in the RAA as a small-scale regional facility capturing runoff from a small neighborhood. Since the RAA was completed, the Cities of Belmont and San Carlos and the County of San Mateo, through its Flood Resilience Program, jointly developed a Watershed Management Plan for Belmont Creek. In this plan, the Twin Pines Park project was increased in scale to be comparable to the other regional projects (~20 acre-feet of storage capacity), with an underground storage/infiltration gallery conceptualized beneath the Twin Pines Park parking lot. C/CAG, in conjunction with the California Natural Resources Agency, allocated $913K of a $2.94M State budget allocation to advance regional stormwater projects in San Mateo County to the Belmont project for preliminary design and environmental review. Currently, the project is being combined with a separate $1M grant from the Department of Water Resources to restore Belmont Creek within Twin Pines Park. The project partners, which now include as lead the Flood and Sea Level Rise Resiliency District, are currently finalizing a Request for Proposals for design services to advance both the stormwater runoff capture project and creek restoration.

- **San Bruno Project (I-280/380 Interchange):** Subsequent to the project concepts developed for the SWRP, C/CAG worked with San Mateo County Permittees to develop additional regional project concepts to help reduce the potential green streets burden on cities indicated as needed by the RAA modeling to meet water quality goals. San Bruno had identified the need for retention within the Crestmoor Canyon watershed to address storm drain system capacity deficiencies. Ultimately, C/CAG and the City collaborated to conceptualize an approximately 20-acre-foot regional underground stormwater capture facility on Caltrans property within the large vacant land area within the I-280/380 interchange. Preliminary discussions with Caltrans indicated that the site was a possible location in terms of lack of any conflicting future uses for the property. Similar to the Belmont project, C/CAG worked with the Natural Resources Agency to provide $913K to San Bruno for preliminary design and environmental review for the project. San Bruno participated in a joint Request for Proposals process with C/CAG, Redwood City, and the County of San Mateo and at the time of drafting this report, are finalizing their selection of a design consultant and working with Caltrans to establish the proper project review and oversight process. In addition, the County of San Mateo received a US EPA Water Quality Improvement Fund grant under which $200K is provided to the San Bruno project for preliminary design, for a total of $1.13M between the two funding sources.
- **Redwood City Project (Red Morton Park):** Similar to the San Bruno project, C/CAG worked with Redwood City staff to identify a regional project opportunity to help the City reduce its potential green streets burden identified through the RAA modeling. A two-phase project was conceptualized for Red Morton Park, with underground storage systems proposed beneath two playing fields, with a combined storage capacity of ~43 acre-feet. As with the San Bruno and Belmont projects, C/CAG worked with the Natural Resources Agency to provide $913K to conduct preliminary design and environmental review. Redwood City also participated in the joint Request for Proposals process and is selecting a consultant and negotiating a scope of work at the time this report was drafted. Like San Bruno, the County of San Mateo is providing an additional $200K from its US EPA grant for preliminary design, for a total of $1.13M between the two funding sources.

C/CAG and the County Office of Sustainability are collaborating on a joint regional project planning effort to find additional regional project opportunities and develop five more project concepts. The County is providing $100K from its US EPA grant described above, and C/CAG is matching that with $100K from its State budget allocation administered by the Natural Resources Agency. Also, as part of the joint Request for Proposals process described above, C/CAG and the County are selecting consultants and negotiating a scope of work at the time this report was drafted. In addition to finding opportunities and developing concepts, the project will connect to the collaborative efforts described above with the Flood and Sea Level Rise Resiliency District to develop the business case for countywide collaboration on stormwater management, including looking at further developing alternative compliance and/or credit trading programs that can support Permittee efforts to meet mandatory levels of GI implementation under the MRP, as well as potentially the development community in meeting onsite treatment obligations. This will include evaluating whether additional stormwater management requirements may be needed to help address climate change resiliency needs.

Requiring More Parcel-Based GI

C/CAG and San Mateo County Permittees are also implementing approaches to pursue additional parcel-based GI beyond what is currently required under Provision C.3 of the MRP. The RAA modeling informed member agencies on the potential significant green streets burden needed to meet water quality goals in MRP 2.0, leading to some agencies requiring additional project categories to be subject to stormwater treatment requirements. It is important to note expanded C.3 treatment requirements have not been modeled by C/CAG, so it is unclear how much additional GI is likely to be implemented as a result. However, jurisdictions that have chosen to require additional project categories be subject to stormwater treatment have not simply reduced the regulated project threshold to 5,000 square feet, as being proposed by Water Board staff for MRP 3.0. For instance, the City of Redwood City is now requiring any new commercial or residential building and substantial commercial remodels to incorporate permanent stormwater controls, regardless of whether they trigger C.3 thresholds. The City of San Mateo is requiring green infrastructure implementation for all projects except single family homes under the 10,000-square foot C.3 threshold.

C/CAG is also implementing efforts to support small-scale parcel-based stormwater management through its ongoing partnership with the Bay Area Water Supply and Conservation Agency (BAWSCA) to provide rain barrel rebates. The program has been in place since 2014 and has resulted in over 1,000 rain barrels installed to-date in San Mateo County. For Fiscal Year 2020/21, C/CAG is piloting increased financial incentives for storage larger than rain barrels (e.g., larger barrels or cisterns), as well as incentives for installing rain gardens as part of BAWSCA's lawn replacement rebate program. To-date, C/CAG has invested $75K in the rebate program.

As part of developing a business case for countywide stormwater management as described above, C/CAG will be investigating whether expanded design standards may be necessary to achieve long-term climate resiliency for precipitation management. While the need for a retention-based standard is unknown with great uncertainty regarding the future need in relation to potential climate impacts, imposition of additional design standards on new and redevelopment for resiliency purposes would likely have increased benefits for water quality. C/CAG will also be evaluating the potential for creating a credit trading marketplace, which may be necessary to allow developers to meet increased retention standards if it becomes less feasible to meet stormwater runoff management standards on site. While there is much that needs to be investigated and discussed at a countywide level with C/CAG member agencies and the Flood and Sea Level Rise Resiliency District, C/CAG is taking the first step by conducting initial evaluations as part of the business case study described above.

Development-Based Green Streets

The final approach shown in Figure 6-1 is to require green street implementation and O&M by developers. This shifts the burden of having to fund costly retrofits and commit to long-term maintenance from local agencies to developers. This approach is more cost-effective in many cases, since developers are often already required to demolish curbs and gutters to build new sidewalks, install street trees or utilities, or to make required Complete Streets improvements. C/CAG is working to support such approaches as part of the Sustainable Streets Master Plan described below, wherein a specific development-based typology of Sustainable Streets was created and model policy documents developed to support member agencies that wish to consider making developers responsible for retrofitting the adjacent public ROW (and potentially making them responsible for long-term operations and maintenance, whether through up front one-time payments to the jurisdiction, or as part of ongoing maintenance of street trees or other public appurtenances installed as part of the development project). Model policy materials included in the forthcoming Sustainable Streets Master Plan include model Sustainable Streets resolutions, visions statements, policies, and development-based conditions of approval. Several C/CAG member agencies have already started requiring development to implement public ROW GI improvements, including Menlo Park, Redwood City, San Mateo, and South San Francisco.

Overall, creation of the Sustainable Streets Master Plan will further support C/CAG member agencies in requiring private development to implement and maintain green street facilities by identifying the priority roadway segments for which Sustainable Streets are prioritized. Identifying the projects in an adopted countywide plan, in conjunction with C/CAG's new Green Infrastructure Design Guide (including typical details and specifications), provide cities with robust tools to advance green and sustainable street projects within their jurisdictions as part of new and redevelopment.

In addition to facilitating approaches whereby green streets are built during private development projects, C/CAG staff has long advocated for integration of transportation and water quality goals as a means of reducing the overall cost of retrofitting roadways to achieve pollutant load reduction. As a demonstration of this, C/CAG funded a $2 million pilot program for 10 San Mateo County Permittees to implement integrated Safe Routes to School / Green Stormwater Infrastructure projects using equal shares of transportation and stormwater funds. To-date, eight of 10 projects have been constructed and can be viewed on the Green Infrastructure Story Map discussed in Section 5.3.

6.2.2 San Mateo Countywide Sustainable Streets Master Plan

C/CAG and San Mateo County Permittees have taken a proactive approach to managing stormwater runoff on streets and roads via green streets, and what are referred to as "Sustainable Streets," which expands the Complete Streets definition to include green stormwater infrastructure. Recognizing the many additional benefits of building green streets, including water quality improvement, reduced urban heat island effects, localized flood mitigation, aesthetic value, and improved safety for bicyclists and pedestrians, C/CAG initiated the San Mateo Countywide Sustainable Streets Master Plan (SSMP) in fall 2019 with funding from a Caltrans Adaptation Planning Grant to identify and prioritize opportunities to integrate green infrastructure with planned and newly identified public ROW projects.

The plan spans the entire county and builds on prior work at the countywide level completed with C/CAG's SWRP, which was the first effort to begin screening and prioritizing opportunities for green infrastructure throughout the county. The SSMP expands on the SWRP primarily by updating and refining the prioritization criteria used in the SWRP and by linking the countywide hydrology and pollutant model for streets and roads and the green infrastructure model (SUSTAIN) outputs to quantify the volume capture and pollutant load reduction benefits from planned and newly identified sustainable streets infrastructure projects. The SSMP also includes a climate change adaptation analysis to model future storm conditions at the county scale and associated changes in predicted stormwater runoff depths as well as the potential benefits of modeled green infrastructure scenarios derived from the green infrastructure RAA. To support future analysis of green infrastructure benefit and planning for sustainable streets that links green stormwater management with bike, pedestrian and streetscape improvements, the project also included a countywide GIS analysis of catch-basin-level drainage areas via updated infrastructure data and new countywide LiDAR data to model flowlines and drainage areas for every catch basin in the county.

The SSMP employs a categorization of sustainable streets typologies based on the type of improvements identified: intersection, linear connectivity, or streetscape improvements. These transportation projects are then prioritized for inclusion of green infrastructure, taking into account a synthesis of performance metrics and co-benefits (such as whether there is a benefit to disadvantaged communities, reduced heat island impacts, ability to manage predicted increases in runoff depth with climate change and whether there is a benefit of adding vegetation to fill gaps in urban tree canopy). The SSMP also includes a fourth typology of sustainable streets opportunities linking green infrastructure in the public ROW via new and redevelopment frontage improvements. The plan will include model Sustainable Streets policy documents for cities to consider adopting as well as model conditions of approval and resolution documents to support advancing local planning policies with respect to green infrastructure and sustainable streets implementation. Eleven project concepts and several new green infrastructure/sustainable streets typical details will be developed to support moving projects into implementation. Lastly, as described in Section 5.4, the SSMP includes an online tracking and mapping tool, which will support C/CAG's permittees in tracking progress towards water quality goals and resiliency with green infrastructure implementation, as well as to provide a visual tool for the public to interact with and learn more about countywide and jurisdiction progress with transforming to a more sustainable approach to stormwater management.

6.2.3 Green Infrastructure at Schools

C/CAG has built relationships with the County Office of Education over the past several years to begin seeking opportunities for collaboration with schools to more sustainably manage stormwater runoff on school sites, which historically have not been addressed via the MRP. C/CAG has developed a three-pronged approach to partnering with schools on green infrastructure, with each prong addressing a different scale of implementation.

At the site scale, C/CAG has leveraged its ongoing rain barrel rebate program in partnership with BAWSCA and its public involvement and participation program to focus on rain barrel installations at schools. In 2019, C/CAG provided two rain barrels and technical support for its first rain barrel installation at the Tierra Middle School in San Carlos. The project included a coordinated effort led by students and teachers to build a connected rain garden. Building from this project, C/CAG was recently awarded a California Resilience Challenge Grant, administered by the Bay Area Council, to develop schoolyard greening concept plans for three sites (including Tierra Linda Middle School) and up to six schools also in San Carlos. The intention of this project is to create concept plans that integrate schoolyard greening and green stormwater infrastructure at schools with climate adaptation goals (like reducing urban heat island impacts and addressing flooding and drought) and that will create the foundation for fundraising and implementation. Another goal is to scale the strategy used in the Resilient San Carlos Schoolyards Project countywide for broader school engagement.

At the street scale, C/CAG has worked with schools through its Safe Routes to School bike and pedestrian safety program in coordination with the countywide stormwater program. Leveraging local vehicle registration funds, C/CAG funded 10 pilot integrated Safe Routes to School and Green Streets Infrastructure Projects across the county, eight of which have been completed between fall 2018 and fall 2020. C/CAG worked with the local jurisdictions and the Safe Routes to School program coordinators at the County Office of Education to identify priority locations to improve walking and biking safety, while also building green stormwater infrastructure for water quality, flood resilience and community benefits.

At the regional scale, C/CAG continues to engage schools on opportunities for larger-scale subsurface stormwater retention projects. With state funds administered through the California Natural Resources Agency, C/CAG, in partnership with the County Office of Education, is procuring technical support to further screen and prioritize regional stormwater capture projects throughout the county. This effort will include evaluating school sites as key opportunities to partner on large stormwater retention projects, where schools may be interested in partnering for additional schoolyard/campus improvements (such as new fields and water supply augmentation), while also building community resiliency and flood protection benefits. The Resilient San Carlos Schoolyards Project will also evaluate opportunities at schools in San Carlos as part of the concept planning effort.

6.2.4 Summary of Funding of Green Infrastructure in San Mateo County

Table 6-1 provides a summary of funding dedicated to furthering GI implementation in San Mateo County. To-date, this funding totals approximately $35M, reflecting C/CAG's extensive efforts to assist Permittees identify GI funding.

Table 6-1. Summary of Funding Dedicated to Furthering GI Implementation in San Mateo County.

Amount of Funding	Description
$28.5M	From Caltrans for South San Francisco / Atherton.
$913K	From California Natural Resources Agency (CNRA) to Belmont regional project.
$1.13M	From CNRA/OOS to San Bruno project.
$1.13M	From CNRA/OOS to Redwood City project.
$200K	From C/CAG/OOS to find more regional projects, new concepts.
$100K	From C/CAG for countywide business case/alternative compliance study.
$1.18M	From Caltrans to C/CAG on SSMP.
$100K	From CA Resilience Challenge Grant for schoolyard greening concepts.
$2M	From C/CAG toward 10 SRTS/GI projects.
$35M	**Approximate Total**

6.3 Uncertainties and Adaptive Implementation

The modeled baseline stormwater loading estimates and estimated load reductions associated with source controls and GI presented in this Control Measures Plan are based on readily available data on pollutant sources and pathways and the pollutant removal effectiveness of the control measures. Although significant resources have been spent collectively over the course of the past two decades on collecting and interpreting these data, significant information gaps continue to create uncertainties in our collective ability to track progress towards pollutant load reduction goals and attainment of TMDL WLAs. These uncertainties should be acknowledged and over time be reduced to the extent feasible, so that reasonable decisions on investments in control measure implementation can be made.

To support the reasonable and cost-effective implementation of control measures to address PCBs (and mercury) in stormwater runoff, investments in control measures by local public agencies should be informed by the level of uncertainty associated with the effectiveness of the actions being proposed. In addition, control measure implementation will be adaptively managed by San Mateo County Permittees over time, based on new information regarding PCBs sources and source areas, and the costs and effectiveness of controls. This adaptive management approach is consistent with the PCBs and mercury TMDLs, which discuss the expectation that information on the technically feasibility, effectiveness and cost efficiency of control measures will evolve over time (SFBRWQCB 2006, 2008). As such, San Mateo

County Permittees intend to continue collecting and evaluating information on the PCBs and mercury levels in stormwater runoff, and the technical feasibility and cost-effectiveness of stormwater controls. Based on this information, Permittees plan to update this Control Measures Plan on a timeframe consistent with MRP requirements.

6.4 Participation in PCBs Control Measure Implementation by Other Entities

New public GI projects, as demonstrated in each of the control measure implementation scenarios presented in this plan, represent scenarios to achieve the PCBs load reduction target in San Mateo County over time. Other scenarios may include the implementation of control measures by other entities (e.g., Caltrans, facilities subject to individual NPDES permits, and Industrial General Permittees) in San Mateo County that are subject to existing and future NPDES permits or WDRs. As shown in Table 2-3, land areas associated with these entities contribute a substantial portion (23.5%) of the PCBs load to the Bay from San Mateo County stormwater runoff.

Many of the existing and planned control measures described in this Control Measures Plan overlap into land areas owned or operated by these entities. Therefore, the PCBs load from the portion of these areas under jurisdiction of other entities is addressed through the expenditure of San Mateo County Permittee resources. This is especially true for stormwater treatment systems that address PCBs from hundreds of acres of land (e.g., high capacity trash full capture systems and proposed regional stormwater capture projects), and include acreage associated with both Permittees and non-MRP entities. That said, PCBs loads from these and other land areas that are currently not addressed via NPDES stormwater permits or WDRs (e.g., railroads) continue to be an important source of PCBs to the Bay.

The need for San Mateo County Permittees to plan, construct and maintain GI projects in the public ROW could be reduced through actions by these entities to reduce PCBs discharges in stormwater runoff from their areas. The Regional Water Board should engage these entities to clarify their responsibilities under the TMDLs and require such PCBs load reduction actions, which would reduce the burden on MRP Permittees. The improved management of PCBs-containing equipment/materials and the enhanced management of sediment/soils on properties owned and operated by these entities could result in significant cost-savings compared to addressing PCBs further “downstream” through GI constructed in the public ROW and maintained in perpetuity by MRP Permittees.

6.5 Request for Review and Revision of the TMDLs

Many uncertainties remain regarding various aspects of the PCBs and mercury TMDLs and the information used to model baseline stormwater loads and calculate load reductions to-date and those predicted to occur in the future. However, as a result the development of this Control Measures Plan and RAA, it is clear that attaining the San Mateo County stormwater runoff PCBs TMDL WLA by 2030 (or decades later) cannot be achieved through the implementation of the currently available technically and economically feasible control measures.

Based on this result, San Mateo County MRP Permittees request that the Regional Water Board review and revise the schedule for attainment of the WLA for stormwater runoff in the PCBs TMDL (SFBRWQCB 2008). This request is consistent with the adaptive management strategy described in the TMDL, which explicitly states that a review and revision of the load reduction expectations for stormwater runoff will be conducted during the term of the third implementing NPDES permit (i.e., MRP 3.0, tentatively scheduled to begin in 2021). Thus, this Control Measures Plan and RAA (and similar plans/RAAs from the other MRP counties) should provide the Regional Water Board with a basis for extending the PCBs TMDL deadline, if Permittees have demonstrated that all technically and economically feasible PCBs/mercury control measures will be implemented within the original timeline. SMCWPPP and San Mateo County Permittees plan to work with other MRP Permittees and Regional Water Board staff to participate in this review and revision process.

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Appendix A

Phase I RAA – Baseline Modeling Report

S E P T E M B E R   2 0 2 0

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury:

Phase I Baseline Modeling Report

flowstobay.org

SAN MATEO COUNTYWIDE

WATER POLLUTION PREVENTION PROGRAM

Clean Water. Healthy Community.

A Program of the City/County Association of Governments of San Mateo County (C/CAG)

Prepared by

PARADIGM ENVIRONMENTAL

LARRY WALKER ASSOCIATES, INC.

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EXECUTIVE SUMMARY

This report provides a summary of the methods and modeling approaches used to represent baseline hydrology and sediment, Polychlorinated Biphenyls (PCBs), and mercury loads resulting from municipal stormwater discharges within San Mateo County to San Francisco Bay. This baseline model supports the first step in preparation of a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates how proposed green infrastructure (GI) control measures will result in sufficient load reductions of PCBs and mercury to meet Total Maximum Daily Load (TMDL) wasteload allocations assigned to municipal stormwater discharges to San Francisco Bay. The report documents the major steps, decisions, and assumptions made in the model development process. The report also provides documentation of model performance and calibration results based on local data. This documented calibration is critical to ensuring that the baseline model reliably captures the watershed characteristics and conditions and is sufficient for estimating pollutant loads and calculating pollutant reduction goals assigned to GI to support implementation of TMDLs.

The hydrologic and water quality model selected for the baseline model of San Mateo County watersheds was the Loading Simulation Program in C++ (LSPC), a watershed modeling system that includes Hydrologic Simulation Program FORTRAN (HSPF) algorithms for simulating watershed hydrology, erosion, water quality processes, and in-stream fate and transport processes. The model can simulate upland loading and transport of sediment, mercury, and PCBs. The model was configured based on the best available spatial and monitoring datasets to represent the land, meteorological, hydrological, and pollutant loading characteristics of San Mateo County watersheds. Based on criteria established by the *Bay Area Reasonable Assurance Analysis Guidance Document* (BASMAA 2017), the baseline hydrology and pollutant loading model was demonstrated to be sufficiently calibrated and validated and acceptable for estimation of existing loads of mercury and PCBs, comparison to TMDL wasteload allocations, and determination of necessary load reductions to support the planning of GI implementation.

The Municipal Regional Stormwater Permit (MRP) (Order No. R2-2015-0049) requires a portion of the TMDL wasteload allocations for PCBs and mercury to be met through the implementation of GI by 2040. Through comparison of modeled baseline PCB loads and the wasteload allocation assigned to municipal stormwater discharges, this study estimates that a 17.6% of annual PCB loads (0.23 kg/year) is to be reduced through GI implementation. For mercury, baseline loads were less than the TMDL wasteload allocation, resulting in no required mercury load reductions for San Mateo County municipalities.

The next phase of the RAA will provide a quantitative approach to establish relationships between GI implementation and required reductions of PCB loads. Model output will estimate the amount of GI needed to achieve the 17.6% PCB load reduction target for C/CAG member agencies. These estimates will serve as GI implementation goals that will support the development of GI plans by each agency.

Contents

Figures

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Acronyms

ABAG	Association of Bay Area Governments
AGWO	Active Groundwater Outflow
BAHM	Bay Area Hydrology Model
BASMAA	Bay Area Stormwater Management Agencies Association
Bay	San Francisco Bay
BMP	Best Management Practice
Caltrans	California Department of Transportation
C/CAG	City/County Association of Governments of San Mateo County
CIMIS	California Irrigation Management Information System
DCIA	Directly Connected Impervious Area
DEM	Digital Elevation Model
ECHO	Enforcement and Compliance History Online
EIA	Effective Impervious Area
EMC	Event-Mean Concentration
EPA	Environmental Protection Agency
ET	Evapotranspiration
FTABLE	Functional Table (Model Rating Curve)
GHCN	Global Historical Climatology Network
GI	Green Infrastructure
GIS	Geographic Information Systems
HgT	Total Mercury
HRU	Hydrologic Response Units
HSG	Hydrologic Soil Group
HSPF	Hydrologic Simulation Program–FORTRAN
IFWO	Interflow Outflow
IGP	Industrial General Permit
LSM	Land Surface Models
LSPC	Loading Simulation Program in C++
MIA	Mapped Impervious Area
MRP	Municipal Regional Stormwater Permit
MS4	Municipal Separate Storm Sewer System
NED	National Elevation Dataset
NHD	National Hydrography Database
NLCD	National Land Cover Database
NLDAS2	North American Land Data Assimilation System
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NOAA	National Oceanic and Atmospheric Administration
PCBs	Polychlorinated Biphenyls
PEVT	Potential Evapotranspiration

POI	Points of Interest
PRISM	Parameter-elevation Regressions on Independent Slopes Model
QAPP	Quality Assurance Project Plans
RAA	Reasonable Assurance Analysis
RWSM	Regional Watershed Spreadsheet Model
SCVWD	Santa Clara Valley Water District
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic Database
STLS	Small Tributaries Loading Strategy
SWRCB	State Water Resources Control Board
TAET	Total Actual Evapotranspiration
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WLA	Waste Load Allocation
WMMS	Watershed Management Modeling System
WY	Water Year

1 INTRODUCTION

The Municipal Regional Stormwater Permit (MRP) (Order No. R2-2015-0049) requires Bay Area cities and counties to develop Green Infrastructure (GI) Plans (Provision C.3) and PCBs and Mercury Control Measure Implementation Plans (Provisions C.11 and C.12) that provide the necessary pollutant load reductions to meet Total Maximum Daily Load (TMDL) wasteload allocations (WLA) over specified compliance periods. A key component of these plans is a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates that proposed control measures will result in sufficient load reductions of Polychlorinated Biphenyls (PCBs) and mercury to meet WLAs for municipal stormwater discharges to San Francisco Bay. The City/County Association of Governments (C/CAG) of San Mateo County has initiated a county-wide effort to develop an RAA to estimate the baseline PCB and mercury loads to the Bay, determine load reductions to meet WLAs, and set goals for the amount of GI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GI (SFBRWQCB 2015).

In 2017, the U.S. Environmental Protection Agency (EPA) Region 9 released *Developing Reasonable Assurance: A Guide to Performing Model-Based Analysis to Support Municipal Stormwater Program Planning* (EPA RAA Guide) (USEPA 2017), which provides guidance on the technical needs of the RAA and considerations for model selection. Building upon the EPA RAA Guide, the Bay Area Stormwater Management Agencies Association (BASMAA) prepared the *Bay Area Reasonable Assurance Analysis Guidance Document* (Bay Area RAA Guidance) (BASMAA 2017) to provide specific guidance on modeling to support RAAs performed in the Bay Area to meet MRP requirements, address TMDLs for PCBs and mercury, and support GI planning. The EPA RAA Guide and Bay Area RAA Guidance both outline essential steps for performing an RAA, as depicted in Figure 1-1. The purpose of this report is to document the first phase of the RAA, which includes the development of a baseline model to address the first 3 steps of the RAA outlined in the EPA RAA Guide and Bay Area RAA Guidance. These steps include:

1. **Designation of Area Addressed by Analysis**: As the RAA associated with GI plans is developed in the context of the MRP and WLAs assigned to municipal stormwater discharges to the Bay, the area where it is applied is typically specific to urban areas within municipal jurisdictions addressed by the MRP.
2. **Characterization of Existing Conditions**: Critical to the RAA is careful characterization of stormwater pollutant loads or flows under existing baseline conditions (average water year 2002). This understanding serves as the foundation of the RAA and identifies the starting point for planning management actions.
3. **Determination of Stormwater Improvement Goals**: Based on the existing conditions characterized above, and in combination with pollutant reduction goals assigned to GI based on TMDL WLAs and the MRP, goals can be determined in terms of the amount of pollutant load reduction to be achieved by GI.

This report provides a summary of the methods and modeling approaches used to represent baseline hydrology and sediment, PCB, and mercury loads in San Mateo County (RAA Step 2). The report provides necessary documentation of model performance and calibration results based on local data. As stated in the Bay Area RAA Guidance, the documented calibration is critical to ensuring that the baseline model reliably captures the watershed characteristics and condition. The report also documents the use of the baseline model for simulation of pollutant loads from the area addressed by the analysis (RAA Step 1), and the comparison to WLAs for calculation of pollutant reduction goals assigned to GI (RAA Step 3). The report documents the major steps, decisions, and assumptions made in the model development process.

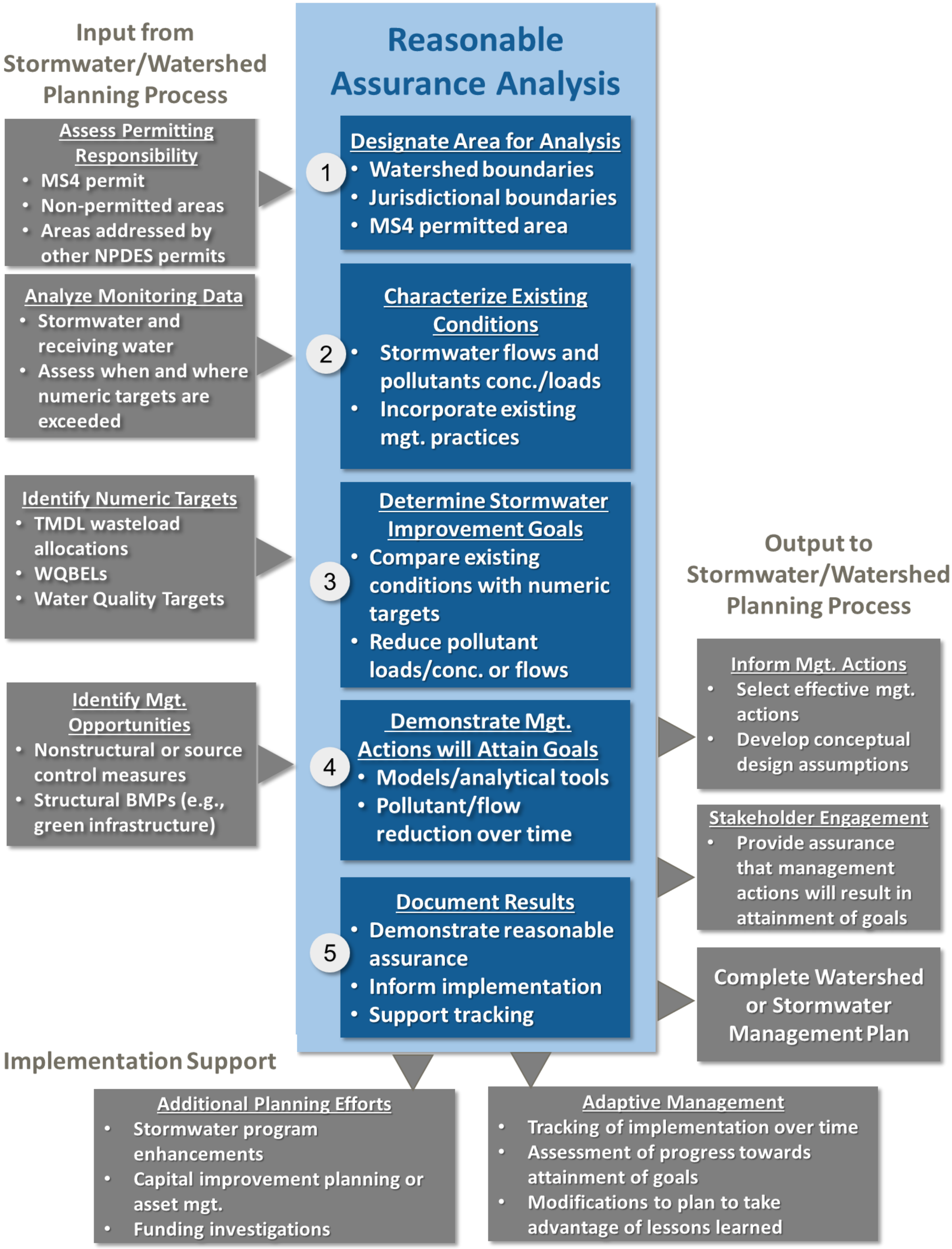


Figure 1-1. RAA Process Flow Chart (USEPA 2017).

1.1 Summary of Previous Studies Considered for Model Approach Development

There were previous and ongoing regional studies and resources available to draw from and build upon for this study. The following provides a summary of each study:

1. **Bay Area Hydrology Model (BAHM):** BAHM is a tool for analyzing the effects of hydromodifications in a watershed (including stormwater and runoff management practices) on hydrology. BAHM uses Hydrologic Simulation Program – FORTRAN (HSPF) (Bicknell et al., 1997) as the underlying watershed model and includes some locally derived hydrology parameters for San Mateo, Santa Clara, and Alameda Counties. BAHM is available for download at: http://www.bayareahydrologymodel.org/.
2. **Guadalupe River HSPF model:** Local monitoring and analysis identified the Guadalupe River as a large contributor of mercury and PCBs to the Bay. The Guadalupe River HSPF watershed model was used to extrapolate sediment, total mercury and PCB loads to the Bay. Model documentation noted that data limitations hindered water quality calibration performance but suggested that future data collection efforts could improve model performance and forecasting potential (Lent and McKee 2011).
3. **Regional Watershed Spreadsheet Model (RWSM):** RWSM was developed by the San Francisco Estuary Institute (SFEI). SFEI monitored several small urban tributaries around the Bay as part of the Small Tributary Loading Study and those data were used to estimate potential sediment, total mercury, and PCB loading rates by land use source categories.

The Bay Area RAA Guidance specified three methods for identifying the baseline condition: (1) utilizing the TMDL Staff Report baseline loading (SFBRWQCB 2006; SFBRWQCB 2008b); (2) utilizing the RWSM loading; and (3) recalculating the baseline using a calibrated computational model. For the San Mateo County-wide RAA, a computation model was selected for simulating baseline conditions and re-evaluating the mercury and PCB load reductions to achieve the WLAs. Model development draws upon elements of the referenced resources above to build robust modeling assumptions and support model calibration. The first two studies provided directly applicable reference material for hydrology model parameterization and calibration. The third study provided guidance about relative magnitude of loads from various sources to help parameterize water quality inputs. By focusing on small urban tributaries, RWSM includes locally derived model coefficients and estimated source loading information for benchmark comparison of simulated model results.

1.2 Overview of Baseline Model Approach

The model development process can be a good platform for gaining valuable information and insight about the system. If well-designed, the model development process is an iterative and adaptive cycle that improves understanding of the system over time as better information becomes available. Ultimately a model can inform future data acquisition efforts and management decisions by highlighting factors that have the most impact on the behavior of a natural system. Figure 1-2 is a conceptual schematic of a model development cycle, which is conceptually represented as circular as opposed to linear. That cycle can be summarized in six interrelated steps:

1. **Assess Available Data**: These data are used for source characterization, trends analysis, and defining modeling objectives.
2. **Delineate Project Extent**: Model segmentation and discretization needed to simulate stream flows at temporal and scale scales appropriate for defining instream flow needs at specified Points of Interest (POIs).

3. **Set Boundary Conditions**: Spatial and temporal model inputs defining the appropriate hydrologic inputs and outputs.
4. **Model Calibration**: Adjustment of model rates and constants to mimic observed physical processes of the natural system.
5. **Model Validation**: Confirmation of model processes and patterns over space and time to assess if the model is a robust predictive tool.
6. **Assess Data Gaps**: Sometimes the nature of modeled responses can indicate the influence of unrepresented physical processes in the modeled system. A well-designed model can be adapted for future applications as new information about the system becomes available. Depending on the study objectives, data gaps sometimes provide a sound basis for further data collection efforts to refine the model, which cycles back to Step 1.

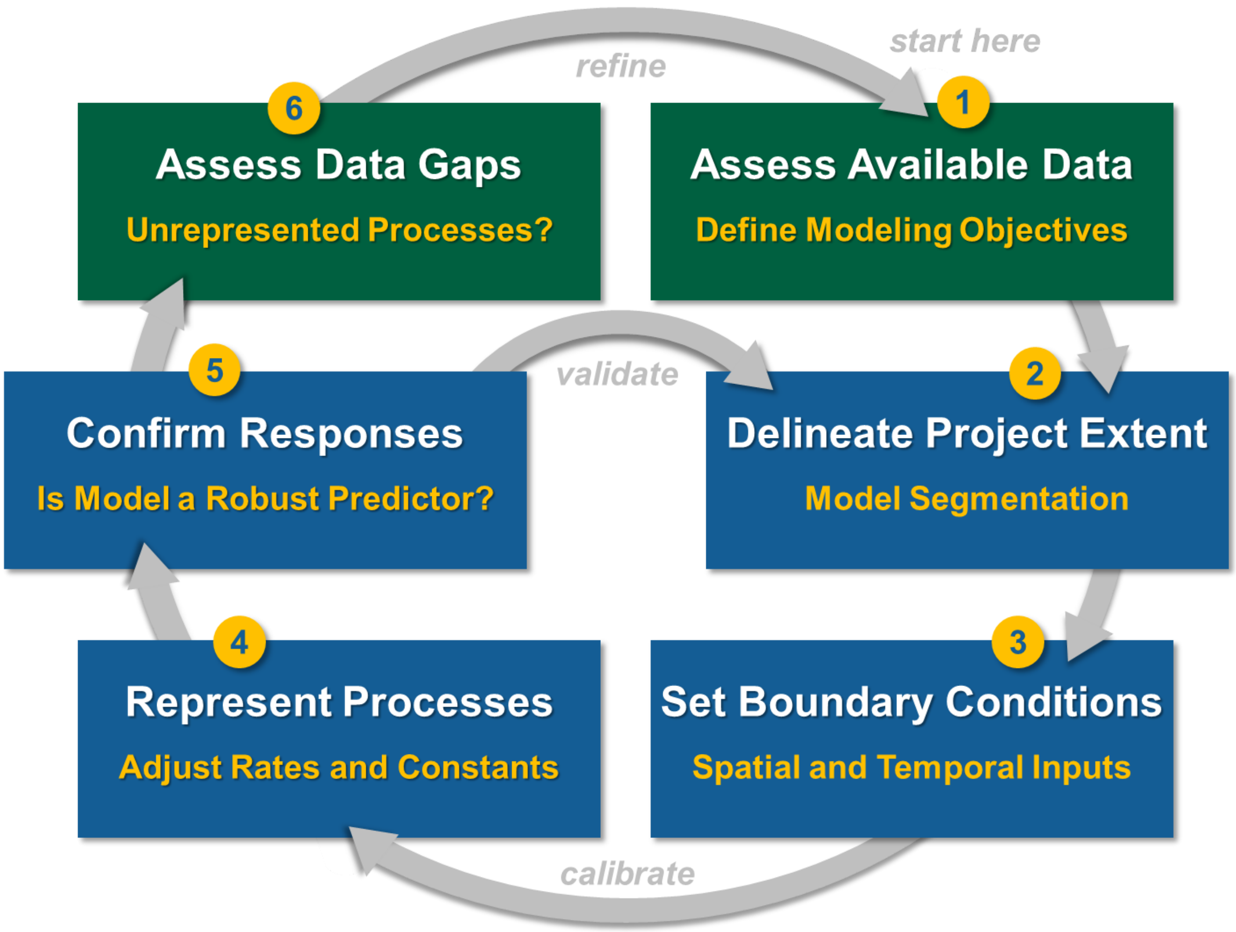


Figure 1-2. Conceptual schematic of a model development cycle.

The hydrologic and water quality model selected for the baseline model of San Mateo County watersheds was the Loading Simulation Program in C++ (LSPC) (Shen et al. 2004, LACDPW and USEPA 2009), a watershed modeling system that includes HSPF algorithms for simulating watershed hydrology, erosion, water quality processes, and in-stream fate and transport processes. The model can simulate upland loading and transport of sediment, mercury, and PCBs.

LSPC is built upon a relational database platform, making it easier to collate diverse datasets to produce robust representations of natural systems. LSPC integrates GIS outputs, comprehensive data storage and management capabilities, the original HSPF algorithms, and a data analysis/post-processing system into a convenient PC-based Windows environment. The algorithms of LSPC are identical to a subset of those in the HSPF model with selected additions, such as algorithms to address land use change over time. LSPC is an open-source public-domain watershed model available from EPA. A recent user's manual for LSPC is available with the Watershed Management Modeling System (WMMS), a large-scale application of LSPC in the Los Angeles, CA Region (http://dpw.lacounty.gov/wmd/wmms/) (LACDPW 2010, LACDPW and USEPA 2009). Figure 1-3 is a generalized schematic of the underlying hydrology model (Stanford Watershed Model) used in HSPF and LSPC. The schematic represents land-based processes for a single land unit in the model.

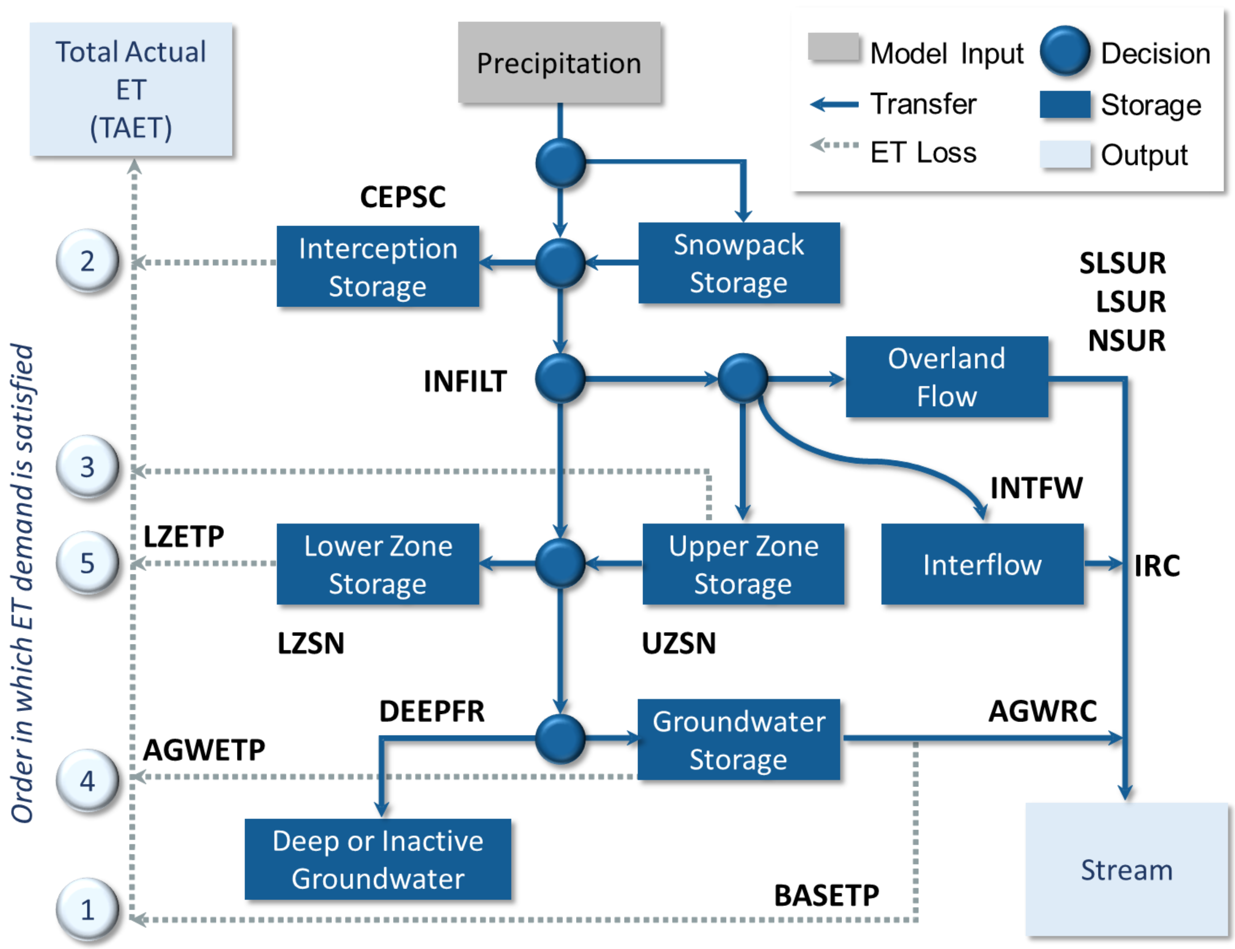


Figure 1-3. Hydrology model schematic (based on Stanford Watershed Model).

Meteorological data are the driver for the modeled hydrologic processes. As shown in the schematic, precipitation is the primary input, while total actual evapotranspiration (TAET) and streamflow are the primary outputs in the water budget. Potential evapotranspiration (PEVT; not explicitly shown in the schematic) is another key meteorological boundary condition for the model. The interaction of model parameters shown above in Figure 1-3 will ultimately determine how much PEVT becomes TAET. There are several pathways that water can take as it makes its way through the network. For each land unit, process-based parameters that reflect differences in geology, soils, vegetation, and land cover will govern the rates and volumes of water at each stage throughout the schematic (Figure 1-3).

Water quality representation in the model builds upon the calibrated hydrology model. The approach considers available data for model parameterization, model calibration and validation, regulatory requirements, and practical considerations. The approach developed for this RAA combines these important considerations and is consistent with the Bay Area RAA Guidance and EPA RAA Guide. The resulting model, in combination with the Phase II modeling effort described in a companion report, will provide a means for identifying and quantifying the load reduction benefits of GI implementation options in all locations but will also identify certain locations or activities for prioritized efforts based on benefits versus costs. GI investment is most cost-effective when costs of implementation are relatively low and pollutant load reduction is relatively high. A three-step approach was developed that leverages RWSM methods for representing PCB and mercury concentrations with the LSPC process-based modeling approach (Figure 1-4):

1. The first step entailed applying the calibrated, land-use-based PCB and mercury runoff concentrations from RWSM to estimate long-term average PCB and mercury loads from LSPC. The product of Step 1 is the total load of PCBs and mercury by source. Using EMCs alone would result in a constant concentration during storm events, which would not be representative of natural processes like first-flush responses.
2. In the second step, the ratio of LSPC modeled PCB and mercury loads to LSPC modeled sediment load was used to estimate an average contaminant sediment concentration, expressed as the mass of contaminant per mass of sediment, for both PCBs and mercury. This process is conducted for each land use component, or hydrologic response unit (HRU; defined in Section 2.2). The resulting PCB and mercury sediment concentrations (i.e., potency factors) were then used to simulate contaminant loadings as a function of sediment rather than runoff. Simulating contaminants as a function of sediment allows the model to capture the first-flush effect, dilution of subsequent events, and non-linear variability of loads with storm intensity.
3. Finally, simulated concentrations are calculated in Step 3, which were then compared to observations from the Small Tributaries Loading Strategy (STLS) as validation.

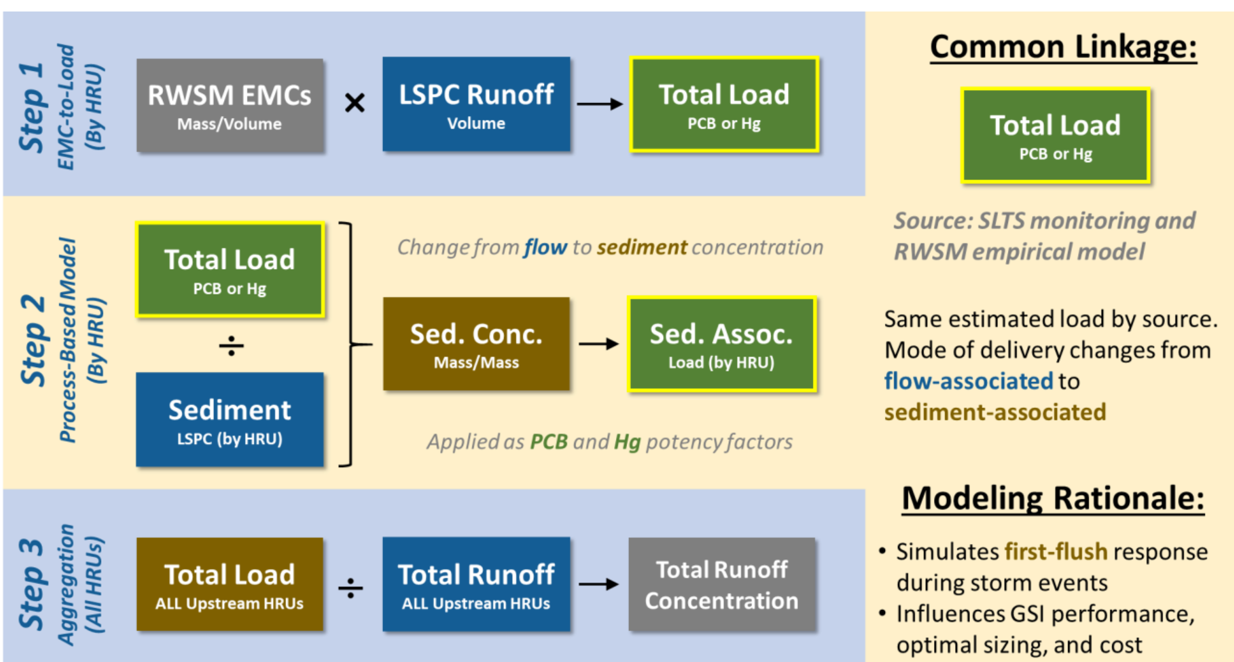


Figure 1-4. Schematic for deriving a process-based, sediment-associated modeling approach for PCBs and mercury.

2 MODEL SEGMENTATION

The organizational framework for LSPC is a relational database. By their very nature, both GIS and timeseries elements of watershed data are organized in a relational database structure (i.e. spatial objects with tabular attributes). In the organizational hierarchy, certain watershed attributes are logically associated with delineated subwatersheds, while other associations are better expressed at a finer spatial scale. It may be suitable to assign climate timeseries to individual subwatersheds; however, process-based parameters (see Figure 1-3) are associated with individual land segments. Irrigation application is one example of an activity that is logically associated at the land-segment level. An important part of the model development process was to determine the acceptable level of resolution to express different parameters. Processes associated with smaller spatial elements of the model provide more degrees of freedom for expressing the spatial resolution of its hydrologic impact; however, more resolution increases computational time and model complexity. Therefore, model configuration involves finding a representative balance between spatial resolution and model complexity. Key elements of model configuration include: (1) subwatershed delineation, (2) hydrologic response units, and (3) parameterization of model processes.

2.1 Subwatershed Delineation

Subwatershed delineation was based primarily on the National Hydrography Dataset (NHD) Plus v2 catchments. This layer provided a good starting point because the subwatersheds were at a relatively fine resolution that captured orographic changes and stream connectivity. For segments where orographic variability was relatively small and stream connectivity was minimally impacted, smaller subwatersheds were aggregated into larger ones. Where necessary, subwatersheds were also adjusted to reflect the locations of streamflow monitoring gages used for calibration. Table 2-1 shows United States Geological Survey (USGS) streamflow gages corresponding to modeled calibration and validation subwatersheds. Figure 2-1 shows delineated subwatersheds for all San Mateo County watersheds and those used for model calibration. For flow and water quality model calibration, some delineated subwatersheds included areas outside of the county to ensure mass balance when compared to observed data. The Guadalupe River watershed in nearby Santa Clara County was included in the model development because those water quality data were the basis for extrapolating total sediment and PCB loads for the Bay Area TMDL (SFBRWQCB 2008b). Modeling the Guadalupe River watershed alongside San Mateo County watersheds draining to the Bay allows for comparison of modeled results to the San Mateo County WLAs.

Table 2-1. Modeled calibration/validation subwatersheds by respective calibration gage (with gage status).

Gage Status[1]	USGS Gage ID	LSPC Model Outlet	Subwatershed Name
Recent Gage Data	11169025	104	Guadalupe River Above Hwy 101 (San Jose, CA)[2]
	11162630	701	Pilarcitos Creek (Half Moon Bay, CA)
	11162620	721	Pilarcitos Creek Below Stone Dam (Hillsborough, CA)
Discontinued Gages	11169500	201	Saratoga Creek (Saratoga, CA)[2]
	11166000	301	Matadero Creek (Palo Alto, CA)[2]
	11162570	501	San Gregorio Creek (San Gregorio, CA)
	11162720	801	Colma Creek (South San Francisco, CA)
Long-Term Gages	11162500	401	Pescadero Creek (Pescadero, CA)
	11164500	601	San Francisquito Creek (Stanford University, CA)

1: Calibration: Recent (primary) and discontinued (secondary) gages; Validation: Long-term gages (used 35 years of record)

2: These gages are outside of San Mateo County. Included for reference in hydrology calibration.

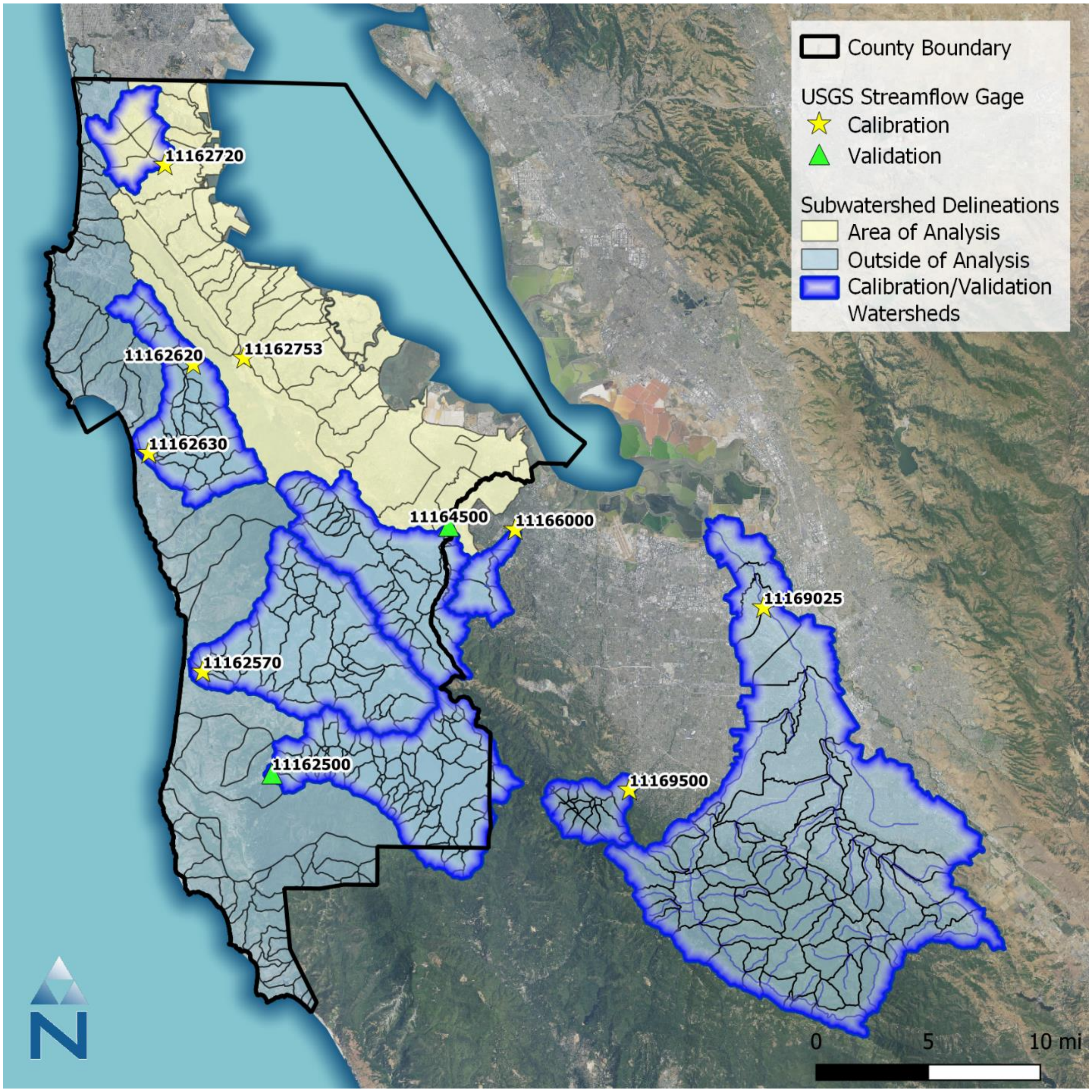


Figure 2-1. Subwatershed delineation for hydrology calibration.

2.2 Hydrologic Response Units

Hydrologic Response Units (HRUs) are the core hydrologic modeling land units in the watershed model. Each HRU represents areas of similar physical characteristics attributable to certain processes. Spatial or geological characteristics, such as soils, slope or steepness, land cover, and land use, are typically used to define HRUs. These four datasets were the primary attributes used in San Mateo County for classifying HRUs. The areal combination of primary characteristics ultimately determines the number of meaningful HRU categories considered for the model. Some consolidation of HRUs is required to balance the need for spatial resolution with model simulation efficiency. Figure 2-2 shows the organizational relationship of HRUs, subwatersheds, and model parameterization. Secondary attributes are properties (e.g., impervious cover) that are summarized by HRU to estimate numerical values for the model.

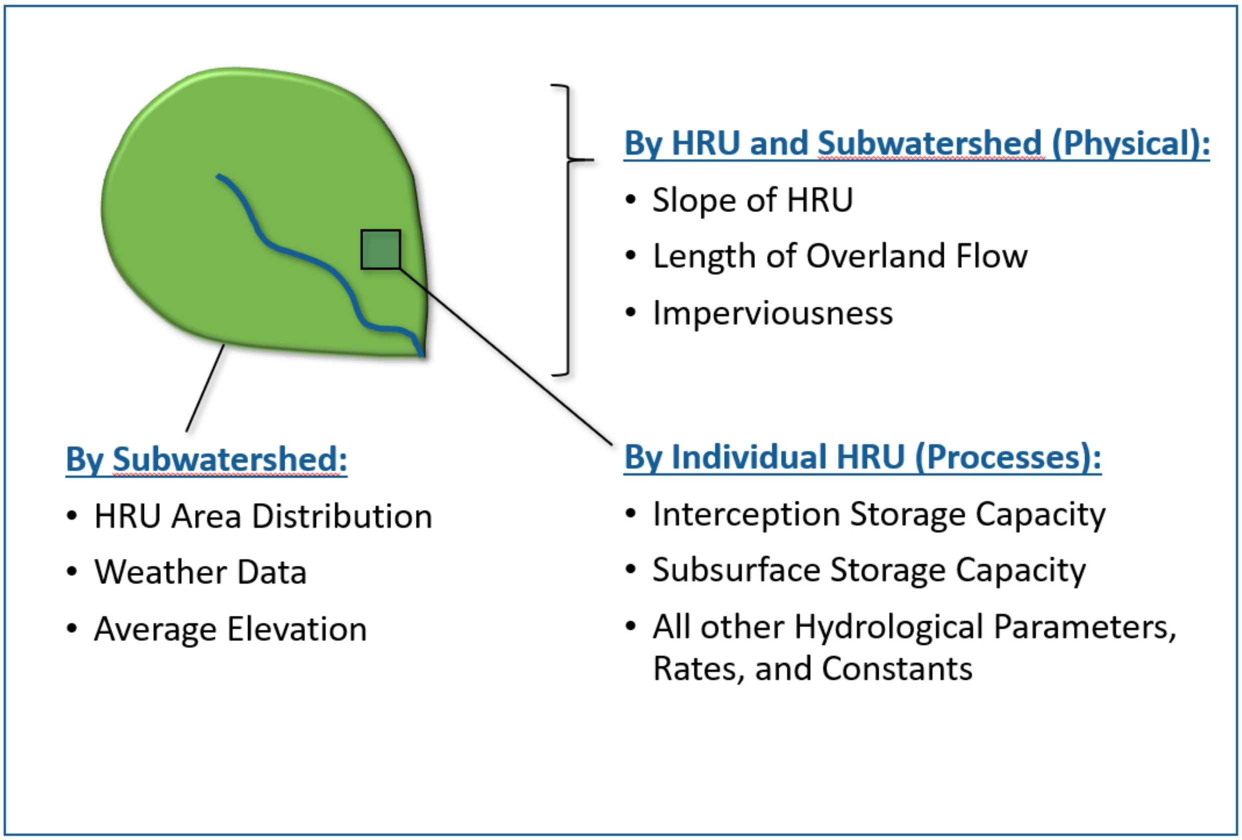


Figure 2-2. Organizational relationship of HRUs, subwatersheds, and model parameterization.

Table 2-2 summarizes the GIS datasets and the corresponding data sources used in HRU processing. All data layers were downloaded from publicly available data sources. The following subsections provide detailed descriptions of each HRU component dataset.

Table 2-2. Summary of input datasets detailing data source and type

GIS Layer	Data Source	Description
Soil Survey Geographic Database (SSURGO)	United States Department of Agriculture (NRCS 2016a)	2016 - polygon layer
State Soil Geographic Database (STATSGO)	United States Department of Agriculture (NRCS 2016b)	2016 - polygon layer
Slope	Generated from DEM	30m raster
Land Use	Association of Bay Area Governments	C. 2005
Land Cover	NLCD (Xian et al. 2011)	c. 2011 – 30m raster
Imperviousness Cover	NLCD (Xian et al. 2011)	c. 2011 – 30m raster

2.2.1 Hydrologic Soil Group

Soils data were obtained from the Soil Survey Geographic Database (SSURGO) and State Soil Geographic Database (STATSGO), both published by the Natural Resource Conservation Service (NRCS). There are four primary hydrologic soil groups (HSG) used to characterize soil runoff potential. Group A generally has the lowest runoff potential whereas Group D has the highest runoff potential. Both SSURGO and STATSGO soils databases are composed of a GIS polygon layer of map units and a linked database with multiple layers of soil property. Soil characteristics of each hydrologic soil group are described in Table 2-3.

Table 2-3. NRCS Hydrologic soil group descriptions.

Hydrologic Soil Group	Description
A	Sand, Loamy Sand, or Sandy Loam
B	Silt, Silt Loam or Loam
C	Sandy Clay Loam
D	Clay Loam, Silty Clay Loam, Sandy Clay, Silty Clay, or Clay

Data Source: Natural Resource Conservation Service (NRCS), Technical Release 55 (TR-55)

Figure 2-3 presents the spatial distribution of the SSURGO hydrologic soil groups for the watershed. The dominant soil group in the watershed is Group C, containing sandy clay loam with relatively low infiltration rates. Group D is the next most common soil group in the watershed, containing clay loam, and silty clay loam that typically have lowest infiltration rates, compared to other hydrologic soil groups. A small portion of the watershed areas had mixed soils, which were grouped with the nearest primary group as follows: A/D → B, B/D → C, and C/D → D. Approximately 2 percent of the watershed HSG area was unknown in the SSURGO database. For those areas, the corresponding HSG from the STATSGO dataset was used to supplement the data gaps.

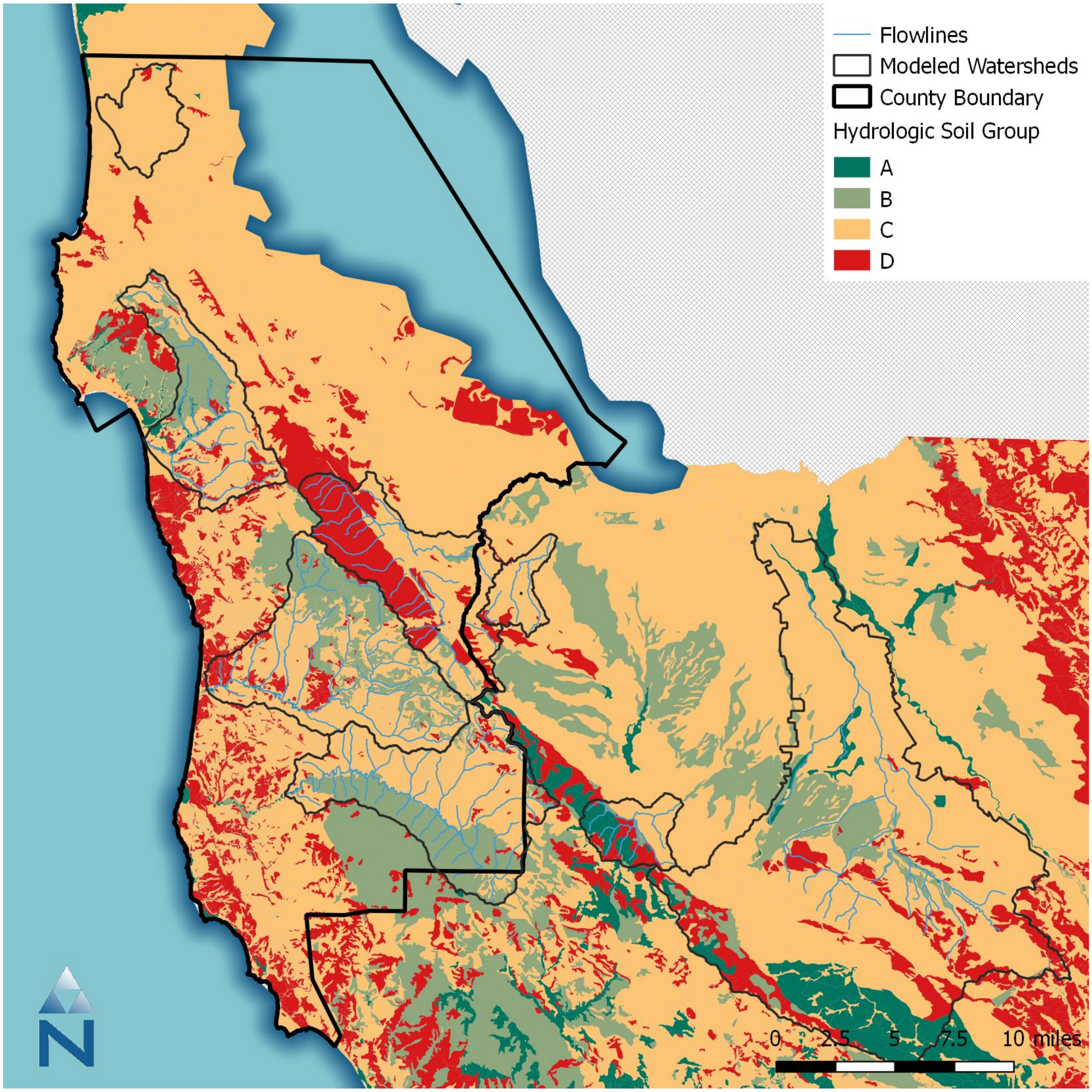


Figure 2-3. Hydrologic soil group classification (Source: USDA SSURGO).

2.2.2 Slope

The DEM grid was used to develop a percent slope raster, which was then reclassified into two groups (i.e., ≤5 percent and >5 percent) corresponding to *low* and *medium* slope areas, respectively. The *low* slope threshold of 5 percent was selected primarily as a threshold for representing urban areas the majority of the total developed area lies below the 5 percent slope threshold. The slope threshold between *low* and *medium* was selected based on a natural breakpoint identified in the distribution of slopes across the total watershed area.

2.2.3 Impervious Cover

Within a given subwatershed, HRU segments are modeled as being parallel to one another. Each segment flows directly to the routing segment without any interaction with neighboring segments. However, in the physical environment, sometimes the lines between impervious and pervious land are not as clearly distinguished—impervious land may flow downhill over pervious land on route to a storm drain or watercourse. For modeling purposes, Effective Impervious Area (EIA) represents the portion of total, or Mapped Impervious Area (MIA), that routes directly to the stream segments. It is derived as a function of Directly Connected Impervious Area (DCIA), with other adjustments as needed to account for other structural and non-structural management practices in the flow network. Figure 2-4**Error! Reference source not found.** illustrates the transitional sequence from MIA to DCIA. For example, impervious areas that are not connected to the drainage network can potentially flow onto pervious surfaces, infiltrate, and become part of pervious subsurface and overland flow; however, because segments are modeled as being parallel to one another in LSPC, this process can be approximated using a conversion of a portion of impervious land to pervious land. During large storm events, both impervious and saturated pervious land can respond like impervious land. Finding the right balance between MIA and EIA can be an important part of the hydrology calibration effort. EIA can be further refined to represent features such as rooftops, driveways, and sidewalks. Some site-scale stormwater management practices that are part of the existing-condition baseline can also be represented using an EIA adjustment.

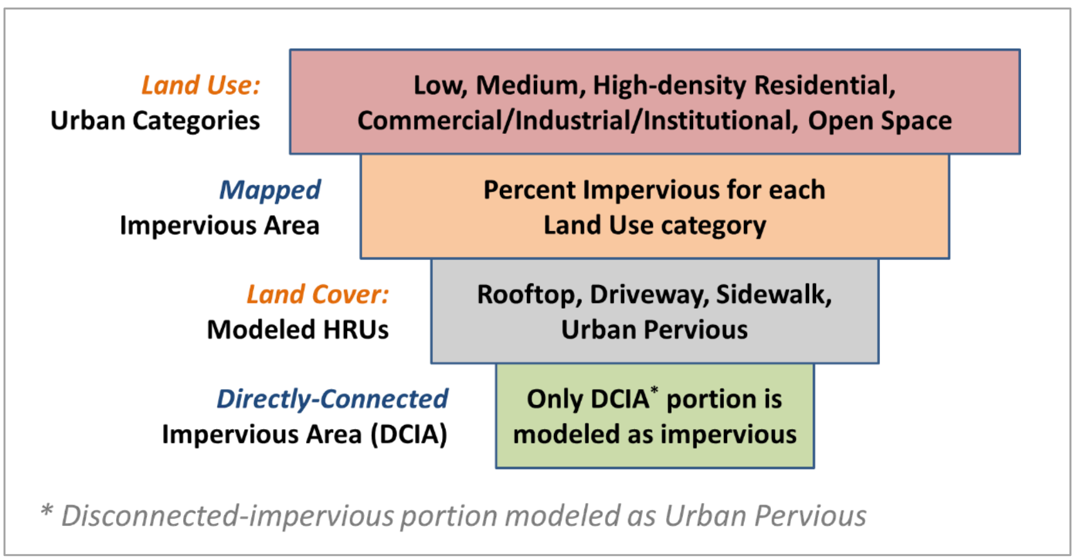


Figure 2-4. Translation sequence from MIA to DCIA.

Empirical relationships like the Sutherland Equations (2000) presented in **Error! Reference source n ot found.** show a strong correlation between the *density* of developed area and DCIA. The curve for high-density developed land trends closer to the line of equal value than the curve for less developed areas. Similarly, as the density of mapped impervious area approaches 1, the translation to DCIA also approaches 1. An initial estimate of EIA (acres) for each land use type in each subcatchment is determined by: (1) extracting the DCIA (%) corresponding to the MIA (%) in **Error! Reference source n ot found.** and (2) multiplying that DCIA (%) by the total area for that land use type. This empirical approximation can be further refined during model calibration to account for other flow disconnections resulting from structural or non-structural BMP or other inline hydraulic routing features. Table 2-4 is a summary of the modeled HRU distributions for each calibration subwatershed.

The color gradient shows the relative distribution of each HRU intersect among all the calibration watersheds.

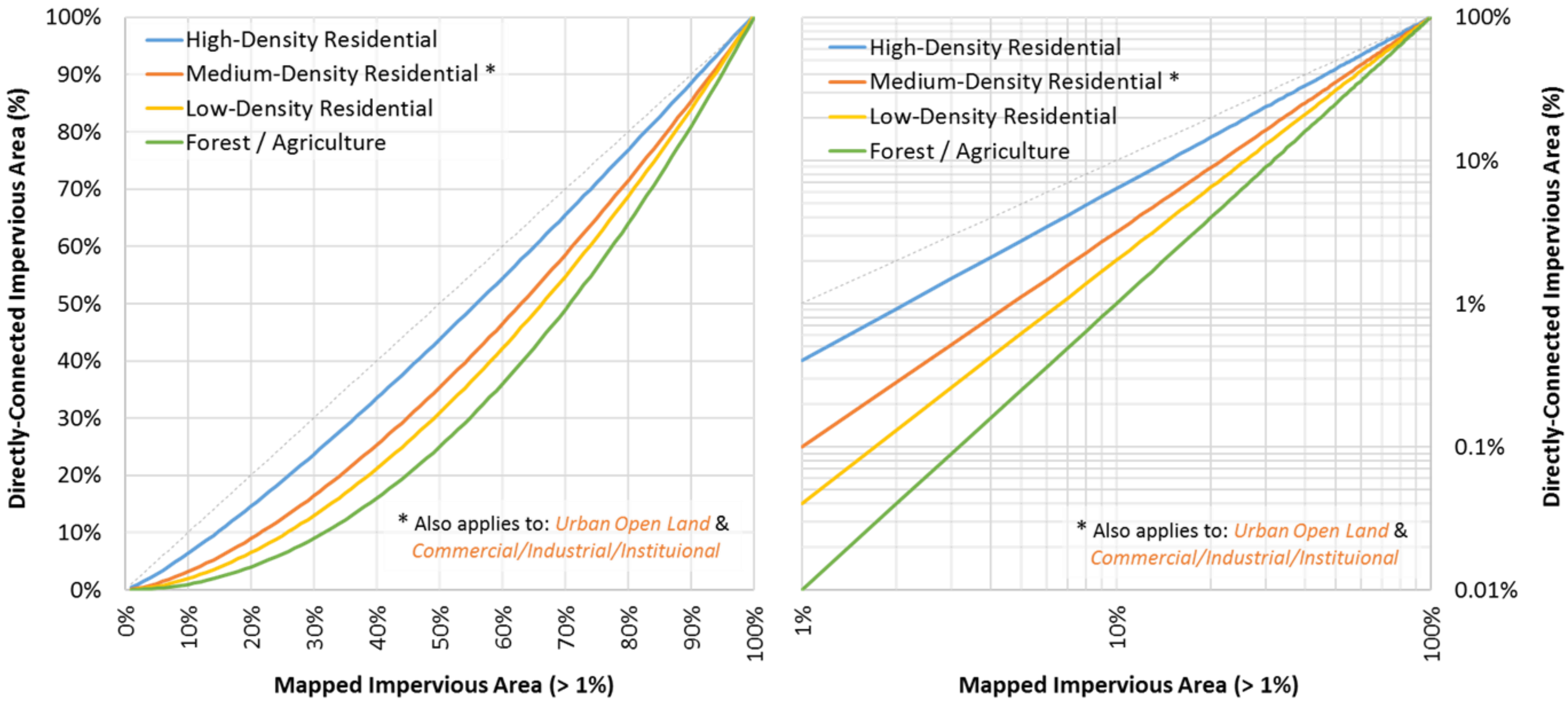


Figure 2-5. Numerical relationships between MIA and DCIA (Sutherland 2000).

2.2.4 Land Cover and Land Use

Land cover and land use data are the primary base layers for HRUs. Land cover describes the physical characteristics that cover the landscape (e.g., forest, wetlands, development) while land use describes the programmatic nature of land cover (e.g., type of development, functional use of open space, zoning etc.). The sources of land use and land cover data used in developing the LSPC watershed model were the Association of Bay Area Governments (ABAG) land use layer and the 2011 National Land Cover Database (NLCD), respectively. The ABAG layer, modified by SFEI to identify old and new urban land uses, was used as the main source of information for representing PCB and mercury source areas. This GIS layer includes the five land use source categories consistent with those used by RWSM. While hydrology and sediment were initially modeled at a higher HRU resolution using the NLCD landuse data, the ABAG layer was intersected during water quality model development, allowing for PCB and mercury sediment concentrations to be assigned spatially. Further descriptions of each dataset are as follows:

- The SFEI-modified ABAG land use source categories are shown in Figure 2-6**Error! Reference source not found.**. These source categories were incorporated as the basis for assignment of water quality parameters (i.e., PCBs and mercury) to appropriately reflect the spatial distribution of pollutant contributions from the San Mateo County watersheds.
- The NLCD is maintained by the Multi-Resolution Land Consortium (MRLC), a joint effort between multiple federal agencies. The primary objective of the MRLC NLCD is to provide a current data product in the public-domain which provides a consistent characterization of land cover across the United States. The first iteration of the NLCD dataset was 1992. Since the 2001 NLCD version, a consistent 16-class land cover classification scheme has been adopted nationwide. The 2011 NLCD adopted this 16-class scheme at a 30-meter grid resolution. The minimum mapping unit is 5 30-m pixels (1.1 acres) for most land cover classes, except urban (1 pixel, 0.2 acres) and cropland and hay/pasture (12 pixels, 2.7 acres) (Homer et al. 2015).
- The NLCD 2011 Imperviousness layer is maintained by MRLC (MRLC) and is published as a companion to the National land Cover Dataset (NLCD). This imperviousness dataset is provided as a raster with a 30-meter grid resolution. Impervious cover is expressed in each raster pixel as a percentage of total area ranging from 0 to 100 percent.

Figure 2-7 shows the organizational relationship of the various datasets used to create HRUs.

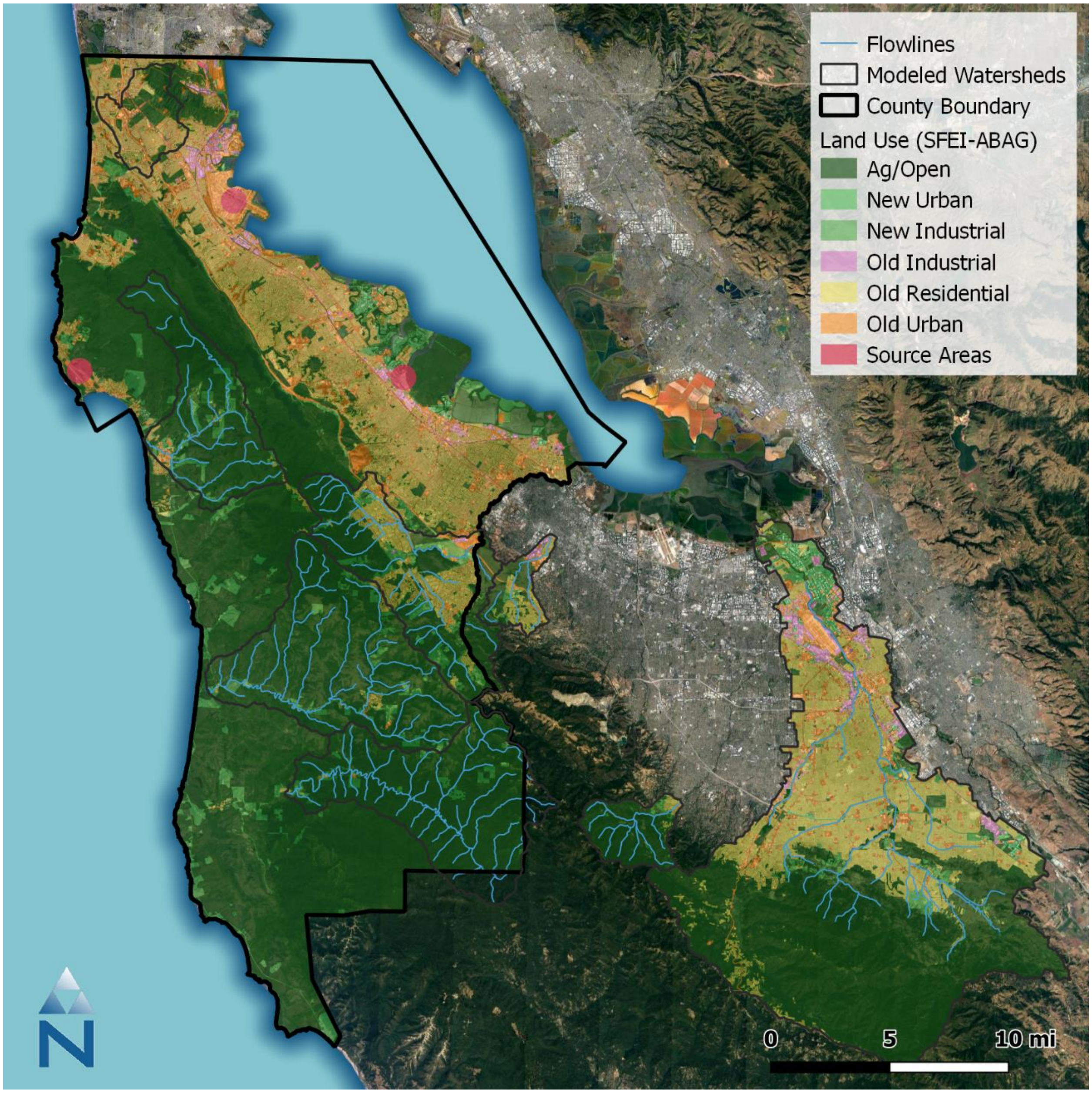


Figure 2-6. ABAG land use data modified by SFEI to represent PCB source categories.

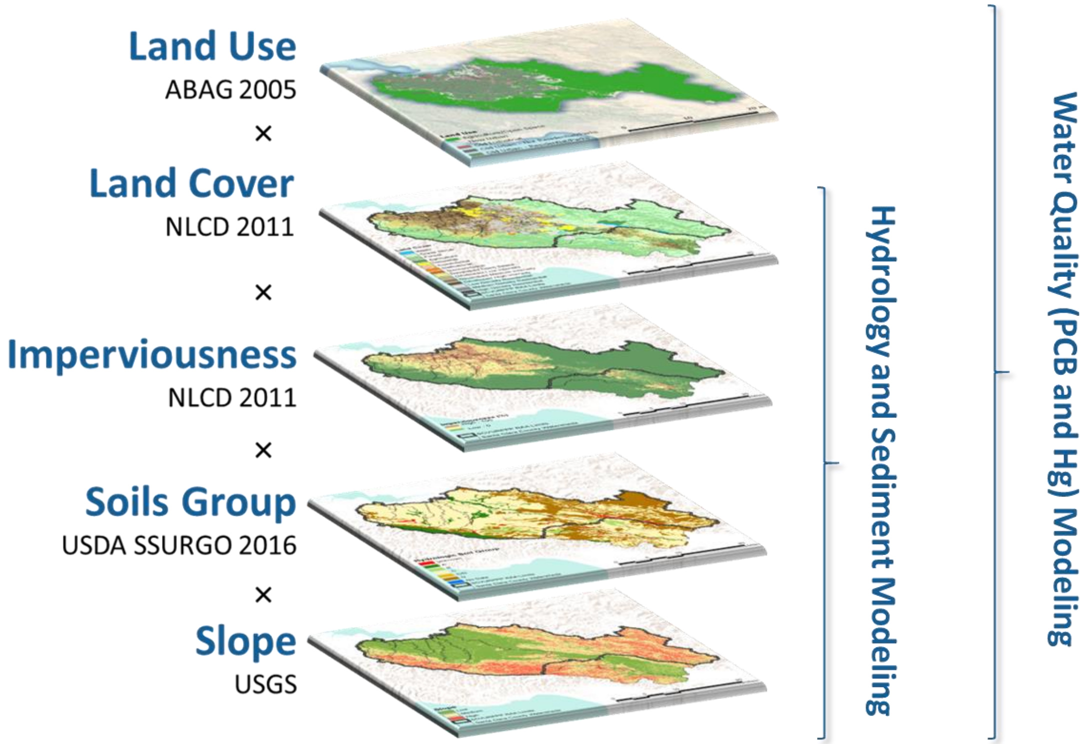


Figure 2-7. Key land characteristic datasets used to create HRUs.

2.2.5 HRU Distribution

Using the reclassified datasets discussed in the previous sections, a set of representative HRUs was developed to reflect key land characteristics of the modeled watersheds. These HRUs serve as the functional pervious and impervious land segment units in the watershed model. The following steps were performed to develop HRU categories:

- Re-project all GIS layers into USA Contiguous Albers Equal Area Conic projected coordinate system (EPSG-102003) to ensure proper overlay and accurate area calculations
- Clip all GIS layers to watershed extent to ensure data overlay to the same spatial extent
- Convert all vector GIS layers into raster grids, resampled to a 30-meter resolution (i.e., 30-meter pixel width by 30-meter pixel height)
- Intersect all input spatial layers and tabulate area distribution for unique combinations of "primary attributes," including land use/land cover, imperviousness, soil, and slope
- Using the final set of HRUs, summarize "secondary attributes" by HRU. Secondary attributes include characteristics such as canopy cover, which can be used to inform the parameterization of model processes.

To illustrate the designation of HRUs in the model, Table 2-4 provides a summary of the modeled HRU distributions for subwatersheds used for the calibration of hydrology (Section 5) and sediment (Section 6). The color gradient shows the relative distribution of each HRU intersect among all the calibration watersheds. Table 2-4 summarizes the percent area by soil and slope HRU groups by each land cover HRU category.

Table 2-4. HRU distribution upstream of each modeled calibration watershed.

Characteristics		Model Calibration Outlet								
		Recent Gages			Discontinued Gages				Long-Term Gages	
USGS Gage ID:		11169025	11162630	11162620	11169500	11166000	11162570	11162720	11162500	11164500
Model Outlet		104	701	721	201	301	501	801	401	601
Drainage Area (Acres)		102,181	18,343	4,202	6,117	4,187	33,063	6,723	28,997	24,133
No. Subcatchments		72	33	7	17	5	54	6	81	44
Average size (acres)		1,419	556	600	360	847	612	1,121	358	548
Size Range (acres)		147-11,862	35-1,481	328-852	41-936	367-1,656	25-2,491	659-1,735	8-2,211	49-2,010
Land Cover	Impervious[1]	17%	2%	0%	1%	8%	0%	26%	0%	2%
	Developed	32%	8%	0%	12%	53%	7%	57%	6%	30%
	Forest	39%	65%	96%	80%	11%	64%	8%	89%	54%
	Shrub/Grass	12%	25%	4%	7%	28%	29%	9%	5%	14%
Slope	Low (≤5%)	58%	37%	44%	19%	62%	48%	90%	40%	69%
	Medium (>5%)	42%	63%	56%	81%	38%	52%	10%	60%	31%
Soils	A	9%	2%	1%	27%	0%	0%	0%	1%	0%
	B	7%	27%	43%	7%	0%	31%	0%	35%	5%
	C	55%	58%	48%	44%	59%	60%	71%	60%	49%
	D	12%	11%	8%	21%	33%	9%	2%	5%	44%
	Impervious[1]	17%	2%	0%	1%	8%	0%	26%	0%	2%

1: Effective Impervious Area (calibrated)

3 METEOROLOGICAL BOUNDARY CONDITIONS

Meteorological data such as precipitation, evapotranspiration, temperature, and other climate timeseries are the primary forcing functions of the model—analytical considerations include data quantity and quality. Primary meteorological data products compiled and reviewed for this effort included two observed precipitation data products from the National Climatic Dataset Center (Global Historical Climatology Network – GHNC Daily and Local Climatic Data). Secondary meteorological data, which are derived or interpolated from primary sources, included monthly precipitation totals from the Parameter-elevation Regressions on Independent Slopes Model (PRISM), hourly precipitation distributions and potential evapotranspiration (ET) estimates from the North American Land Data Assimilation System (NLDAS2), a quality-controlled spatiotemporal dataset supported by the National Aeronautics and Space Administration (NASA), and reference ET rates from the California Irrigation Management Information System (CIMIS).

Because hydrologic models are highly dependent on the quantity and quality of meteorological forcing data, sometimes challenges arise when trying to associate point-sampled weather gauge data over complex terrain (Henn et al. 2018). The development and application of high-resolution gridded data products, or land surface models (LSM), to support continuous-simulation modeling and other geophysical applications has increased with advancements in computing capability and resources. Research related to those products focuses on methodology refinements, assessment of differences between products, and identification of primary drivers and geophysical conditions that affect the robustness of their application in different settings (Henn et al 2018; Behnke et al. 2016). All seven of the gridded products reviewed by Behnke et al. (2016) use the PRISM methodology to interpolate spatially because it considers orographic influence on rainfall variability.

The use of products like NLDAS2 and PRISM also helps to overcome some of the common issues encountered when working with rainfall gauge data, which sometimes contain impaired intervals of missing, deleted, or accumulated data. Missing or deleted intervals are periods during which either the gauge malfunctioned, or the data records were lost. Accumulated intervals contain cumulative precipitation reported over several hours or days, but the exact temporal distribution of the data is unknown due to a gauge malfunction. The LSM uses observed gauge data to guide the meteorological data extrapolation at fixed spatial intervals. LSM extrapolation considers orographic influence on the spatial variation, which can capture the influence of weather movements like those depicted in Figure 3-1. Topographic properties like elevation, aspect, and the windward/leeward location of the prediction point are considered when modeling rainfall variability (both timing and volume) across the landscape. As a result, LSMs extrapolate conditions for ungauged areas and interpolate spatial variability between gauged areas in a non-linear way. Gridded meteorological data representations can capture localized impacts such as rain shadow over the landscape. The quality-control and increased spatiotemporal resolution of meteorological boundary conditions improves the predictions of continuous simulation watershed models and benefits water balance calculations in large-scale continuous-simulation applications. NLDAS2 and PRISM are both updated in real-time in a consistent format, making it easier to periodically update boundary conditions for the watershed model as new information becomes available.

Figure 3-1. Orographic influence on weather movement.

Table 3-1 is a summary of available meteorological data by source that were reviewed as part of model development. Table icons indicate the temporal resolution of the data by source. NLDAS2 also includes the full suite of hourly meteorological timeseries that the model uses, except for dewpoint temperature, which is a function of air temperature, station pressure, and specific humidity and was computed from those NLDAS2 timeseries. The approach used was to intersect NLDAS2 and PRISM and scale the NLDAS2 hourly rainfall timeseries distributions with PRISM monthly precipitation totals. The resulting intersect is an hourly 4-km spatial distribution of PRISM timeseries (based on NLDAS2 rainfall distributions) for the San Mateo County watersheds—there are 94 unique sets of meteorological timeseries available for assignment to the modeled subwatersheds. The sets of meteorological timeseries covered the period between water years 1981 through 2015 at an hourly timestep, covering the periods of record from the USGS streamflow stations used for calibration and validation (Table 5-1). These timeseries include the representative water year 2002, which is suggested by the Bay Area RAA Guidance for simulation of baseline loading and is used as the evaluation period in this RAA.

Table 3-1. Summary of the climate parameters evaluated during the initial inventory.

Meteorological Data	Temporal Resolution of Meteorological Data by Source (Timestep: ● Hourly, ○ Daily, ☐ Monthly)			
	(a) GHCN	(b) LCD	(c) PRISM-M	(d) NLDAS2
Precipitation	○	●	☐	●
Potential Evapotranspiration	--	--	--	●
Daily Air Temperature (Min/Max)	○	--	☐	--
Hourly Air Temperature	--	●	--	●
Solar Radiation	--	●	--	●
Cloud Cover	--	●	--	●
Wind Speed	--	●	--	●
Wind Direction	--	●	--	●
Station Pressure	--	--	--	●
Specific Humidity	--	--	--	●[1]
Dewpoint Temperature	--	●	--	●[2]

Acronyms: (a) Global Historical Climatology Network, (b) Local Climatic Data, (c) Parameter-elevation Regressions on Independent Slopes Model-Monthly aggregated timeseries, (d) North American Land Data Assimilation System.
1: *Specific Humidity* converted to *Relative Humidity* as a function of *Air Temperature* and *Station Pressure*
2: *Dewpoint Temperature* calculated as a function of *Air Temperature* and *Relative Humidity*

3.1 Subwatershed Assignment

In the LSPC model, one set of meteorological timeseries are assigned to each of the delineated model subwatersheds—it is also assumed that the associated precipitation falls uniformly within each subwatershed. To better manage the rigidity of that assumption, subwatersheds were delineated at a finer resolution in portions of the watershed where rainfall variability was relatively high over short distances. Data analysis from other modeling studies have shown notable differences in observed rainfall data collected at different locations at the same facility (e.g., opposite ends of an airport runway). Henn et al. (2018) also describe paired comparisons of observed rainfall gauges located within the extent of a single grid, which report different rainfall volumes and distributions. Ultimately, the predicted hydrologic response of higher-resolution meteorological boundary conditions validates how representative they are of weather conditions upstream of the modeled assessment point.

Figure 3-2 shows long-term historical average distribution of annual average PRISM rainfall for the region overlaid with modeled subwatersheds, PRISM, and NLDAS2 data centroids. Meteorological boundary conditions were associated with subwatersheds by assigning the grid that covered most of the subwatershed area.

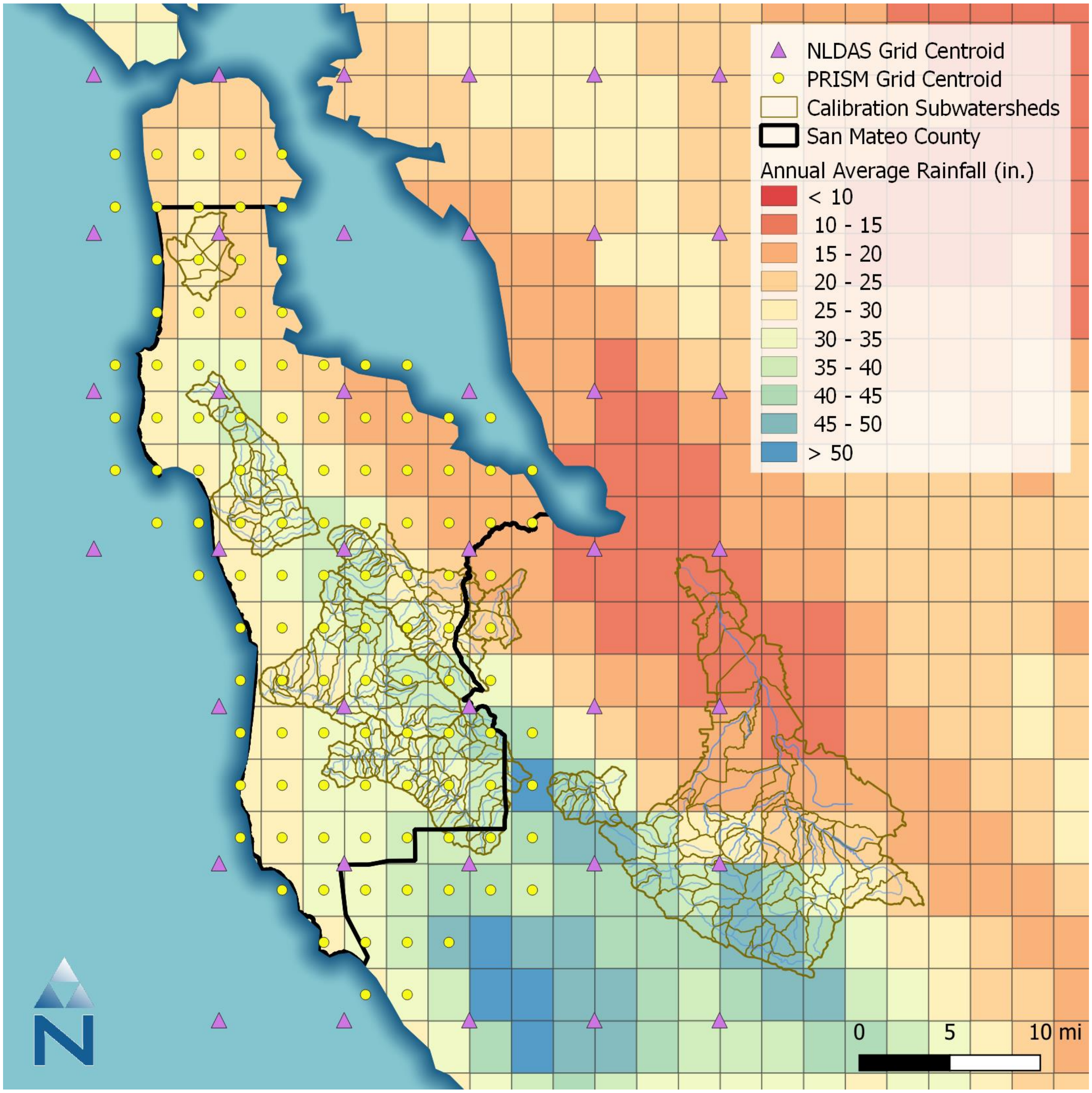


Figure 3-2. Annual average PRISM rainfall depths with associated PRISM and NLDAS2 data centroids.

3.2 Elevation and Aspect Analysis

The PRISM data were analyzed against topographic data to better understand the implications of orographic influences reflected in the PRISM annual average rainfall totals. The elevation of each PRISM centroid was extracted from an overlay with National Elevation Dataset (NED) Digital Elevation Model (DEM). Hillslope aspect was also derived from the DEM and extracted for each PRISM centroid. Aspect was categorized into north-, east-, south-, and west-facing quadrants using the degrees scale shown in the legend of Figure 3-3. Of the available PRISM grid centroids, 137 centroids were within the clipped NED-watershed boundary.

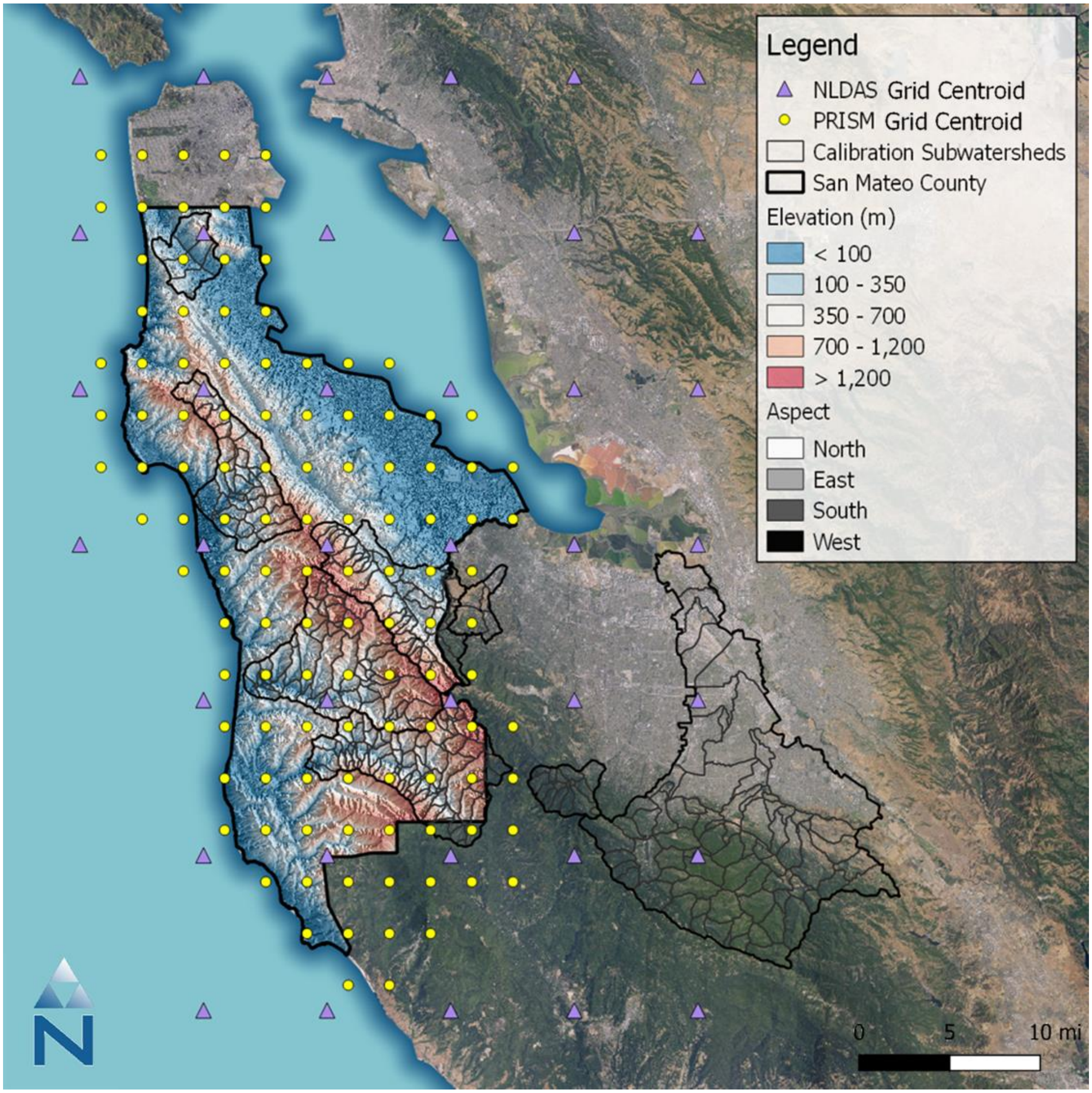


Figure 3-3. Overlay of PRISM centroids with NED-derived elevation and aspect.

The influence of elevation on precipitation was first evaluated. PRISM centroids were sorted by increasing elevation and associated average annual rainfall was plotted. The data were grouped into 5 equal elevation bins for analysis (low, medium-low, medium, medium-high, and high)—the median elevation of each bin was plotted for reference, as shown in Figure 3-4. The graph shows a gradual increase in rainfall with elevation; however, the variability suggests that other factors besides elevation also have an influence on annual average rainfall. The data were also binned and analyzed by aspect. Figure 3-5 shows how average rainfall varies by both elevation and aspect.

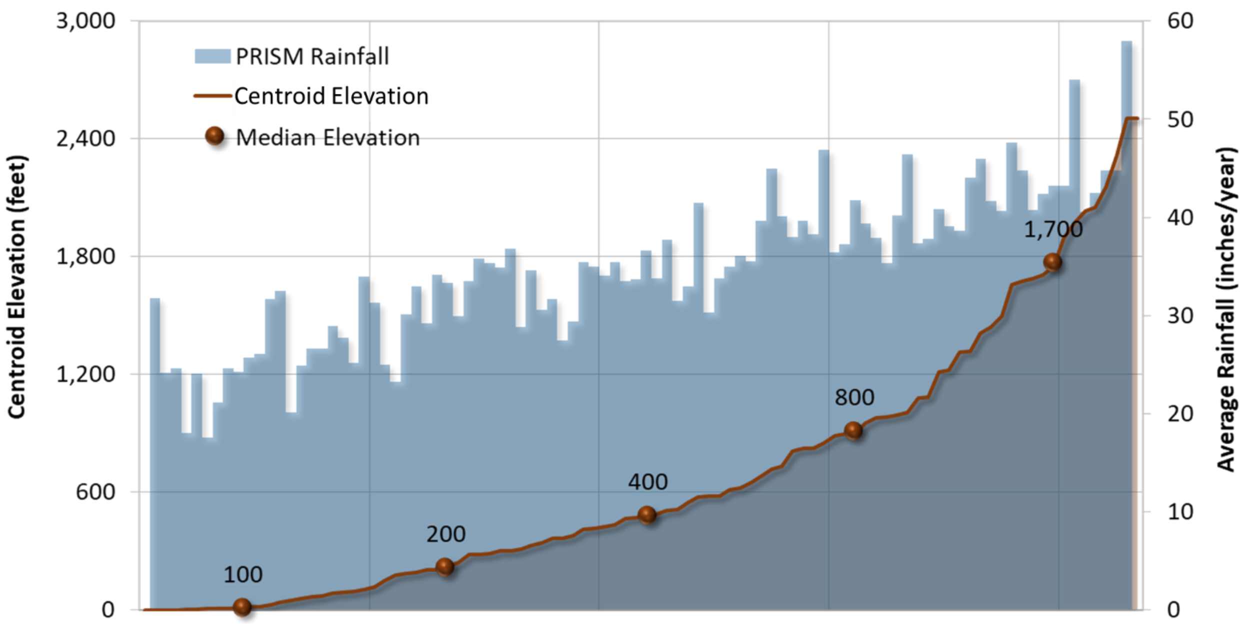


Figure 3-4. Average annual PRISM rainfall vs. centroid elevation (with median elevation of 5 bins).

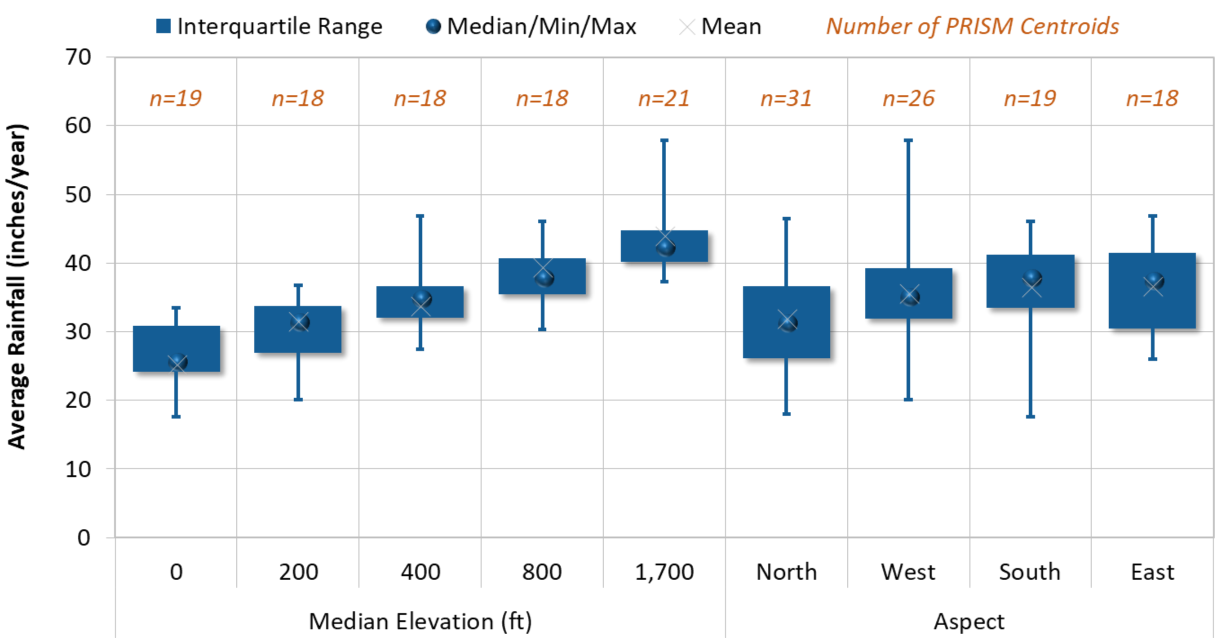


Figure 3-5. Box plots of average annual rainfall variability by elevation and aspect.

To assess the combined impact of elevation and aspect in San Mateo County PRISM average annual rainfall, the 94 centroids were grouped into 20 bins of elevation and aspect (5 elevation × 4 aspect groups). Because of the variable terrain, there were between 3 to 7 centroids within each of the 20 bins. The median rainfall was calculated for each bin, as summarized in Table 3-2. Figure 3-6 is a surface plot of the median rainfall (vertical axis) versus elevation and aspect (horizontal plane)—the surface illustrates the central tendency of the combined impact of elevation and aspect on average annual rainfall. The right panel of Figure 3-6 is the birds-eye view from the top of the surface shown in the left panel—it shows horizontal and vertical surface transects for aspect and elevation, respectively.

Table 3-2. Median rainfall (and distribution of PRISM centroids) by elevation and aspect.

Elevation		Hillslope Aspect (No. Centroids)				Total
Bin	Median (ft)	North	West	South	East	
1	0	6	5	4	4	**19**
2	200	6	5	4	3	**18**
3	400	6	5	3	4	**18**
4	800	6	5	4	3	**18**
5	1,700	7	6	4	4	**21**
Total		**31**	**26**	**19**	**18**	**94**
Elevation		**Hillslope Aspect (Median Rainfall, in./yr)**				**Median**
Bin	**Median (ft)**	**North**	**West**	**South**	**East**	
1	0	25	25	29	29	**25**
2	200	26	34	33	30	**33**
3	400	30	35	40	37	**34**
4	800	35	38	41	41	**38**
5	1,700	40	45	42	44	**43**
Median		**31**	**35**	**38**	**38**	**35**

Color gradient shows relative rainfall depth. Darker is higher.

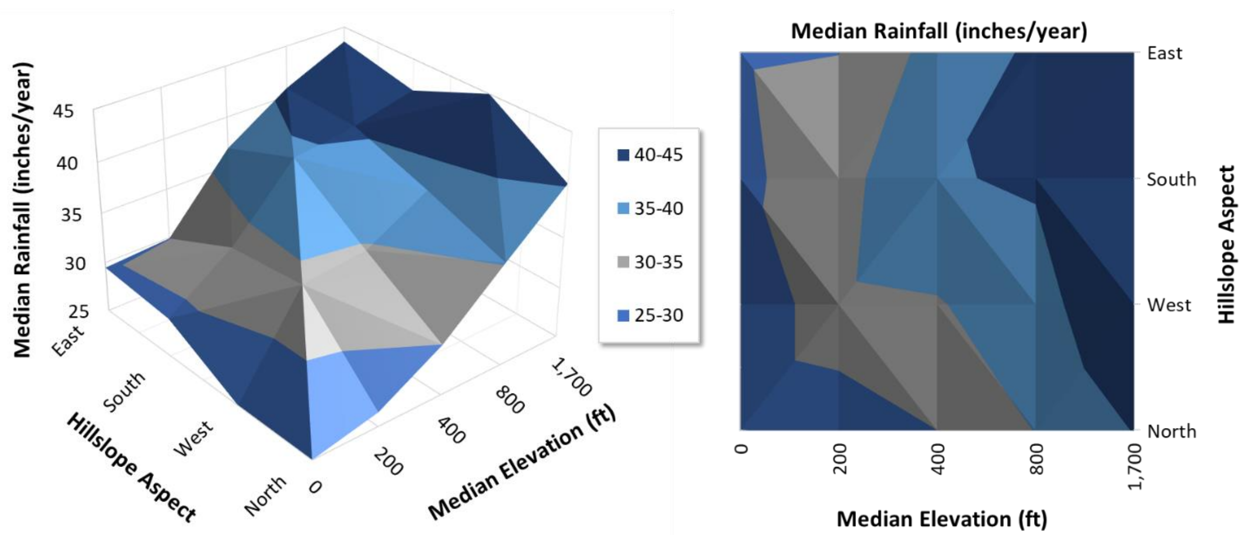


Figure 3-6. Surface plot of median rainfall (vertical axis) vs. elevation and aspect (horizontal plane).

Figure 3-6 shows that the driest areas of the study area are the lowest-elevation areas, regardless of aspect; however, the wettest are highest-elevation west-facing slopes. In general, above 1,700 feet, the impact of aspect on annual average rainfall volume is diminished. The 800-feet elevation transect has the least variability in median rainfall. There is a lot of variability along the aspect transects, with the west-facing slopes having the widest range of variability across the range of elevations. Sometimes this insight can guide the selection/assignment of representative gages to subwatersheds and help with understanding modeled responses; however, the default assignments used for model calibration were sufficiently reflective of the spatial variability and resolution.

3.3 Evapotranspiration (CIMIS)

Evapotranspiration (ET), the combined loss of water to the atmosphere from soil evaporation, plant surfaces, and plant transpiration, accounts for a large portion of a hydrologic water budget. The model requires potential ET (PEVT) as an input, but the actual ET varies depending on vegetative cover (type, density, height) and soil conditions, making it virtually impossible to measure precisely for all environmental conditions. Nevertheless, having approximate estimates for ET is beneficial for simulating flux of soil moisture in the watershed model. The CIMIS was established to help irrigators efficiently manage water resources. CIMIS was developed in 1982 by the California Department of Water Resources and the University of California, Davis. The network is composed of over 145 automated weather stations throughout California where primary weather data including temperature, relative humidity, wind speed, and solar radiation are monitored and quality-controlled. Those data are measured over standardized reference surfaces (e.g. well-watered grass or alfalfa) and are used to estimate reference evapotranspiration (ETo) using the customized Penman and Penman-Monteith equations. CIMIS has divided California into 18 zones based on long-term monthly average ETo values calculated using data from CIMIS weather stations. Figure 3-7 is a map of CIMIS zones for San Mateo County with a plot of monthly average ETo for the mapped zones.

The western portion of San Mateo County closest to the coast falls in the Coastal Plains Heavy Fog Belt (CIMIS Zone 1); however, those areas drain to the ocean. The coastal marine cloud layer reduces PEVT by limiting solar radiation exposure. As shown in Figure 3-7, this results in lower PEVT per unit area in the Heavy-Fog belt compared to the rest of the county. Watersheds draining to the Bay are part of the Upland Central Coast and Inland San Francisco Bay CIMIS Zones, which have higher PEVT than the portions of San Mateo county closer to the ocean.

CIMIS provides relative macro-scale differences in PEVT; however actual ET varies in magnitude as a function of vegetative cover. There are smaller-scale changes to instream flows due to changes in activities like agriculture and irrigation demand. For water budget calculations, ET coefficients are applied to PEVT data as a function of land cover to reflect the stratification of vegetative density and impacts. Example ET coefficients from literature are shown in Table 3-3, along with the range of calibrated values used in the model. This approach adds spatial resolution by allowing ET to vary as a function of land cover, which also varies by subwatershed. Stratification by land cover, using coefficients like those presented in Table 3-3, adds more texture and spatial variability when calculating the ET component of the water balance.

Table 3-3. Literature vs. calibrated stratification of PEVT multipliers by land cover type.

Cover Type	Land Cover	PEVT Multipliers		Rationale [1]
		Literature	Model	
Urban	Impervious	1.2	1.0	Above average PEVT (warm exposed surfaces)
	Pervious	0.9	0.7	Grass or shrub vegetation
	Construction	1.0	1.0	No vegetation; use standard PEVT rate
Rural [2]	Agriculture	0.9	0.8 - 0.9	Grass or shrub vegetation
	Barren	0.9	0.8 - 0.9	Grass or shrub vegetation
	Forest/Wetland	0.85	1.2 – 1.3	Light wind, high relative humidity
	Grass-Shrub	0.9	0.8 – 1.2	Grass or shrub vegetation
Water	Water	1.0	1.0	Use evaporation rate for open water

1 Reference: Bedient and Huber, 2002. Table 1.2, Page 47.

2 Rural Land Cover categories and PEVT coefficients were further refined to account for soil type, slope, and irrigation activity. Areas with steeper slopes generally had taller vegetation with deeper root systems and therefore, more PEVT. Forest also tended to be spatially mixed with grass/shrub areas.

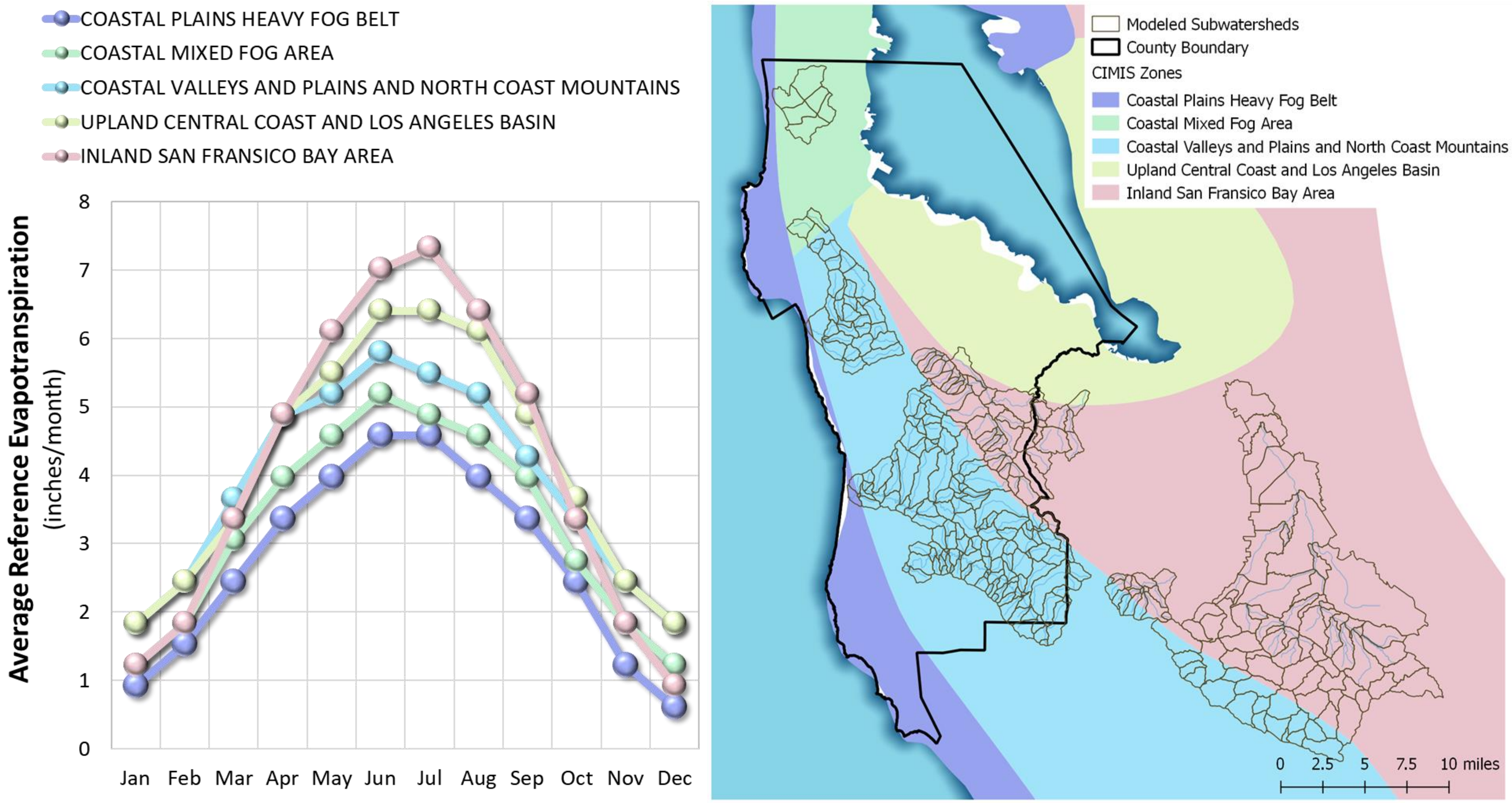


Figure 3-7. Average monthly reference evaporation for CIMIS zones in the region near San Mateo County.

4 MODEL CALIBRATION PROCESS

The approach described here follows modeling recommendations from both the EPA RAA Guide and the Bay Area RAA Guidance while incorporating internationally recognized modeling protocols and conventions. For example, the 2002 EPA guidance document on developing Quality Assurance Project Plans (QAPP) for modeling refers to calibration as the configuration and refinement of the analytical instruments that will be used to generate analytical data. The “instrument” is the predictive tool (i.e. the model) that is to be developed and/or applied. Figure 4-1 is a generalized schematic describing the process for model calibration that aims to minimize the propagation of uncertainty. This process builds upon the model development cycle and elements of data quality control previously shown in Figure 1-2. The previous section provided a comprehensive discussion of the analysis and processing of weather data to ensure quality of input data that drives the overall accuracy of the model. The following sections summarize the remaining model calibration processes depicted in Figure 4-1.

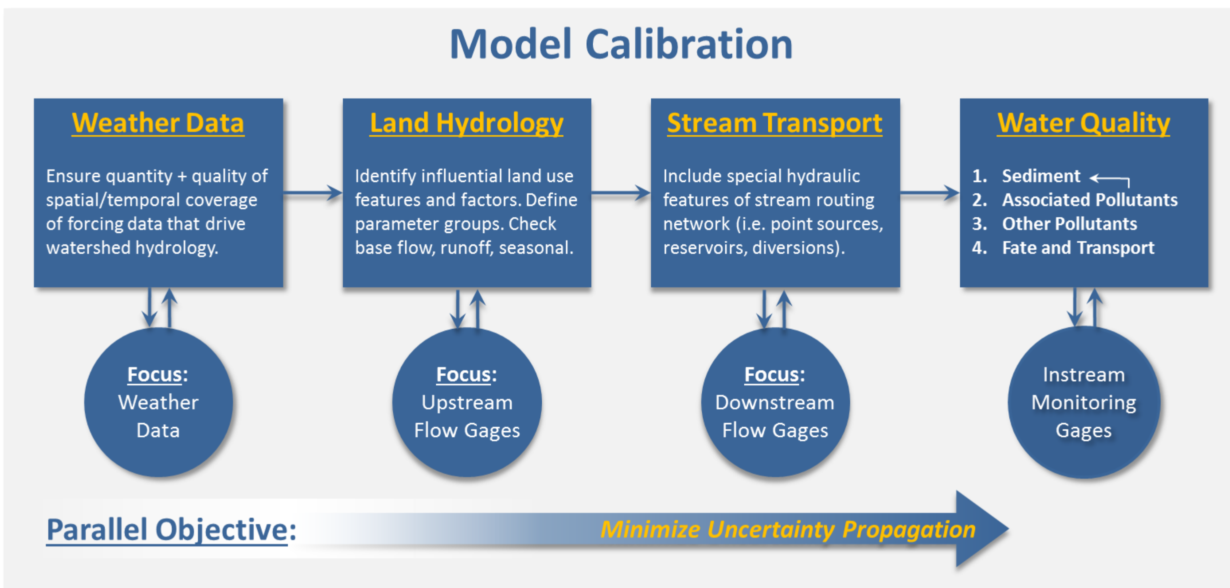


Figure 4-1. Process for model calibration to minimize propagation of uncertainty.

4.1 Land Hydrology

Demonstrating model calibration is key to the model development process, as it forms the basis for establishing the degree of uncertainty in model predictions and the reliability of the model for making management decisions. Models are deemed acceptable when they can simulate field data within predetermined statistical measures provided in the Bay Area RAA Guidance. After weather data and meteorological boundary conditions are well established, a top-down weight of evidence approach progresses as follows: (1) calibrate undeveloped background conditions, (2) add intermediate mixed land use areas, and (3) aggregate all sources via routing to a downstream location for comparison with co-located flow data. Figure 4-2 is a schematic showing the parameterization and calibration sequence for land hydrology. Unit-area results from this step were summarized and compared relative to each other and against representative published literature values. This step provides an early opportunity to identify possible errors, anomalies, or other unrepresentative behavior prior to aggregation, instream routing, and transport.

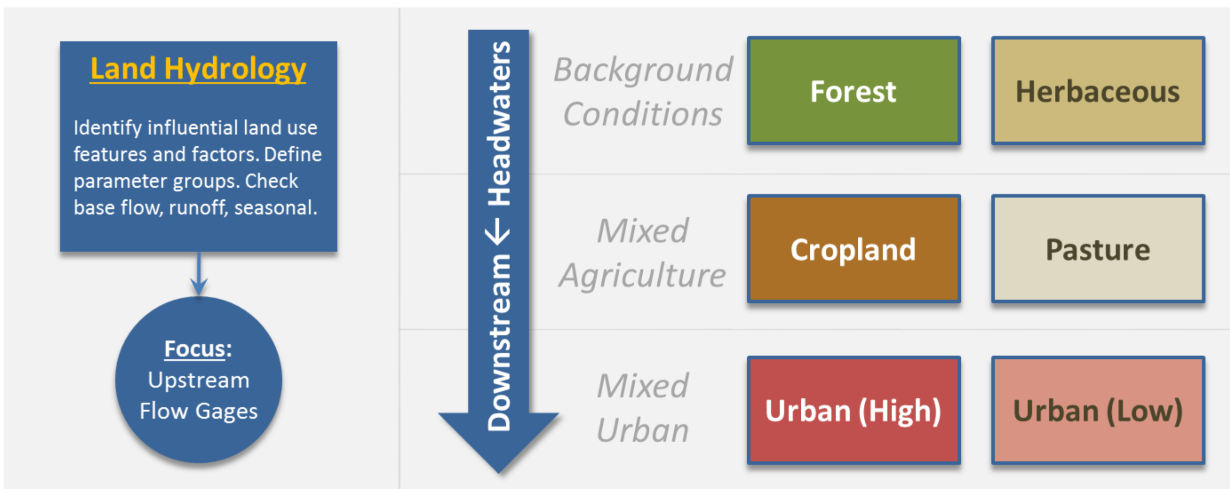


Figure 4-2. Model parameterization and calibration sequence for land hydrology.

4.2 Stream Transport

Outputs from land hydrology were aggregated and routed to the stream transport model. In some cases, other features such as impoundments, diversions, withdrawals, and point sources influence the water balance. Figure 4-3 is a schematic of stream transport model parameterization and calibration sequence. Results for Colma Creek and the Guadalupe River watershed, which respectively represent urbanized and mixed urban/natural watersheds with multiple hydraulic controls (e.g., spreading grounds, impoundments), are presented here. Among the calibration watersheds, Guadalupe River watershed was most heavily influenced by hydraulic controls. Daily streamflow data immediately downstream of reservoir releases and in diversion channels from the Santa Clara Valley Water District were requested and used to characterize reservoir operations and stream transport elements during model calibration.

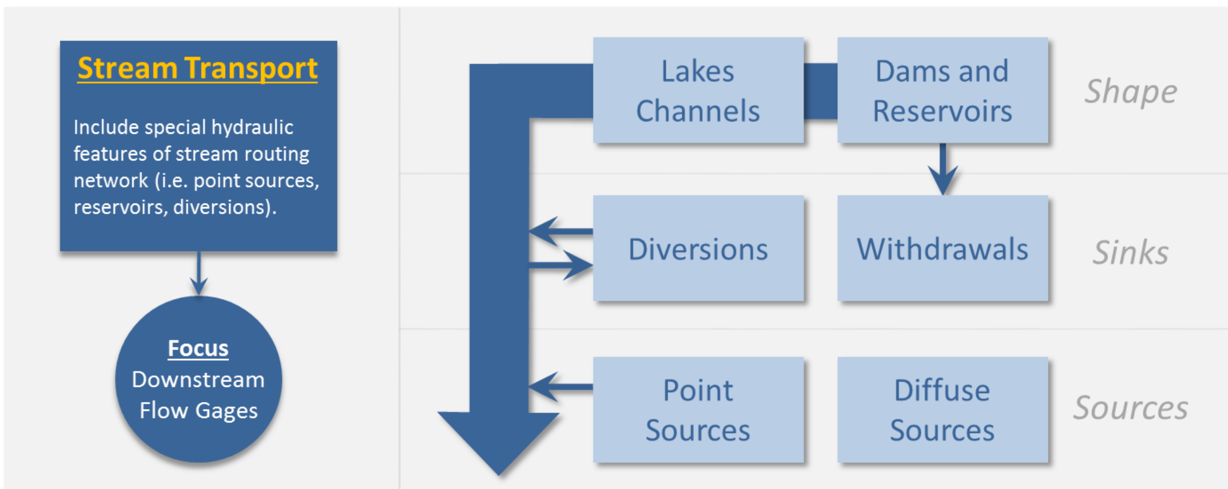


Figure 4-3. Model parameterization and calibration sequence for waterbodies and stream transport.

4.3 Performance Metrics

Table 4-1 presents recommended model performance metrics for hydrology, sediment, and PCBs (BASMAA 2017). The Bay Area RAA Guidance specifies annual percent difference calibration metrics, which align with the spatial and temporal scales of the Bay TMDLs. For additional resolution regarding the timing of flow and pollutant loads, monthly and seasonal model hydrology performance were also evaluated as part of the calibration effort.

Table 4-1. Model calibration performance targets (Bay Area RAA Guidance document, Table 4-2).

Model Parameters	%-Difference (Annual Simulated vs. Observed)		
	Very Good	Good	Fair
Hydrology/Flow[1]	< 10%	10-15%	15-25%
Sediment[1]	< 20%	20-30%	30-45%

1: Reference: Donigian 2000 as cited in LARWQCB 2014.

5 HYDROLOGY

A phased weight-of-evidence approach was used for hydrology calibration. First, an initial set of model parameters were selected from the BAHM (Clear Creek Solutions 2014) and refined and stratified by HRU with guidance from the BASINS Technical Note 6: *Estimating Hydrology and Hydraulic Runoff Parameters* (USEPA 2000). The goal was to characterize the relative hydrological response of the various HRU combinations of land cover, soil type, and slope such that the routed aggregate response of the model was representative of observed trends at the flow monitoring gages. A regional model development approach was used, meaning that the same HRU in different parts of the watershed had the same parameterization. Identically parameterized HRUs can produce a different result because of changes in meteorological conditions. Parameters like the infiltration index (INFILT) were varied by soil type, while others like interception storage (CEPSC) varied seasonally as a function of estimated vegetation cover. The spatial texture provided by HRU combinations of land cover, soil type, and slope provided a physical basis for assigning parameters during calibration, which resulted in robust model validation as they were spatially aggregated by the model.

When model results diverged from observed data, Google Earth was used to further investigate and identify unrepresented features such as impoundments, concrete-lined channels, or other hydraulic features that may be attributable to the divergent model results. Finally, wherever it was possible to represent those notable features, model parameters were fine-tuned so that the calculated error statistics fell within the targeted model performance ranges.

A weight-of-evidence based modeling approach is strengthened by evaluating model performance against observed streamflow across different sized watersheds and time periods that capture a range of hydrologic conditions. Table 5-1 presents a temporal summary of nine of the best-quality USGS streamflow gages in the San Mateo County region. The USGS streamflow records were flagged to differentiate periods of "good" data from "missing" or "estimated" records, which were derived using non-standard methods. The gages selected for calibration had at least 7 continuous years of "good" data records. Smaller watersheds with shorter periods of record were used for calibration, while the larger watersheds with longer continuous data were used for validation. The primary calibration stations are the three outlined in yellow, which all had at least 10 continuous years of data between 2006 and 2015; the secondary calibration stations were the four outlined in red with continuous consecutive years of data ranging from 7 to 21 years for earlier periods (between 1981 and 2001). Two stations in the watershed had 35 years of continuous streamflow records and represented a drainage area with a mix of modeled HRUs. Those two stations were used for model validation.

Table 5-1. Summary of USGS gage data quantity and quality for calibration watersheds between 10/1/1980 and 9/30/2015.

Outlet	Gage ID	Water Years (October 1, 1980 – September 30, 2015)																																	
		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
104	11169025																						●	●	●	●	●	●	●	●	●	●	●	●	●	●
201	11169500	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◕	●	●	◕													
301	11166000	●	●	●	●	●	●	●	●	●	●	●																								
401	11162500	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◕	●	◕	◕	●	●	●	●	◕	●	●	●	●	●	●	●	●	●	●	●	●
501	11162570	●	●	●	●	●	●	●	●	●	●	●	●	●	●																					
601	11164500	●	●	●	●	●	●	●	●	●	◕	●	●	●	◕	●	●	●	◕	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
701	11162630	●	●	●	●	●	●	●	●	●	●	●	●	◕	◕	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
721	11162620																		●	●	◕	●	◕	◕	●	●	●	●	●	●	●	●	●	●	●	●
801	11162720	●	●	●	●	●	●	●	◕	◕	●	◕	●	◕	◑	○	◕	●												○	○	○	○	○	○	○

Legend:

Data Quality (Percent Estimated):

	○	◔	◑	◕	●
No Data	90-100%	65-90%	35-65%	10-35%	0-10%

Monitoring time period:

Older	Recent	Long Term
Calibration	Calibration	Validation

Data Quantity (Percent Complete, **Calibration** watersheds)

0%	25%	50%	75%	100%

Data Quantity (Percent Complete, **Validation** watersheds):

0%	25%	50%	75%	100%

Table 5-2 and Table 5-3 present quantitative and qualitative assessments of modeled vs. observed comparisons respectively, at the selected calibration/validation gages. The Bay Area RAA guidance (BASMAA 2017) recommends attaining model performance of ≤10% error in total annual volume, which corresponds to the first column in Table 5-2. Three additional metrics that are commonly evaluated for hydrology were also assessed to test the robustness of model predictions during critical conditions for the TMDLs. The following subsections present additional details about model configuration and comparisons for a selected subset of the gages presented below.

Table 5-2. Modeled vs. observed calibration/validation statistics at selected locations.

Gage Status	USGS Gage ID	LSPC Model Outlet	Relative Error Model Statistics			
			Total Annual Volume	10% Highest Flow	Total Winter Volume	Seasonal R^2
Recent Gage Data[1]	11169025	104	-6.8%	-12.5%	-4.7%	0.954
	11162630	701	-1.6%	0.3%	-0.7%	0.977
	11162620	721	-3.7%	-7.4%	0.9%	0.979
Discontinued Gages[1]	11169500	201	2.6%	-3.6%	7.8%	0.967
	11166000	301	-1.7%	-7.1%	-7.6%	0.981
	11162570	501	2.0%	-10.2%	3.0%	0.978
	11162720	801	5.9%	8.6%	14.3%	0.965
Long-Term Gages[2]	11162500	401	6.8%	-11.5%	3.9%	0.984
	11164500	601	5.0%	-10.1%	-2.5%	0.969

1: Calibration gages: Recent (primary) and discontinued (secondary) gages

2: Validation gages: Long-term streamflow data (35 consecutive/continuous recorded years)

Table 5-3. Qualitative assessment of modeled vs. observed calibration/validation statistics.

Gage Status	USGS Gage ID	LSPC Model Outlet	Relative Error Model Statistics			
			Total Annual Volume	10% Highest Flow	Total Winter Volume	Seasonal R^2
Recent Gage Data[1]	11169025	104	Good	Good	Very Good	Very Good
	11162630	701	Very Good	Very Good	Very Good	Very Good
	11162620	721	Very Good	Very Good	Very Good	Very Good
Discontinued Gages[1]	11169500	201	Very Good	Very Good	Good	Very Good
	11166000	301	Very Good	Very Good	Very Good	Very Good
	11162570	501	Very Good	Good	Very Good	Very Good
	11162720	801	Good	Very Good	Good	Very Good
Long-Term Gages[2]	11162500	401	Good	Good	Very Good	Very Good
	11164500	601	Good	Good	Very Good	Very Good

1: Calibration gages: Recent (primary) and discontinued (secondary) gages

2: Validation gages: Long-term streamflow data (35 consecutive/continuous recorded years)

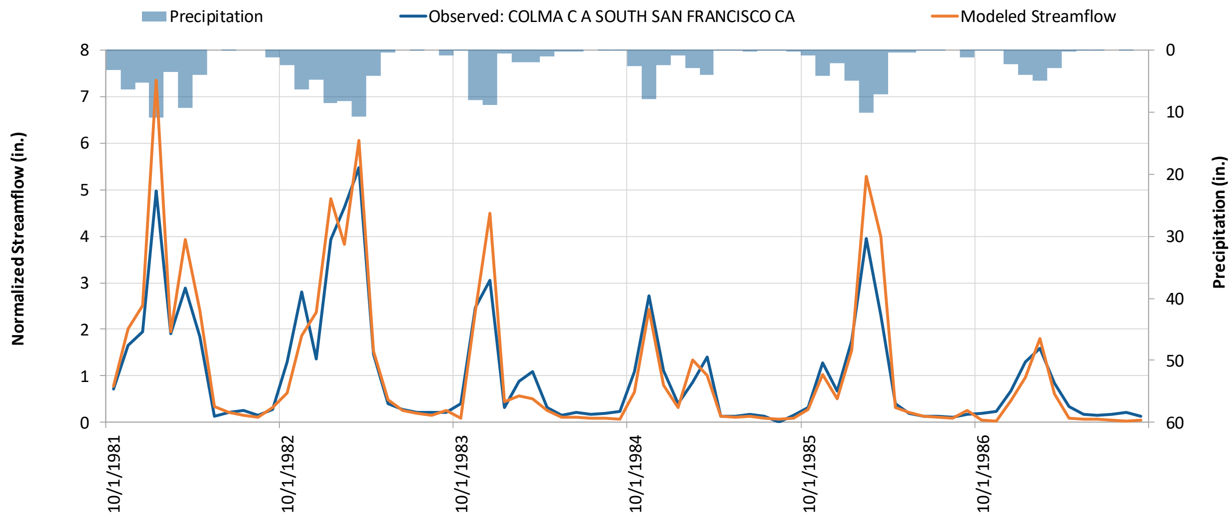
5.1 Calibration: Colma Creek

Colma Creek was the only primarily urban tributary with multiple years of flow monitoring data. As summarized in Table 5-1, the quality of recent data was poor; however, there were 7 years of continuous USGS monitoring between water years 1981 and 1987 that were both complete and of high-quality. As shown in Figure 5-1, the lower portion of Colma Creek is surrounded by flood-control walls, and some parts are buried. The upper portion of the watershed has more green space, some of which is irrigated. The flow gage is in the concrete-lined portion of the creek.

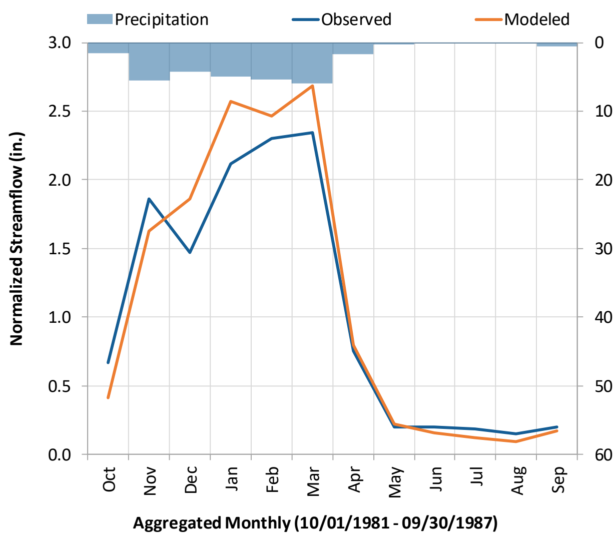
Specific adjustments were made to the model to account for known physical features or anthropogenic activities in the watershed. To represent concrete lined channels, all active groundwater outflow (AGWO) and 50 percent of interflow outflow (IFWO) from the lower four subwatersheds was restricted from entering the stream channel. These adjustments reduced low-flow streamflow to mimic the resulting impact of flood control walls, which restrict baseflow from entering the stream channel. Irrigation was also represented in the model, assuming that 20 percent of the urban pervious areas was irrigated at an Irrigation Demand rate of (0.7 × PEVT). The actual amount of water irrigated on any given day is the difference between computed demand and precipitation.

Figure 5-1. Colma Creek land characteristics and special features modeled.

The model calibrated very well after accounting for the influence of concrete-lined channels. Figure 5-2 shows comparison of monthly observed vs. modeled flow in the top panel, calibration statistics in the middle panel, and a seasonal aggregate comparison in the lower panel. The model captures year-to-year variability as well as seasonal hydrograph swings.



Calibration Metrics (10/01/1981 - 09/30/1987)	Relative Mean Error	Recommended Error Criteria			
		Very Good	Good	Fair	Poor
Total Annual Volume	5.9%	≤ 5%	5 - 10%	10 - 15%	>15%
Highest 10% of Flows	8.6%	≤ 10%	10 - 15%	15 - 25%	>25%
Lowest 50% of Flows	9.2%	≤ 10%	10 - 15%	15 - 25%	>25%
Annual Storm Volume	12.2%	≤ 10%	10 - 15%	15 - 25%	>25%



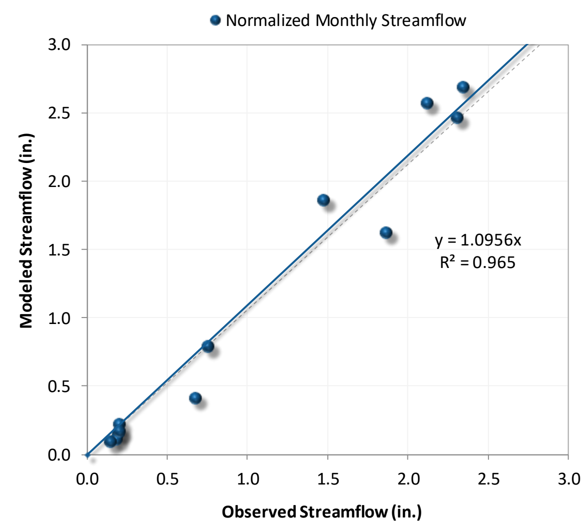


Figure 5-2. Hydrology calibration monthly summary for Colma Creek.

5.2 Calibration: Guadalupe River

The Guadalupe River watershed has been previously modeled for hydrology, PCBs, and mercury loading using HSPF (Lent and McKee 2011). Prior to that study, the Guadalupe River was identified as supplying a disproportionately large load of mercury and PCBs to the Bay. The watershed has a history of known water quality issues, such as historic mining activities decommissioned in the 1970s, and large amounts of supporting data. The results of that model served as the basis for regional extrapolation of PCB and mercury loads for the Bay TMDLs.

The Guadalupe River watershed has a mix of urban and non-urban features. There are some reservoirs in the undeveloped/natural headwaters. The Santa Clara Valley Water District maintains some long-term streamflow gages immediately downstream of those reservoirs and at other streams in the watershed. The previous HSPF modeling effort used gage data downstream of the reservoirs as boundary conditions because the modeling focus was primarily the lower urbanized portion of the watershed. An objective of this effort was to better characterize the water balance and understand the mobility of sediment and associated pollutants during transport. There were a few ungaged reservoirs in the San Mateo watersheds as well; therefore, having a calibrated response at gaged watersheds supported the extrapolation of generalized methods and assumptions to ungaged watersheds.

Figure 5-3 shows the schematic for a generalized reservoir segment used to represent to represent reservoirs in this model. Locking down the known and estimated properties shown in the schematic makes it possible to predict the volume-discharge rating curve (or FTABLE), which is used by the model to simulate the reservoir. Other unique features in the watershed, as shown in Figure 5-4, include the Almaden-Calero diversion channel, an inflatable dam for low flow recharge (Kirk Dam), and managed low-flow releases from upstream reservoirs to the Los Alamitos percolation ponds. The downstream portion of the watershed is developed. In contrast to the other mixed or non-urban reservoir-impacted calibration gages, Canoas Creek is an urbanized tributary to the Guadalupe River with a flatter terrain, as is typical of the downstream portion of the watershed and other coastal Bay subwatersheds. As shown in Figure 5-5 calibration summary, the model predicted flow well in Canoas Creek for 2006 to 2015.

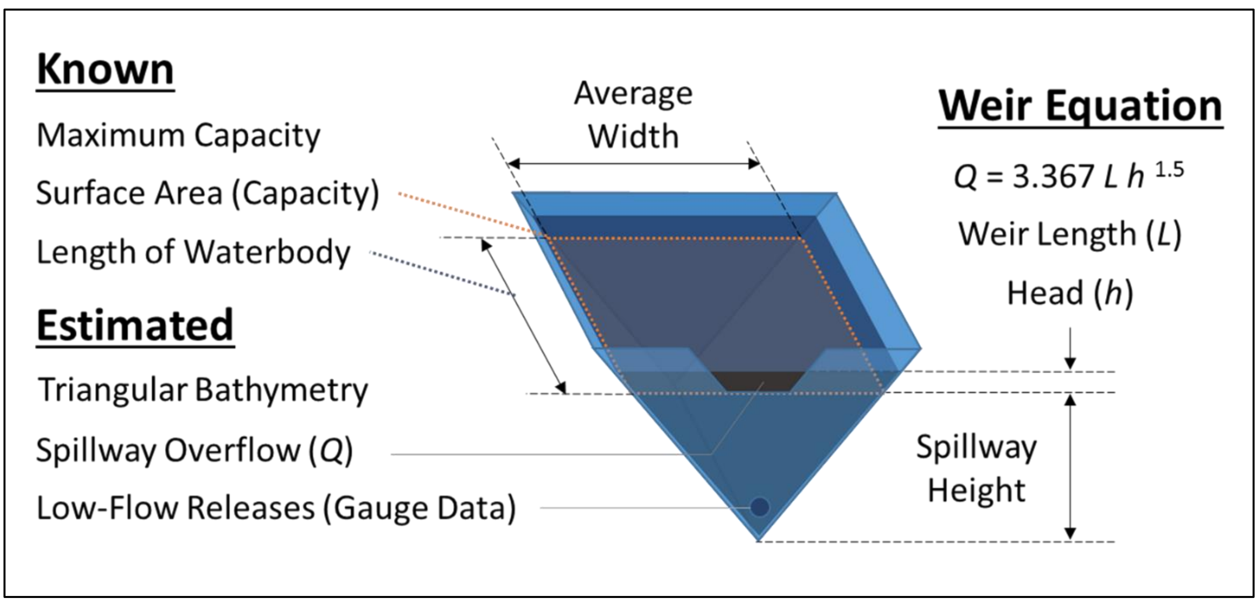


Figure 5-3. Generalized representation of reservoir segments in the model.

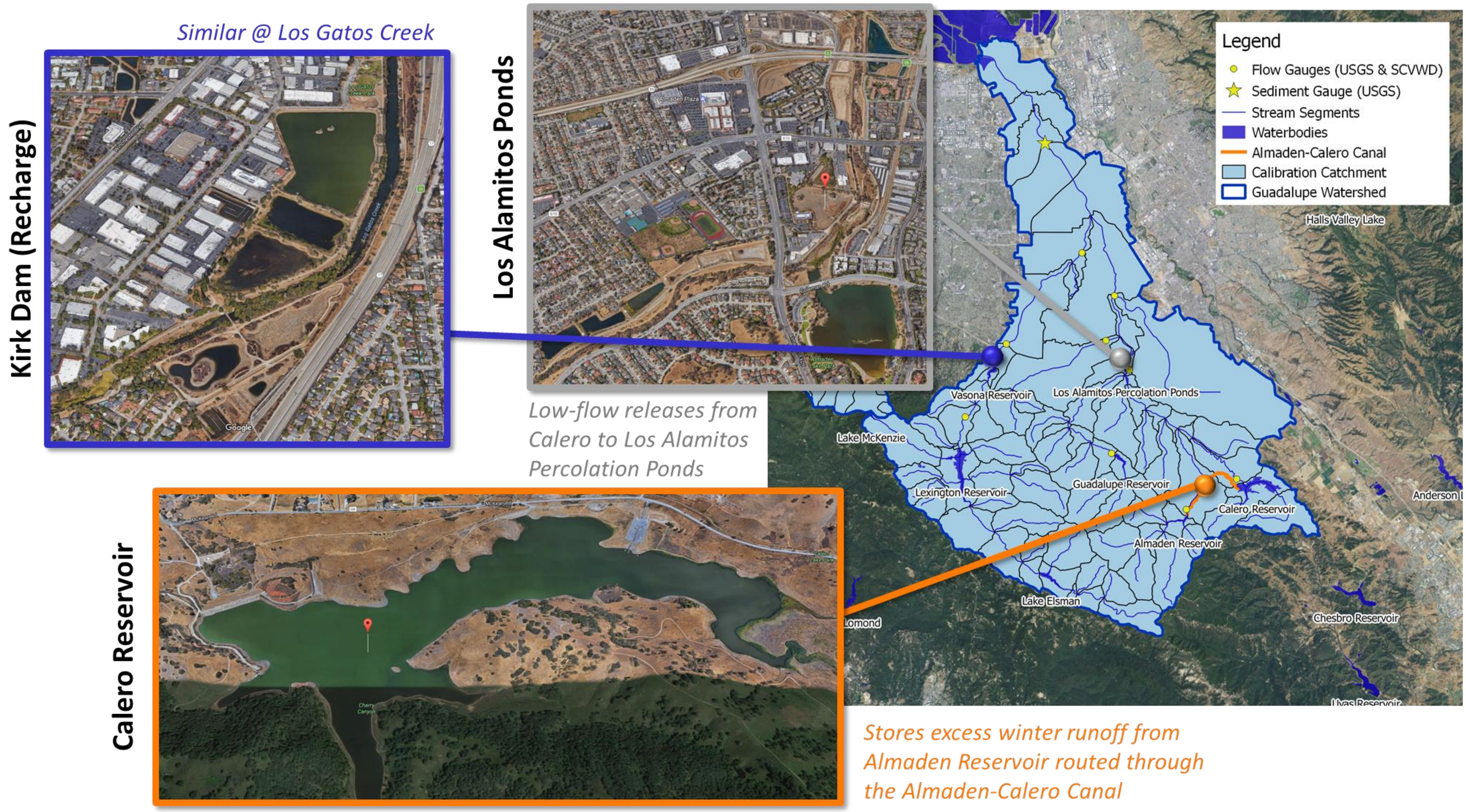


Figure 5-4. Guadalupe River watershed delineation, reservoir segments, and special features modeled.

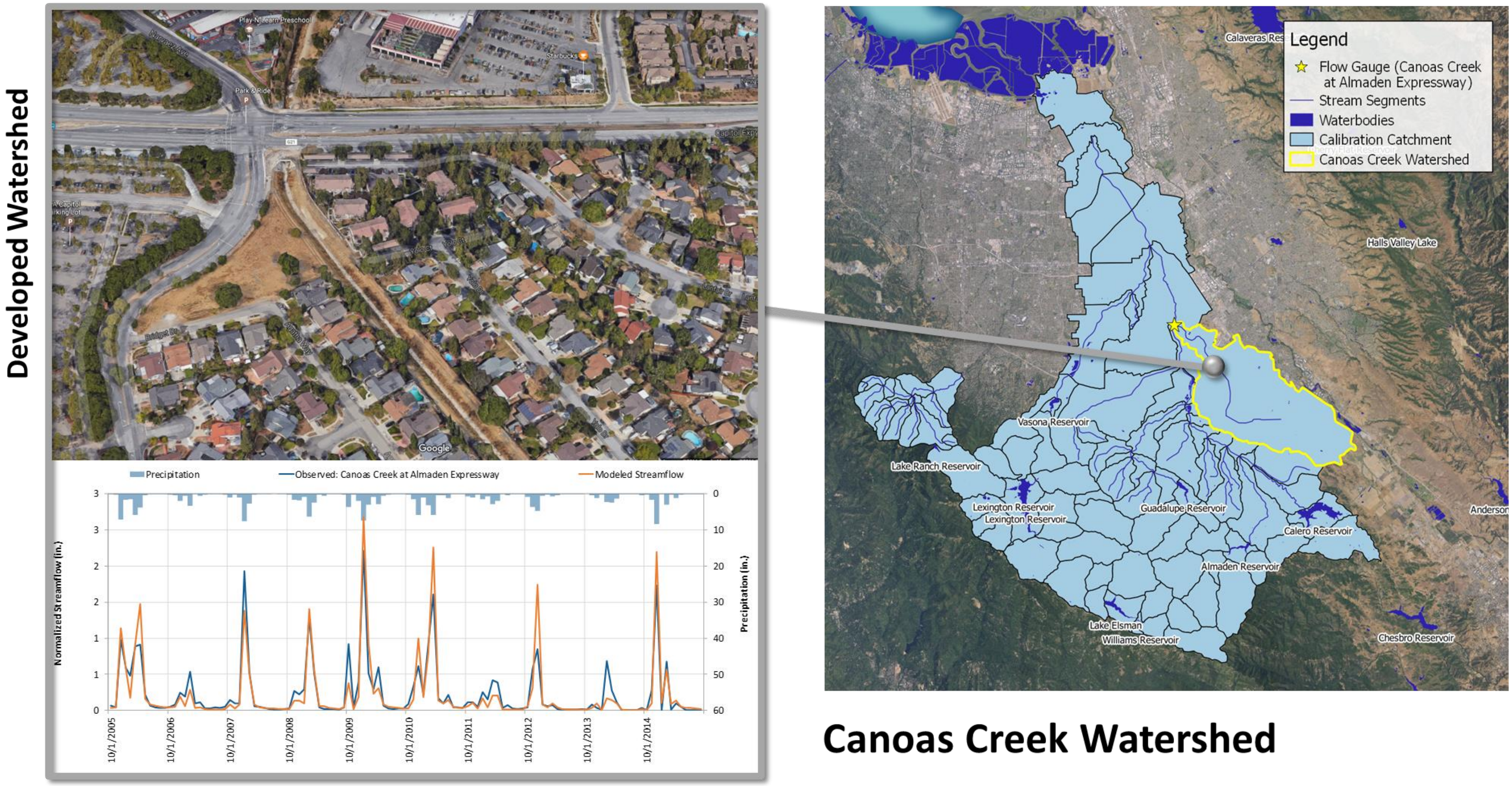


Figure 5-5. Canoas Creek (developed watershed) calibration summary.

Model performance was evaluated at several intermediate gages to check water balance throughout the network. Low-flow reservoir releases to percolation ponds were represented using hydrograph separation approaches on the Santa Clara Valley Water District data downstream of each reservoir and represented as point source withdrawal/discharges from the reservoirs to the downstream segments—high flows could overflow the spillway weirs when applicable. Figure 5-7 shows comparison of observed versus modeled seasonally aggregated flow comparison in the lower panel, interquartile seasonal ranges in the lower left, and monthly 1-to-1 over the same period in the lower right. Figure 5-7 shows the associated monthly timeseries comparison and Table 5-4 shows calibration statistics at the downstream Guadalupe River gage. Across all calibration metrics and evaluation windows, the model is a robust predictor of observed flow and captures year-to-year variability as well as seasonal hydrograph fluctuations.

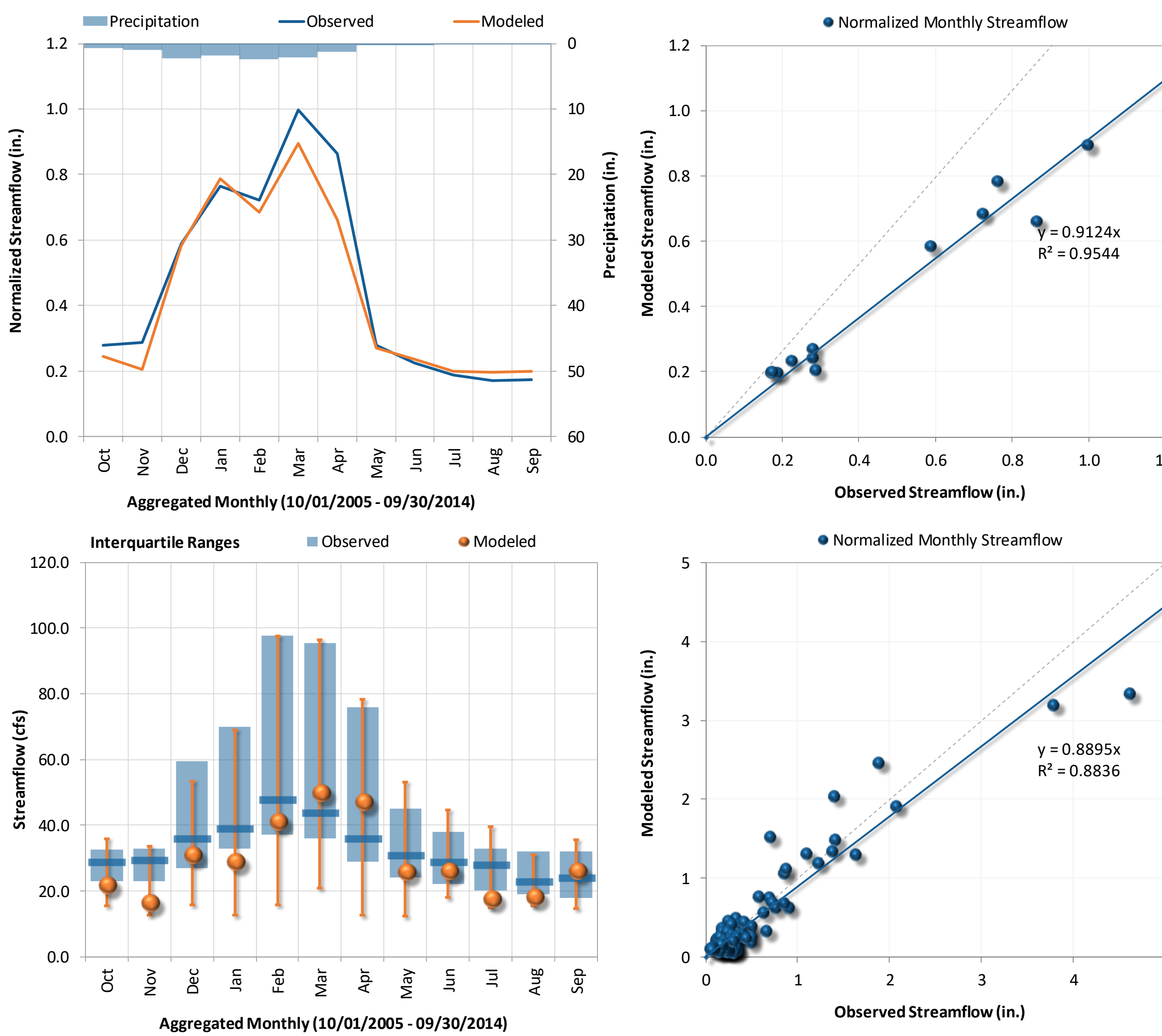


Figure 5-6. Hydrology calibration summary for Guadalupe River Watershed above Highway 101, San Jose.

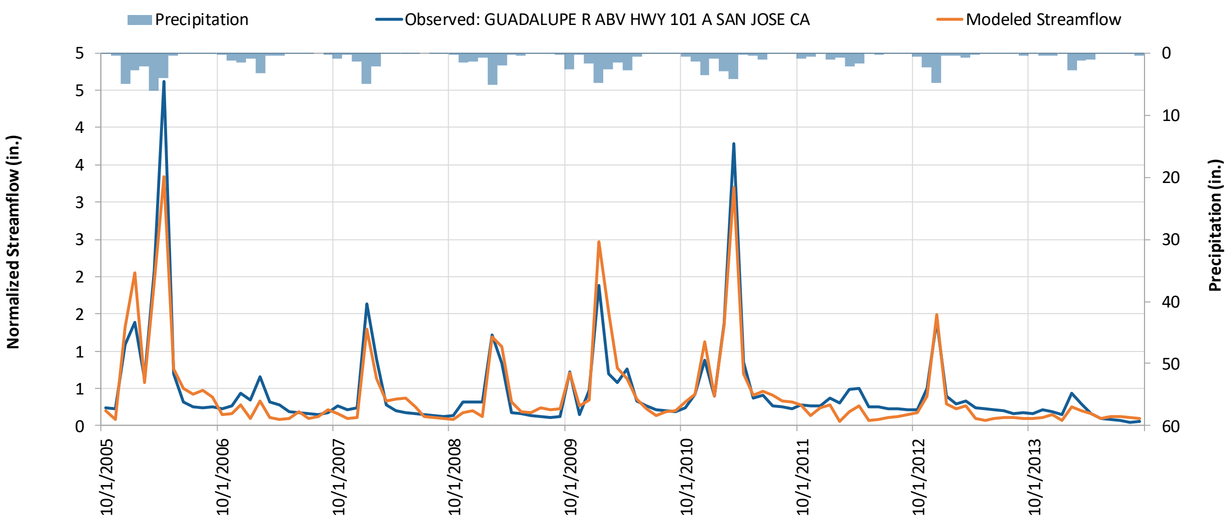


Figure 5-7. Seasonal hydrology calibration for Guadalupe River Watershed above Highway 101, San Jose.

Table 5-4. Relative-error calibration statistics for Guadalupe River Watershed above Highway 101, San Jose.

Calibration Metrics (10/01/2005 - 09/30/2014)	Relative Mean Error	Recommended Error Criteria			
		Very Good	Good	Fair	Poor
Total Annual Volume	-6.8%	≤ 5%	5 - 10%	10 - 15%	>15%
Highest 10% of Flows	-12.5%	≤ 10%	10 - 15%	15 - 25%	>25%
Lowest 50% of Flows	-3.9%	≤ 10%	10 - 15%	15 - 25%	>25%
Annual Storm Volume	-6.3%	≤ 10%	10 - 15%	15 - 25%	>25%
Summer Storm Volume	5.5%	≤ 15%	15 - 30%	30 - 50%	>50%
Annual Baseflow Volume	-7.1%	≤ 10%	10 - 15%	15 - 25%	>25%
Baseflow Recession	1.4%	≤ 3%	3 - 5%	5 - 10%	>10%

5.3 Validation: San Francisquito Creek and Pescadero Creek

The model was validated at two locations with 35 years of continuous streamflow data. Validation is defined as testing the model through application to a set of data not used to develop the calibration. Model validation is an extension of the calibration process. Its purpose is to test the predictive ability of the calibrated model, identify aspects of the calibration that might need further refinement, and provide information on prediction uncertainty.

Several approaches can be used to validate a model, but perhaps the most effective way is to use only a portion of the available observed values for calibration and use the rest for validation. As previously described, a subset of gages were used for model calibration. For model validation, calibrated parameters were applied to the San Francisquito Creek watershed at Stanford University (Station ID: 11164500) and Pescadero Creek, which are two larger watersheds with long-term continuous flow records. San Francisquito Creek on the eastern side of the ridge flows toward the Bay, while

Pescadero, which is on the western side of the ridge, flows toward the Pacific Ocean. The purpose of this exercise was to validate the model response both spatially (for mixed HRU areas) and temporally across wet and dry hydrologic conditions. Figure 5-8 and Figure 5-9 show monthly timeseries and seasonal average flow for a 35-year simulation period at San Francisquito Creek and Pescadero Creek, respectively. The model performed generally well, matching observed data over the 35-years evaluated. The Searsville Dam is also located along San Francisquito Creek upstream of the USGS flow gage. Only 10 percent of the original capacity of Searsville Reservoir was represented in the model because over 90 percent of that capacity is known to have been lost to sedimentation.

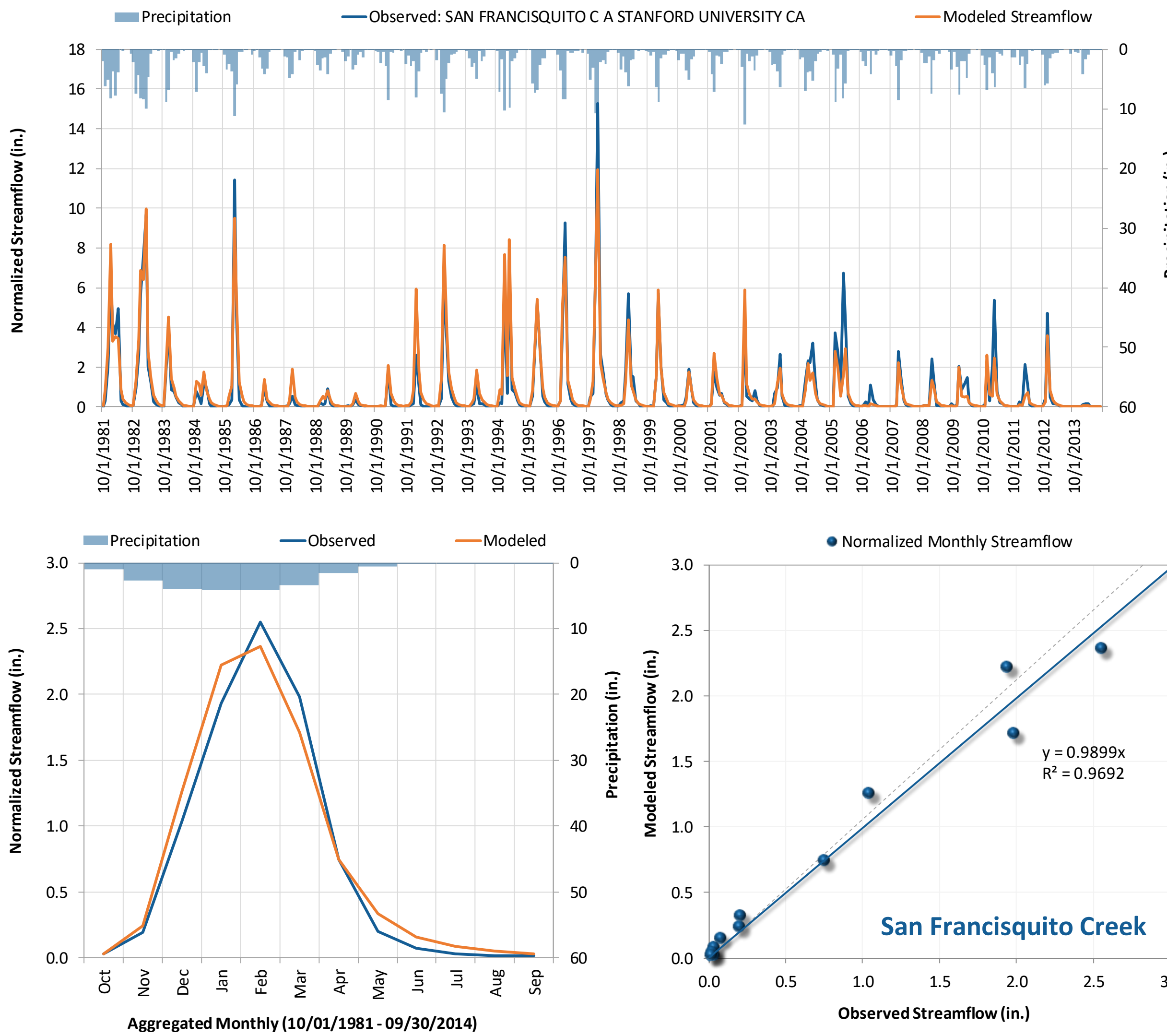


Figure 5-8. Monthly timeseries and seasonal model validation assessment for San Francisquito Creek.

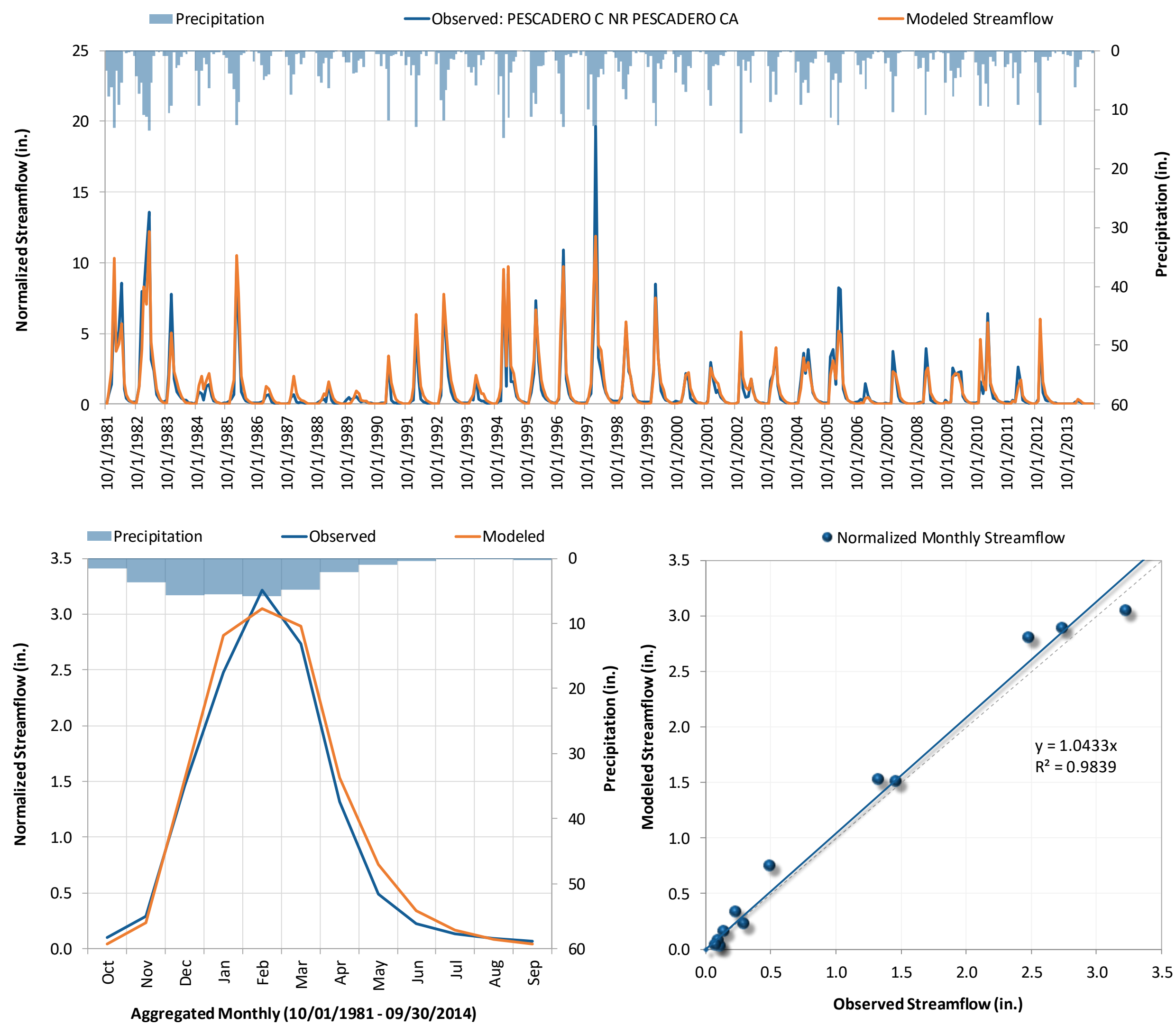


Figure 5-9. Monthly timeseries and seasonal model validation assessment for Pescadero Creek.

6 SEDIMENT

Regional studies conducted in the Bay Area have assessed monitoring data and quantified mercury and PCB loading rates with sediment as the primary mode of delivery (Gilbreath et al. 2018; McKee 2017). Those studies show that the relative distribution of mercury and PCB yield varies spatially as a function of contributing land use, sediment, and pollutant sources. Figure 6-1 shows regression-based pollutant yield estimate at two locations in the Guadalupe River watershed. The watershed upstream of the Almaden Expressway is largely undeveloped; however, there is an urbanized portion between the Expressway and Highway 101. Yield estimates show relatively comparable sediment yield at both locations; however, PCB and mercury are notably different and inverted in relative magnitudes. Findings from those datasets provide meaningful insight for source characterization and model parameterization. It suggests that in the Guadalupe River, PCBs are predominantly associated with urban sediment, while mercury is predominantly associated with loads from natural areas.

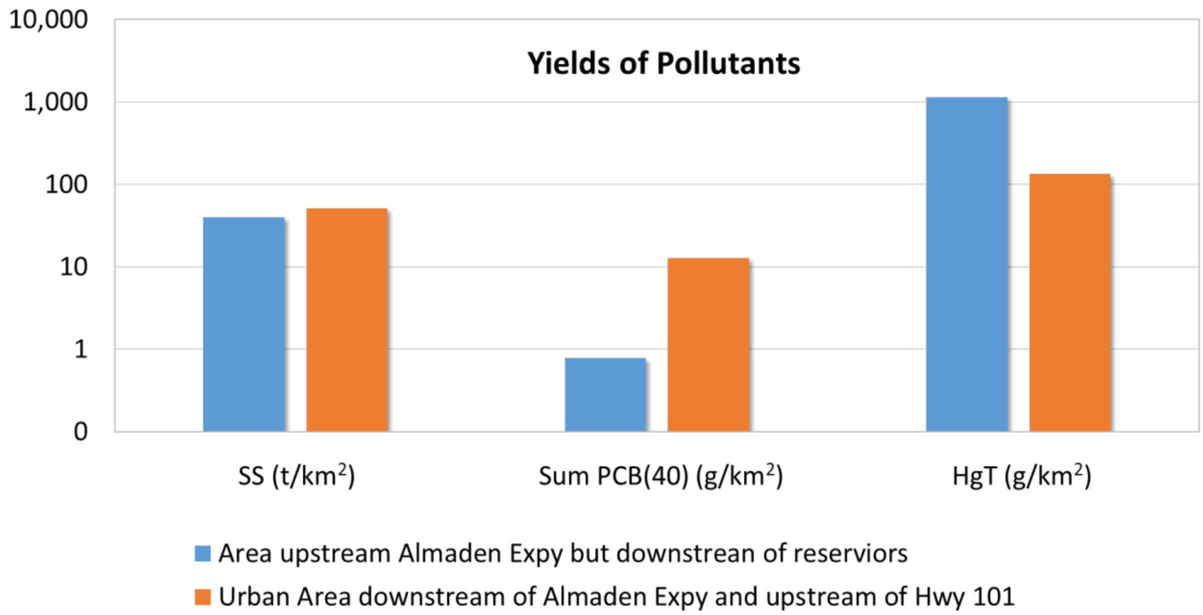


Figure 6-1. Regression-based pollutant yield estimates derived from instream monitoring data in the Guadalupe River (McKee et. al 2017).

Model representation of sediment builds upon the hydrology calibration and is considered the primary mode of delivery for PCBs and mercury in this study; therefore, modeling erosion and sediment mobilization is the next step in the top-down weight of evidence-based approach. Once that primary mode of pollutant delivery has been established, sediment-associated mercury and PCBs are simulated. Throughout the water quality calibration process, intermediate checks, data sources, and references are consulted to ensure that assumptions are reasonable and error propagation is minimized. This section first describes sediment calibration.

Sediment sources and mobilization processes vary with land cover (pervious/impervious) and soil type. PCBs and some mercury are associated with urban runoff; but, when calibrating to mixed instream sediment samples, it is helpful to characterize relative loadings from all sources. The advantage of an HRU-based approach is that it retains much of the resolution of spatial variability for model parameterization at the level of the smallest modeling unit (land unit). This minimizes the need to specify diverse combinations of model parameter groups at the subwatershed level. Sediment calibration was performed in two steps: (1) edge-of-field yield estimation and (2) instream transport.

6.1 Edge-of-Field Sediment Yield Estimation

One of the key attributes of the STATSGO/SSURGO soil layer is the K-factor, which is a measure of soil erodibility (detachment and runoff). K-factor was estimated as an area-weighted average value of the top soil layer for each HRU raster pixel. In the model, soil erodibility is a calibrated process by HRU. Clay soils, which are more resistant than sand and silt to detachment, tend to have relatively low K values (0.05 to 0.15). Likewise, coarse-textured sandy soils that are easily detached, but are not easily mobilized by runoff, also have low K values (0.05 to 0.2). Soils with moderate silt and loam content have moderate K values (0.2-0.4) because they are moderately susceptible to both detachment and runoff. Soils with high silt content are the most erodible of all soils (K > 0.4) because they are easily detached and are associated with high rates of runoff. K-factor was cross-tabulated for areas having the same hydrologic soil group, as summarized in Table 6-1. Soil erodibility metrics in San Mateo County and the Guadalupe River watershed differ notably. The K-factor percentile distribution was computed across all modeled watersheds. The STATSGO/SSURGO spatial layers were intersected with the model subwatersheds. Areas were binned by hydrologic soil group into 10 percentile bins of K-factor magnitude. Table 6-1 shows a composition consisting of more erodible soils in San Mateo County than in the Guadalupe River watershed. Table 6-1 showed that D soils were moderately erodible, while C soils were generally more erodible in both areas. This suggests that C soils should be parameterized as more erodible than D soils, even though D soils produce more runoff than C soils. This finding was used to inform default parameters for each HRU associated with hydrologic soil groups.

Table 6-1. K-Factor vs. hydrologic soil group and associated soil textures (Source Data: STATSGO/SSURGO).

K-Factor (Soil Erodibility)					Hydrologic Soil Group (% of Area)			
Percentile			Min	Max	A	B	C	D
Guadalupe Watershed	← High Moderate Low →	0-10%	0.00	0.03	11.2%	1.2%	9.7%	7.7%
		10-20%	0.03	0.05	0.8%	7.1%	14.8%	1.3%
		20-30%	0.05	0.07	--	0.0%	37.7%	0.0%
		30-40%	0.07	0.10	--	--	4.4%	0.6%
		40-50%	0.10	0.13	--	--	0.2%	--
		50-60%	0.13	0.17	--	--	0.1%	--
		60-70%	0.17	0.20	--	--	--	--
		70-80%	0.20	0.21	--	--	1.2%	--
		80-90%	0.21	0.24	0.1%	--	1.9%	--
		90-100%	0.24	0.44	--	--	--	--
San Mateo County	← High Moderate Low →	0-10%	0.00	0.03	2.0%	0.2%	2.2%	2.5%
		10-20%	0.03	0.05	--	0.3%	1.1%	0.9%
		20-30%	0.05	0.07	0.1%	5.2%	0.6%	0.2%
		30-40%	0.07	0.10	0.1%	10.0%	1.6%	0.2%
		40-50%	0.10	0.13	0.3%	5.3%	10.0%	0.1%
		50-60%	0.13	0.17	0.1%	0.9%	10.1%	2.2%
		60-70%	0.17	0.20	--	0.9%	8.2%	7.1%
		70-80%	0.20	0.21	0.1%	0.7%	11.1%	1.3%
		80-90%	0.21	0.24	0.0%	0.1%	13.6%	0.9%
		90-100%	0.24	0.44	--	--	--	0.0%

Erodibility	HSG	Soils Composition
Low	A	Sand, Loamy Sand, or Sandy Loam
Moderate	B	Silt, Silt Loam or Loam
High	C	Sandy Clay Loam
Moderate	D	Clay Loam, Silty Clay Loam, Sandy Clay, Silty Clay, or Clay

1. Color Gradient: Relative area distribution within model calibration watersheds (0.0% indicates <0.1% of area)

As shown in Table 6-1 and illustrated in Figure 6-2, soil texture and soil erodibility are both associated with hydrologic soil group. Most San Mateo County watersheds that drain to the Bay do not have any soil classification because of the density of urban land cover—PCB-contaminated sediment originates from aging and deterioration of old urban infrastructure, building demolition, and build-up/deposition on associated urban surfaces. The coastal pervious land areas in the County have relatively low K-factor values, but the headwater regions and western portion of the County draining to the ocean are where natural soil erosion primarily occurs. Within a given soil group, K-factor varies with soil texture. About 65 percent of the soils are C and 10 percent are D soils. The spatial variability of K-factor within the region is shown in Figure 6-3.

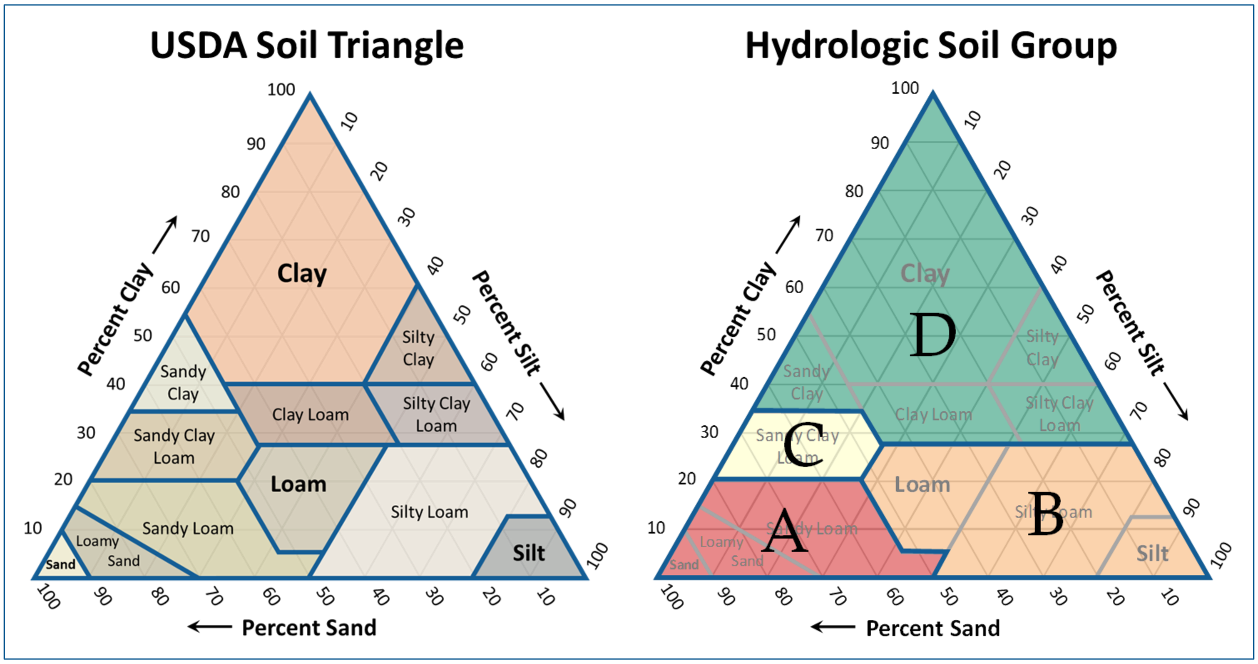


Figure 6-2. Standard USDA soil triangle with hydrologic soil group mapping.

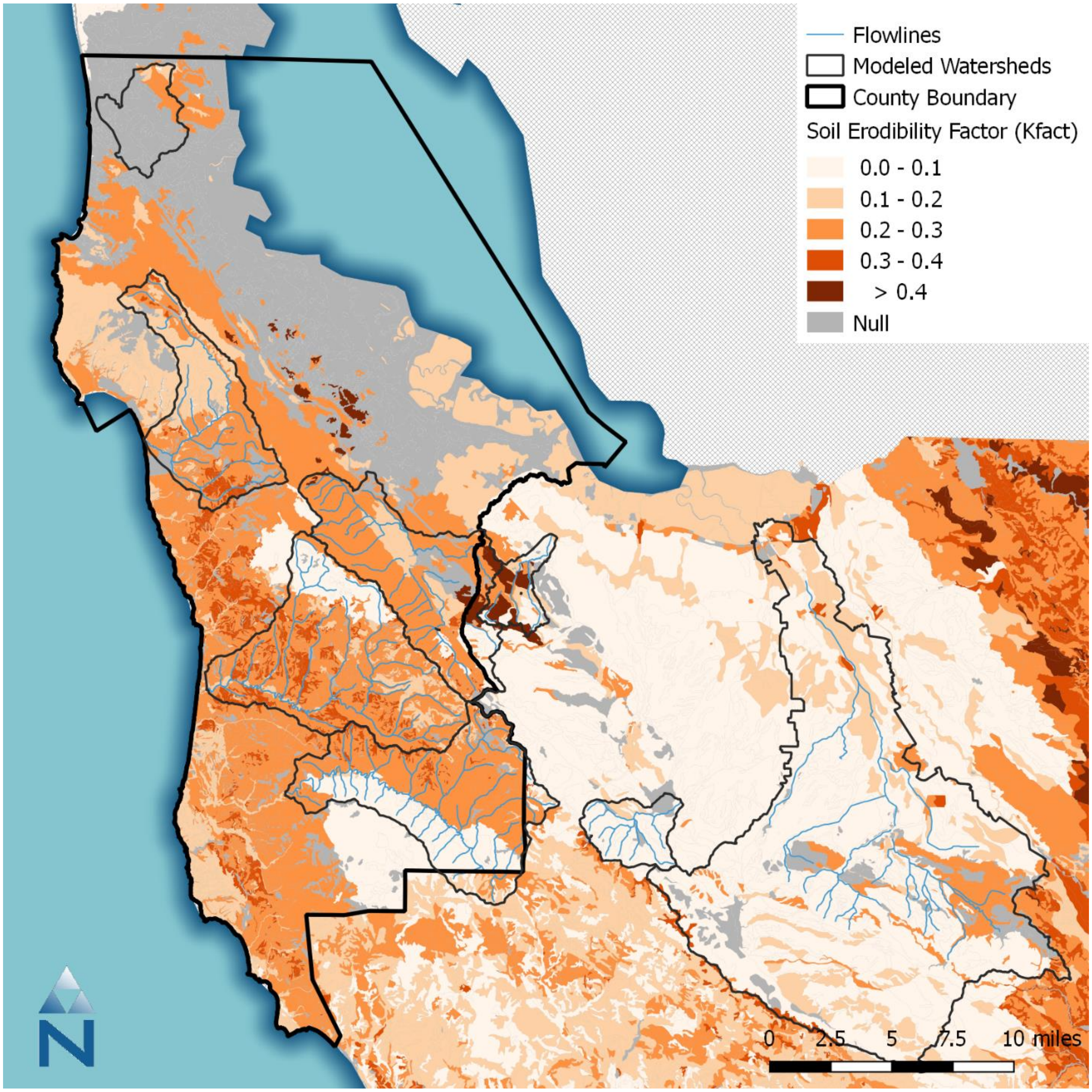


Figure 6-3. Soil erodibility K-factor (Source: USDA SSURGO).

A literature review of local and natural sediment yields and event-mean concentrations by land use type was conducted to summarize documented ranges of variability by source. Because the model configuration reflects physical characteristics of the land surface, such as slope and soil type, and spatial variability of meteorological conditions, the goal of model calibration is to parameterize sediment properties that capture the relative range of variability between sources observed in literature. Table 6-2 summarizes yield estimates from literature and Figure 6-4 shows the range of variability in the modeled response across different watersheds. Table 6-3 and Figure 6-5 show similar literature and modeled response summaries for flow-weighted event mean concentrations.

Table 6-2. Summary of regional sediment yield estimates by land use.

Land Use	Load ($t/km^2/year$)			Data Sources and Locations
	Min	Mean	Max	
Natural		72.0		San Francisco Bay Region[1]
Agriculture		2,461.0		San Francisco Bay Region[1]
Low Density Urban		450.0		San Francisco Bay Region[1]
High Density Urban		996.0		San Francisco Bay Region[1]
Industrial		1,836.0		San Francisco Bay Region[1]
Urban Watersheds ALL	44.0		788.0	San Francisco Bay Region[1]
Urban		24.9		Hayward, CA. San Francisco Bay Region[2]
Combined		36.0		Guadalupe River Watershed, Santa Clara, CA[2]
Combined	11.9		28.2	Guadalupe River Watershed, Santa Clara, CA[3]
Combined	10.3		473.1	San Francisquito Creek, at Stanford[3]
Combined	414.1		4,300.9	Colma Creek at South San Francisco[3]

1. Watershed specific and regional scale suspended sediment loads for Bay Area small tributaries. (McKee et al. 2009)
2. Concentrations and loads of trace contaminants in the Zone 4 Line A small tributary, Hayward, California: Water Year 2007. (McKee et al.2009)
3. Watershed specific and regional scale suspended sediment loads for Bay Area small tributaries. (McKee et al.2009)

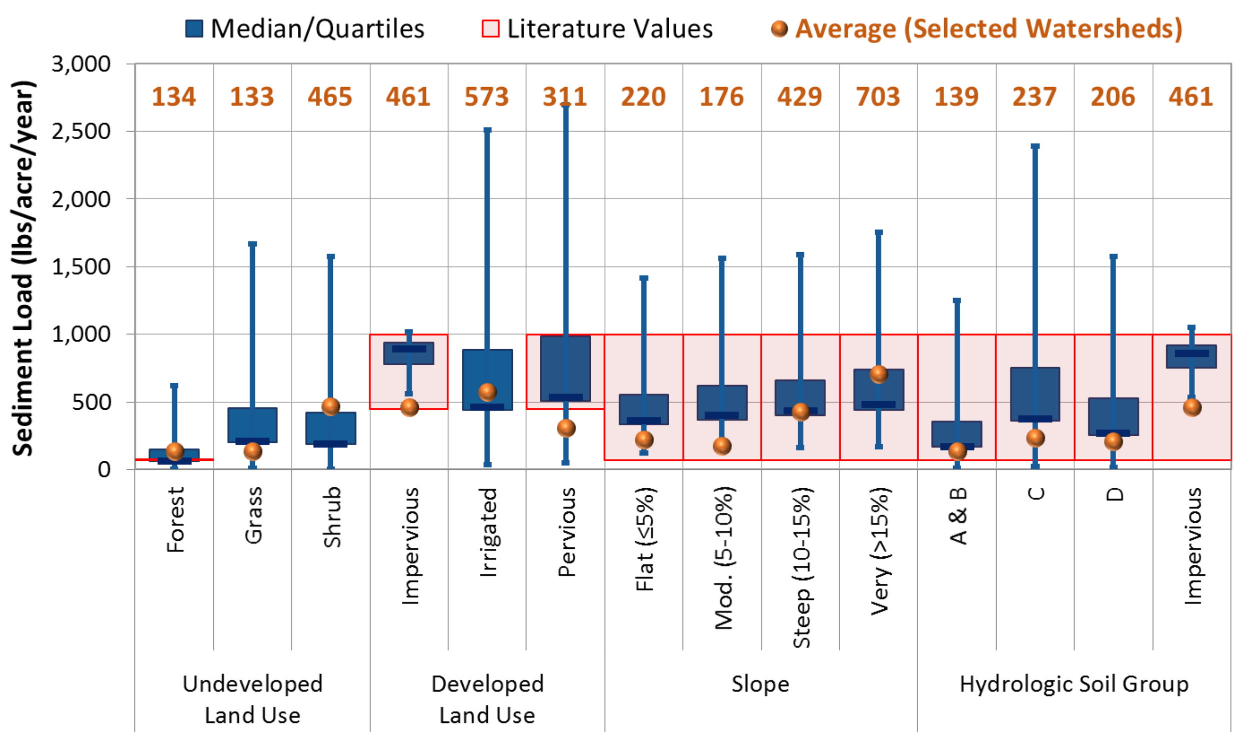


Figure 6-4. Modeled vs. literature ranges for sediment yield by land use.

Table 6-3. Summary of national sediment event-mean concentrations by land use.

Land Use	Event-Mean Concentration (mg/L)			Data Sources and Locations
	Min	Mean	Max	
Forest	11.10	238.23	487.00	Los Angeles, CA[1]; FL[2], NC[2]
Pervious Irrigated	202.00	202.00	202.00	NC[2]
Roads	50.30	64.05	77.80	Los Angeles, CA[1]; FL[2]
Shrub	94.30	122.65	151.00	NC[2], FL[2]
Urban	19.10	173.45	786.50	Los Angeles, CA[1], NC[2], CO[2], FL[2], MN[2]

1. Reference: LARWQCB 2014
2. Reference: Lin 2004

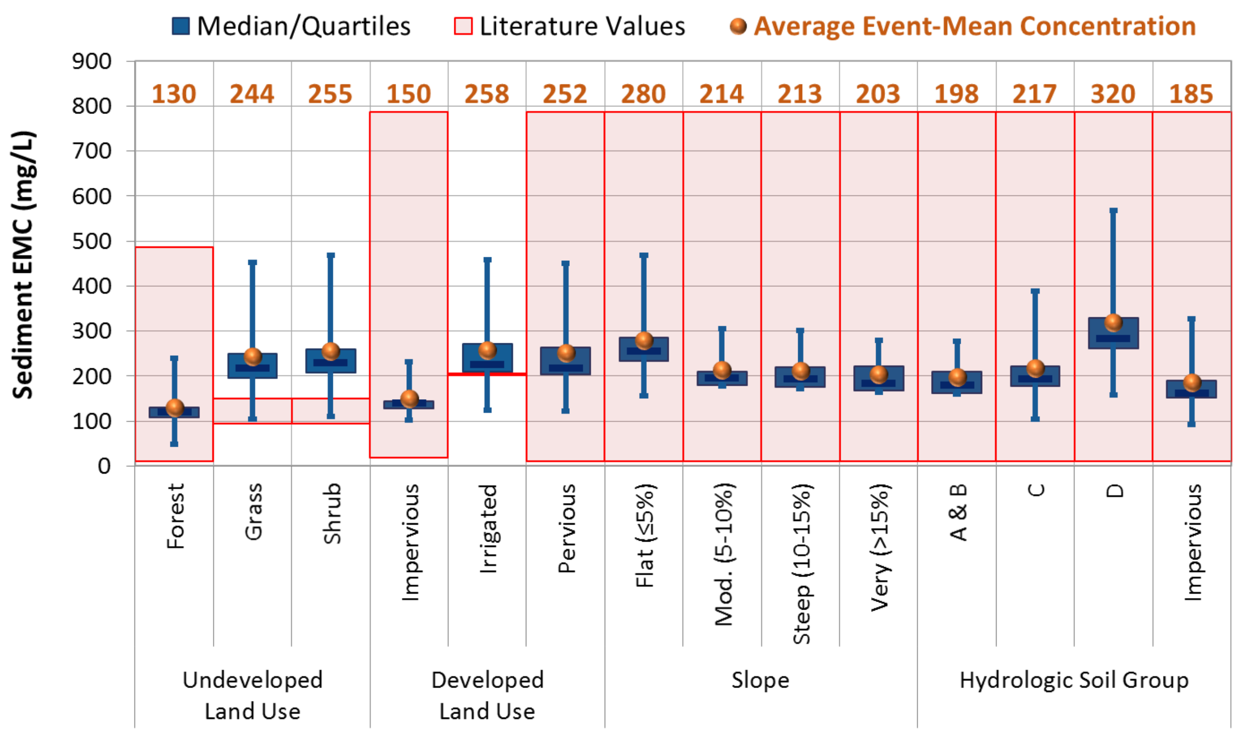


Figure 6-5. Modeled vs. literature ranges for sediment event-mean concentrations by land use.

6.2 Instream Sediment Transport

Sediment generated from the land is partitioned into sand, silt, and clay using fractions by land use before getting routed to stream segments associated with each subwatershed. LSPC represents sediment transport processes (i.e., settling and resuspension) as a function of modeled shear stress, the lateral force of the water imposed on the channel cross-section (USEPA 2006). For cohesive sediment (silt and clay), critical shear stress was estimated for each reach segment as summarized in Table 6-4. Sand movement is modeled using a user-specified power function of velocity. Both shear stress and velocity are derivative values computed as a function of flow volume and channel geometry; however, using reach-specific percentile ranges helps to normalize uncertainty in channel geometry by making settling and resuspension relative. For lake segments, critical shear stress for deposition and resuspension were not applicable—sediment settled at the user-specified particle settling rate in still water.

Table 6-4. Calibrated critical sheer stress percentiles by sediment class.

Sediment Class	Deposition	Resuspension
Sand	Power Function[1]	Power Function[1]
Silt	15th Percentile	90th Percentile
Clay	10th Percentile	85th Percentile

1: Sand transport is modeled using a power function on velocity (coefficient and exponent)

With sediment transport being closely tied to flow simulation, high-flow years with the closest overall match in modeled hydrology were the primary focus for sediment calibration. Data from the three years highlighted in Figure 6-6 were used to calibrate sediment transport at the downstream Guadalupe River gage, as shown in Figure 6-7. The left panel shows both observed and modeled sediment concentration versus flow for sampled days. The right panel shows both observed and modeled sediment load versus flow for sampled days. Figure 6-7 shows that the model predicts both the slope and relative spread of the data. Data from all years were used for model validation as shown in Figure 6-8. Regression metrics show a slightly better match in the calibration years versus the validation years but demonstrate that the model is a robust predictor of sediment variability and transport. Table 6-5 shows modeled vs. observed sediment load for different water years.

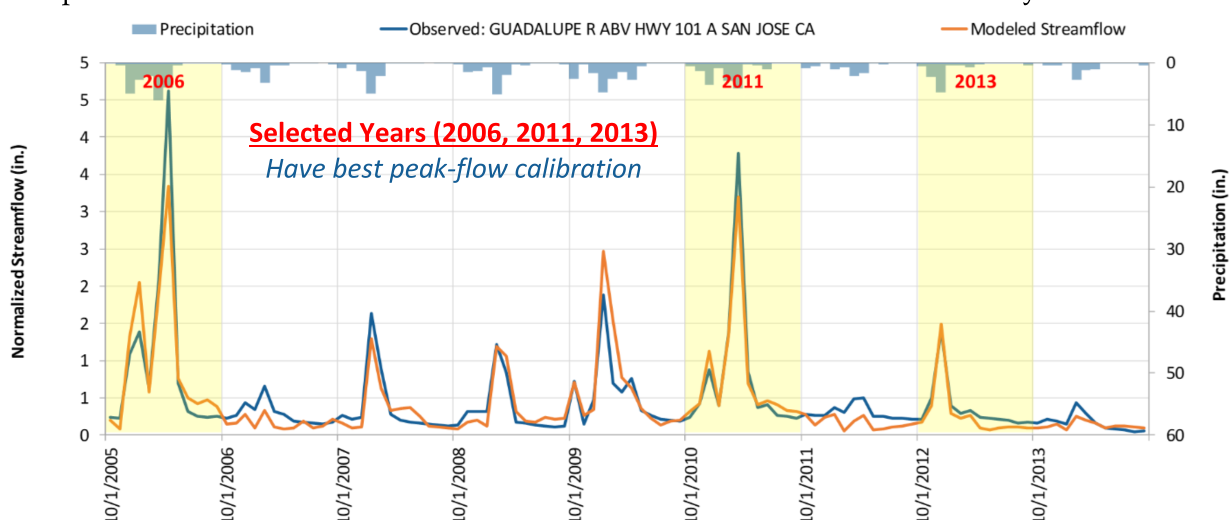


Figure 6-6. Hydrology calibration summary with selected years for sediment calibration.

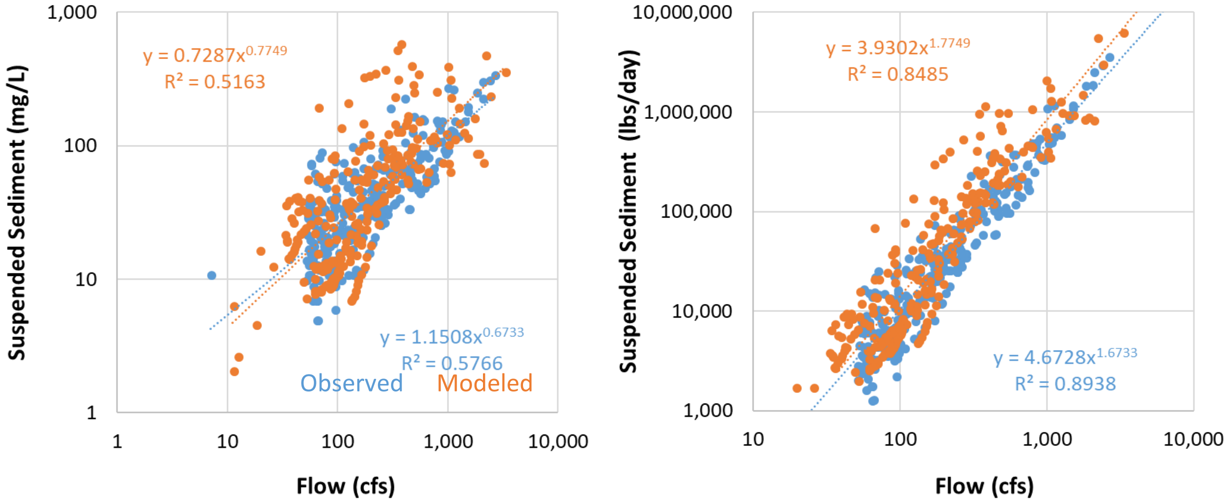


Figure 6-7. Model calibration for sediment concentration and load vs. flow in the Guadalupe River for water years 2006, 2011, and 2013.

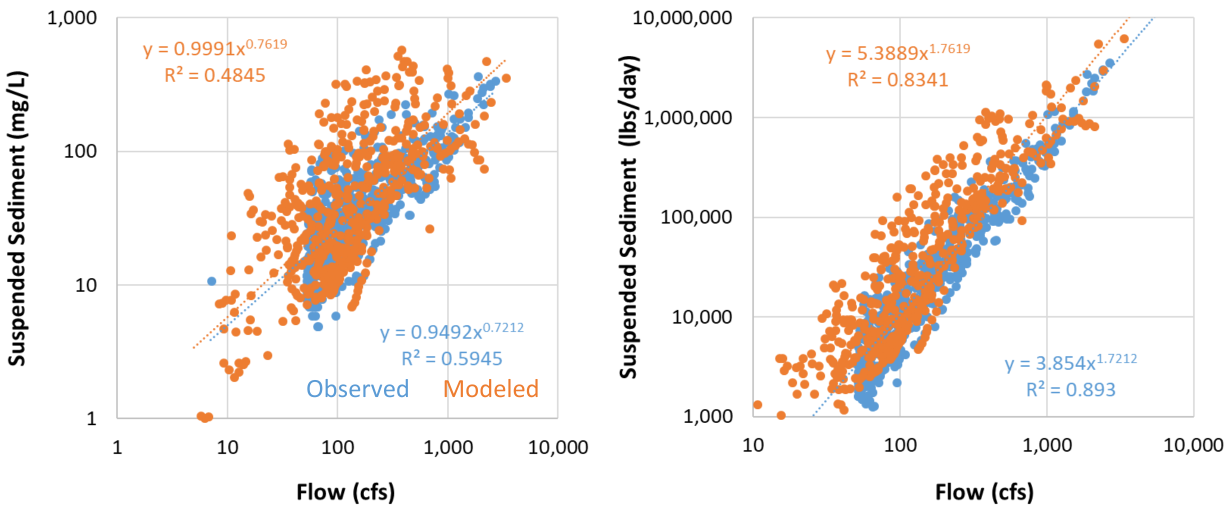


Figure 6-8. Multi-year validation of sediment concentration and load vs. flow in the Guadalupe River for water years 2006-2014.

Table 6-5. Modeled vs. observed sediment loads for selected water years.

Water Years	Sediment Load (kg/day)		Modeled:Observed Ratio
	Observed	Modeled	
3 years: 2006, 2011, 2013	63,088	92,414	1.465
9 years: 2006-2014	49,700	78,301	1.575

7 POLYCHLORINATED BIPHENYL (PCB)

During development of the Bay Area RAA Guidance, it was acknowledged through multiple discussions between permittees, EPA, the Water Board, and researchers (e.g., SFEI) that limited local water quality data may impact the robustness of any new computational method developed by an individual Bay Area permittee or stormwater program to represent PCB or mercury loading. Although Bay-wide tools such as RWSM are deemed acceptable through model calibration utilizing monitoring data collected throughout Bay watersheds, there is often not enough data within a single County jurisdiction to provide the same level of resolution needed for calibration of a model within that jurisdiction. As demonstrated in the previous sections, sufficient data is available for calibration of a model for simulation of hydrology and sediment loading for San Mateo County watersheds. The modeling approach used for the RAA combines this LSPC hydrology and sediment loading model with RWSM, using RWSM values for pollutant concentrations representative of various land use and PCB source categories. The Bay Area RAA Guidance states that "if RWSM is used to represent pollutant concentrations or loads, this calibration is assumed to be conducted as part of the RWSM process," and "if sufficient concentration and loading data are available, these data should be used as part of model validation." This section describes the approach for using RWSM in combination with LSPC for simulating PCB loads, summarizes the local PCB monitoring data available for validation, and presents results of the calibration.

A two-step process was used for simulating PCB fate and transport in the model. First, the calibrated PCB runoff concentrations from RWSM (BASMAA 2017, Wu et al. 2017) were applied to modeled LSPC runoff volumes to estimate PCB mass and approximate timing and delivery. From the results of that model run, simulated long-term PCB and sediment loads were calculated for the model simulation period. Second, the ratio of modeled PCB mass to sediment mass from the first model run was used to estimate an average sediment concentration for each HRU. The model was run a second time, substituting the estimated sediment concentration for the runoff concentration so that PCBs would be delivered with sediment instead of only runoff volume. Although the long-term estimated load is unchanged between the two runs, associating PCBs with sediment spreads the range of modeled instream concentrations because sediment loading is nonlinearly correlated with runoff volume. Larger storms will mobilize more sediment than smaller storms; therefore, PCB concentrations in runoff will also vary accordingly. This is relevant to the second phase of the RAA for modeling the benefits of GI, where the timing of pollutant loading affects the performance of GI.

As part of the Small Tributaries Loading Strategy (STLS) conducted by SFEI, nine storm events were sampled for PCBs at the Pulgas Creek Pump Station North and South Gages between 2011 and 2014. Figure 7-1 shows drainage area boundaries and flow direction for the Pulgas Pump North and South monitoring stations. For both catchment boundaries, Table 7-1 summarizes land use distribution, computed NLCD percent imperviousness, and presents RWSM-calibrated PCB runoff concentrations by land use. The land use distribution was derived for RWSM by SFEI using Association of Bay Area Governments (ABAG) land use data with modifications to represent PCB source area categories (Wu et al. 2017) (Figure 2-6).

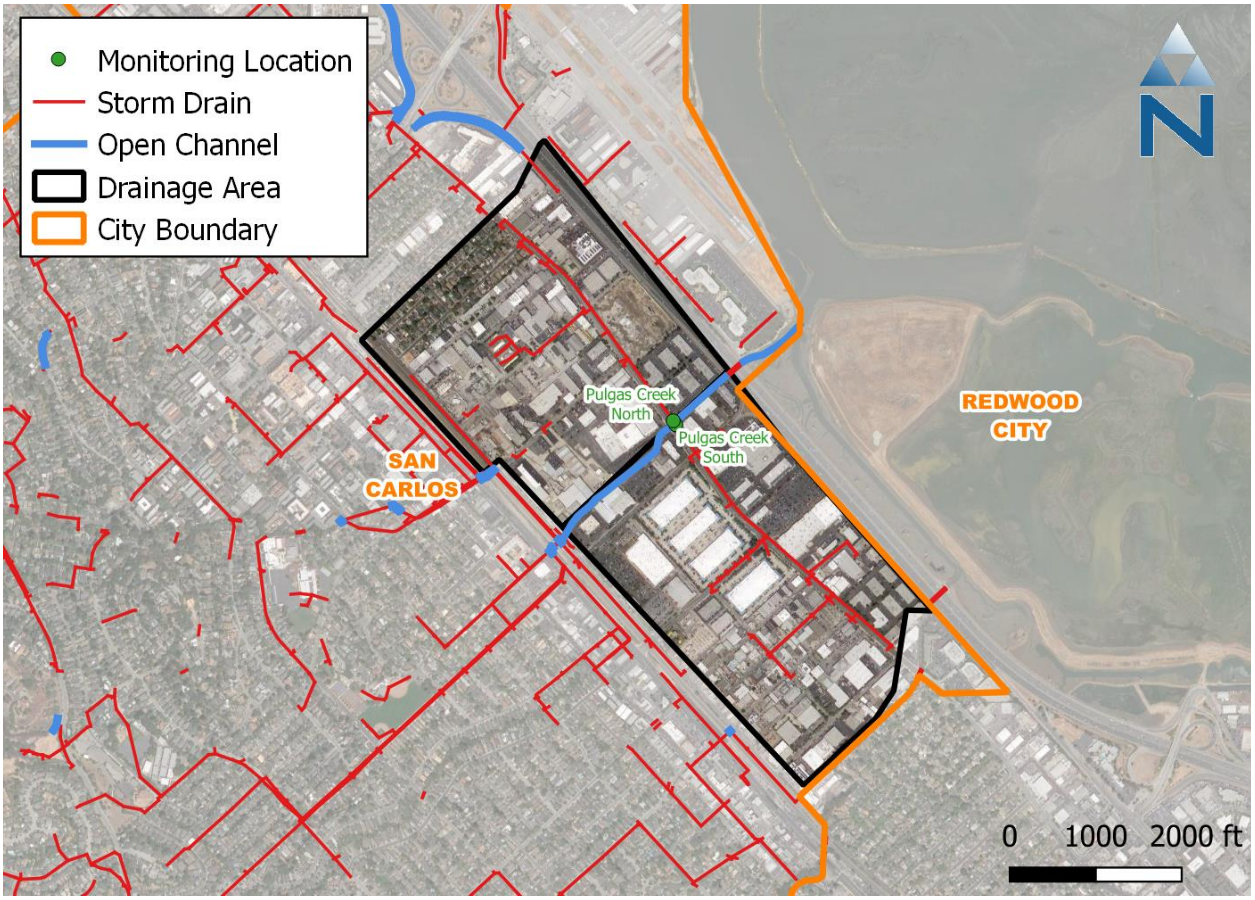


Figure 7-1. Drainage area boundaries for Pulgas Creek North and South monitoring gages.

Table 7-1. Drainage area land use distribution, estimated percent impervious cover, and recommended PCB runoff concentrations by land use category.

SFEI-ABAG Category[1]	Area (acres)		Percent of Area		PCB[3] Runoff Conc. (ng/L)
	PulPumpN	PulPumpS	PulPumpN	PulPumpS	
0_Ag_Open	0.2	0.2	0.1%	0.1%	0.2
1_New_Industrial	11.8	2.8	8.7%	1.9%	0.2
2_New_Urban	--	0.1	--	0.1%	0.2
3_Old_Industrial	54.8	77.5	40.2%	53.7%	204
4_Old_Residential	8.9	0.02	6.5%	0.02%	4
5_Old_Urban	21.5	62.9	15.8%	43.6%	40
6_Source_Areas	39.1	0.7	28.7%	0.5%	204
Total	**136.3**	**144.2**	**100%**	**100%**	--
% Impervious (NLCD)[2]	**--**	**--**	**83.5%**	**87.0%**	--

1: Wu et al. 2017. Land use layer derived for RWSM by SFEI using ABAG and modified to identify key source areas.
2: NLCD impervious cover raster summary
3: Wu et al. 2017

A parallel small-scale LSPC model was configured for the Pulgas Creek pump station drainage areas using the same HRUs and model parameters as the County-scale LSPC model. Average slope and soil composition were computed for the drainage areas to determine representative HRUs to use for that model. The slopes of both drainage areas were less than 5 percent and hydrologic soil group was a mix of C and D. Average percent impervious cover for both drainage areas was about 85 percent, all of which was assumed to be directly connected given the relatively small size and drainage area composition of the watershed. The total combined drainage area of both catchments is 280 acres. The drainage areas are characterized as mostly old industrial and old urban, with about 40 acres of PCB source areas designated by SFEI (Wu et al. 2017). The best, most representative hourly rainfall gage was San Francisco International Airport (SFO, WBAN: 23234). Although the San Carlos Airport gage (WBAN: 93231) is adjacent to the modeled catchment, the hourly rainfall data there was found to be incomplete for the time period corresponding to when the samples were taken.

To maintain consistency with regional reporting conventions, the PCB samples used for this comparison were the ones labeled as “Sum of 40 PCBs (SFEI).” Of the 40 samples collected, two samples had PCB concentrations that were significantly higher than the other 38 samples. Five samples collected on 11/19/2013 included both of those samples. The two unusually high samples were the first and last samples collected on that date—they were dramatically higher than the other three samples, which were collected in the middle of the sampling window. After excluding those two samples, the range of the remaining 38 samples was better aligned with the range of modeled runoff concentrations, suggesting that the first and last sampled concentrations collected during that event may have been skewed. Those two samples were among a subset annotated “some blank contamination issues” in the laboratory analysis remarks. Because they were the first and last samples collected, another potential cause may be that those samples were collected during relatively low-flow periods that may have impacted mixing at the time of collection, although this cannot be verified because instantaneous flows were not reported with the PCB concentrations.

Figure 7-2 presents a summary of observed versus modeled PCB concentrations at the Pulgas Creek South station, where most of the data were collected. Matching concentrations can be challenging because of factors including: (1) flashiness of the system, (2) a mismatch in the timing of a localized storm event that was not reflected in the rainfall gage used in the model, or (3) obstructions or inefficiencies in the collection system upstream of the sampling location. For this reason, modeled concentrations that coincided with ±1 day of the sampling date were summarized and paired for comparison with the samples. Figure 7-2 shows five summaries for comparison: (1) all observed samples, (2) observed samples excluding 2 potential outliers, (3) modeled results using runoff concentrations for ±1 day of the sampling date, (4) modeled results using sediment concentrations for ±1 day of the sampling date, and (5) modeled results using sediment concentrations for the 2011-2014 simulation period.

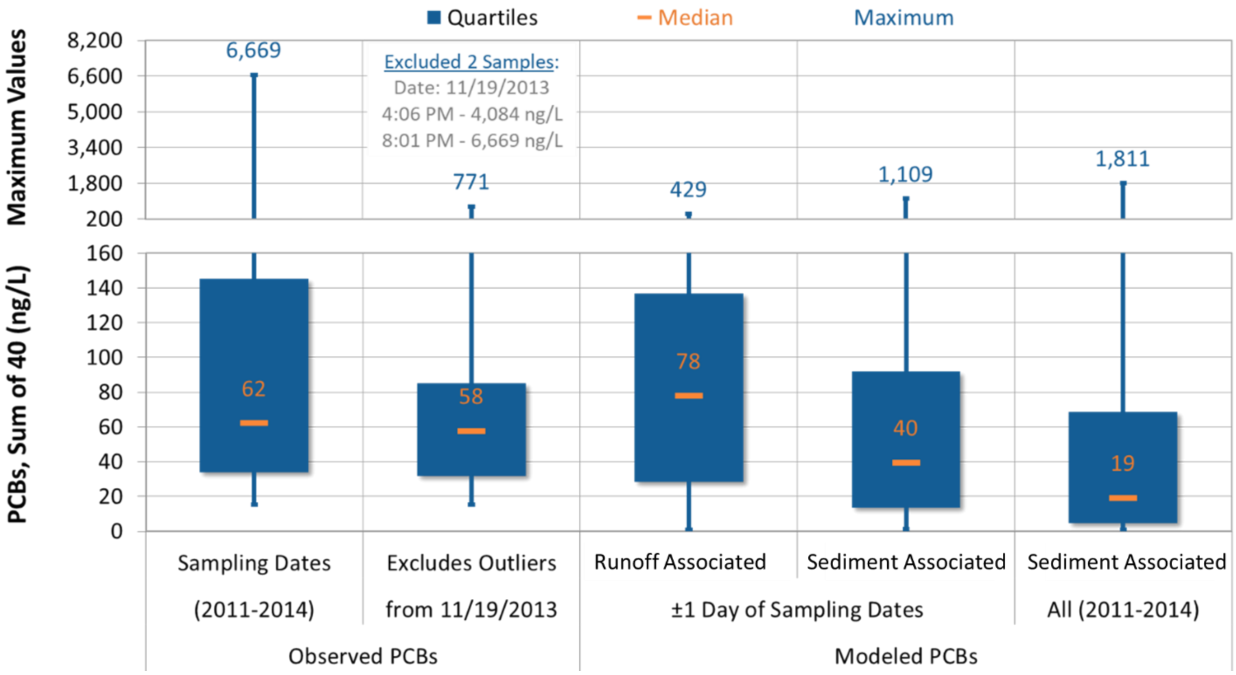


Figure 7-2. Observed vs. modeled PCB concentrations at the Pulgas Creek monitoring stations.

The top panel of Figure 7-3 shows the relative magnitude of the two outlier samples mentioned above and illustrated in Figure 7-2. The bottom panel zooms into the y-axis below 1,000 ng/L and shows that the model distribution follows observed concentrations. The shift in timing may have been because the intensity of the localized event that occurred on 11/19/2013 differed from what was reported at SFO; however, the SFO event from 11/20/2013, which was not monitored, resembles the shape and magnitude of the 11/19/2013 event. Figure 7-4 and Figure 7-5 show modeled vs. observed concentrations for two of the other sampled storm events. In both figures, the top panel shows modeled results using runoff concentrations, while the bottom panel shows results using sediment concentration. Although total PCB load is unchanged over the entire simulation period for both runs, the delivery mechanism changes the shape of the concentration timeseries graphs. In general, using sediment concentrations tends to produce runoff concentration curves that better resemble the sampled pollutographs; however, for some samples the results seemed to match more closely for the simulation using runoff concentrations. This suggests that the PCB delivery mechanism and process is probably a combination of both sediment and runoff association.

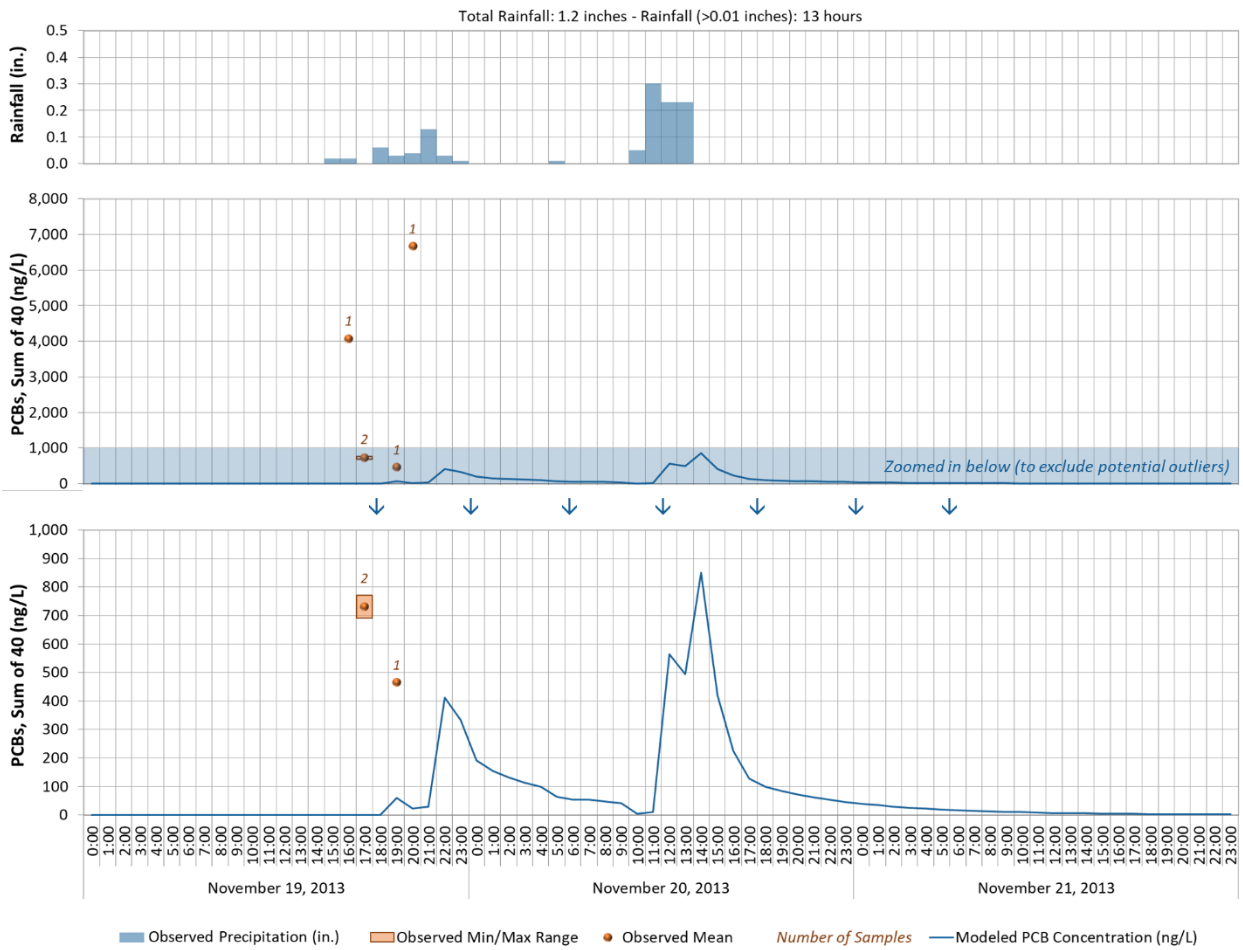


Figure 7-3. Modeled vs. Observed PCBs for the 11/19/2013 sampling event at Pulgas Creek South Gage. Top: Rainfall; middle: all samples (including 2 potential outliers) bottom: excluding 2 potential outliers.

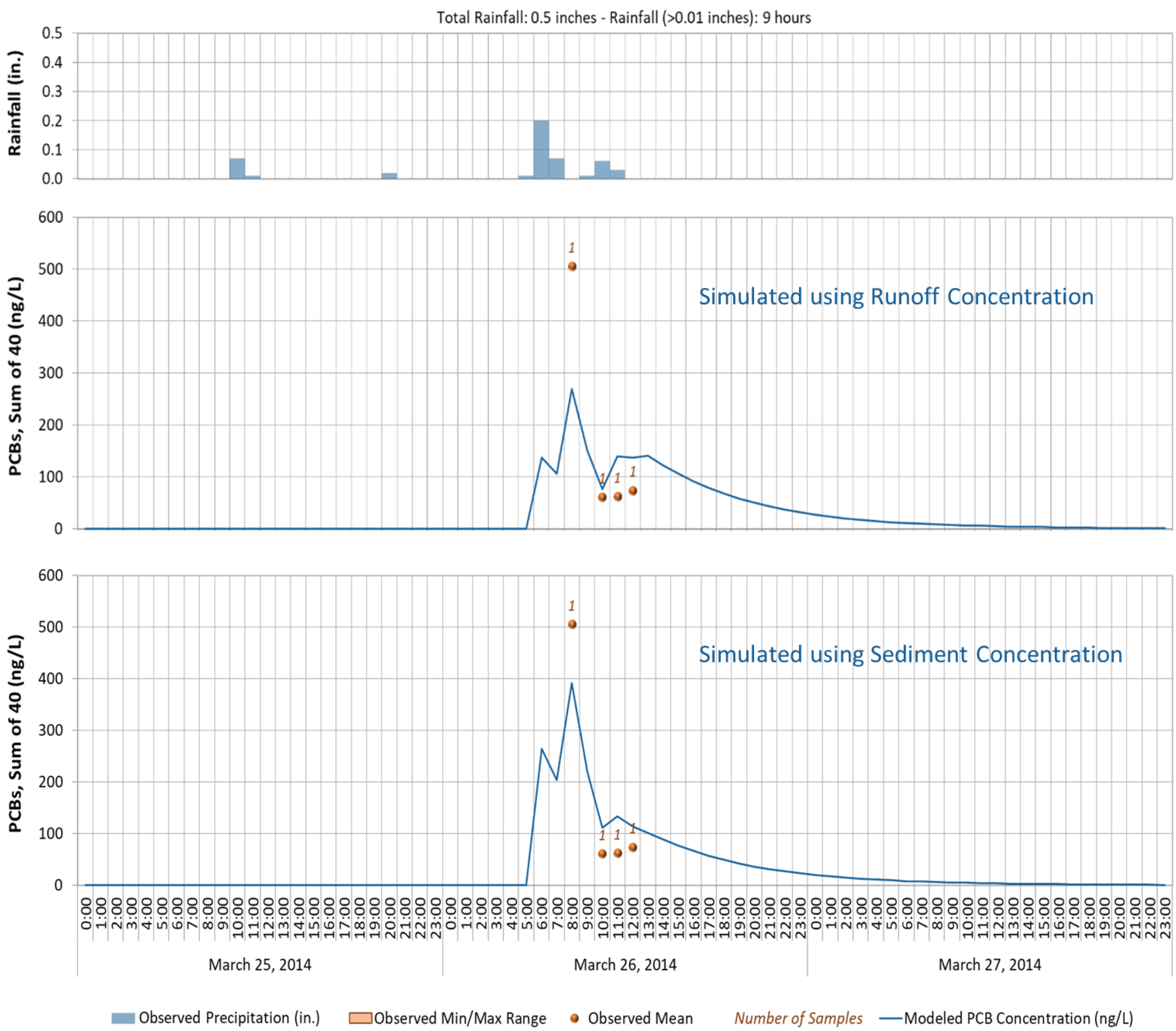


Figure 7-4. Modeled vs. observed PCBs at Pulgas Ck South Gage for a selected storm (3/25/2014 - 3/27/2014). Top panel: rainfall; middle panel: runoff concentration; bottom panel: sediment concentration.

Figure 7-5 through Figure 7-8 show modeled vs. observed PCBs concentrations for four of the other sampled storm events using the sediment-based RWSM concentration values as an assessment of model performance at the Pulgas Creek South gage. Some of the storm events presented contain non-detect values which are notated as "ND" in place of the sample count above the observed value.

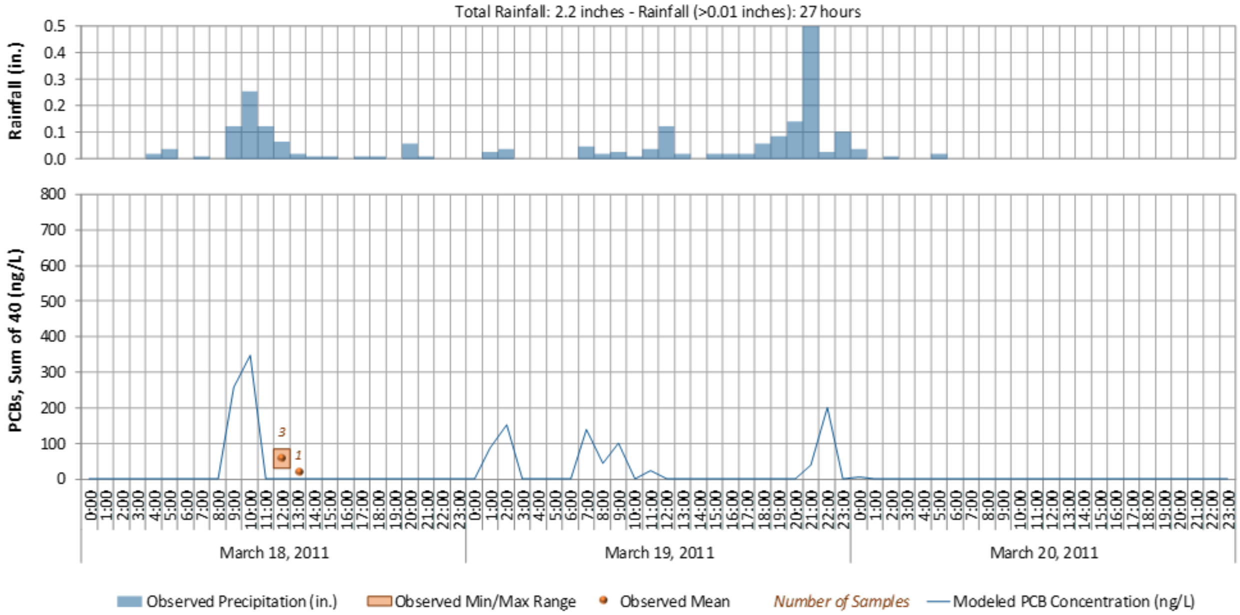


Figure 7-5. Modeled vs. observed PCBs for a selected storm at Pulgas Ck South Gage (3/18/2011 - 3/20/2011).

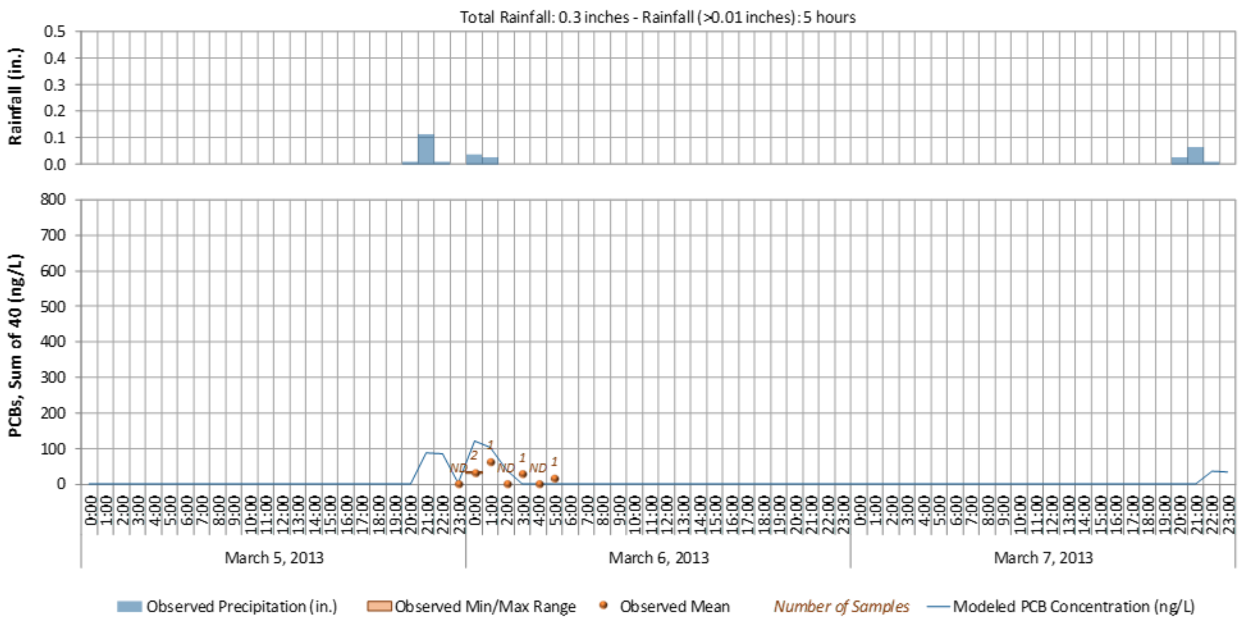


Figure 7-6. Modeled vs. observed PCBs for a selected storm at Pulgas Ck South Gage (3/5/2013 - 3/7/2013).

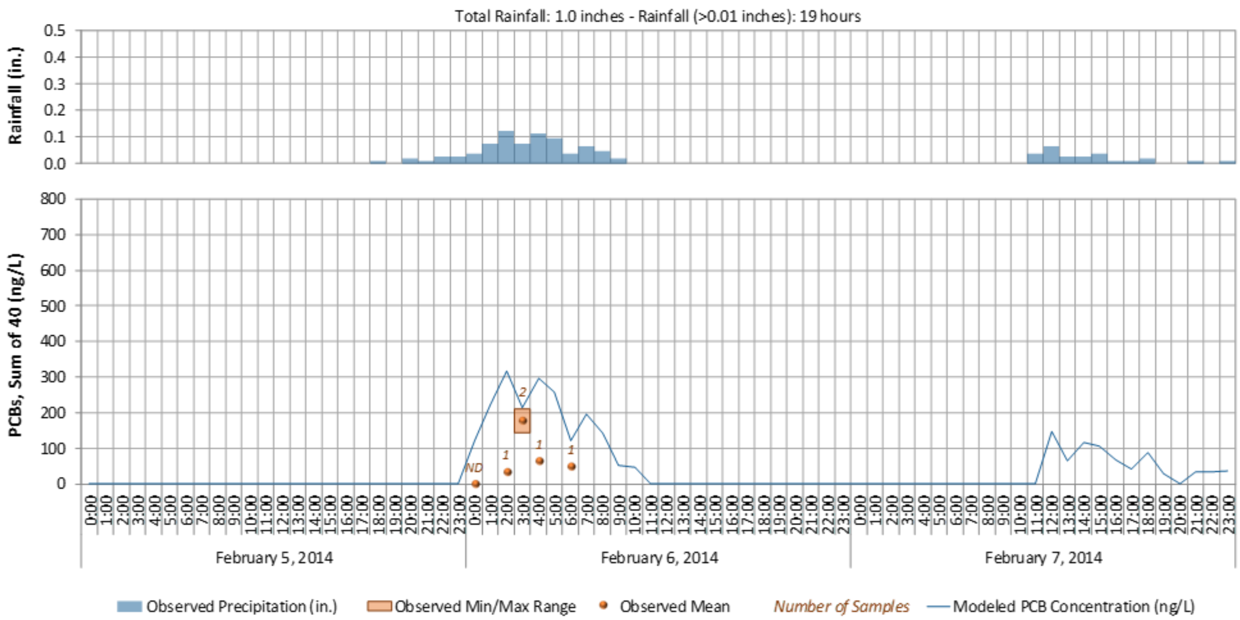


Figure 7-7. Modeled vs. observed PCBs for a selected storm at Pulgas Ck South Gage (2/5/2014 - 2/7/2014).

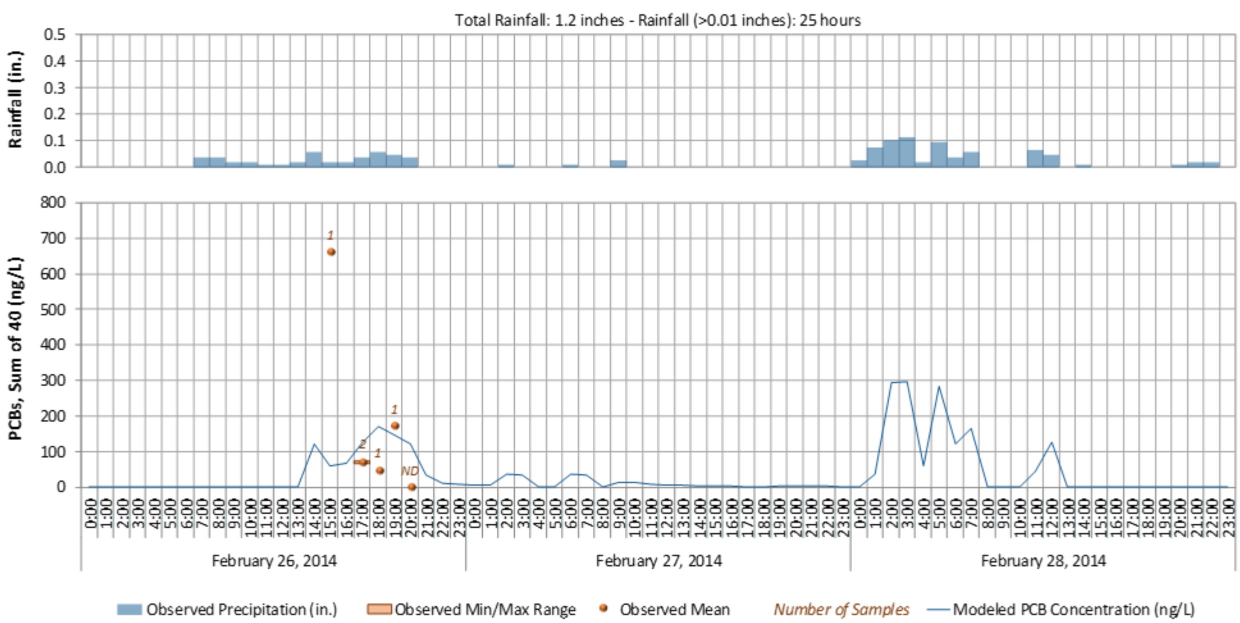


Figure 7-8. Modeled vs. observed PCBs for a selected storm at Pulgas Ck South Gage (2/26/2014 - 2/28/2014).

Similar to the analysis for Pulgas Creek above, the RWSM land use concentrations were combined with the countywide LSPC model to provide an estimate of PCB loads throughout the county. The ABAG-SFEI land use layer was intersected with the modeled HRU layer to estimate land use distribution for PCB source areas at the modeled subwatershed-level. Countywide PCB loads were estimated for water year 2002[1] (10/1/2001 to 9/30/2002). Figure 7-9 shows PCB source area land use distribution and modeled PCB loads for water year 2002. The top left panel shows area distribution for the portion of the county draining to the Ocean, while the top right panel shows the distribution for area draining to the Bay. The bottom two panels show estimated Bayside PCB loads at the source (left) and delivered to the Bay (right). Many of the source areas are located near the shoreline of the Bay; therefore, there transport losses are lower for those areas than for others that are more inland-located. Figure 7-10 is a map of unit-area sediment loads at the source (left) and PCB loads from each subwatershed that are ultimately delivered to the Bay (right).

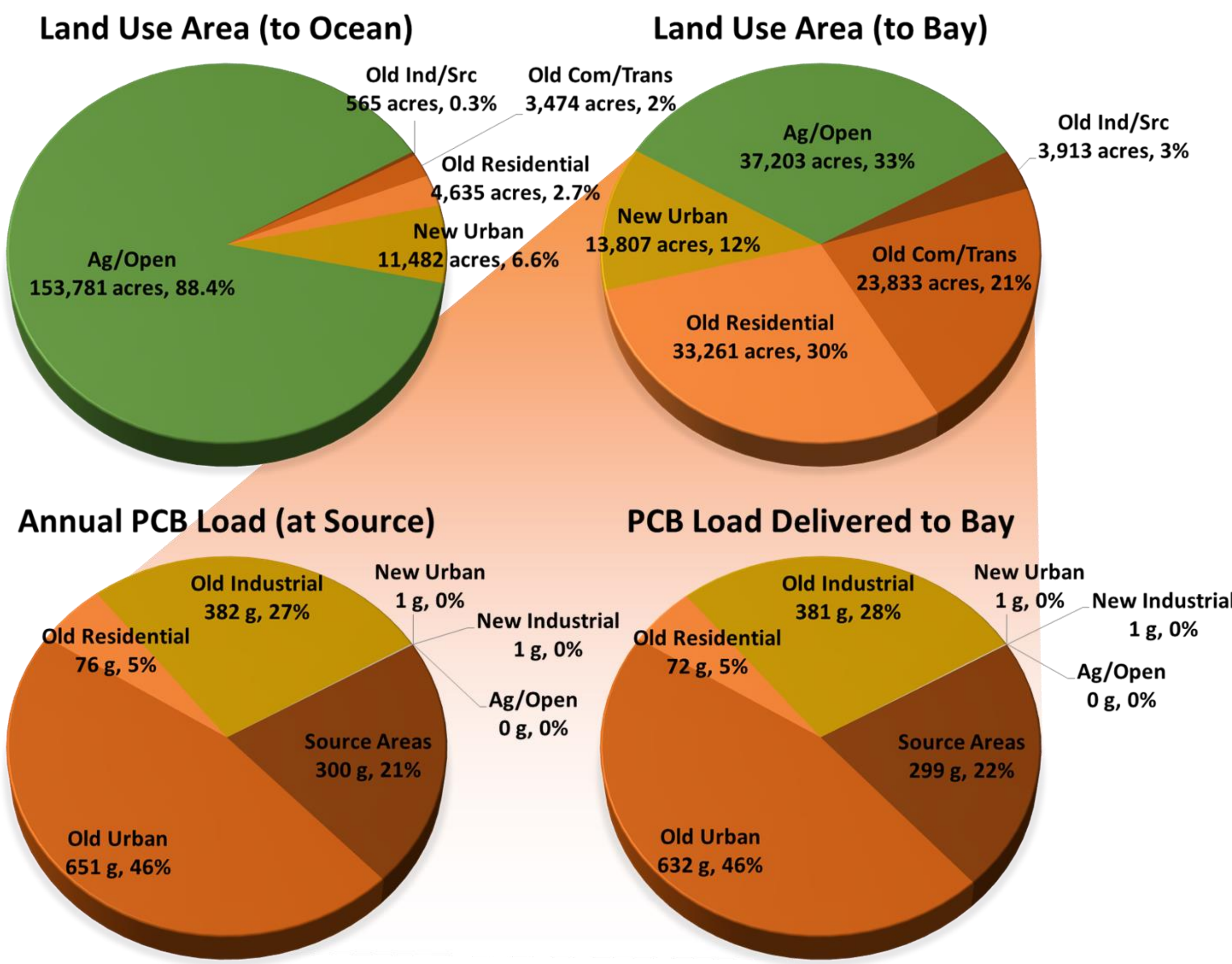


Figure 7-9. PCB source area land use distribution and modeled PCB load estimates for water year 2002.

[1] For the RAA analysis and direct comparison to TMDL WLAs based on average annual loading conditions, the Bay Area RAA Guidance recommends two options for simulation of baseline loading: (1) water years 2000-2009 (for long-term continuous simulation), or (2) water year 2002 (for representative water year).

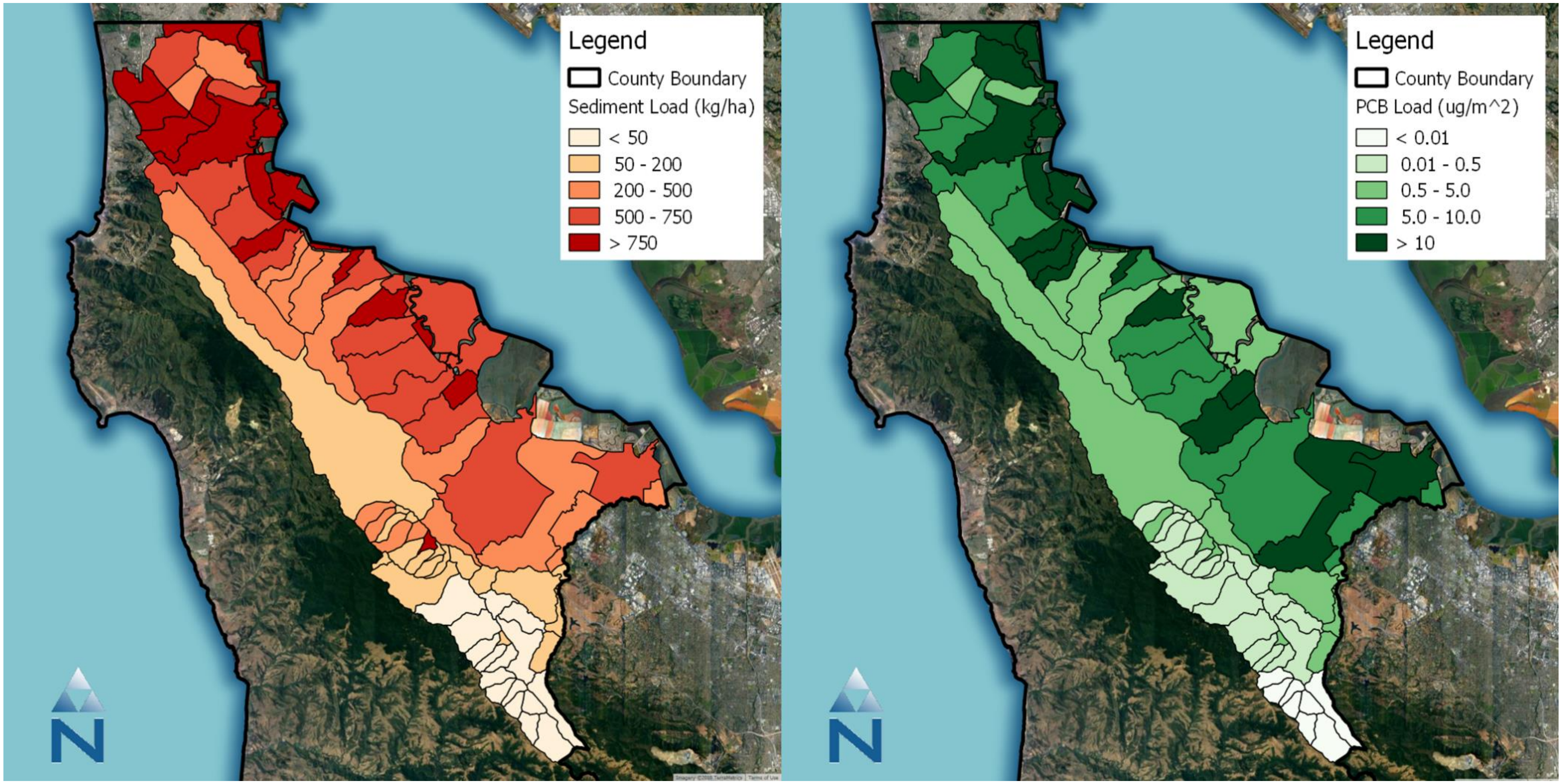


Figure 7-10. Modeled sediment and PCB unit-area loads (at source) by subwatershed in San Mateo County for 2002.

8 TOTAL MERCURY

The SLTS sampled sediment and mercury at three locations within San Mateo County: (1) Borel Creek, (2) Belmont Creek, and (3) Pulgas Creek. Figure 8-1 shows the location of the sampling site and the drainage area boundary for the most representative model subwatershed.

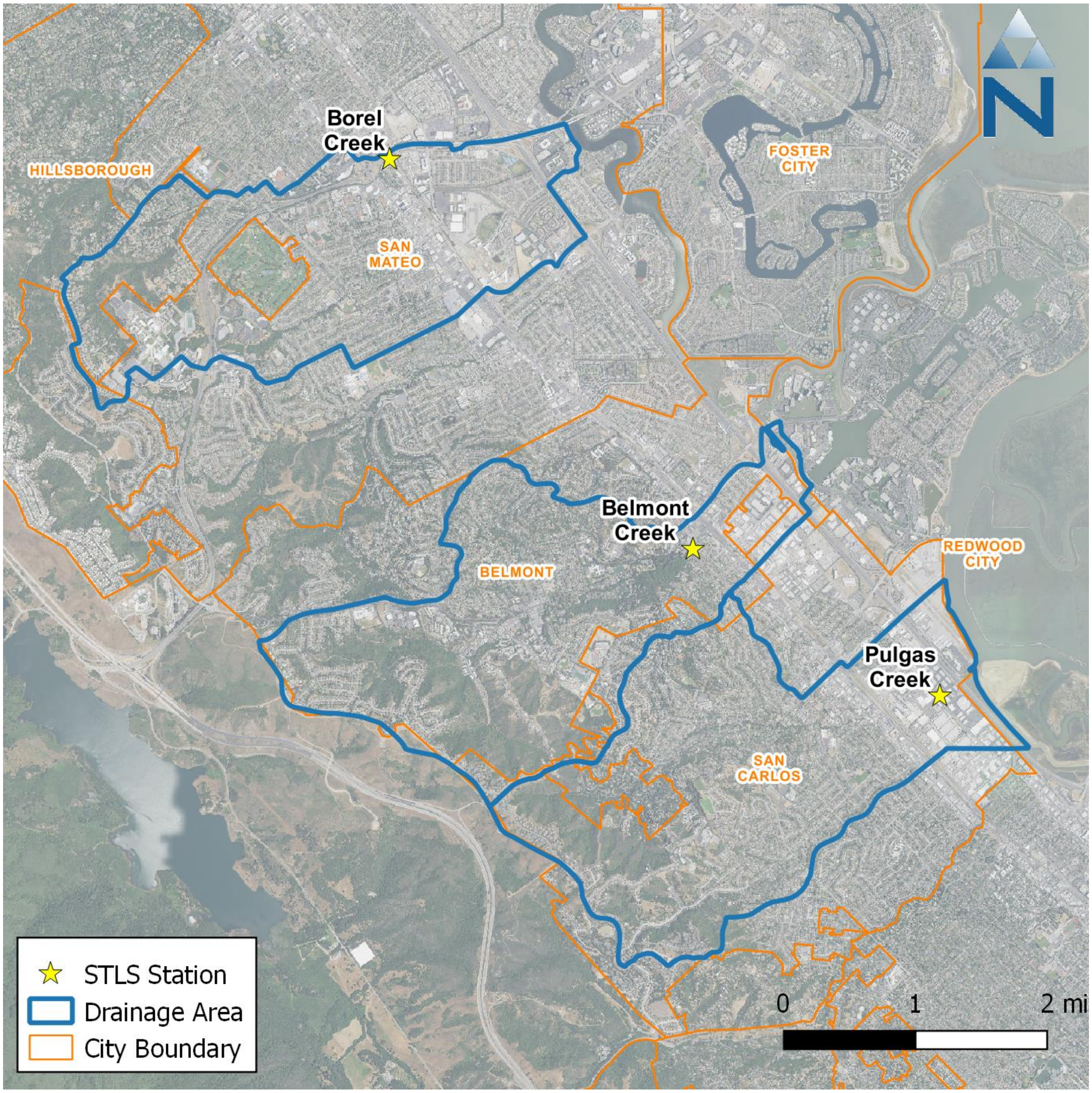


Figure 8-1. SLTS sampling locations in San Mateo County.

Previous SFEI studies of sediment and mercury in other regional tributaries have demonstrated a positive relationship between instream sediment and mercury concentrations. Results from a mercury monitoring study conducted in an urban tributary in Hayward, CA are plotted in black in the upper-left panel of Figure 8-2 (McKee et al. 2009). Consolidated data from the three San Mateo County stations are superimposed in blue on the Hayward samples, showing how those levels trend slightly higher than the Hayward levels, although the slopes are similar. The slope of the line provides a rough estimate of mercury concentration relative to sediment concentrations; however, because the trend line does not intersect at zero, it is reasonable to expect some level of background mercury concentration in the water column, presumably from background sources, when sediment concentrations are near zero.

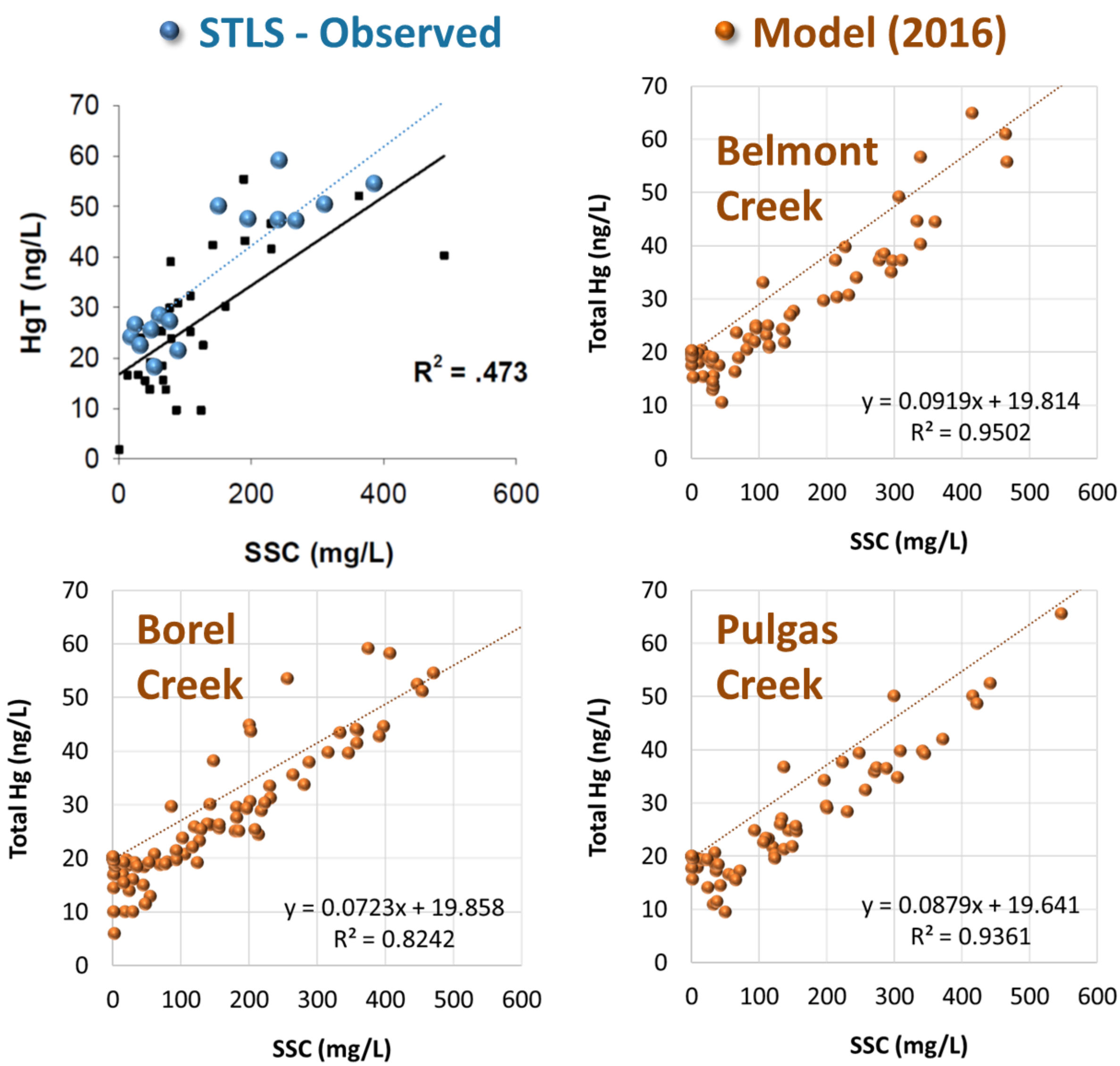


Figure 8-2. Modeled (orange) vs. observed (blue) mercury trends for SLTS sampling sites in San Mateo County.

Runoff concentrations from RWSM (based on SFEI-ABAG categories) were combined with LSPC-modeled hydrology to estimate total long-term loads at tributary outlets. When applied to the timeseries output, this approach by itself produces a linear relationship that intersects the y-axis of

Figure 8-2 at the zero point; however, the observed STLS relationships (McKee et al. 2009) suggest that the intersect is not zero. To better reflect this trend, a background mercury concentration of 20 ng/L was assigned to modeled baseflows as shown Figure 8-2. The model also assumes atmospheric wet-deposition concentration of 9.7 ng/L and a dry-deposition rate of 19 µg/m^2/year; however, studies also indicated that only about 5 percent of the atmospheric deposition load is exported from land into waters (SFBRWQCB 2008a). The model was parameterized to reflect net mercury delivery to waterbodies from atmospheric deposition (0.485 ng/L wet deposition and 0.95 µg/m^2/year for dry deposition) (SFBRWQCB 2008a). With those two mercury loading signatures added to represent contributions from natural sources, the RWSM land-based mercury sediment estimates were proportionally adjusted (maintaining the same relative distributions by source) to match the slope of the curve in the calibration panels shown in Figure 8-2.

Figure 8-3 through Figure 8-8 show modeled versus observed mercury concentrations for six sampled storm events using the sediment-based RWSM concentration values as an assessment of model performance at the Pulgas Creek South gage. The selected storm events are consistent with the events presented in Section 7 showing PCB concentrations. Some of the storm events presented contain non-detect values which are notated as "ND" in place of the sample count above the observed value.

Figure 8-9 is a map of unit-area sediment loads at the source (left) and mercury loads from each subwatershed that are ultimately delivered to the Bay (right). Countywide mercury loads were estimated for water year 2002[1] (10/1/2001 to 9/30/2002).

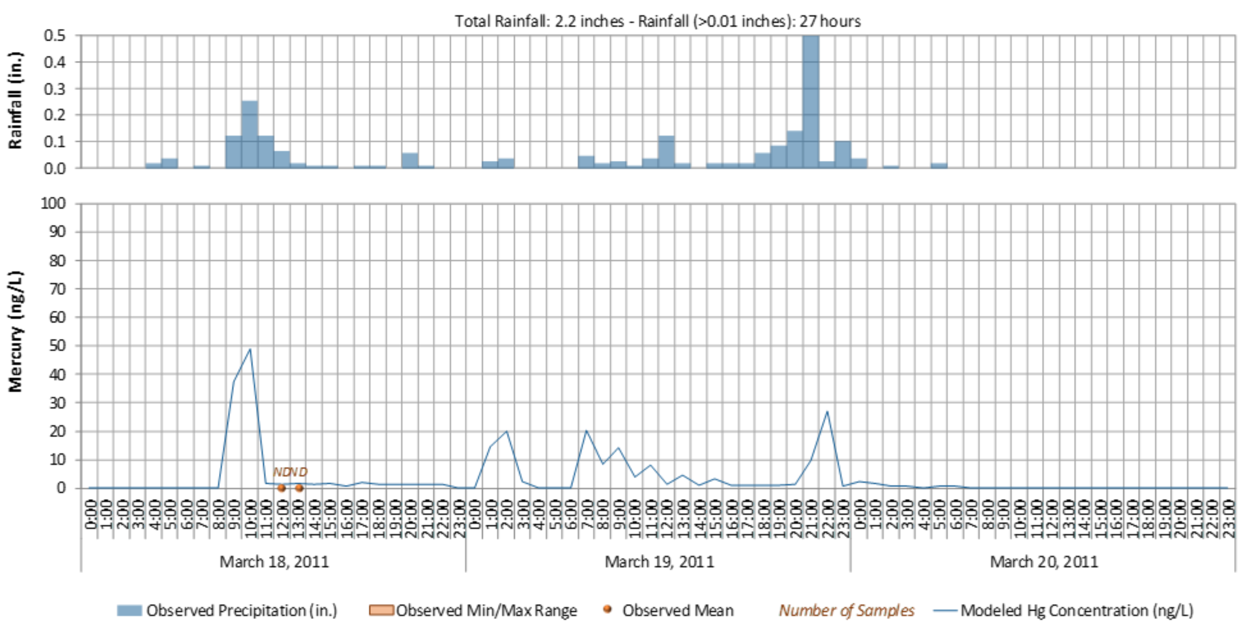


Figure 8-3. Modeled vs. observed total mercury for a selected storm at Pulgas Ck South Gage (3/18/2011 - 3/20/2011).

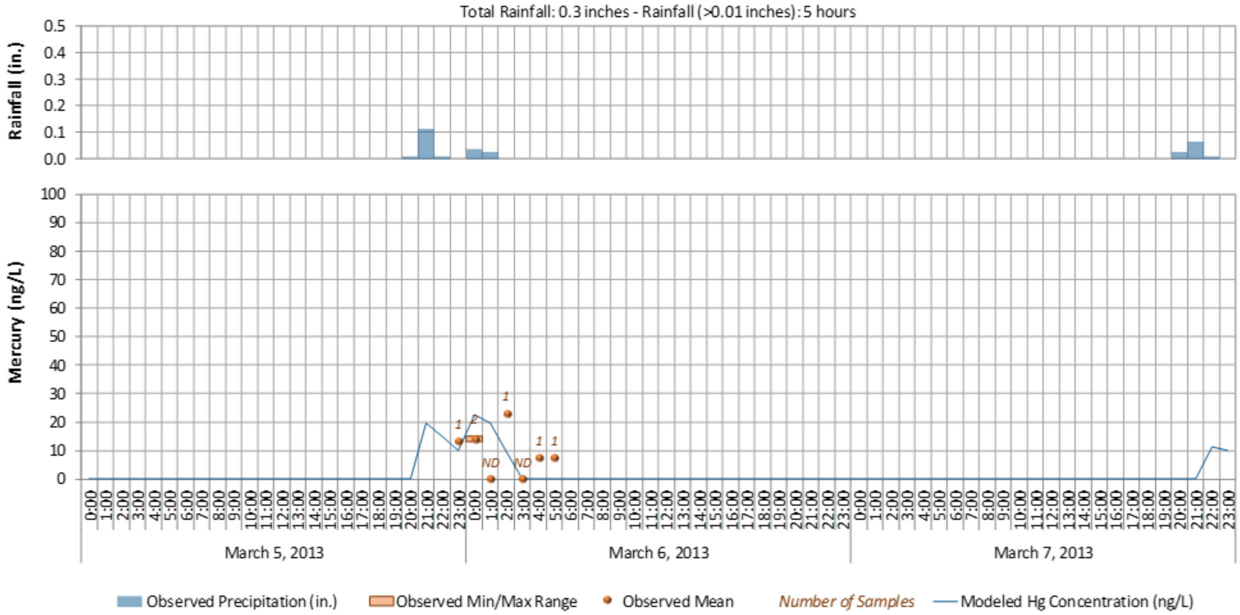


Figure 8-4. Modeled vs. observed total mercury for a selected storm at Pulgas Ck South Gage (3/5/2013 - 3/7/2013).

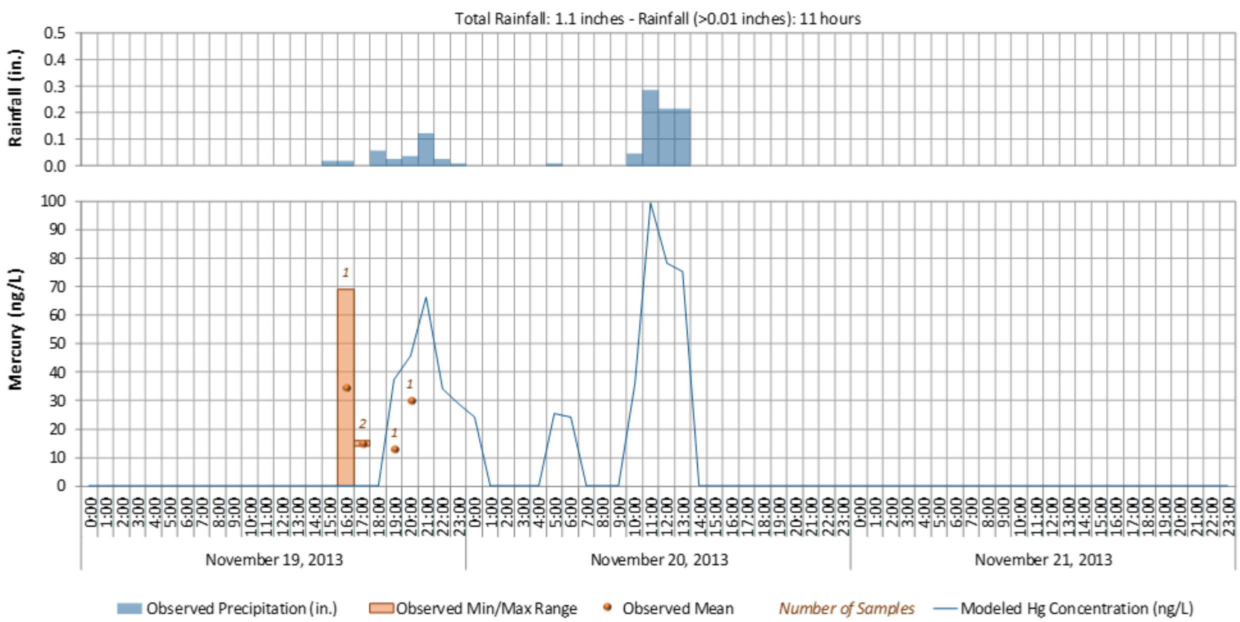


Figure 8-5. Modeled vs. observed total mercury for a selected storm at Pulgas Ck South Gage (11/19/2013 - 11/21/2013).

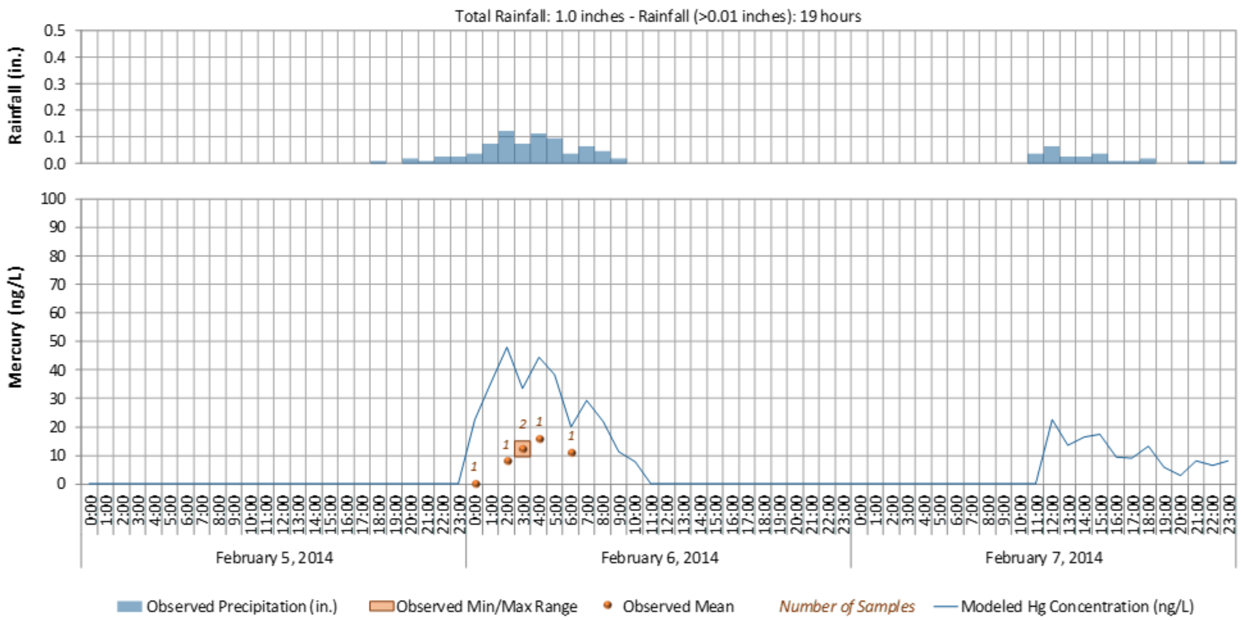


Figure 8-6. Modeled vs. observed total mercury for a selected storm at Pulgas Ck South Gage (2/5/2014 - 2/7/2014).

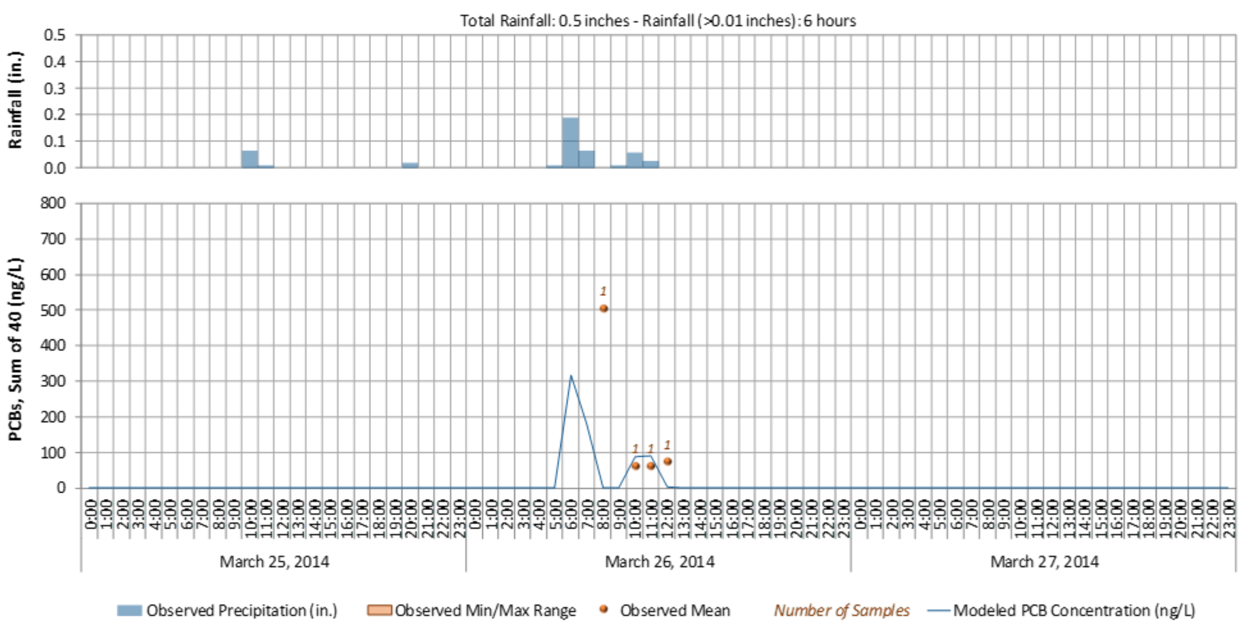


Figure 8-7. Modeled vs. observed Total Hg for a selected storm at Pulgas Ck South Gage (2/26/2014 - 2/28/2014).

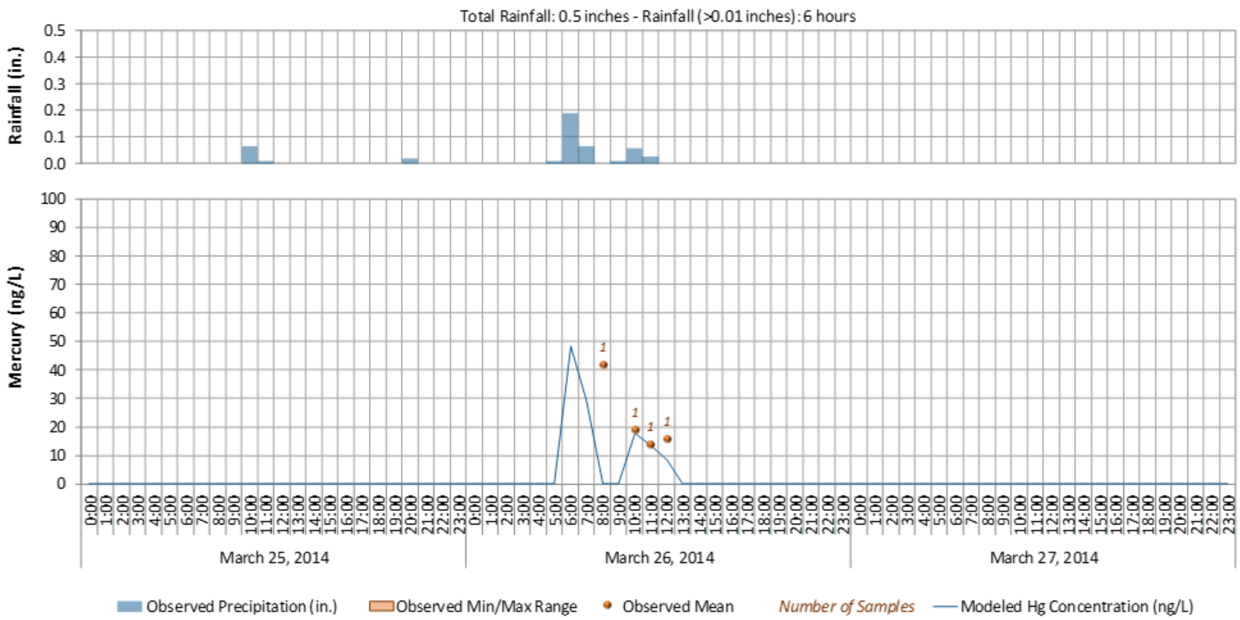


Figure 8-8. Modeled vs. observed total mercury for a selected storm at Pulgas Ck South Gage (3/25/2014 - 3/27/2014).

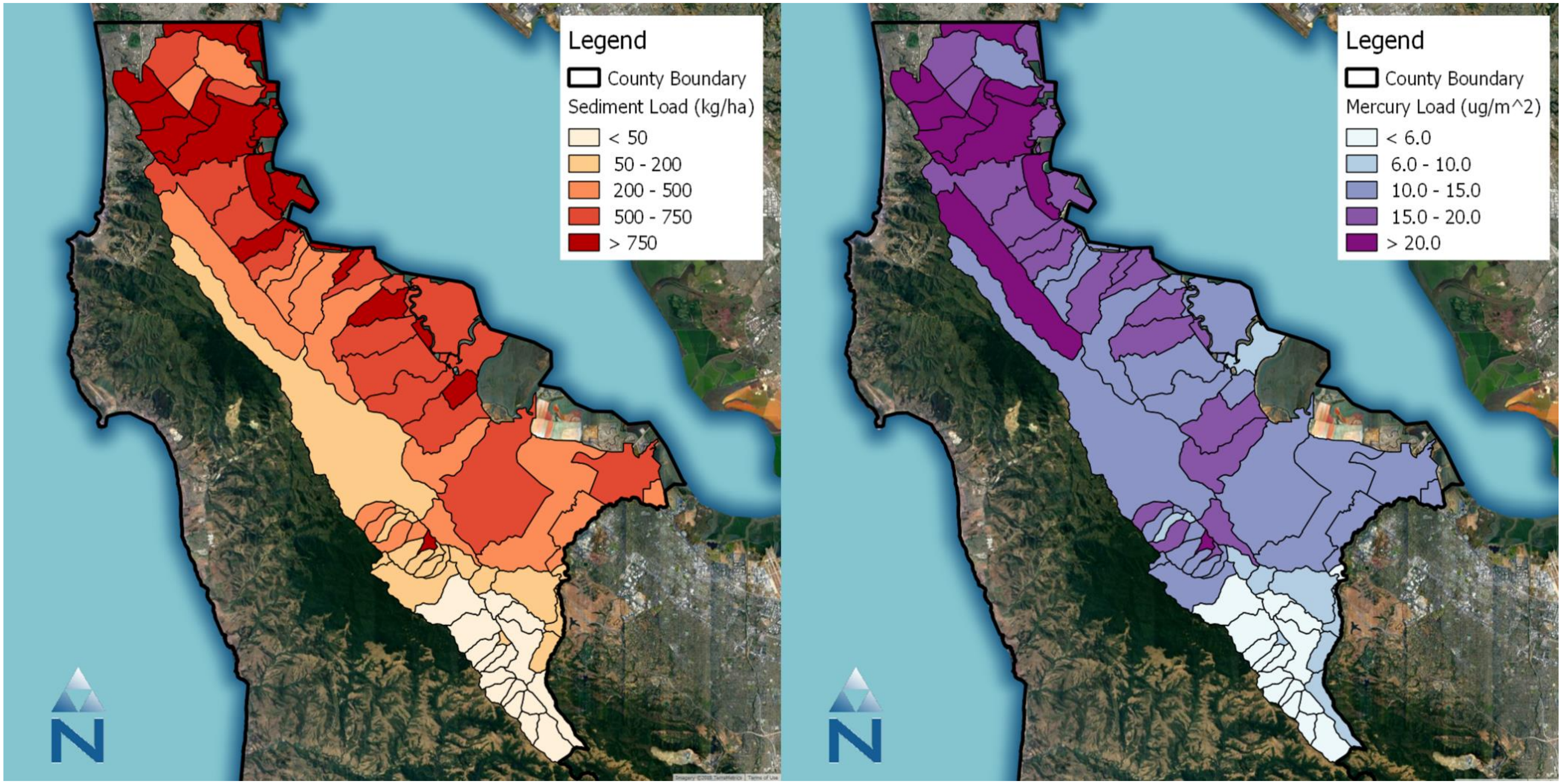


Figure 8-9. Modeled sediment and mercury unit-area loads (at source) by subwatershed in San Mateo County.

9 IDENTIFICATION OF AREA FOR ANALYSIS

The modeling system reported in the previous sections was developed for all areas within County watersheds and provides a complete estimate of all PCB loads delivered to the Bay via stormwater. However, the RAA is performed to estimate baseline pollutant loads from areas covered by the TMDL and MRP. This is performed to provide direct comparison to TMDL WLAs designated for permitted municipal stormwater discharges (SFBRWQCB 2008b). The Bay Area RAA Guidance states that "consistent with TMDL accounting, areas within the boundaries of the Permittee's jurisdiction that do not need to be incorporated into the area of analysis include non-urban land areas, including non-urban areas upstream from dams, which are not needed for calibration or validation of the RAA model." The EPA RAA Guide and Bay Area RAA Guidance also both outline the following factors for consideration in defining the area for analysis:

- If multiple municipal jurisdictions are addressed by the RAA, the analysis should be capable of distinguishing among jurisdictions in terms of relative contributions of wet weather flow and pollutant loads.
- If areas not subject to municipal jurisdiction are included, their flows and loads should be distinguishable.
- The area of analysis should make sense in terms of hydrologic function and connectivity, and for some approaches, flows and loads may require routing through the modeled area of analysis.

The following subsections describe the processes for separating and allowing modeling of distinguishable flows and pollutant loads from areas addressed by the TMDL and MRP, non-urban open space, Caltrans rights-of-way, Industrial NPDES permitted facilities, and Industrial General Permitted (IGP) from the Municipal Separate Storm Sewer System (MS4) jurisdiction.

9.1 Non-Urban Open Space

The Bay PCB and mercury TMDLs present WLAs specific to urban stormwater runoff. Consequently, non-urban open space within San Mateo County was categorized as non-MRP and separated into distinguishable modeled areas for the RAA. These areas were identified by separating all the land designated as *Ag/Open* in the SFEI ABAG land use layer from the other categories.

9.2 Caltrans

The California Department of Transportation (Caltrans) operates with a statewide National Pollutant Discharge Elimination System (NPDES) MS4 permit that regulates the discharge of stormwater associated with the operation and management of the State's highway system. Since the State's highways are permitted separately, these areas are classified as non-MRP. Caltrans right-of-way was estimated through an analysis of road classifications. Using the San Mateo County Department of Public Works (DPW) street centerline dataset, all road designated as state, federal, or interstate highways were selected. A representative buffer width varying between 60 and 100 feet was estimated based on a review of aerial imagery and applied to the centerline to create a buffered right-of-way polygon. Finally, geometric holes created by this buffering technique at interchanges were filled. This analysis resulted in over 4,500 acres of land attributed to Caltrans. Figure 9-1 presents a map of the estimated Caltrans right-of-way developed through this approach.

9.3 Industrial Stormwater Permits

Industrial facilities with industrial stormwater permits must meet requirements outlined in their permit for managing and treating stormwater at the parcel or site level. Active industrial stormwater permits within San Mateo County were identified using EPA's Enforcement and Compliance History Online (ECHO) database. Permitted facilities included two categories (1) those facilities operating under individual NPDES permits, and (2) those facilities operating under the IGP. Individual permits are typically issued for larger facilities or those with unique requirements that deviate from those outlined under the IGP. In San Mateo County, the San Francisco International Airport and the Corinda Los Trancos Landfill were identified as the only two individual NPDES permits. The remaining 112 facilities identified through the EPA ECHO database search were included in the IGP, which included various industrial operations including warehouses, quarries, port facilities, and the SLAC National Accelerator Laboratory which totaled over 200 acres.

Both individual NPDES permits IGPs are regulated under a program separate from MS4 permits and are not considered a direct contribution from MS4 drainage areas. Therefore, these industrial parcel areas area were separated from the MS4 area within the model to distinguish MS4 load contributions from other those covered by other permits. While these parcels encompass a relatively small area compared to the size of the County, some of these facilities are located within areas of higher pollutant loading. Figure 9-2 presents a map of the industrial stormwater facilities identified through this search.

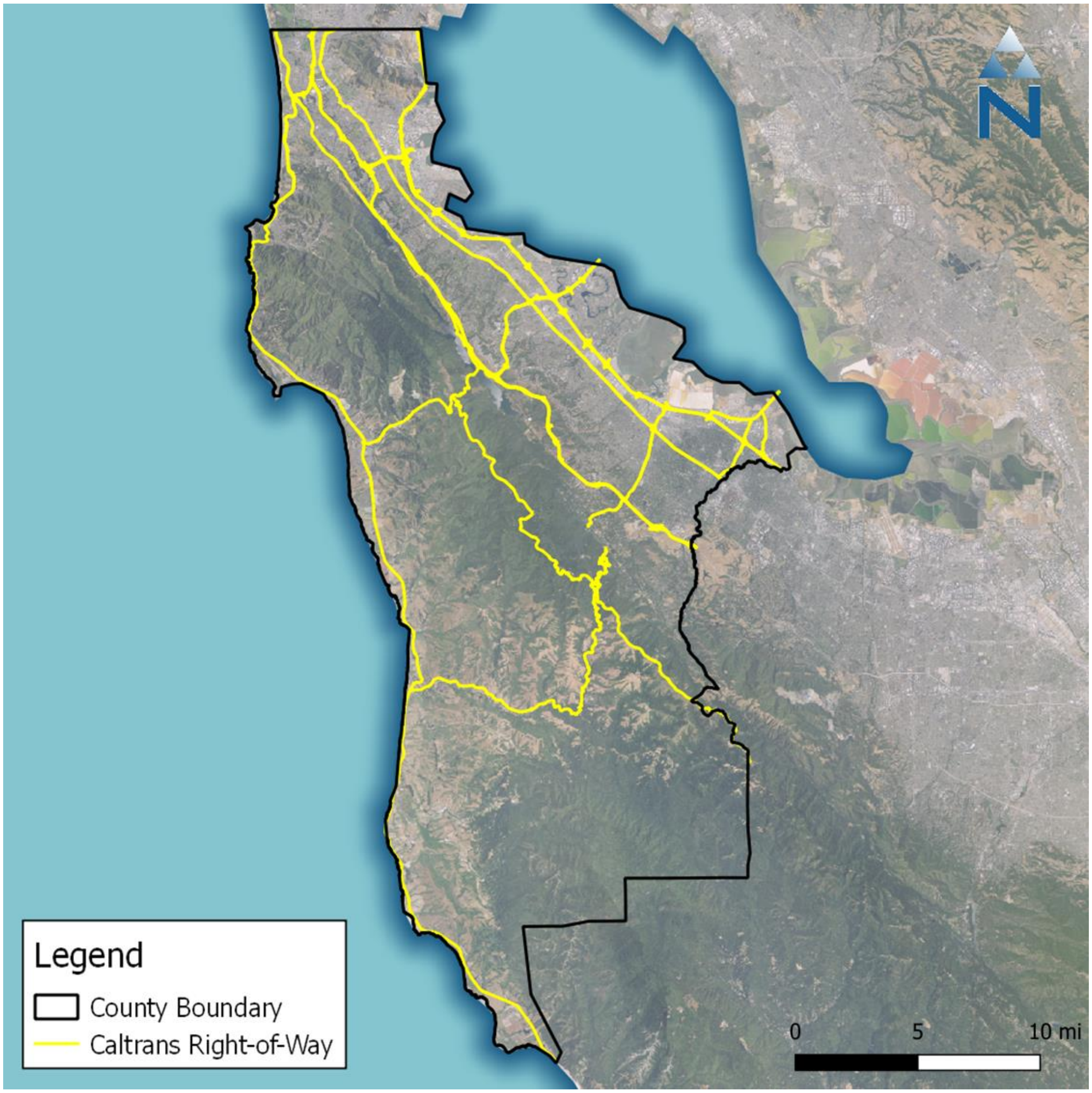


Figure 9-1. Location of estimated Caltrans right-of-way.

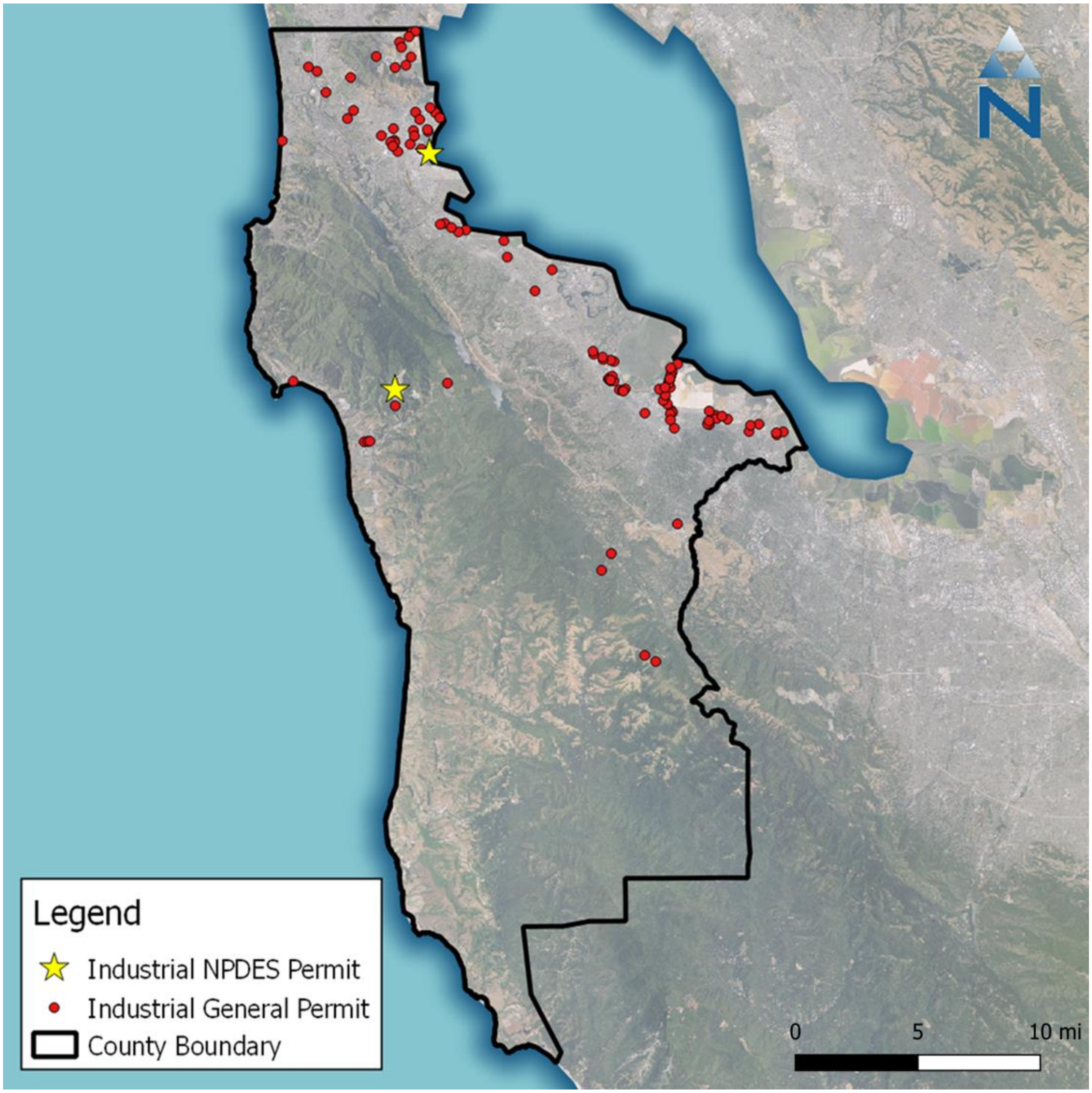


Figure 9-2. Locations of identified NPDES (individual) and facilities included in the IGP.

10 IDENTIFICATION OF BASELINE POLLUTANT LOADS AND STORMWATER IMPROVEMENT GOALS

To provide a direct comparison to WLAs assigned to municipal stormwater discharges to the Bay, the pollutant loadings associated with land areas identified in Section 9 were separated from loads addressed by the MRP. Table 10-1 summarizes the MRP and non-MRP land areas and their pollutant loads. The MRP pollutant loads in Table 10-1 can be directly compared to respective TMDL WLAs for the determination of necessary stormwater improvement goals. Figure 10-1 depicts the area of analysis addressed by the MRP.

Table 10-1. Summary of total area and pollutant loading by watershed and type of area.

Permitted and Other Areas		Area (acres)	PCB (kg/year)	Hg (kg/year)
MRP		56,943	1.3	1.63
Non-MRP	*Open Space*	44,958	0.001	0.56
	Caltrans	2,992	0.08	0.08
	Industrial (NPDES)	1,796	0.225	0.07
	Industrial (General)	828	0.09	0.02

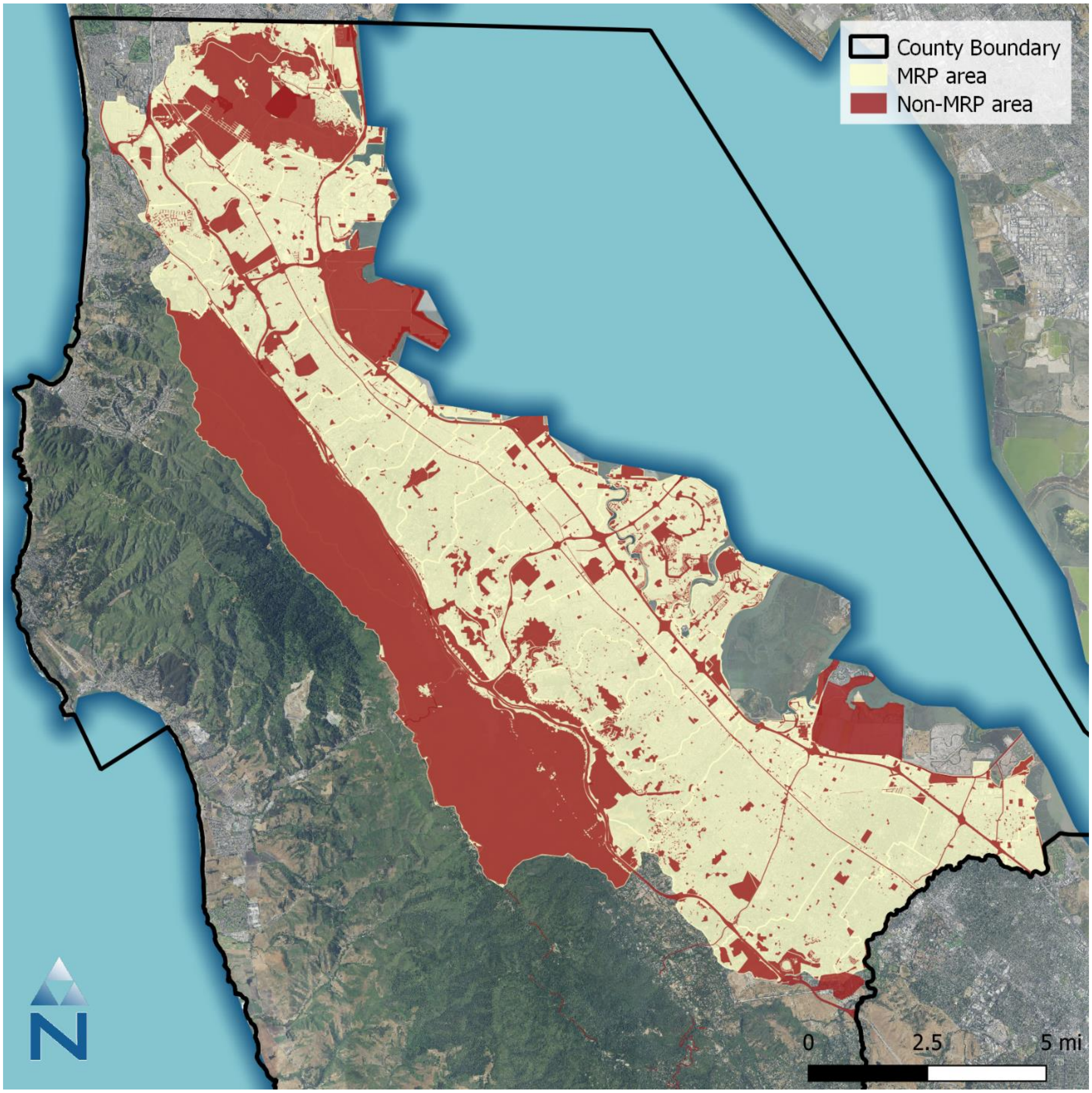


Figure 10-1. Area of analysis covered by the Municipal Regional Stormwater NPDES Permit (MRP).

Table 10-2 and Table 10-3 provide a summary of the calculation of stormwater improvement goals, or pollutant load reductions, to meet WLAs for PCBs and mercury, respectively. The tables summarize values reported in the TMDLs for existing pollutant and sediment loads for all stormwater loads to the Bay, sediment targets, and WLAs and pollutant reductions assigned to all municipal stormwater discharges to the Bay; the San Mateo County portion of the WLAs; and the existing pollutant and sediment loads and load reductions estimated by the RAA model for MRP areas designated in Table 10-1. For PCBs, an 84.6% reduction in annual loads is estimated for municipal discharges within San Mateo County to meet the San Mateo County portion of the TMDL wasteload allocation. For mercury, the baseline annual load is estimated to be less than the San Mateo County portion of the wasteload allocation, requiring no load reduction. The model is not determined to be under-predicting mercury load, as can be demonstrated by the validation of modeled mercury concentrations presented in Section 8 and sediment loads (basis for mercury load predictions) presented in Section 6.

Table 10-2. Calculation of stormwater improvement goals to address PCBs TMDL.

TMDL Component		PCB Loads	
		Bay-wide	San Mateo County
1	Existing PCB Load (kg/year)	20[1]	1.3[2]
2	Existing Sediment Load (t/year)	2,000,000[1]	8,107[2]
3	Target Sediment Concentration (µg/kg)	1[1]	n/a
4	Wasteload Allocation for Municipal Stormwater Discharges(kg/year)	2[1]	0.2[1]
5 = 1 - 4	Load Reduction for Municipal Stormwater Discharges (kg/year)	18[1]	1.1[3]
6 = 5 / 1	Percent Reduction	90[1]%	84.6[3]%

1: Reference: SFBRWQCB 2008b
2: Determined using the RAA model based on simulation of Water Year 2002, defined by the Bay Area RAA Guidance to be representative of average annual loading conditions for comparison to TMDL WLAs.
3: Calculated based on the difference between the RAA modeled Existing PCB Load (blue = 1.3 kg/yr) and the TMDL WLA (green = 0.2 kg/yr).

Table 10-3. Calculation of stormwater improvement goals to address mercury TMDL.

TMDL Component		Hg Loads	
		Bay-wide	San Mateo County
1	Existing Mercury Load (kg/year)	160[1]	1.6[2]
2	Existing Sediment Load (t/year)	410,000[1]	8,107[2]
3	Target Sediment Concentration (mg/kg)	0.2[1]	n/a
4	Wasteload Allocation for Municipal Stormwater Discharges(kg/year)	82[1]	8.4[1]
5 = 1 - 4	Load Reduction for Municipal Stormwater Discharges (kg/year)	78[1]	0[3]
6 = 5 / 1	Percent Reduction	48.8[1]%	0[3]%

1: Reference: SFBRWQCB 2006
2: Determined using the RAA model based on simulation of Water Year 2002, defined by the Bay Area RAA Guidance to be representative of average annual loading conditions for comparison to TMDL WLAs.
3: Calculated based on the difference between the RAA modeled Existing PCB Load (blue = 1.6 kg/yr) and the TMDL WLA (green = 8.4 kg/yr). Since the existing load is estimated to be less than the TMDL WLA, zero reduction is required.

The MRP assigns required mercury (62 kg/yr) and PCB (14.4 kg/yr) load reductions to be achieved through the implementation of GI. Through the development of the Bay Area RAA Guidance, it was agreed that if a new baseline model is developed that results in a revised calculation of the load reduction required to meet WLAs, the percent of the permittee load reduction can be used as the stormwater improvement goal to guide GI planning. Table 10-4 provides a summary of the MRP required PCB and mercury load reductions and the interpretation of percent of permittee load reductions reported by the Bay Area RAA Guidance.

Table 10-4. MRP required pollutant load reductions achieved through GI Bay-wide.

Pollutant	MRP Required Load Reduction (kg/yr)	Percent of Permittee Load Reduction
PCBs	3.0	20.8%
Mercury	10.0	16.1%

Based on the total load reductions calculated for PCBs and mercury (Table 10-2 and Table 10-3, respectively), and the percentage of these load reductions to be achieved through GI (Table 10-4), a new totals for PCB and mercury load reductions can be calculated as goals for GI. Summarized in Table 10-5 and Table 10-6, these load reductions serve as goals for GI plans to be achieved by 2040.

Table 10-5. Calculation of San Mateo County PCB load reduction by 2040 through GI.

Achieved Through GI Implementation by 2040	San Mateo Co. (Based on RAA Model)
Load Reduction (kg/yr)	0.23[1]
Percent Reduction	17.6[2]%

1: Bay Area RAA Guidance reports 20.8% of the permittee load reduction associated with the MRP GI requirements. Calculated based on 20.8% of the PCB Load Reduction (Table 10-2).
2: Calculated based on difference of Load Reduction reported above (0.23 kg/yr) and Existing PCB Load (1.3 kg/yr).

Table 10-6. Calculation of mercury load reduction by 2040 through GI.

Achieved Through GI Implementation by 2020	San Mateo Co. (Based on RAA Model)
Load Reduction (kg/yr)	0[1]
Percent Reduction	0[2]%

1: Bay Area RAA Guidance reports 16.1% of the permittee load reduction associated with the MRP GI requirements. Calculated based on 16.1% of the Mercury Load Reduction (Table 10-3).
2: Calculated based on difference of Load Reduction reported above (8.6 kg/yr) and Existing Mercury Load (1.6 kg/yr). Because the existing Load is less than the required load reduction, no reduction is required.

11 SUMMARY AND NEXT STEPS

Based on criteria established by the Bay Area RAA Guidance, the baseline hydrology and pollutant loading model is considered calibrated and validated and sufficient for estimation of existing loads of mercury and PCBs, comparison to TMDL wasteload allocations, and determination of necessary load reductions to support the planning of GI implementation. Based on requirements of the MRP and results of the baseline model, Table 10-5 and Table 10-6 provide a summary of the PCB and mercury load reduction goals, respectively, to be attained by 2040 through the implementation of GI.

The next Phase II of the RAA will provide modeling and cost-optimization of GI projects to determine the amount GI needed over time to meet pollutant load reduction goals by 2040. C/CAG has started identifying opportunities for GI projects opportunities through development of the San Mateo County Stormwater Resource Plan (SRP) (SMCWPPP 2017). The SRP categorized GI project opportunities in three primary categories:

- Parcel-based or Low Impact Development (LID), where stormwater is managed at parcel level;
- Green streets, where stormwater is managed in the public rights-of-way at the block scale; and,
- Regional projects, where stormwater is managed at the neighborhood or watershed scale.

For the RAA, these primary categories are further grouped or broken down as follows:

1. **Existing Projects**: Stormwater treatment and GI projects that have been implemented since FY-2004/05. This is primarily all of the Regulated Projects that were mandated to treat runoff via Provision C.3 of the MMRP, but also includes any public green street or other demonstration projects that were not subject to Provision C.3 requirements. For Regulated Projects in the early years of C.3 implementation, stormwater treatment may have been achieved through non-GI means, such as underground vault systems or media filters.
2. **Future New and Redevelopment:** This is all the regulated projects that will be subject to Provision C.3 requirements to treat runoff via GI and is based on spatial projections of future new and redevelopment tied to regional models for population and employment growth.
3. **Regional Projects (identified)**: The SRP identified three projects within public parks to provide regional capture and infiltration/treatment of stormwater, and included conceptual designs to support further planning and designs. C/CAG is currently working with agencies to identify additional regional project opportunities for conceptual design and inclusion in the RAA.
4. **Green Streets**: The SRP identified and prioritized opportunities throughout San Mateo County for retrofitting existing streets with GI in public rights-of-way. Green streets were ranked as high, medium, and low priority based on a multiple-benefit prioritization process developed for the SRP.
5. **Other GI Projects (to be determined)**: Other types of GI projects on publicly owned parcels, representing a combination of either additional parcel-based GI or other Regional Projects. The SRP screened and prioritized public parcels for opportunities for onsite LID and Regional Projects. These opportunities need further investigation to determine the best potential projects.

Phase II of the RAA will provide a quantitative approach to establish relationships between GI implementation and pollutant load reduction. Model output will estimate the amount of GI, or capacity expressed in acre-feet of treatment area, needed to achieve pollutant load reduction targets for C/CAG member agencies, and the resultant amount of impervious area treated. During development of the SRP, C/CAG developed a street- and parcel-level project identification and prioritization process to identify and rank potential locations suitable for implementation of GI. This list will be used to develop assumptions for GI project opportunities used as input to the RAA model, and to provide a head start in the development of GI Plans. Figure 11-1 presents an example GI implementation scenario showing the distribution of selected GI categories versus incremental reductions in pollutant loading and increasing cost.

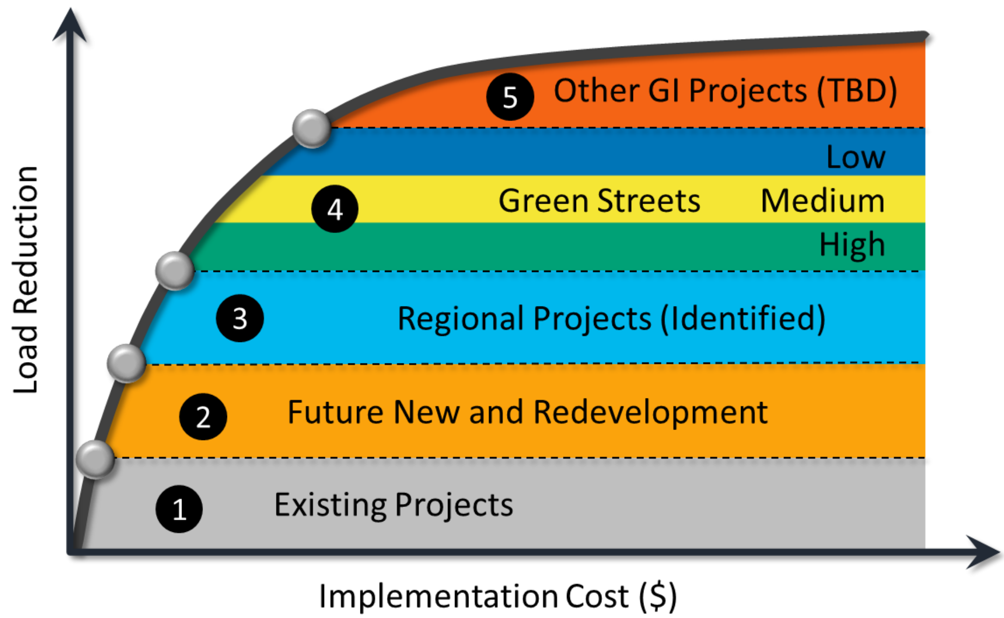


Figure 11-1. Example implementation recipe showing the general sequencing of GI categories.

Phase II of the RAA will provide a useful tool for investigation of alternative implementation scenarios through cost-benefit optimization that can inform cost-effective GI implementation within each city/unincorporated jurisdiction. After modeling and cost-optimization has been performed for each city and unincorporated county area, the GI types presented in Figure 11-1 will be summarized by jurisdiction in a single implementation "recipe" capable of meeting the required pollutant load reduction. A unique GI recipe will be developed for each jurisdiction representing the distribution of GI categories recommended through the RAA. The results of the RAA will be presented as tables and maps for each jurisdiction, and will set the goals for GI planning efforts for each agency.

12 REFERENCES

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Appendix B

Phase II RAA – Green Stormwater Infrastructure Modeling Report

SEPTEMBER 2020

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury:

Phase II Green Infrastructure Modeling Report

flowstobay.org

SAN MATEO COUNTYWIDE
WATER POLLUTION PREVENTION PROGRAM
Clean Water. Healthy Community.

A Program of the City/County Association of Governments of San Mateo County (C/CAG)

Prepared by

PARADIGM ENVIRONMENTAL

LARRY WALKER ASSOCIATES, INC.

PARADIGM ENVIRONMENTAL

LARRY WALKER ASSOCIATES

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EXECUTIVE SUMMARY

To support member agencies of the City/County Association of Governments of San Mateo County (C/CAG) with development of Green Infrastructure (GI) Plans and to address requirements of the Municipal Regional Stormwater Permit (Order No. R2-2015-0049) (SFBRWQCB 2015), the San Mateo Countywide Pollution Prevention Program performed a study to quantify baseline hydrology and loadings of Polychlorinated Biphenyls (PCBs) and mercury loads to San Francisco Bay, and evaluate the benefits of proposed GI projects to reduce these loads through the capture, infiltration, and/or treatment of stormwater. The previous *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report* RAA (RAA Phase I Report) provided documentation of the methods and modeling approaches used to represent baseline hydrology and sediment, PCBs, and mercury loads resulting from municipal stormwater discharges within San Mateo County to San Francisco Bay (SMCWPPP 2018a). This RAA Phase II Report builds upon the previous effort and provides a summary of the modeling approaches used to simulate hydraulic and pollutant removal processes associated with GI project opportunities within each of the cities and unincorporated areas throughout San Mateo County, determine the amount of GI needed within each municipal jurisdiction to address pollutant load reduction goals, and quantify metrics that can support GI planning, implementation, and tracking. Results from this report can be considered by each city and San Mateo County to set goals for GI implementation, which will be addressed through separate plans developed by each agency.

The baseline model documented in the RAA Phase I Report provided the first step in preparation of a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates that proposed GI control measures will result in sufficient load reductions of PCBs and mercury to meet Total Maximum Daily Load (TMDL) wasteload allocations (WLAs) assigned to municipal stormwater discharges to San Francisco Bay. Based on the Loading Simulation Program C++ (LSPC), the baseline model was calibrated and validated using available historic monitoring data and was demonstrated to meet performance criteria specified in the *Bay Area Reasonable Assurance Analysis Guidance Document* (Bay Area RAA Guidance) (BASMAA 2017). The LSPC model provides hourly simulation of historical hydrology and pollutant loads for multiple watersheds discharging to San Francisco Bay.

Phase II of the RAA includes linkage of the LSPC baseline model with a GI performance model based on the System for Urban Stormwater Treatment & Analysis Integration (SUSTAIN). Developed by the U.S. Environmental Protection Agency's (EPA) Office of Research and Development, SUSTAIN was primarily designed as a decision-support system for selection and placement of GI projects at strategic locations in urban watersheds. It includes a process-based continuous project simulation module for representing flow and pollutant transport routing through various types of GI projects. A distinguishing feature of SUSTAIN is a robust cost-benefit optimization model that incorporates dynamic, user-specified project unit-cost functions to quantify the implementation costs associated with various types of GI projects (USEPA 2009, Riverson et al. 2014). The cost-benefit optimization model was run iteratively to generate cost-effectiveness curves representing different combinations of projects within each municipal jurisdiction. Those results were used to evaluate cost-effective goals for GI implementation by evaluating the trade-offs between different scenarios.

The output from the RAA needs to consider multiple perspectives and strike the right balance between detail and specificity while still leaving ample opportunity for future adaptive management. The following are key considerations for the RAA output:

- **Demonstrate PCBs and Mercury Load Reductions** – The primary goal of the RAA is to quantitatively demonstrate that GI implementation will result in load reductions of PCBs and mercury sufficient to attain their respective TMDL WLAs and the component of stormwater improvement goals to be achieved with GI outlined in the MRP. Based on the baseline hydrology and water quality model (SMCWPPP 2018a), the RAA determined that a 17.6% reduction in PCB loads is needed to meet the GI implementation goals established by the MRP. Zero reduction in mercury loads was determined to be needed because baseline loads were demonstrated to be below the TMDL WLA for San Mateo County. As a result, a 17.6% reduction in PCB loads is established as the primary pollutant reduction target for the RAA.
- **Develop Metrics to Support Implementation Tracking** – The MRP (Provision C.3.j) requires tracking methods to provide reasonable assurance that TMDL WLAs are being met. Provision C.3.j states that the GI Plan "shall include means and methods to track the area within each Permittee's jurisdiction that is treated by green infrastructure controls and the amount of directly connected impervious area." C/CAG is currently leading the development of a tracking tool that will allow for the calculation of metrics consistent with the results of the RAA.
- **Support Adaptive Management** – Given the relatively small scale of most GI projects (e.g., low impact development [LID] on an individual parcel or a single street block converted to green street), numerous individual GI projects will be needed to address the pollutant reduction target at the countywide scale. All the GI projects will require site investigations to assess feasibility and costs. As a result, the RAA provides a preliminary investigation of the amount of GI needed spatially (e.g., by subwatershed and municipal jurisdiction) to achieve the countywide pollutant load reduction goal. The RAA sets the GI planning goals in terms of the amount of GI implementation required over time to address pollutant load reductions. As GI Plans are implemented and more comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans) are performed, the adaptive management process will be key to ensuring that goals are met. In summary, the RAA informs GI implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analyses performed over time.

This RAA Phase II Report provides necessary documentation of the methods and assumptions for modeling GI and selecting implementation goals to meet the 17.6% countywide reduction of PCB loads to San Francisco Bay. The RAA predicts the most cost-effective GI implementation plan for each municipal jurisdiction and subwatershed throughout San Mateo County and sets implementation goals for the amount of stormwater volumes to be managed and impervious area to be retrofitted that can serve as metrics for implementation tracking. Through the adaptive management process, future implementation of GI may vary from results of the RAA based on further engineering analysis and evaluation of GI project opportunities. However, the RAA provides goals for GI planning that can be adapted over time as lessons are learned through GI implementation.

Contents

Figures

Tables

Acronyms

ABAG	Association of Bay Area Governments
AGWO	Active Groundwater Outflow
BAHM	Bay Area Hydrology Model
BASMAA	Bay Area Stormwater Management Agencies Association
Bay	San Francisco Bay
BMP	Best Management Practice
Caltrans	California Department of Transportation
C/CAG	City/County Association of Governments of San Mateo County
CIMIS	California Irrigation Management Information System
DCIA	Directly Connected Impervious Area
DEM	Digital Elevation Model
ECHO	Enforcement and Compliance History Online
EIA	Effective Impervious Area
EMC	Event-Mean Concentration
EPA	Environmental Protection Agency
ET	Evapotranspiration
FTABLE	Functional Table (Model Rating Curve)
GHCN	Global Historical Climatology Network
GI	Green Infrastructure
GIS	Geographic Information Systems
HgT	Total Mercury
HRU	Hydrologic Response Units
HSG	Hydrologic Soil Group
HSPF	Hydrologic Simulation Program–FORTRAN
IFWO	Interflow Outflow
IGP	Industrial General Permit
LSM	Land Surface Models
LSPC	Loading Simulation Program in C++
MIA	Mapped Impervious Area
MRP	Municipal Regional Stormwater Permit
MS4	Municipal Separate Storm Sewer System
NED	National Elevation Dataset
NHD	National Hydrography Database
NLCD	National Land Cover Database
NLDAS2	North American Land Data Assimilation System
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NOAA	National Oceanic and Atmospheric Administration
PCBs	Polychlorinated Biphenyls
PEVT	Potential Evapotranspiration

POI	Points of Interest
PRISM	Parameter-elevation Regressions on Independent Slopes Model
QAPP	Quality Assurance Project Plans
RAA	Reasonable Assurance Analysis
RWSM	Regional Watershed Spreadsheet Model
SCVWD	Santa Clara Valley Water District
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic Database
STLS	Small Tributaries Loading Strategy
SWRCB	State Water Resources Control Board
TAET	Total Actual Evapotranspiration
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WLA	Waste Load Allocation
WMMS	Watershed Management Modeling System
WY	Water Year

1 INTRODUCTION

The Municipal Regional Stormwater Permit (MRP) (Order No. R2-2015-0049) requires Bay Area cities and counties to develop Green Infrastructure (GI) Plans (Provision C.3) and Polychlorinated Biphenyls (PCBs) and Mercury Control Measure Implementation Plans (Provisions C.11 and C.12) that provide pollutant load reductions to attain Total Maximum Daily Load (TMDL) wasteload allocations (WLA) over specified compliance periods. A key component of these plans is a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates that proposed control measures will result in sufficient load reductions of Polychlorinated Biphenyls (PCBs) and mercury to meet WLAs for municipal stormwater discharges to San Francisco Bay. The San Mateo Countywide Pollution Prevention Program (SMCWPPP), a program of the City/County Association of Governments (C/CAG) of San Mateo County, has initiated a countywide effort to develop an RAA to estimate the baseline PCB and mercury loads to the Bay, determine load reductions to meet WLAs, and set goals for the amount of GI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GI (SFBRWQCB 2015).

In 2017, the U.S. Environmental Protection Agency (EPA) Region 9 released *Developing Reasonable Assurance: A Guide to Performing Model-Based Analysis to Support Municipal Stormwater Program Planning* (EPA RAA Guide) (USEPA 2017), which provides guidance on the technical needs of the RAA and considerations for model selection. Building upon the EPA RAA Guide, the Bay Area Stormwater Management Agencies Association (BASMAA) prepared the *Bay Area Reasonable Assurance Analysis Guidance Document* (Bay Area RAA Guidance) (BASMAA 2017) to provide specific guidance on modeling to support RAAs performed in the Bay Area to meet MRP requirements, address TMDLs for PCBs and mercury, and support GI planning. The EPA RAA Guide and Bay Area RAA Guidance both outline essential steps for performing an RAA, as depicted in Figure 1-1. In 2018, C/CAG completed the *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report* (RAA Phase I Report), which includes development of a baseline model to address the first three steps of the RAA outlined in the EPA RAA Guide and Bay Area RAA Guidance. These steps included: (1) Designation of Area Addressed by Analysis, (2) Characterization of Existing Conditions, and (3) Determination of Stormwater Improvement Goals (SMCWPPP 2018a). This RAA Phase II Report builds upon the RAA Phase 1 Report to address the following final steps of the RAA:

1. **Estimating Load Reduction Achieved by Controls (Demonstrating Management Actions Will Attain Goals)** – The RAA includes methods for estimating pollutant load reductions[1] associated with GI. Load reductions from GI can include: (1) land use change associated with redevelopment, (2) low impact development (LID) and non-LID treatment controls on land development projects as required by MRP Provision C.3, and (3) retrofit of existing streets and developed sites with GI features and LID treatment controls (e.g., green streets and regional projects). The Bay Area RAA Guidance states that "GI performance should be simulated directly using a process-based model, or simulated using a combination of continuous simulation-based volume performance and empirically based concentration performance to estimate load reductions."

[1] The source control component of the RAA will be performed through a separate coordinated effort based on regionally acceptable methods and assumptions for an accounting methodology and will be reported as part of the PCBs and Mercury Control Measure Implementation Plans for San Mateo County due for completion in 2020.

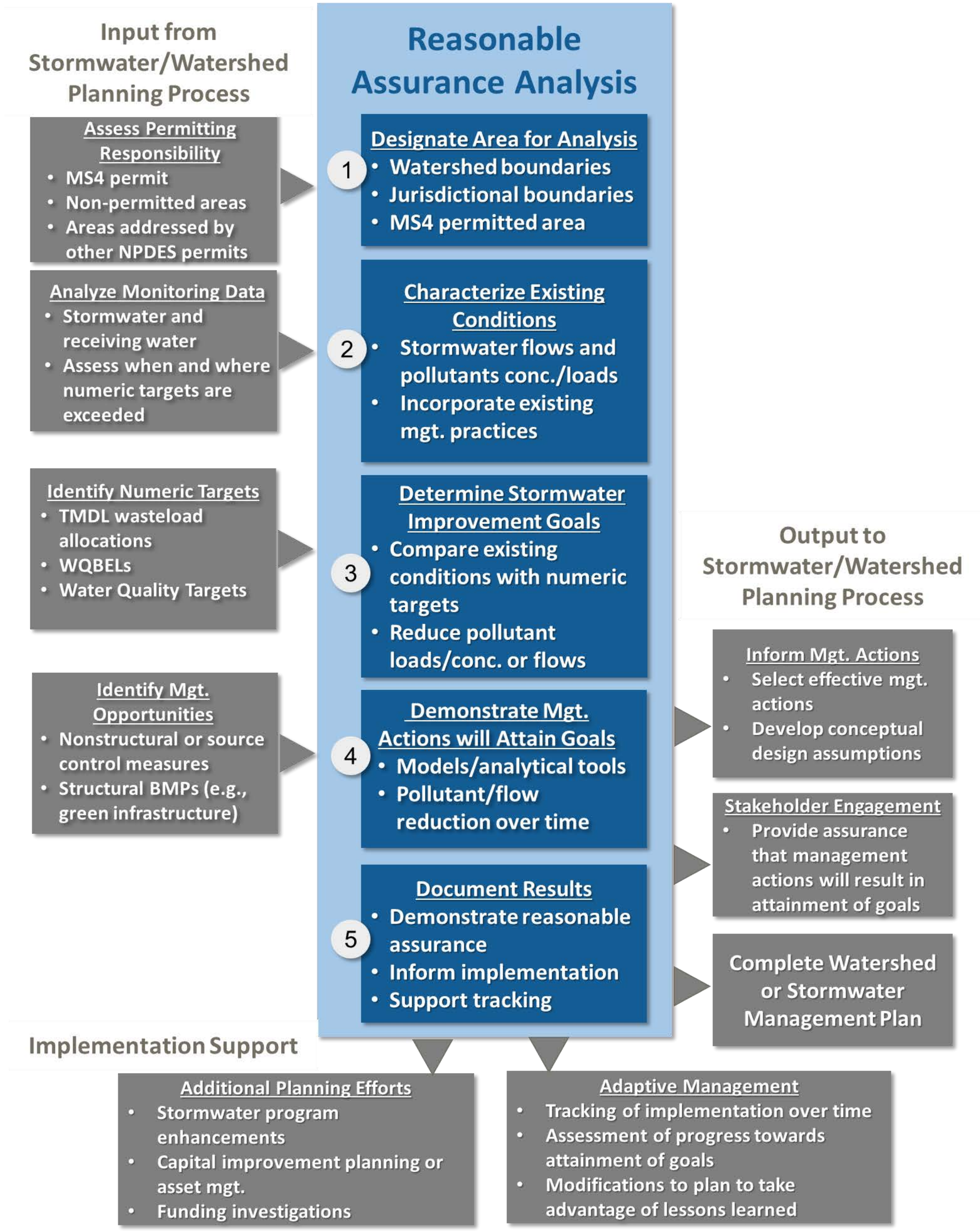


Figure 1-1. RAA Process Flow Chart (USEPA 2017).

2. **Documentation** – Documentation of RAA results is critical to the demonstration that GI Plans and Control Measure Implementation Plans will result in attainment of pollutant load reduction goals. The documentation can serve various purposes, including providing: (1) reasonable assurance to stakeholders and regulators that the plans will lead to effective implementation, (2) information to support next steps for implementation (e.g., capital improvement planning, investigation of funding options), and (3) quantitative results to support an adaptive management process, tracking of implementation over time, and/or assessment of progress towards attainment of pollutant reduction goals (USEPA 2017). The Bay Area RAA Guidance provides recommendations for minimum requirements for RAA documentation, including summaries of model input (e.g., model parameters, data sources, or other assumptions), calibration results, model processes and procedures, key model outputs (e.g., baseline loads, load reduction goals), modeled GI and source control measures, and modeled load reductions by control measure category. The combination of the RAA Phase I Report (SMCWPPP 2018a) and this RAA Phase II Report fulfill all required documentation for the San Mateo Countywide RAA addressing the GI portion of PCBs and mercury load reductions specified in the MRP.

This RAA Phase II Report provides a summary of the methods and modeling approaches used to simulate hydraulic and pollutant removal processes associated with GI project opportunities, determine the amount of GI needed within each city and unincorporated County jurisdiction to address pollutant load reduction goals, and quantify metrics that can support GI planning, implementation, and tracking. Results from the RAA Phase II Report can be considered by each city and San Mateo County to set goals for GI implementation, which will be addressed through separate GI Plans developed by each agency.

The Phase I RAA effort included the use of the baseline hydrologic and pollutant loading model to calculate San Mateo Countywide PCB and mercury load reduction goals to be addressed through the implementation of GI. Table 1-1 provides a summary of the total PCB load reductions determined by Phase I of the RAA to be addressed by GI by 2040 to meet the TMDL WLA (SFBRWQCB 2008b and 2015). Phase I of the RAA determined that for mercury, the baseline annual load is estimated to be less than the San Mateo County portion of the TMDL WLA for mercury (SFBRWQCB 2006), requiring no load reduction through implementation of GI. See the RAA Phase I Report for additional details regarding methods and assumptions for calculating load reduction goals (SMCWPPP 2018a).

Table 1-1. Calculation of PCB Load Reduction by 2040 Through Green Infrastructure (SMCWPPP 2018a).

Achieved Through GI Implementation by 2040	San Mateo Co. (Based on RAA Model)
Load Reduction (kg/yr)	0.23[1]
Percent Reduction (%)	17.6[2]

1: Bay Area RAA Guidance reports 20.8% of the permittee load reduction associated with the MRP GI requirements. Calculated based on 20.8% of the PCB Load Reduction of 1.1 kg/yr, determined through comparison of the modeled baseline pollutant load (1.3 kg/yr) with the TMDL WLA for San Mateo County (0.2 kg/yr).
2: Calculated based on difference of Load Reduction reported above (0.23 kg/yr) and Existing PCB Load (1.3 kg/yr).

This report provides documentation of the methods and assumptions for modeling GI and selecting implementation goals to meet the 17.6% (Table 1-1) countywide reduction of PCB loads to San Francisco Bay. The RAA predicts the most cost-effective GI implementation plan for each municipal jurisdiction and subwatershed throughout San Mateo County, and sets implementation goals for the amount of stormwater volumes to be managed and impervious area to be retrofitted. Through the adaptive management process, future implementation of GI may vary from results of the RAA based on further engineering analysis and evaluation of GI project opportunities. However, the RAA provides goals for GI planning that can be adapted over time as lessons are learned through GI implementation.

2 PURPOSE OF THE RAA

Depending on the audience, the purpose of the RAA can vary in terms of what constitutes reasonable assurance. The EPA RAA Guide provides an example of three differing perspectives for defining reasonable assurance (USEPA 2017):

- **Regulator Perspective** - Reasonable assurance is a demonstration that the implementation of a GI Plan will result in sufficient pollutant reductions over time to meet TMDL WLAs or other targets specified in the MRP.
- **Stakeholder Perspective** - Reasonable assurance is a demonstration that specific management practices are identified with sufficient detail and implemented on a schedule to ensure that necessary improvements in water quality will occur.
- **Permittee Perspective** - Reasonable assurance is based on a detailed analysis of the TMDL WLAs and associated MRP targets themselves, and a determination of the feasibility of those requirements. The RAA may also assist in evaluating the financial resources needed to meet pollutant reductions based on schedules identified in the MRP.

The output from the RAA must consider multiple perspectives and strike the right balance between detail and specificity while still leaving ample opportunity to allow for future adaptive management. The following are key considerations for the RAA output:

- **Demonstrate PCBs and Mercury Load Reductions** – The primary goal of the RAA is to quantitatively demonstrate that GI Plans and Control Measure Implementation Plans will result in load reductions of PCBs and mercury sufficient to attain their respective TMDL WLAs and the component stormwater improvement goals to be achieved with GI. Based on the baseline hydrology and water quality model (SMCWPPP 2018a), the RAA determined that a 17.6% reduction in PCB loads is needed to meet the GI implementation goals established by the MRP. Zero reduction in mercury loads was determined to be needed from MRP areas because baseline loads were predicted to be below the TMDL WLA for San Mateo County. As a result, a 17.6% reduction in PCB loads is established as the primary pollutant reduction goal for the RAA. However, there is some uncertainty in terms of how PCB source areas are represented in the model, which will require more monitoring and analysis in the future to gain an improved understanding of PCB source areas and the ability to target these areas with GI. Because PCBs are generally understood to be transported with cohesive sediment (e.g., silt and clay), cohesive sediment load can serve as a surrogate on which to base a load reduction target. The RAA considers a 17.6% reduction of cohesive sediment load as a more conservative surrogate until a better understanding is reached in terms of specific PCB source areas within the County. If additional PCB source areas are confirmed, these areas could be targeted for source control measures or additional GI implementation, likely resulting in greater effectiveness for GI to reduce PCB loads in those areas, and thus redistributing or reducing the overall amount of GI needed to meet the load reduction target based on sediment loading estimates.
- **Develop Metrics to Support Implementation Tracking** – The MRP (Provision C.3.j) also requires tracking methods to provide reasonable assurance that TMDL WLAs are being met. Provision C.3.j states that the GI Plan “shall include means and methods to track the area

within each Permittee's jurisdiction that is treated by green infrastructure controls and the amount of directly connected impervious area." Through C/CAG's current effort preparing a Sustainable Streets Master Plan for San Mateo County, a tracking tool will be developed that will enable calculation of metrics consistent with the results of the RAA and additional metrics relevant to sustainable street implementation. The tracking tool is planned for completion in 2020.

- **Support Adaptive Management** – Given the relatively small scale of most GI projects (e.g., LID on an individual parcel or a single street block converted to green street), numerous individual GI projects will be needed to address the pollutant reduction goals. All the GI projects will require site investigations to assess feasibility and costs. As a result, the RAA provides a preliminary investigation of the amount of GI needed spatially (e.g., by subwatershed and municipal jurisdiction) to achieve the countywide pollutant load reduction target. The RAA sets the GI Plan "goals" in terms of the amount of GI implementation over time to address pollutant load reductions. As GI Plans are implemented and more comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans) are performed, the adaptive management process will be key to ensuring that goals are met. In summary, the RAA informs GI implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analyses performed over time.

The RAA output, or goals for GI implementation, attempt to identify the appropriate balance in terms of detail and specificity needed to address the above considerations.

3 OVERVIEW OF GI PERFORMANCE MODEL

The GI Performance Model selected for the RAA is EPA's System of Urban Stormwater Treatment & Analysis Integration (SUSTAIN). Developed by EPA's Office of Research and Development, SUSTAIN was primarily designed as a decision-support system for selection and placement of GI projects at strategic locations in urban watersheds (Figure 3-1). It includes a process-based continuous project simulation module for representing flow and pollutant transport routing through various types of GI projects. A distinguishing feature of SUSTAIN is a robust cost-benefit optimization model that incorporates dynamic, user-specified project unit-cost functions to quantify the implementation costs associated with various types of GI projects. The cost-benefit optimization model runs iteratively to generate a cost-effectiveness curve that is sometimes comprised of millions of GI project scenarios representing different combinations of projects throughout a watershed. Those results are used to make cost-effective management recommendations by evaluating the trade-offs between different scenarios. The "benefit" component can be represented in several ways: (1) reduction in flow volume (2) reduction in load of a specific pollutant or (3) other conditions including numeric water quality targets, frequency of exceedances of numeric water quality targets, or minimizing the difference between developed and pre-developed flow-duration curves (USEPA 2009, Riverson et al. 2014).

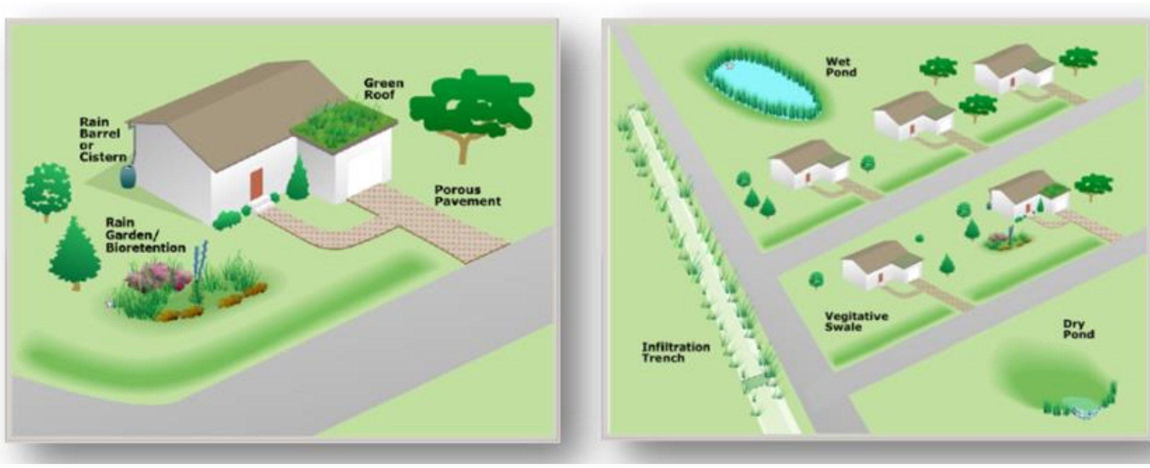


Figure 3-1. SUSTAIN figure illustrating GI opportunities in watershed settings (USEPA 2009).

The SUSTAIN model was linked to the baseline hydrology and pollutant loading model developed as part of the RAA Phase I (SMCWPPP 2018a), based on the Loading Simulation Program C++ (LSPC) (Shen et al. 2004), to simulate the combination of hydrology and the processes associated with GI. The LSPC model was used to simulate the continuous flow and PCB concentrations as inputs to the SUSTAIN model. SUSTAIN was then used to simulate the GI response in terms of stormwater capture, infiltration, routing through the GI project designs (e.g., underdrain or overflow), and removal of sediment and PCBs. SUSTAIN was used to perform the analysis of alternative implementation scenarios and costs to determine cost-optimal solutions for countywide management of stormwater and associated sediment and PCB loads. Figure 3-2 provides an overview of the linked LSPC-SUSTAIN modeling system.

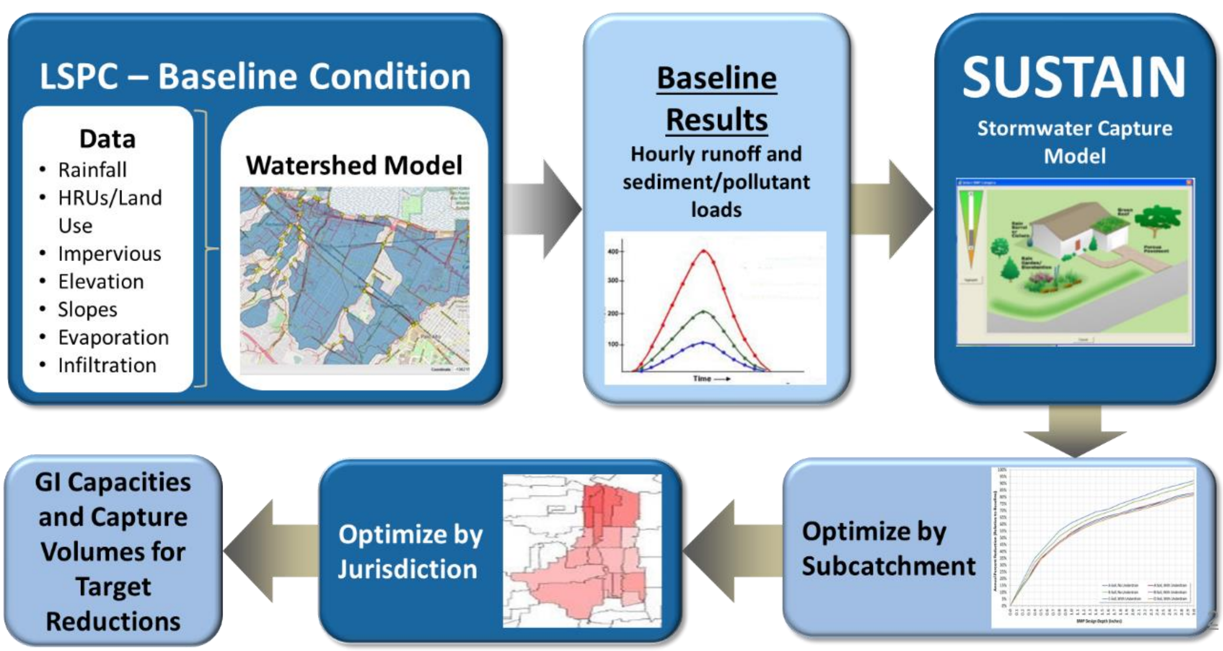


Figure 3-2. Linked modeling system supporting the RAA.[2]

[2] For further description of the baseline LSPC model, see the RAA Phase I Report (SMCWPPP 2018a).

4 GI MODELING ASSUMPTIONS

The representation of GI projects in the model is an important element of the RAA, as it provides the link between future GI implementation, model-predicted water quality improvement, and, ultimately, determine the necessary amount of GI projects to meet the PCB load reduction goal. Since the GI modeling parameters will greatly influence the outcome of the RAA, it is imperative that the suite of GI assumptions is based on the best available data and represent the latest understanding in GI project designs and effectiveness. Further, the technical rigor of the analysis must be appropriately balanced with the resolution of the modeling system and the accuracy of the key datasets.

As depicted in Figure 4-1, the SUSTAIN optimization approach provides estimates of GI effectiveness and costs to select the most cost-optimal combination of GI projects to meet the PCB load reduction target. This section presents and reviews the following three primary elements for representing GI projects in the RAA model:

- **Opportunity** – Where can the GI projects be located and how many can be accommodated?
- **System Configuration** – How is the runoff routed to and through the GI projects and what is the maximum GI project size?
- **Cost Functions** – What is the relationship between GI project volume/footprint/design elements and costs?

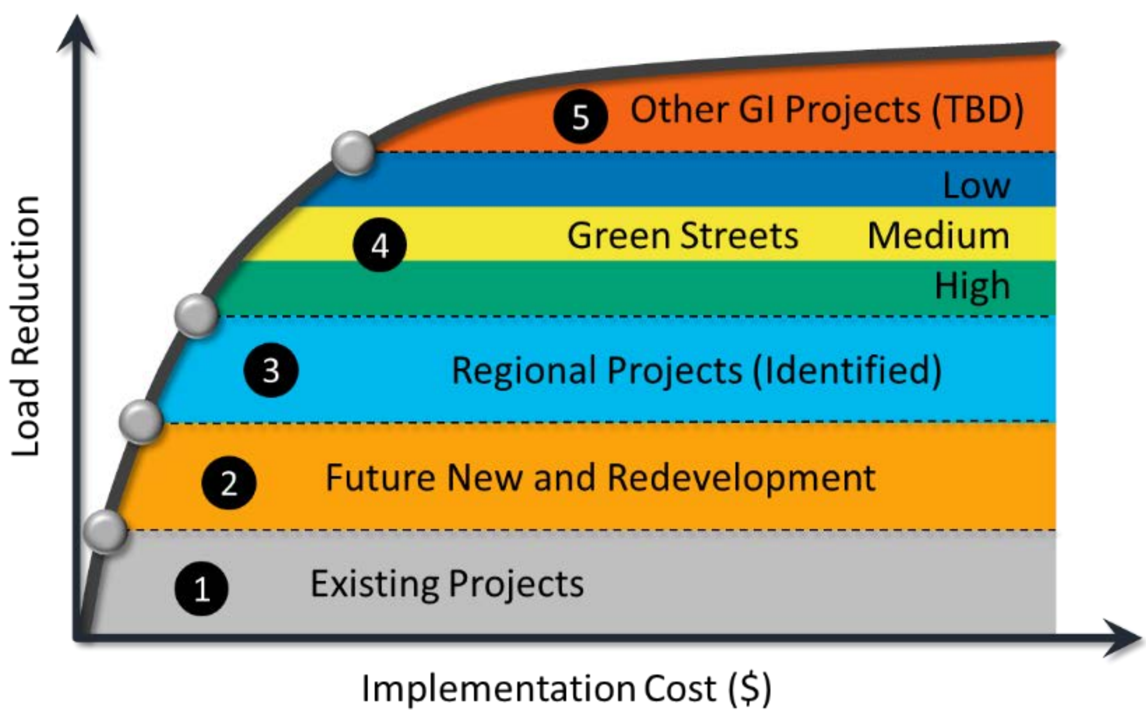


Figure 4-1. Overview of cost-optimization approach and selection of GI projects.

4.1 GI Project Opportunities

To support the RAA and GI Plans, the SMCWPPP has initiated a number of planning efforts that identify opportunities for GI implementation. The following is a summary of those efforts:

- **LID for New Development and Redevelopment** – The MRP includes a Provision (C.3) for the integration of LID within new development and redevelopment. As LID techniques are implemented as new development and redevelopment occurs throughout the County, the benefits of such practices in terms of reducing urban runoff flows and associated pollutant loads can be considered as part of the pollutant load reductions attributed to implementation of GI. To support the preparation of annual reports to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), the SMCWPPP (2018b) has worked with San Mateo County Permittees to compile information on LID practices that have been implemented within new development and redevelopment since water year 2003 (baseline year for the TMDL). The SMCWPPP (2019) has also performed analysis to project the number of acres of future new development and redevelopment to be addressed by the Provision C.3 regulated development by 2040. Appendix A includes the results of the SMCWPPP (2019) analysis of projected new development and redevelopment. The RAA considers existing LID practices and projections of LID in future new development and redevelopment areas to estimate anticipated PCBs and mercury load reductions from 2003 to 2040.
- **Countywide Stormwater Resource Plan (SRP)** – The SRP is a comprehensive plan that identifies and prioritizes thousands of GI project opportunities throughout San Mateo County and within each municipal jurisdiction. Prioritized project opportunities include: (1) large regional projects within publicly owned parcels (e.g., public parks) that infiltrate or treat stormwater runoff generated from surrounding areas (e.g., diversion from neighborhood storm drain system; diversions from creeks draining large urban areas); (2) retrofit of publicly owned parcels with GI that provide demonstration of onsite LID designs; and (3) retrofit of public street rights-of-way with GI, or "green streets." The SRP included a multi-benefit scoring and prioritization process that ranks GI project opportunities based on multiple factors beyond pollutant load reduction (e.g., proximity to flood prone channels, potential groundwater basin recharge). Figure 4-2 shows green street opportunities identified, scored, and prioritized by the SRP throughout San Mateo County (SMCWPPP 2017). For three high-priority opportunities for regional projects located within Atherton (Holbrook-Palmer Park), South San Francisco (Orange Memorial Park), and Belmont (Twin Pines Park), the SRP includes conceptual designs to support future GI planning and implementation.

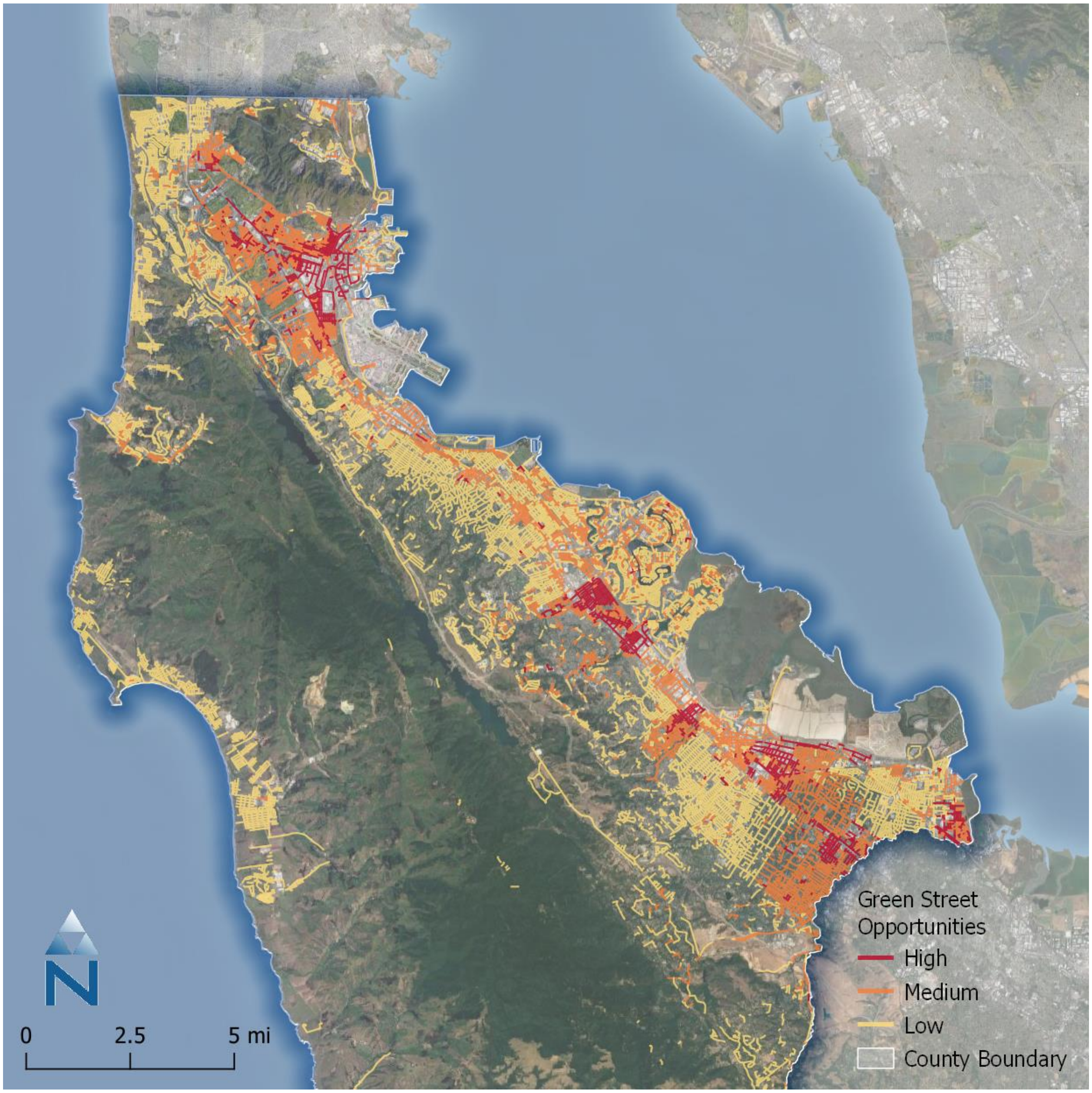


Figure 4-2. SRP Prioritized Green Street Opportunities.

Following completion of the SRP, the SMCWPPP and San Mateo County Permittees continued efforts to identify new regional project opportunities and initiate engineering designs that resulted in refinements of project concepts identified in the SRP. The following is a summary of these efforts:

- The SMCWPPP worked with the San Bruno and Redwood City to identify one regional project opportunity within each city (I-280/I-380 interchange in San Bruno; Red Morton Mark in Redwood City) and develop conceptual designs (Appendix B).
- South San Francisco partnered with Caltrans to prepare engineering designs for the regional project concept identified in the SRP at Orange Memorial Park. Further engineering analysis and planning efforts have resulted in modifications to the original conceptual design.

- Atherton also partnered with Caltrans to prepare engineering designs of a regional project, however, the location of the regional project changed from Holbrook-Palmer Park to Cartan Field. Atherton is in the process of developing a new conceptual design for the project.

The SRP and subsequent planning and engineering work of the SMCWPPP and cities have resulted in the identification of five regional project opportunities that are considered for GI planning efforts and included in the RAA. Figure 4-3 shows regional project locations and their associated drainage areas.

Figure 4-3. Regional Project Opportunities and Associated Drainage Areas.

The above planning efforts and resulting technical products provide preliminary identification of opportunities for GI projects. These GI project opportunities serve as the foundation for the RAA and GI Plans as strategies are developed for implementation plans to meet the PCBs and mercury load reduction goals. Table 4-1 provides a summary of the categories of GI project opportunities included in the RAA.

Table 4-1. Summary of GI project opportunities included in the RAA.

GI Project Category	GI Type	Opportunity Identified
Existing Projects	LID and Green Streets	SMCWPPP worked with San Mateo County Permittees to identify GI projects implemented since 2003, including LID within new development and redevelopment and retrofit projects, green streets, and regional retrofit projects, and report progress in annual reports to the SFBRWQCB (SMCWPPP 2018b). The combination of these projects represents the "Existing Projects" category in the RAA model (Figure 4-1).
Future New and Redevelopment	LID	Provision C.3 of the MRP requires new development and redevelopment projects that create and/or replace defined amounts of impervious surface to implement post-construction control measures to address stormwater runoff generated on-site and comply with other applicable elements of the provision. The SMCWPPP (2019) developed and applied a methodology to predict the amount of land area that will be redeveloped throughout San Mateo County and for which stormwater runoff will be addressed via GI installed on privately owned parcels from 2018 to 2040 (see Appendix A for more detail). For model configuration, these areas are assumed to include LID to capture stormwater runoff onsite.
Regional Projects (Identified)	Regional Projects	The RAA considers implementation of the five priority regional projects for which concept designs have been developed (Figure 4-3). These projects were configured in the RAA model to match their concept designs.
Green Streets	Green Streets	The SRP identified and prioritized green street opportunities throughout the San Mateo County (Figure 4-2). These opportunities are subject to further investigations regarding the feasibility of GI integration into streetscape improvement projects. The green street opportunities identified and prioritized in the SRP as "Low," "Medium," and "High" were included and represented separately in the RAA.
Other GI Projects (TBD)	LID, Green Streets, or Regional Projects	In the case that the above projects are insufficient to provide necessary load reductions within each municipal jurisdiction, or are determined to not be cost-efficient through the model optimization, an additional category of "Other GI Projects (TBD)" was considered. This category serves as a placeholder to set goals in terms of needed storage capacity of GI projects within each municipal jurisdiction, in addition to the above identified project opportunities. Further investigation can determine how these goals can be met, either through: (1) increased incentives for LID on private land or increased future development resulting in more C.3 Regulated Projects; (2) additional regional projects for which concept designs can be developed; and/or (3) additional green streets or onsite LID on publicly owned land.

4.2 GI Model Configuration

For each of the GI type of projects outlined in Table 4-1 (i.e., LID, green streets, regional projects), design and modeling assumptions were developed to represent the projects in SUSTAIN and simulate their effectiveness in terms of managing stormwater. The following provides a summary of the design and modeling assumptions for each GI type.

4.2.1 Regional Projects

Regional projects can consist of both subsurface and above-ground systems that manage stormwater runoff through any combination of infiltration, filtration, and reuse. In the SUSTAIN model, both subsurface and above-ground systems were represented with similar hydraulic configurations for water storage and infiltration, with variations in modeling assumptions specific to each project's design. Depending on specific site constraints, these facilities can capture stormwater diverted from adjacent channels or storm drains, which often results in greater captured drainage area compared to other GI measures. Regional projects typically require a diversion structure and may require pumping, increasing capital and operation and maintenance (O&M) costs. Modeling assumptions for the five identified regional projects were based on configurations outlined in each project's conceptual design or based on discussions with agencies regarding the current status of further investigations and engineering analyses. Table 4-2 summarizes design assumptions for each of the regional projects included in the RAA.

Table 4-2. Modeling Assumptions for regional projects.

Project	City	Footprint (acres)	Capacity (acre-feet)	Pump Rate (cfs)	Estimated Infiltration Rate (in/hr)	Filtration/ Discharge Rate (cfs)
Orange Memorial Park	South San Francisco	1.2	3	10	0.5	--
Cartan Field	Atherton	0.545	6	40	--	2.88[2]
Twin Pines Park	Belmont	0.15	0.45	--[1]	0.5	--
Caltrans I-280 @ I-380	San Bruno	2.5	21	20	0.5	--
Red Morton Park	Redwood City	2.31	43.2	41.2	0.5	--

1: Twin Pines Park regional project includes a direct diversion of a storm drain, and therefore does not require pumping.
2: Cartan Field regional project assumes a discharge of treated water back to Atherton Channel.

Most of the regional projects capture runoff from drainage areas that include multiple Permittee jurisdictions. To utilize model output to report the benefits of the regional projects in terms of stormwater volume captured and treated, the RAA required assumptions for assigning these benefits to the Permittees. Because the predominant source of stormwater produced in each project's drainage area is associated with impervious runoff, the amount of impervious area within each Permittee jurisdiction and project drainage area was used to allocate the "credit" associated with amount of stormwater that is captured and treated by each regional project. Table 4-3 provides a summary of the percentage of each Permittees impervious area within each project's upstream drainage area.

Table 4-3. Amount of impervious areas for Permittees within each regional project drainage area.

Permittee	Upstream Impervious Area (acres)	Cartan Field		Caltrans I-280 @ I-380		Orange Memorial Park		Red Morton Park		Twin Pines Park	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Atherton	210	210	32%	--	--	--	--	--	--	--	--
Belmont	8	--	--	--	--	--	--	--	--	8	100%
Colma	130	--	--	--	--	130	9%	--	--	--	--
Daly City	601	--	--	--	--	601	40%	--	--	--	--
Menlo Park	169	169	26%	--	--	--	--	--	--	--	--
Pacifica	4	--	--	--	--	4	<1%	--	--	--	--
Redwood City	462	--	--	--	--	--	--	462	77%	--	--
San Bruno	184	--	--	177	79%	7	<1%	--	--	--	--
South San Francisco	637	--	--	--	--	637	42%	--	--	--	--
Woodside	89	82	13%	--	--	--	--	7	1%	--	--
Unincorporated County	513	192	29%	46	21%	141	9%	134	22%	--	--
Total	**3,007**	**652**	**100%**	**224**	**100%**	**1,520**	**100%**	**603**	**100%**	**8**	**100%**

4.2.2 Green Streets

Green streets are implemented in public rights-of-way and typically capture runoff from the street and adjacent parcels. Green streets were represented in the model using bioretention either with or without an underdrain, depending on infiltration rates. The modeling assumptions for both the bioretention components of green streets are listed in Table 4-4.

The footprint for green street bioretention is estimated by assuming available length and width for GI improvements. Fifty percent of the street segment length is assumed to be available for bioretention. The other 50 percent of length is assumed to be unavailable due to constraints like driveways, fire hydrants, and utilities. The available width for bioretention is assumed to be 8 feet (4 feet on each side of the street).

Bioretention consists of three components: a surface layer, a media layer, and an aggregate underdrain layer. The surface layer is typically vegetated and provides storage through ponding and removal of runoff volume through evapotranspiration. The media layer typically consists of an engineered soil mixture designed to support plant growth and promote adequate infiltration. The media layer provides storage in pore space and pollutant reduction through filtration, plant root uptake, adsorption, or other physical processes. The media layer was assumed to be a minimum of 18 inches for bioretention (SMCWPPP 2016).

Underdrains are typically required for bioretention when the underlying soils have low infiltration below a specific threshold. In most of San Mateo County, underdrains will generally be required unless exempted by the local jurisdiction on a case-by-case basis depending on soil permeability (SMCWPPP 2016). According to several regional design resources across the United States, underdrains should be included when underlying soils have an infiltration rate below 0.5 inches per hour (DOEE 2013; VA DEQ 2011; SF DPW Order No. 178,493). This value was used in the model to determine which projects include underdrains. The aggregate underdrain layer was assumed to be 12 inches for bioretention (SMCWPPP 2016; SFPUC 2016). Underdrains are typically placed at the top of the aggregate underdrain layer to maximize infiltration (BASMAA 2015; SMCWPPP 2016) and is the default configuration used by SUSTAIN. The underdrain pollutant removal estimate for sediment, which is associated with PCBs and mercury, is based on studies of bioretention performance reported by the *California Best Management Practice Handbook: New Development and Redevelopment* (CASQA 2003). BASMAA's white paper on Provision C.3 cites a reduction in PCBs of 98% through the bioretention underdrain. Therefore, an assumed sediment removal of 90% (as a surrogate for reduction in PCBs) provides a conservative assumption for bioretention performance. During model simulation, the sediment reduction is only applied to the portion of flow that exits the underdrain outlet, which is a relatively constant outflow rate. Overall green streets performance diminishes during larger events with bypass flow because that portion is untreated.

Table 4-4. Modeling assumptions for green streets (bioretention).

Groups	Item Description	Value	Units	Source [1] [2] [3] [4]
Surface	Design Drainage Area	*Sized using WEF method (~85th percentile, 24-hour storm)*		[1] C.3.d.i.(1).(a) pg.22
	Project Footprint	*50% of street length x 8 ft width*		
	Ponding Depth	6	in	[2] Section 6.1 pg.6-4
Media	Depth	1.5	ft	[2] Section 6.1 pg.6-5
	Soil Porosity	0.35	-	[3] Appendix A
	Soil Infiltration Rate	5	in/hr	[1] C.3.c.i.(2).(c).(ii) pg.20
Underdrain	Use if soil infiltration rate is less than	0.5	in/hr	
	Depth	1	ft	[2] Section 6.1 pg.6-5, [3]
	Media Porosity	0.4	-	[3] Appendix A
	Pollutant Filtration	*90% sediment reduction*		[4] CA BMP Handbook, TC-32 pg.3
	Background Infiltration	*Match underlying soils*		

[1] Reference: SFBRWQCB 2015
[2] Reference: SMCWPPP 2016
[3] Reference: ULAR WMG 2016
[4] Reference: CASQA 2003 (only applied to underdrain outflow)

4.2.3 Low Impact Development

LID generally treats runoff generated onsite so the drainage area for LID is typically no larger than the parcel area. Although LID includes various design options for a given site, in order to develop a process for modeling of countywide LID implementation (as a function of new and redevelopment), all LID features were represented in SUSTAIN as bioretention. The components for bioretention are discussed in Section 4.2.2. The modeling assumptions for LID are the same as bioretention for green streets with the exception of project footprint. The project footprint for LID is estimated using 4 percent of the parcel's impervious area, specified in the SMCWPPP C.3 Stormwater Technical Guidance (SMCWPPP 2016). Modeling assumptions for LID are presented in Table 4-5.

Table 4-5. Modeling assumptions for LID (bioretention).

Groups	Item Description	Value	Units	Source [1] [2]
Surface	Design Drainage Area	*Sized using WEF method (~85th percentile, 24-hour storm)*		[1] C.3.d.i.(1).(a) pg.22
	Project Footprint	*Volume determined by WEF method ÷ effective storage depth (determined from assumptions below)*		
	Ponding Depth	6	in	[2] Section 6.1 pg.6-4
Media	Depth	1.5	ft	[2] Section 6.1 pg.6-5
	Soil Porosity	0.35	-	[3] Appendix A
	Soil Infiltration Rate	5	in/hr	[1] C.3.c.i.(2).(c).(ii) pg.20
Underdrain	Use if soil infiltration rate is less than	0.5	in/hr	
	Depth	1	ft	[2] Section 6.1 pg.6-5
	Media Porosity	0.4	-	[3] Appendix A
	Pollutant Filtration	*90% sediment reduction*		[4] CA BMP Handbook, TC-32 pg.3
	Background Infiltration	*Match underlying soils*		

[1] Reference: SFBRWQCB 2015
[2] Reference: SMCWPPP 2016
[3] Reference: ULAR WMG 2016
[4] Reference: CASQA 2003 (only applied to underdrain outflow)

As mentioned in Section 4.1, the MRP requires new and redevelopment projects to incorporate stormwater control measures that mitigate the impact of runoff generated from impervious surfaces (Provision C.3). The SMCWPPP (2019) performed a study to identify future areas subject to new development and redevelopment (described in detail in Appendix A). For the RAA, the C.3-regulated projects were modeled using the LID assumptions described above with the projections of new and redevelopment. Due to the uncertainty of projecting development initiated by third-party developers, a methodology was developed that can be updated over time using Traffic Analysis Zones (TAZ) from the *San Mateo Countywide Transportation Plan 2040* as the functional planning unit. The rates of new and redevelopment were estimated for three land use classes: (1) Single-Family Residential, (2) Multi-Family Residential (MFR), or (3) Employer (represents an aggregate of retail, service/office, manufacturing, warehousing, and industrial land uses) and aggregated by total land use area in each TAZ. The TAZs were then intersected with the RAA subwatershed boundaries to distribute the redevelopment projections across the model domain for incorporation into the RAA. The Water Environment Foundation (WEF) method (1998), one of the methods specified in the MRP for sizing GI, was used to estimate the total storage capacity from C.3 regulated projects in each subwatershed. The WEF method is based on an equation accounting for drainage area, imperviousness, and the 85th percentile, 24-hour rainfall depth, which accounts for spatially variable rainfall across San Mateo County.

4.3 GI Cost Functions

To support GI project optimization, cost functions were developed for each GI type to relate capital costs to physical GI project characteristics such as depth, footprint, and configuration. The cost functions are primarily based on Enhanced Watershed Management Plans (EWMPs) developed in the Los Angeles Region (ULAR WMG 2016), which were derived through extensive review of GI construction projects and literature, and were subject to peer review and stakeholder input. They are 20-year lifecycle costs that include both construction and O&M costs. O&M is assumed to maintain consistent performance of the GI throughout its life cycle. There will be some uncertainty regarding the true costs pertaining to GI projects implemented in San Mateo County, but the relative costs between project types are well represented for the optimization of project types in the RAA. In other words, although it would not be recommended to use these cost functions for projections of countywide implementation costs, these functions are sufficient for optimization and comparison of alternative implementation scenarios that can be used to select the most cost-effective strategy and combination of GI to meet necessary pollutant reductions. The cost functions used for the SUSTAIN optimization analysis are listed in Table 4-6.

Table 4-6. GI project cost functions for SUSTAIN cost-optimization.

Project Type	Project Subtype	Cost Estimate Formula ($)	User inputs
Regional Project	Infiltration basin w/o pump station	10.01 (A_f) + 100,013.76 (S) + 2.8 (V_m)	S - Capacity A_f - Footprint area V_m - Media volume
	Infiltration basin w/ pump station	10.01 (A_f) + 100,013.76 (S) + 2.8 (V_m) + 56,227 (P) + 1,207,736	S - Capacity A_f - Footprint area V_m - Media volume P - Pumping rate
Green Streets	Bioretention w/ underdrain	17.688 (A_f) + 94,307.4 (S) + 2.64 (V_m) + 10.367 $(R)^2$ (U)	S - Bioretention capacity A_f - Bioretention area V_m - Media volume R - Underdrain radius U - Underdrain length
	Bioretention w/o underdrain	9.438 (A_f) + 94,307.4 (S) + 2.64 (V_m)	S - Bioretention capacity A_f - Bioretention area V_m - Media volume
Low Impact Development	Bioretention retrofit w/ underdrain	17.688 (A_f) + 94,307.4 (S) + 2.64 (V_m) + 10.367 $(R)^2$ (U)	S - Bioretention capacity A_f - Bioretention area V_m - Media volume R - Underdrain radius U - Underdrain length
	Bioretention retrofit w/o underdrain	9.438 (A_f) + 94,307.4 (S) + 2.64 (V_m)	S - Bioretention capacity A_f - Bioretention area V_m - Media volume

Units: S [ac-ft], V_m [ft^3], A_f [ft^2], P [cfs], R [ft], U [ft]

5 ESTIMATING LOAD REDUCTION ACHIEVED BY CONTROLS

The SUSTAIN model provides a powerful tool for considering millions of scenarios for alternative combinations of GI projects throughout San Mateo County and recommending cost-effective solutions to serve as implementation goals supporting GI planning by each Permittee. The cost functions described in the previous subsection were used to weigh the cost of different GI implementation scenarios with benefits of management of stormwater and the reduction of pollutant loads. The primary scenario for the RAA (Scenario 1) assumes that all Permittees equally address the goal for 17.6% reduction of PCB loads within their jurisdictions. However, since the 17.6% reduction in PCBs is a countywide goal, there are alternative pathways for addressing the load reduction that do not necessarily require proportional reductions within each jurisdiction. Alternative modeling scenarios are presented in Section 7, which may be considered for future GI planning through the adaptive management process.

The optimization modeling is conducted stepwise to determine the GI projects located throughout each Permittee jurisdiction for cost-effective stormwater management, as follows:

1. **Determine the cost-effective GI solutions for each subwatershed**: an example set of "GI solutions" is shown in Figure 5-1, which shows thousands of scenarios considered for an individual subwatershed. The scenarios are based on the available opportunity (*e.g.*, the available footprints for regional projects and length of right-of-way for green streets) and the predicted performance of managing stormwater and reducing pollutant loads. The most cost-effective GI solutions for each of the subwatersheds provide the basis for cost optimization for each Permittee jurisdiction.[3] Based on GI project categories and modeling assumptions defined in Section 4, SUSTAIN was used to simulate effectiveness/load reductions and estimate planning-level costs for various combinations of GI projects within each Permittee's jurisdiction (along the x-axis, from low pollutant reduction/effectiveness to high reduction/effectiveness). For the purposes of estimating PCB load reductions associated with GI implementation, model-predicted cohesive sediment load reductions were used as a surrogate for estimating reductions in PCBs[4].

2. **Determine the cost-effective scenario for each Permittee jurisdiction:** by rolling up the GI solutions from the subwatershed level to the jurisdictional level, the most cost-effective scenario can be determined for increasing levels of pollutant reduction for each Permittee. Figure 5-2 shows an example cost optimization curve for Unincorporated County areas. The optimization curve demonstrates the capacity of each type of GI project (colored layers corresponding to "Structural BMP Capacity [acre-ft]" for the primary y-axis) and resulting model-estimated capital costs (black line corresponding to the secondary y-axis). As noted in Section 4.3, caution should be exercised in interpreting model-predicted capital costs, as those cost functions are meant for comparison of model scenarios and are not meant for projections of capital improvement costs for GI implementation. For this reason, costs shown in Figure 5-2 are reported as the percent of the countywide capital costs for GI implementation, based on GI projects selected within Unincorporated County areas. Cost optimization curves for each Permittee jurisdiction are provided in Appendix C.

3. **Extract the cost-effective scenario to meet stormwater improvement goal:** Figure 5-3 illustrates the process for extracting the cost effective GI Implementation Strategy, providing 17.6% reduction in PCB loads (via cohesive sediment reduction), from the cost optimization

[3] Subwatershed boundaries will continue to be refined and improved in the future, potentially resulting in updates of the RAA over time as part of the adaptive management process. For example, portions of subwatersheds in Daly City are known to drain to the combined stormwater-wastewater system managed by the San Francisco Public Utilities Commission. C/CAG is also currently performing a high-resolution drainage area delineation as part of development of the countywide Sustainable Streets Master Plan, which will result in a better understanding of stormwater runoff and routing through the storm drain network.

[4] As the San Francisco Bay TMDL for PCBs is focused on sediment toxicity, and wasteload allocations were calculated based on sediment loads to the Bay (SFBRWQCB 2008b), a 17.6% reduction in cohesive sediment load to the Bay can be assumed to have an equivalent reduction in PCBs that are transported with that sediment.

curve. SUSTAIN is used to provide cost-optimization and selection of the most cost-effective combination of GI projects to attain the target reduction. This solution is depicted in Figure 5-3 as the vertical slice that intersects the point on the x-axis at 17.6% reduction. The combination of GI structural capacities in that slice at the 17.6% load reduction represents the proposed GI Implementation Strategy for Unincorporated County. The table to the right provides details on that implementation strategy for the multiple subwatersheds within Unincorporated County jurisdiction (represented by each row in table). Optimization results recommend that varying amounts of GI capacity in different subwatersheds (different rows) are needed to achieve the most cost-effective solution, but the overall PCBs load (via cohesive sediment) reduction exceeds the 17.6% goal (bottom row of table). The extracted GI Implementation Strategy comprises a detailed "implementation recipe" with the cost-optimized amount of each GI type within each Permittee jurisdiction. The resulting GI Implementation Strategy to address the PCB load reduction goal is presented in Section 6.

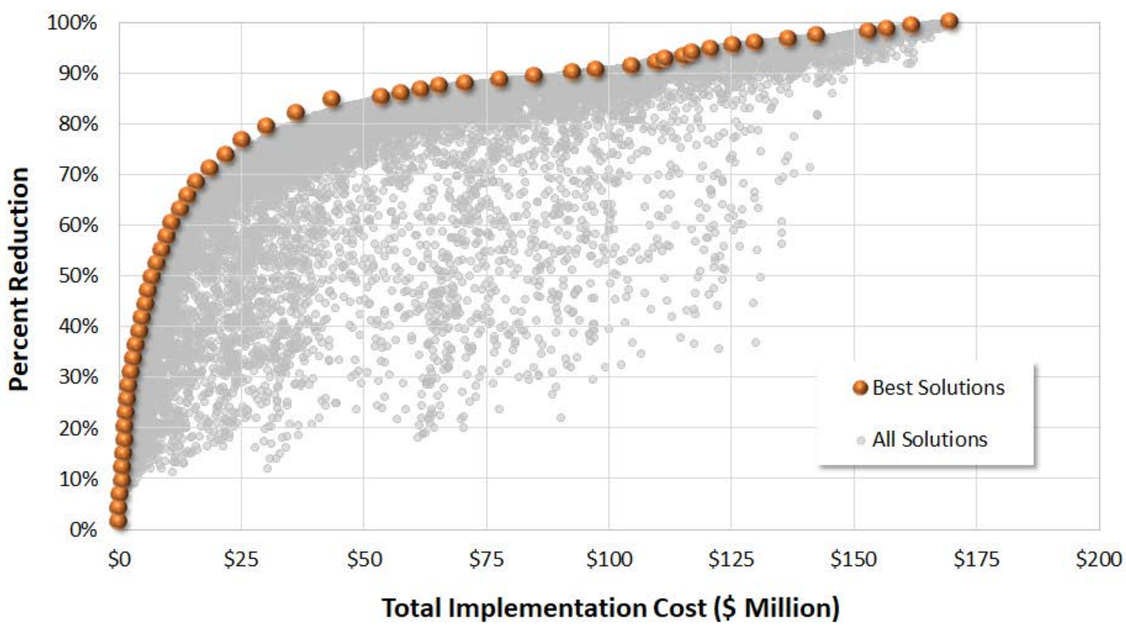


Figure 5-1. Example GI solutions for a single subwatershed and the advantage of cost-benefit optimization.

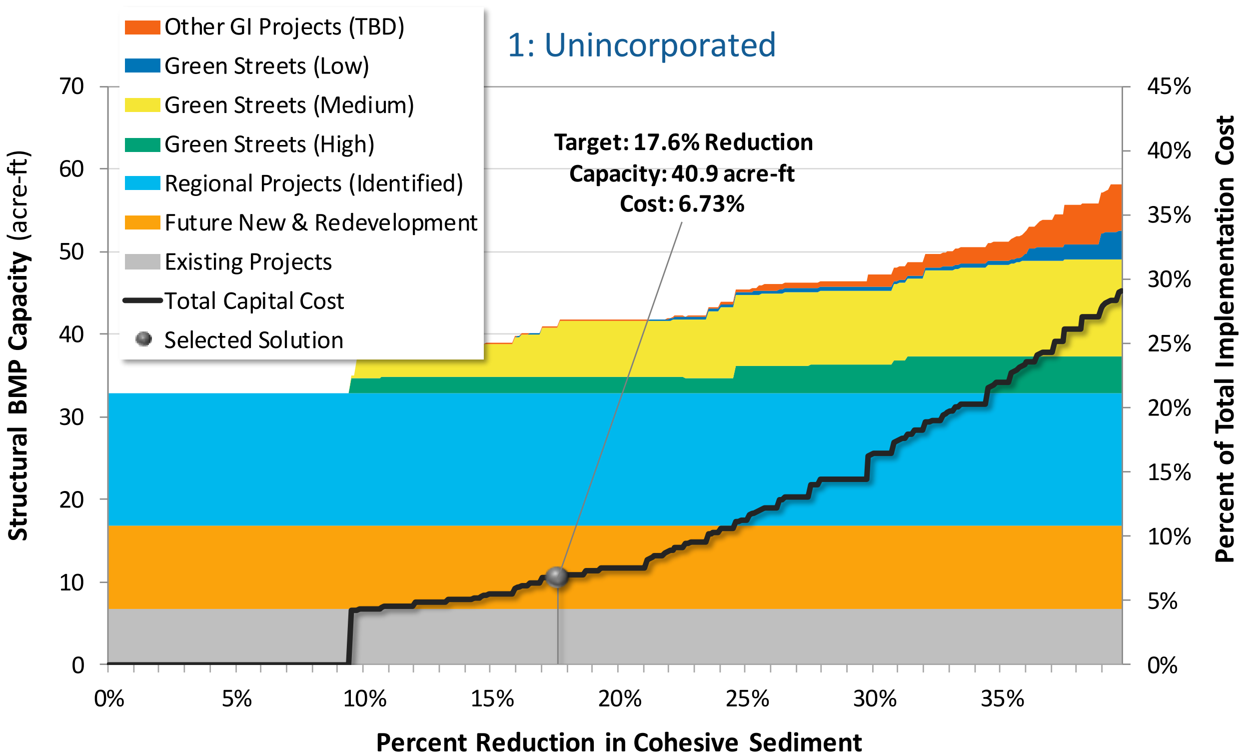
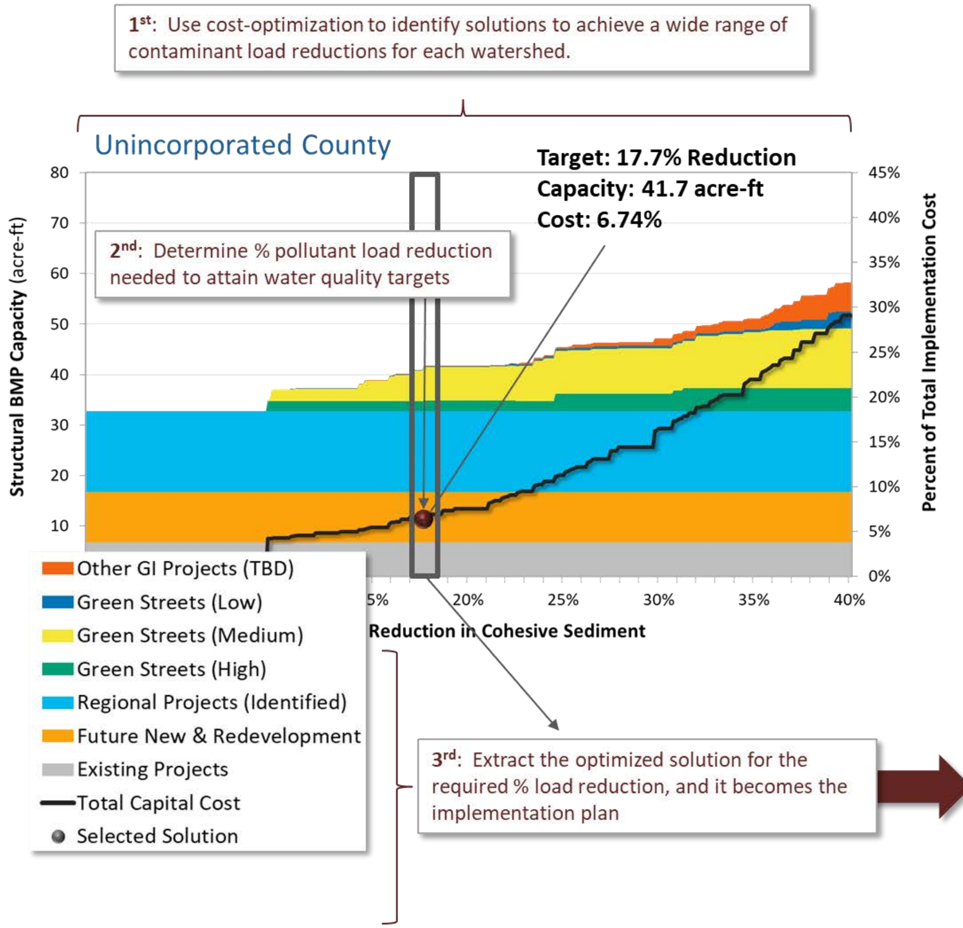


Figure 5-2. Example GI optimization curve for Unincorporated County.[5]

[5] SUSTAIN model was configured to incorporate "Existing Projects," "Future New & Redevelopment," "and Regional Projects (Identified)" based on assumptions listed in Table 4-1 and Section 4.2, and therefore were not subject to cost optimization (i.e., these projects were "locked in the model). SUSTAIN was then used to provide cost optimization of the additional GI needed to meet the load reduction goal.



Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
220121	17%	0.18	0.39	0.00	--	0.01	--	--	--	--	**0.0**
220321	0%	0.00	--	--	--	--	--	--	--	--	**0.0**
220421	12%	0.21	0.05	--	0.01	--	--	0.01	--	--	**0.0**
220821	5%	1.62	0.49	0.22	0.07	--	0.01	--	--	--	**0.3**
221121	2%	0.10	0.00	--	0.01	--	--	--	--	0.00	**0.0**
221221	17%	0.15	9.35	5.17	1.14	0.01	--	--	--	--	**6.3**
221321	15%	0.37	0.92	--	0.04	0.02	--	--	--	--	**0.1**
221421	49%	0.01	0.02	--	0.01	0.00	--	0.01	--	0.00	**0.0**
221821	6%	0.00	0.00	--	0.00	--	--	--	--	--	**0.0**
222221	22%	4.54	0.04	--	0.11	--	--	0.10	--	--	**0.2**
222321	27%	0.89	0.00	--	0.10	--	--	0.00	--	0.02	**0.1**
222521	16%	1.14	0.00	--	0.14	--	--	--	--	0.03	**0.2**
222621	4%	0.63	0.00	--	0.08	--	--	--	--	--	**0.1**
232521	20%	50.03	30.96	--	0.53	4.35	0.00	--	--	--	**4.9**
232621	0%	0.01	0.02	--	0.00	--	--	--	--	--	**0.0**
232721	7%	0.76	0.21	--	--	--	--	--	--	0.03	**0.0**
232821	42%	0.71	18.35	--	0.17	0.04	--	2.40	--	--	**2.6**
232921	3%	4.00	0.21	--	0.06	--	--	0.08	--	--	**0.1**
240121	12%	2.16	1.80	--	0.07	0.01	0.07	--	--	--	**0.1**
240221	12%	9.44	1.74	--	0.01	0.05	--	--	--	--	**0.1**
240321	8%	1.15	0.30	--	0.07	0.01	--	--	--	--	**0.1**
240421	12%	9.09	1.67	--	0.05	0.04	--	--	--	--	**0.1**
240621	12%	2.38	2.72	0.20	0.03	0.01	--	--	--	--	**0.2**
240721	12%	33.25	6.12	--	0.14	0.16	0.02	--	--	--	**0.3**
250221	0%	0.00	0.04	--	0.07	--	--	--	--	--	**0.1**
250421	12%	0.03	0.16	--	0.06	0.00	--	--	--	--	**0.1**
250521	40%	0.36	0.05	--	0.01	0.00	--	--	--	--	**0.0**
Total	**17.7%**	**306.7**	**242.2**	**6.7**	**10.0**	**16.0**	**2.0**	**6.7**	**0.1**	**0.1**	**41.7**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category

Figure 5-3. Example extraction of the cost-effective GI Implementation Strategy for Unincorporated County.

6 GI IMPLEMENTATION STRATEGY

The GI Implementation Strategy for each Permittee is expressed as (1) the percent load reduction of PCBs, (2) the volumes of stormwater to be managed spatially by GI to address the PCB load reduction goal, (3) amount of impervious area from which GI is planned to capture stormwater runoff, and (4) the amount of GI that will be needed spatially to manage the stormwater volumes The two primary elements of the GI Implementation Strategy are as follows:

- **Implementation Goals**: to track implementation progress[6] over time, the primary metrics serving as goals for GI implementation are (1) the volume[7] of stormwater managed by implemented GI projects, and (2) the amount of impervious area treated with GI. To support future implementation and adaptive management, the performance metrics are reported along with the capacities of GI to be implemented based on the GI Implementation Strategy.
- **Implementation Recipe**: the network of GI opportunities and associated capacities that provides reasonable assurance of reducing PCBs to meet the countywide load reduction goal of 17.6% is referred to as the Implementation Recipe. The identified GI capacities (and GI preferences) of the Implementation Recipe will likely evolve over the course of the implementation of each Permittee's GI Plan through an adaptive management process and in response to lessons learned. As such, it is anticipated the capacities specific to the various types of GI will not be tracked explicitly. As GI projects are substituted over the course of GI Plan implementation (e.g., replace green street capacity in a subwatershed with additional regional project capacity), Permittees will show equivalency for achieving the corresponding Implementation Goals.

For each of the RAA results for the primary Scenario 1, Appendix C also includes corresponding GI Implementation Strategies for each Permittee. These results demonstrate the cost-optimization favored implementation of different combinations and amounts of GI projects within each subwatershed. These combinations were based on: (1) number and type of GI project opportunities identified within each subwatershed, and (2) cost-effectiveness given various characteristics associated with GI control measure efficiency (typically governed by infiltration rates), higher cohesive sediment (or PCBs) generation in upstream areas, etc. During implementation, it is almost certain that the actual implementation of GI will not follow the RAA output exactly; however, the recipe provides "management metrics" by subwatershed (described below) to guide the adaptive management process. Dimensions and location of GI projects will vary based on on-the-ground feasibility and site-specific constraints. GI performance will vary based on factors like the physical properties of the facility and upstream drainage area managed. For these reasons, it is not recommended that *GI capacity* serve as the focus for stormwater improvement goals for the GI Plan.

The RAA recommends management metrics to support GI planning and implementation that are based on metrics that can be easily measured and tracked throughout implementation. At the left side of the table in Figure 5-3 are columns under the header "Management Metrics for GI," which include

[6] The MRP requires the tracking of the implementation of GI for GI Plans addressing PCB and mercury load reductions.

[7] The reported volume is determined by estimating the amount of water that is be retained (and/or infiltrated) by GI over the course of the average annual period (Water Year 2002) used for simulating the baseline load and comparing to the TMDL WLA for PCBs (BASMAA 2017). Additional volume would be *treated* by these GI projects, but that additional treatment is *implicit* to the reported volume. For the purposes of future tracking of GI implementation, volumes metrics can be tracked in terms of the stormwater volumes that are either retained and/or treated to reduce PCB concentrations.

performance metrics for "% Load Reduction PCBs (Annual)," "Annual Volume Managed (acre-ft)," and "Impervious Area Treated (acres)." The "% Load Reduction PCBs (Annual)" and "Annual Volume Managed (acre-ft)" metrics are based on annualized model results that are directly comparable to TMDL WLAs. The "% Load Reduction PCBs (Annual)" provides a relative comparison of the load reduction to be achieved within each subwatershed. The "Annual Volume Managed (acre-ft)" shows the acre-feet of water captured and infiltrated and/or treated within each subwatershed, resulting in a total annual volume for each Permittee jurisdiction. This total stormwater managed by each Permittee could serve as the primary metric to be tracked for GI implementation. In other words, stormwater volume managed can serve as a unifying metric to evaluate GI effectiveness. "Impervious Area Treated (acres)" is an additional metric suggested by the MRP for implementation tracking. As a result of adaptive management, the implementation plan may change over time and alternative GI projects can be substituted without having to re-run the RAA model, as long as the "Management Metrics for GI," representing the goals for the GI Plan, remain on track.

7 ALTERNATIVE GI IMPLEMENTATION STRATEGIES TO INFORM ADAPATIVE MANAGEMENT

To further inform GI implementation and the adaptive management process, the RAA also considered multiple alternative scenarios that tested the underlining assumptions for GI implementation, and demonstrate the need for further research, collaboration among multiple Permittees, and incorporation of lessons learned to gain efficiencies and maximize the cost-effectiveness of GI to reduce pollutant loads over time. Four modeling scenarios were configured for this analysis, as summarized in Table 7-1. Scenario 1 represents the primary scenario for the RAA reported in the previous sections. The following provides a description of the additional scenarios and considerations for comparison of model results:

- **Jurisdictional versus Countywide** - There are many possible ways to achieve a 17.6% load reduction for all of San Mateo County. The "Jurisdictional" approach (utilized in Scenario 1) stipulates that each jurisdiction must individually achieve at least a 17.6% load reduction of PCBs. Alternatively, the "Countywide" approach achieves the 17.6% load reduction by allowing the model to allocate the wasteload reduction via GI countywide, regardless of jurisdictional boundary. The countywide approach can provide significant cost savings over the jurisdictional approach, especially where pollutant sources are spatially concentrated or better infiltration results in more cost-effective GI. Figure 7-1 conceptually illustrates the jurisdictional versus countywide optimization approaches. Where there is cooperation among jurisdictions, results from these two scenarios can provide a useful analytical framework for future cost-sharing and implementation of the most cost-effective management scenarios.
- **Load Reduction Objective** - With a cohesive sediment load reduction objective, Scenarios 1 and 2 represent the most conservative approaches. Those scenarios assume that given the uncertainties about PCB source areas, targeting an overall 17.6% load reduction of cohesive sediment (silts and clays) in general achieves the PCB load reduction objective for GI. Scenarios 3 and 4 assume that PCB sources are spatially distributed based on analysis of land use types[8]. The cost-benefit optimization process targets those areas as having the highest

[8] The RAA Phase I Report (SMCWPPP 2018a) summarized results of baseline modeling of PCB loading that considered concentrations of PCBs representative of various land use and PCB source categories developed by the San Francisco Estuary Institute as part of Regional Watershed Spreadsheet Model (BASMAA 2017, Wu et al. 2017). Although this approach was determined appropriate for estimation of baseline PCB loads and comparison to the TMDL WLA, these assumptions for sources of PCBs were not determined sufficient for detailed planning of site-scale GI projects that potentially treat runoff from these source areas.

likelihood of being PCB sources. Scenarios 3 and 4 highlight the potential cost savings (relative to Scenarios 1 and 2) that could be realized if PCB sources are identified and targeted for GI implementation.

Table 7-1. Model scenarios objectives and cost-benefit evaluation.

Load Reduction Objective	Percent of Total GI Cost to Achieve Reduction Objective		
	Jurisdictional	Countywide	*Total Savings (Jurisdictional vs. Countywide)*
Cohesive Sediment 17.6% Reduction	**Scenario 1**	**Scenario 2**	→ *Savings*
Total PCBs 17.6% Reduction	**Scenario 3**	**Scenario 4**	→ *Savings*
Total Savings (Sediment vs. PCBs)	↓ *Savings*	↓ *Savings*	↘ *Overall Savings*

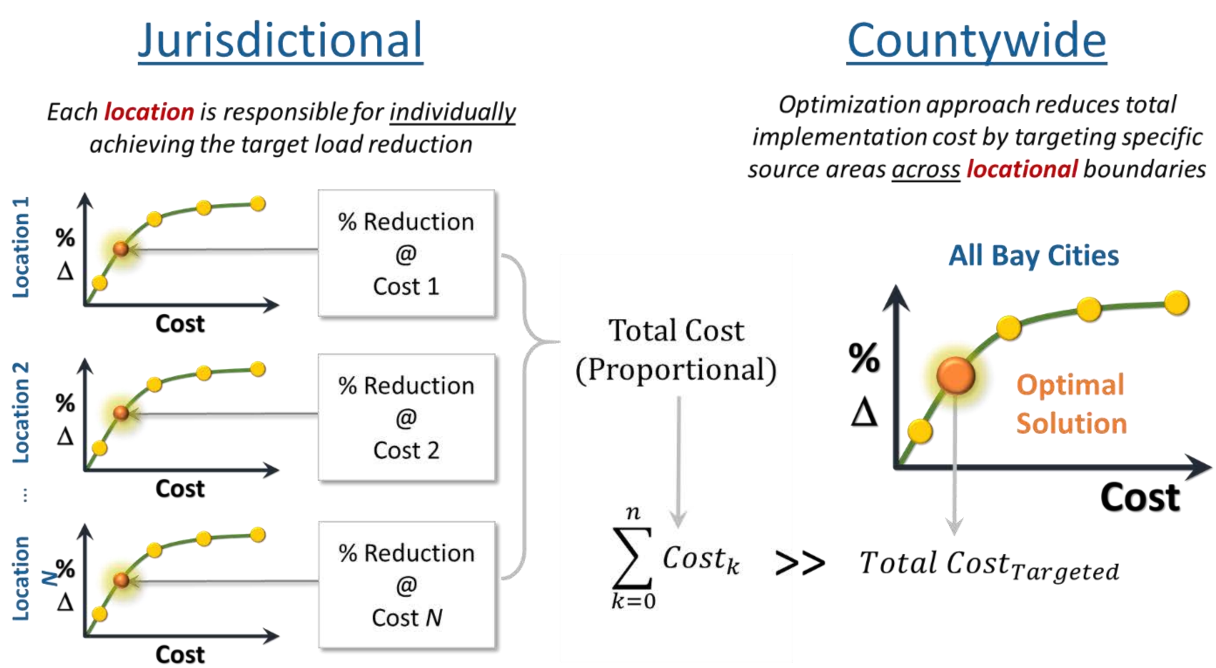


Figure 7-1. Jurisdictional vs. countywide approaches for cost-benefit optimization

7.1 Comparison of Jurisdictional versus Countywide Scenarios

To compare results of Scenario 1 (jurisdictional) and Scenario 2 (countywide), Figure 7-2 and Figure 7-3 show stacked optimization curves that present county summation of results (GI capacity and implementation cost vs. load reduction benefit) for each Permittee jurisdiction, respectively. Like the optimization curves provided for each individual jurisdiction (Appendix C), Figure 7-2 presents the proportion of the countywide cost for GI implementation. Because these results are presented as a summation of individual Permittee results throughout the County, the selected solution for Scenario 1 is presented as 100% of countywide implementation costs in Figure 7-2. To provide relative comparison of Scenarios 1 and 2, costs for Scenario 2 in Figure 7-3 are normalized relative to the total cost of Scenario 1. Scenario 2 is 66.2% of the cost of Scenario 1. This suggests that if GI were implemented throughout the County where projects are most cost-effective, independent of Permittee jurisdiction (resulting in disproportional implementation of GI), countywide costs for GI could be significantly reduced.

For each scenario, Table 7-2 and Table 7-3 provide tabular summaries of the optimized GI Implementation Strategies for each jurisdiction. Those summaries correspond to the point on the curve that meets the load reduction objective. In some jurisdictions, identified regional project reductions exceed the 17.6% load reduction objective for the jurisdictional scenario. The countywide Scenario 2 adjusts for the extra reduction provided by those facilities and redistributes the remaining management burden, concentrating on areas where it is the most cost-effective to achieve cohesive sediment load reduction.

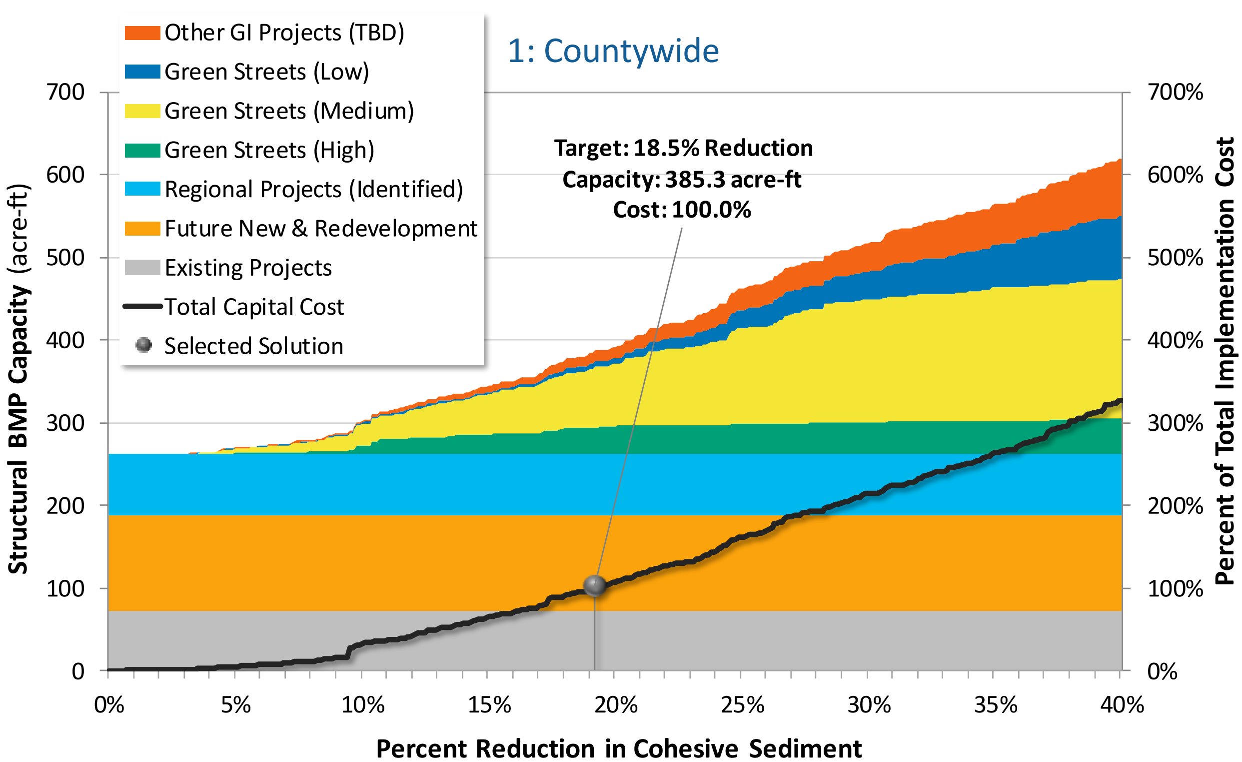


Figure 7-2. County summation of optimization results for Scenario 1 (cohesive sediment target, proportional by jurisdiction).

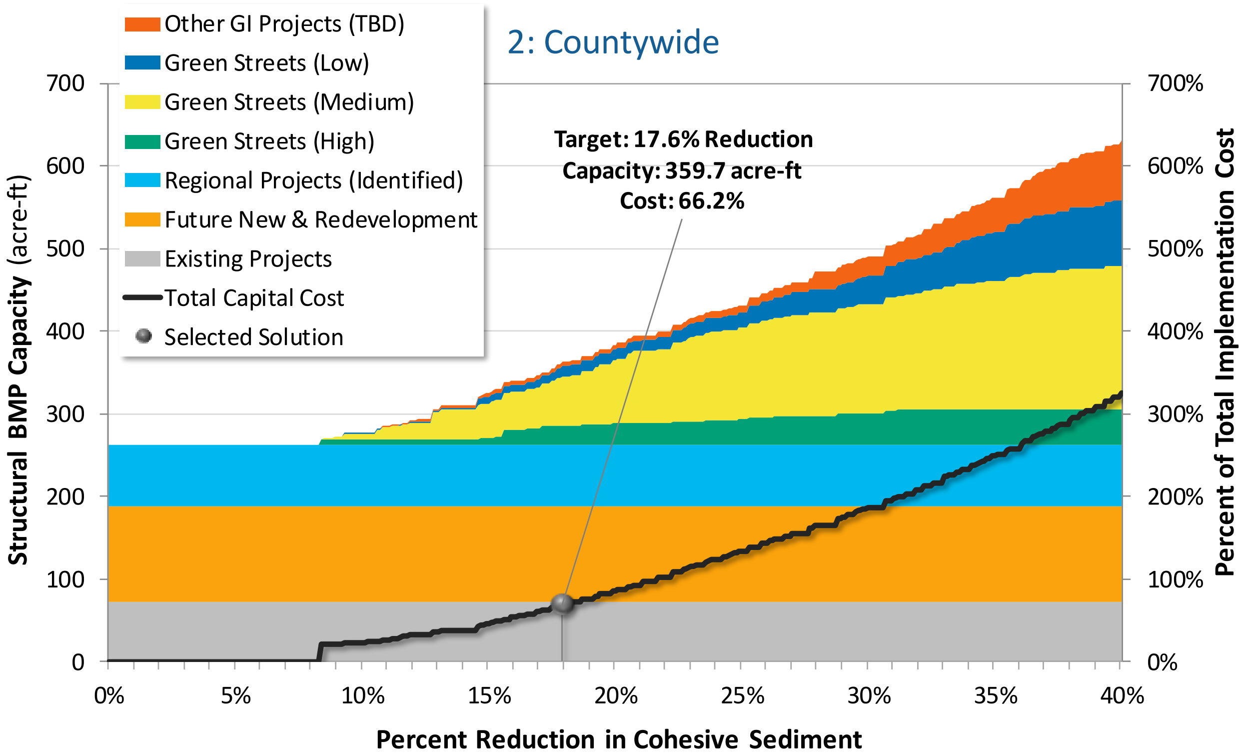


Figure 7-3. County summation of optimization results for Scenario 2 (cohesive sediment target, countywide).

Table 7-2. Summary of GI Implementation Strategy for Scenario 1 (cohesive sediment target, proportional by jurisdiction).[1]

Jurisdiction	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
Atherton	20%	63.64	110.25	0.36	0.19	1.93	0.16	2.53	0.11	0.75	**6.0**
Belmont	19%	145.24	107.87	0.65	2.12	0.45	3.04	1.02	0.46	0.29	**8.0**
Brisbane	24%	199.30	163.61	0.50	16.82	--	--	--	--	--	**17.3**
Burlingame	18%	281.20	190.90	2.84	7.53	--	0.22	7.11	0.07	0.08	**17.9**
Colma	18%	116.53	68.98	1.39	0.30	0.26	0.80	0.00	0.54	0.16	**3.5**
Daly City	18%	380.34	170.74	8.99	2.37	1.19	0.06	3.67	0.56	0.00	**16.8**
East Palo Alto	24%	105.77	110.74	1.46	5.00	--	1.57	2.00	--	--	**10.0**
Foster City	19%	173.71	134.79	3.16	3.49	--	0.27	4.61	--	--	**11.5**
Hillsborough	19%	118.09	47.71	0.00	0.16	--	--	5.85	--	0.10	**6.1**
Menlo Park	18%	110.62	204.99	8.88	13.95	1.55	3.10	0.11	0.05	--	**27.6**
Millbrae	21%	192.01	120.81	0.51	3.49	--	0.09	6.23	0.00	0.09	**10.4**
Pacifica	19%	2.52	0.33	--	0.18	0.01	--	--	--	0.00	**0.2**
Portola Valley	19%	129.91	16.19	--	0.57	--	--	2.60	0.10	3.69	**7.0**
Redwood City	18%	388.40	272.91	9.15	13.35	33.13	0.51	0.75	0.82	0.30	**58.0**
San Bruno	18%	202.38	168.65	1.23	5.52	16.66	1.77	0.08	--	--	**25.3**
San Carlos	18%	308.40	236.31	2.69	3.22	--	2.16	8.48	1.85	0.44	**18.8**
San Mateo	18%	583.75	457.05	5.61	16.51	--	3.41	14.11	--	0.00	**39.6**
South San Francisco	18%	528.17	576.89	17.87	8.46	1.26	13.40	2.35	0.50	0.00	**43.8**
Unincorporated	18%	306.75	242.20	6.74	10.04	15.99	2.00	6.73	0.09	0.09	**41.7**
Woodside	18%	156.45	87.13	0.05	2.51	1.23	--	5.32	0.74	5.79	**15.6**
Total	**18.5%[2]**	**4,493.2**	**3,489.1**	**72.1**	**115.8**	**73.6**	**32.6**	**73.6**	**5.9**	**11.8**	**385.3**

1: The color gradient provides a visual comparison of higher levels of PCB load reduction and GI capacity (darker colors indicate higher values).
2: Projected Future New & Redevelopment and Regional Projects achieves more than the target reduction in certain jurisdictions

Table 7-3. Summary of GI Implementation Strategy for Scenario 2 (cohesive sediment target, countywide).[1]

Jurisdiction	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing/Planned			Green Streets			Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
				Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low		
Atherton	15%	41.92	103.06	0.36	0.19	1.93	0.04	--	--	--	**2.5**
Belmont	4%	32.95	26.57	0.65	2.12	0.45	--	--	--	--	**3.2**
Brisbane	52%	380.83	309.93	0.50	16.82	--	--	3.54	0.58	1.51	**23.0**
Burlingame	7%	110.25	103.44	2.84	7.53	--	--	--	--	--	**10.4**
Colma	18%	116.53	68.98	1.39	0.30	0.26	0.80	0.00	0.54	0.16	**3.5**
Daly City	15%	307.12	170.72	8.99	2.37	1.19	0.04	2.78	0.56	0.00	**15.9**
East Palo Alto	24%	105.77	110.74	1.46	5.00	--	1.57	2.00	--	--	**10.0**
Foster City	8%	72.84	82.72	3.16	3.49	--	--	--	--	--	**6.7**
Hillsborough	0%	0.39	0.36	0.00	0.16	--	--	--	--	--	**0.2**
Menlo Park	29%	185.69	260.21	8.88	13.95	1.55	3.59	3.72	2.94	0.04	**34.7**
Millbrae	4%	45.53	40.24	0.51	3.49	--	0.09	0.55	0.00	0.03	**4.7**
Pacifica	22%	3.04	0.51	--	0.18	0.01	--	0.01	--	0.00	**0.2**
Portola Valley	3%	14.89	1.94	--	0.57	--	--	0.31	0.05	0.11	**1.0**
Redwood City	37%	732.06	651.97	9.15	13.35	33.13	0.56	27.11	6.48	0.99	**90.8**
San Bruno	18%	202.38	168.65	1.23	5.52	16.66	1.77	0.08	--	--	**25.3**
San Carlos	4%	61.04	79.91	2.69	3.22	--	0.03	0.16	--	--	**6.1**
San Mateo	9%	299.93	298.04	5.61	16.51	--	0.18	3.67	--	0.00	**26.0**
South San Francisco	19%	554.62	594.65	17.87	8.46	1.26	13.40	2.37	0.99	0.00	**44.4**
Unincorporated	23%	379.28	246.41	6.74	10.04	15.99	1.92	6.96	0.33	0.15	**42.1**
Woodside	8%	54.23	76.69	0.05	2.51	1.23	--	3.89	0.31	1.28	**9.3**
Total	**17.6%[2]**	**3,701.3**	**3,395.7**	**72.1**	**115.8**	**73.6**	**24.0**	**57.1**	**12.8**	**4.3**	**359.7**

1: The color gradient provides a visual comparison of higher levels of PCB load reduction and GI capacity (darker colors indicate higher values).
2: Scenario 2 targets opportunities throughout the county that provide the greatest cost-benefit for achieving the target load reduction.

7.2 Comparison of Scenarios for Cohesive Sediment versus PCB Load Reduction Objectives

As previously discussed, cohesive sediment (silt and clay) was used in Scenario 1 to serve as primary RAA results for each Permittee (Appendix C). Cohesive sediment was used as a surrogate in the RAA to estimate load reductions that can be achieved through GI implementation. This was due to the uncertainty associated with preliminary efforts to identify PCB source areas and associated concentrations in stormwater runoff. As part of the baseline PCB loading analysis performed in the RAA and reported in the Phase I RAA Report, the watershed model (LSPC) was used to simulate PCBs based on assumptions for PCB concentrations associated with various land uses and PCB source areas (Figure 7-4) identified by the San Francisco Estuary Institute (SFEI) during development of the Regional Watershed Spreadsheet Model (RWSM) (BASMAA 2017, Wu et al. 2017). The Phase I RAA Report provides a complete description of these assumptions and how they were integrated in the RAA model, with results validated based on local monitoring data (SMCWPPP 2018a). Phase I of the RAA utilized the baseline watershed model to estimate PCB loads to San Francisco Bay, and determine the load reduction to meet San Mateo County's portion of the TMDL WLA. Although determined sufficient for the countywide estimate of PCB loads, the PCB source categories were determined to be too uncertain for estimating GI performance in reducing PCB loads and optimizing the selection of GI projects for cost-effective implementation. More study is recommended to further understand the locations of PCB source areas and their associated concentrations of PCBs transported via stormwater. However, the RAA modeling system can be used to test the potential cost savings if PCB source areas are better understood and targeted for GI implementation. Utilizing the assumptions for PCB source areas identified by SFEI (Figure 7-4) the RAA modeling system simulated PCBs originating from the various source areas, estimated the load reductions associated with GI implementation, and optimized the selection of GI projects for cost-effective implementation.

Scenarios 3 and 4 provide an assessment of alternative, cost-optimized GI Implementation Strategies using modeled PCBs, which correspond to the jurisdictional and countywide RAA results for Scenarios 1 and 2 based on cohesive sediment, respectively. Table 7-4 and Figure 7-5 provide a summary and comparison of the results of all scenarios, demonstrating the cost savings if PCB source areas can be strategically focused for GI implementation. All costs are normalized to the total cost of Scenario 1 to simplify comparison across scenarios; therefore, the percentages can be treated like currency for comparison with the understanding that costs and cost savings are relative to the total implementation cost of Scenario 1. As expected, strategically locating GI to capture and treat runoff with higher PCB concentrations can potentially reduce countywide costs for GI implementation.

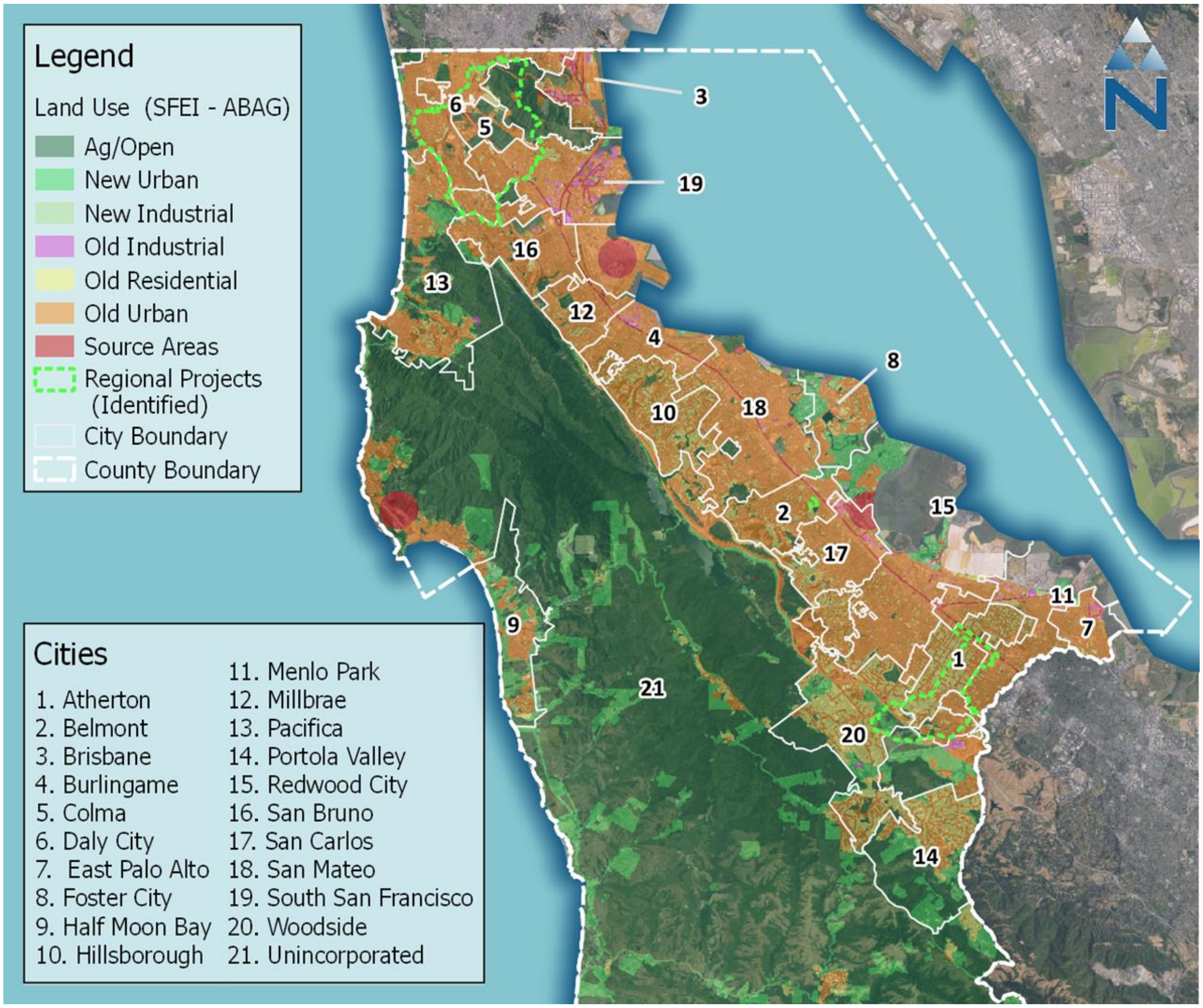


Figure 7-4. PCB source categories identified by SFEI.

Table 7-4. Comparison of relative GI implementation costs by scenario.[9]

Load Reduction Objective	Percent of Total GI Cost to Achieve Reduction Objective		
	Jurisdictional	Countywide	*Total Savings (Jurisdictional vs. Countywide)*
Cohesive Sediment 17.6% Reduction	**Scenario 1: 100%**	**Scenario 2: 66%**	34%
Total PCBs 17.6% Reduction	**Scenario 3: 77%**	**Scenario 4: 48%**	29%
Total Savings (Sediment vs. PCBs)	23%	18%	52%

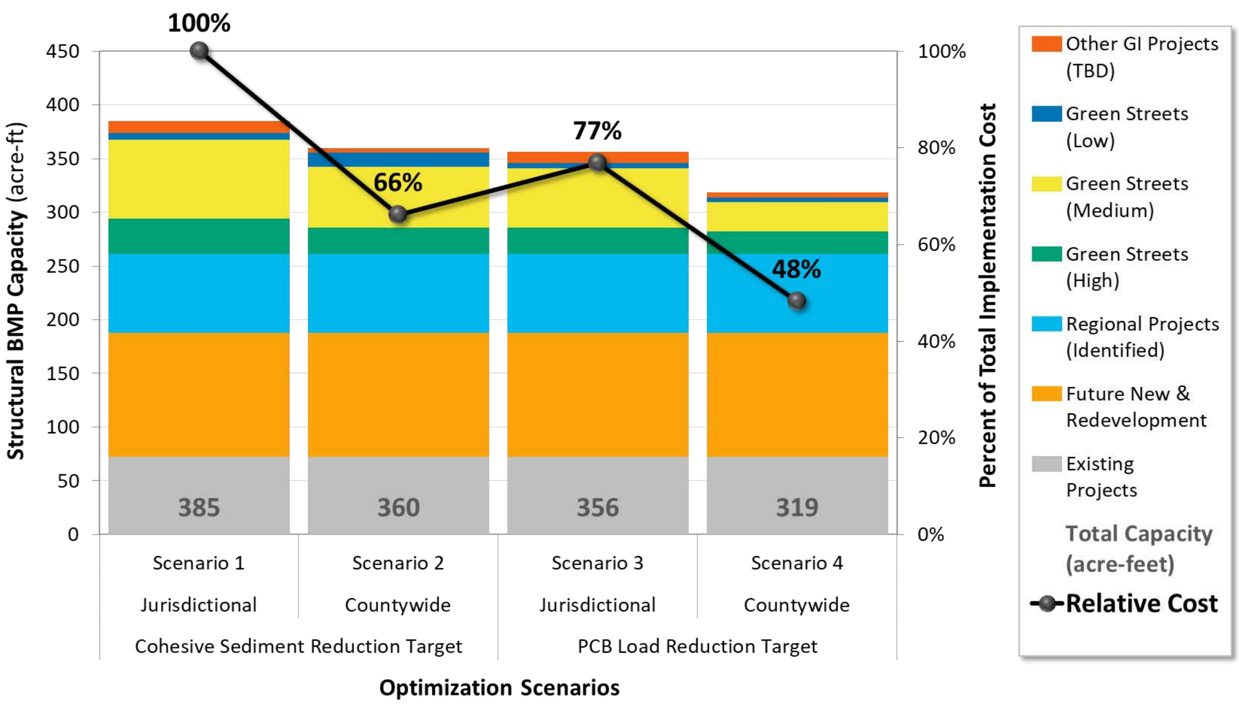


Figure 7-5. Summary of GI storage capacity and relative implementation cost by scenario.[8]

8 EVALUATION OF BENEFITS OF REGIONAL PROJECTS

Section 4.1 and 4.2.1 identify five regional projects that have been conceptualized and are in various stages of planning and engineering design. With the increased cost efficiencies associated with these larger projects over more distributed and numerous green streets and LID retrofits, it is likely that more agencies will identify additional regional projects in the future. To support further planning of

[9] Cost for Scenarios 2, 3, and 4 are reported as percentages of total costs for Scenario 1, illustrating the amount of savings if these scenarios are pursued in the future as part of the adaptive management process.

regional project opportunities, an evaluation was performed to determine the cost benefits of regional projects over distributed GI projects. The RAA model was used to compare implementation costs with and without the five regional projects included in Scenarios 1 and 2. Table 8-1 and Figure 8-1 present countywide GI capacity and cost summaries for Scenarios 1 and 2 with regional projects, relative to corresponding reference scenarios without regional projects. All the solutions in the table achieve a 17.6% reduction in cohesive sediment load (silts and clays). The scenarios without regional projects present the optimized solutions using other screened GI opportunity with cohesive sediment as the management objective.

Table 8-1. Projected savings provided by regional projects (jurisdictional vs. countywide).[10]

Scenarios	Percent of Total GI Cost to Achieve Reduction Objective		
	Jurisdictional	Countywide	*Total Savings (Jurisdictional vs. Countywide)*
Without Regional Projects	**111%**	**83%**	28%
With Regional Projects	**Scenario 1:** **100%**	**Scenario 2:** **66%**	34%
Total Savings (With vs. Without Regional Projects)	11%	17%	45%

[10] Cost for Scenario 2 and reference scenarios without regional projects are reported as percentages of total costs for Scenario 1, illustrating the savings provided by regional projects over alternative distributed GI projects.

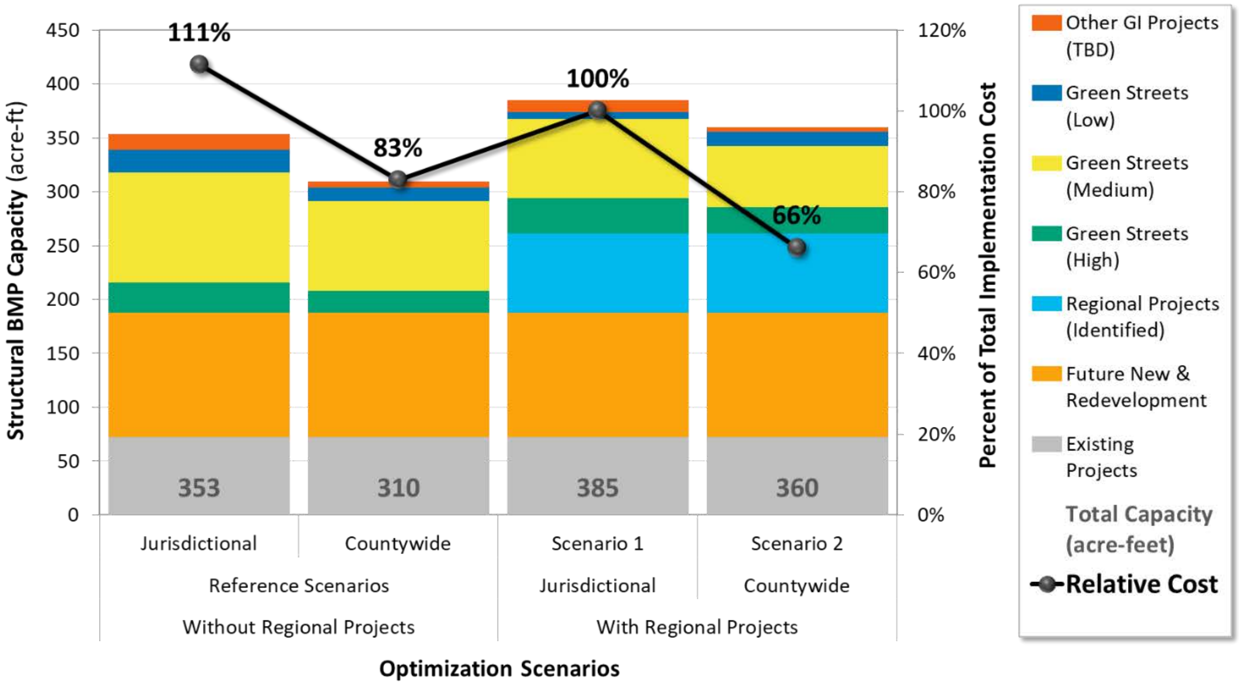


Figure 8-1. Summary of GI storage capacity and cost to achieve 17.6% target reduction.[9]

Results of analysis indicate that regional projects provide an 11% cost savings for Scenario 1 that assumes that all Permittees proportionally meet the 17.6% load reduction goal. For Scenario 2, the cost saving is higher at 17% due to the full capture of regional project benefits if the load reduction goal is achieved at the countywide rather than jurisdictional scale, as demonstrated in the comparison of Scenarios 1 and 2 discussed in Section 7.1.

9 GI IMPLEMENTATION SCHEDULES

Throughout the adaptive management process for GI implementation, each Permittee will continue to identify and test feasible opportunities for GI projects to meet the final PCB load reduction goal of 17.6% for 2040. The process will include the tracking of management metrics and continued re-evaluation of GI project opportunities considered for the RAA. For instance, the RAA assumed projected amounts of LID associated with new and redevelopment, which are subject to change based on factors that are outside the control of the Permittees. If less development occurs over time, more green streets or regional projects on public land may be needed to provide equivalent stormwater volume management. To support the GI plans, preliminary schedules were developed to chart a potential course for GI implementation, which considered the various project opportunities.

The MRP requires reporting of goals for implementation of GI for interim milestones 2020 and 2030, in addition to the final milestone of 2040. Various assumptions were made about the order and pace of implementation for various GI project types to estimate the amount of GI to be implemented at each of these milestones. Separate analyses performed by the SMCWPPP (2019) and included in Appendix A determined the projected amount of LID associated with new development and redevelopment by 2020, 2030, and 2040. The regional projects with current funding (Cartan Field in Atherton, Orange Memorial Park in South San Francisco) were assumed to be built and operational by 2030. Finally, for each Permittee, it is assumed that 33% of green streets required by 2040 will be implemented by 2030. The resulting schedule presented in Figure 9-1 demonstrates anticipated interim and final milestones for GI implementation in terms of structural capacity (corresponding to the capacities presented right side of Table 7-2). Table 9-1shows milestones for both structural capacities and management metrics (e.g., volume managed, treated imperviousness). These interim and final GI capacities are subject to adaptive management; however, the 2040 Management Metrics for GI (left side of Table 7-2 and top of Table 9-1) set the ultimate goals for GI planning efforts and tracking. Individual Permittee implementation schedules are provided in Appendix D.

The countywide implementation schedule (Figure 9-1 and Table 9-1) and individual Permittee schedules (Appendix D) also provide comparisons of the amount of required GI capacities estimated to address 2040 goals for Scenario 1 (jurisdictional) and Scenario 2 (countywide) (see Table 7-3). The countywide scenario offers notable cost savings; however, in light of existing jurisdictional autonomies, there would need to be significant additional discussions among Permittees to establish cost-share agreements that would result in more GI implementation within some Permittee jurisdictions resulting in less GI implemented in other jurisdictions. Comparison of these scenarios further demonstrates the need for an adaptive management framework to further investigate the most cost-effective approach to countywide GI implementation.

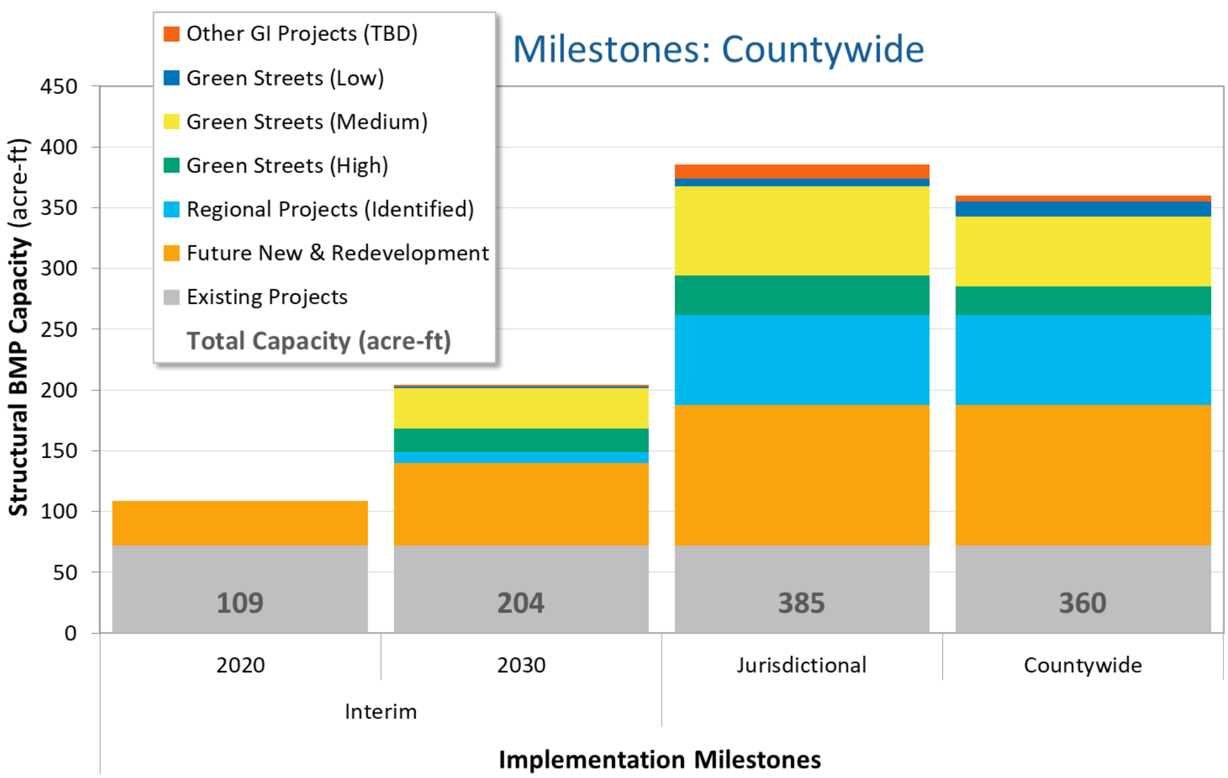


Figure 9-1. Summary of GI storage capacity by implementation milestone.

Table 9-1. Implementation Milestones: Countywide

Implementation Metrics		Implementation Milestones: Countywide					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	6.0%	7.5%	5.0%	11.0%	18.5%	17.6%
	Volume Managed (acre-ft/yr)	1,313.0	1,655.5	1,524.7	2,837.6	4,493.2	3,701.3
	Treated Impervious (acres)	627.0	1,945.8	916.3	1,543.2	3,489.1	3,395.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	72.1	72.1	72.1	72.1
	Future New & Redevelopment	30.9	48.3	36.6	67.5	115.8	115.8
	Regional Projects (Identified)	9.0	64.6	--	9.0	73.6	73.6
	Green Streets (High)	20.0	12.6	--	20.0	32.6	24.0
	Green Streets (Medium)	32.9	40.7	--	32.9	73.6	57.1
	Green Streets (Low)	1.4	4.5	--	1.4	5.9	12.8
	Other GI Projects (TBD)	1.2	10.6	--	1.2	11.8	4.3
	Total	**95.3**	**181.3**	**108.7**	**204.0**	**385.3**	**359.7**

10 CONCLUSIONS

The RAA provides assessment of multiple implementation scenarios that can support the adaptive management process for GI implementation, help garner support for collaborative efforts for GI implementation, and inform further research of PCB source areas that will allow Permittees to seek more cost-effective implementation strategies over time. To set goals for GI Plans, results of Scenario 1 (Appendix C) provide a conservative assessment of the amount of GI needed to address the 17.6% reduction in PCBs, using cohesive sediment reduction as a surrogate for PCB load reduction. Alternative scenarios were evaluated to better understand the sensitivity of modeling assumptions and help guide future decisions on data collection (e.g., improve understanding of sources of PCBs that can be addressed with GI), project selection (e.g., regional projects or green streets), or collaboration of Permittees to jointly meet the countywide load reduction goal.

The adaptive management process will utilize a GI tracking tool that will enable agencies to continuously quantify and evaluate progress towards meeting the 2040 goal for PCB load reduction. As demonstrated in the GI Implementation Strategies presented in Appendix C, these management metrics can include percent load reduction, stormwater volumes managed, or impervious area treated. The SMCWPPP is currently leading the development of a GI tracking tool, which will enable Permittees to enter GI project information and calculate these management metrics. The tool will also allow Permittees to evaluate alternative GI projects prior to implementation, providing a mechanism to inform cost-effective decisions that maximize progress towards addressing management goals. The tracking tool can also serve as a future repository of GI project information as projects are implemented, which can be used to support future updates of the RAA over time.

As Permittees initiate implementation of GI Plans and future studies are implemented to better understand GI processes to capture and treat stormwater, the Permittees will continue to gain more understanding of the water quality benefits of various GI projects that can inform the adaptive management process. For example, Section 4 documented a number of assumptions on the potential locations for GI project opportunities and their associated effectiveness at capturing, infiltrating, or treating stormwater. Future more-detailed field reconnaissance performed by each Permittee can result in improved understanding of these GI project opportunities, identification of new opportunities not identified in the SRP, or identification of impediments to potential projects (e.g., multiple driveways or other obstructions for bioretention in streets rights-of-way). As projects are implemented, additional studies performed within San Mateo County or throughout the San Francisco Bay region can provide an improved understanding of infiltration and treatment processes associated with GI project designs. As a result, it is anticipated that the RAA will be periodically updated in the future to reassess GI project opportunities and GI Implementation Strategies for each Permittee, likely resulting in fine-tuning of management metrics over time. This adaptive management process will provide continued assurance that GI project implementation is on track to meet 2040 goals for PCB reduction, while seeking to maximize cost-efficiency associated with project prioritization and selection.

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APPENDIX A: PROJECTIONS OF FUTURE NEW DEVELOPMENT AND REDEVELOPMENT

ATTACHMENT #2

MEMORANDUM

COMMUNITY DESIGN + ARCHITECTURE

Philip Erickson, Architect, AIA

Date: January 3, 2019

To: Green Infrastructure Committee

Cc: Matt Fabry and Reid Bogert, City/County Association of Governments

From: Phil Erickson and Bharat Singh, Community Design + Architecture, Inc.

Re: SMCWPPP Green Infrastructure Plan Development Support – UPDATED estimate of land area for new and redevelopment from 2015 to 2020, 2020 to 2030, and 2030 to 2040

In support of the Reasonable Assurance Analysis (RAA) to model pollutant load reductions, Community Design + Architecture (CD+A) developed an estimate of the land area and location of new and redevelopment within San Mateo County that would be required to implement MRP targeted C.3 regulated green infrastructure stormwater management improvements by 2040. The methodology and numbers were finalized with the GI Committee in December 2017. Following that, some revisions were made in response to comments from Foster City. A memorandum with the initial 2015 to 2020, 2020 to 2030, and 2030 to 2040 estimates was distributed to member agencies for comment on October 24, 2018 and it was discussed with the agencies at the October 31, 2018 GI Committee.

Comments where received from Brisbane, Burlingame, Redwood City, and San Mateo County. **Table 1** on the following page is the revised final estimate for 2015 to 2040. Green numbers in the tables indicate that agency requested revisions increased the number, and red means the changes reduced the number.

The MRP also asks that the Green Infrastructure Plans (GI Plans) include estimates for the land area of new and redevelopment by 2020 and 2030. The updated estimates for the time periods of 2015 to 2020, 2020 to 2030, and 2030 to 2040; this information is provided in **Tables 2 through 4**.

2015 to 2020 Land Development Estimate

The C/CAG and MTC demographic dataset that was used in developing the 2040 land area estimate included a projection to 2020 as well as 2040. CD+A used this information to make an estimate of the growth rate for the three land use categories that have been included in making the land area estimates – single family homes, multi-family homes, and employment. These growth rates were applied to estimate the acreage of each land use category that is anticipated to be developed between 2015 and 2020. **Table 2** presents these numbers and what percentage of the 2040 total growth estimate the 2015 to 2020 increment represents.

The percentage of 2040 total growth that would be achieved by 2020 varies significantly between communities and land use types. The progression of growth towards the 2040 growth projection is illustrated in **Chart 1**, for the county as a whole (Countywide) and for a sampling of communities, and a linear growth line is also provided for comparison purposes;

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these were chosen as examples of communities that are projected to see more near-term growth, a growth rate similar to the county as a whole, and some that are projected to see a higher rate of growth towards the end of the 2040 time period.

More specifically, the 2015-2020 time period, 5 years, is 20% of the time period from 2015 to 2040. So, if growth were linear, one would expect roughly 20% of the total projected land area to be developed by 2020. Countywide, the estimate is 30%, which is 60% more than would be expected with a linear growth. As illustrated in **Chart 1**, on page 3 of the memorandum, Portola Valley is projected to achieve all its growth by 2020. Burlingame, San Bruno, and total Countywide growth are projected to achieve more growth than a linear progression; and Foster City is projected to achieve a lower percentage than a linear progression.

TABLE 1
REVISED ESTIMATE OF LAND AREA FOR NEW AND REDEVELOPMENT THAT MUST COMPLY WITH C.3 GREEN INFRASTRUCTURE REQUIREMENTS
(2015 TO 2040 growth in acres)

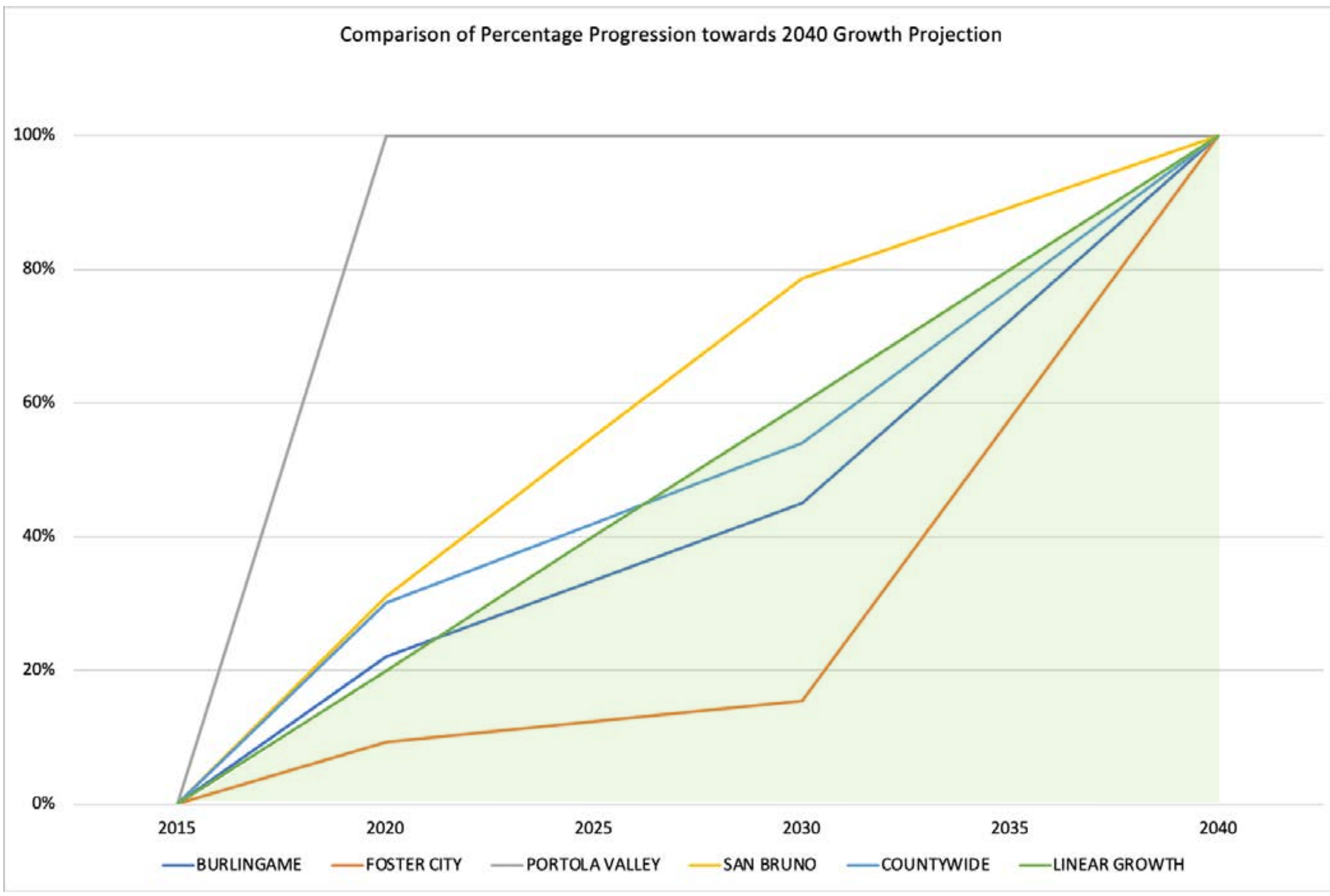
Jurisdiction	Housing		Employment	Total New and Redevelopment
	Single-family	Multi-family		
Atherton	0	0	0	0
Belmont	8	9.5	23.5	41
Brisbane	8.5	69.5	206	284
Burlingame	4	26.5	95	125.5
Colma	0	1.5	2.5	4
Daly City	13.5	23.5	26	63
East Palo Alto	11	8.5	63	82.5
Foster City	0	30	83	113
Half Moon Bay	30	7	13	50
Hillsborough	0	0	0	0
Menlo Park	7	14.5	300	321.5
Millbrae	13.5	19	14.5	47
Pacifica	22.5	1.5	10.5	34.5
Portola Valley	0.	0	0.5	0.5
Redwood City	10	115.5	129.5	255
San Bruno	4.5	39	24	67.5
San Carlos	10	14	34	58
San Mateo, City of	18.5	122	128	268.5
South San Francisco	17.	39.5	67	123.5
Woodside	5.5	0.	4.5	10
San Mateo County	6	62.5	61.5	186
Total all Jurisdictions	**245.5**	**603.5**	**1,286.0**	**2,135**

2020 to 2030 Land Development Estimate

MTC's most recent Plan Bay Area efforts included development of jurisdiction specific growth rates for the 2020 to 2030 time period. CD+A applied these growth rates to derive the land area estimates for 2030. **Table 3** presents these numbers and what percentage of the 2040 total growth estimate the 2020 to 2030 increment represents.

The percentage of 2040 total growth that would be achieved between 2015 and 2030 also varies significantly between communities and land use types. If growth were linear, one would expect roughly 60% of the total projected land area to be developed from 2015 to 2030. But, given the projected slowdown in growth between 2020 and 2030, the overall countywide growth is projected to be about 54%, generally in alignment with linear growth, see **Chart 1**. San Bruno is projected to maintain a higher rate of growth up to 2030, Burlingame and Foster City follow the countywide trend of slowing growth.

Chart 1
PERCENT OF 2040 GROWTH PROJECTION ACHIEVED INTERIM TIME POINTS



2030 to 2040 Land Development Estimate

The 2030 to 2040 land use estimate is simply the remainder of the 2040 land area estimate that is not expected to have been developed by 2030. **Table 4** presents these numbers and what percentage of the 2040 total growth estimate the 2030 to 2040 increment represents.

The percentage of 2040 total growth that would be achieved between 2030 and 2040 also varies significantly between communities and land use types. The 2030-2040 time period, 10 years, is 40% of the time period from 2015 to 2040. Again, if growth were linear, one would expect roughly 40% of the total projected land area to be developed during the 2030 to 2040 time period. Countywide, the estimate is roughly equal to this amount. So, regionally performed demographic and economic analysis estimates that development activity would be increasing following 2030, but not to the extent that development activity has and is expected to occur between 2015 and 2020.

TABLE 2
2020 INCREMENT
ESTIMATE OF LAND AREA FOR NEW AND REDEVELOPMENT
THAT MUST COMPLY WITH C.3 GREEN INFRASTRUCTURE REQUIREMENTS
(2015 TO 2020 growth in acres)

Jurisdiction	Housing				Employment		Total New and Redevelopment	
	Single-family		Multi-family					
	Acres	% of 2040	Acres	% of 2040	Acres	% of 2040	Acres	% of 2040
Atherton	0	—	0	—	0	—	0	—
Belmont	3.5	44%	2	21%	11	27%	16.5	40%
Brisbane	2	24%	0.5	1%	3	1%	5.5	2%
Burlingame	0.5	13%	5	19%	22	18%	27.5	22%
Colma	0	—	0.5	33%	1	25%	1.5	38%
Daly City	2.5	19%	4.5	19%	9.5	15%	16.5	26%
East Palo Alto	1	9%	0.5	6%	23.5	28%	25	30%
Foster City	0	—	3.5	12%	7	6%	10.5	9%
Half Moon Bay	7.5	25%	4	57%	4.5	9%	16	32%
Hillsborough	0	—	0	—	0	—	0	—
Menlo Park	7	100%	3	21%	59.5	19%	69.5	22%
Millbrae	4	30%	4.5	24%	5.5	12%	14	30%
Pacifica	4.5	20%	0.5	33%	4	12%	9	26%
Portola Valley		—	0	—	0.5	100%	0.5	100%
Redwood City	6.5	65%	21.5	19%	81	32%	109	43%
San Bruno	4.5	100%	8	21%	8.5	13%	21	31%
San Carlos	4.	40%	2.5	18%	16	28%	22.5	39%
San Mateo, City of	12	65%	111	91%	44	16%	167	62%
South San Francisco	7	41%	7.5	19%	35	28%	49.5	40%
Woodside	1	18%	0	—	1	10%	2	20%
San Mateo County	21	34%	12.5	20%	22.5	12%	56	30%
Total all Jurisdictions	**88.5**	**36%**	**191.5**	**32%**	**359**	**17%**	**639**	**30%**

TABLE 3
2030 INCREMENT
ESTIMATE OF LAND AREA FOR NEW AND REDEVELOPMENT
THAT MUST COMPLY WITH C.3 GREEN INFRASTRUCTURE REQUIREMENTS
(2020 TO 2030 growth in acres)

Jurisdiction	Housing				Employment		Total New and Redevelopment	
	Single-family		Multi-family					
	Acres	% of 2040	Acres	% of 2040	Acres	% of 2040	Acres	% of 2040
Atherton	0	—	0	—	0	—	0	—
Belmont	4.5	56%	3.5	37%	1	47%	19	46%
Brisbane	0	0%	67	96%	39.5	19%	106.5	38%
Burlingame	2.5	63%	19	72%	7.	7%	28.5	23%
Colma	0	—	1	67%	0.5	20%	1.5	38%
Daly City	1.0	7%	1.5	6%	0	0%	2.5	4%
East Palo Alto	0	0%	1	12%	0	0%	1	1%
Foster City	0	—	5	17%	2	2%	7	6%
Half Moon Bay	9	30%	0.5	7%	4	31%	13.5	27%
Hillsborough	0.	—	0	—		—	0	—
Menlo Park	0	0%	2	14%	16.5	6%	18.5	6%
Millbrae	6	44%	14.5	76%	0.5	3%	21	45%
Pacifica	7.	31%	0.5	33%	2.5	24%	10	29%
Portola Valley	0	—	0	—	0.	0%	0	0%
Redwood City	2	20%	26	23%	12	9%	40	16%
San Bruno	0	0%	20.5	53%	11.5	48%	32	47%
San Carlos	2	20%	6	43%	16	47%	24	41%
San Mateo, City of	5	27%	7.5	6%	74.5	58%	87	32%
South San Francisco	1	6%	4	10%	14.5	22%	19.5	16%
Woodside	1	18%	0	—	2.5	56%	3.5	35%
San Mateo County	27.5	44%	28	45%	14.5	24%	70.	38%
Total all Jurisdictions	**68.5**	**28%**	**207.5**	**34%**	**229**	**18%**	**50**	**24%**

TABLE 4
2040 INCREMENT
ESTIMATE OF LAND AREA FOR NEW AND REDEVELOPMENT
THAT MUST COMPLY WITH C.3 GREEN INFRASTRUCTURE REQUIREMENTS
(2030 TO 2040 growth in acres)

Jurisdiction	Housing				Employment		Total New and Redevelopment	
	Single-family		Multi-family					
	Acres	% of 2040	Acres	% of 2040	Acres	% of 2040	Acres	% of 2040
Atherton	0	—	0	—	0	—	0	—
Belmont	0	0%	4	42%	1.5	6%	5.5	13%
Brisbane	6.5	76%	2	3%	163.5	79%	172	61%
Burlingame	1	25%	2.5	9%	66	69%	69.5	55%
Colma	0	—	0	0%	1	40%	1	25%
Daly City	10	74%	17.5	74%	16.5	63%	44	70%
East Palo Alto	10	91%	7	82%	39.5	63%	56.5	68%
Foster City	0	—	21.5	72%	74	89%	95.5	85%
Half Moon Bay	13.5	45%	2.5	36%	4.5	35%	20.5	41%
Hillsborough	0	—	0	—	0	—	0	—
Menlo Park	0	0%	9.5	66%	224	75%	233.5	73%
Millbrae	3.5	26%	0	0%	8.5	59%	12	26%
Pacifica	11	49%	0.5	33%	4	38%	15.5	45%
Portola Valley	0	—	0	—	0	0%	0	0%
Redwood City	1.5	15%	68	59%	36.5	28%	106	42%
San Bruno	0	0%	10.5	27%	4	17%	14.5	21%
San Carlos	4.	40%	5.5	39%	2	6%	11.5	20%
San Mateo, City of	1.5	8%	3.5	3%	9.5	7%	14.5	5%
South San Francisco	9	53%	28	71%	17.5	26%	54.5	44%
Woodside	3.5	64%	0	—	1	22%	4.5	45%
San Mateo County	13.5	22%	22	35%	24.5	40%	60	32%
Total all Jurisdictions	**88.5**	**36%**	**204.5**	**34%**	**698**	**54%**	**991**	**46%**

Relationship of Interim Land Use Area Estimates to Green Infrastructure Plan Development

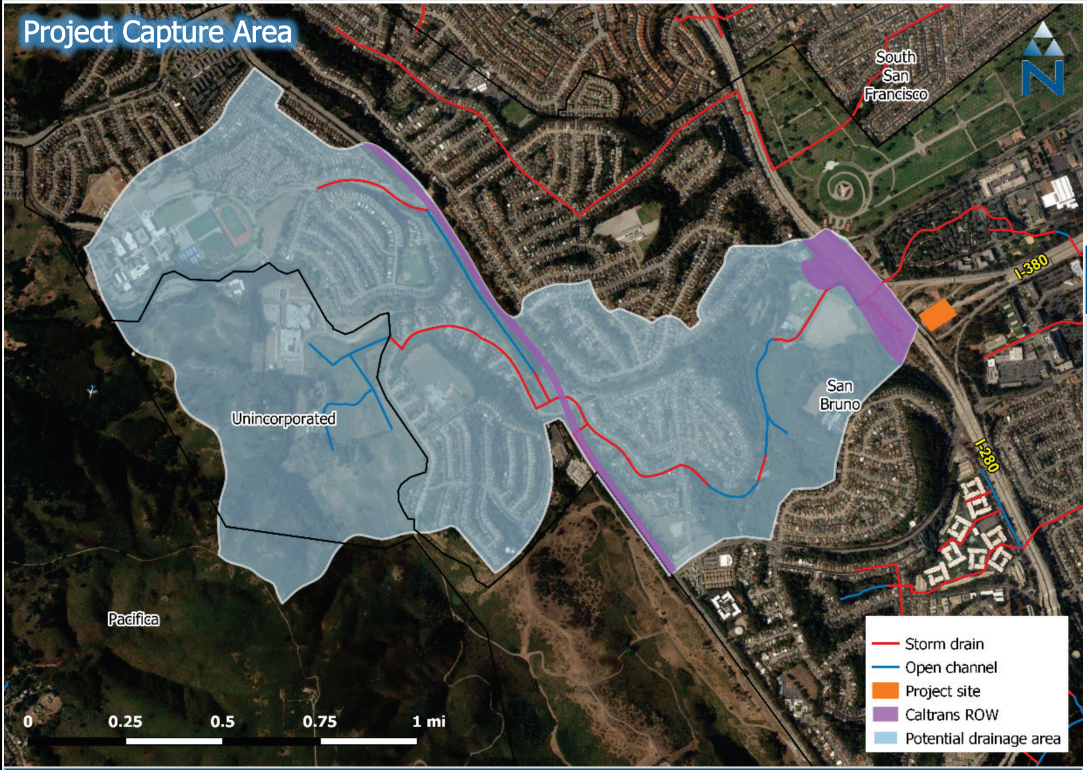
For the vast majority of SMCWPPP member agencies, the high development rates experienced through 2020 will be beneficial by providing a more GI in the near term, as communities begin to focus on the planning and design of regional and public green infrastructure projects that will be needed to achieve the TMDL targets of the MRP.

There are policies and strategies that can be considered to define a reasonable path within a GI Plan to achieve the 2040 TMDL targets. These could include:

- Setting interim year targets for public GI projects that account for likely variable growth rates over time.
- Identifying ways to increase GI that is constructed and maintained by private development. This could position permittees for more flexible load reduction requirements in future stormwater permits.
- Identifying a local, countywide, or regional funding stream for implementation, operations, and maintenance of public GI.

Also, the significant variation in projected growth rates for individual communities highlights the importance to consider a countywide GI implementation strategy.

APPENDIX B: ADDITIONAL REGIONAL PROJECT CONCEPTS (COMPLETED AFTER THE STORMWATER RESOURCE PLAN)



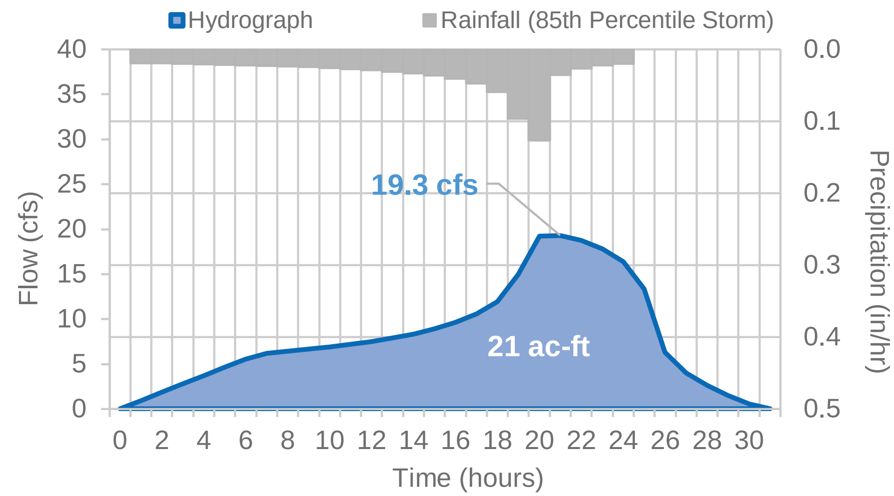
Project Overview

This concept describes a regional stormwater capture project for San Bruno. The project is designed to be a subsurface infiltration gallery located at open space in the Caltrans right-of-way between the I-280/I-380 interchange (see map above). This project has the potential to supplement groundwater supplies, alleviate downstream flooding, and improve water quality in San Bruno Creek. The project will treat runoff from a total of 942 acres. Approximately 700 acres is in San Bruno (40 acres in Caltrans right-of-way), 220 acres is in unincorporated county, and 22 acres is in Pacifica. Residential impervious area in western San Bruno is the largest contributor of runoff. The project is sized to capture 21 ac-ft, 100% of the 85th percentile, 24-hour runoff volume that is typically used to meet water quality targets. This volume reduces the detention capacity needed in the Crestmoor Canyon to address flooding from the 25-year storm, according to the 2014 San Bruno Storm Drain Master Plan, by one-third. The project can reduce the PCBs load in the drainage area by 69%. This benefit may offset the amount of green streets that would otherwise need to be implemented to meet permit and TMDL requirements, reducing San Bruno's green street requirement by 84%. Project details and costs are outlined in the subsequent pages.

Site Information

Project Lead	San Bruno
Location	Caltrans Right-of-Way @ I-280 and I-380
Land Owner	Caltrans
Receiving Water	San Bruno Creek

Jurisdiction	San Bruno	San Mateo County	Pacifica	Caltrans ROW
Capture Area (acres)	660	220	22	40
Percent of Capture Area	70.0%	23.4%	2.3%	4.3%



Wet Weather Drainage Characteristics

Sizing Criteria		85th percentile, 24-hour storm
Total Capture Area		942 acres
Imperviousness		27%
Design Conditions for 85th %-ile storm	***Rainfall Depth:***	0.85 inches
	Total Runoff Volume:	21.0 ac-ft
	Peak Flow Rate:	19.3 cfs

Regional Stormwater Capture Project at I-280 and I-380

Project Overview and Drainage Area Map

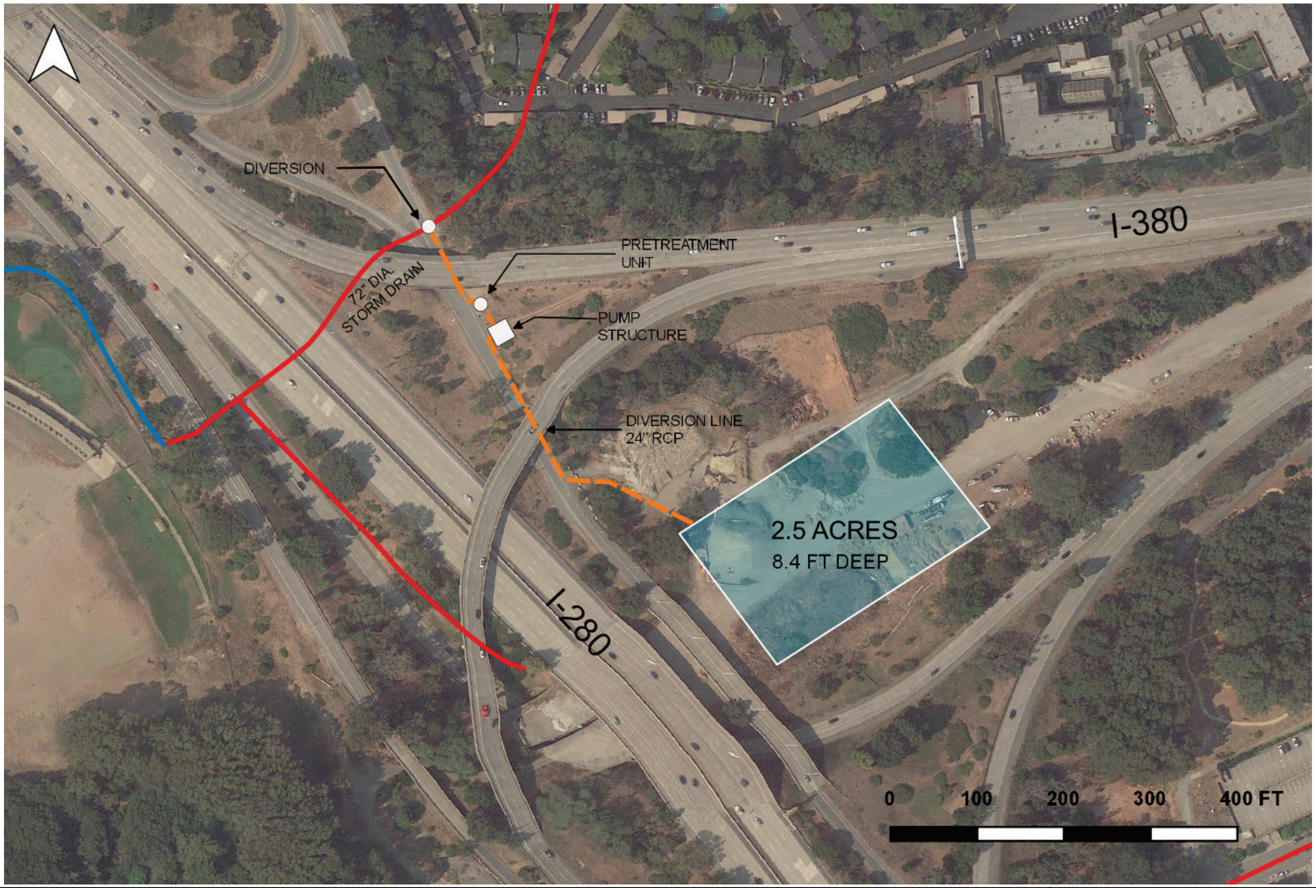
San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Plan Description

The project consists of a subsurface concrete gallery that will be located beneath vacant space in the Caltrans right-of-way between the I-280 and I-380 interchange. The project would divert from a storm drain that serves portions of the Rollingwood, Crestmoor, Portola Highlands, and Pacific Heights neighborhoods of San Bruno. The storm drain eventually discharges to San Bruno Creek, which flows to the Bay. The drain runs underneath I-280 and crosses the frontage road along the northbound side of the freeway. The diversion structure will be constructed in the section of the drain that runs beneath the frontage road to minimize disruption to highway traffic while providing accessibility. A 650-foot length of diversion pipe will be required to route runoff to the facility. Captured runoff will be routed through a pretreatment system, such as a hydrodynamic separator, to remove solids and sediment, then routed to the facility. Due to the length of the required diversion line, a pump structure will likely be necessary to move captured runoff to the facility. However, a geotechnical analysis may show that a gravity-flow diversion alternative is feasible. A gravity diversion may increase excavation costs but will eliminate capital and O&M costs associated with operating a pump station. A pump system may also be beneficial for flood control downstream since diversions can be timed to manage the peak of storms. A passive system may potentially fill the facility before the peak occurs, effectively eliminating potential flood control benefits. Cost-benefit analysis should be performed to select a diversion alternative. The subsurface concrete gallery is designed to capture 21 ac-ft and will be 8.4-ft deep with a 2.5-acre footprint. Captured runoff will be removed from the storm drain system and treated through infiltration. Soil testing will need to confirm infiltration rates greater than 1.4 inches per hour in order to drain the facility within 72-hours, in compliance with local design standards. A shallower structure with greater footprint may be needed if a lower infiltration rate is found. All conceptual design details should be explored in greater detail during a feasibility analysis.

Disclaimer: Utilities were evaluated through GIS analysis using best available data. A utilities survey should be performed prior to construction to confirm the location of all utilities on site.



Regional Stormwater Capture Project at I-280 and I-380

Site Plan and Description

(Sheet 2 of 3)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Budget-level Cost Estimates

DESCRIPTION	UNIT COST	UNIT	QUANTITY	SUBTOTAL
Excavation/Removal	$50	CY	40,000	$2,000,000
Diversion Structure	-	LS	1	$150,000
Pretreatment	$6,000	CFS	20	$120,000
Diversion Pump Structure	$56,000	CFS	20	$1,120,000
Diversion Pipe (24” RCP)	$200	LF	650	$130,000
Subsurface Gallery	$300	CY	34,000	$10,200,000
Restoration	$5	SF	109,000	$545,000
CONSTRUCTION SUBTOTAL				$14,265,000
Mobilization (10% construction)				$1,427,000
Contingency (15% construction)				$2,140,000
Design (10% total)				$1,783,000
TOTAL COST				**$19,615,000**

Subsurface Structure Design Values

Item Description	Value	Units
Footprint	2.5	acres
Design Height	8.4	ft
Depth of Excavation	10	ft
Pumping Requirements	20	cfs
Infiltration Rate	Needs further investigation	
Drawdown Time	Needs further investigation	
Infiltration Rate Needed for 72-hr Drawdown Time*	1.4	in/hr
Capacity	**21**	**ac-ft**
Annual Capture Volume	**226**	**ac-ft**
% Design Storm Managed	**100**	**%**

*Maximum 72-hr drawdown time is recommended in the SMCWPPP C.3 Stormwater Technical Guidance. Using a larger footprint and a smaller design height, while keeping storage capacity constant, will lower the infiltration requirement for 72-hr drawdown.

Proposed Schedule	FY 21/22				FY 22/23				FY 23/24			
	2021		2022		2022		2023		2023		2024	
	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ
Design		X	X	X	X	X	X					
Environmental Documentation								X				
Bid & Award								X				
Construction									X	X	X	X

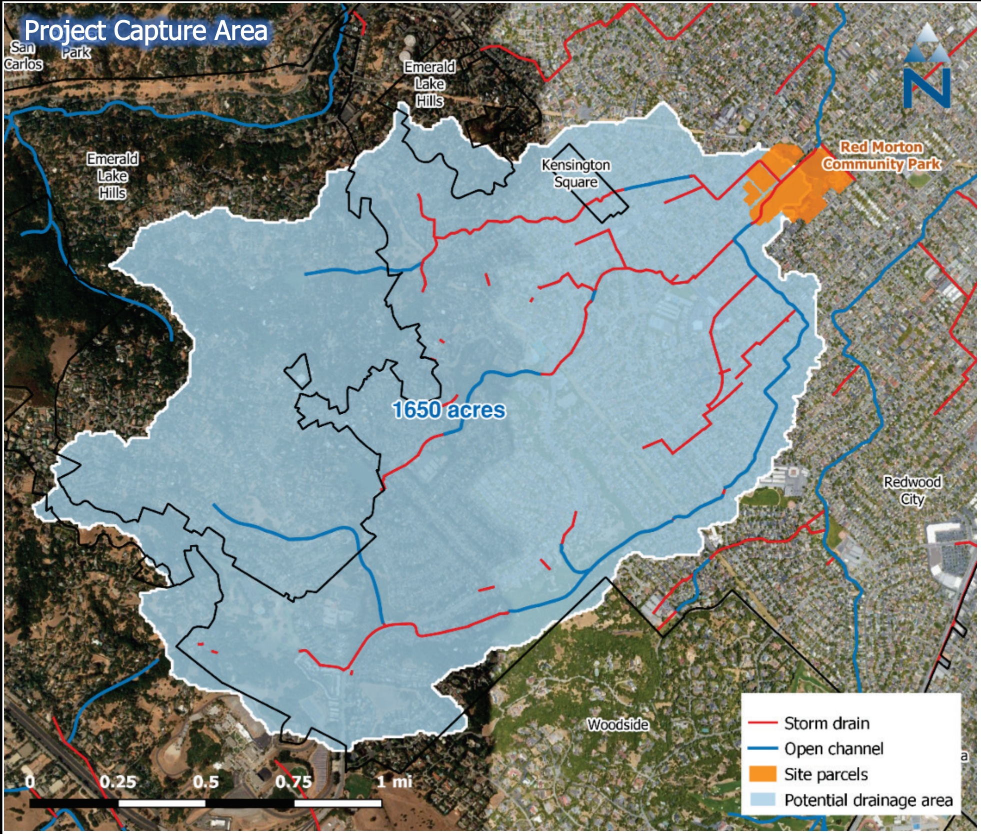
Additional Considerations

This project concept is planning-level and subject to review and revision during project design. A variety of confounding factors, including geotechnical and environmental considerations, will need to be further investigated to inform project design. Factors to be considered include but are not limited to the following:

- **Drainage delineation**: the drainage was delineated using best available data in GIS analysis. Field examinations of the upstream storm drain network should be performed to confirm drainage area.
- **Utilities**: a utilities survey along the frontage road should be performed to minimize the disruption of utilities during construction.
- **Groundwater levels**: the distance between the bottom of the infiltrating structure and the seasonal high groundwater level should be at least 10 feet apart to allow for adequate infiltration. This should be confirmed during a feasibility study.
- **Pumping Requirements:** pumping is generally assumed for large-scale regional projects. However, gravity-flow diversion alternatives may be possible, reducing capital and O&M costs associated with pumping. Gravity diversions would require the structure to be placed below the storm drain invert, increasing the required excavation depth. As-builts for the storm drain will need to be examined to determine this depth. A break-even analysis should be performed to determine if a gravity-flow alternative is more cost-effective. All cost estimates are preliminary and will need to be reevaluated during a feasibility analysis when project details are developed further.
- **Infiltration rates**: the NRCS Soil Survey did not contain an infiltration rate estimate for the project area. Infiltration tests should be performed during a feasibility study to ensure the structure is sized appropriately. It is recommended that infiltrating structures drain within 72 hours. The infiltration rate may determine design components, such as structure depth and capacity.
- **Environmental factors**: with the exception of a voluntary cleanup at The Crossings over 0.5 miles away, the California Envirostor database shows no active cleanup sites near the project site. Additional investigation should be performed at the project site to assess the possibility of existing contamination interfering with stormwater infiltration.

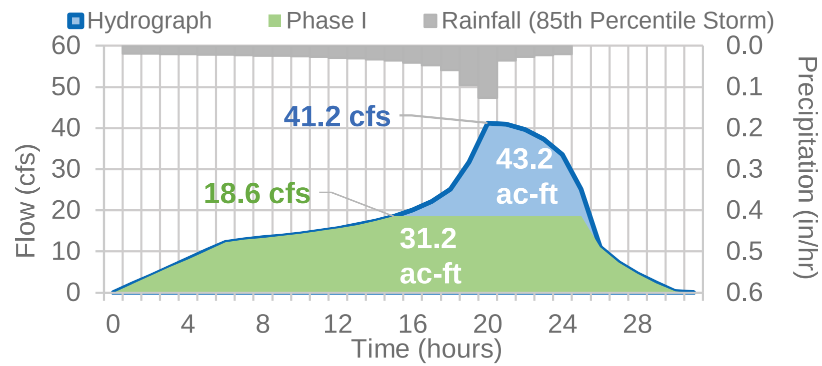
SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL



Project Overview

This concept describes a regional stormwater capture project for Redwood City. The project, which would serve as the cornerstone for the City's MRP compliance and water resiliency efforts, is envisioned as a subsurface infiltration gallery located at Red Morton Park (see map to left). This project has the potential to supplement groundwater supplies, alleviate flooding, offset water use at the park, and improve downstream water quality in the Arroyo Ojo and downstream Redwood Creek. The project has potential to treat runoff from a total of 1,650 acres, approximately 70% of which is in Redwood City. The remaining 30% of the potential drainage area is from Woodside and the unincorporated communities, Emerald Lake Hills and Kensington Square. This may present an opportunity to explore co-funding options with Woodside and the County. The project is envisioned as a single subsurface gallery with potential for additional phases to be considered in the future. A multi-phase approach will allow for flexibility in procuring funding and coordinating with scheduled park improvements (e.g. resurfacing of turf fields). The first phase of the project has potential to capture and treat approximately 31.2 ac-ft, 72% of the 85th percentile, 24-hour runoff volume (43.2 ac-ft). The project can potentially reduce PCBs load by 16.7%. This benefit may offset the amount of green streets that would otherwise need to be implemented to meet permit and TMDL requirements, reducing Redwood City's green street requirement by 92.6%. Project details and costs are outlined in further detail in the subsequent pages.



Site Information

Project Lead	Redwood City
Location	Red Morton Community Park – McGarvey Field
Land Owner	Redwood City
Receiving Water	Arroyo Ojo (tributary to Redwood Creek)

Jurisdiction	Redwood City	San Mateo County	Woodside
Capture Area (acres)	1,142	467	41
Percent of Capture Area	69.2%	28.3%	2.5%

Wet Weather Drainage Characteristics

Sizing Criteria		85th percentile, 24-hour storm
Total Capture Area		1,650 acres
Imperviousness		34%
Design Conditions for 85th %-ile storm	***Rainfall Depth:***	0.85 inches
	Total Runoff Volume:	43.2 ac-ft
	Peak Flow Rate:	41 cfs

Regional Stormwater Capture Project at Red Morton Community Park

Project Overview and Drainage Area Map

San Mateo Countywide Water Pollution Prevention Program

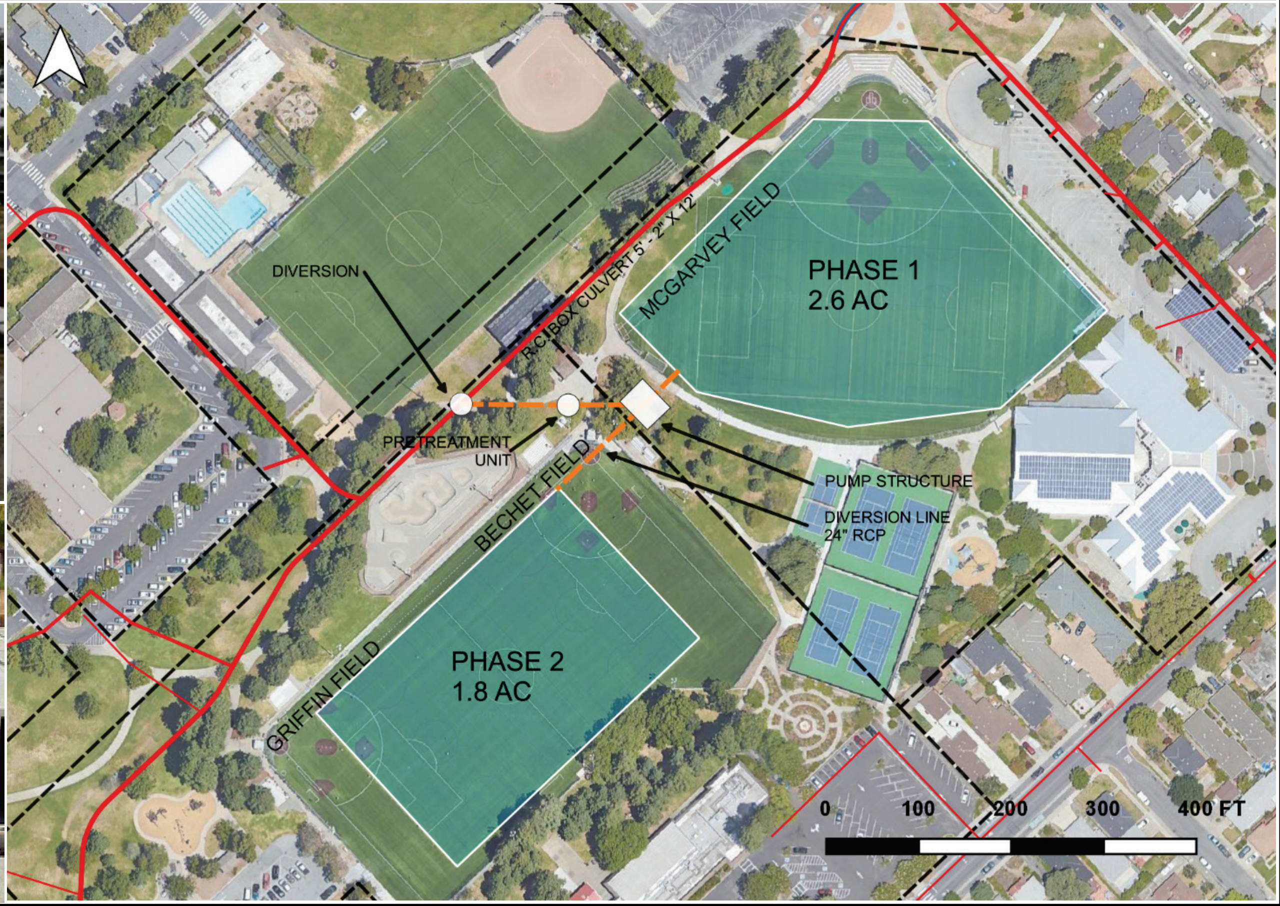
PARADIGM ENVIRONMENTAL

Site Plan Description

The project consists of a subsurface concrete gallery that will be located beneath McGarvey Field at Red Morton Community Park. The structure has potential to capture 31.2 acre-feet of runoff from Arroyo Ojo, a tributary of Redwood Creek that flows to the Bay. Storage capacity is capped at 31.2 acre-feet due to available area at McGarvey Field and a reasonable structure depth of 12 feet. The section of Arroyo Ojo just west of the park is an open channel that is routed underneath the park through a large reinforced concrete drain before daylighting to an open channel east of the park. The project will divert from the 5-ft 2-in by 12-ft drain using a rubber dam system and intake basin. Runoff will be routed through a pretreatment system, such as a hydrodynamic separator, to remove solids and sediment, then pumped to the gallery. The total storage (31.2 ac-ft) will account for approximately 72% of the 85th percentile, 24-hour runoff volume (43.2 ac-ft). Captured runoff will be treated through infiltration. Stormwater reuse elements (irrigation, greywater, etc.) may be incorporated if infiltration rates are deemed too low at the site.

A second phase may be considered to capture the remaining 12 ac-ft of the design volume uncaptured by the McGarvey Field structure (Phase I). Phase II would likely be located on Griffin and Bechet Fields just west of the Phase I structure to minimize disruption of utilities on the northern half of the park. The Phase II facility can be constructed at a later date but may still be able to utilize some of the diversion infrastructure from Phase I. For example, it may be possible for the diversion components to be built in parallel to make use of the same pump housing and intake structure. These design aspects should be explored in greater detail during a feasibility analysis.

Disclaimer: Utilities were evaluated through GIS analysis using best available data. A utilities survey should be performed prior to construction to confirm the location of all utilities on site.



Budget-level Cost Estimates			Phase I (McGarvey Field)		Phase II (Griffin-Bechet Fields)	
DESCRIPTION	UNIT COST	UNIT	QUANTITY	SUBTOTAL	QUANTITY	SUBTOTAL
Excavation/Removal	$50	CY	63,000	$3,150,000	29,000	$1,450,000
Rubber Dam System	-	LS	1	$80,000	-	-
Diversion Structure	-	LS	1	$150,000	1	$150,000
Pretreatment	$6,000	CFS	20	$120,000	23	$138,000
Diversion Pump Structure	$56,000	CFS	20	$1,120,000	23	$1,288,000
Diversion Pipe (24" RCP)	$200	LF	100	$20,000	100	$20,000
Subsurface Gallery	$300	CY	50,000	$15,000,000	20,000	$6,000,000
Restoration	$5	SF	113,000	$565,000	78,000	$390,000
CONSTRUCTION SUBTOTAL				$20,475,000		$9,436,000
Mobilization (10% construction)				$2,048,000		$944,000
Contingency (15% construction)				$3,071,000		$1,415,000
Design (10% total)				$2,559,000		$1,180,000
TOTAL COST				**$28,153,000**		**$12,975,000**

Additional Considerations

This project concept is planning-level and subject to review and revision during project design. A variety of confounding factors, including geotechnical and environmental considerations, will need to be further investigated to inform project design. Factors to be considered include but are not limited to the following:

- **Drainage delineation**: the drainage was delineated using best available data in GIS analysis. Field examinations of the upstream storm drain network should be performed to confirm drainage area.
- **Utilities**: a utilities survey at the park should be performed to minimize the disruption of utilities during construction.
- **Groundwater levels**: the distance between the bottom of the infiltrating structure and the seasonal high groundwater level should be at least 10 feet apart to allow for adequate infiltration.
- **Pumping Requirements:** pumping is generally assumed for large-scale regional projects. However, gravity-flow diversion alternatives may be possible, reducing O&M costs associated with pumping. Gravity diversions would require the structure to be placed below the storm drain invert, increasing the required excavation depth. As-builts for the storm drain will need to be obtained from the City to determine this depth. For a 2.6-acre footprint, capital cost may increase $300,000 per foot of additional excavation. In comparison, the O&M associated with a pump diversion may be around $50,000 annually ($1.4 million projected over 20 years with 2.5% inflation). A break-even analysis should be performed to determine if a gravity-flow alternative is more cost-effective. All cost estimates are preliminary and will need to be reevaluated during a feasibility analysis when project details are developed further.
- **Infiltration rates**: the NRCS Soil Survey did not contain an infiltration rate estimate for the Red Morton Community Park area. Infiltration tests should be performed during a feasibility study to ensure the structure is sized appropriately. It is recommended that infiltrating structures drain within 72 hours. The infiltration rate may determine design components, such as structure depth and capacity. Additional uses of captured runoff, such as irrigation or greywater, may contribute to 72-hr drawdown requirement.
- **Environmental factors**: with the exception of an active environmental investigation from renovations/redevelopment at nearby John Gill Elementary School, the California Envirostor database shows no active cleanup sites near the project site. Additional investigation should be performed at the project site to assess the possibility of existing contamination interfering with stormwater infiltration.

Phase I – McGarvey Field design values

Item Description	Value	Units
Footprint	2.6	acres
Design Height	12	ft
Depth of Excavation	15	ft
Pumping Requirements	18.6	cfs
Infiltration Rate	Needs further investigation	
Drawdown Time	Needs further investigation	
Infiltration Rate Needed for 72-hr Drawdown Time*	2	in/hr
Phase I Capacity	**31.2**	**ac-ft**
% Design Storm Managed	**72**	**%**

Phase II – Griffin-Bechet Fields design values

Item Description	Value	Units
Footprint	1.8	acres
Design Height	6.67	ft
Depth of Excavation	10	ft
Pumping Requirements	22.6	cfs
Infiltration Rate	Needs further investigation	
Drawdown Time	Needs further investigation	
Infiltration Rate Needed for 72-hr Drawdown Time*	1.10	in/hr
Phase II Capacity	**12**	**ac-ft**
% Design Storm Managed	**28**	**%**

*Maximum 72-hr drawdown time is recommended in the SMCWPPP C.3 Stormwater Technical Guidance. Using a larger footprint and a smaller design height, while keeping storage capacity constant, will lower the infiltration requirement for 72-hr drawdown.

APPENDIX C: RAA RESULTS FOR SCENARIO 1

Contents

Atherton

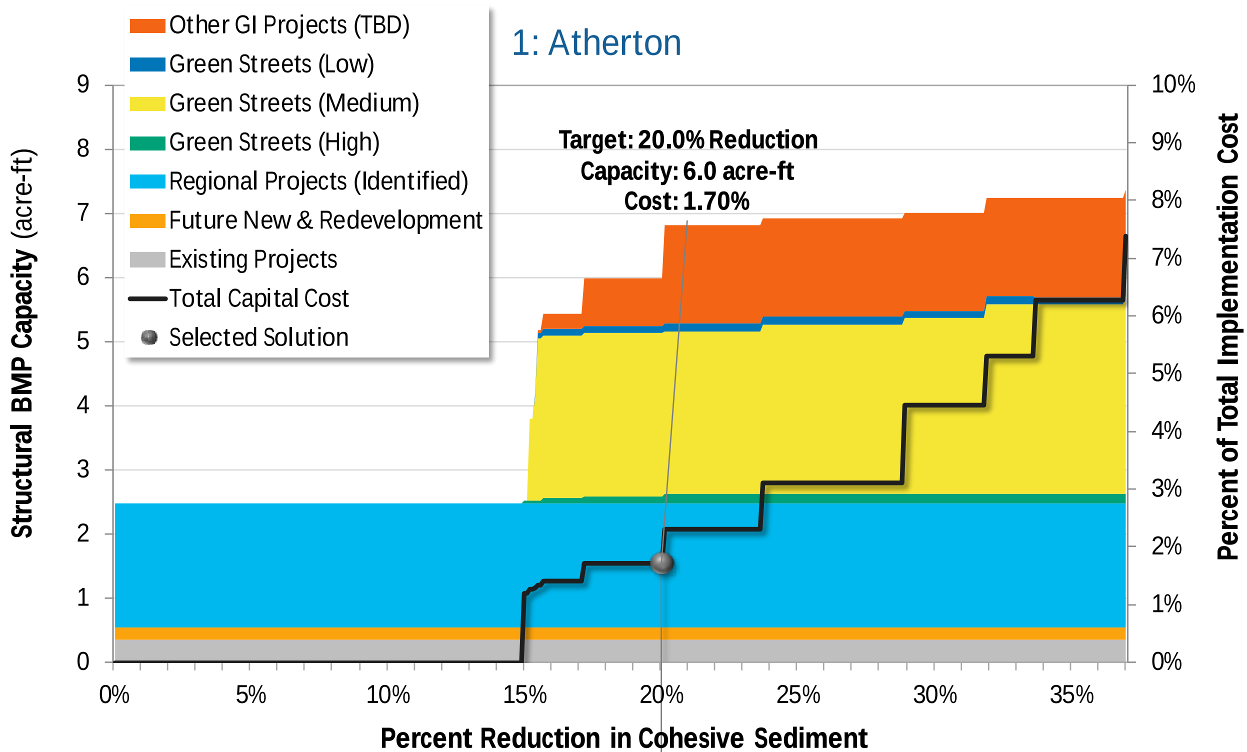


Figure C-1. Optimization summary for Atherton - Scenario 1.

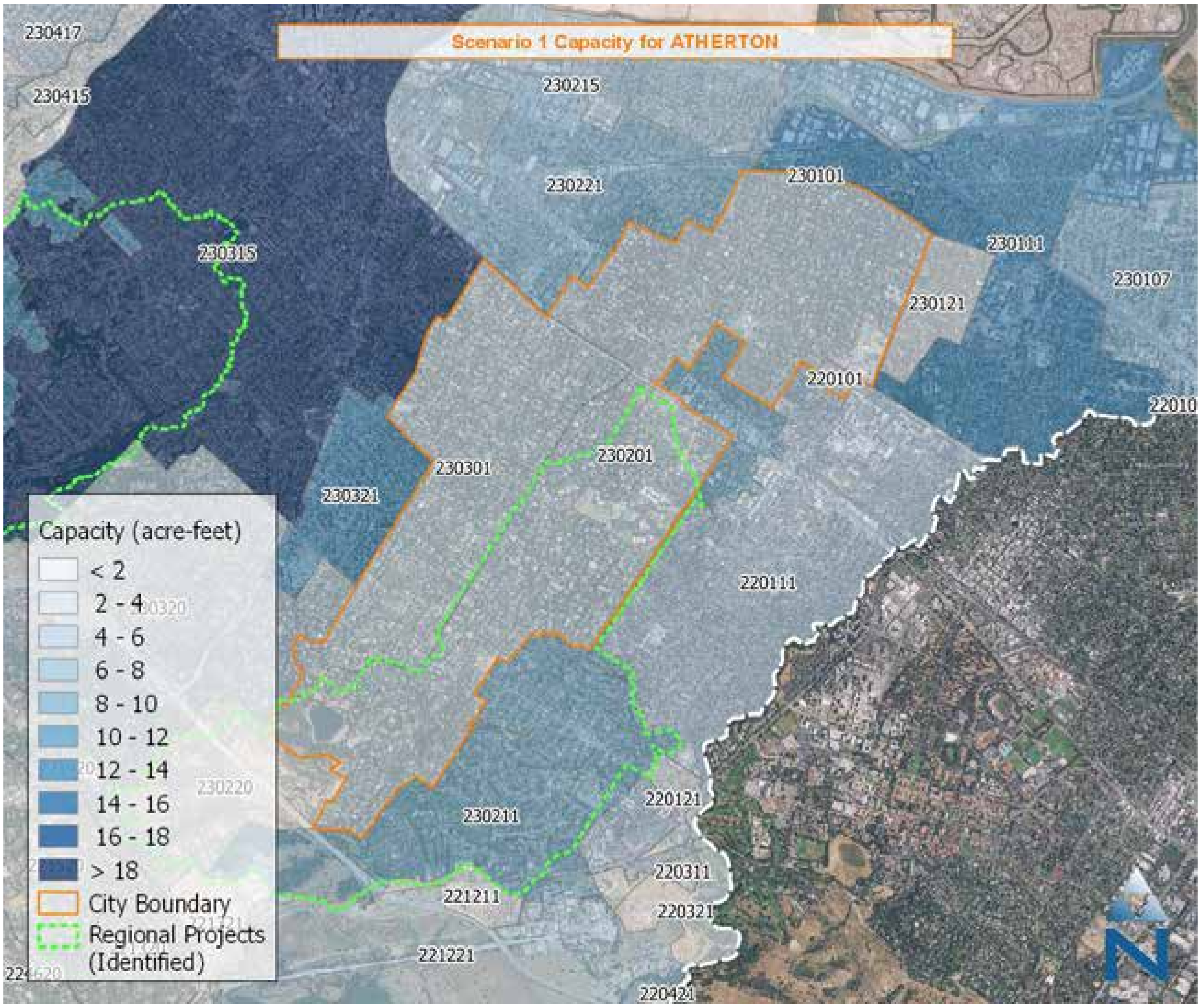


Figure C-2. Map of GI capacities by subwatershed in Atherton - Scenario 1.

Table C-1. GI Implementation Strategy for Atherton - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
220101	62%	0.82	0.15	--	0.01	--	0.00	--	0.04	0.02	**0.1**
230101	23%	0.00	0.00	--	--	--	--	--	--	0.00	**0.0**
230201	19%	60.20	101.77	0.36	0.14	1.90	0.16	--	--	--	**2.6**
230301	58%	2.62	8.33	--	0.03	0.02	--	2.53	0.07	0.72	**3.4**
Total	**20.0%**	**63.6**	**110.3**	**0.4**	**0.2**	**1.9**	**0.2**	**2.5**	**0.1**	**0.7**	**6.0**

Belmont

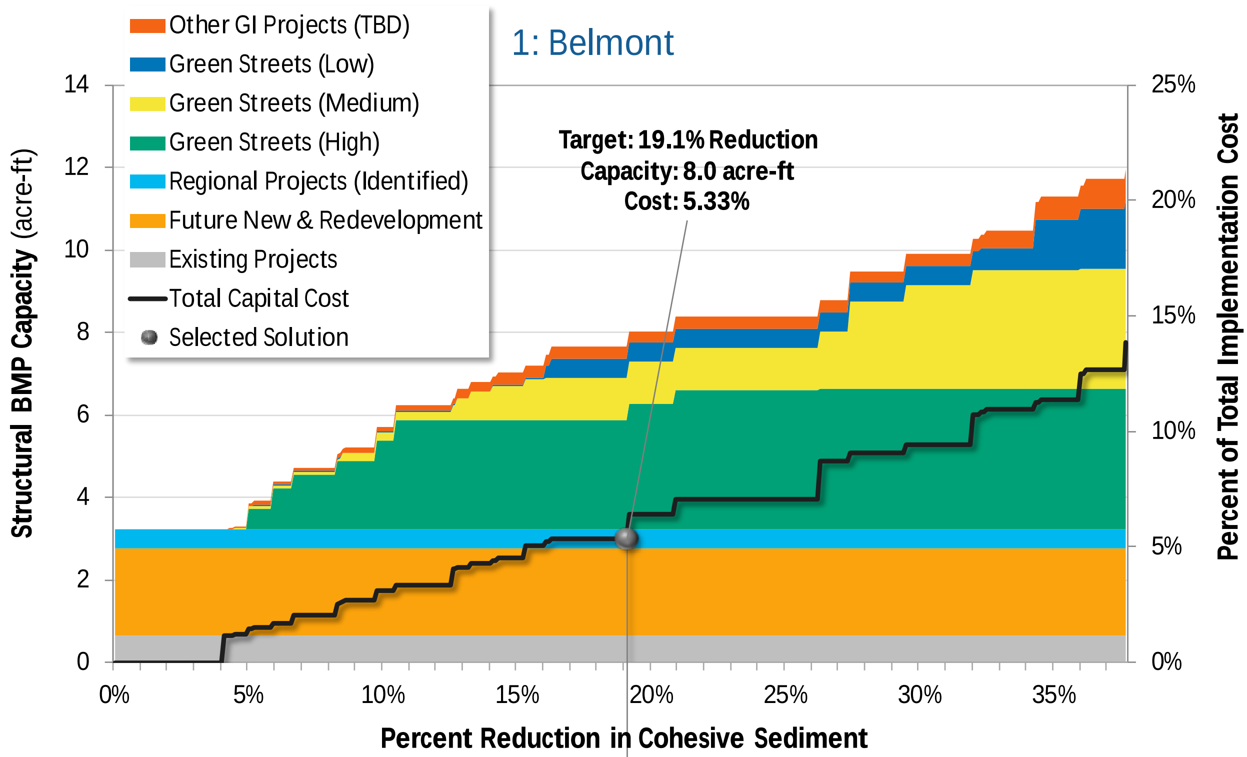


Figure C-3. Optimization summary for Belmont - Scenario 1.

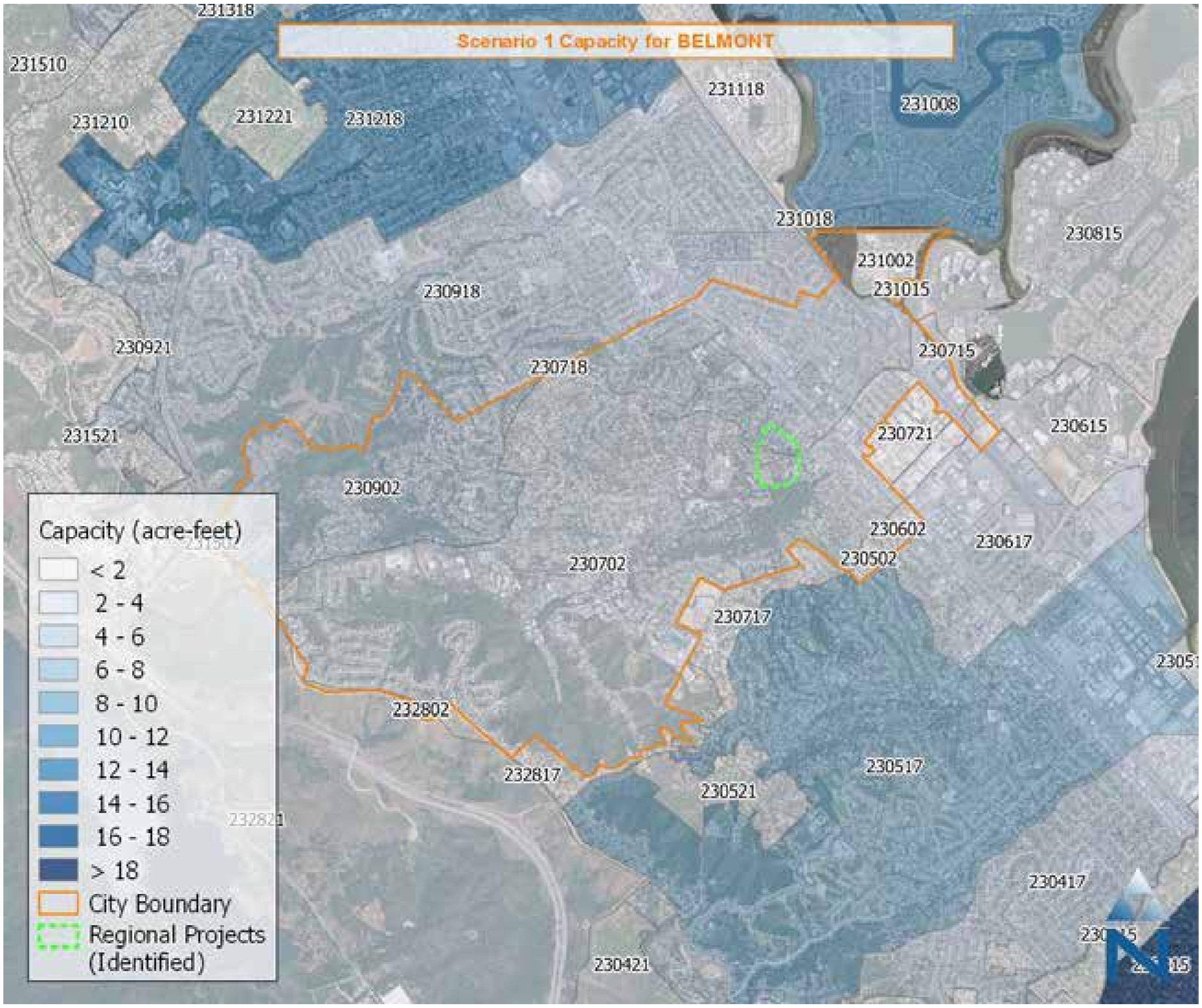


Figure C-4. Map of GI capacities by subwatershed in Belmont - Scenario 1.

Table C-2. GI Implementation Strategy for Belmont - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
230502	42%	1.42	1.13	--	0.01	--	--	0.03	--	0.05	**0.1**
230602	59%	5.73	6.29	0.19	0.07	--	0.00	0.03	0.03	0.19	**0.5**
230702	12%	67.76	25.57	0.33	0.61	0.32	1.02	--	--	--	**2.3**
230902	33%	64.73	68.50	0.13	1.23	0.13	2.01	0.78	0.25	--	**4.5**
231002	33%	4.73	6.13	--	0.20	--	--	0.19	0.18	--	**0.6**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
231502	69%	0.04	0.01	--	--	--	--	--	--	0.00	**0.0**
232802	30%	0.82	0.24	--	--	--	--	--	--	0.05	**0.0**
Total	**19.1%**	**145.2**	**107.9**	**0.7**	**2.1**	**0.5**	**3.0**	**1.0**	**0.5**	**0.3**	**8.0**

Brisbane

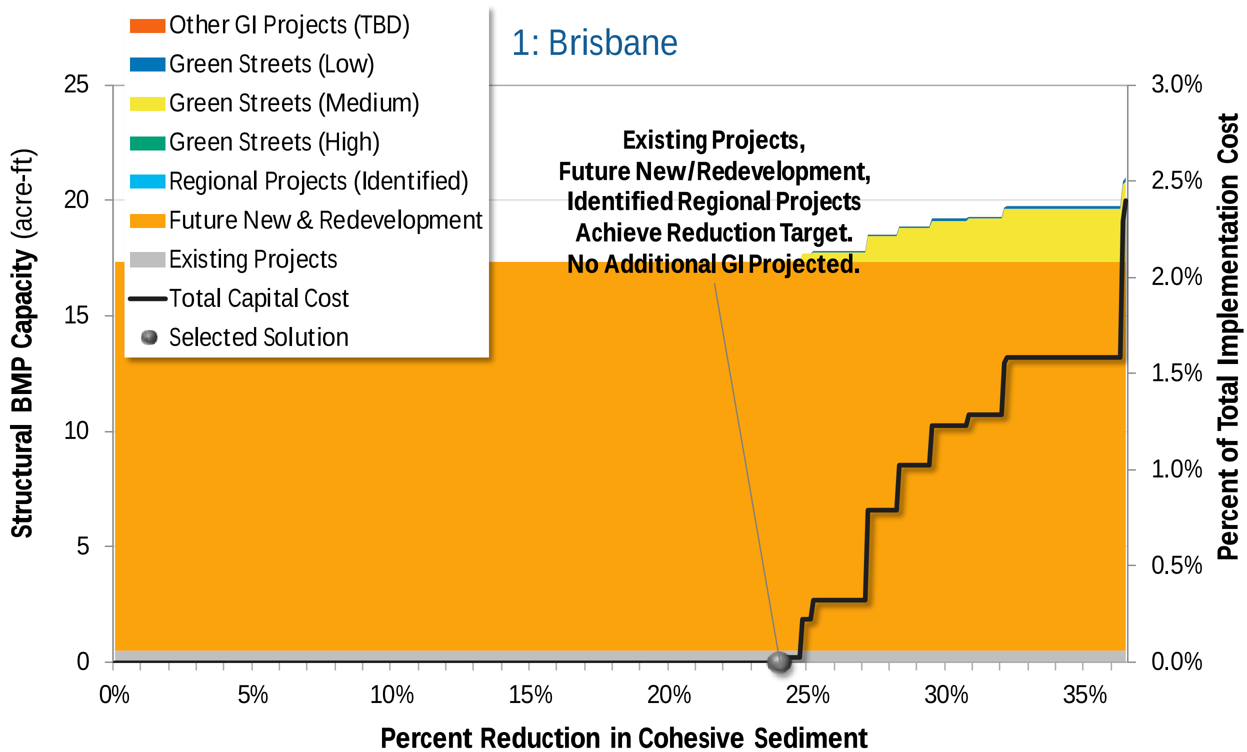


Figure C-5. Optimization summary for Brisbane - Scenario 1.

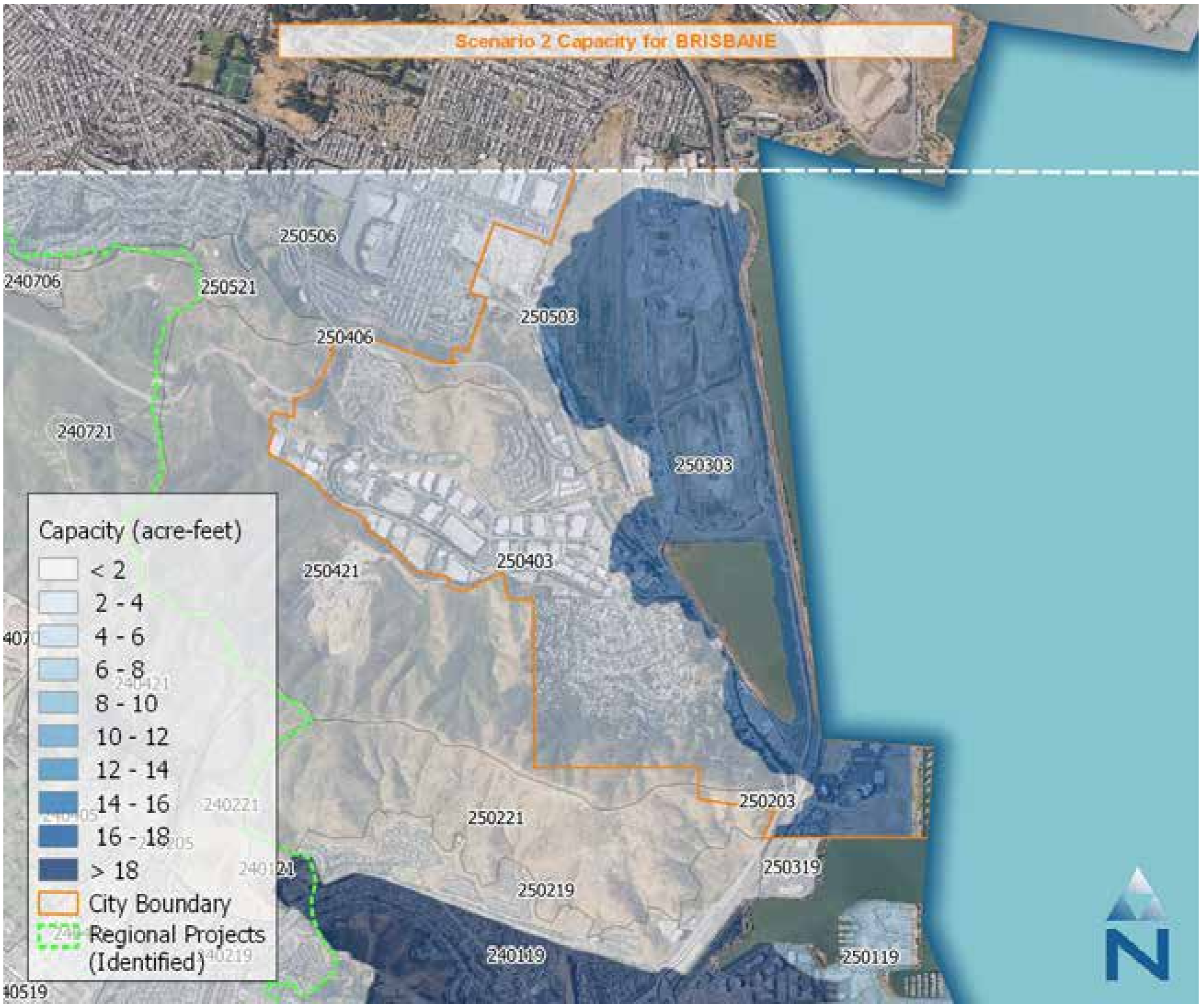


Figure C-6. Map of GI capacities by subwatershed in Brisbane - Scenario 1.

Table C-3. GI Implementation Strategy for Brisbane - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
250203	35%	0.77	0.50	--	0.15	--	--	--	--	--	**0.2**
250303	42%	150.20	122.82	--	13.28	--	--	--	--	--	**13.3**
250403	5%	18.37	13.67	0.50	1.16	--	--	--	--	--	**1.7**
250503	29%	29.96	26.63	--	2.23	--	--	--	--	--	**2.2**
Total	**24.0%**	**199.3**	**163.6**	**0.5**	**16.8**	**--**	**--**	**--**	**--**	**--**	**17.3**

Burlingame

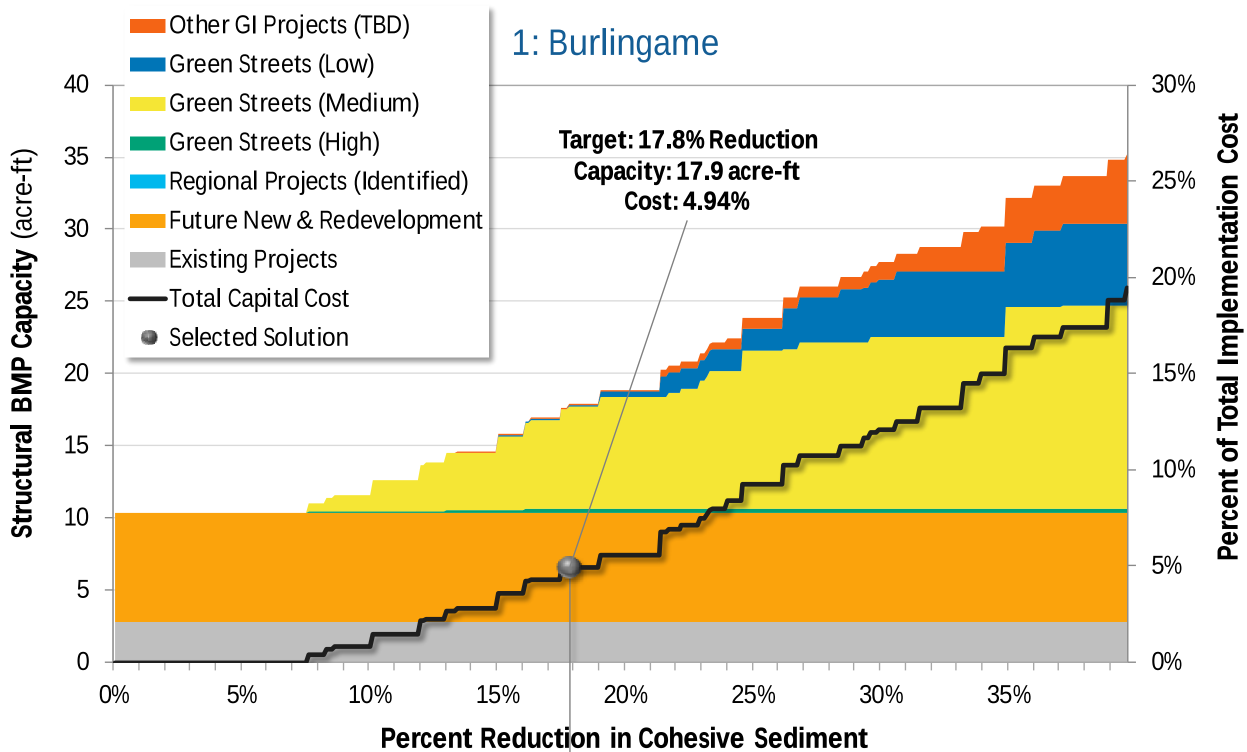


Figure C-7. Optimization summary for Burlingame - Scenario 1.

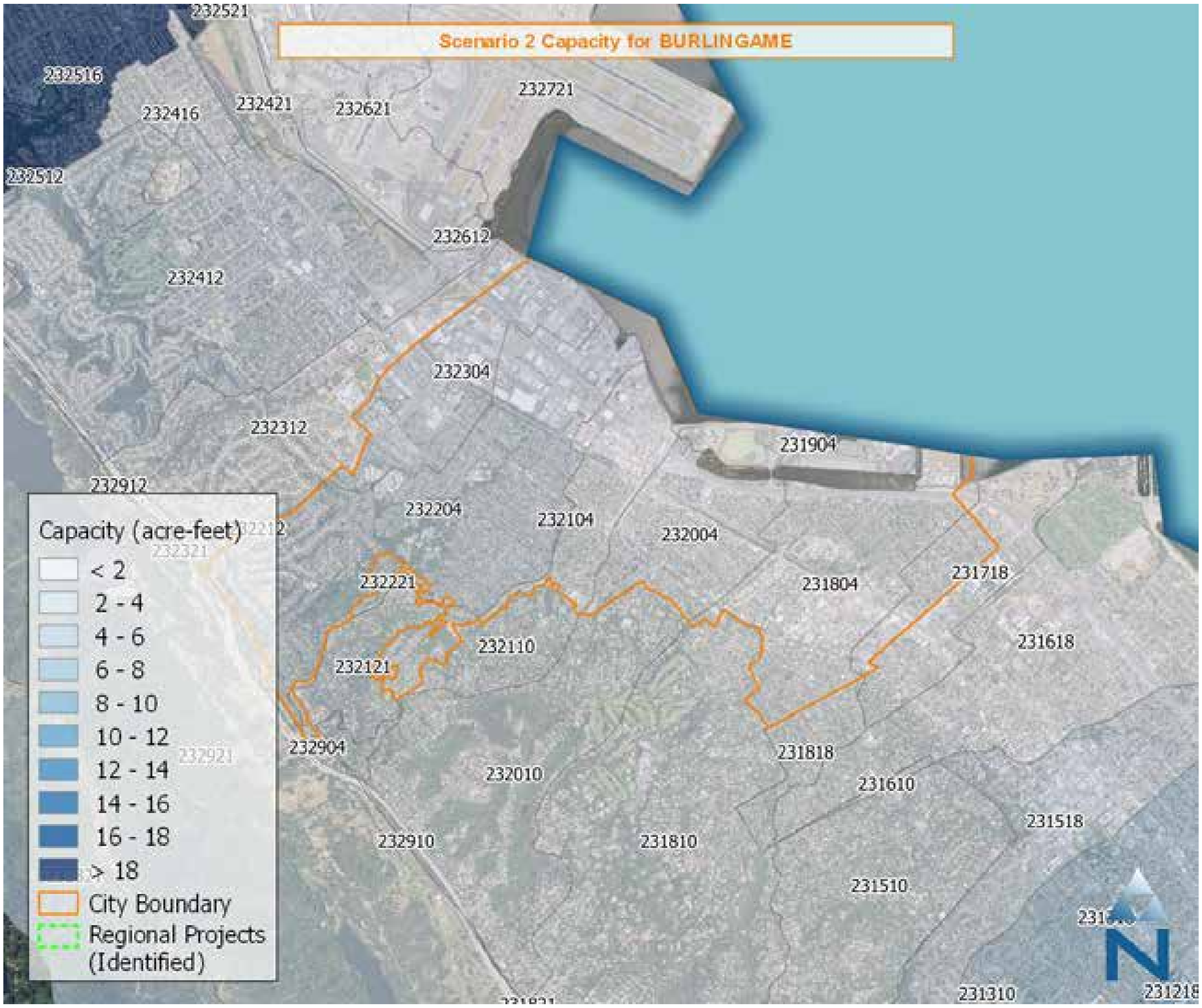


Figure C-8. Map of GI capacities by subwatershed in Burlingame - Scenario 1.

Table C-4. GI Implementation Strategy for Burlingame - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
231704	18%	10.79	7.25	0.03	0.10	--	--	0.53	--	--	**0.7**
231804	13%	48.88	23.42	0.40	0.78	--	0.17	1.39	--	--	**2.7**
231904	37%	22.86	19.87	0.80	0.02	--	--	0.76	0.07	0.08	**1.7**
232004	15%	26.14	12.56	0.30	0.48	--	--	0.79	--	--	**1.6**
232104	12%	20.31	17.97	0.44	1.52	--	0.04	--	--	--	**2.0**

Subwatershed ID	**Management Metrics for GI**			**Green Infrastructure Capacity to Achieve 17.6% Reduction Target** (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232204	23%	97.01	59.46	0.09	2.30	--	--	3.24	--	--	**5.6**
232304	16%	55.16	50.36	0.78	2.34	--	0.01	0.41	--	--	**3.6**
232904	38%	0.05	0.01	--	--	--	--	--	--	0.00	**0.0**
Total	**17.7%**	**281.2**	**190.9**	**2.8**	**7.5**	**--**	**0.2**	**7.1**	**0.1**	**0.1**	**17.9**

Colma

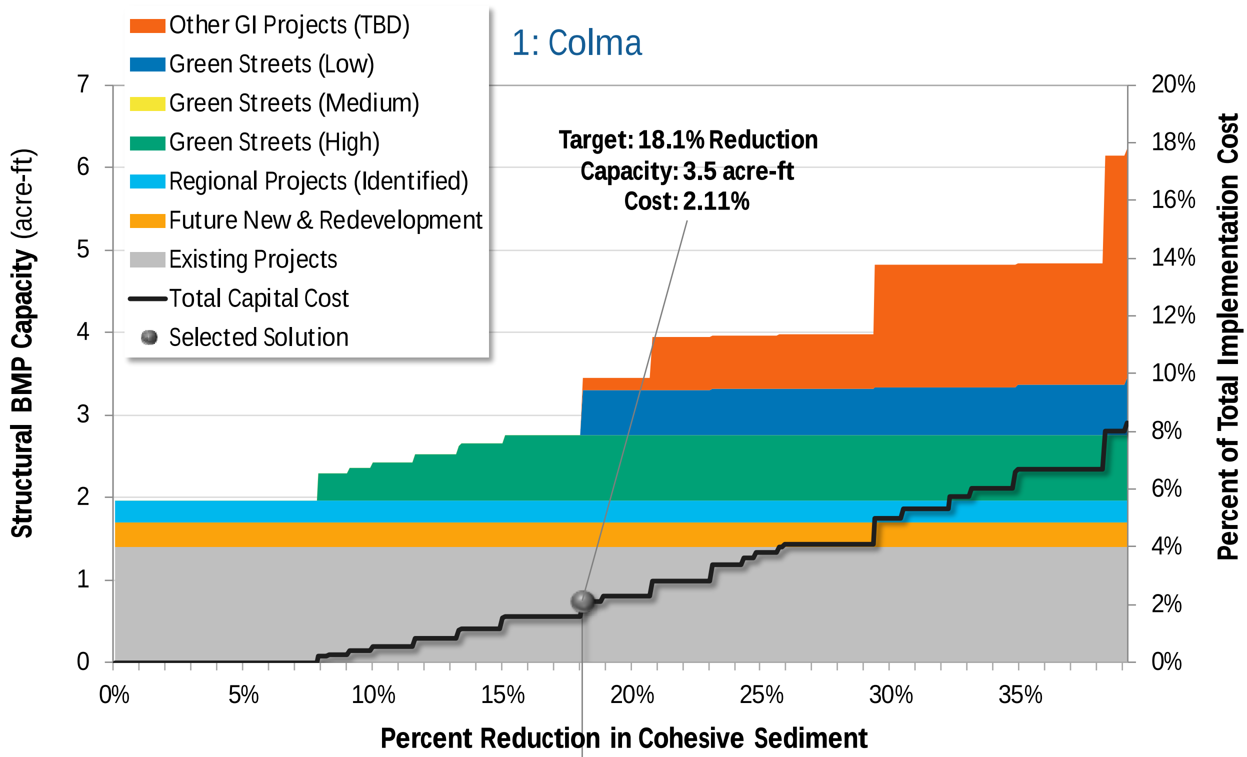


Figure C-9. Optimization summary for Colma - Scenario 1.

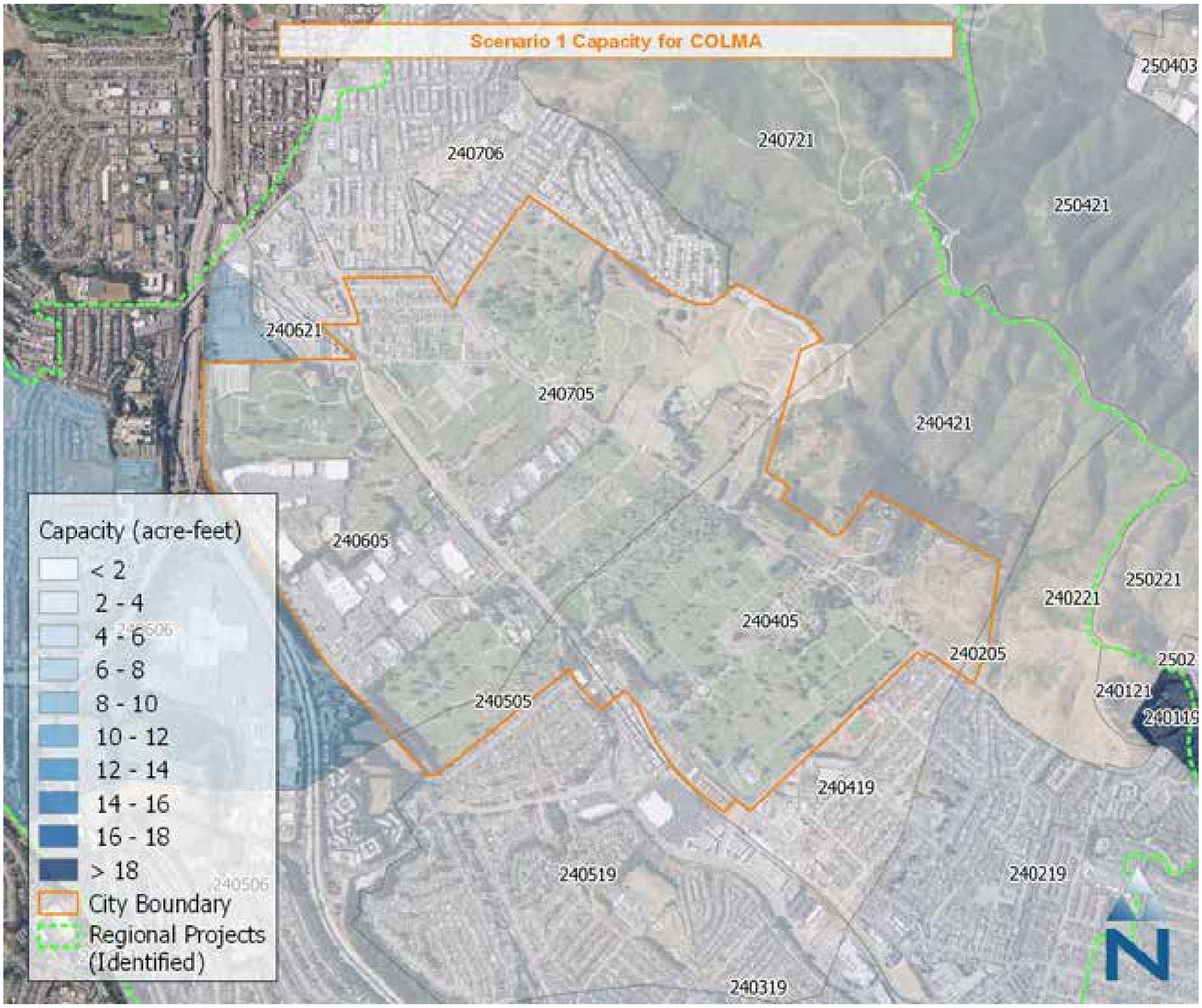


Figure C-10. Map of GI capacities by subwatershed in Colma - Scenario 1.

Table C-5. GI Implementation Strategy for Colma - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
240205	38%	0.66	0.04	--	0.00	0.00	--	--	0.00	--	**0.0**
240405	16%	22.76	4.36	0.10	0.09	0.08	0.28	--	--	--	**0.5**
240505	27%	4.37	0.35	0.01	0.01	0.01	--	0.00	--	--	**0.0**
240605	17%	33.26	50.95	0.70	0.09	--	0.12	--	0.54	0.16	**1.6**
240705	19%	55.48	13.27	0.58	0.12	0.16	0.40	--	--	--	**1.3**
Total	**18.1%**	**116.5**	**69.0**	**1.4**	**0.3**	**0.3**	**0.8**	**0.0**	**0.5**	**0.2**	**3.5**

Daly City

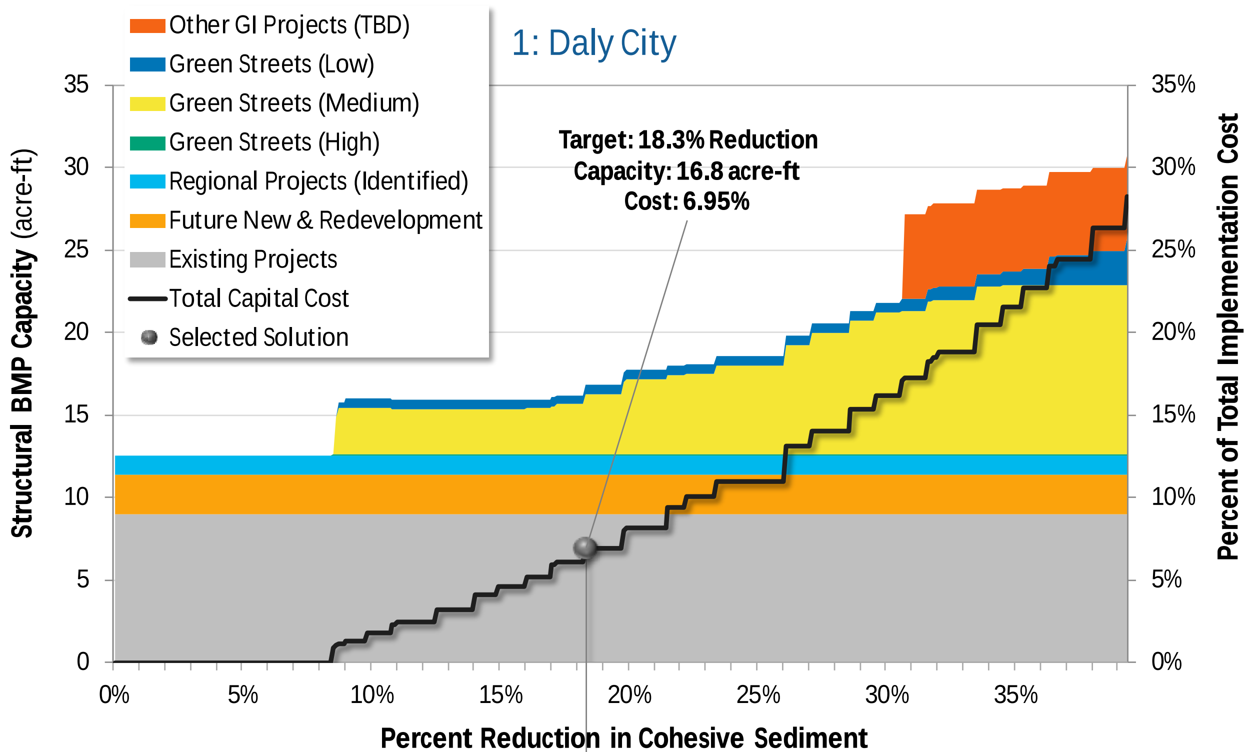


Figure C-11. Optimization summary for Daly City - Scenario 1.

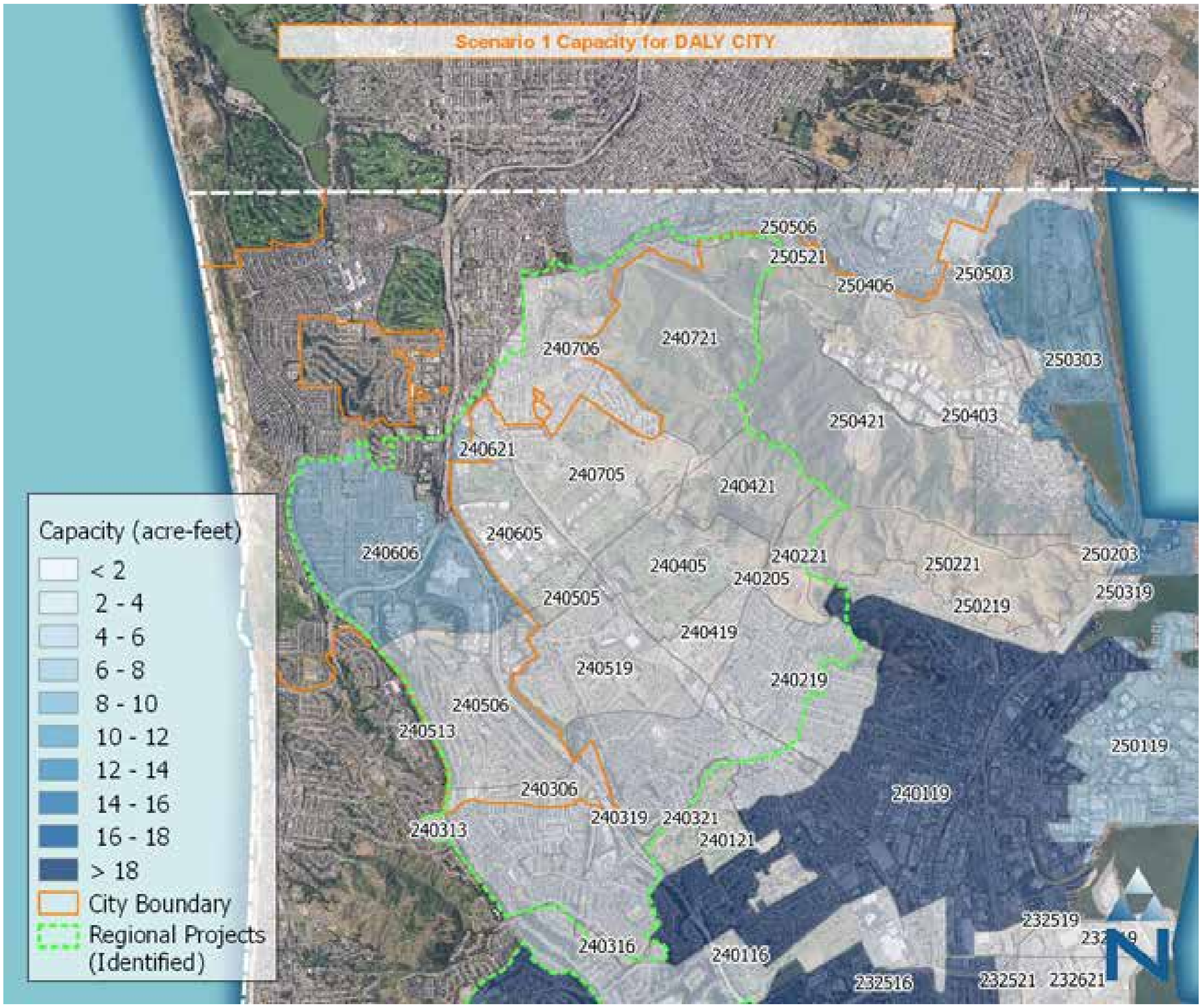


Figure C-12. Map of GI capacities by subwatershed in Daly City - Scenario 1.

Table C-6. GI Implementation Strategy for Daly City - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
240306	24%	30.97	2.80	--	0.05	0.07	--	0.28	--	--	**0.4**
240506	19%	98.89	11.24	0.83	0.00	0.29	--	0.50	--	--	**1.6**
240606	16%	132.12	48.08	7.67	0.30	0.48	--	--	--	--	**8.5**
240706	19%	112.03	12.74	0.24	0.27	0.33	0.06	0.12	--	--	**1.0**
250406	7%	0.00	0.00	--	0.00	--	--	--	--	0.00	**0.0**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
250506	47%	6.33	95.89	0.25	1.75	0.01	--	2.78	0.56	--	**5.3**
Total	**18.3%**	**380.3**	**170.7**	**9.0**	**2.4**	**1.2**	**0.1**	**3.7**	**0.6**	**0.0**	**16.8**

East Palo Alto

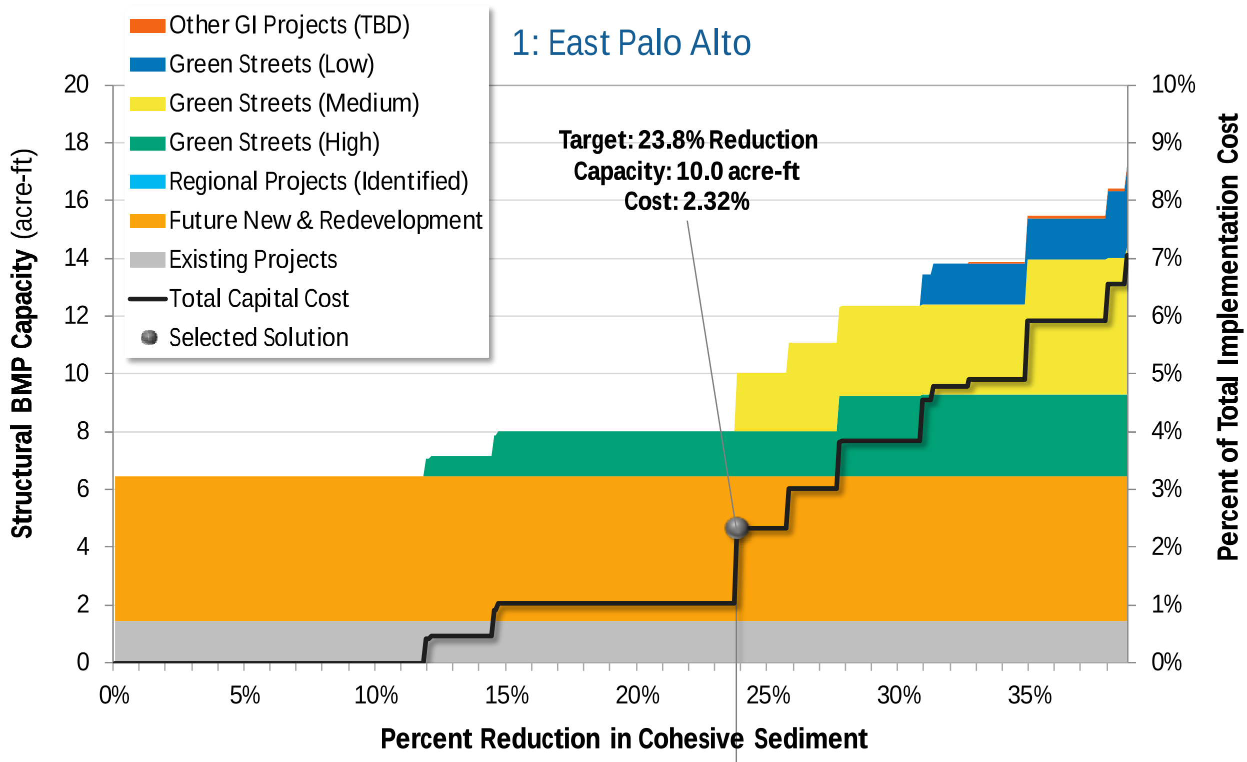


Figure C-13. Optimization summary for East Palo Alto - Scenario 1.

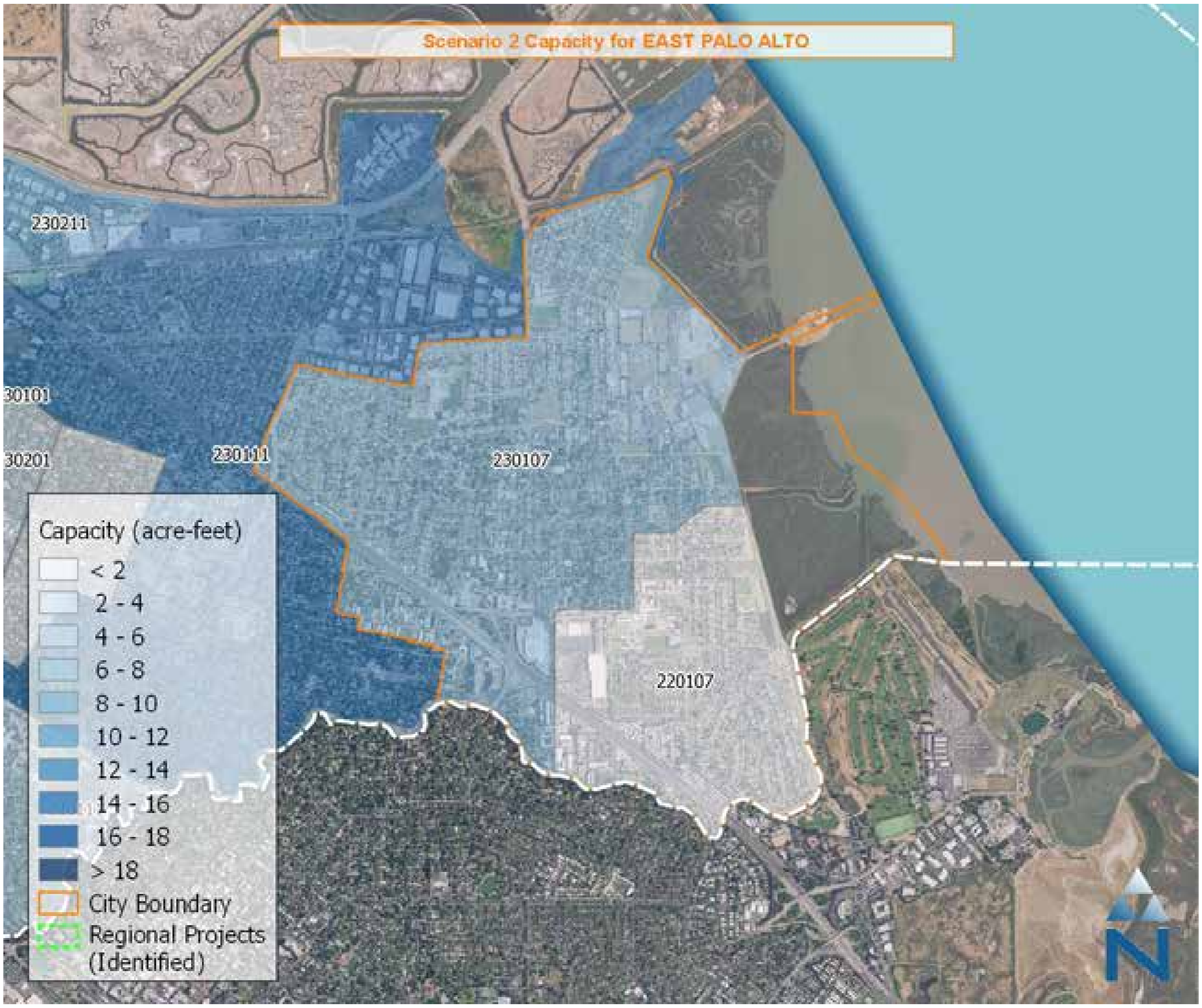


Figure C-14. Map of GI capacities by subwatershed in East Palo Alto - Scenario 1.

Table C-7. GI Implementation Strategy for East Palo Alto - Scenario 1

Subwatershed ID	**Management Metrics for GI**			**Green Infrastructure Capacity to Achieve 17.6% Reduction Target** (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
220107	15%	22.86	22.61	0.23	0.33	--	1.24	--	--	--	**1.8**
230107	28%	82.90	88.13	1.23	4.67	--	0.33	2.00	--	--	**8.2**
Total	**23.7%**	**105.8**	**110.7**	**1.5**	**5.0**	**--**	**1.6**	**2.0**	**--**	**--**	**10.0**

Foster City

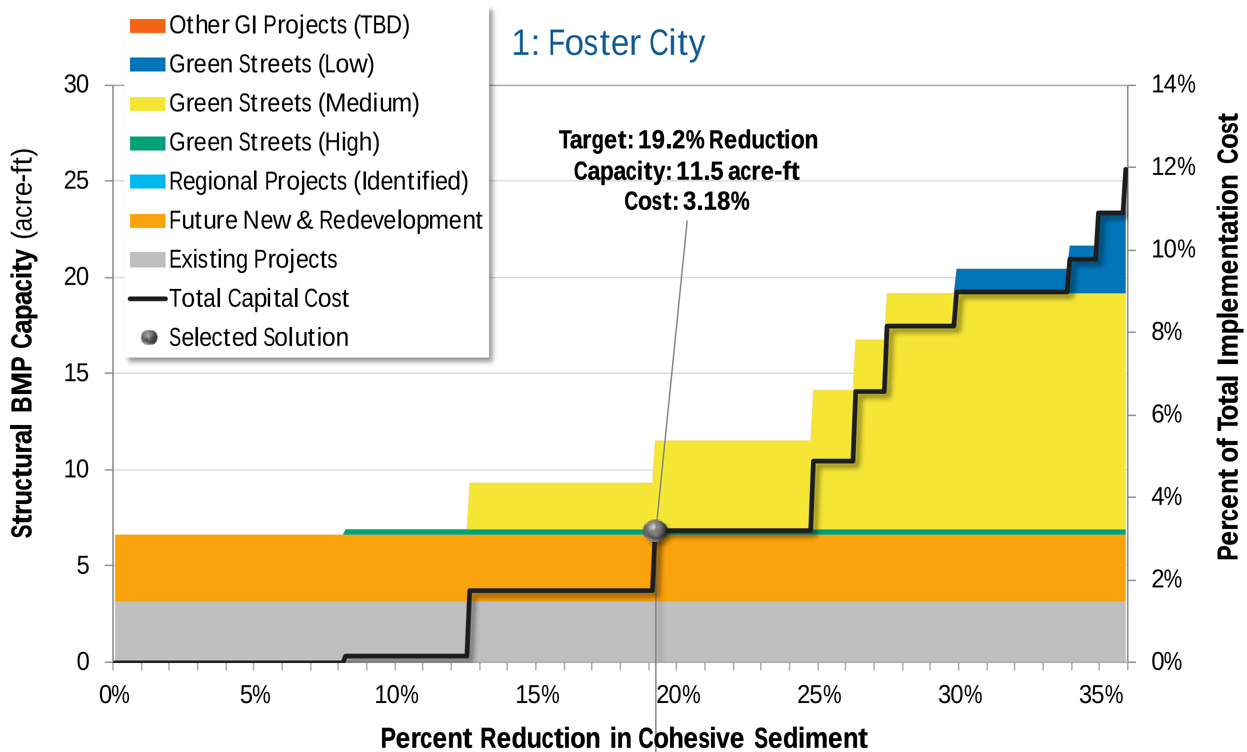


Figure C-15. Optimization summary for Foster City - Scenario 1.

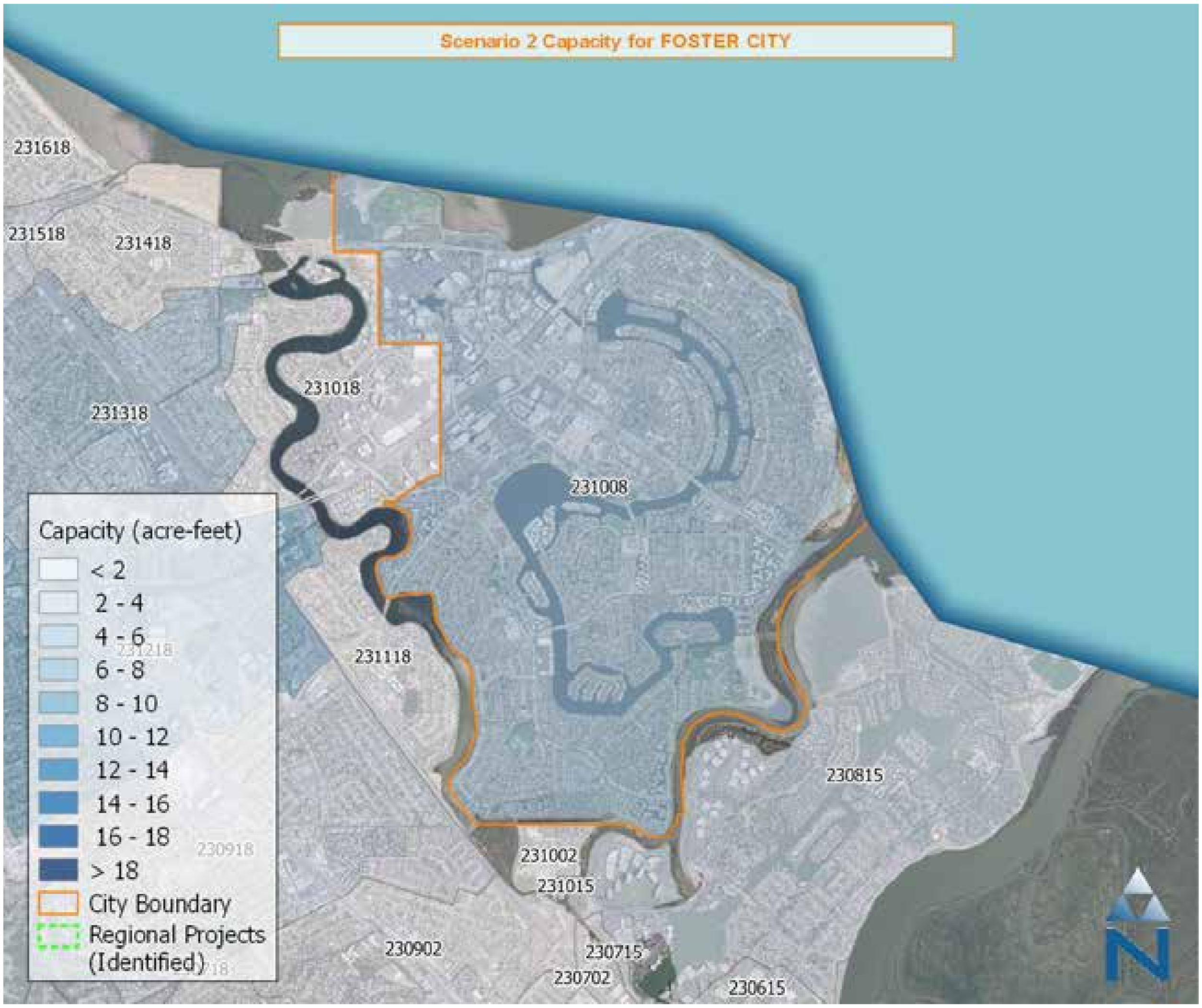


Figure C-16. Map of GI capacities by subwatershed in Foster City - Scenario 1.

Table C-8. GI Implementation Strategy for Foster City - Scenario 1

Subwatershed ID	**Management Metrics for GI**			**Green Infrastructure Capacity to Achieve 17.6% Reduction Target** (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
231008	19%	173.71	134.79	3.16	3.49	--	0.27	4.61	--	--	**11.5**
Total	**19.1%**	**173.7**	**134.8**	**3.2**	**3.5**	**--**	**0.3**	**4.6**	**--**	**--**	**11.5**

Hillsborough

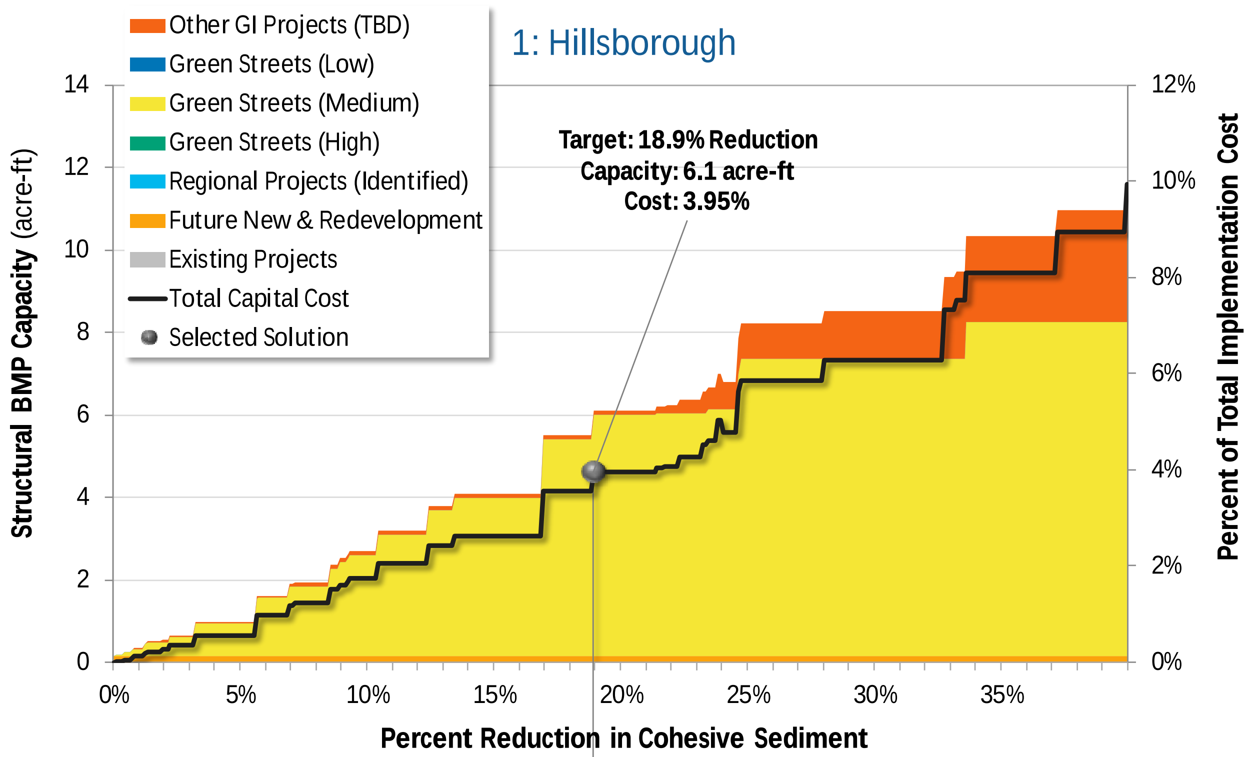


Figure C-17. Optimization summary for Hillsborough - Scenario 1.

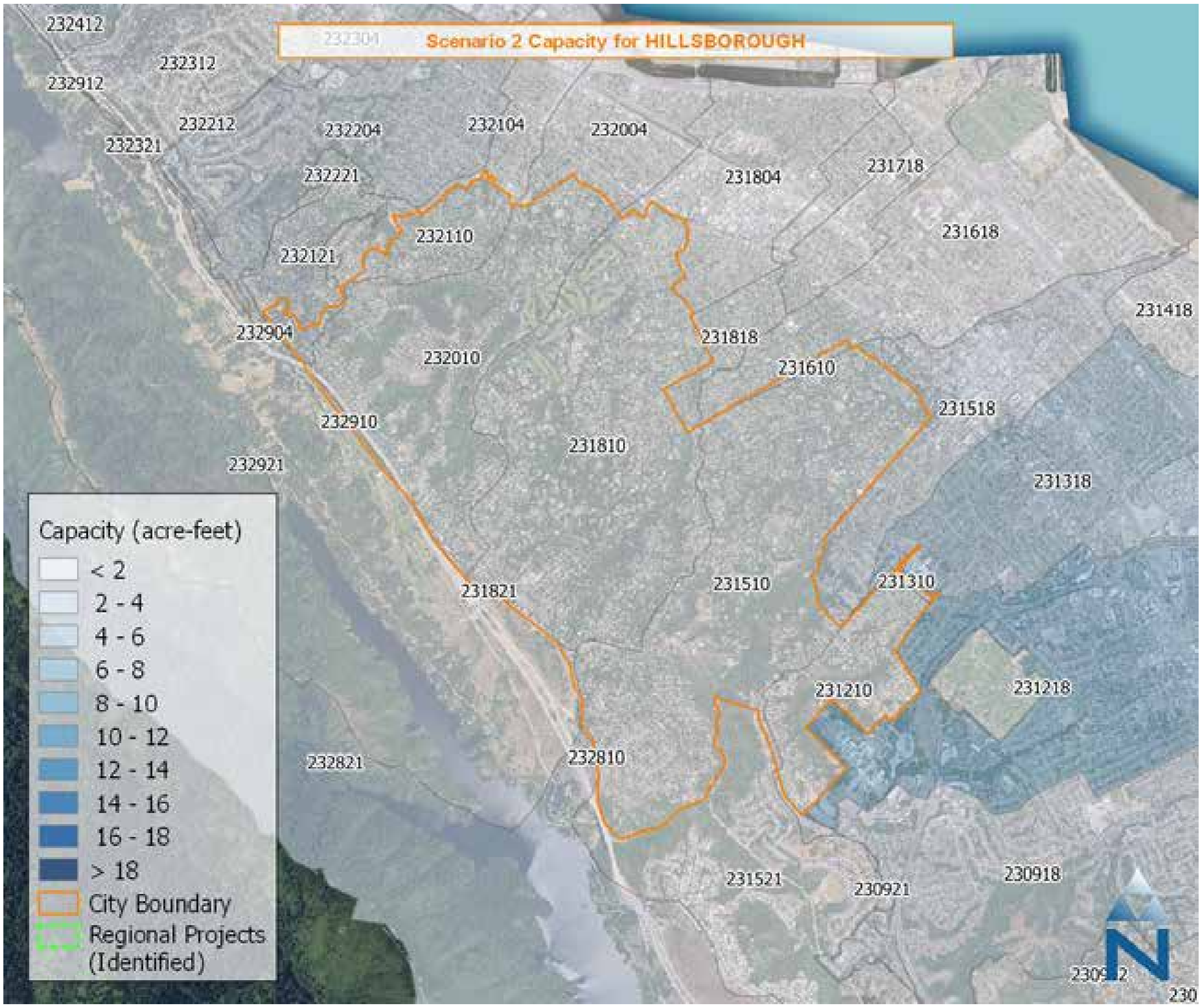


Figure C-18. Map of GI capacities by subwatershed in Hillsborough - Scenario 1.

Table C-9. GI Implementation Strategy for Hillsborough - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
231210	25%	5.97	7.79	--	0.02	--	--	0.21	--	0.04	**0.3**
231310	29%	0.48	0.30	--	0.00	--	--	0.05	--	--	**0.0**
231510	23%	25.43	8.93	--	0.07	--	--	1.33	--	--	**1.4**
231610	44%	0.34	0.29	--	0.00	--	--	0.01	--	0.00	**0.0**
231810	15%	61.79	23.42	0.00	0.06	--	--	3.07	--	--	**3.1**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232010	23%	17.15	4.68	0.00	0.01	--	--	0.76	--	--	**0.8**
232110	25%	5.42	2.01	--	0.01	--	--	0.39	--	--	**0.4**
232810	36%	0.06	0.03	--	0.00	--	--	0.00	--	0.00	**0.0**
232910	43%	1.45	0.25	--	0.00	--	--	0.03	--	0.05	**0.1**
Total	**18.9%**	**118.1**	**47.7**	**0.0**	**0.2**	**--**	**--**	**5.8**	**--**	**0.1**	**6.1**

Menlo Park

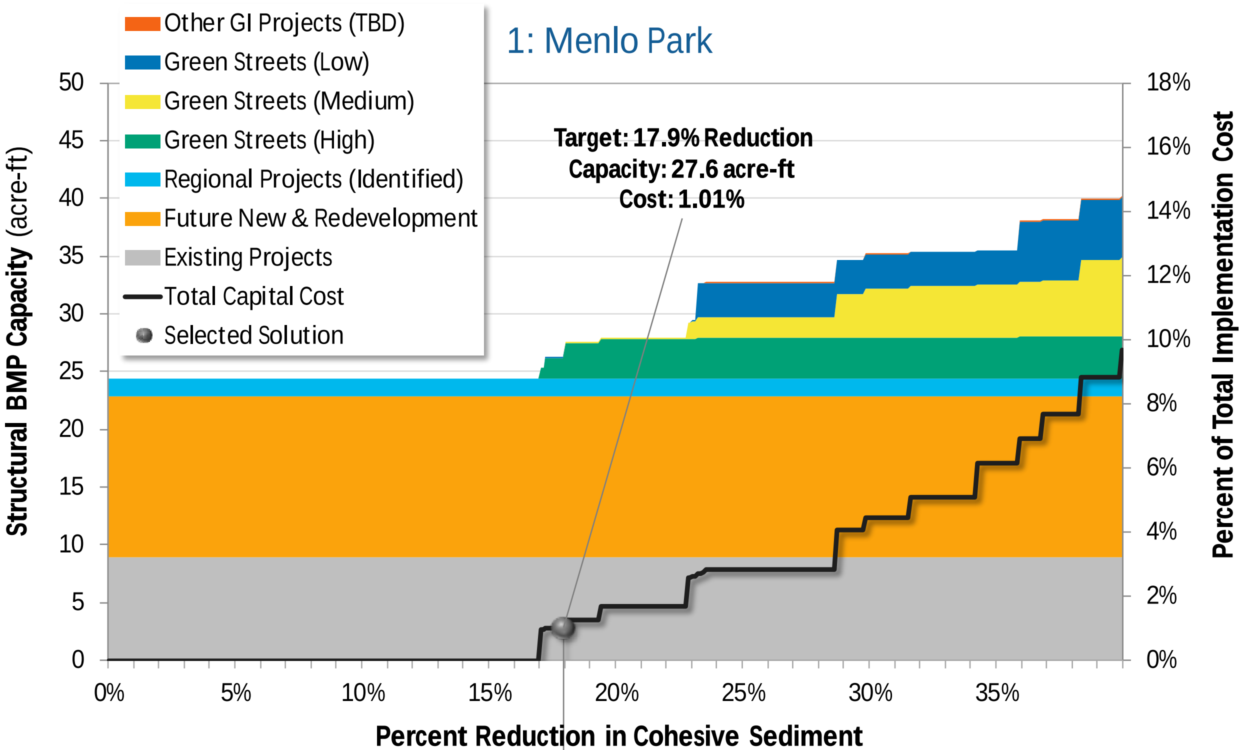


Figure C-19. Optimization summary for Menlo Park - Scenario 1.

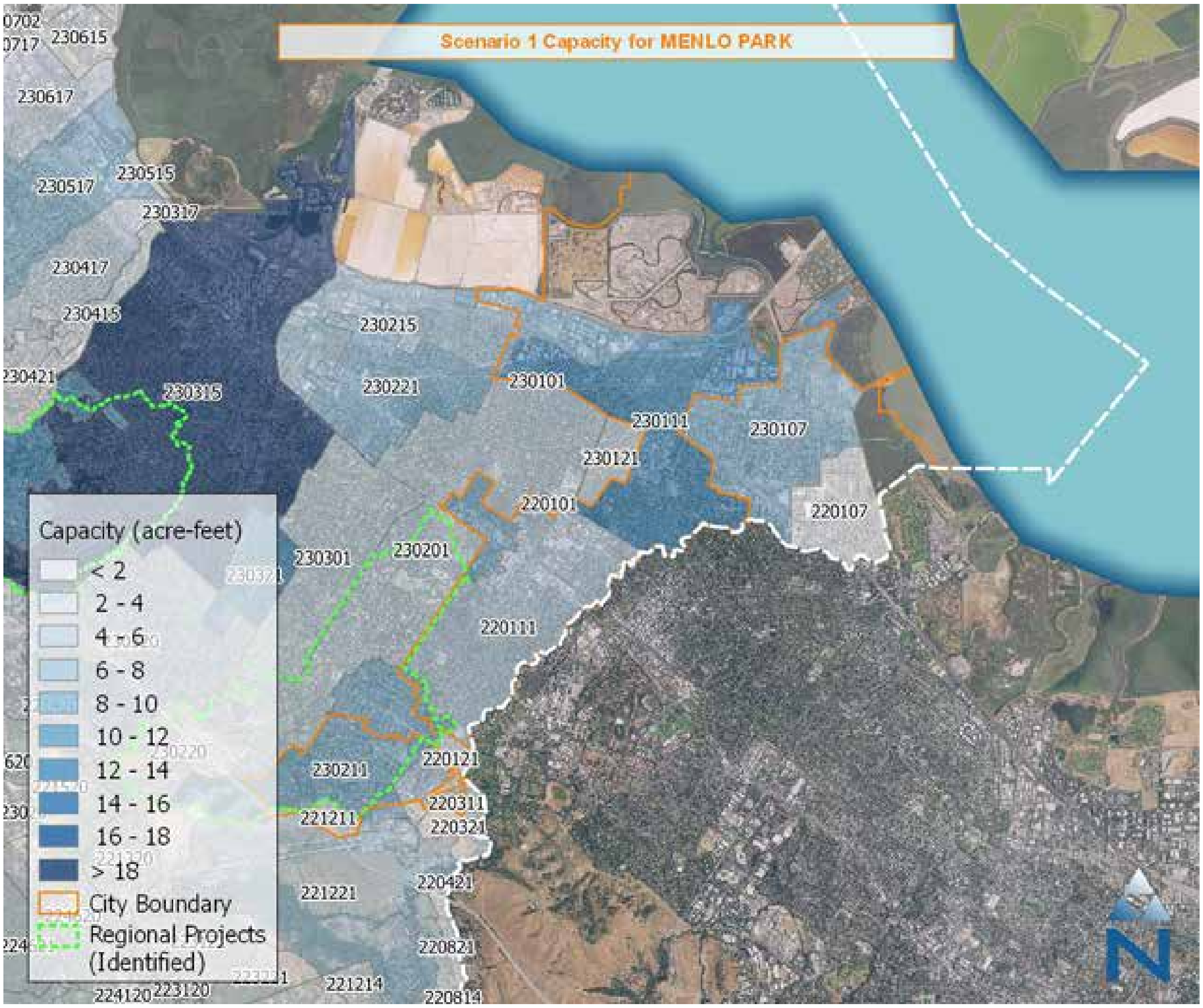


Figure C-20. Map of GI capacities by subwatershed in Menlo Park - Scenario 1.

Table C-10. GI Implementation Strategy for Menlo Park - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
220111	23%	1.26	26.11	1.12	1.12	0.03	2.19	0.08	--	--	**4.5**
220311	13%	1.10	0.27	--	--	--	--	0.03	0.05	--	**0.1**
221211	15%	0.50	4.22	0.86	0.10	0.02	--	--	--	--	**1.0**
230111	19%	69.81	94.39	4.81	7.32	--	--	--	--	--	**12.1**
230211	17%	37.95	80.00	2.10	5.41	1.50	0.91	--	--	--	**9.9**
Total	**17.9%**	**110.6**	**205.0**	**8.9**	**13.9**	**1.6**	**3.1**	**0.1**	**0.0**	**--**	**27.6**

Millbrae

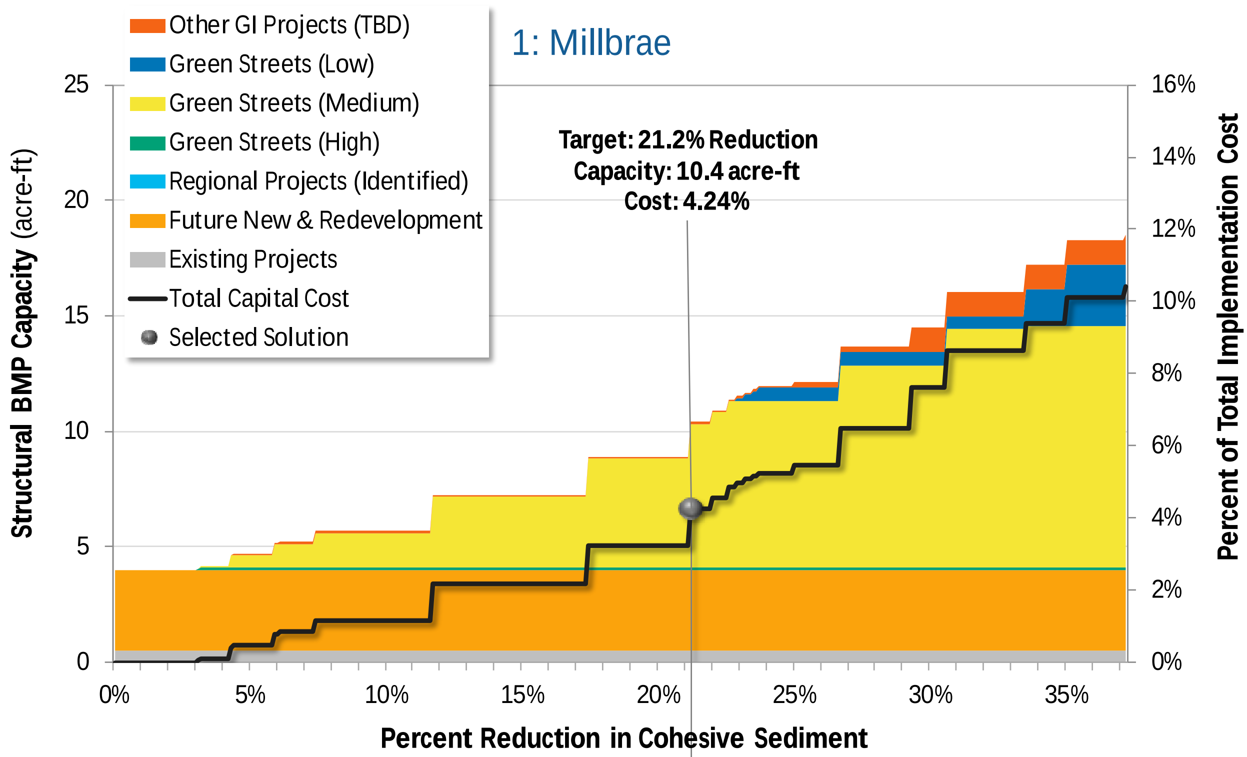


Figure C-21. Optimization summary for Millbrae - Scenario 1.

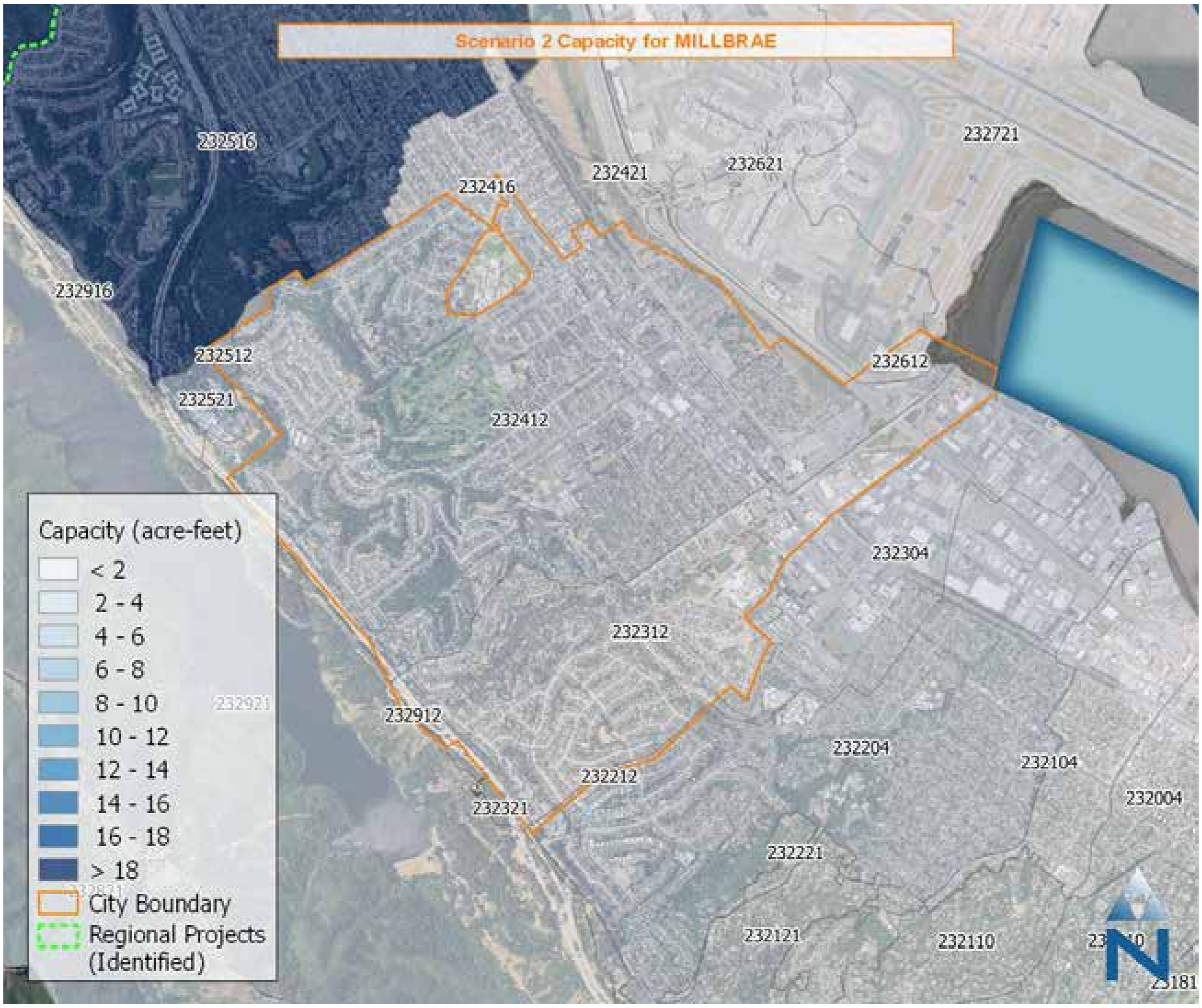


Figure C-22. Map of GI capacities by subwatershed in Millbrae - Scenario 1.

Table C-11. GI Implementation Strategy for Millbrae - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing/Planned: Existing Projects	Existing/Planned: Future New & Redevelopment	Existing/Planned: Regional Projects (Identified)	Green Streets: High	Green Streets: Medium	Green Streets: Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232212	75%	1.55	0.66	--	0.00	--	--	0.06	--	0.05	**0.1**
232312	16%	42.40	27.21	0.23	0.68	--	--	1.44	--	--	**2.4**
232412	23%	146.83	92.11	0.28	2.76	--	0.09	4.72	--	--	**7.8**
232512	46%	0.09	0.02	--	0.00	--	--	--	0.00	0.00	**0.0**
232612	59%	0.99	0.76	--	0.04	--	--	0.01	--	0.03	**0.1**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232912	53%	0.15	0.04	--	0.00	--	--	--	--	0.01	**0.0**
Total	**21.2%**	**192.0**	**120.8**	**0.5**	**3.5**	**--**	**0.1**	**6.2**	**0.0**	**0.1**	**10.4**

Pacifica

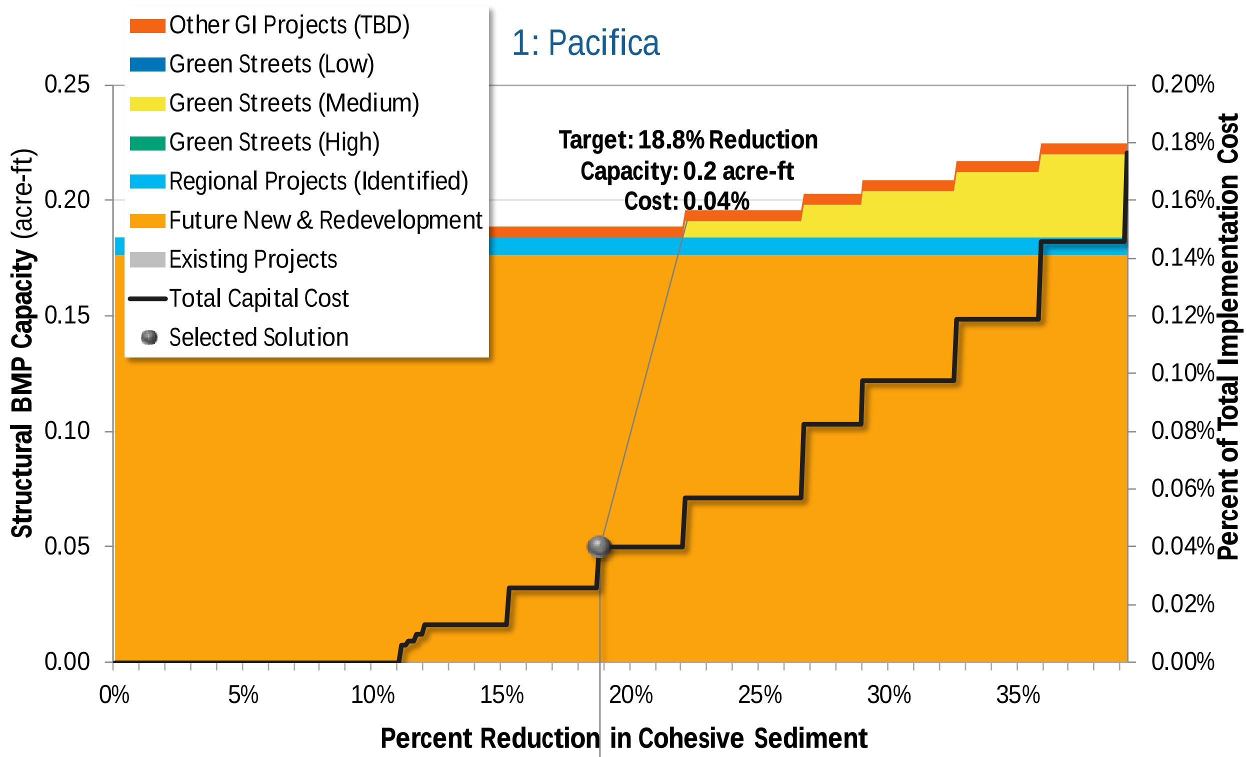


Figure C-23. Optimization summary for Pacifica - Scenario 1.

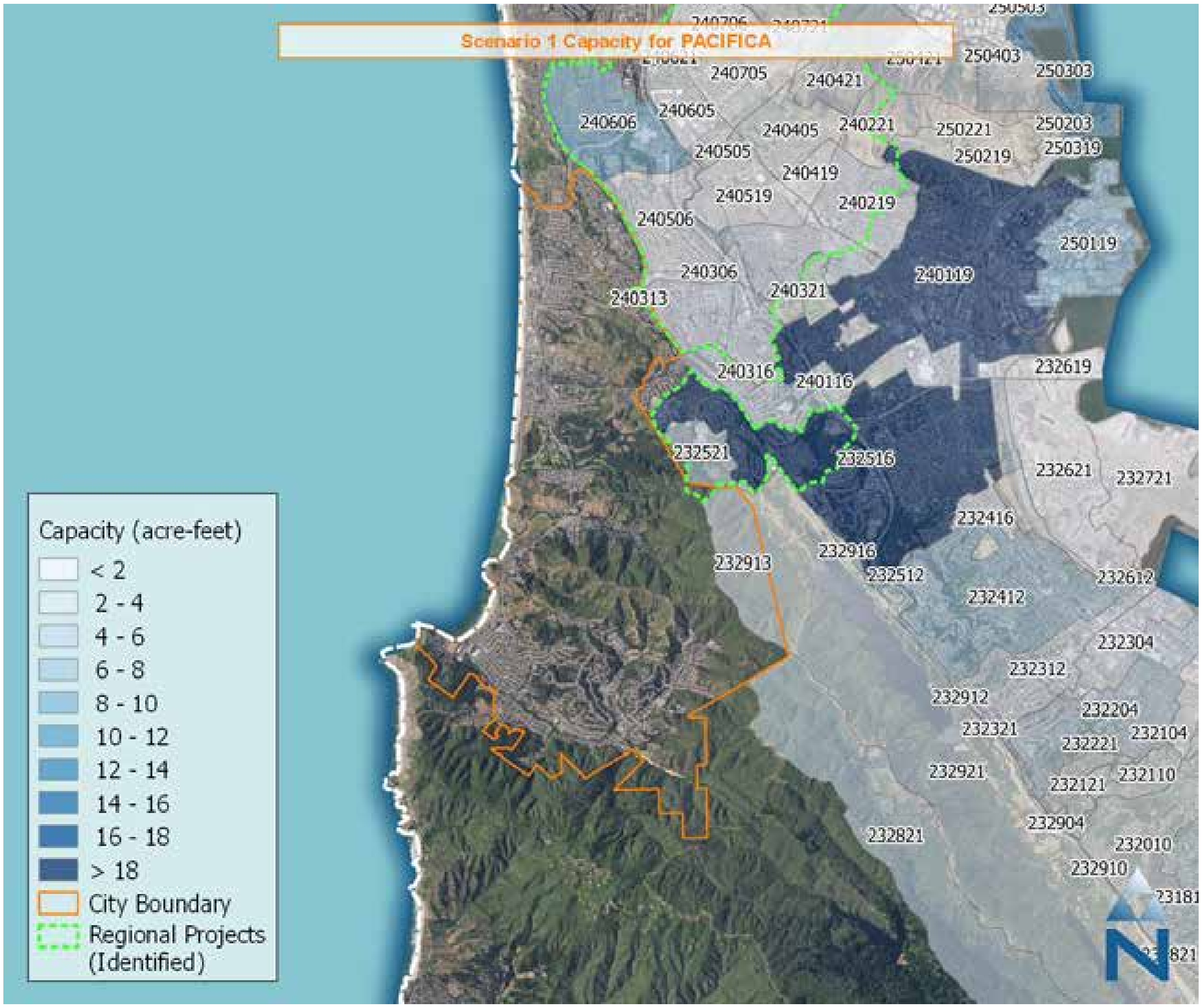


Figure C-24. Map of GI capacities by subwatershed in Pacifica - Scenario 1.

Table C-12. GI Implementation Strategy for Pacifica - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232913	90%	0.26	0.01	--	0.14	--	--	--	--	--	**0.1**
240313	16%	2.14	0.30	--	0.03	0.01	--	--	--	--	**0.0**
240513	34%	0.12	0.02	--	0.01	--	--	--	--	0.00	**0.0**
Total	**18.8%**	**2.5**	**0.3**	**--**	**0.2**	**0.0**	**--**	**--**	**--**	**0.0**	**0.2**

Portola Valley

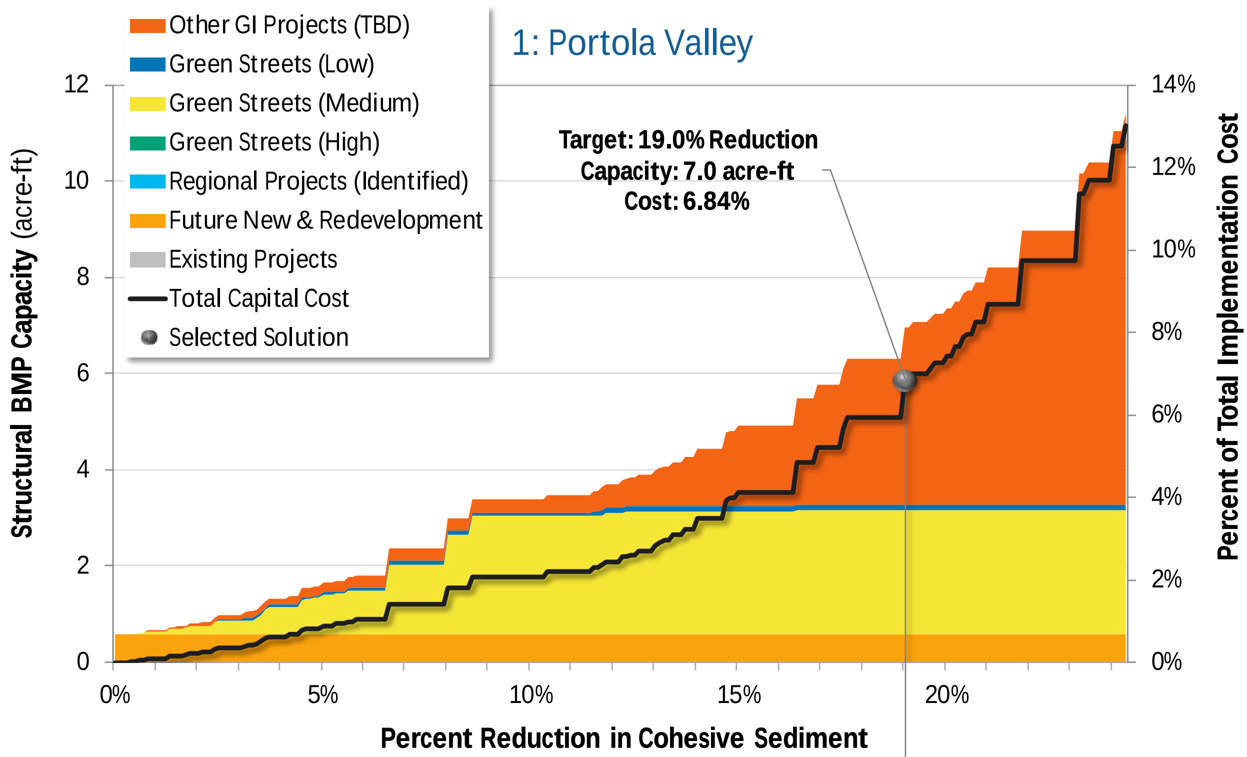


Figure C-25. Optimization summary for Portola Valley - Scenario 1.

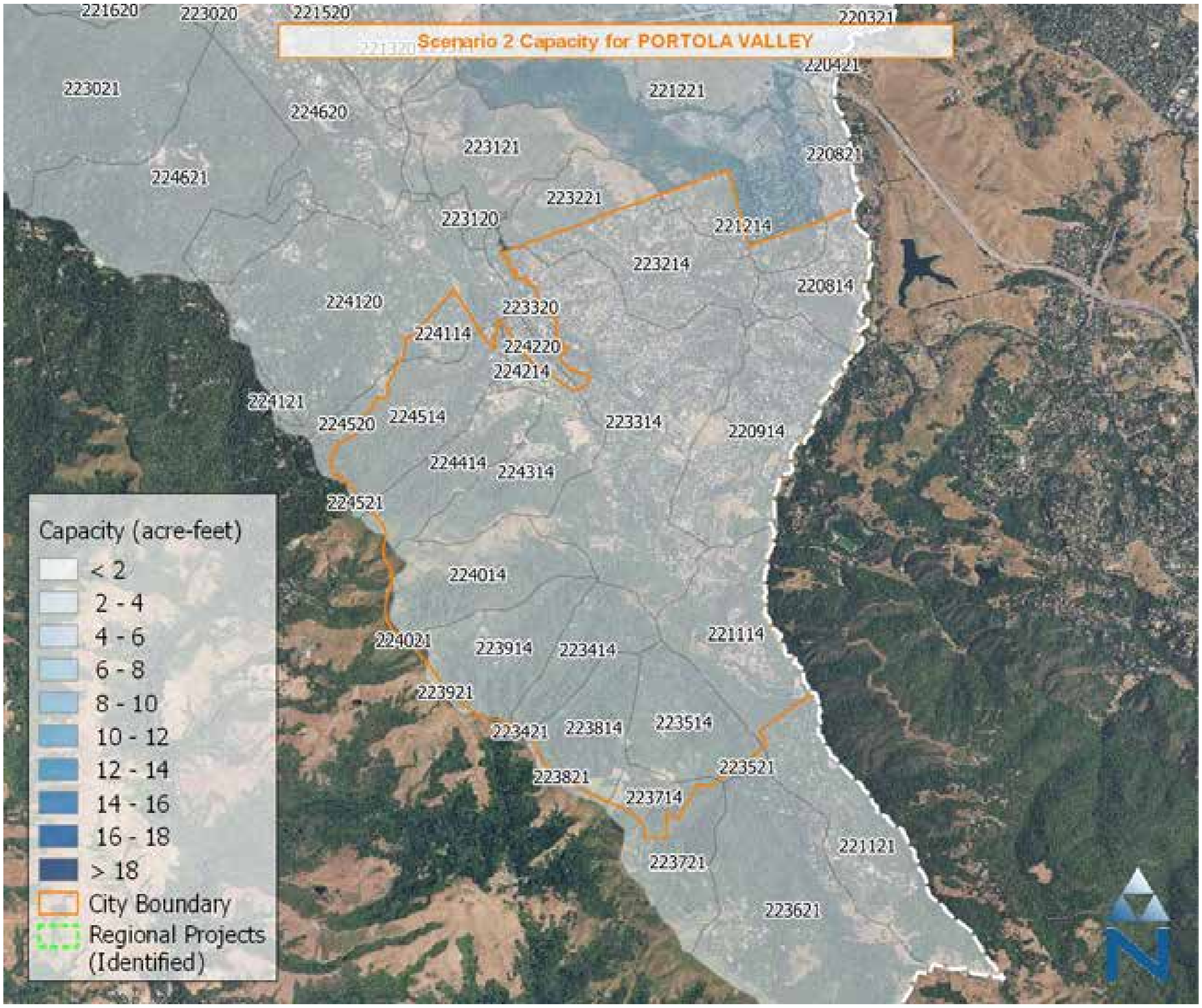


Figure C-26. Map of GI capacities by subwatershed in Portola Valley - Scenario 1.

Table C-13. GI Implementation Strategy for Portola Valley - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
220814	14%	7.21	0.64	--	0.05	--	--	0.11	0.05	0.24	**0.4**
220914	32%	34.57	4.85	--	0.01	--	--	0.77	0.05	0.91	**1.7**
221114	20%	5.77	0.20	--	0.01	--	--	0.05	0.00	0.22	**0.3**
221214	6%	2.38	0.30	--	0.13	--	--	0.04	--	0.05	**0.2**
223214	10%	8.61	1.56	--	0.13	--	--	0.16	--	0.29	**0.6**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
223314	22%	44.10	5.06	--	0.16	--	--	1.03	--	0.98	**2.2**
223414	15%	0.16	0.00	--	0.01	--	--	--	--	0.01	**0.0**
223514	10%	0.19	0.00	--	0.01	--	--	0.00	--	0.00	**0.0**
223714	11%	0.02	0.00	--	0.00	--	--	--	--	0.00	**0.0**
223814	10%	0.08	0.00	--	0.01	--	--	--	--	0.00	**0.0**
223914	28%	0.53	0.00	--	0.01	--	--	--	--	0.07	**0.1**
224014	99%	0.02	0.00	--	0.01	--	--	--	--	--	**0.0**
224114	6%	0.23	0.00	--	0.00	--	--	--	--	0.02	**0.0**
224214	41%	9.43	1.35	--	0.00	--	--	0.15	--	0.49	**0.6**
224314	32%	9.87	1.89	--	0.01	--	--	0.16	--	0.33	**0.5**
224414	21%	0.61	0.09	--	0.01	--	--	--	--	0.06	**0.1**
224514	9%	6.15	0.24	--	0.01	--	--	0.12	--	0.02	**0.2**
Total	**19.0%**	**129.9**	**16.2**	**--**	**0.6**	**--**	**--**	**2.6**	**0.1**	**3.7**	**7.0**

Redwood City

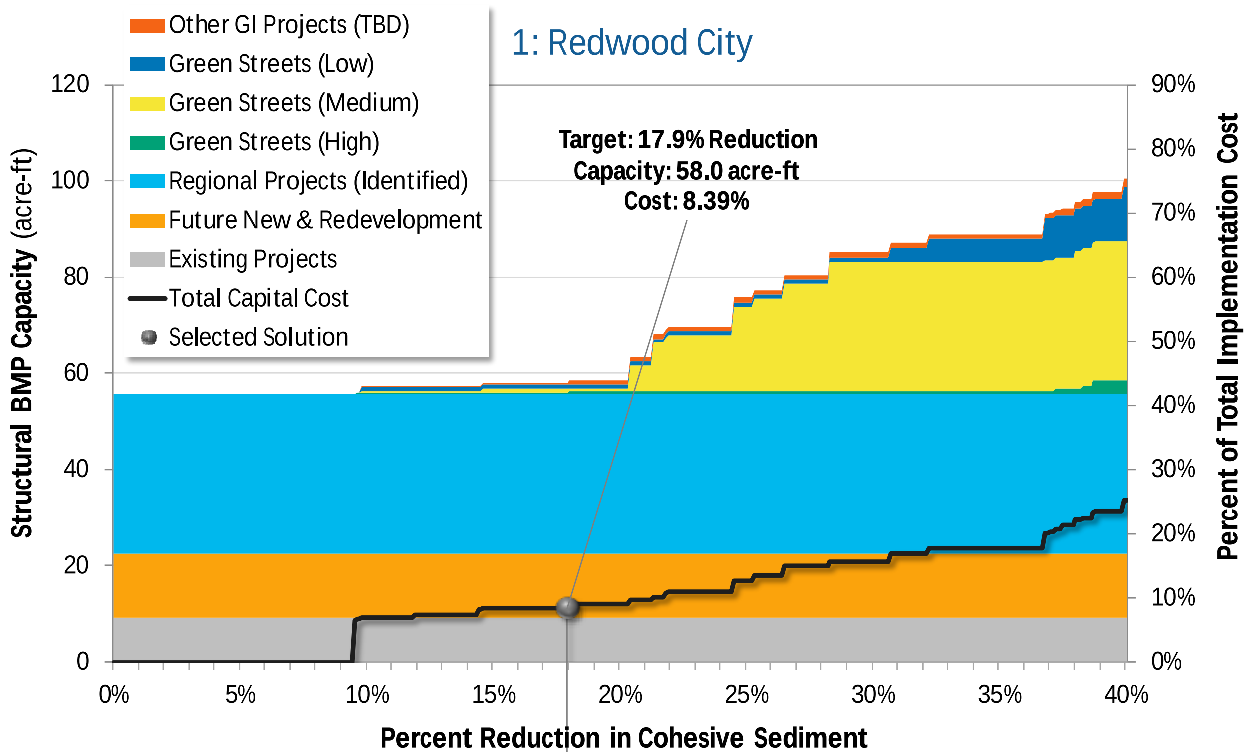


Figure C-27. Optimization summary for Redwood City - Scenario 1.

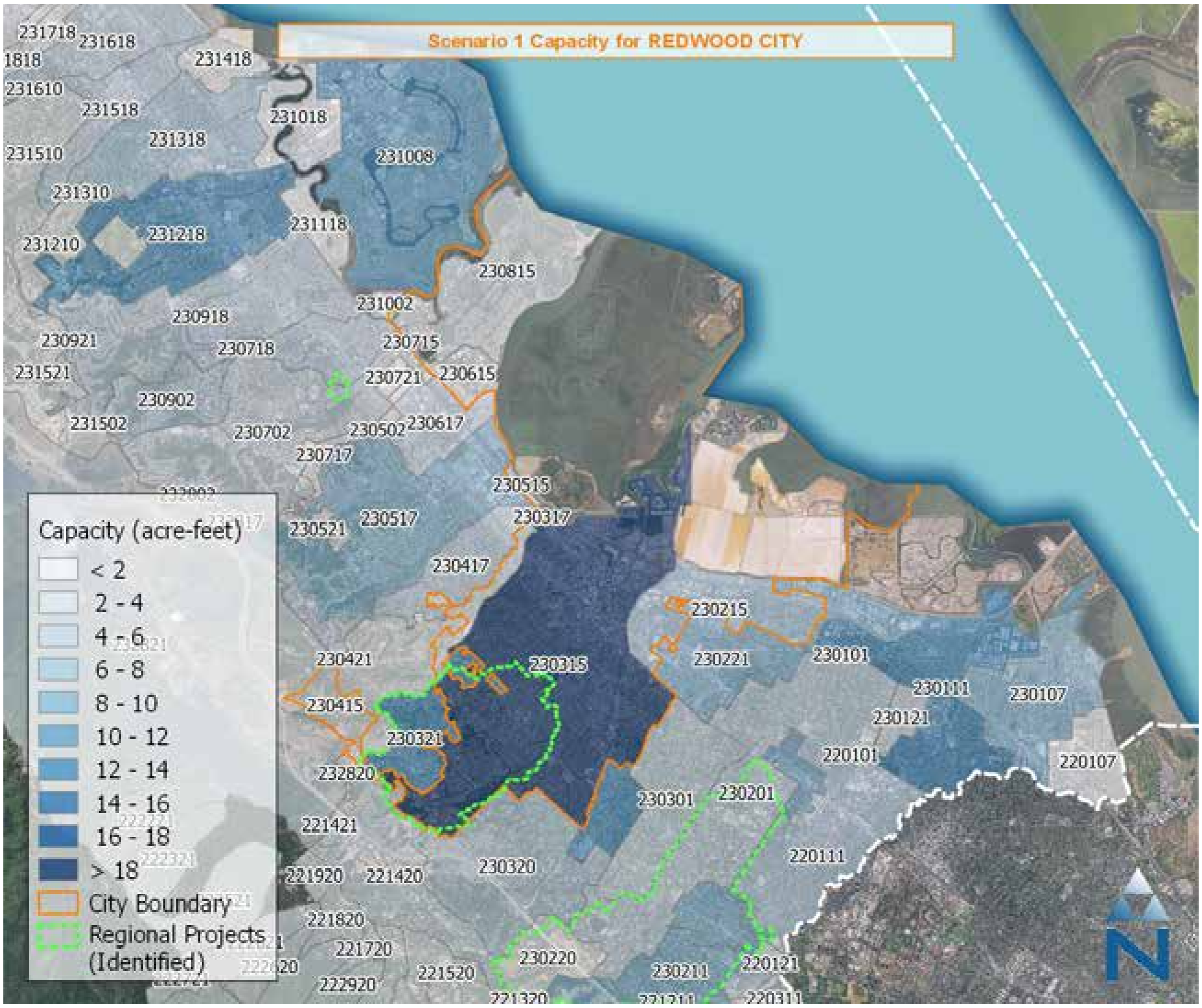


Figure C-28. Map of GI capacities by subwatershed in Redwood City - Scenario 1.

Table C-14. GI Implementation Strategy for Redwood City - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
221415	52%	0.03	0.00	--	--	0.00	--	--	--	0.00	**0.0**
230215	15%	64.02	98.10	3.15	4.12	--	--	--	--	--	**7.3**
230315	20%	295.42	135.21	4.76	8.25	32.97	0.26	--	--	--	**46.2**
230415	49%	1.23	8.46	0.45	0.14	0.06	0.23	0.06	0.82	0.24	**2.0**
230515	15%	0.25	0.13	--	0.01	--	--	--	--	0.01	**0.0**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
230615	13%	13.33	16.72	0.04	0.29	--	--	0.61	--	--	**0.9**
230715	9%	0.49	0.27	--	0.02	--	0.02	0.00	--	--	**0.0**
230815	3%	11.28	12.79	0.76	0.52	--	0.01	--	--	--	**1.3**
231015	21%	0.21	0.31	--	0.01	--	--	--	--	0.01	**0.0**
232815	52%	2.14	0.92	--	0.00	0.09	--	0.08	--	0.05	**0.2**
Total	**17.9%**	**388.4**	**272.9**	**9.2**	**13.4**	**33.1**	**0.5**	**0.8**	**0.8**	**0.3**	**58.0**

San Bruno

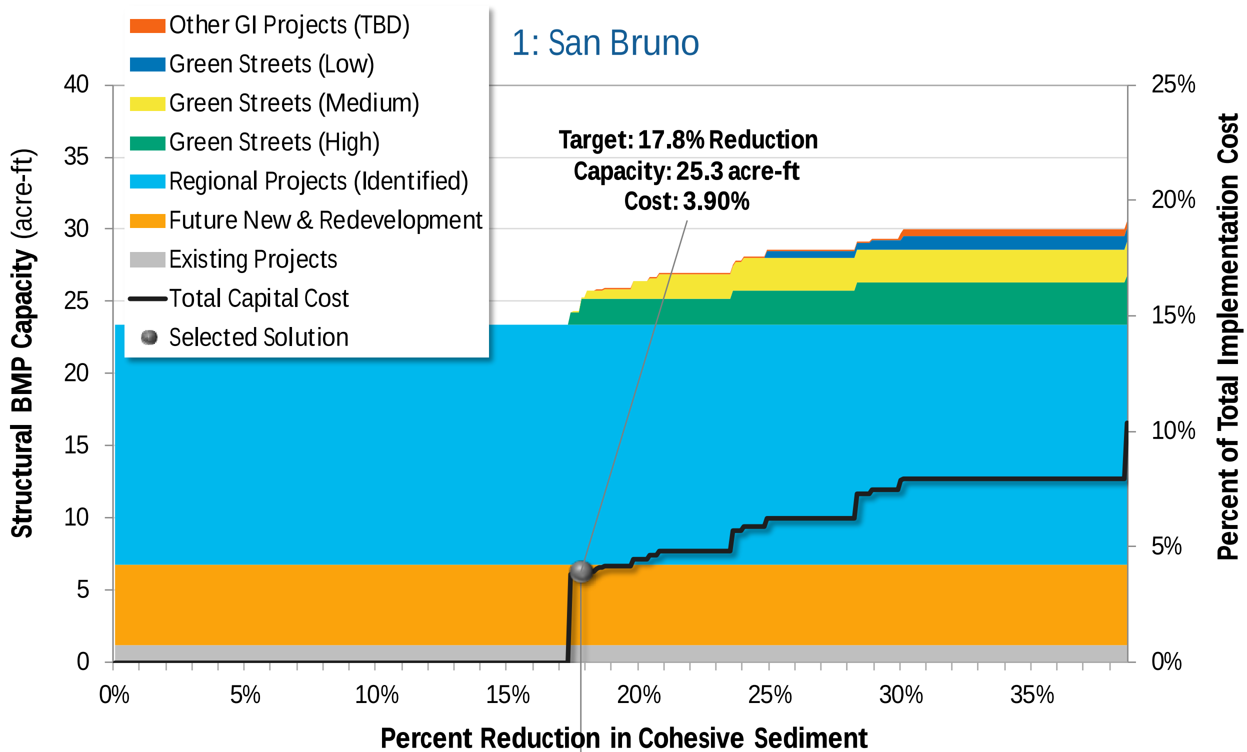


Figure C-29. Optimization summary for San Bruno - Scenario 1.

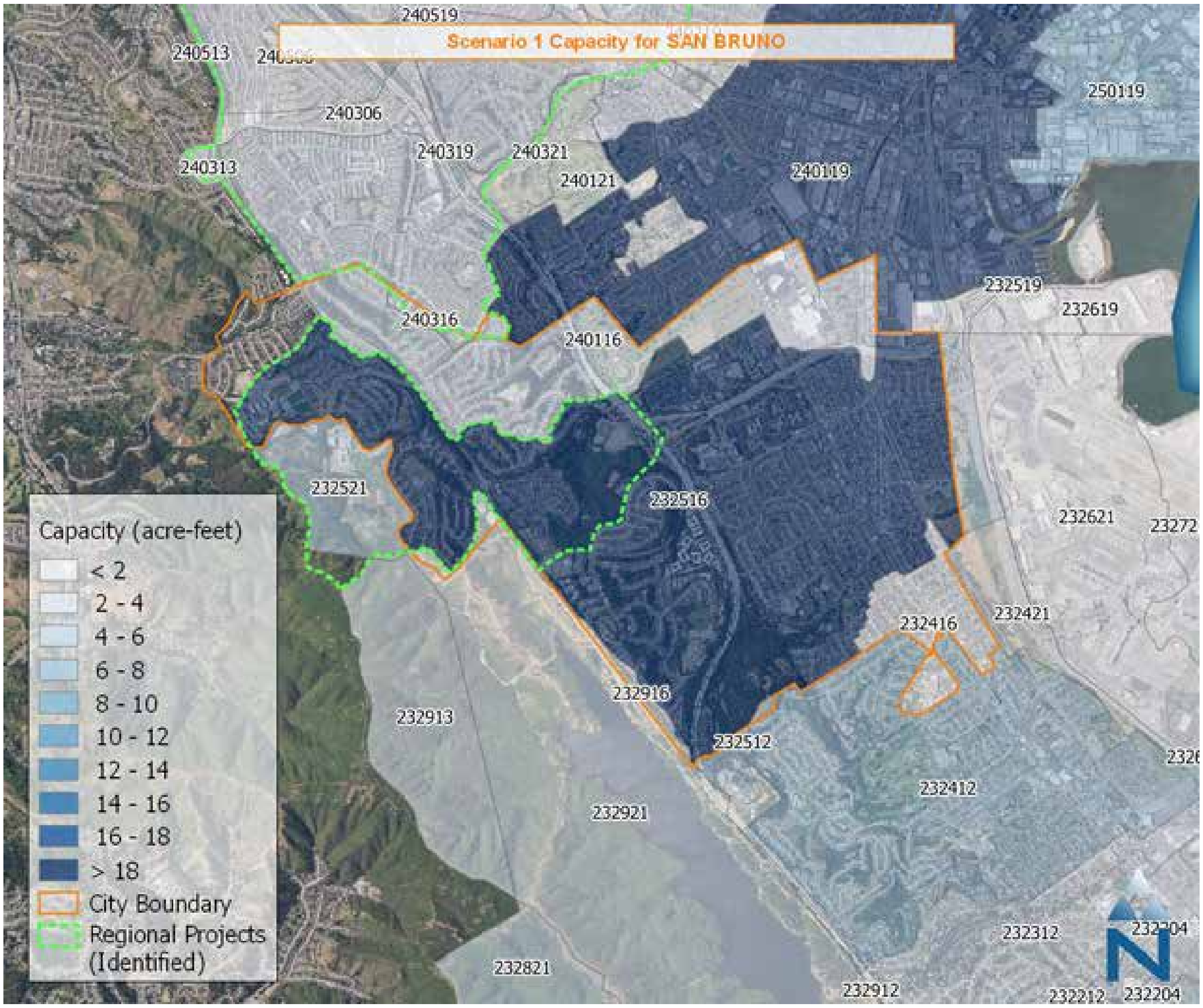


Figure C-30. Map of GI capacities by subwatershed in San Bruno - Scenario 1.

Table C-15. GI Implementation Strategy for San Bruno - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232416	4%	5.10	6.56	--	0.62	--	--	--	--	--	**0.6**
232516	20%	191.40	118.47	0.84	4.08	16.65	0.55	--	--	--	**22.1**
232916	5%	1.67	1.60	--	0.00	--	--	0.07	--	--	**0.1**
240116	16%	1.53	40.32	--	0.82	0.01	1.22	--	--	--	**2.0**
240316	19%	2.68	1.72	0.40	0.00	0.01	--	0.02	--	--	**0.4**
Total	**17.8%**	**202.4**	**168.7**	**1.2**	**5.5**	**16.7**	**1.8**	**0.1**	**--**	**--**	**25.3**

San Carlos

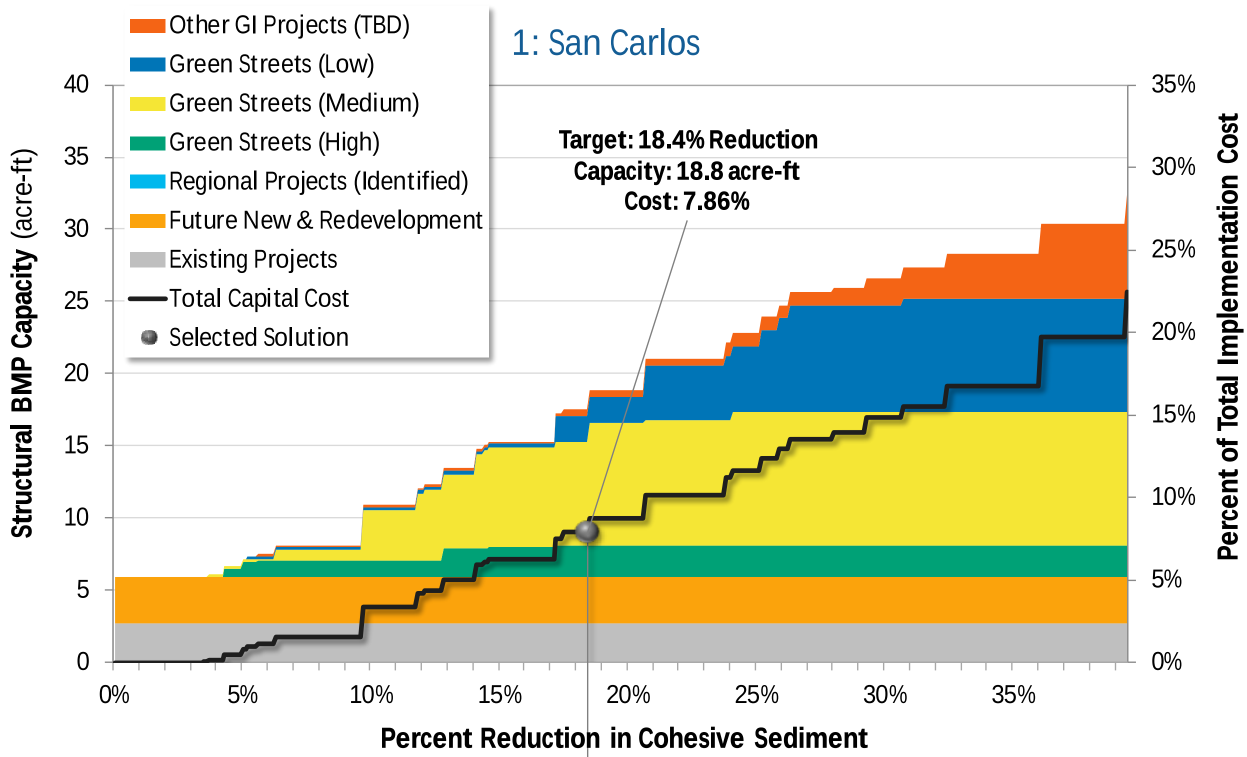


Figure C-31. Optimization summary for San Carlos - Scenario 1.

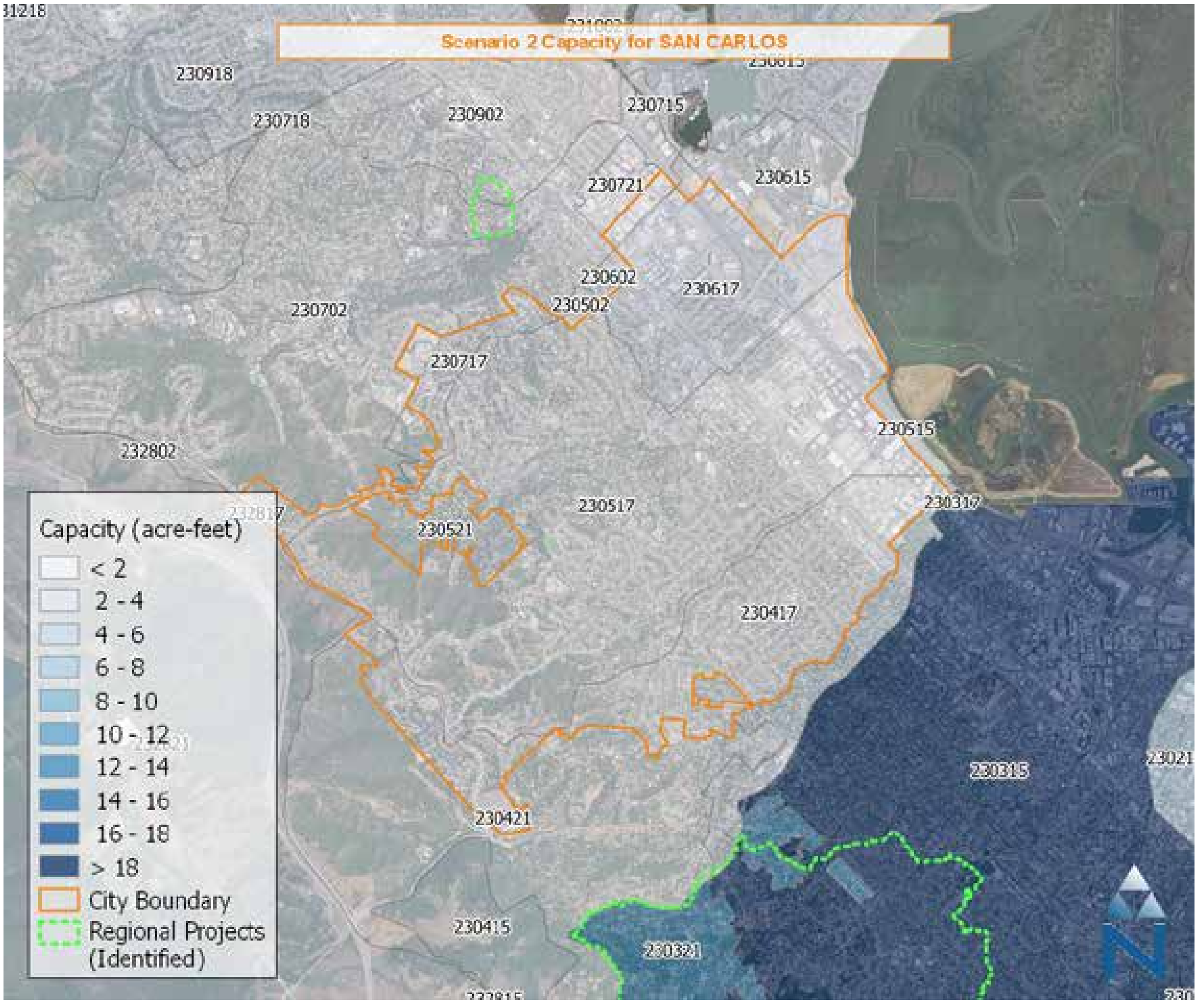


Figure C-32. Map of GI capacities by subwatershed in San Carlos - Scenario 1.

Table C-16. GI Implementation Strategy for San Carlos - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
230317	50%	0.57	0.64	--	0.00	--	--	--	--	0.03	**0.0**
230417	18%	96.09	45.38	0.14	0.66	--	2.10	0.77	1.65	--	**5.3**
230517	18%	148.34	113.07	0.44	1.33	--	0.01	6.67	--	--	**8.4**
230617	19%	46.58	57.92	2.01	1.11	--	0.03	0.87	--	--	**4.0**
230717	24%	16.43	19.16	0.10	0.11	--	0.03	0.17	0.20	0.39	**1.0**
232817	36%	0.39	0.13	--	--	--	--	--	--	0.02	**0.0**
Total	**18.4%**	**308.4**	**236.3**	**2.7**	**3.2**	**--**	**2.2**	**8.5**	**1.9**	**0.4**	**18.8**

San Mateo

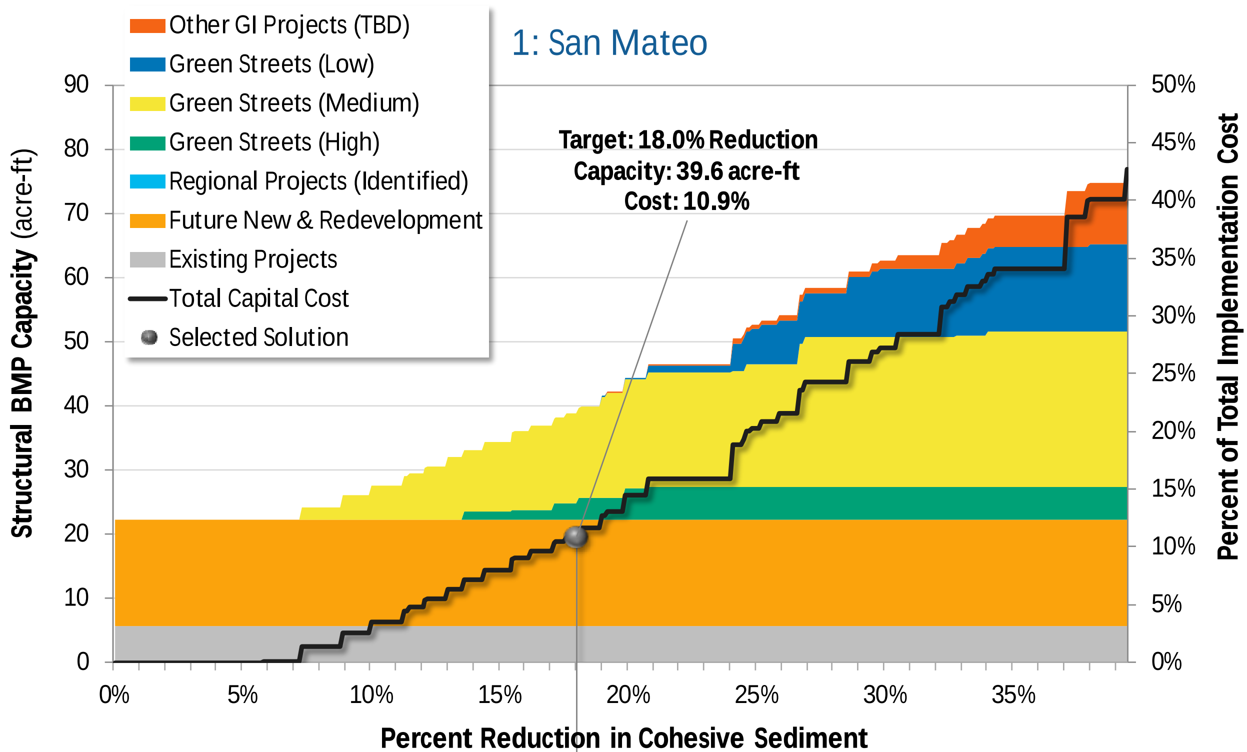


Figure C-33. Optimization summary for San Mateo - Scenario 1.

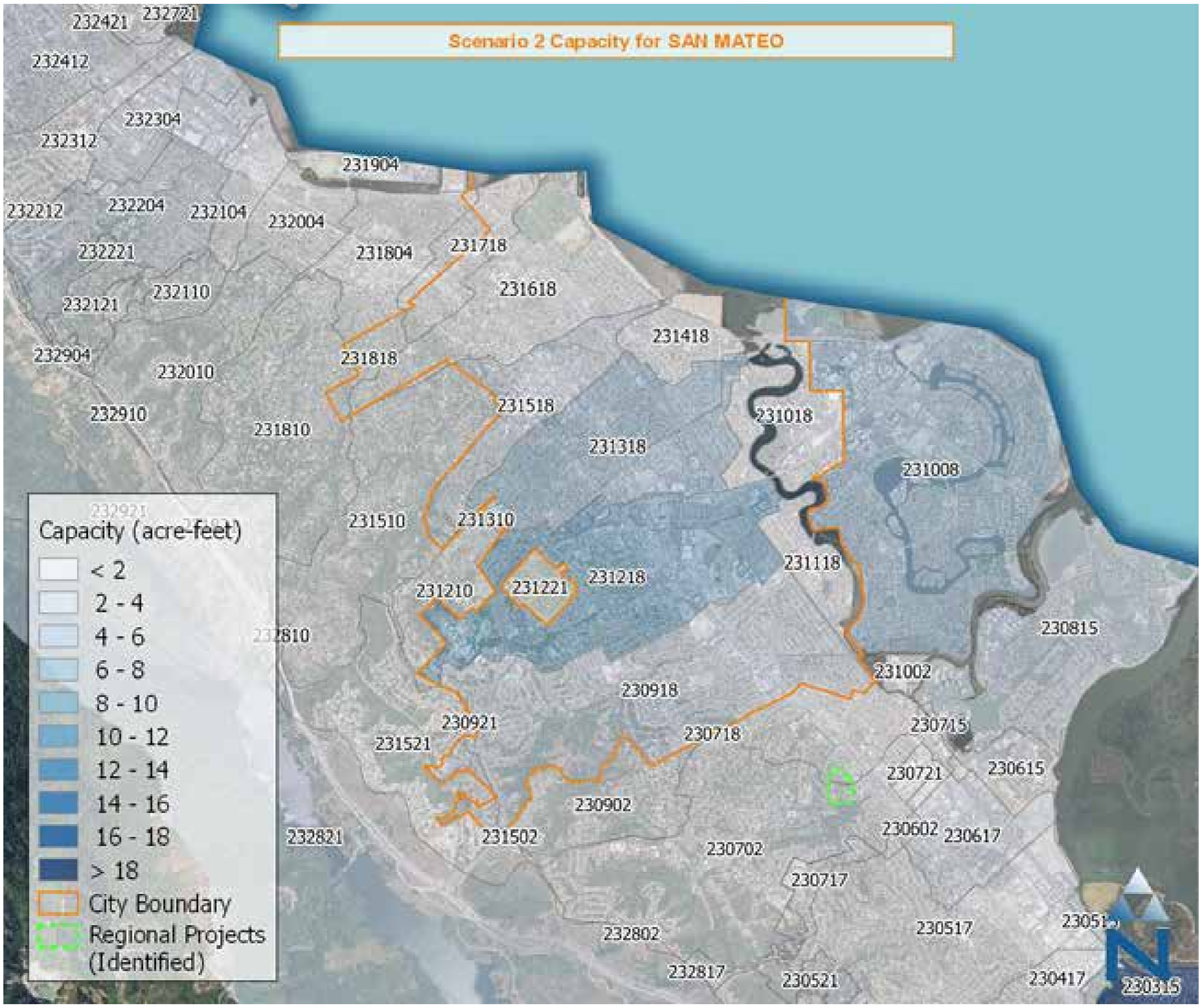


Figure C-34. Map of GI capacities by subwatershed in San Mateo - Scenario 1.

Table C-17. GI Implementation Strategy for San Mateo - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
230718	44%	0.03	0.01	--	--	--	--	--	--	0.00	**0.0**
230918	12%	71.11	67.38	0.21	1.89	--	3.18	--	--	--	**5.3**
231018	10%	21.68	20.07	0.07	0.55	--	--	0.88	--	--	**1.5**
231118	7%	7.15	5.48	--	0.10	--	--	0.37	--	--	**0.5**
231218	24%	171.55	153.18	3.76	6.04	--	0.00	2.86	--	--	**12.7**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
231318	19%	116.56	80.36	1.08	3.54	--	0.12	2.48	--	--	**7.2**
231418	21%	20.59	13.26	--	0.17	--	--	1.01	--	--	**1.2**
231518	19%	62.34	46.54	0.21	2.30	--	--	1.95	--	--	**4.5**
231618	24%	88.54	56.51	0.09	1.34	--	0.11	3.51	--	--	**5.1**
231718	16%	16.34	11.99	0.19	0.44	--	--	0.61	--	--	**1.2**
231818	14%	7.86	2.28	--	0.15	--	--	0.43	--	--	**0.6**
Total	**18.0%**	**583.8**	**457.0**	**5.6**	**16.5**	**--**	**3.4**	**14.1**	**--**	**0.0**	**39.6**

South San Francisco

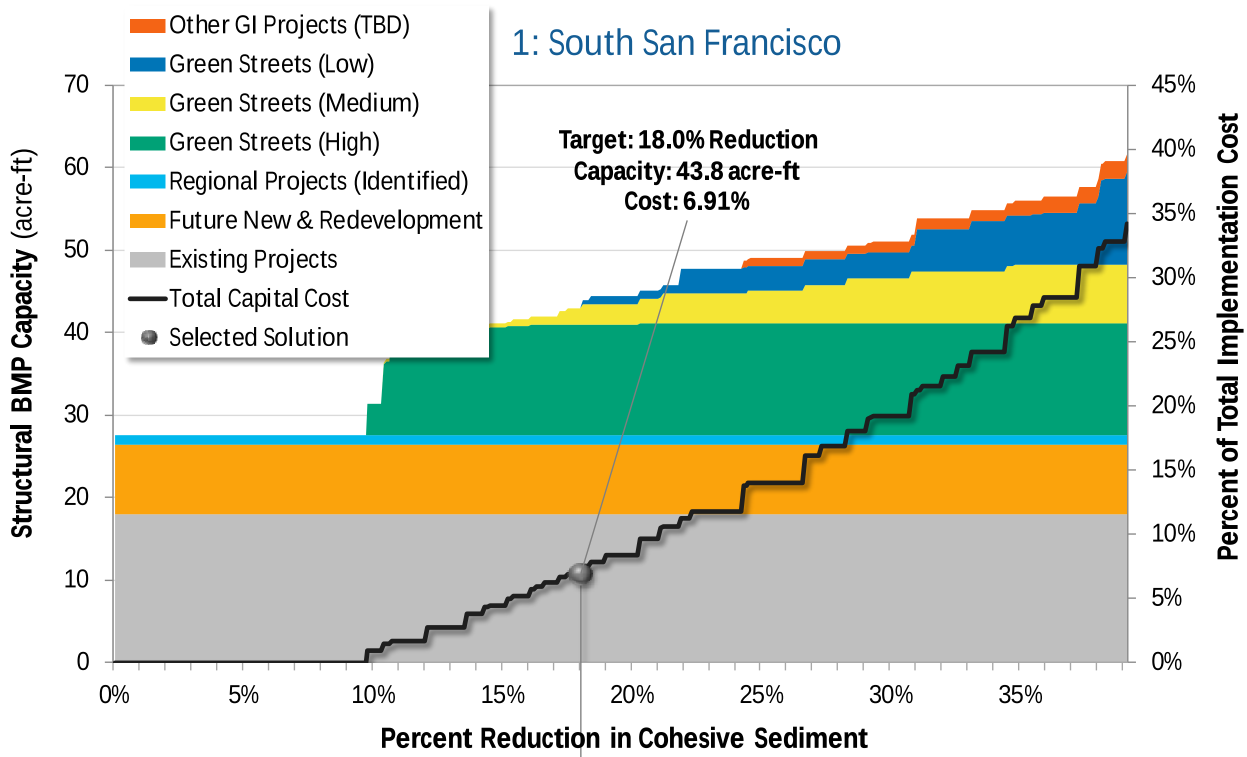


Figure C-35. Optimization summary for South San Francisco - Scenario 1.

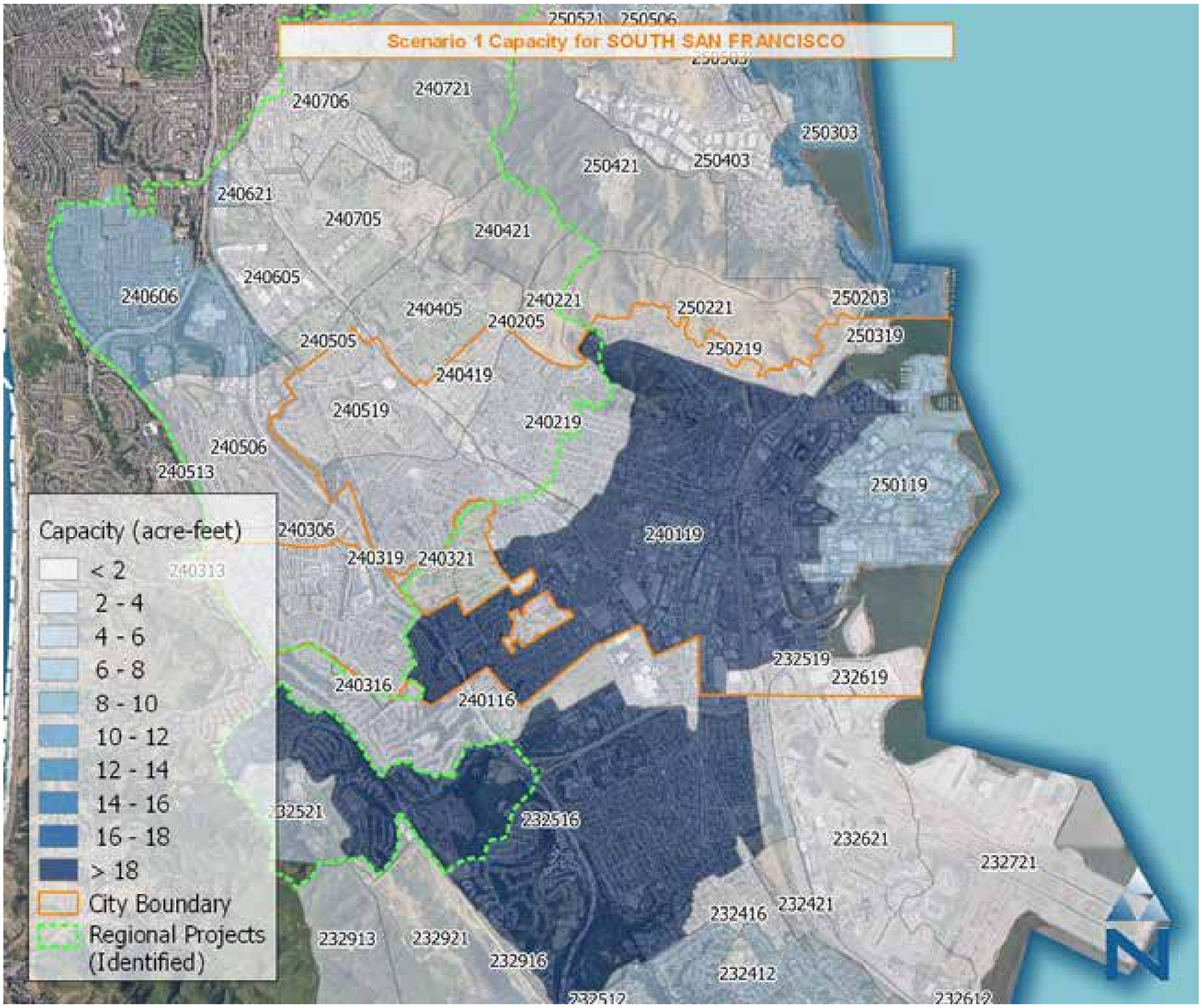


Figure C-36. Map of GI capacities by subwatershed in South San Francisco - Scenario 1.

Table C-18. GI Implementation Strategy for South San Francisco - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232519	24%	4.67	4.55	0.15	0.10	--	0.08	0.00	--	--	**0.3**
232619	31%	0.29	0.07	--	0.01	--	--	0.01	0.01	0.00	**0.0**
240119	24%	3.67	321.35	10.40	4.09	0.01	9.43	0.30	--	--	**24.2**
240219	16%	68.00	25.93	0.18	0.80	0.25	1.26	--	--	--	**2.5**
240319	16%	165.61	28.27	0.74	1.07	0.61	1.38	--	--	--	**3.8**
240419	24%	37.28	9.66	0.05	0.14	0.09	0.38	--	--	--	**0.7**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing/Planned			Green Streets			Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
				Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low		
240519	16%	83.65	14.14	0.14	0.38	0.31	0.87	--	--	--	**1.7**
250119	27%	150.75	161.72	5.91	1.21	--	0.00	1.84	0.49	--	**9.5**
250219	16%	13.46	9.87	0.30	0.58	--	0.00	0.19	--	--	**1.1**
250319	3%	0.79	1.32	--	0.08	--	--	--	--	--	**0.1**
Total	**18.0%**	**528.2**	**576.9**	**17.9**	**8.5**	**1.3**	**13.4**	**2.3**	**0.5**	**0.0**	**43.8**

Unincorporated County

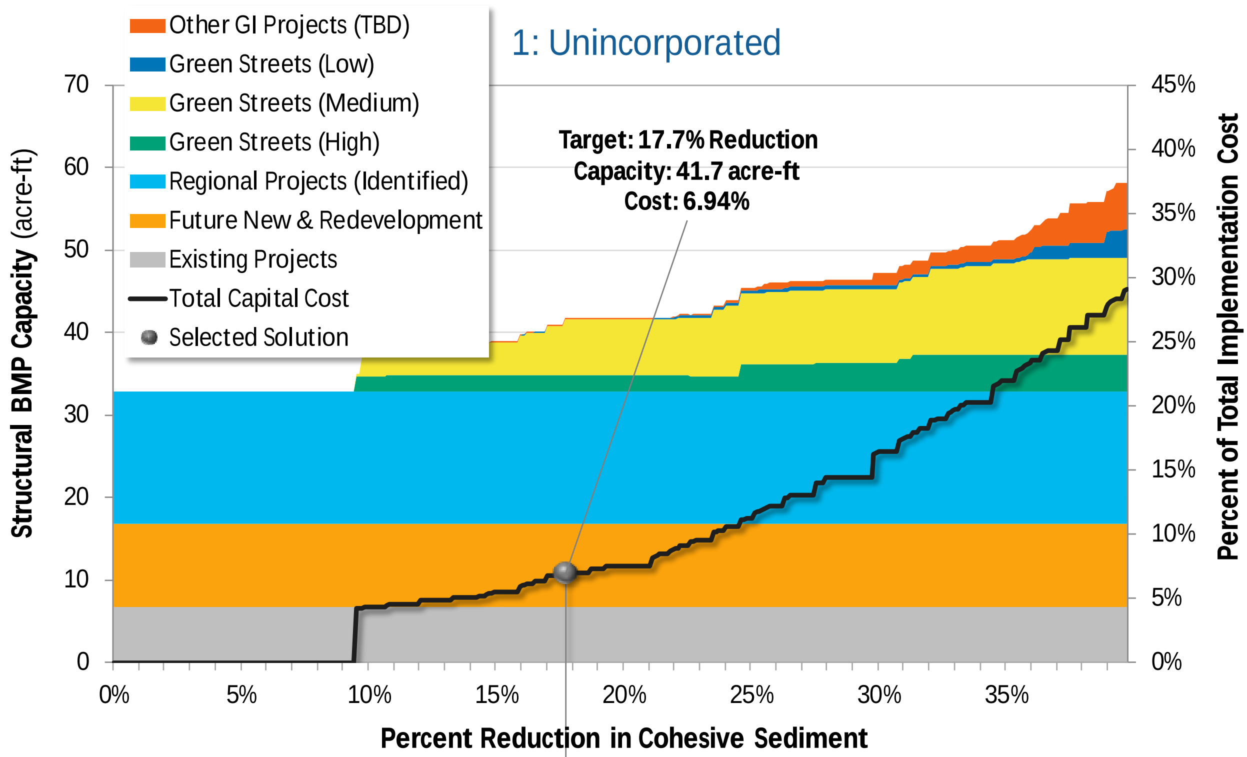


Figure C-37. Optimization summary for Unincorporated County - Scenario 1.

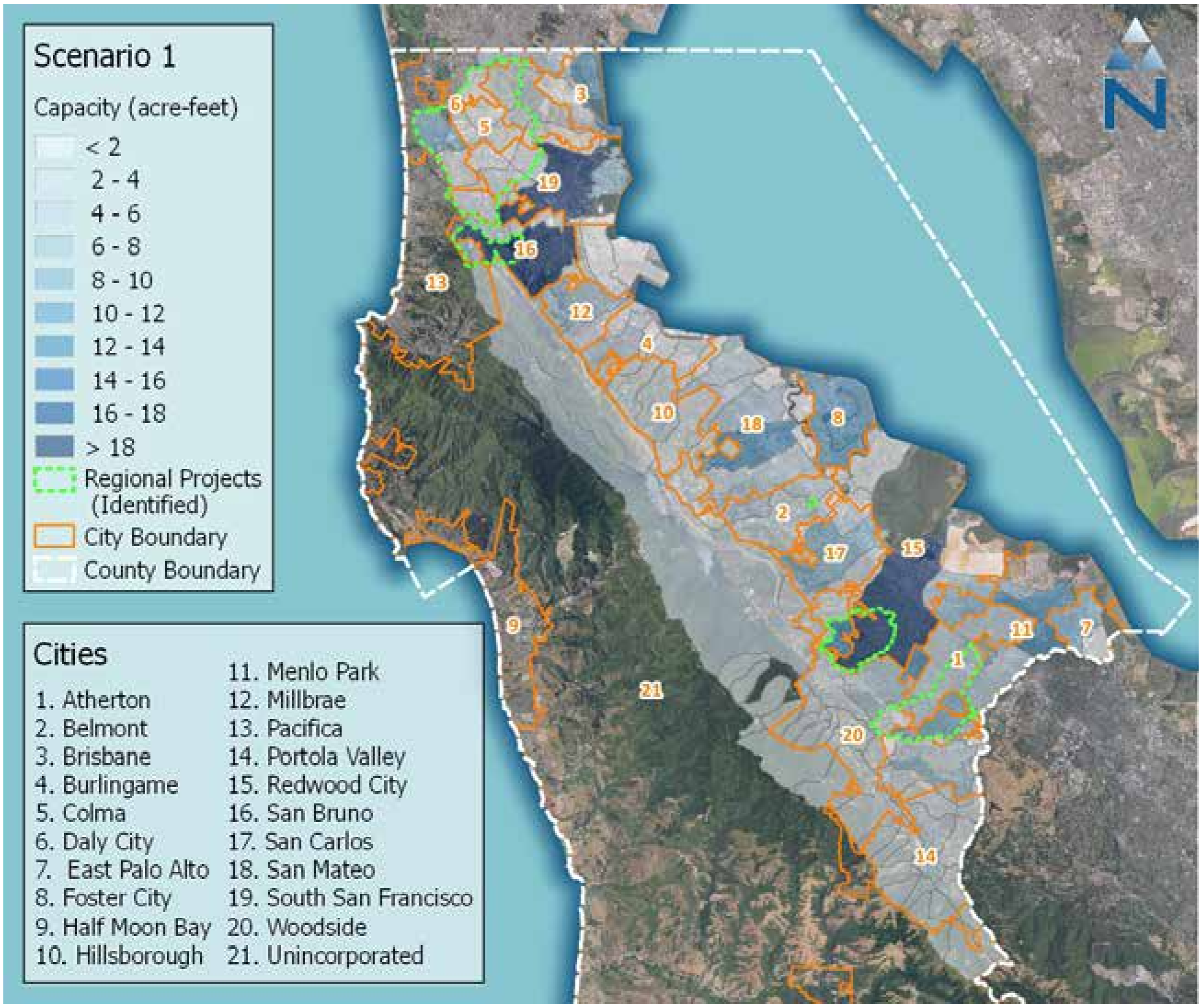


Figure C-38. Map of GI capacities by subwatershed in Unincorporated County - Scenario 1.

Table C-19. GI Implementation Strategy for Unincorporated County - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
220121	17%	0.18	0.39	0.00	--	0.01	--	--	--	--	**0.0**
220321	0%	0.00	--	--	--	--	--	--	--	--	**0.0**
220421	12%	0.21	0.05	--	0.01	--	--	0.01	--	--	**0.0**
220821	5%	1.62	0.49	0.22	0.07	--	0.01	--	--	--	**0.3**
221121	2%	0.10	0.00	--	0.01	--	--	--	--	0.00	**0.0**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)								
				Existing/Planned			Green Streets					
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Idenified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
221221	17%	0.15	9.35	5.17	1.14	0.01	--	--	--	--	**6.3**
221321	15%	0.37	0.92	--	0.04	0.02	--	--	--	--	**0.1**
221421	49%	0.01	0.02	--	0.01	0.00	--	0.01	--	0.00	**0.0**
221821	6%	0.00	0.00	--	0.00	--	--	--	--	--	**0.0**
222221	22%	4.54	0.04	--	0.11	--	--	0.10	--	--	**0.2**
222321	27%	0.89	0.00	--	0.10	--	--	0.00	--	0.02	**0.1**
222521	16%	1.14	0.00	--	0.14	--	--	--	--	0.03	**0.2**
222621	4%	0.63	0.00	--	0.08	--	--	--	--	--	**0.1**
222721	1%	0.22	0.00	--	0.03	--	--	--	--	--	**0.0**
223021	7%	2.29	0.01	--	0.42	--	--	--	--	--	**0.4**
223121	5%	0.98	0.05	--	0.30	--	--	--	--	--	**0.3**
223221	86%	0.22	0.02	--	0.16	--	--	--	--	--	**0.2**
223421	0%	0.00	0.00	--	0.00	--	--	--	--	--	**0.0**
223521	7%	0.03	0.00	--	0.00	--	--	--	--	0.00	**0.0**
223621	1%	0.14	0.00	--	0.02	--	--	--	--	0.00	**0.0**
223721	4%	0.05	0.00	--	0.01	--	--	--	--	0.00	**0.0**
223821	8%	0.01	--	--	0.00	--	--	--	--	0.00	**0.0**
223921	9%	0.00	--	--	0.00	--	--	--	--	0.00	**0.0**
224021	7%	0.00	0.00	--	0.00	--	--	--	--	0.00	**0.0**
224121	11%	0.19	0.00	--	0.01	--	--	--	--	--	**0.0**
224421	10%	0.00	--	--	0.00	--	--	--	--	0.00	**0.0**
224521	10%	0.00	--	--	0.00	--	--	--	--	0.00	**0.0**
224621	3%	0.78	0.05	--	0.23	--	--	--	--	--	**0.2**
230121	1%	0.07	0.08	0.10	0.00	--	--	--	--	--	**0.1**
230221	15%	37.75	92.83	0.51	4.61	1.74	1.89	--	--	--	**8.8**
230321	31%	125.87	46.24	0.04	0.18	9.26	0.01	3.86	--	--	**13.3**
230421	42%	5.13	15.80	0.11	0.17	0.29	--	0.16	0.09	--	**0.8**
230521	2%	0.27	0.15	--	0.08	--	--	--	--	--	**0.1**
230721	5%	3.59	5.88	0.11	0.23	--	--	--	--	--	**0.3**
230921	1%	0.02	0.03	--	0.01	--	--	--	--	--	**0.0**
231221	34%	0.60	0.31	0.04	0.03	--	--	0.01	--	--	**0.1**
231521	1%	2.61	2.73	0.22	0.29	--	--	--	--	--	**0.5**
231821	12%	0.00	0.00	--	0.00	--	--	--	--	0.00	**0.0**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232121	9%	1.96	1.70	--	0.00	--	--	0.08	--	--	**0.1**
232221	0%	0.01	0.01	--	0.01	--	--	--	--	--	**0.0**
232321	0%	0.00	0.00	--	0.00	--	--	--	--	--	**0.0**
232421	4%	0.72	0.70	--	0.27	--	--	--	--	--	**0.3**
232521	20%	50.03	30.96	--	0.53	4.35	0.00	--	--	--	**4.9**
232621	0%	0.01	0.02	--	0.00	--	--	--	--	--	**0.0**
232721	7%	0.76	0.21	--	--	--	--	--	--	0.03	**0.0**
232821	42%	0.71	18.35	--	0.17	0.04	--	2.40	--	--	**2.6**
232921	3%	4.00	0.21	--	0.06	--	--	0.08	--	--	**0.1**
240121	12%	2.16	1.80	--	0.07	0.01	0.07	--	--	--	**0.1**
240221	12%	9.44	1.74	--	0.01	0.05	--	--	--	--	**0.1**
240321	8%	1.15	0.30	--	0.07	0.01	--	--	--	--	**0.1**
240421	12%	9.09	1.67	--	0.05	0.04	--	--	--	--	**0.1**
240621	12%	2.38	2.72	0.20	0.03	0.01	--	--	--	--	**0.2**
240721	12%	33.25	6.12	--	0.14	0.16	0.02	--	--	--	**0.3**
250221	0%	0.00	0.04	--	0.07	--	--	--	--	--	**0.1**
250421	12%	0.03	0.16	--	0.06	0.00	--	--	--	--	**0.1**
250521	16%	0.36	0.05	--	0.01	0.00	--	--	--	--	**0.0**
Total	**17.7%**	**306.7**	**242.2**	**6.7**	**10.0**	**16.0**	**2.0**	**6.7**	**0.1**	**0.1**	**41.7**

Woodside

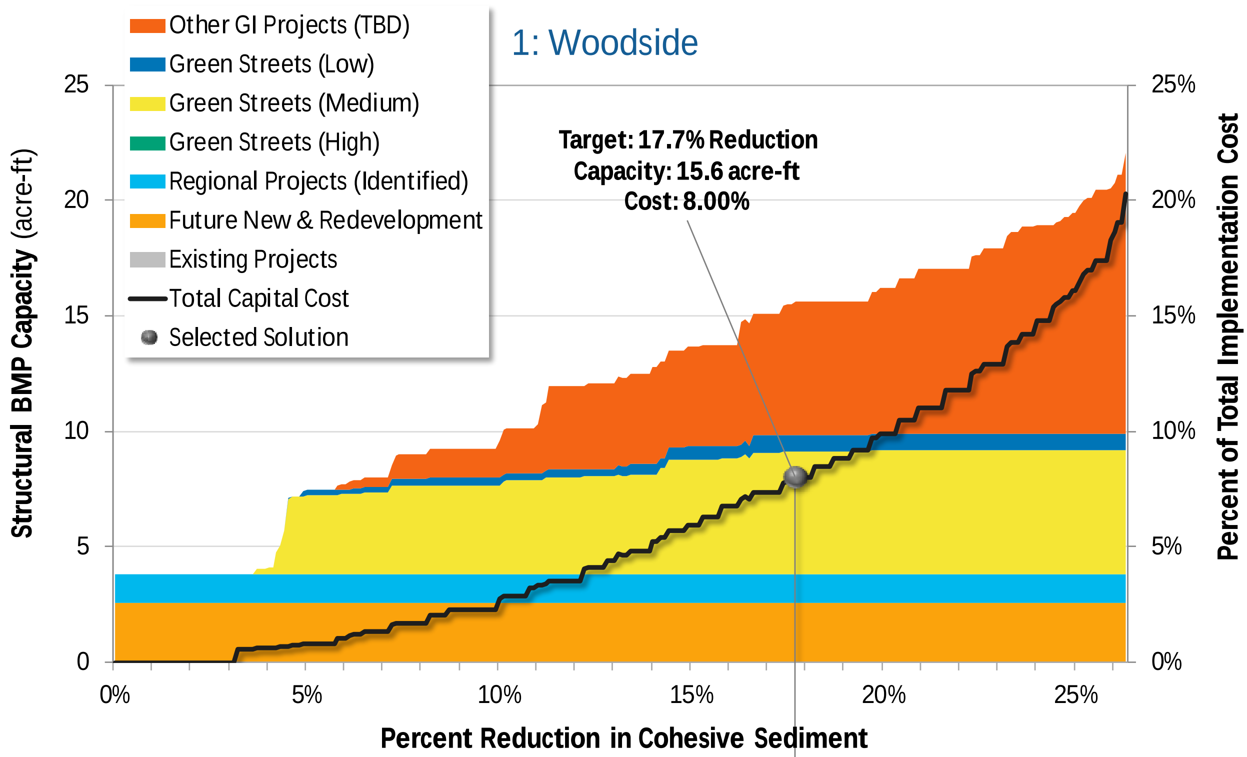


Figure C-39. Optimization summary for Woodside - Scenario 1.

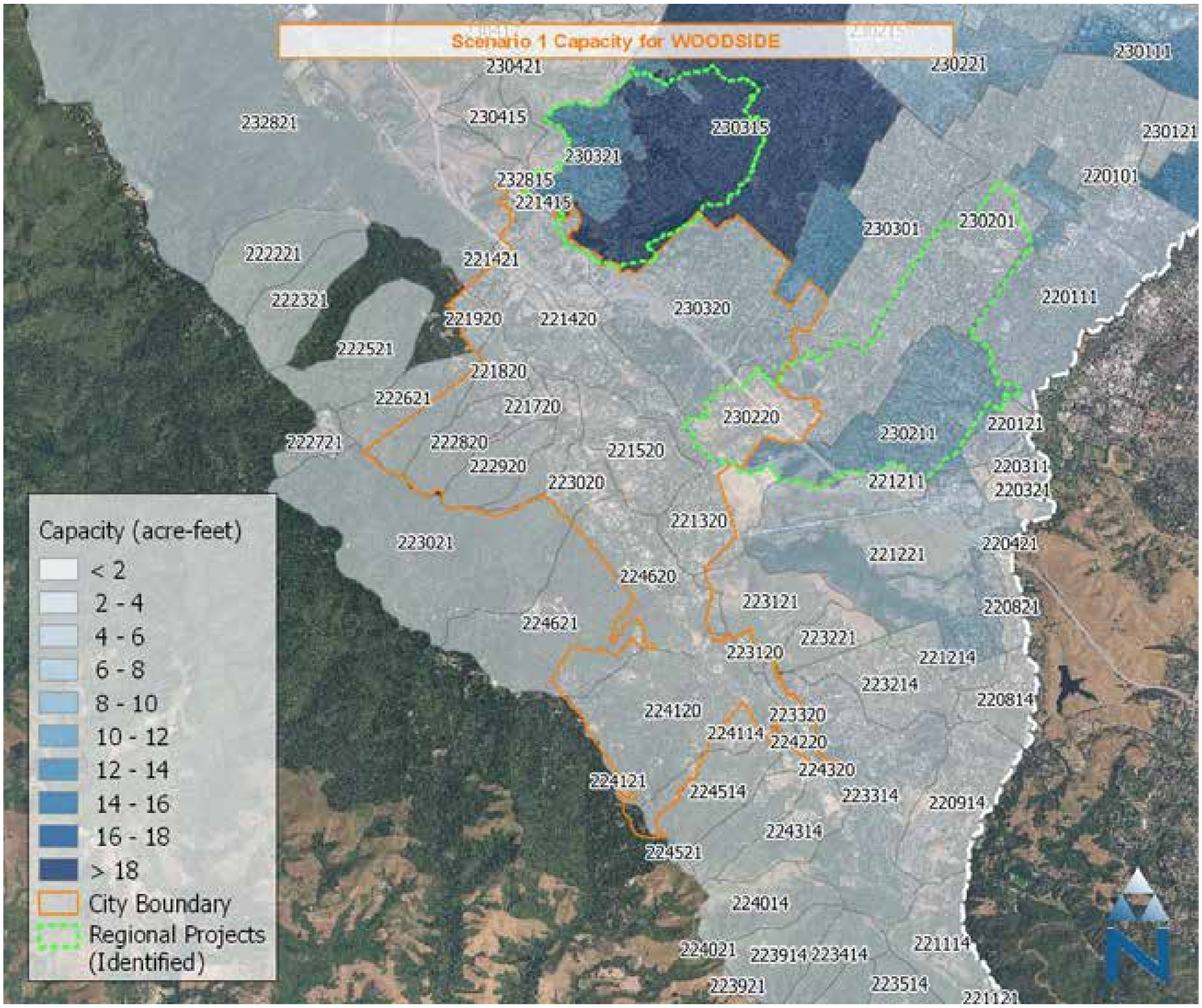


Figure C-40. Map of GI capacities by subwatershed in Woodside - Scenario 1.

Table C-20. GI Implementation Strategy for Woodside - Scenario 1

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
221320	60%	0.02	1.53	--	0.08	0.00	--	0.47	0.09	0.31	**1.0**
221420	52%	0.42	12.07	0.05	0.34	0.02	--	1.34	0.22	1.17	**3.1**
221520	7%	18.57	2.11	--	0.12	--	--	0.61	0.16	0.16	**1.0**
221620	11%	8.70	0.72	--	0.06	--	--	0.17	--	0.32	**0.5**
221720	7%	6.49	0.37	--	0.03	--	--	0.10	--	0.07	**0.2**

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
221820	25%	7.22	0.20	--	0.04	--	--	0.01	--	0.95	**1.0**
221920	9%	0.33	0.00	--	0.02	--	--	--	--	0.03	**0.0**
222620	6%	0.53	0.00	--	0.05	--	--	--	--	0.01	**0.1**
222820	9%	4.91	0.13	--	0.07	--	--	0.07	--	0.04	**0.2**
222920	9%	5.22	0.25	--	0.07	--	--	0.07	--	0.05	**0.2**
223020	12%	9.00	0.77	--	0.05	--	--	0.17	--	0.36	**0.6**
223120	5%	0.72	0.02	--	0.01	--	--	0.01	--	--	**0.0**
223320	6%	0.68	0.02	--	0.03	--	--	0.02	--	0.01	**0.1**
224120	4%	11.36	0.80	--	0.27	--	--	0.04	0.11	0.11	**0.5**
224220	12%	0.79	0.01	--	0.01	--	--	--	--	0.04	**0.1**
224320	14%	0.03	0.00	--	0.00	--	--	--	--	0.00	**0.0**
224520	6%	0.74	0.01	--	0.02	--	--	0.01	--	0.01	**0.0**
224620	8%	12.35	2.41	--	0.20	--	--	0.28	0.15	0.19	**0.8**
230220	40%	57.97	40.27	--	0.25	0.75	--	0.08	--	--	**1.1**
230320	52%	10.07	24.93	--	0.77	0.44	--	1.83	0.00	1.87	**4.9**
232820	52%	0.31	0.49	--	0.01	0.01	--	0.04	--	0.09	**0.2**
Total	**17.6%**	**156.5**	**87.1**	**0.1**	**2.5**	**1.2**	**--**	**5.3**	**0.7**	**5.8**	**15.6**

APPENDIX D: IMPLEMENTATION SCHEDULES

Contents

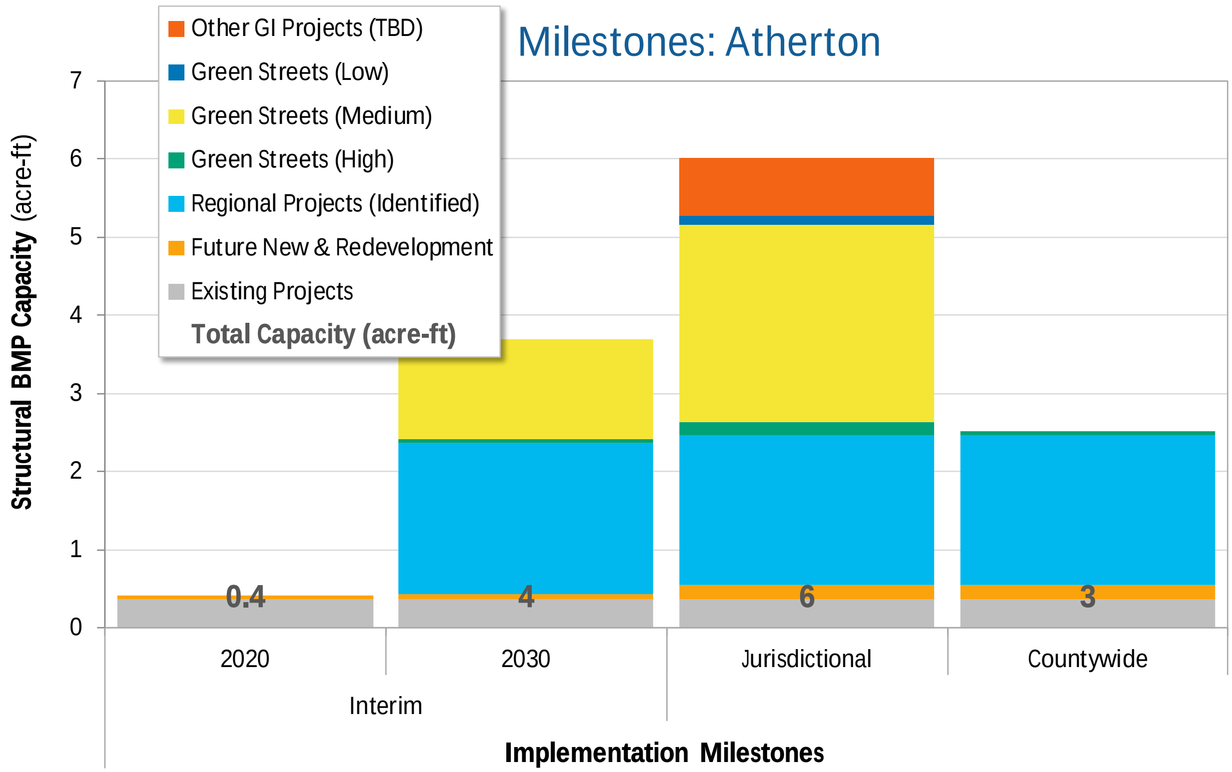


Figure D-1. Implementation Milestones: Atherton.

Table D-1. Implementation Milestones: Atherton

Implementation Metrics		Implementation Milestones: Atherton					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	18.5%	1.3%	0.2%	18.7%	20.0%	15.0%
	Volume Managed (acre-ft/yr)	58.9	4.1	0.7	59.5	63.6	41.9
	Treated Impervious (acres)	102.6	7.2	0.4	103.0	110.3	103.1
Capacities (acre-ft)	Existing Projects	0.0	0.0	0.4	0.4	0.4	0.4
	Future New & Redevelopment	0.0	0.1	0.1	0.1	0.2	0.2
	Regional Projects (Identified)	1.9	0.0	--	1.9	1.9	1.9
	Green Streets (High)	0.0	0.1	--	0.0	0.2	0.0
	Green Streets (Medium)	1.3	1.2	--	1.3	2.5	--
	Green Streets (Low)	--	0.1	--	--	0.1	--
	Other GI Projects (TBD)	--	0.7	--	--	0.7	--
	Total	**3.3**	**2.3**	**0.4**	**3.7**	**6.0**	**2.5**

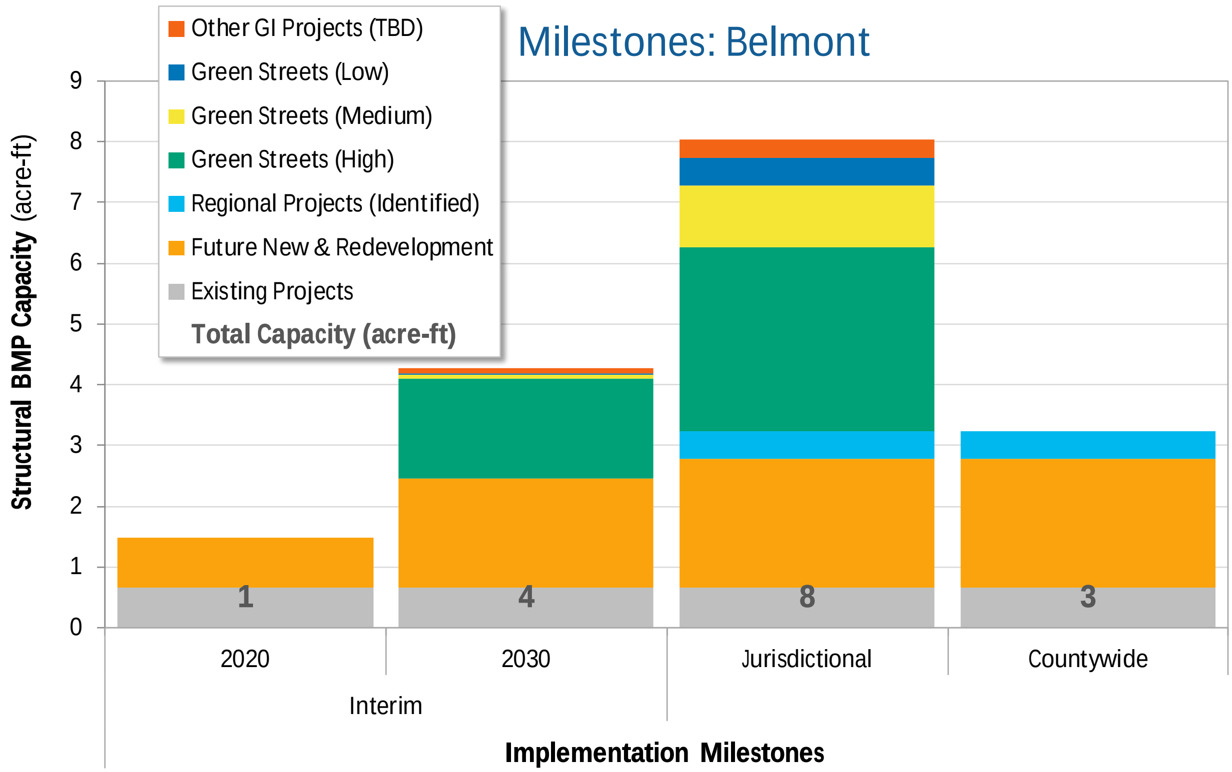


Figure D-2. Implementation Milestones: Belmont.

Table D-2. Implementation Milestones: Belmont

Implementation Metrics		Implementation Milestones: Belmont					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	3.7%	13.5%	1.9%	5.7%	19.1%	4.1%
	Volume Managed (acre-ft/yr)	27.1	98.7	19.4	46.6	145.2	33.0
	Treated Impervious (acres)	10.1	84.6	13.1	23.3	107.9	26.6
Capacities (acre-ft)	Existing Projects	0.0	0.0	0.7	0.7	0.7	0.7
	Future New & Redevelopment	1.0	0.3	0.8	1.8	2.1	2.1
	Regional Projects (Identified)	--	0.5	--	--	0.5	0.5
	Green Streets (High)	1.6	1.4	--	1.6	3.0	--
	Green Streets (Medium)	0.1	1.0	--	0.1	1.0	--
	Green Streets (Low)	0.0	0.4	--	0.0	0.5	--
	Other GI Projects (TBD)	0.1	0.2	--	0.1	0.3	--
	Total	**2.8**	**3.8**	**1.5**	**4.3**	**8.0**	**3.2**

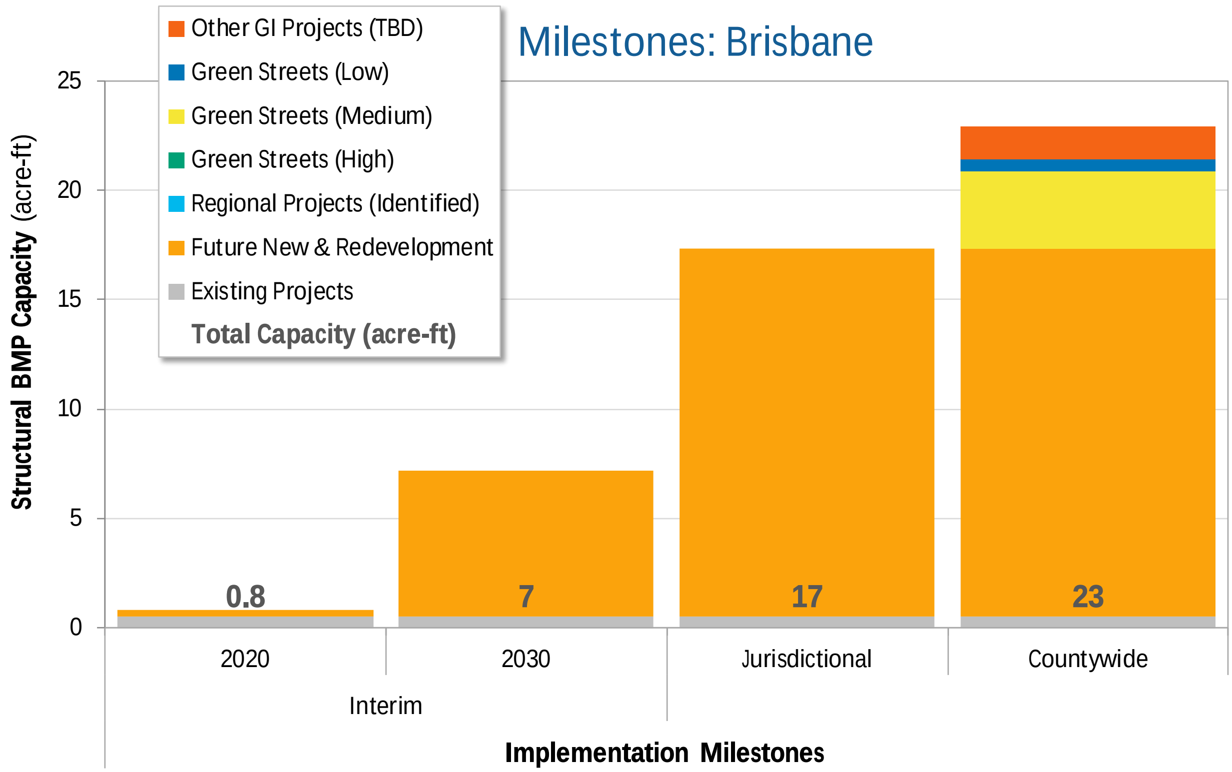


Figure D-3. Implementation Milestones: Brisbane.

Table D-3. Implementation Milestones: Brisbane

Implementation Metrics		Implementation Milestones: Brisbane					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	9.1%	13.4%	1.5%	10.6%	24.0%	51.7%
	Volume Managed (acre-ft/yr)	74.4	109.3	15.6	90.0	199.3	380.8
	Treated Impervious (acres)	60.1	97.3	6.1	66.3	163.6	309.9
Capacities (acre-ft)	Existing Projects	0.0	0.0	0.5	0.5	0.5	0.5
	Future New & Redevelopment	6.3	10.1	0.3	6.7	16.8	16.8
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	--	--	--	--	--	--
	Green Streets (Medium)	--	--	--	--	--	3.5
	Green Streets (Low)	--	--	--	--	--	0.6
	Other GI Projects (TBD)	--	--	--	--	--	1.5
	Total	**6.3**	**10.1**	**0.8**	**7.2**	**17.3**	**23.0**

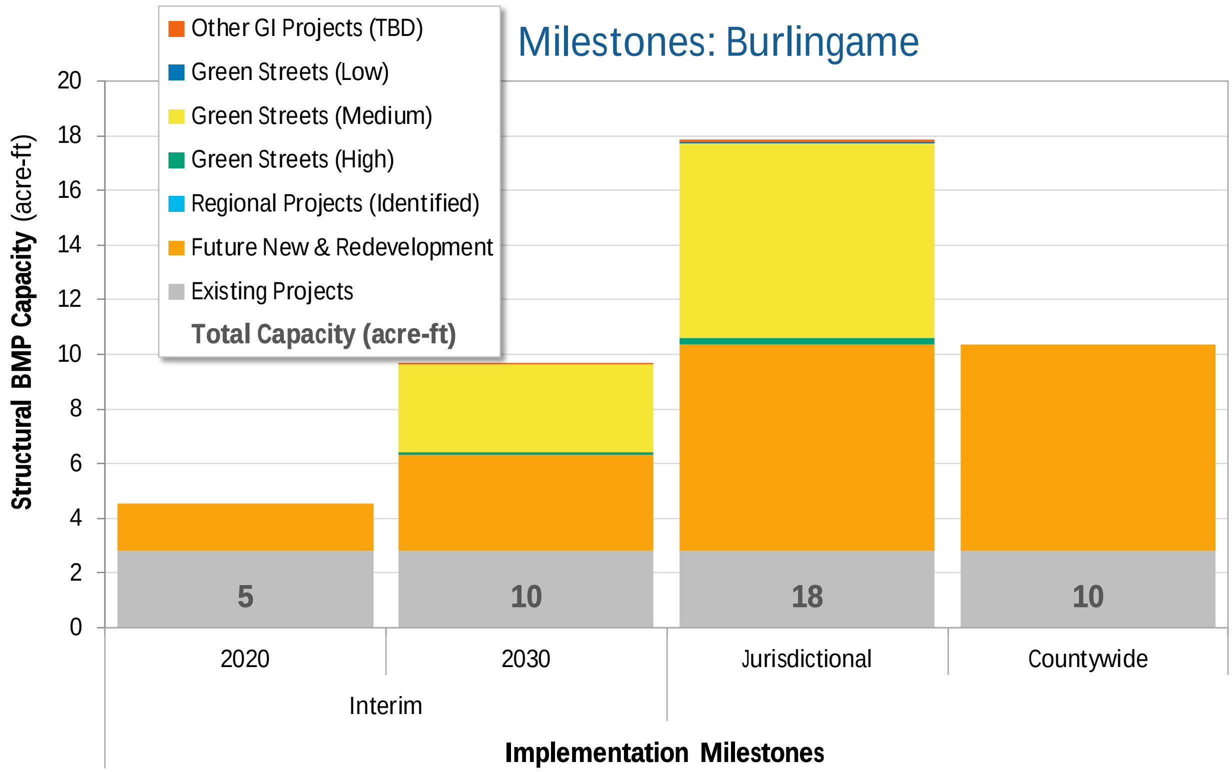


Figure D-4. Implementation Milestones: Burlingame.

Table D-4. Implementation Milestones: Burlingame

Implementation Metrics		Implementation Milestones: Burlingame					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	4.2%	9.4%	4.1%	8.3%	17.7%	6.7%
	Volume Managed (acre-ft/yr)	63.2	141.7	76.4	139.5	281.2	110.3
	Treated Impervious (acres)	19.3	132.0	39.6	58.9	190.9	103.4
Capacities (acre-ft)	Existing Projects	0.0	0.0	2.8	2.8	2.8	2.8
	Future New & Redevelopment	1.8	4.0	1.7	3.5	7.5	7.5
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	0.1	0.2	--	0.1	0.2	--
	Green Streets (Medium)	3.2	3.9	--	3.2	7.1	--
	Green Streets (Low)	--	0.1	--	--	0.1	--
	Other GI Projects (TBD)	0.0	0.1	--	0.0	0.1	--
	Total	**5.1**	**8.2**	**4.5**	**9.6**	**17.9**	**10.4**

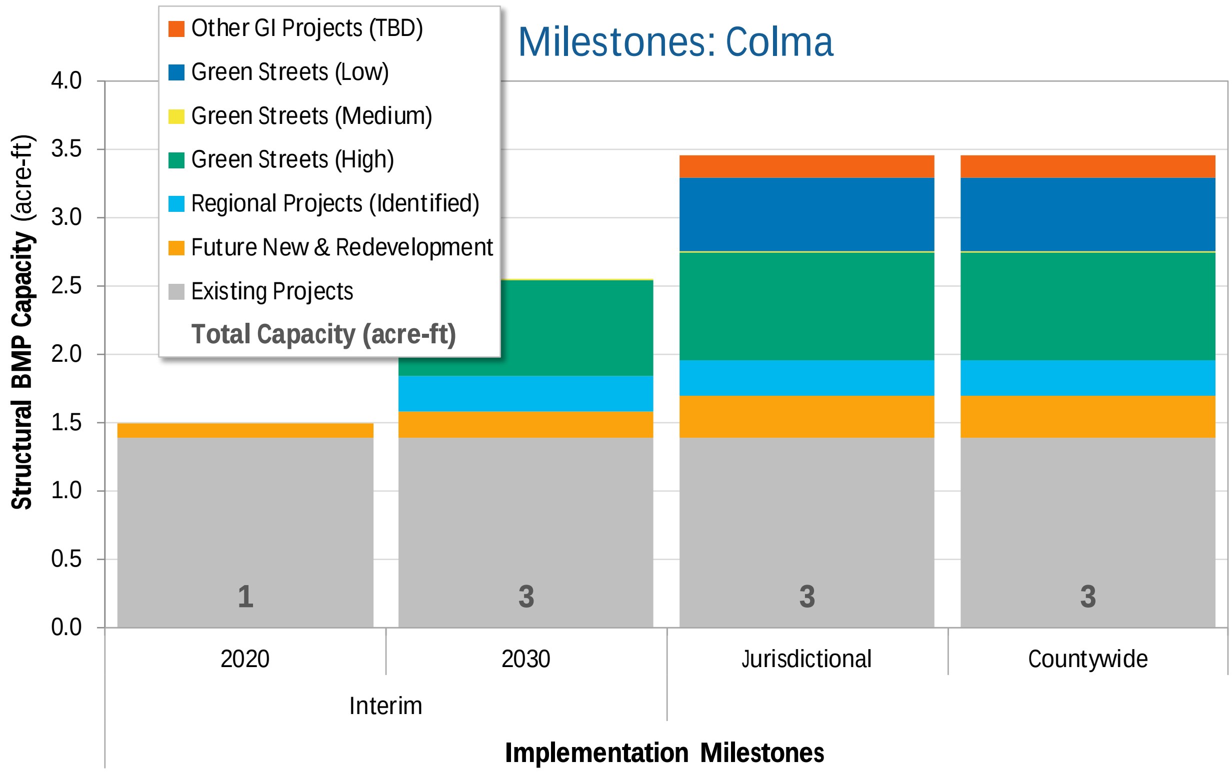


Figure D-5. Implementation Milestones: Colma.

Table D-5. Implementation Milestones: Colma

Implementation Metrics		Implementation Milestones: Colma					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	2.7%	8.8%	6.6%	9.3%	18.1%	18.1%
	Volume Managed (acre-ft/yr)	22.2	72.1	22.3	44.5	116.5	116.5
	Treated Impervious (acres)	5.7	52.8	10.5	16.2	69.0	69.0
Capacities (acre-ft)	Existing Projects	0.0	0.0	1.4	1.4	1.4	1.4
	Future New & Redevelopment	0.1	0.1	0.1	0.2	0.3	0.3
	Regional Projects (Identified)	0.3	0.0	--	0.3	0.3	0.3
	Green Streets (High)	0.7	0.1	--	0.7	0.8	0.8
	Green Streets (Medium)	0.0	0.0	--	0.0	0.0	0.0
	Green Streets (Low)	--	0.5	--	--	0.5	0.5
	Other GI Projects (TBD)	--	0.2	--	--	0.2	0.2
	Total	**1.1**	**0.9**	**1.5**	**2.5**	**3.5**	**3.5**

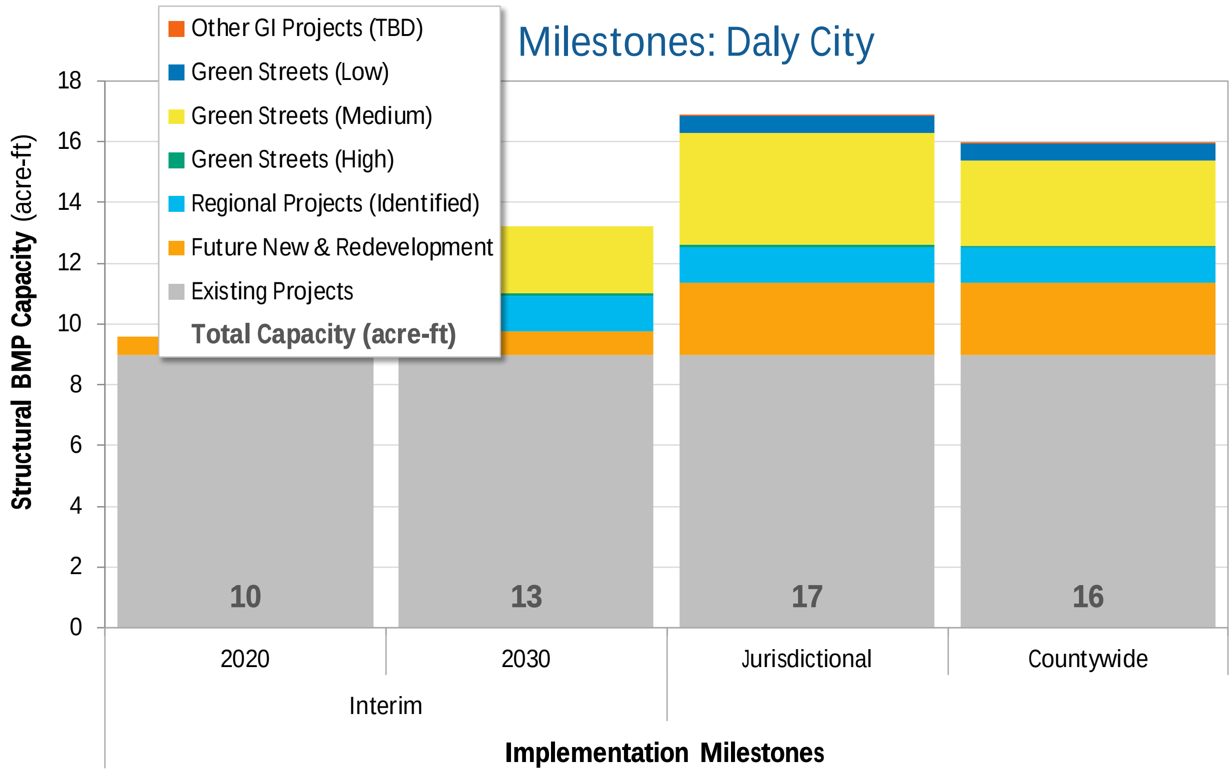


Figure D-6. Implementation Milestones: Daly City.

Table D-6. Implementation Milestones: Daly City

Implementation Metrics		Implementation Milestones: Daly City					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	5.3%	5.9%	7.1%	12.4%	18.3%	14.9%
	Volume Managed (acre-ft/yr)	111.5	124.5	144.3	255.8	380.3	307.1
	Treated Impervious (acres)	21.1	90.1	59.5	80.7	170.7	170.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	9.0	9.0	9.0	9.0
	Future New & Redevelopment	0.1	1.6	0.6	0.8	2.4	2.4
	Regional Projects (Identified)	1.2	0.0	--	1.2	1.2	1.2
	Green Streets (High)	0.1	0.0	--	0.1	0.1	0.0
	Green Streets (Medium)	2.2	1.5	--	2.2	3.7	2.8
	Green Streets (Low)	--	0.6	--	--	0.6	0.6
	Other GI Projects (TBD)	--	0.0	--	--	0.0	0.0
	Total	**3.6**	**3.6**	**9.6**	**13.2**	**16.8**	**15.9**

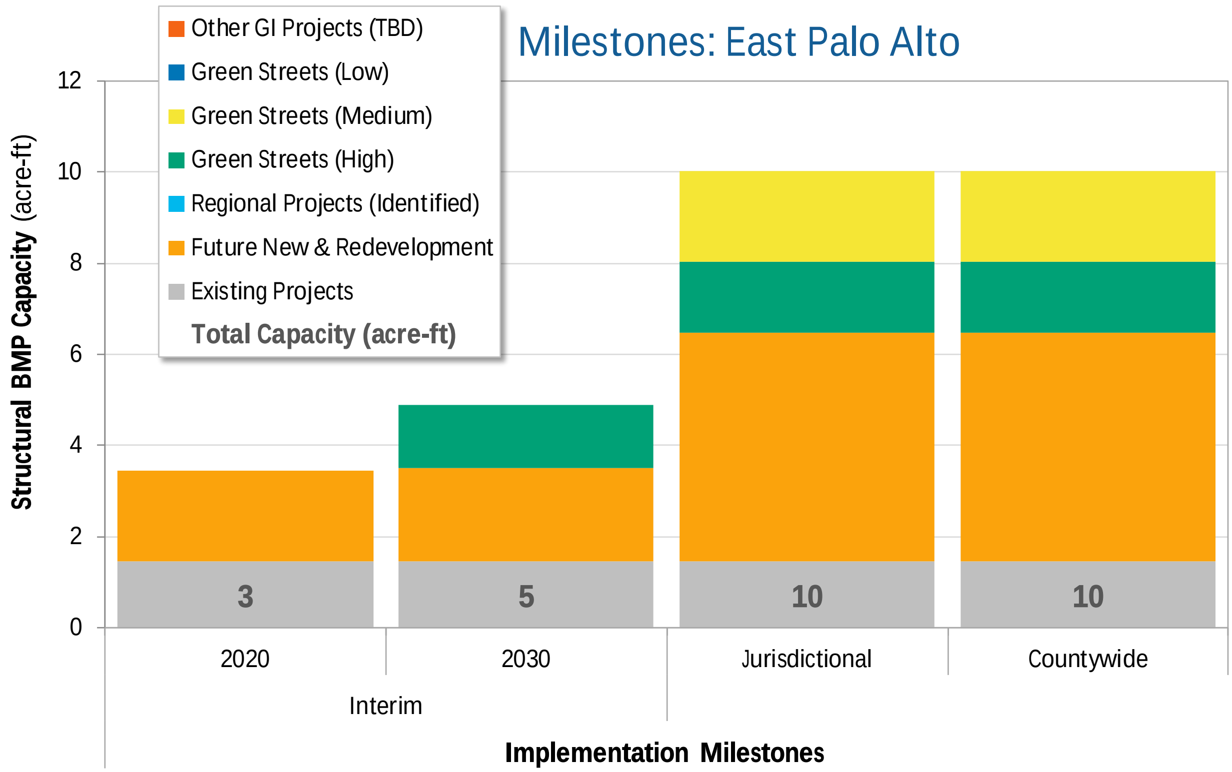


Figure D-7. Implementation Milestones: East Palo Alto.

Table D-7. Implementation Milestones: East Palo Alto

Implementation Metrics		Implementation Milestones: East Palo Alto					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	4.7%	9.9%	9.2%	13.9%	23.7%	23.7%
	Volume Managed (acre-ft/yr)	20.5	43.3	42.0	62.5	105.8	105.8
	Treated Impervious (acres)	0.7	75.2	34.9	35.6	110.7	110.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	1.5	1.5	1.5	1.5
	Future New & Redevelopment	0.1	3.0	2.0	2.0	5.0	5.0
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	1.4	0.2	--	1.4	1.6	1.6
	Green Streets (Medium)	--	2.0	--	--	2.0	2.0
	Green Streets (Low)	--	--	--	--	--	--
	Other GI Projects (TBD)	--	--	--	--	--	--
	Total	**1.5**	**5.1**	**3.4**	**4.9**	**10.0**	**10.0**

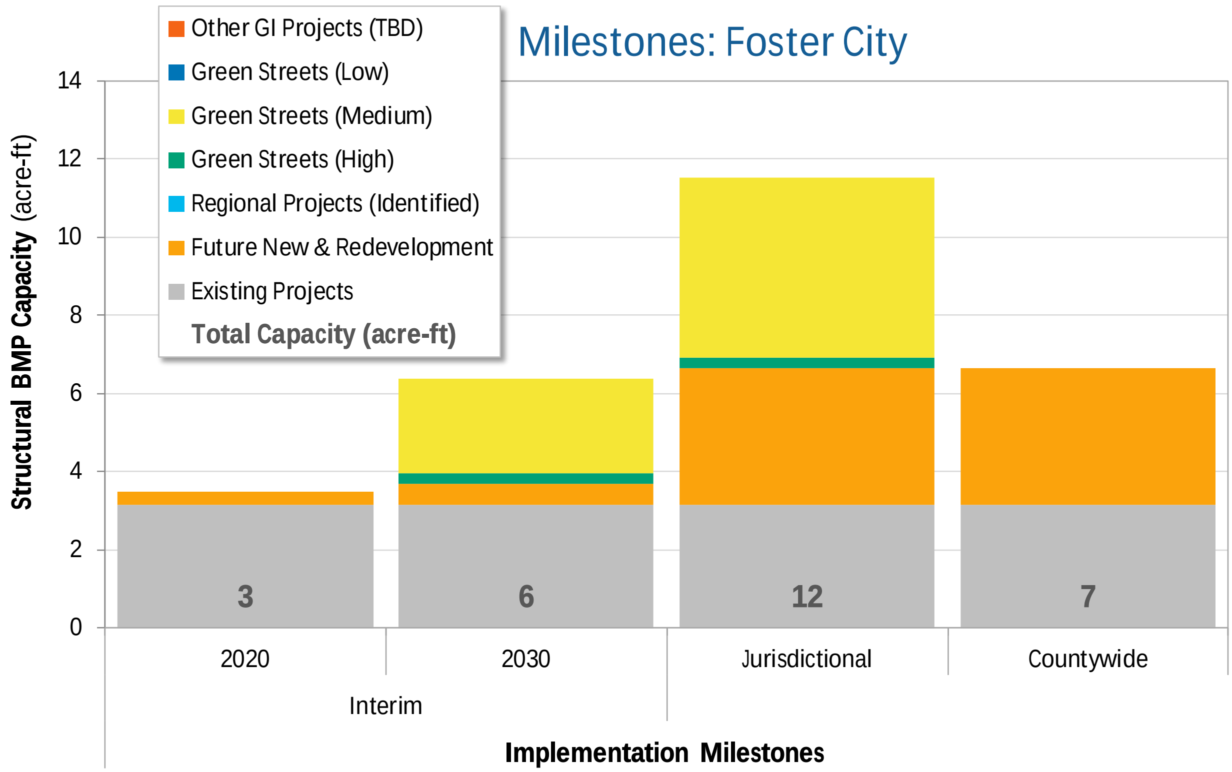


Figure D-8. Implementation Milestones: Foster City.

Table D-8. Implementation Milestones: Foster City

Implementation Metrics		Implementation Milestones: Foster City					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	4.0%	11.7%	3.4%	7.4%	19.1%	8.1%
	Volume Managed (acre-ft/yr)	35.5	104.0	34.2	69.7	173.7	72.8
	Treated Impervious (acres)	3.3	100.5	31.0	34.3	134.8	82.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	3.2	3.2	3.2	3.2
	Future New & Redevelopment	0.2	3.0	0.3	0.5	3.5	3.5
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	0.3	0.0	--	0.3	0.3	--
	Green Streets (Medium)	2.4	2.2	--	2.4	4.6	--
	Green Streets (Low)	--	--	--	--	--	--
	Other GI Projects (TBD)	--	--	--	--	--	--
	Total	**2.9**	**5.1**	**3.5**	**6.4**	**11.5**	**6.7**

Figure D-9. Implementation Milestones: Hillsborough.

Table D-9. Implementation Milestones: Hillsborough

Implementation Metrics		Implementation Milestones: Hillsborough					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	0.1%	18.7%	0.1%	0.2%	18.9%	0.1%
	Volume Managed (acre-ft/yr)	0.8	116.7	0.6	1.4	118.1	0.4
	Treated Impervious (acres)	0.2	47.4	0.1	0.3	47.7	0.4
Capacities (acre-ft)	Existing Projects	0.0	0.0	0.0	0.0	0.0	0.0
	Future New & Redevelopment	0.1	0.0	0.0	0.1	0.2	0.2
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	--	--	--	--	--	--
	Green Streets (Medium)	2.1	3.7	--	2.1	5.8	--
	Green Streets (Low)	--	--	--	--	--	--
	Other GI Projects (TBD)	0.1	0.0	--	0.1	0.1	--
	Total	**2.3**	**3.8**	**0.0**	**2.3**	**6.1**	**0.2**

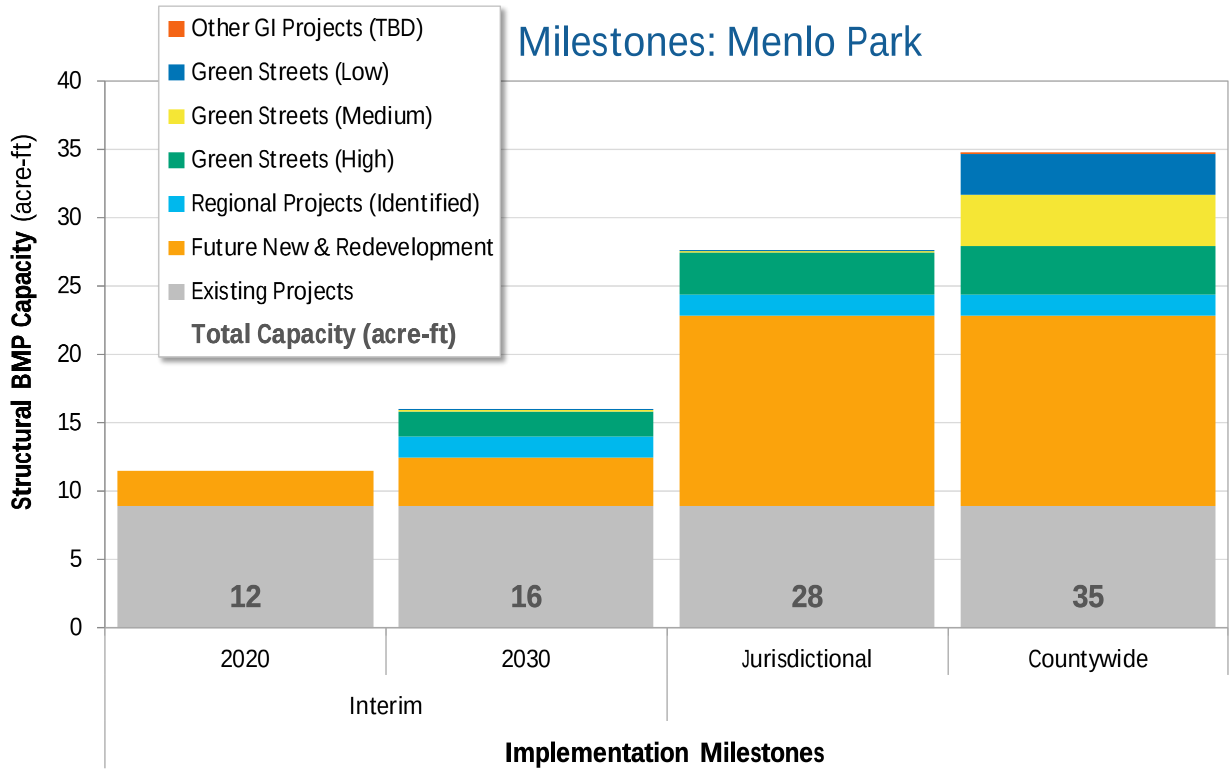


Figure D-10. Implementation Milestones: Menlo Park.

Table D-10. Implementation Milestones: Menlo Park

Implementation Metrics		Implementation Milestones: Menlo Park					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	5.8%	3.4%	8.8%	14.6%	17.9%	28.6%
	Volume Managed (acre-ft/yr)	11.2	6.6	92.8	104.1	110.6	185.7
	Treated Impervious (acres)	65.2	75.6	64.2	129.4	205.0	260.2
Capacities (acre-ft)	Existing Projects	0.0	0.0	8.9	8.9	8.9	8.9
	Future New & Redevelopment	1.0	10.3	2.7	3.6	13.9	13.9
	Regional Projects (Identified)	1.6	0.0	--	1.6	1.6	1.6
	Green Streets (High)	1.8	1.3	--	1.8	3.1	3.6
	Green Streets (Medium)	0.0	0.1	--	0.0	0.1	3.7
	Green Streets (Low)	0.0	0.0	--	0.0	0.0	2.9
	Other GI Projects (TBD)	--	--	--	--	--	0.0
	Total	**4.4**	**11.7**	**11.5**	**15.9**	**27.6**	**34.7**

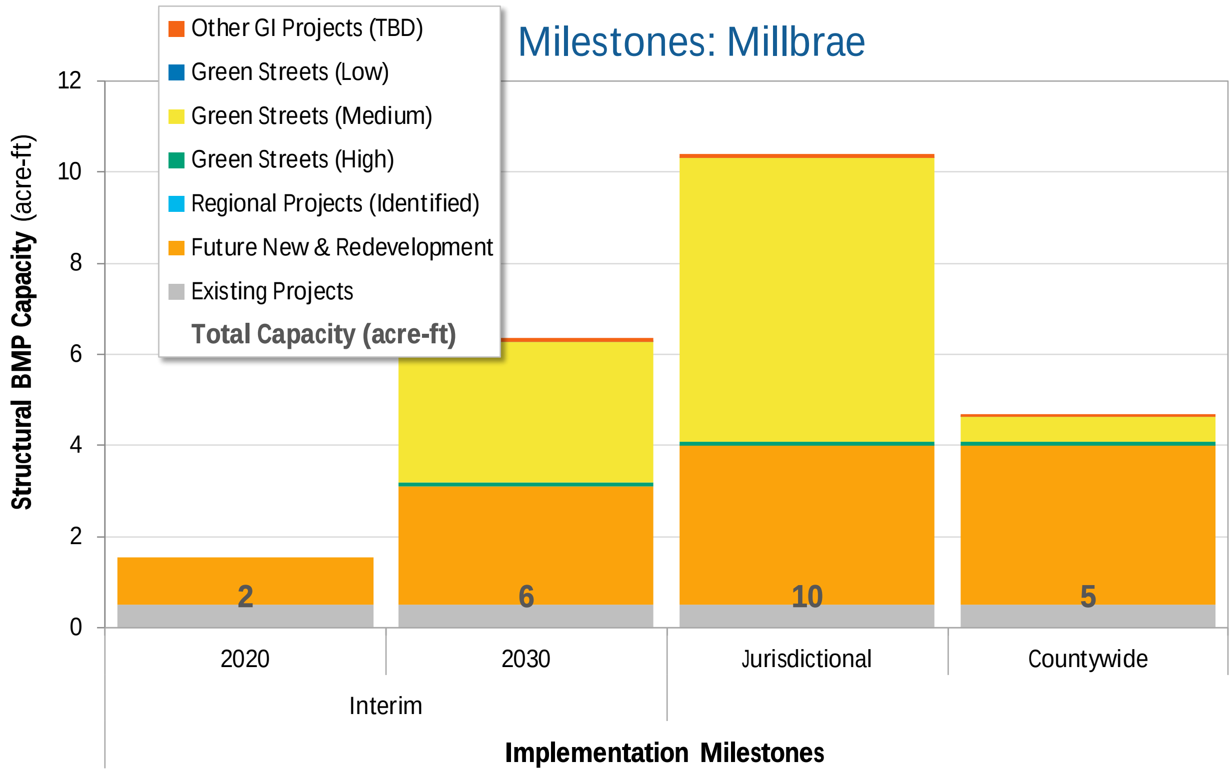


Figure D-11. Implementation Milestones: Millbrae.

Table D-11. Implementation Milestones: Millbrae

Implementation Metrics		Implementation Milestones: Millbrae					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	3.6%	14.7%	3.0%	6.5%	21.2%	4.4%
	Volume Managed (acre-ft/yr)	32.1	131.0	28.9	61.0	192.0	45.5
	Treated Impervious (acres)	12.8	97.1	10.9	23.7	120.8	40.2
Capacities (acre-ft)	Existing Projects	0.0	0.0	0.5	0.5	0.5	0.5
	Future New & Redevelopment	1.6	0.9	1.0	2.6	3.5	3.5
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	0.1	0.0	--	0.1	0.1	0.1
	Green Streets (Medium)	3.1	3.2	--	3.1	6.2	0.5
	Green Streets (Low)	0.0	0.0	--	0.0	0.0	0.0
	Other GI Projects (TBD)	0.1	0.0	--	0.1	0.1	0.0
	Total	**4.8**	**4.1**	**1.5**	**6.4**	**10.4**	**4.7**

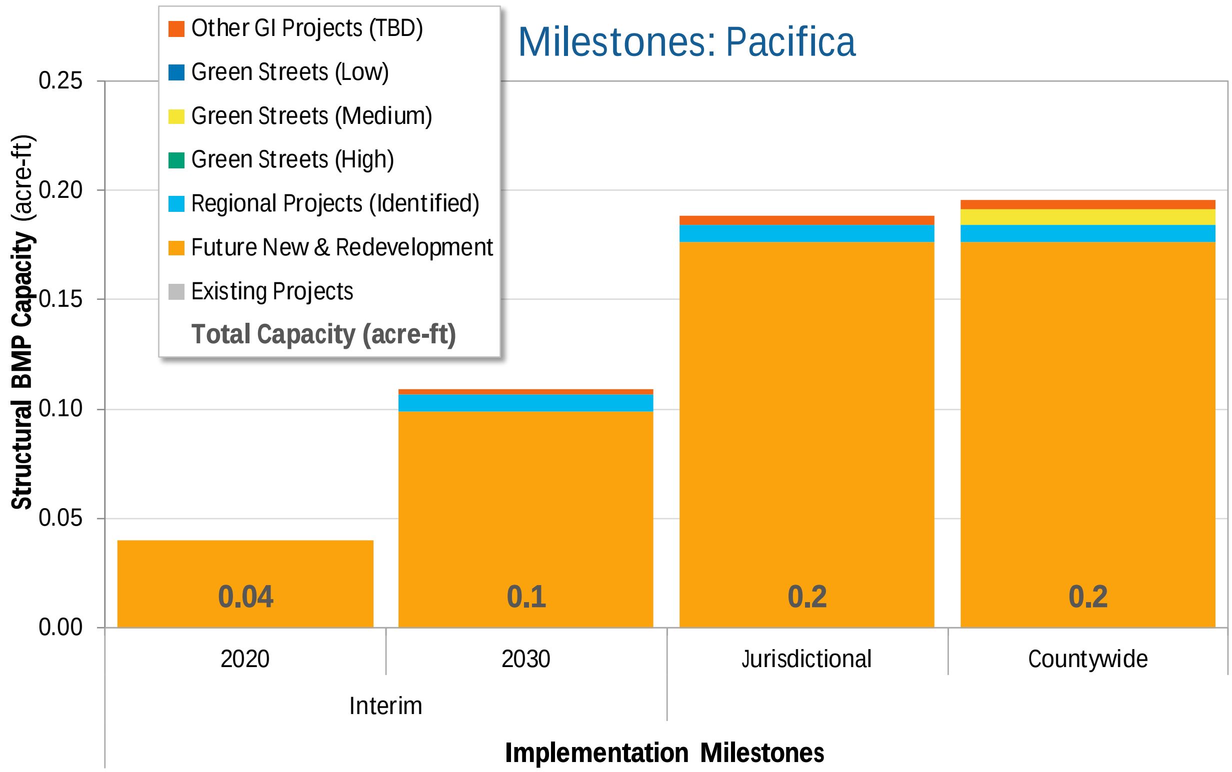


Figure D-12. Implementation Milestones: Pacifica.

Table D-12. Implementation Milestones: Pacifica

Implementation Metrics		Implementation Milestones: Pacifica					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	14.6%	0.6%	3.6%	18.2%	18.8%	22.1%
	Volume Managed (acre-ft/yr)	2.05	0.09	0.38	2.43	2.52	3.04
	Treated Impervious (acres)	0.25	0.01	0.06	0.31	0.33	0.51
Capacities (acre-ft)	Existing Projects	--	--	--	--	--	--
	Future New & Redevelopment	0.06	0.08	0.04	0.10	0.18	0.18
	Regional Projects (Identified)	0.01	0.00	--	0.01	0.01	0.01
	Green Streets (High)	--	--	--	--	--	--
	Green Streets (Medium)	--	--	--	--	--	0.01
	Green Streets (Low)	--	--	--	--	--	--
	Other GI Projects (TBD)	0.00	0.00	--	0.00	0.00	0.00
	Total	**0.07**	**0.08**	**0.04**	**0.11**	**0.19**	**0.20**

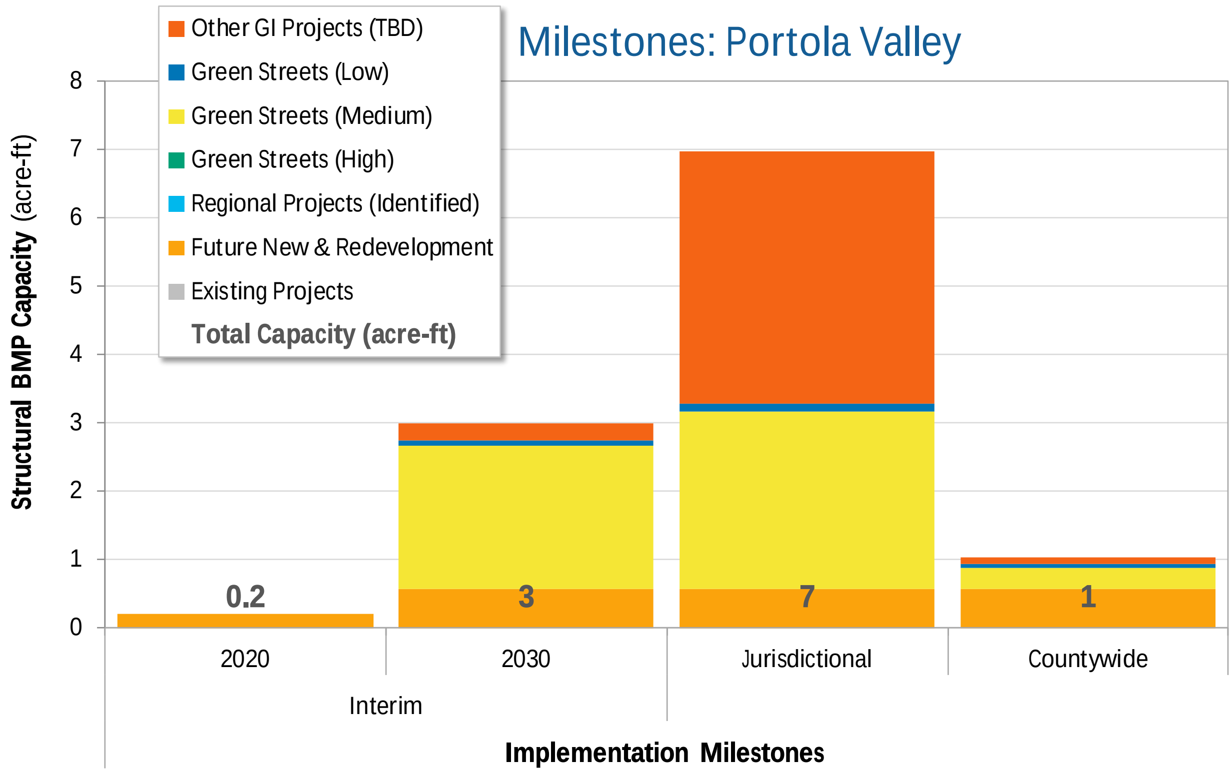


Figure D-13. Implementation Milestones: Portola Valley.

Table D-13. Implementation Milestones: Portola Valley

Implementation Metrics		Implementation Milestones: Portola Valley					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	0.2%	18.6%	0.2%	0.4%	19.0%	3.0%
	Volume Managed (acre-ft/yr)	1.0	127.3	1.5	2.6	129.9	14.9
	Treated Impervious (acres)	0.1	16.1	0.0	0.1	16.2	1.9
Capacities (acre-ft)	Existing Projects	--	--	--	--	--	--
	Future New & Redevelopment	0.4	0.0	0.2	0.6	0.6	0.6
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	--	--	--	--	--	--
	Green Streets (Medium)	2.1	0.5	--	2.1	2.6	0.3
	Green Streets (Low)	0.1	0.0	--	0.1	0.1	0.0
	Other GI Projects (TBD)	0.3	3.4	--	0.3	3.7	0.1
	Total	**2.8**	**4.0**	**0.2**	**3.0**	**7.0**	**1.0**

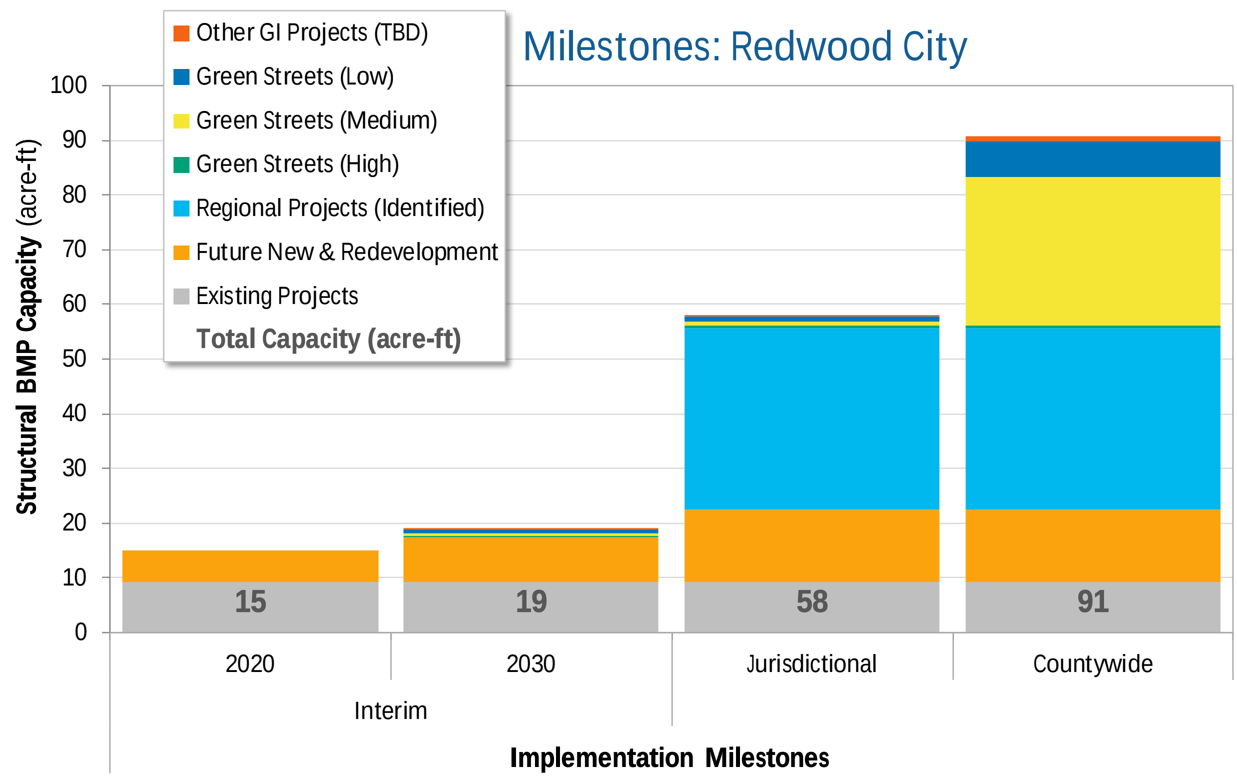


Figure D-14. Implementation Milestones: Redwood City.

Table D-14. Implementation Milestones: Redwood City

Implementation Metrics		Implementation Milestones: Redwood City					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	7.9%	3.8%	6.2%	14.1%	17.9%	36.7%
	Volume Managed (acre-ft/yr)	121.9	59.3	207.2	329.1	388.4	732.1
	Treated Impervious (acres)	33.1	89.3	150.5	183.6	272.9	652.0
Capacities (acre-ft)	Existing Projects	0.0	0.0	9.2	9.2	9.2	9.2
	Future New & Redevelopment	2.4	5.1	5.8	8.2	13.4	13.4
	Regional Projects (Identified)	--	33.1	--	--	33.1	33.1
	Green Streets (High)	0.4	0.1	--	0.4	0.5	0.6
	Green Streets (Medium)	0.3	0.4	--	0.3	0.8	27.1
	Green Streets (Low)	0.8	0.0	--	0.8	0.8	6.5
	Other GI Projects (TBD)	0.1	0.2	--	0.1	0.3	1.0
	Total	**4.0**	**39.0**	**15.0**	**19.0**	**58.0**	**90.8**

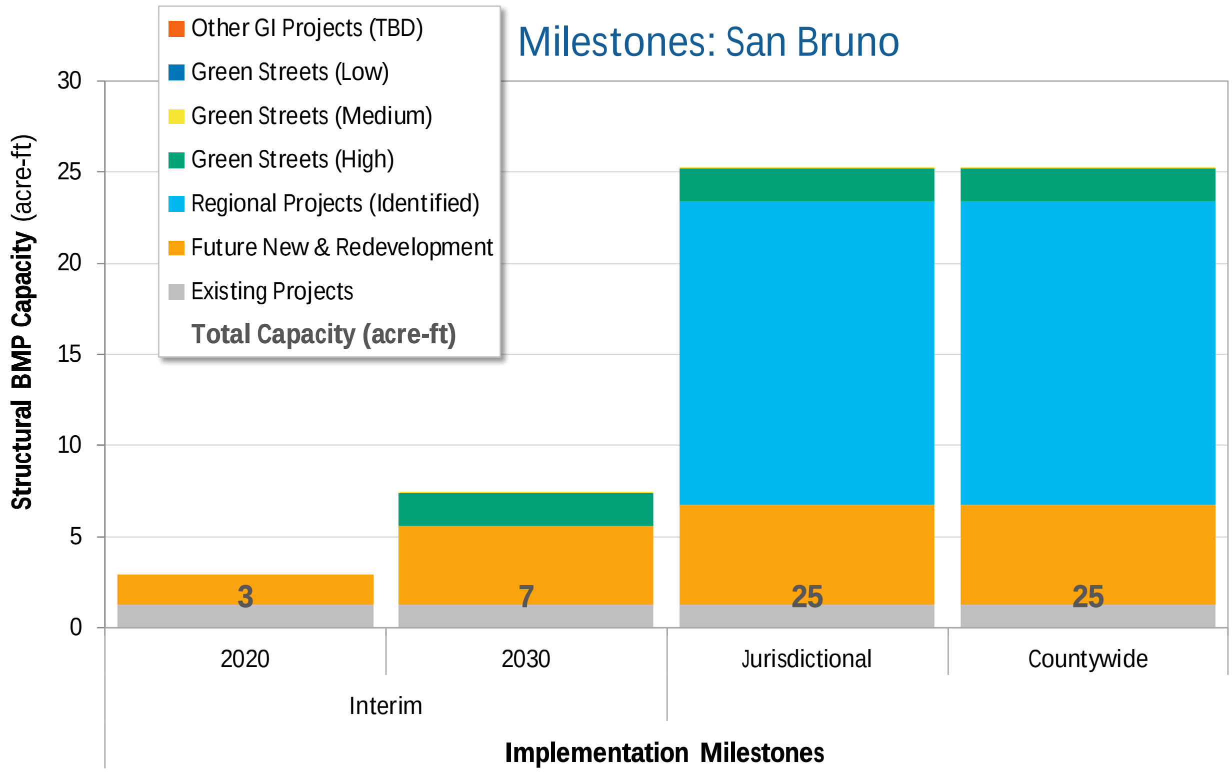


Figure D-15. Implementation Milestones: San Bruno.

Table D-15. Implementation Milestones: San Bruno

Implementation Metrics		Implementation Milestones: San Bruno					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	3.8%	10.8%	3.1%	7.0%	17.8%	17.8%
	Volume Managed (acre-ft/yr)	39.1	110.5	52.7	91.8	202.4	202.4
	Treated Impervious (acres)	23.2	124.6	20.9	44.1	168.7	168.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	1.2	1.2	1.2	1.2
	Future New & Redevelopment	2.6	1.2	1.7	4.4	5.5	5.5
	Regional Projects (Identified)	0.0	16.6	--	0.0	16.7	16.7
	Green Streets (High)	1.8	0.0	--	1.8	1.8	1.8
	Green Streets (Medium)	0.1	0.0	--	0.1	0.1	0.1
	Green Streets (Low)	--	--	--	--	--	--
	Other GI Projects (TBD)	--	--	--	--	--	--
	Total	**4.5**	**17.8**	**3.0**	**7.4**	**25.3**	**25.3**

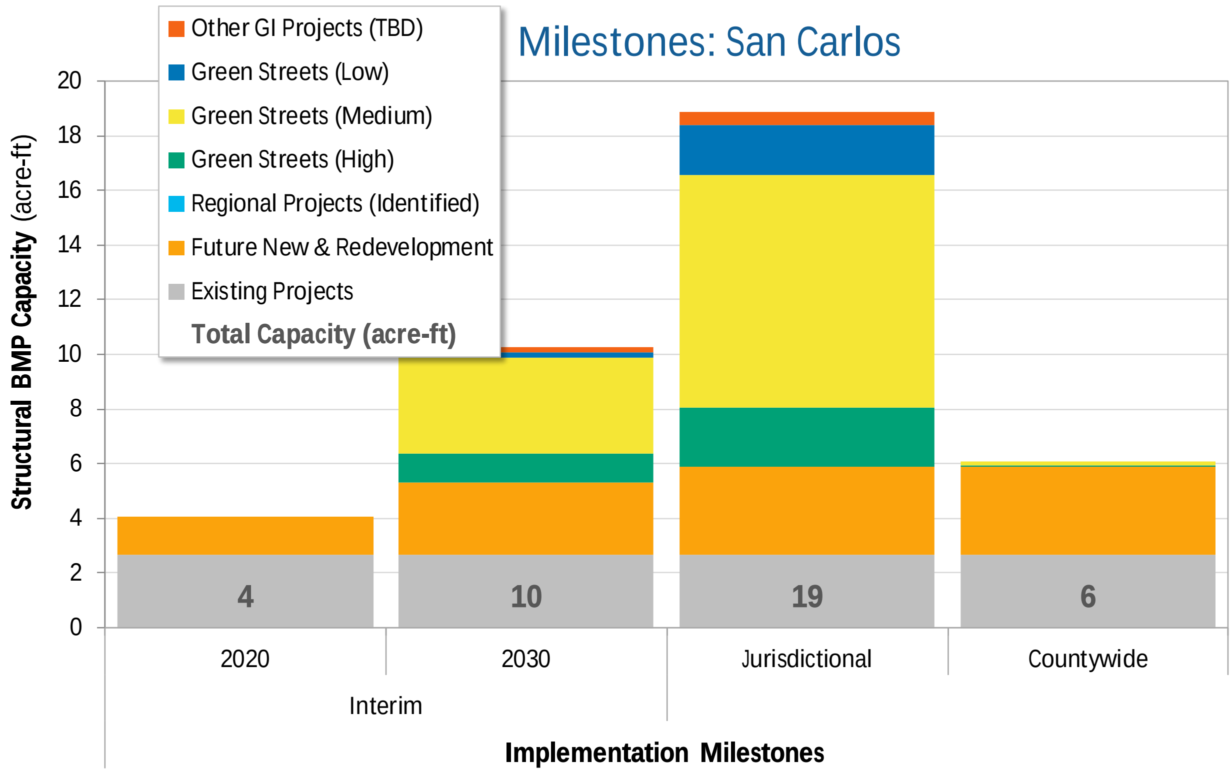


Figure D-16. Implementation Milestones: San Carlos.

Table D-16. Implementation Milestones: San Carlos

Implementation Metrics		Implementation Milestones: San Carlos					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	4.1%	11.1%	3.2%	7.3%	18.4%	3.6%
	Volume Managed (acre-ft/yr)	67.7	183.5	57.1	124.9	308.4	61.0
	Treated Impervious (acres)	18.8	172.6	44.9	63.7	236.3	79.9
Capacities (acre-ft)	Existing Projects	0.0	0.0	2.7	2.7	2.7	2.7
	Future New & Redevelopment	1.2	0.6	1.4	2.6	3.2	3.2
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	1.1	1.1	--	1.1	2.2	0.0
	Green Streets (Medium)	3.5	5.0	--	3.5	8.5	0.2
	Green Streets (Low)	0.2	1.7	--	0.2	1.9	--
	Other GI Projects (TBD)	0.2	0.3	--	0.2	0.4	--
	Total	**6.2**	**8.6**	**4.1**	**10.3**	**18.8**	**6.1**

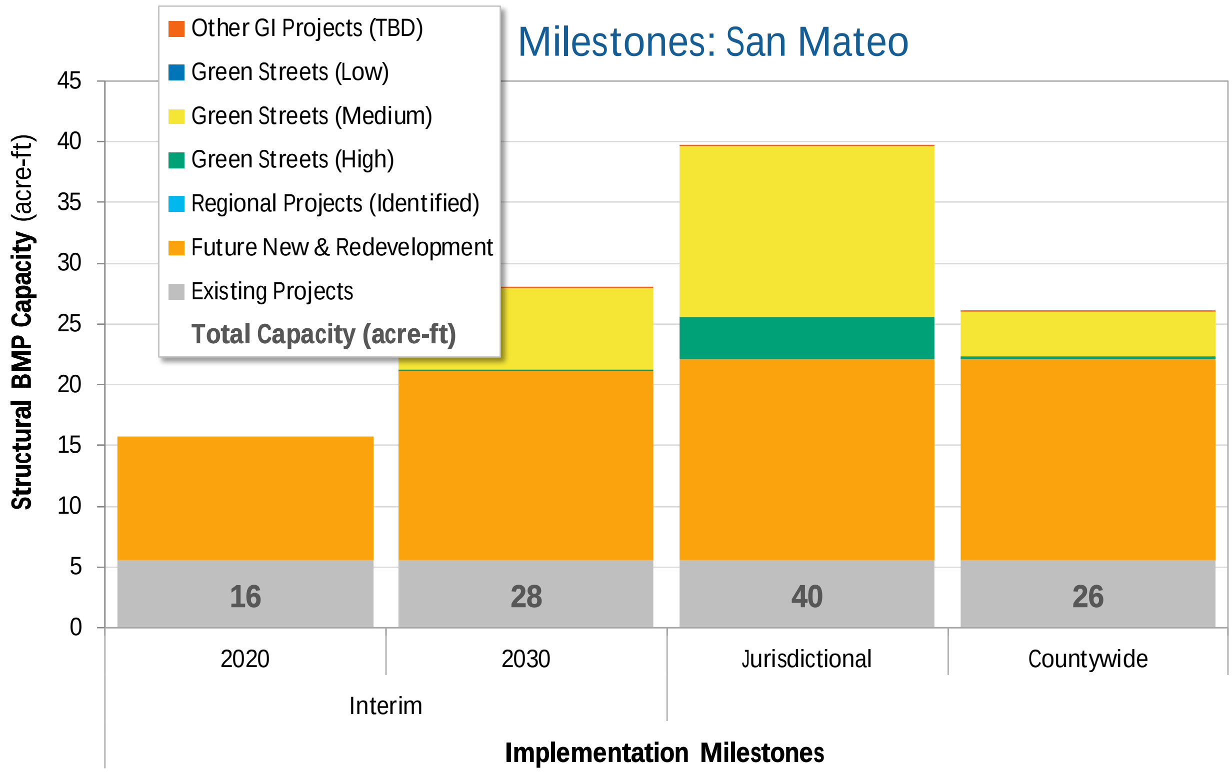


Figure D-17. Implementation Milestones: San Mateo.

Table D-17. Implementation Milestones: San Mateo

Implementation Metrics		Implementation Milestones: San Mateo					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	5.3%	4.4%	8.3%	13.6%	18.0%	8.9%
	Volume Managed (acre-ft/yr)	169.9	141.6	272.3	442.2	583.8	299.9
	Treated Impervious (acres)	71.3	207.8	178.0	249.3	457.0	298.0
Capacities (acre-ft)	Existing Projects	0.0	0.0	5.6	5.6	5.6	5.6
	Future New & Redevelopment	5.3	1.0	10.2	15.5	16.5	16.5
	Regional Projects (Identified)	--	--	--	--	--	--
	Green Streets (High)	0.2	3.2	--	0.2	3.4	0.2
	Green Streets (Medium)	6.7	7.5	--	6.7	14.1	3.7
	Green Streets (Low)	--	--	--	--	--	--
	Other GI Projects (TBD)	0.0	0.0	--	0.0	0.0	0.0
	Total	**12.2**	**11.7**	**15.8**	**27.9**	**39.6**	**26.0**

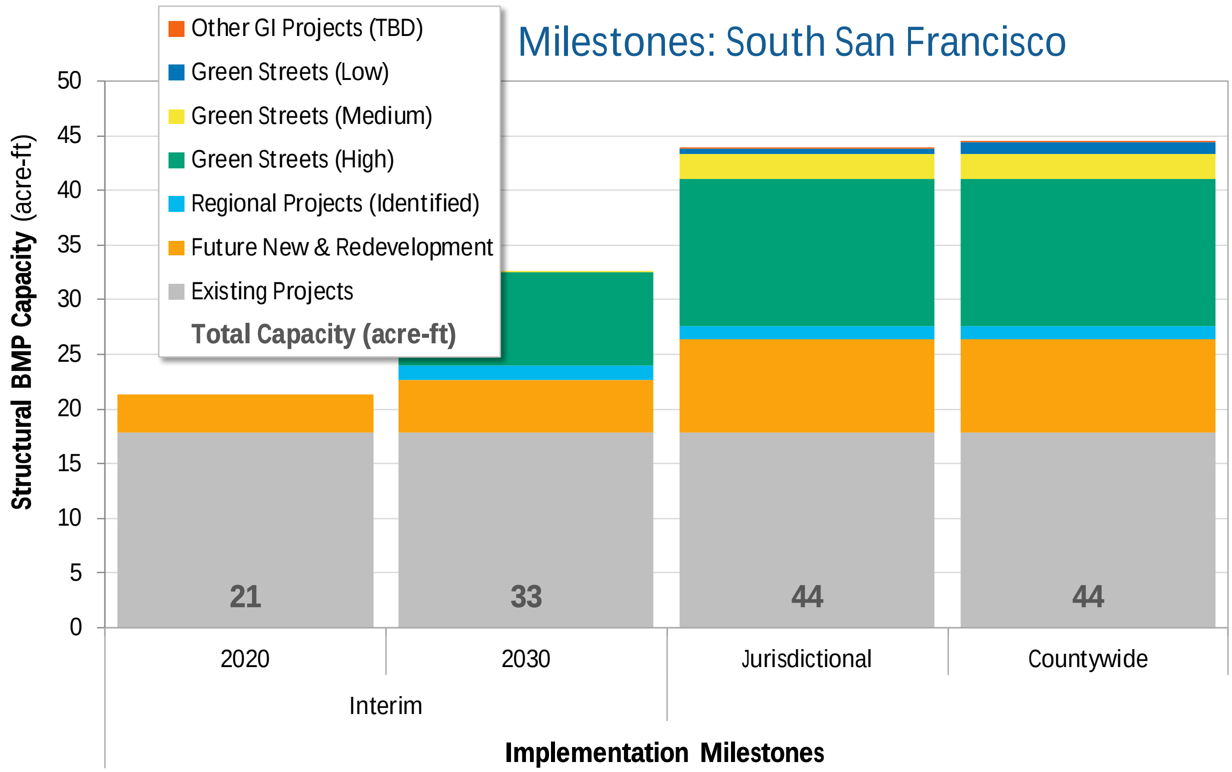


Figure D-18. Implementation Milestones: South San Francisco.

Table D-18. Implementation Milestones: South San Francisco

Implementation Metrics		Incremental 2020-2030	Incremental 2030-2040	Cumulative 2020	Cumulative 2030	Final 2040 Jurisdictional	Final 2040 Countywide
Management Metrics	% Load Reduction	4.7%	5.7%	7.6%	12.3%	18.0%	18.9%
	Volume Managed (acre-ft/yr)	81.9	99.1	347.1	429.0	528.2	554.6
	Treated Impervious (acres)	50.1	315.8	210.9	261.1	576.9	594.6
Capacities (acre-ft)	Existing Projects	0.0	0.0	17.9	17.9	17.9	17.9
	Future New & Redevelopment	1.4	3.6	3.5	4.8	8.5	8.5
	Regional Projects (Identified)	1.3	0.0	--	1.3	1.3	1.3
	Green Streets (High)	8.6	4.9	--	8.6	13.4	13.4
	Green Streets (Medium)	0.0	2.3	--	0.0	2.3	2.4
	Green Streets (Low)	--	0.5	--	--	0.5	1.0
	Other GI Projects (TBD)	--	0.0	--	--	0.0	0.0
	Total	**11.2**	**11.3**	**21.3**	**32.5**	**43.8**	**44.4**

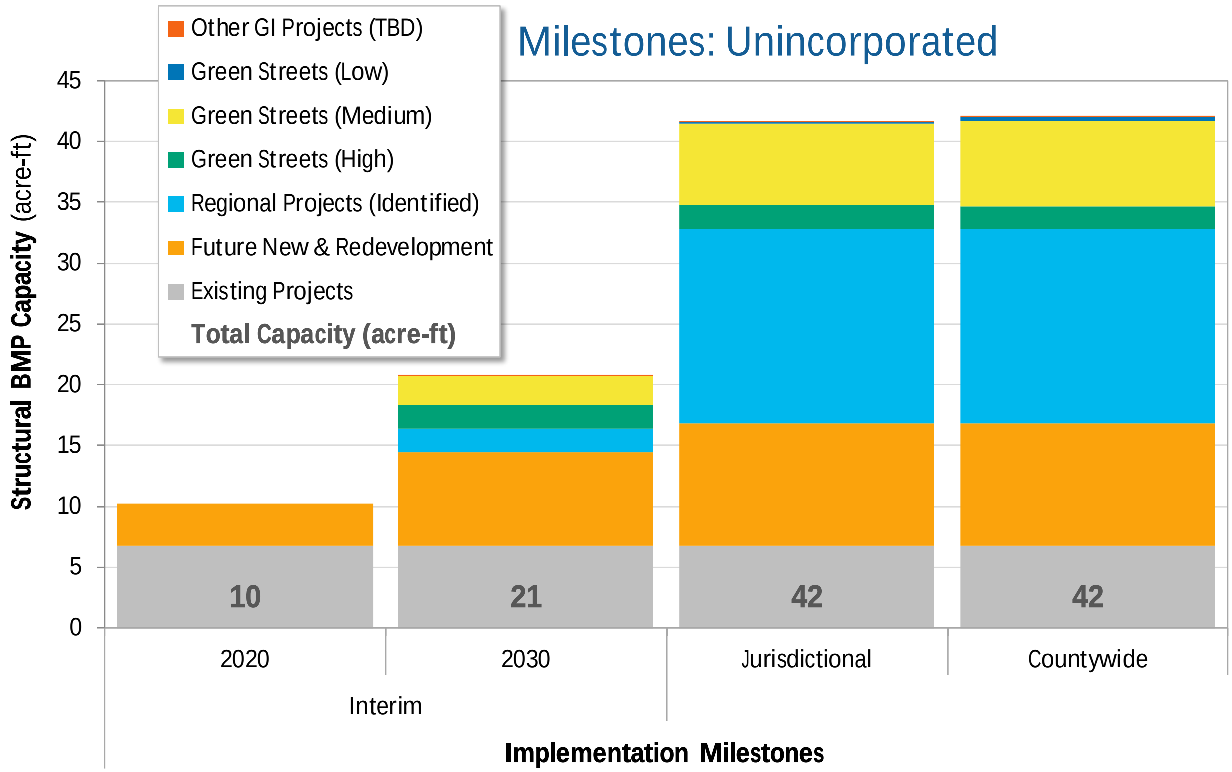


Figure D-19. Implementation Milestones: Unincorporated.

Table D-19. Implementation Milestones: Unincorporated

Implementation Metrics		Implementation Milestones: Unincorporated					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	7.4%	6.6%	3.6%	11.1%	17.7%	22.6%
	Volume Managed (acre-ft/yr)	110.7	98.2	97.8	208.5	306.7	379.3
	Treated Impervious (acres)	88.0	113.9	40.3	128.3	242.2	246.4
Capacities (acre-ft)	Existing Projects	0.0	0.0	6.7	6.7	6.7	6.7
	Future New & Redevelopment	4.1	2.4	3.5	7.7	10.0	10.0
	Regional Projects (Identified)	2.0	13.9	--	2.0	16.0	16.0
	Green Streets (High)	1.9	0.1	--	1.9	2.0	1.9
	Green Streets (Medium)	2.3	4.4	--	2.3	6.7	7.0
	Green Streets (Low)	--	0.1	--	--	0.1	0.3
	Other GI Projects (TBD)	0.0	0.1	--	0.0	0.1	0.1
	Total	**10.4**	**21.0**	**10.3**	**20.7**	**41.7**	**42.1**

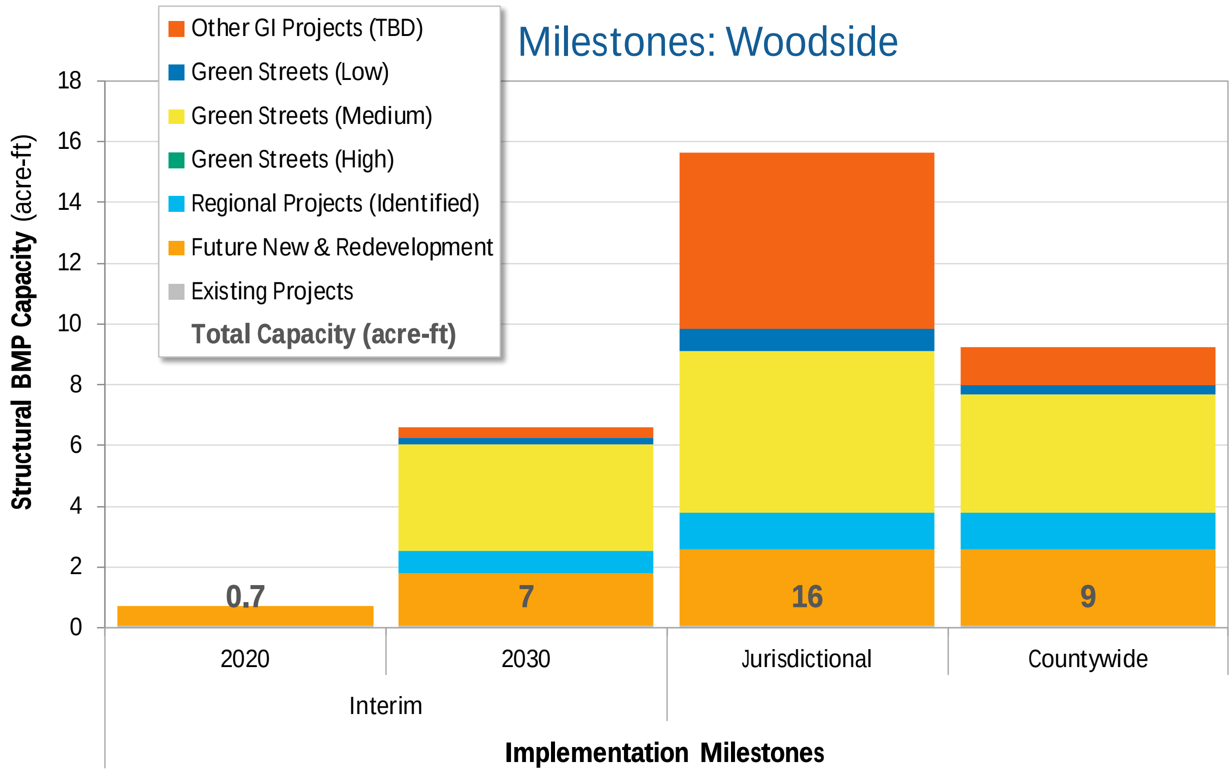


Figure D-20. Implementation Milestones: Woodside.

Table D-20. Implementation Milestones: Woodside

Implementation Metrics		Implementation Milestones: Woodside					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	8.1%	9.2%	0.3%	8.5%	17.6%	8.1%
	Volume Managed (acre-ft/yr)	68.3	76.8	11.4	79.6	156.5	54.2
	Treated Impervious (acres)	40.7	46.1	0.3	41.0	87.1	76.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	0.1	0.1	0.1	0.1
	Future New & Redevelopment	1.1	0.8	0.6	1.7	2.5	2.5
	Regional Projects (Identified)	0.8	0.5	--	0.8	1.2	1.2
	Green Streets (High)	--	--	--	--	--	--
	Green Streets (Medium)	3.5	1.8	--	3.5	5.3	3.9
	Green Streets (Low)	0.2	0.5	--	0.2	0.7	0.3
	Other GI Projects (TBD)	0.3	5.5	--	0.3	5.8	1.3
	Total	**5.9**	**9.0**	**0.7**	**6.6**	**15.6**	**9.3**

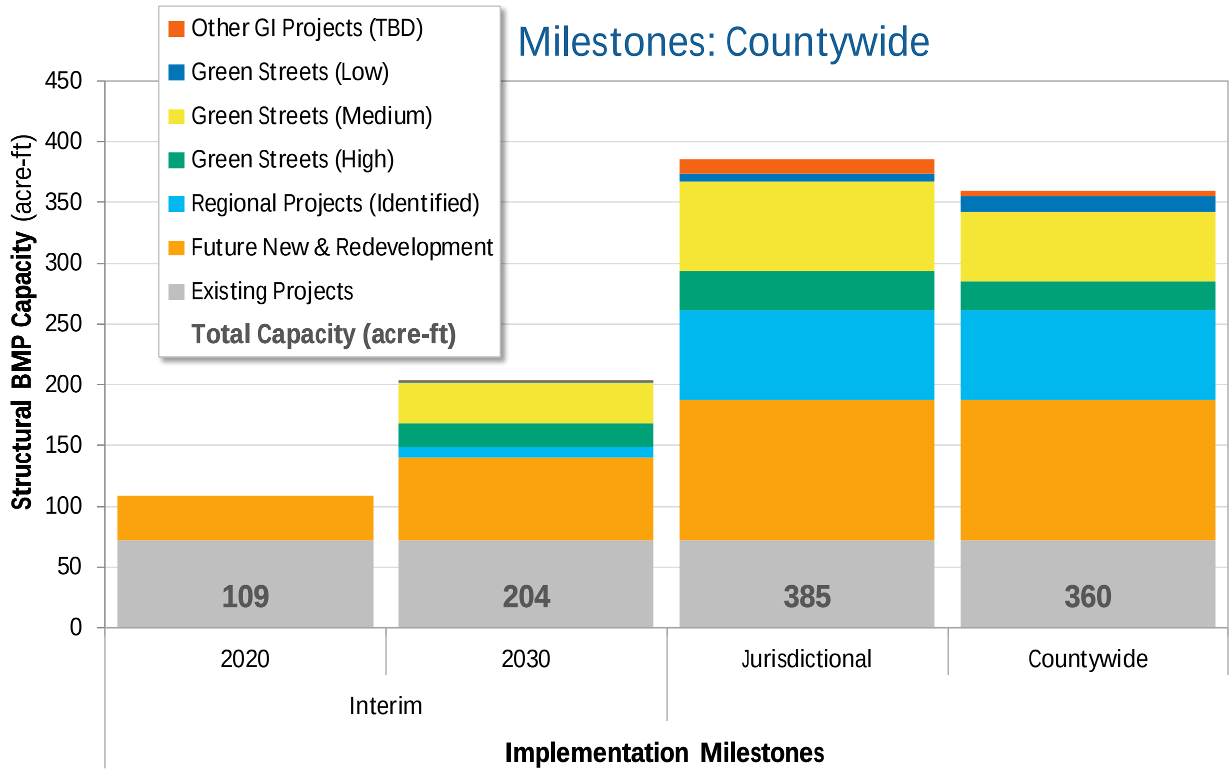


Figure D-21. Implementation Milestones: Countywide.

Table D-21. Implementation Milestones: Countywide

Implementation Metrics		Implementation Milestones: Countywide					
		Incremental		Cumulative		Final 2040	
		2020-2030	2030-2040	2020	2030	Jurisdictional	Countywide
Management Metrics	% Load Reduction	6.0%	7.5%	5.0%	11.0%	18.5%	17.6%
	Volume Managed (acre-ft/yr)	1,313.0	1,655.5	1,524.7	2,837.6	4,493.2	3,701.3
	Treated Impervious (acres)	627.0	1,945.8	916.3	1,543.2	3,489.1	3,395.7
Capacities (acre-ft)	Existing Projects	0.0	0.0	72.1	72.1	72.1	72.1
	Future New & Redevelopment	30.9	48.3	36.6	67.5	115.8	115.8
	Regional Projects (Identified)	9.0	64.6	--	9.0	73.6	73.6
	Green Streets (High)	20.0	12.6	--	20.0	32.6	24.0
	Green Streets (Medium)	32.9	40.7	--	32.9	73.6	57.1
	Green Streets (Low)	1.4	4.5	--	1.4	5.9	12.8
	Other GI Projects (TBD)	1.2	10.6	--	1.2	11.8	4.3
	Total	**95.3**	**181.3**	**108.7**	**204.0**	**385.3**	**359.7**

Appendix C

Phase III RAA – Source Control Load Reduction Accounting for RAA Report

SOURCE CONTROL LOAD REDUCTION ACCOUNTING

FOR REASONABLE ASSURANCE ANALYSIS

Prepared for

Bay Area Stormwater Management Agencies Association

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August 31, 2020

Bay Area Stormwater Management Agencies Association

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ACRONYMS AND ABBREVIATIONS

ACCWP	Alameda Countywide Clean Water Program
BASMAA	Bay Area Stormwater Management Agencies Association
CCCWP	Contra Costa Clean Water Program
GSI	Green Stormwater Infrastructure
GIS	Geographic Information System
IMR	Integrated Monitoring Report
mg/ac/yr	milligram per acre per year
mg/kg	milligram per kilogram
MPC	Monitoring and Pollutants of Concern Committee
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OFEE	Oil-Filled Electrical Equipment
PCBs	Polychlorinated Biphenyls
PG&E	Pacific Gas and Electric Company
POC	Pollutants of Concern
POTW	Publically Owned Treatment Works
RAA	Reasonable Assurance Analysis
ROW	Right-of-Way
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFEI	San Francisco Estuary Institute
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
TMDL	Total Maximum Daily Load
WY	Water Year

1. INTRODUCTION

1.1 Background

Municipal Regional Permit (MRP; SFBRWQCB, 2015[1]) Provisions C.11.b and C.12.b required the Permittees to develop and implement an assessment methodology and data collection program to quantify mercury and polychlorinated biphenyls (PCBs) loads reduced through implementation of pollution prevention, source control, and treatment control measures. BASMAA prepared the report *Interim Accounting Methodology for TMDL Loads Reduced* (BASMAA, 2017a), which was approved by the Water Board for use during MRP 2.0. The Permittees have used this assessment methodology to demonstrate progress towards achieving the load reductions required in the MRP 2.0 permit term. This report has been prepared to address the requirements of MRP Provisions C.11.b.iii.(3) and C.12.b.iii.(3), which require the Permittees to submit, for Executive Officer approval, refinements to the Interim Accounting Methodology to assess mercury and PCBs load reductions in the next permit term (i.e., MRP 3.0).

MRP Provisions C.11.d. and C.12.d. require the Permittees to prepare plans and schedules for mercury and PCBs control measure implementation and a reasonable assurance analysis (RAA) demonstrating that those control measures will be sufficient to attain the mercury total maximum daily load (TMDL) wasteload allocations by 2028 and the PCBs TMDL wasteload allocations by 2030. The *Bay Area RAA Guidance Document* (BASMAA, 2017b) establishes a regional framework and guidance for conducting RAAs in the Bay Area, including the types of modeling and data inputs that may be used by the Programs and Permittees for estimating loads reduced by green stormwater infrastructure (GSI). Section 4.2 of the *Bay Area RAA Guidance Document* states that load reductions for source control measures should be calculated based on methods provided in an approved refinement of the Interim Accounting Methodology, which was previously developed by BASMAA. This report refines the Interim Accounting Methodology for the purposes of non-green infrastructure load reduction accounting in the RAAs.

This report does not include methods used to account for the implementation of GSI and other types of stormwater treatment control measures. The RAA methodologies for GSI are preliminarily described in countywide reports submitted to the SFBRWQCB in September 2018 (ACCWP, 2018; CCCWP, 2018; FSURMP, 2018; SMCWPPP, 2018; and SCRURPPP, 2018) and will be more fully described in the countywide RAA reports that will be submitted in September 2020. The GSI RAA methodologies have undergone external peer review and the results of the countywide GSI RAA modeling for each county will be submitted to the SFBRWQCB in September 2020. Non-GSI treatment control measure[2] load reductions would be modeled similarly to GSI load reductions, so are not discussed in this report.

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[1] Reissued November 19, 2015 with effective date January 1, 2016, to 77 Phase I municipal stormwater Permittees in five Bay Area counties which are among over 90 local agencies comprising the Bay Area Stormwater Management Agencies Association (BASMAA).

[2] Non-GSI treatment control measures that are not included in this report, for example, include treatment wetlands or media filters. Full trash capture devices, enhanced operations and maintenance activities, and diversion to POTW could also be considered as treatment control measures; these measures are included in this report.

1.2 Report Overview

A description of the source control measures, load reduction accounting methodologies, reporting requirements, and assumptions are presented in Sections 2 through 10 of this report for the following mercury and PCBs source control measure categories:

- Source Property Identification and Abatement;
- Management of PCBs in Building Materials;
- Management of PCBs in Electrical Utilities;
- Management of PCBs in Roadway and Storm Drain Infrastructure;
- Enhanced Operations and Maintenance Control Measures;
- Trash Full Capture Systems Implementation;
- Diversion to Publicly Owned Treatment Works (POTW); and
- Mercury Load Avoidance and Reduction.

The appendices present:

- A summary of how the land used-based PCBs and mercury yields were developed;
- A statistical summary of the observed urban sediment concentrations;
- Source area investigation and abatement guidance and referral/self-abatement forms;
- An estimate of load reductions for the PCBs in Electrical Utilities Management Program and the PCBs in Roadway and Storm Drain Infrastructure Program;
- Enhanced inlet cleaning efficiency factor data analysis for storm drain inlets with and without inlet-based full trash capture devices;
- Enhanced street sweeping efficiency factors; and
- Non-inlet-based trash capture device unit efficiency factor data analysis.

1.3 Source Control Load Reduction Accounting Basis

The source control load reduction accounting methodology outlined in this report is based on relative mercury and PCBs yields from different land use categories. This methodology was first outlined in the 2014 Integrated Monitoring Reports (IMRs) (ACCWP, 2014; CCCWP, 2014; SCVURPPP, 2014; SMCWPPP, 2014) and was described in the MRP 2.0 Fact Sheet. The method involves using default factors for PCBs and mercury load reduction credits resulting from foreseeable control measures. This report updates and refines the accounting system to account for new information; justifies the assumptions, analytical methods, sampling schemes, and parameters used to quantify the load reduction for each type of control measure; and indicates what information will be collected and submitted to confirm the calculated load reduction for each unit of activity for each control measure.

As described in the MRP 2.0 Fact Sheet, a land use-based yield is an estimate of the mass of a contaminant contributed by an area of a particular land use per unit time. Essentially, different types of land uses yield different amounts of pollutants because land use types differ in their degree of contamination resulting from differing intensities of historic or ongoing use of pollutants. The land use categories used to calculate land use-based yields were identified from studies conducted to identify potential POC sources and source areas, as described below.

The Regional Watershed Spreadsheet Model (RWSM) was developed as part of the Regional Monitoring Program's Small Tributaries Loading Strategy as a regional-scale planning tool primarily for the purpose of estimating long-term average annual pollutant loads from the small tributaries surrounding San Francisco Bay, and secondarily to provide supporting information for prioritizing watersheds or areas within watersheds for management actions (Wu et al, 2016). The RWSM is structured with three stand-alone empirical models: the hydrology model, sediment model, and pollutant models. The hydrology model uses runoff coefficients based on land use-soil-slope combinations to estimate annual runoff from a watershed. The sediment model uses a function of geology, slope, and land-use to simulate suspended sediment transport in the landscape while adjusting for watershed storage factors. The pollutant model is essentially a "concentration map" that can be driven by either the hydrology model (for pollutant concentrations in water) or the sediment model (for pollutant concentrations on fine sediment particles as particle ratios[3] for specific land use or source areas). Starting in 2010, a multi-year effort was undertaken to systematically develop and calibrate the RWSM. Calibration was completed[4] and the model was released in 2018.

A PCBs source property yield was derived as the product of a representative PCBs concentration in shallow surface soils at known source properties and a representative soil/sediment yield for Old Industrial land use areas. The derivation of the estimated PCBs source property yield is described in Appendix A.

PCBs were more heavily used in older industrial areas so older industrial land use areas yield a much higher mass of PCBs per unit area than newer urban land use areas. The estimated average PCBs and mercury yields from the RWSM are summarized for six land use yield categories in Table 1-1 below. These yields are assigned based on land use but may also be assigned by the Permittees based on monitoring data and/or inspection results (e.g., to assign the Source Property yield to a parcel mapped as Old Industrial). These yield values have been developed using the best available data and technical approach at this time. The Permittees may re-evaluate these yields in the future as more information becomes available.

[3] Particle ratios = pollutant concentration in water (ng/L) / suspended sediment concentration (mg/L), equivalent to mg/kg.
[4] The calibration for PCBs is "reasonable" but there remains a lower confidence in the calibration for mercury (SFEI, 2017).

Table 1-1: Land Use-Based Yields for PCBs and Mercury

Land Use Category	Assumed Average PCBs Yield (mg/ac/yr)	Assumed Average Mercury Yield[1] (mg/ac/yr)
Source Property	5,078	53
Old Industrial	259	53
Old Commercial / Old Transportation	49	57
Old Residential	2.8	57
New Urban	0.4	4
Agriculture/Open Space	0.4	81

mg/ac/yr – milligrams per acre per year
Source: RWSM Toolbox v1.0 Pollutant Model, Pollutant Spreadsheet Model Calculations – Region. Spreadsheet dated 6/9/2017.
1. The model calibration for PCBs is "reasonable" but there remains a lower confidence in the calibration for mercury (Wu et al., 2017).

Appendix B presents concentration statistics for PCBs and mercury observed in street, storm drain, and private property sediment samples collected by BASMAA from 1999 through 2019. The data are summarized by the predominant land use within the vicinity of where the sediment was collected.

2. SOURCE AREA IDENTIFICATION AND ABATEMENT PROGRAM

2.1 Control Measure Description

Source area identification and abatement involves investigations of properties located in historically industrial land use or other land use areas where PCBs were used, released, and/or disposed of and/or where sediment concentrations are significantly elevated above urban background levels[5] and are being transported to the municipal separate storm sewer system (MS4). The source area identification and abatement control measure begins with performing investigations in High Likelihood/Interest areas to identify PCBs sources. Once a source property is identified, the source of PCBs on the property may be abated or caused to be abated directly by the Permittee or the Permittee may choose to refer the source property to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) for investigation and abatement by the SFBRWQCB. Source properties may include sites that were previously remediated but still have soils concentrations of PCBs that are elevated above urban background levels or may be newly identified source properties. Source properties may also include industrial facilities with ongoing industrial activities that are covered under the General Permit for Stormwater Discharges Associated with Industrial Activities (Industrial General Permit) or another National Pollutant Discharge Elimination System (NPDES) permit.

The Permittees identify significantly elevated PCBs concentrations through surface soil/sediment sampling in the right-of-way or through water sampling where visual inspections and/or other information suggest that a specific property is a potential source of significantly elevated PCBs concentrations. Where data confirm significantly elevated concentrations (e.g., a sediment PCBs concentration equal to or greater than 1.0 mg/kg or a sediment concentration greater than 0.5 mg/kg and other lines of evidence) are present in soil/sediment from a potential source property or in stormwater samples, the Permittees may take actions to cause the property to be abated or may refer that property to the SFBRWQCB to facilitate the issuance of orders for further investigation and remediation of the subject property.

For each referred source property, the applicable Permittee will implement or cause to be implemented one or a combination of interim enhanced operation and maintenance (enhanced O&M) measures in the street or storm drain infrastructure adjacent to the source property during the source property abatement process, or will implement a stormwater treatment system downstream of the property to intercept historically deposited sediment. The intent is to prevent further contaminated sediment from being discharged from the storm drain system. These enhanced O&M measures and/or treatment systems will be described in the source property referral form that is sent to the SFBRWQCB.

The selected enhanced O&M control measure(s) or stormwater treatment must be implemented and maintained during the source property abatement process and should be sufficient to intercept historically deposited sediment in the public right-of-way and prevent additional contaminated sediment from being discharged from the MS4. The Permittee should discuss the

[5] See Appendix B for a statistical summary of urban sediment concentrations.

referral and achieve resolution with the SFBRWQCB prior to submitting the source property referral.

When a referred industrial facility is considered to be abated by the Permittee and the SFBRWQCB, the enhanced O&M measures may be discontinued, and ongoing facility inspections would be conducted as appropriate as part of the Permittee's routine industrial inspection program.

Source area investigation and abatement program guidance is provided in Appendix C.

2.2 Loads Reduced Accounting Methodology

The amount of PCBs loads (i.e., annual mass or milligrams per year (mg/yr)) reduced will be assessed for source properties using the following accounting method:

$$Load\ of\ PCBs\ Reduced = SP_A \bullet (SP_Y - OCOT_Y)$$

Where:

SP_A	=	Source property area (acres (ac))
SP_Y	=	Source property PCBs yield (mg/ac/yr)
$OCOT_Y$	=	Old Commercial/Old Transportation land use PCBs yield (mg/ac/yr)

Thus, the PCBs load reduced in mg/yr will be calculated as the area of the source property in acres multiplied by 5,029 mg/ac/yr (i.e., 5,078 – 49 mg/ac/yr).

There is no mercury load reduction credit given to PCBs source property referrals, as there is not a significant difference between the estimated source property, old industrial, old residential, and old commercial/old transportation mercury yield values.

Fifty percent of this load reduction will be credited to the Permittee for properties that are referred to the SFBRWQCB for abatement at the time of referral provided that enhanced O&M measures or stormwater treatment are implemented or caused to be implemented in the vicinity of the referred source property to prevent further contaminated sediment from being discharged from the storm drain system. The remaining 50% load reduction for referred properties will be credited to the Permittee upon completion of the abatement process or at ten years, whichever occurs first. The SFBRWQCB will notify the Permittee when the abatement process is complete.

Source properties that drain directly to the Bay (as opposed to the street or public storm drain infrastructure) do not allow for implementation of enhanced O&M measures or stormwater treatment by the Permittee. These properties may be submitted to the SFBRWQCB as a referral; 100% load reduction credit will be awarded upon completion of the abatement process, after ten years, or the TMDL compliance date (i.e., 2030 for PCBs), whichever occurs first.

If a source property has been abated without referral to the SFBRWQCB, either through voluntary actions by the property owner or using municipal enforcement powers, then 100% of the load reduction will be credited to the Permittee at the time that the abatement is complete. The Permittee shall provide documentation to the SFBRWQCB that abatement has effectively eliminated the transport of PCBs or mercury to the MS4 or directly to the Bay for all transport mechanisms that apply to the site (e.g., stormwater runoff, wind, vehicle tracking). The documentation shall include information on the type and extent of abatement that has occurred (e.g., have the sources of PCBs to the MS4 been eliminated via soil removal, capping, paving, walls, plugging/removal of internal storm drains, etc.). Documentation may be from a cleanup regulatory agency such as the US Environmental Protection Agency (USEPA) or the California Department of Toxic Substances Control (DTSC). For sites with ongoing industrial activities, water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4 or to the Bay should be provided. Information that supports the determination of abatement should be submitted to the SFBRWQCB for review using the Abatement Form in Appendix D.

For source properties that include a combination of industrial area and area that is not likely to be a source of PCBs (e.g., unimpacted open space area), the source property yield will only be applied to the portion of the property that is an industrial area.

Load reduction credit for enhanced O&M measures conducted as a part of a source property referral is included in the credit afforded by the source property referral. Enhanced O&M measures conducted adjacent to a source property that has not been referred to the SFBRWQCB may receive load reduction credit under the enhanced O&M control measure category using the source property yield (see Section 6).

2.3 Reporting

Standard report forms are provided for Source Property Referral and Source Property Self Abatement in Appendix D.

For load reduction reporting associated with the source property identification and abatement control measure, the area of each property will be estimated using the County Assessor's parcel map or an equivalent method. For those source properties that are referred to the SFBRWQCB for abatement, the referral form has a space to describe any enhanced O&M control measures or downstream treatment control measures that have been implemented or are planned to be implemented at the source property. For those source properties that have been abated, the Permittee will provide a statement that the property has been abated, along with documentation on the date, type, and extent of abatement, as described above.

3. PCBS IN BUILDING MATERIALS MANAGEMENT PROGRAM

3.1 Control Measure Description

The MRP Permittees have developed and implemented a process, beginning in July 2019, for managing materials with PCBs concentrations of 50 ppm or greater in applicable structures at the time such structures undergo demolition. Applicable structures include commercial, public, institutional, and industrial buildings constructed or remodeled between the years 1950 and 1980 undergoing full-building demolition. Single-family residential and wood frame structures are exempt.

Permittees have implemented the following process for this control measure:

- Municipalities inform applicable demolition permit applicants that their projects are subject to the program for managing materials with PCBs, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.
- For every applicable demolition project, applicants implement the BASMAA protocol for identifying building materials with PCBs concentrations of 50 ppm and then complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality.
- The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
- The municipality then issues the demolition permit or equivalent, according to its procedures.
- The municipality sends each completed Screening Form for applicable structures and any supporting documents to its countywide program. The countywide program compiles the forms and works with the other MRP countywide programs to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

3.2 Loads Reduced Accounting Methodology

The load of PCBs reduced through implementation of the PCBs in Building Materials Management Program will be assessed using the following accounting method:

$$Load\ of\ PCBs\ Reduced = \left[\sum_{i=1}^{n}(N_i \bullet M_i \bullet SW_i)\right] \bullet E_f$$

Where:

N_i	=	Number of applicable buildings demolished each year (units/yr)
M_i	=	Average mass of PCBs per applicable building (mg/unit)
SW_i	=	Average fraction of PCBs that enters the MS4 due to demolition without controls (%)

E_f = Average fraction of PCBs prevented by controls from entering MS4 (%)

Reasonable values were used to assign the load reduction for this control measure in MRP 2.0. Permittees received a total of 2,000 g/yr (2 kg/yr) PCBs load reduction value in 2019 when protocols for managing PCBs-containing materials during demolition, as required in MRP 2.0 Provision C.12.f., were developed and implemented. Table 3-1 below lists the four terms and the assumed values used to derive the 2 kg/yr credit. These values may be updated based on data gathered in the future, as described below.

Table 3-1: Terms Used to Estimate the Loading of PCBs in Building Materials for MRP 2.0

Term	Estimated Value	Units
1. Number of applicable buildings[1] demolished per year	50	buildings/year
2. Average mass of PCBs per applicable building	5	kg
3. Average fraction of PCBs that enters MS4s due to demolition without controls[2]	0.01	dimensionless fraction
4. Average fraction of PCBs prevented by controls[2] from entering MS4	0.8	dimensionless fraction

[1]Applicable buildings: constructed from 1950 through 1980 with PCBs concentration in caulks/sealants greater than 50 ppm, excluding single family residential and wood frame buildings.

[2]The term "controls" refers to the proposed new demolition management program, not existing construction controls.

The 2 kg/yr PCBs load reduction stipulated during MRP 2.0 will be retained. During the MRP 3.0 permit term, Permittees may, with the necessary supporting data, request an increase in the credit received for the current program and/or expand the scope of the program to increase loads reduced. Any proposed revision of load reduction credit and/or program expansion would be submitted to the Regional Water Board for Executive Officer approval.

The new management program implemented by Permittees as of July 1, 2019 requires that demolition project proponents identify priority materials in applicable buildings, collect representative samples for analysis, and report the concentrations of PCBs. When a sample concentration is equal to or greater than 50 ppm, the estimated amount of material in the building associated with that sample (and presumably removed and properly disposed of before the demolition occurs) is also reported. These concentration and quantity data can be combined to determine the mass of PCBs removed from the building. These data represent an estimate of the mass of PCBs removed from the building via removal of the priority materials (rather than the estimate provided in the MRP 2.0 fact sheet of the total mass of PCBs in the building in all PCBs-containing materials). Thus, the value of Term 4 in Table 3-1 may be set to 1 when evaluating the PCBs load avoided using data from the new program, since it may be assumed that the program removes 100% of the priority materials identified by the sampling.

3.3 Reporting

BASMAA is developing a regional data management system for compiling the data reported by demolition project applicants. This data for applicable structures, listed below, may be used to support a request for additional loads reduced by the existing program and/or an expansion of the program:

- Project information (e.g., address, APN, year building built, type of construction, estimated demolition date).
- Is building subject to the PCBs screening requirement based on type, use, and age of the building?
- PCBs concentration in each sample of a priority material. Currently, the BASMAA protocol identifies priority materials as caulk, thermal insulation, fiberglass insulation, adhesive mastics, and rubber window gaskets.
- When PCBs equal to or greater than 50 ppm are measured in a priority material sample, the estimated amount of that material in the building (only required to report on sampling of priority materials but reporting any available data on other materials is encouraged).

Permittees will provide documentation of each of the following items:

- The number of applicable structures that applied for a demolition permit during the reporting year; and
- A running list of the applicable structures that applied for a demolition permit (since the date the PCBs control protocol was implemented) that had material(s) with PCBs at 50 ppm or greater, with the address and demolition date.

4. PCBS IN ELECTRICAL UTILITIES MANAGEMENT PROGRAM

4.1 Control Measure Description

The Electrical Utilities Management Program will include improved procedures for documenting removal and disposal of PCBs-containing electrical equipment as part of ongoing equipment maintenance practices.

Electrical utility equipment in both the transmission and distribution systems are distributed across the MRP region. In the past, PCBs were routinely used in electrical utility equipment that contained dielectric fluid as an insulator. This is because prior to the 1979 PCBs ban, dielectric fluid was typically formulated with PCBs due to a number of desirable properties (e.g., high dielectric strength, thermal stability, chemical inertness, and non-flammability). Electrical equipment containing dielectric fluid is typically identified as Oil-Filled Electrical Equipment (OFEE). Any OFEE that contained PCBs in the past could still potentially contain PCBs today. The most common types of OFEE that may contain PCBs are transformers, capacitors, circuit breakers, reclosers, switches in vaults, substation insulators, voltage regulators, load tap changers, and synchronous condensers (PG&E, 2000).

There are hundreds of thousands of pieces of OFEE in public rights-of-way and at hundreds of electrical sub-station facilities across the MRP region. Some portion of these OFEE that are older and/or refurbished may contain (or contained in the past) dielectric fluids with PCBs at concentrations that are of concern if released to MS4s. Due to their large quantity, dispersed nature, and the difficulty in tracking and monitoring discharges, Permittees are limited in their ability to implement and/or enforce consistent and appropriate control measures to reduce releases of PCBs from this source category. This creates a potential missed opportunity to account for past and ongoing removal of PCBs-containing OFEE which has been and continues to reduce loads of PCBs from MS4s to the Bay.

For this control measure, Permittee owned electrical utilities will document the removal of PCBs-containing OFEE since the start of the TMDL and in the future until all PCBs-containing OFEE have been removed from active service, and provide data to support calculations of the associated stormwater load reductions due to these efforts. Additionally, it is anticipated that non-municipally owned regional electrical utilities that are not currently subject to PCBs load reduction requirements (i.e., PG&E) have been and will continue to remove PCBs-containing OFEE and document these efforts, past and present, consistent with methods used by applicable MRP permittees.

4.2 Loads Reduced Accounting Methodology

The load of PCBs reduced through implementation of the Electrical Utilities Management Program will be assessed using the following accounting method:

$$Load\ of\ PCBs\ Reduced = \left[\sum_{i=1}^{n}(LR_i)\right]$$

Where:

LR_i = Load of PCBs reduced for Action i during a given time period of interest (kg/yr).

The PCBs loads reduced in mg/yr will be assessed using the following equation:

$$Load\ of\ PCBs\ Reduced\ (LR) = L_0 \bullet ER_1 \bullet Y_i$$

Where:

L_0 = Estimated annual load of PCBs that enters MS4 from OFEE at the start of the PCBs TMDL.

ER_1 = Estimated percent of PCBs load prevented from entering the MS4 each year due to equipment removal (percent per year); the percent of loads prevented each year is assumed equivalent to the annual average rate of PCBs-containing equipment removal.

Y_i = Number of Years during the time period of interest i.

The above equation assumes the rate of load reduction achieved over the time period of interest is approximately equivalent to the equipment removal rate.

Reasonable values were developed for each of the terms shown in the equation above in order to calculate the total load reduction credit for implementing the Electrical Utilities Management Program (Table 3, see Appendix E for further detail). Based on equipment removal rates of 1.3% to 4.8% per year (average = 2.3% per year) for municipally-owned electrical utilities between 2005 and 2020 (calculated as described in detail in Appendix E), equipment removals since the start of the PCBs TMDL have reduced PCBs loads each year between 0.014 kg/yr to 0.053 kg/yr (average = 0.025 kg/yr). This equates to a total load reduction achieved by 2020 of between 0.210 kg/yr and 0.795 kg/yr (average = 0.375 kg/yr) due to equipment removals across the Bay Area. Assuming the same annual equipment removal rates in the future, then during the five-year term of MRP 3.0, additional load reductions will range from 0.072 kg/yr to 0.264 kg/yr (average 0.127 kg/yr) for equipment removals. Table 4-1 below identifies the assumed ranges of values for the terms in the above equation that were used to calculate the load reductions achieved since the start of the PCBs TMDL and during MRP 3.0. The derivation of each of the terms shown in Table 4-1 is presented in detail in Appendix E. These values may be updated based on data gathered during MRP 3.0.

Table 4-1: Range of Values used to Estimate the Load Reductions due to the Electrical Utilities Management Program Actions Since the Start of the PCBs TMDL and for MRP 3.0.

Term	Description	Estimated Values	Units
L_0	Annual load of PCBs to MS4 from OFEE at the start of the PCBs TMDL; this value is assumed to be the TMDL-normalized McKee et al. (2006) estimated load to stormwater from transformers and large capacitors in 2005 (see Appendix E for details on how this value was developed).	1.1	kg/yr
ER_1	Percent of PCBs prevented from entering MS4 due to ongoing equipment removals; these values are assumed equivalent to the annual equipment removal rates for municipally owned electrical utilities in the Bay Area between 2005 and 2020 (see Appendix E for details on how these values were developed).	1.3 - 4.8 (Average=2.3)	%/year

Term	Description	Estimated Values	Units
Y_i	The time period of interest since the start of the PCBs TMDL is the fifteen years between 2005 and 2020.	15	years
Y_i	The time period of interest during MRP 3.0 is the five years of the permit term.	5	years

All Permittees will receive a share of the total PCBs load reductions achieved as a result of program implementation based on the accepted countywide apportionment method (e.g., population).

4.3 Reporting

Permittees will summarize the steps they have taken to begin implementing this control measure, either collectively or individually.

Additionally, a report will be developed and provide the following information:

- Estimates of the current annual PCBs loads released to the MS4 from OFEE, based on the best available data;
- Permittees will document efforts by municipally owned electrical utilities in the MRP area to remove PCBs-containing equipment since the TMDL baseline period (i.e., 2003). The report will include the following information:
    - Describe actions that remove PCBs-containing OFEE, including handling and disposal methods; and
    - Document loads avoided calculations, inputs, and assumptions.

5. PCBS IN ROADWAY AND STORM DRAIN INFRASTRUCTURE CAULK MANAGEMENT PROGRAM

5.1 Control Measure Description

The BASMAA study *Evaluation of PCBs in Caulk and Sealants in Public Roadway and Storm Drain Infrastructure* (BASMAA, 2018) sampled caulk and sealant materials from public roadway and storm drain infrastructure around the Bay Area. The sampling program was designed to specifically target roadway and storm drain structures that were constructed during the most recent time period when PCBs were potentially used in caulk and sealant materials (i.e., prior to 1980, with a focus on the 1960's and 1970's). A total of 54 caulk and sealant samples were collected from ten different types of roadway and storm drain structures in the right-of-way (ROW), including concrete bridges/overpasses, sidewalks, curbs and gutters, roadway surfaces, above and below ground storm drain structures (i.e., flood control channels and storm drains accessed from manholes), and electrical utility boxes or poles attached to concrete sidewalks. The individual samples were grouped by structure type and sample appearance (color and texture) and the groups were combined into 20 composites; 10 of these groups were collected from concrete bridges, overpasses, or roadways.

Total PCBs concentrations across the 20 composite samples ranged from non-detect to greater than 4,000 mg/kg. The majority of the composites had PCBs concentrations that were below 0.2 mg/kg. PCBs were not detected in ten of the composite samples, representing nearly 60% of the individual samples collected during this program. PCBs in twenty-five percent (5 of 20) of the composites were above 1 mg/kg. Of these, two composites had very high PCBs concentrations (greater than 1,000 ppm) that indicate PCBs were likely part of the original caulk or sealant formulations. Both of these composites were comprised of black, pliable joint filler materials that were collected from concrete bridges/overpasses.

This control measure has been developed as a result of the outcome of this study. For this control measure, Permittees will track development of a Caltrans specification for managing PCBs-containing caulks and sealants on bridges or roadway overpasses during bridge replacement or joint maintenance. The Caltrans standard specifications for removal, handling, and disposal of caulk or sealant materials during infrastructure replacement or joint maintenance projects will be used to prevent the release of PCBs to the MS4. The Caltrans specification will be applied to all applicable public bridges or roadway overpass structures when the bridge infrastructure undergoes replacement or joint maintenance. Additionally, Permittees will implement the following actions:

1. Maintain a list of applicable bridges that are scheduled for replacement or joint maintenance.
2. Implement or cause to be implemented the Caltrans specifications during applicable bridge projects that are under the direction of the Permittee.
3. Track and report on the use of the specifications for all applicable bridge projects within the Permittee's jurisdiction.

5.2 Loads Reduced Accounting Methodology

A detailed load reduction accounting methodology is provided in Appendix F and summarized here.

Total PCBs load contained in bridges built and/or reconstructed prior to 1981 within the jurisdictions subject to the MRP was estimated using the following equation:

$$\text{Total Load}_{\text{PCBs, Bridges}} = \text{Density}_{\text{sealant}} * \text{Concentration}_{\text{PCBs}} * \sum \text{Volume}_{\text{sealant, bridges}}$$

Where:

$\text{Density}_{\text{sealant}}$ = average sealant density [kg/m^3]

$\text{Concentration}_{\text{PCBs}}$ = empirically derived concentration of PCBs [mg/kg]

$\sum \text{Volume}_{\text{sealant, bridges}}$ = Volume of sealant in all applicable bridges [m^3]

The volume of joint sealant was calculated using an assumed cross-section of sealant, multiplied by the assumed length of applied sealant:

$$\text{Volume}_{\text{sealant, bridges}} = \text{Cross-Section}_{\text{sealant}} * \text{Length}_{\text{sealant}}$$

Where:

$\text{Cross-Section}_{\text{sealant}}$ = Cross-section of applied sealant

$\text{Length}_{\text{sealant}}$ = Length of applied sealant

A summary of the data inputs is provided in Table 5-1 below. The derivation of the values presented in Table 5-1 is described in Appendix F.

Table 5-1: Bridge Load Calculation Data Inputs

Input	Result	Units	Source
Density of Sealant	1,100	kg/m^3	Takhar, 2013
Cross-Section of Sealant	1	square inch	Caltrans, 2007
PCBs Concentration	184	mg/kg	See Section 2.2.1

The estimated total PCBs load contained in bridges built and/or reconstructed prior to 1981 within the jurisdictions subject to the MRP is provided in Table 5-2.

Table 5-2: Total Calculated Loads for Bridges within the MRP Area, Built and/or Reconstructed Prior to 1981

County	Total Sealant PCBs Mass - Joints Only (kg)	Total Sealant PCBs Mass - Joints and Longitudinal Seal (kg)	Number of Bridges[1]
Alameda	3.8	11.2	340
Contra Costa	1.7	7.3	277
San Mateo	2.5	7.2	254
Santa Clara	3.7	10.1	473
Solano	0.9	3.2	133

County	Total Sealant PCBs Mass - Joints Only (kg)	Total Sealant PCBs Mass - Joints and Longitudinal Seal (kg)	Number of Bridges[1]
Total	**12.6**	**39.0**	**1,477**

1. U.S. Department of Transportation Federal Highway Administration, 2019. National Bridge Inventory. Visited 24 March 2020.

To estimate the load reduction associated with long-term bridge or expansion joint replacement, it is assumed that an ongoing PCBs release rate from bridge joints is mitigated through bridge joint maintenance and whole bridge replacement projects. The load reduction estimation is based on the assumption that PCBs in caulk are leaching from bridge joints and longitudinal seals over their lifetime. When that PCBs-containing caulk is replaced or removed through maintenance or replacement projects, the source of PCBs release is removed, and the associated annual released load is also removed. PCBs leaching from the material could occur through incremental wear or through larger damage (e.g., pieces of caulk torn out) over the lifetime of the caulk.

Lacking a literature-based release rate of sealant over time, two potential average annual release rates (i.e., average over the life of the seal) were assumed to calculate an estimated load reduction from removing the joint seal –0.5% and 1.0%. These average annual release rates were applied to the estimated mass for the 1,477 bridges meeting the identified age criteria (Table 5-3). These releases would be eliminated through removal of the joint seal through joint replacement or bridge replacement.

Table 5-3: Long-Term Load Reduction (i.e., Replacement of PCBs-Containing Joints in All Older Bridges)

County	Total Sealant PCBs Load Reduced - Joints Only (g/year)		Total Sealant PCBs Load Reduced - Joints and Longitudinal Seal (g/year)	
	0.5% annual loss rate over life	1% annual loss rate over life	0.5% annual loss rate over life	1% annual loss rate over life
Alameda	19	38	56	112
Contra Costa	8	17	37	73
San Mateo	12	25	36	72
Santa Clara	19	37	50	101
Solano	5	9	16	32
Total	63	126	195	390

This load reduction would occur no later than 2080, based on the assumption that all older joints will be removed/replaced within 100 years of installation.

5.3 Reporting

Permittees will report on the development and use of the Caltrans specification during all applicable replacement activities.

6. ENHANCED OPERATIONS AND MAINTENANCE PROGRAM

6.1 Control Measure Description

Routine MS4 operation and maintenance (O&M) activities include street sweeping, drain inlet cleaning, and pump station maintenance. In addition, culverts and channels are also routinely maintained (i.e., desilted). Enhancements to routine operations and new actions such as storm drain line and street flushing may enhance the Permittees' ability to reduce PCBs and mercury in stormwater. PCBs load reductions achieved through implementation of enhanced O&M control measures, aside from enhanced O&M control measures associated with source property referrals, may be counted as part of the overall load reductions expected during this permit term.

6.2 Loads Reduced Accounting Methodology

6.2.1 Enhanced Inlet Cleaning (With and Without Small Full Trash Capture Devices) and Street Sweeping

Load reductions for enhanced inlet cleaning and street sweeping will be calculated as follows:

$$\boldsymbol{Annual\ Load\ of\ PCB\ Reduced = P_A \bullet P_Y \bullet EE_f}$$

Where:

P_A	=	Catchment area for enhanced O&M measure (acres)
P_Y	=	Area-weighted PCBs yield (mg/acre-year) for the enhanced O&M catchment area based on land use yield (see Table 1-1)
EE_f	=	Enhancement Efficiency factor for enhanced O&M control measure (See Appendix G for enhanced inlet cleaning with and without small full trash capture devices and Appendix H for enhanced street sweeping).

6.2.2 Pump Station Cleanout, Storm Drain Line Cleanout, Street Flushing, and Culvert/Channel Desilting

Load reductions for enhanced pump station cleanout, storm drain line cleanout, street flushing, and culvert/channel desilting will be calculated as follows:

$$Enhanced_{LR} = Current_{LR} - Baseline_{LR}$$

Where:

$Current_{LR}$	=	$Vol_{Current} \bullet \%Sed \bullet \rho \bullet Conc$
$Baseline_{LR}$	=	$Vol_{Baseline} \bullet \%Sed \bullet \rho \bullet Conc$
$Vol_{Current}$	=	Average volume of material collected via the enhanced O&M control measure in current year(s) (post-Fiscal Year 2001-02) (m3/yr)

$Vol_{Baseline}$	=	Average volume of material collected via the O&M control measure in baseline years (prior to and including Fiscal Year 2001-02) (m^3/yr) (assumed to be zero for storm drain line cleanout and street flushing)
%Sed	=	Percent of material collected (by volume) by the enhanced O&M control measure that is sediment < 2mm in diameter (measured)
ρ	=	Sediment density of the material collected by the enhanced O&M control measure (weight per unit volume) (measured)
Conc	=	Average concentration of PCBs in sediments collected by the enhanced O&M control measure (mg/kg; see Appendix B for land use-based sediment concentrations to calculate area-weighted concentrations or alternatively use project-specific measurements).

6.3 Reporting

The following information will be reported for this control measure:

- Description of O&M measure enhancement, including the location of the enhanced measure and description of the enhancement (e.g., increased frequency of implementation over the baseline frequency).
- Baseline and current volumes of material collected.
- Assumptions/data on the percent of the material that was < 2 mm
- Assumptions/data on sediment density
- The calculated loads reduced.

7. TRASH FULL CAPTURE SYSTEMS IMPLEMENTATION PROGRAM

7.1 Control Measure Description

This control measure includes the implementation of large (non-inlet based) full trash capture devices, including hydrodynamic separators (HDS), gross solids removal devices (GSRDs), and baffle boxes in existing developed areas for the purposes of MRP Provision C.10 compliance. These devices collect sediment and debris along with trash, so are considered as a source control measure for the PCBs and mercury associated with the sediment that is captured.

7.2 Loads Reduced Accounting Methodology

The Permittees will quantify and report the amount of PCBs and mercury loads reduced from implementation of large full trash capture devices using the following accounting method:

$$Load\ of\ POC\ Reduced = P_A \bullet P_Y \bullet E_f$$

Where:

P_A	=	Tributary area treated by large full trash capture device (acres)
P_Y	=	Area-weighted PCBs or mercury yield (mg/acre-year) (see Table 1-1)
E_f	=	Efficiency factor for large full trash-capture devices (assumed to be 20%)[6]

7.3 Reporting

The following information will be reported for large full trash capture projects:

- Project name, type of device, and location.
- The year that project construction was completed.
- Total project tributary drainage area.
- The land use area(s) for the project and the area-weighted land use-based yield for the project area.
- POC loads reduced for each project.

[6] See Appendix I for large trash capture device unit efficiency factor data analysis.

8. DIVERSION TO POTW PROGRAM

8.1 Control Measure Description

This control measure consists of diverting dry weather and/or first flush events from MS4s to publicly owned treatment works (POTWs) as a method to reduce loads of PCBs and mercury in urban runoff.

8.2 Loads Reduced Accounting Methodology

The load reduction calculation method for this control measure is:

$$EnhancedReductionDiversion = CurReductionDiversion - BaseReductionDiversion$$

Where:

BaseReductionDiversion	=	Mass of PCBs or mercury reduced via POTW diversions of urban stormwater in 2010 (assume zero for all diversions prior to MRP 1.0 except the Palo Alto Diversion Structure)
CurReductionDiversion	=	Mass of PCBs or mercury reduced via POTW diversions of urban stormwater in Year of Interest

And:

Base or Cur ReductionDiversion = ConcDiversion • VolDiversion

Where:

ConcDiversion	=	Average concentration of PCBs or mercury in sediment and/or water diverted to POTW (measured)
VolDiversion	=	Volume of sediment and/or water diverted to POTW (measured)

8.3 Reporting

For diversions, a project-specific report will be prepared that describes the diversion and project-specific load reduction calculations.

9. MERCURY LOAD AVOIDANCE AND REDUCTION PROGRAM

9.1 Control Measure Description

Mercury load avoidance and reduction includes a number of source control measures listed in the California Mercury Reduction Act adopted by the State of California in 2001. These source controls include material bans, reductions of the amount of mercury allowable for use in products, and mercury device recycling. The following source controls bans are included:

- Sale of cars that have light switches containing mercury;
- Sale or distribution of fever thermometers containing mercury without a prescription;
- Sale of mercury thermostats; and,
- Manufacturing, sale, or distribution of mercury-added novelty items.

In addition, fluorescent lamps manufacturers continue to reduce the amount of mercury in lamps sold in the U.S. Manufactures have significantly reduced the amount of mercury in fluorescent linear tube lamps and streetlamps. The use of mercury containing bulbs has also decreased through replacement of these bulbs with LED lamps.

Mercury Device Recycling Programs resulting in Mercury load reduction generally include three types of programs that promote and facilitate the collection and recycling of mercury–containing devices and products:

1. Permittee-managed household hazardous waste (HHW) drop-off facilities and curbside or door-to-door pickup;
2. Private business take-back and recycling programs (e.g., Home Depot); and,
3. Private waste management services for small and large businesses.

9.2 Loads Avoided/Reduced Accounting Methodology

The load avoidance/reduction methodology for this control measure is:

$$HgReductionL/S/T = BaseLoadLST - CurLoadLST$$

Where:

BaseLoadLST	=	Baseline load of mercury in urban stormwater in 2002 from lamps (L), switches (S), and thermostats (T)
CurLoadLST	=	Current load of mercury in urban stormwater in year of interest from lamps (L), switches (S), and thermostats (T)

And:

BaseLoadLST	=	BaseMassL/S/T • BaseNumL/S/T • T
CurLoadLST	=	CurMassL/S/T • CurNumL/S/T • T

Where:

$BaseMass_{LST}$	=	Average mass of total mercury in each lamp (L), switch (S), and thermostat (T) in 2002 (Assume: 93mg per kilogram of linear fluorescent lamp or Compact Fluorescent Lamp (CFL); 2.9g per switch; and 4g per thermostat).
$CurMass_{LST}$	=	Average mass of total mercury in each lamp (L), switch (S), and thermostat (T) recycled in year of interest (Assume: 35mg per kilogram of linear fluorescent lamp or CFL; 2.9g per switch; and 4g per thermostat).
$BaseNum_{LST}$	=	Number or weight of lamps (L), switches (S), and thermostats (T) improperly discarded into the environment in 2002.
$CurNum_{LST}$	=	Number or weight of lamps (L), switches (S), and thermostats (T) discarded into the environment improperly in year of interest.
T	=	% of total mercury in lamps (L), switches (S), and thermostats (T) that when improperly discarded are transported to the Bay via urban stormwater (Assume 4.8%).

And:

BaseNumLST	=	BaseSpentL/S/T - BaseRecycleL/S/T
CurNumLST	=	CurSpentL/S/T - CurRecycleL/S/T

Where:

BaseSpentLST	=	Number or weight of lamps (L), switches (S), and thermostats (T) that reached their end-of-life in 2002
BaseRcyLST	=	Number or weight of lamps (L), switches (S), and thermostats (T) recycled in 2002
CurSpentLST	=	Number or weight of lamps (L), switches (S), and thermostats (T) that reached their end-of-life in year of interest
CurRecycleLST	=	Number or weight of lamps (L), switches (S), and thermostats (T) recycled in year of interest

Table 9-1 below provides conversion factors and references for the assumed values used in these calculations.

Table 9-1: Mercury Recycling Conversion Factors and References

Item	Conversion and Citation
Fluorescent Lamps	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.

Item	Conversion and Citation
Compact Fluorescent Lamps (CFLs)	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.
High Intensity Discharge (HID) Lamps	The average content of a HID bulb is .5 milligrams of mercury (0.5 x 10 -6 kg). Source NEMA Opposition to Ban on Mercury Containing Headlamps, 2004 http://www.nema.org/Policy/Environmental-Stewardship/Lamps/Documents/HID%20Headlamps%2010%2004.pdf
Thermostats	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. Each thermostat recycled is assumed to contain approximately 4.0 g (0.004 kg) of mercury. The average weight of one thermostat is 12 ounces. There are 1.3333 thermostats in a pound of thermostats (1 pounds/0.75 pounds = 1.33 thermostats. It is estimated that 0.005333 kg of mercury is recycled for every pound of thermostat recycled (1.333*0.004= 0.005333). Source: Average weight of thermostat obtained from retail websites - www.amazon.com.
Switches	The Recycling Corporation reports that one mercury switch contains 2.87 g (0.00287 kg) of mercury. Source: TRC 2010. Thermostat Recycling Corporation's Annual Report for California. Prepared by the Thermostat Recycling Corporation. Prepared for the State of California's Office of Pollution Prevention and Green Technology, Department of Toxic Substances Control. March 31, 2010.

9.3 Reporting

The Permittees will provide a description of their ongoing mercury recycling program and activities.

10. PROGRAM UPDATES AND REFINEMENTS

The accounting methodology outlined in this report may be updated and refined to account for significant new information as it becomes available. If needed, the proposed updates will be submitted as an addendum to this report for Executive Office approval during the MRP 3 permit term.

11. REFERENCES

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APPENDIX A
Land Use-Based Yield Analysis

A.1 METHODOLOGY

The methodology presented in this appendix was developed to assist the MRP Permittees in identifying which watershed characteristics correlate well with areas that have high, moderate, and low rates of pollutant of concern (POC) (i.e., mercury and PCBs) loading to receiving waters via stormwater runoff. The methodology was developed using the collective local understanding of the types of land areas, facilities, and activities that generate POCs, with a focus on PCBs. The ultimate goal of the analysis was to provide first order estimates of POC loading rates from high, moderate, and low likelihood source areas and to assist Permittees in identifying areas for implementing POC load reduction measures that would have the greatest load reduction benefit.

A.1.1 Source Area Mapping

Documented uses and sources of PCBs and mercury in the urban environment and the results of PCBs source identification and abatement studies described in the 2014 Integrated Monitoring Report (IMR) Part B (BASMAA, 2014) have been used to identify PCBs source areas. Findings demonstrate that PCBs (and to a lesser extent mercury) sources are generally associated with watershed areas where equipment containing POCs were transported or used and facilities that recycle POCs or POC-containing devices and equipment. These sources include current and historic metal, automotive, and hazardous waste recycling and transfer stations; electrical properties and power plants; and rail lines. These sources are typically located in areas that were industrialized between the late 1920's and the late 1970's, the timeframe when PCBs and mercury production were the greatest in the U.S.

To assist Permittees in identifying potential POC sources and source areas, a number of preliminary GIS data layers were developed using existing and historical information on land use and facility types that were located in the Bay Area during the early to mid-20th century. GIS data layers included a revised "Old Industrial" land use layer that attempted to depict industrial areas that were present in the year 1968; an "Old Urban" land use layer that depicts urban areas developed by 1974, other than those depicted as Old Industrial; points depicting current facilities that have the potential to have or have had PCBs on-site; and historical and current rail lines where PCBs may have been transported.

A.1.1.1. Old Industrial Land Areas

Three sets of data layers were acquired and served as the primary sources of information used to create the Old Industrial data layer: 1) the 2005 version of the Association of Bay Area Governments (ABAG) land use data layers for the five Bay Area counties, which depicts current industrial land use areas; 2) 1968 aerial photographs for the Bay Area at 30,000 scale acquired from the United States Geological Survey's (USGS) Earth Explorer website; and 3) the most currently available County Assessor parcel data layers for Bay Area counties. Through the development of the Old Industrial layer, two data layers were created. The first depicts industrial land areas in 1968 that are not currently characterized as industrial by ABAG. This data layer was created by panning through 1968 aerial photography and identifying industrial land areas outside of the areas characterized as industrial land use in roughly 2005 by ABAG. The purpose of this layer was to identify potential industrial facilities that were present in 1968, but possibly redeveloped or incorrectly identified within the ABAG land use data. The second data layer that was created depicts areas characterized by ABAG in 2005 as industrial land uses that were clearly not industrial in the 1968 aerial photographs. Most of these areas were developed into industrial land uses after 1968 and are most commonly agricultural in the aerial photographs. All parcels that were identified as at least partially industrial in 1968 were visually checked in the data layer to provide greater confidence in its accuracy. Minor edits were then made based on this quality assurance check. If there was uncertainty as to whether a parcel in the 1968 photographs was industrial, then the parcel was classified based on the ABAG land use data. As a final check, the 1968 aerial photographs were also compared to current aerial photographs and each parcel that had been redeveloped was attributed with the current land use, even if that land use remained industrial.

A.1.1.2. Old and New Urban Land Areas

Old Urban and New Urban land use data layers that depict areas urbanized prior to and after 1974, respectively, were developed using an urban extents data layer from 1974, the closest year to 1968 that the data were available. All areas that were within the urban extent in 1974 were defined as Old Urban; those areas that fell outside of this definition were classified as New Urban. Old Urban areas have been further divided into residential and parks areas versus commercial areas in the current land use classification schema.

A.1.1.3 Identification of Potential POC Associated Facilities

Point data were collected for a number of facility types that may be associated with either PCBs or mercury. These facility types include those associated with electrical generation, known mercury emitters, metal manufacturing, drum recycling, metal recycling, shipping, automotive recycling, general recycling, and those known to have or historically have had PCBs in use. This information was primarily gathered by the San Francisco Estuary Institute (SFEI) as part of the Urban Stormwater Best Management Practices (BMPs) Proposition 13 Grant project and contains data from a variety of sources, including the California Air Resources Board, EnviroStor, Superfund, Department of Toxic Substances Control, and the State Water Resource Control Board.

Certain facility types for which point data were developed were mapped in greater detail to develop polygons to allow area calculations to be performed. Of particular interest for PCBs were the several hundred electrical substations in the Bay Area. Areas for these facilities were delineated using current and 1968 aerial photographs to attribute whether each facility was built prior to or after 1968. Additionally, military, port, and railroad land use areas were developed using ABAG 2005 land use data and the latest assessor's parcel data. Military parcels were further edited to only include developed areas.

Land use and facility data layers created as part of this effort were then combined to create one contiguous data layer. This data layer was attributed with additional information such as city, county, and watershed.

A.2 Regional Watershed Spreadsheet Analysis

A.2.1 Background

The Regional Watershed Spreadsheet Model (RWSM) was developed as part of the Regional Monitoring Program's (RMP) Small Tributaries Loading Strategy as a regional-scale planning tool primarily for the purpose of estimating long-term average annual loads from the small tributaries surrounding San Francisco Bay, and secondarily to provide supporting information for prioritizing watersheds or areas within watersheds for management actions (Wu et al., 2016).

The RWSM is structured with three stand-alone empirical models: the hydrology model, the sediment model, and the pollutant model (Wu et al., 2016). The hydrology model uses runoff coefficients based on geospatially identified land use-soil-slope combinations along with rainfall based on PRISM average precipitation[7] to estimate annual runoff from a defined watershed area. The sediment model uses a function of geology, slope, and land-use to simulate suspended sediment transport in the landscape of a defined watershed while adjusting for watershed storage factors. The pollutant model is a spreadsheet model that combines land use-based pollutant concentrations (i.e., pollutant concentrations in water or pollutant concentrations on fine sediment particles as particle ratios[8] corresponding with specific land use types or source areas) with land use-based hydrology model output or sediment model output. Land use-based loading results are compiled to obtain pollutant loading across a defined watershed.

Starting in 2010, a multi-year effort was undertaken to systematically develop and calibrate the RWSM for San Francisco Bay watersheds using RMP data. Calibration was completed[9] and the model was released in 2018 (SFEI, 2018). For further detail about each component of the model, see the RWSM User Manual (SFEI, 2018).

A.2.2 RWSM Results

The estimated average PCBs and mercury yields from the RWSM Toolbox v1.0 Pollutant Model, "Pollutant Spreadsheet Model Calculations – Region" for the modeled land use yield categories are provided in Table A-1 below. The "Region" spreadsheet results were developed using RMP data from well-sampled watersheds to calibrate pollutant concentration coefficients and applying the resulting coefficients to the region to get average pollutant yield results (Gilbreath, 2019).

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[7] 800-m grid, from PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu.
[8] Particle ratios = pollutant concentration in water (ng/L) / suspended sediment concentration (mg/L), equivalent to mg/kg.
[9] The calibration for PCBs is "reasonable" but there remains a lower confidence in the calibration for mercury (Wu et al., 2017).

Table A-1: RWSM Land Use-Based Yields for PCBs and Mercury

Land Use Category	Average PCBs Yield (mg/ac/yr)	Average Mercury Yield[1] (mg/ac/yr)
Old Industrial and Source Areas	259	53
Old Commercial and Old Transportation	49	57
Old Residential	2.8	57
New Urban	0.4	4
Agriculture/Open Space	0.4	81

mg/ac/yr – milligrams per acre per year
Note: RWSM Toolbox v1.0 Pollutant Model, Pollutant Spreadsheet Model Calculations - Region. Spreadsheet dated 6/9/2017.
1. The model calibration for PCBs is "reasonable" but there remains a lower confidence in the calibration for mercury (Wu et al., 2017).

Table A-2 below presents the RWSM Toolbox v1.0 Pollutant Model, "Pollutant Spreadsheet Model Calculations – Region" results for PCBs and mercury average concentrations in runoff for the five RWSM modeled land use categories (SFEI, 2018).

Table A-2: Regional Watershed Spreadsheet Model PCBs and Mercury Concentrations in Runoff

Land Use Category	Total PCBs (ng/L)	Total Mercury[1] (ng/L)
Old Industrial and Source Areas	204	40
Old Commercial and Old Transportation	40	63
Old Residential	4	63
New Urban	0.2	3
Agriculture/Open Space	0.2	80

1. The model calibration for PCBs is "reasonable" but there remains a lower confidence in the calibration for mercury (Wu et al., 2017).

A.3 Source Area/Property PCBs Yield

The derivation of the estimated PCBs source property yield is described below. The PCBs source property yield was derived as the product of a representative PCBs concentration in surface soils at known source properties and a representative soil/sediment yield for old industrial areas.

Table A-3 and Table A-4 present descriptive statistics for measured concentrations of PCBs from source properties located in Alameda, Contra Costa, Santa Clara, and San Mateo Counties. This dataset includes 670 PCBs surface soil samples from twelve source property locations as well as on-site source property data identified in the street and storm drain sediment dataset that has been compiled by BASMAA to-date (see Appendix B). All soil samples included in the analysis were collected from the 0 to 0.5-foot depth interval, with the exception those collected at one site, based on the assumption that the top six inches of soil would have the most potential to mobilize offsite via wind or rainfall erosion. Data collected from the 0 to 1.0-depth interval were included for the General Electric site in Oakland, as this represented the shallowest reported depth for that site. The range of PCBs concentration (mg/kg) in surface soils for individual Bay Area source properties are provided in Table A-3 and the summary statistics for all sites combined are provided in Table A-4.

Table A-3: Site specific PCBs concentration in surface soil collected on-site from source properties located in Alameda, Contra Costa, Santa Clara, and San Mateo Counties.

Site Location	Minimum (mg/kg)	Average (mg/kg)	Maximum (mg/kg)	Count	Reference
1411 Industrial Rd, San Carlos	1.66	236.31	418.00	5	EKI Environment and Water, 2018. Letter from EKI to Mark Johnson, RWQCB, October 8, 2018. Subject: PCB Storm Drain Sediment Sampling Results 1411 Industrial Road, San Carlos, CA (EKI B80090.00)
270 Industrial Road and 495 Bragato Rd, San Carlos (Delta Star Inc./Tiegel Manufacturing Co.)	3.40	28.36	122.00	14	GHD, 2016. Incremental Sampling Investigation Report. August 4.
335 Brokaw Road, Santa Clara	3.56	3.56	3.56	1	SCVURPPP POC Monitoring
1645 Old Bayshore Highway, San Jose	11.91	11.91	11.91	1	SCVURPPP POC Monitoring
1695 and 1775 Monterey Highway, San Jose	5.47	6.26	7.06	2	SCVURPPP POC Monitoring
1800 South Monterey Road, San Jose	1.79	2.70	3.61	2	SCVURPPP POC Monitoring
Union Pacific Railroad at Schallenberger Road, San Jose	2.80	2.80	2.80	1	CW4CB Final Report/database (http://basmaa.org/Clean-Watersheds-for-a-Clean-Bay-Project)
Union Pacific Railroad Leo Avenue, San Jose	0.02	12.86	127.00	45	GHD, 2017. Remedial Investigation Report. Union Pacific Railroad Property, Leo Avenue ROW, San Jose, CA. September.
ETT111, Oakland	3.70	3.70	3.70	1	Kleinfelder, 2006. Private Property Sediment Sampling Report: Ettie Street Watershed, Oakland, California. Kleinfelder West, Inc.
3430 Wood Street, Oakland (Granite Expo)	93.41	93.41	93.41	1	ibid
1797 12th St, Oakland (Cole Brothers Auto Wrecker)	1.67	1.67	1.67	1	ibid
3015 Adeline St, Oakland (California Electric)	6.08	6.08	6.08	1	ibid
1266 14th St, Oakland (Amtech Lighting)	5.70	5.70	5.70	1	ibid
3425 Ettie St, Oakland (Allied Painter)	1.75	1.75	1.75	1	ibid
2838 Hannah St, Oakland (Former Giampolini)	0.74	9.23	17.73	2	ibid
3428-3434 Helen Street, Oakland (ACM)	10.62	10.62	10.62	1	ibid

Site Location	Minimum (mg/kg)	Average (mg/kg)	Maximum (mg/kg)	Count	Reference
1639 18th St, Oakland (Martinez Bros Trucking)	1.95	1.95	1.95	1	ibid
2601-2812 Peralta St, Oakland (Custom Alloy Scrap Sales)	1.78	7.09	14.73	4	ibid
280 West MacArthur Blvd, Oakland (Kaiser Oakland)	0.01	1.67	27.20	101	Forensic Analytical Environmental Health Consultants, 2017. PCB Soil and Sediment Waste Characterization and Disposal Plan, Kaiser Permanente Medical Center Oakland Legacy Tower Demolition Project, 280 West MacArthur Boulevard, Oakland, CA. Revised April 21, 2017.
710 73rd Avenue, Oakland (Former Aero Plating)	0.01	101.42	790.00	8	Fugro Consultants, Inc. 2016. Limited Soil Sampling Investigation, 710 73rd Avenue, Oakland, CA. January.
700 73rd Avenue, Oakland (Union Pacific Railroad)	0.92	88.16	1,100	14	CDM Smith, 2014. Report of Findings for Data Gaps Investigation Phase B - On-site Investigations, Union Pacific Railroad Company Property, 700 73rd Avenue Oakland, CA. November 14.
5441 International Boulevard, Oakland (General Electric)	0.03	248.36	11,000	134	Geosyntec Consultants, 2009. Feasibility Study Report for the GE Site at 5441 International Boulevard, Oakland, CA. June.
4560 Horton Street, Emeryville (Former South Southern Pacific Railroad)	0.03	0.40	1.91	6	EKI, 2016. Corrective Action Work Plan – Shallow Soil Excavation, Former SPRR Parcel South of 53rd Street, Emeryville, CA. June 29.
One Cyclotron Rd, Berkeley (Lawrence Berkeley National Laboratory)	0.0019	3.23	135.0	227	Lawrence Berkeley National Laboratory, 2016. Quarterly and Semiannual Progress Reports, for the LBNL Hazardous Waste Facility Permit. Environmental Restoration Program. August 1993 through February 2016.
CC-SPL-600-P	1.29	1.29	1.29	1	Contra Costa County 2015 POC Sampling
San Diego St, Richmond (San Diego St)	0.03	0.12	1.20	14	Arcadis, 2016. San Diego Street Transformer Oil Release Cleanup and Closure Report, West End of San Diego Street Richmond, CA, February.
1014 Chesley Ave, Richmond (World Oil)	0.01	0.79	6.50	70	APEX, 2018. PCB Characterization Report, World Oil Corporation Property, 1014 Chesley Avenue, Richmond, California. July 13.
1215 Willow Pass Road, Pittsburg (Molino)	0.02	1.19	5.60	10	Ground Zero Analysis, 2016. Phase II Investigation at 1215 Willow Pass Road, Pittsburg, November 11.
Average for All Properties		**31.88**			

Table A-4: Summary of PCBs concentration in surface soil collected on-site from source properties located in Alameda, Contra Costa, Santa Clara, and San Mateo Counties.

Statistic	PCBs (mg/kg)
Maximum	11,000
90th Percentile	36.90
75th Percentile	4.80
Average	57.71
Median	0.57
25th Percentile	0.069
10th Percentile	0.0020
Minimum	0.0019
N	670

Based on the data reviewed, the Bay Area wide average of PCBs in surface soil from known source properties based on individual property averages is 31.9 mg/kg (Table A-3) and the average based on individual sample concentrations is 57.7 mg/kg (Table A-4). An average concentration is the appropriate metric to use for the yield estimate as it is representative of the total expected loading, which is affected by very high concentrations.

A sediment yield for Old Industrial land uses within the Santa Clara Basin watersheds was estimated based on a Loading Simulation Program – C++ (LPSC) watershed model developed for the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) as part of their reasonable assurance analysis (Paradigm Environmental, 2019 (attached)). The sediment yield estimated from the LPSC watershed model represents baseline hydrology and water quality, specifically sediment and solids. The median, LPSC-modeled sediment yield from Old Industrial land uses in the Santa Clara Basin is 39 grams/m^2/year or 157.8 kg/acre/year. Using the average PCBs concentration, estimated in two different approaches, of 31.9 mg/kg and 57.7 mg/kg from surface soils on Bay Area source properties presented above and the median Old Industrial sediment yield of 157.8 kg/acre, the estimated PCBs yield from source properties is 5,031 mg/acre/year and 9,108 mg/acre/year, respectively.

For mercury, the RWSM yield value for old industrial/source areas will be used for load reduction accounting.

A.4 LIMITATIONS AND UNCERTAINTY

Land use is used as a surrogate for actual PCBs and mercury sources, and although the types of potential sources have been identified, the actual locations and sizes of sources are difficult to determine at this level of analysis. While categorized the same for modeling and analysis purposes, similar land use in different locations may have very different sources and thus distinctly different PCBs and mercury concentrations in runoff.

It is difficult to quantitatively assess the implications of these limitations on the projected magnitude of loads, especially as analysis shifts from regional to more refined spatial scales. The projected loads should be considered first order approximation and reflective of the central tendency of the data for the Bay Area as a whole.

A.5 REFERENCES

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APPENDIX B
Urban Sediment Concentration Statistics

B.1 Descriptive Statistics

Tables B-1 and B-2, and Figures B-1 and B-2 presents descriptive statistics for the PCBs and mercury street and storm drain sediment dataset that has been compiled by BASMAA to-date. This dataset includes 1,535 PCBs samples and 1,350 mercury samples taken within the street right-of-way, storm drain conveyance system, and private properties from 1999 through 2019. Data are summarized by the predominant land use within the vicinity of where the sediment was collected.

Table B-1: PCBs concentrations in sediment (mg/kg) collected from streets, stormwater conveyance systems, and private properties located in Alameda, Contra Costa, Santa Clara, San Mateo, and Solano Counties between 1999 and 2019.

Statistic	Old Industrial	Old Urban (Not Residential/Parks)	Old Urban (Residential /Parks)	New Urban	Open Space	All Samples
Maximum	193	17	5.7	0.72	1.1	193
90th Percentile	1.1	0.18	0.30	0.27	0.19	0.77
75th Percentile	0.21	0.08	0.10	0.047	0.054	0.16
Mean	0.79	0.22	0.20	0.066	0.067	0.65
Geometric Mean	0.26	0.09	0.12	0.059	0.058	0.22
Median	0.05	0.03	0.023	0.016	0.009	0.041
25th Percentile	0.01	0.01	0.006	0.001	0.002	0.009
10th Percentile	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND
n	1,205	110	98	69	53	1,535

Table B-2: Mercury concentrations in sediment (mg/kg) collected from streets, stormwater conveyance systems, and private properties located in Alameda, Contra Costa, Santa Clara, San Mateo, and Solano Counties between 1999 and 2015.

Statistic	Old Industrial	Old Urban Not Res/Parks	Old Urban Res/Parks	New Urban	Open Space	All Samples
Maximum	21	1.7	4.5	13	4.3	21
90th Percentile	0.80	0.41	0.78	0.63	0.35	0.74
75th Percentile	0.30	0.22	0.40	0.27	0.20	0.29
Mean	0.43	0.20	0.43	0.46	0.29	0.41
Geometric Mean	0.29	0.13	0.19	0.27	0.11	0.28
Median	0.15	0.11	0.18	0.14	0.11	0.15
25th Percentile	0.088	0.071	0.082	0.100	0.046	0.086
10th Percentile	0.057	0.051	0.045	0.056	0.030	0.054
Minimum	ND	0.015	0.015	ND	0.020	ND
n	1,069	80	91	62	48	1,350

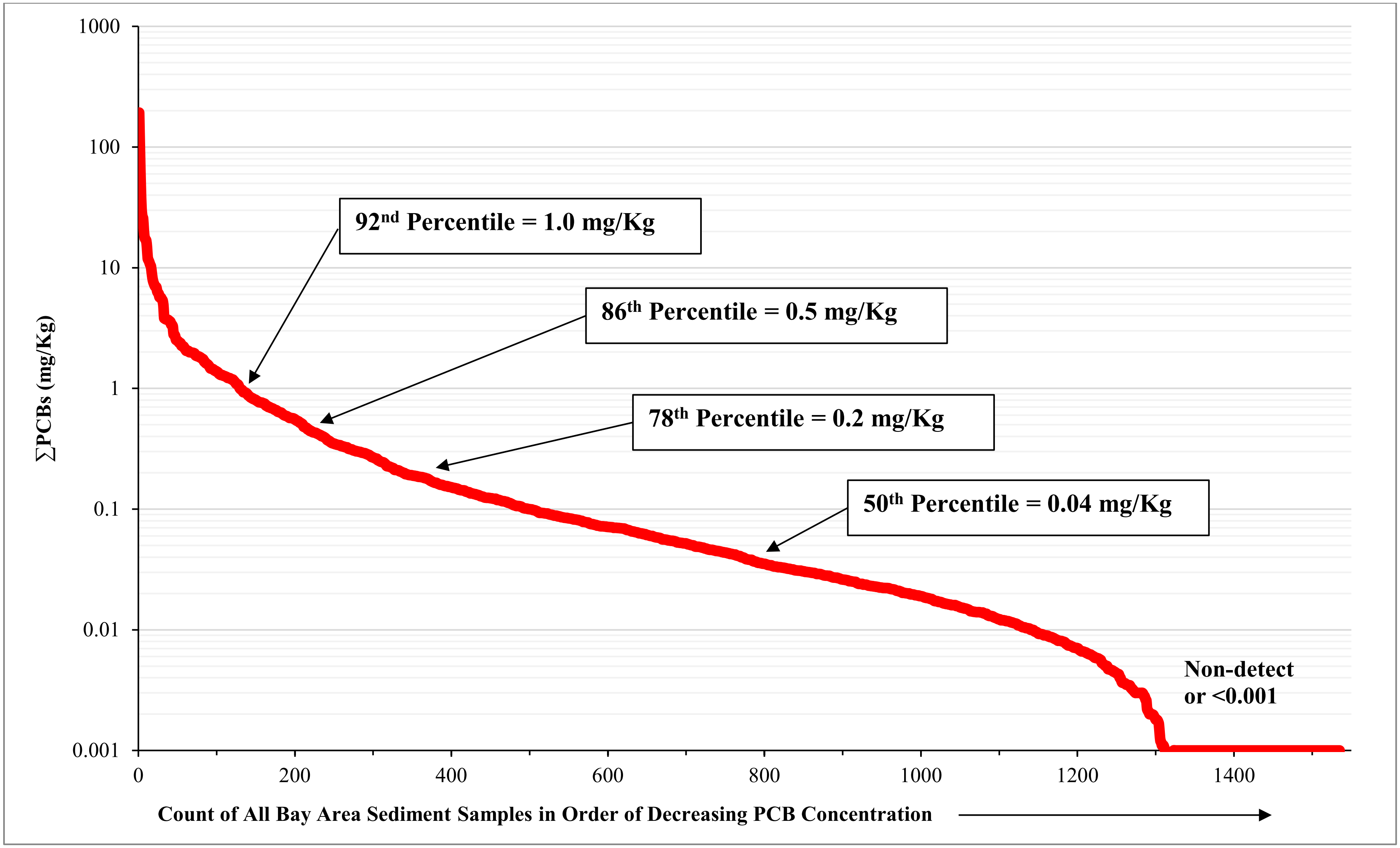

Figure B.1: Total PCB concentrations in sediment collected from streets, stormwater conveyance systems, and private properties located in Alameda, Contra Costa, Santa Clara, San Mateo, and Solano Counties between 1999 and 2019.

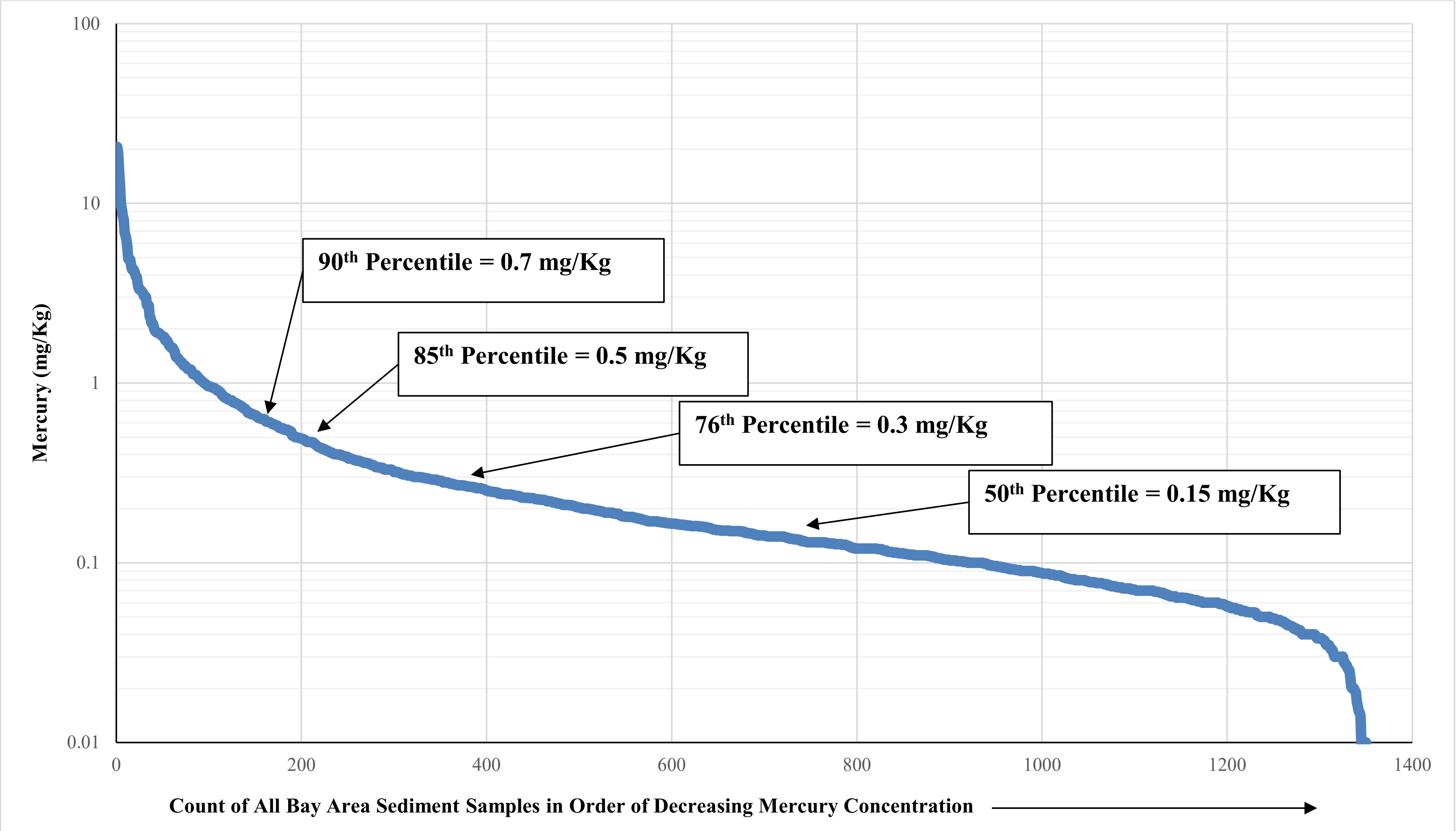

Figure B.2: Total mercury concentrations in sediment collected from streets, stormwater conveyance systems and private properties located in Alameda, Contra Costa, Santa Clara, San Mateo, and Solano Counties between 1999 and 2019.

APPENDIX C
Source Area Investigation and Abatement Guidance

C.1 BACKGROUND

Since 2000, Bay Area stormwater programs have conducted investigations on behalf of MRP Permittees to identify land areas or properties that contribute substantial amounts of PCBs to Bay Area municipal separate storm sewer systems (MS4s). These investigations have largely focused on land areas where industrial land use activities occurred prior to 1980 and continue today (i.e., old industrial land use areas). The *Interim Accounting Methodology for TMDL Loads Reduced Report* (BASMAA, March 2017) described this control measure and defined the methodology that was used for PCBs load reduction accounting during the MRP 2.0 permit term.

The pollutant reduction benefits and costs of conducting source property investigations were examined, along with other stormwater control measures, via the *Clean Watersheds for Clean Bay* (CW4CB) project. The CW4CB project concluded that PCBs source property investigations are much more cost-effective at reducing loads of PCBs than retrofitting old industrial areas with green stormwater infrastructure (GSI). This finding and the pollutant reductions achieved during the MRP 2.0 permit term via this control measure provide an impetus for MRP Permittees to continue source property investigations as a viable control measure for PCBs during MRP 3.0.

The process for conducting source area investigations that would be followed by each stormwater program during MRP 3.0 is presented below.

C.2 SOURCE AREA INVESTIGATION PROCESS

The source area investigation process consists of the four steps outlined below:

1. Identify areas that should be considered for source area investigations;
2. Conduct screening-level investigations in the areas identified in (1) to prioritize these areas as high, moderate, or low-likelihood source areas;
3. Conduct targeted source area investigations in areas prioritized as high or moderate-likelihood source areas in (2) to identify and confirm source areas; and
4. Determine next steps for confirmed source areas.

Each of these steps is described in more detail below.

C.2.1 Step 1: Identify Areas Considered for Source Area Investigations

Identify areas that should be considered for source area investigations as follows:

A. Identify the extent of old industrial land use areas that were present in 2002, the starting date for accounting for POC load reductions;

B. Remove those old industrial land use areas that have already been investigated, referred, and/or abated since 2002;

C. Remove those old industrial land use areas that have undergone redevelopment or GSI retrofit since 2002;

D. Remove those old industrial land use areas that do not drain to an MS4, rather drain directly to the Bay shoreline; and

E. Identify the remaining old industrial land use areas that should be considered for source property investigations by subtracting B, C, and D from A above.

Each countywide stormwater program has implemented this process to identify the total area that will be considered for investigation within each of the five MRP counties.

C.2.2 Step 2: Conduct Screening-level Source Area Investigations

The purpose of screening-level source area investigations is to identify both (1) areas that are likely to contain sources of PCBs, and (2) areas that are unlikely to contain sources of PCBs. This effort will assist Permittees in narrowing the focus for more in-depth, targeted source investigations to those areas that are most likely to contain sources. The screening methods described below are designed to categorize areas at the watershed, MS4 catchment, or individual parcel-scale as high-, moderate-, or low-likelihood source areas according to the following criteria:

- Low-likelihood source areas:
  - No evidence of current or historical use of PCBs; and,
  - all MS4 sediment concentrations and stormwater particle ratios are below 0.5 mg/kg.
- Moderate-likelihood source areas
  - There may be evidence of current or historical use of PCBs; and/or
  - At least one MS4 sediment or stormwater particle ratio between 0.5 and 1.0 mg/kg.
- High-likelihood source areas:
  - There is evidence of current or historical use of PCBs; and/or
  - At least one MS4 sediment or stormwater particle ratio is greater than 1.0 mg/kg.

Screening-level investigation methods may involve any of the following:

- Desktop Analysis. Desktop analysis conducted to gather available information on potential sources of PCBs in a given area or on a specific parcel can also be used to screen areas for further investigation or to remove them from further consideration. This type of screening may include review of current and historic land uses, historical parcel records, contaminated properties databases (e.g., Geotracker and EnviroStor), and aerial photography to identify past and current activities that may be associated with PCBs (e.g., recycling facilities, parcels with large electrical equipment, PCBs manufacturing sites, industrial activities that used PCBs, etc.). Any stormwater or MS4 sediment data collected in the past may also be used as an indicator of likely PCBs sources that warrant further investigation.
- Stormwater Monitoring. Stormwater samples collected at the outlet of a defined drainage area (watershed, MS4 catchment, or individual parcel scale) can be used to screen the entire area that drains to the sampling location; if the PCBs particle ratio in all

stormwater samples is less than 500 ng/g[10], then the entire area draining to that sampling location can be identified as a low-likelihood source area.

- Sediment Monitoring. Suspended sediment samples collected from storm drain infrastructure or a channel that drains a defined area (e.g., a watershed, MS4 catchment, or one or more individual parcels) can be also be used to screen potential source areas. If the PCBs particle ratio in samples collected are less than 0.5 mg/kg, then the area or parcels that drain to the sampling location can be identified as low-likelihood area/parcels.

C.2.3 Step 3: Conduct Targeted Source Area Investigations

Select parcels or smaller areas within areas that are identified in Step 2 as high- and moderate-likelihood source areas may be targeted for more in-depth source investigation. The purpose of a targeted source area investigation is to identify and confirm specific source properties that contribute elevated PCBs to MS4s. Once a source property has been confirmed, Permittees may refer the property to the Regional Water Board for abatement, or the Permittee can oversee property abatement directly. The targeted source area investigation steps are modeled after the CW4CB Source Property Identification and Referral Pilot Projects (BASMAA, 2017). The targeted source area investigation process proceeds through the following four tasks:

1. Records Review. The purpose of the records review is to evaluate available information on specific parcels of interest within an investigation area to identify sources of PCBs. The types of information reviewed may include the following:

    - Site history, cleanup records, or monitoring data available through online databases (i.e., Geotracker and EnviroStor);
    - Cal OES records of PCBs releases from electrical utility equipment;
    - Changes in aerial photos from prior to 1980 and present condition;
    - Outdoor storage, suspected waste areas or ponds;
    - Available stormwater inspection history, including occurrence of PCBs, spills, and stormwater violations on prior inspection reports; and
    - Industrial General Permit (IGP) facility data.

2. Public ROW Surveys / Facility Site Visits. The purpose of public ROW surveys / facility site visits is to verify information obtained during records review, document possible sources, observe sediment migration and flow patterns from parcels of interest to the public ROW, document existing stormwater control measures, and identify potential sample locations. Information documented during public ROW surveys / site visits may include the following:

[10] This value may be adjusted in the future based on the results of the Advanced Data Analysis under development by the Regional Monitoring Program Sources, Pathways, and Loadings workgroup or equivalent analyses conducted by the Permittees.

- Electrical equipment associated with PCBs (e.g., transformers and capacitors);
- Old equipment with hydraulic fluids;
- Outdoor hazardous material/waste storage areas (e.g., tanks, drums), especially with poor housekeeping;
- Signs related to hazardous materials and wastes;
- Recycling/scrap yards (e.g., for automobiles);
- Building demolition activities;
- Unidentified puddles or stains;
- Flow patterns and storm drain structures;
- Existing and potential stormwater control measures;
- Sediment erosion from a property and migration to the street or storm drains;
- Properties that have been redeveloped or are in the process of redevelopment; and
- Redeveloped areas where older exposed soils are available for tracking off site.

The combined results of the records reviews, public ROW surveys / facility site visits are then used to prioritize sampling and develop the sampling plan.

3. Sampling. The purpose of sampling is to confirm if the suspected source area is an actual source of elevated PCBs to the MS4 or is not. Sampling methods may include the collection of sediment in the ROW, and inlet, or the storm drain; and/or stormwater sampling.

4. Identification of Source Areas. This task will review the information gathered throughout the investigation process in order to identify and confirm any source areas. Pollutant concentrations provide the primary means of confirming the identification of source areas. Elevated soil/sediment or stormwater concentrations from samples collected onsite, at the border of a parcel, or at the junction of an onsite underground drainage pipe (lateral) and the MS4 provide the best definitive evidence of whether a property is a source of PCBs to the MS4 or is not. Parcels or areas with PCBs concentrations ≥ 1.0 mg/kg are considered *confirmed source areas* and need no further investigation.

C.2.4 Step 4: Determine Next Steps for Confirmed Source Areas

The options Permittees may pursue for confirmed source areas include the following:

- Submit a referral to the Regional Water Board (and/or other regulatory agency) for follow-up investigation and abatement. The referral process and standard referral form are more fully described in the *Source Control Load Reduction Accounting for Reasonable Assurance Analysis* report (BASMAA, 2020).

- Abate or cause the area to be abated directly, without referral to a regulatory agency. For this option, the City will work directly with the property owner to ensure the property is fully abated and a self-abatement report will be submitted to the Regional

Water Board according to the process outlined in the *Source Control Load Reduction Accounting for Reasonable Assurance Analysis* report (BASMAA, 2020).

- If the investigation conducted in Step 3 does not identify a specific source area for the observed elevated concentrations, then the source area will be considered for the application of other types of control measures.

APPENDIX D
Source Property Referral Form
Source Property Self Abatement Report

PCBs SOURCE PROPERTY REFERRAL FORM

The purpose of this form is to provide the Department of Toxic Substances Control, the United States Environmental Protection Agency (USEPA) or the Regional Water Quality Control Board with sufficient information to require site owner/operators to conduct follow-up investigations and/or PCB cleanup actions.

Referring Agency:

Staff Contact Name:

Phone:

Email Address:

Date of Report:

1. Name of Site:

2. Address City County ZIP:

3. APN(s):

4. Provide a Site Location Map and a Site Diagram showing significant features.
Parcel Area (acres):

5. Current Owner

   Name:

   Address:

   City, County & Zip Code:

   Phone:

   E-mail Address:

   Contact:

   Title:

6. Background: Current Business Operations

   Name:

   Period of Operation:

   Type:

7. Background: Previous Business Operations (if known)

   Name:

   Period of Operation:

   Type:

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site.

9. Describe the known and suspected sources of PCBs at the site.

10. Has sampling or other investigation been conducted in the vicinity of the property to identify it as a source property? Yes No

Specify. For samples collected in the public right-of-way, show the nexus to the subject property as clearly as possible. Attach maps or pictures and coordinates (if applicable).

11. Is the site subject to the industrial general stormwater permit? Yes No

If yes, describe the findings of recent and past stormwater inspections conducted on the site, especially in regard to potential PCB sources.

12. Is there currently a potential for exposure of the community or workers to hazardous substances, pollutants, or contaminants at the site? Yes No

If yes, explain:

13. Are any Federal, State, or Local regulatory agencies involved with the site? Yes No

If yes, provide as much of the information below as known:

Agency	Involvement	Contact Name	Phone Number

14. Provide any other pertinent site information not covered above.

15. Describe enhanced control measures or downstream treatment control measures that will be implemented at the site. The selected enhanced O&M control measure(s) or stormwater treatment must be implemented and maintained during the source property abatement process and should be sufficient to intercept historically deposited sediment in the public right-of-way and prevent additional contaminated sediment from being discharged from the MS4.

Attach: Site Location Map, Site Diagram, and any pertinent sampling & analyses data

SOURCE PROPERTY ABATEMENT REPORT

The purpose of this form is to provide the Regional Water Quality Control Board with sufficient documentation that source property abatement has effectively eliminated the transport of PCBs or mercury offsite and from entering the municipal separate storm sewer system (MS4) infrastructure for all transport mechanisms that apply to the site (e.g., stormwater runoff, wind, vehicle tracking). This documentation shall include information on the type and extent of abatement that has occurred (e.g., have the sources of PCBs to the MS4 been eliminated via capping, paving, walls, plugging/removal of internal storm drains, etc.) and any available water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4.

Responsible Agency:

Staff Contact Name:

Phone:

Email Address:

Date of Report:

1. Name of Site:

2. Address City County ZIP:

3. APN(s):

4. Provide a Site Location Map and a Site Diagram showing significant features. Parcel Area (acres):

5. Current Owner

   Name:

   Address

   City, County & Zip Code:

   Phone:

   E-mail Address:

6. Describe Current (Post-Abatement) Site Operations/Land Use.

7. Describe Previous Business Operations / Sources of PCBs or Mercury (if known).

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site.

9. Has sampling or other investigation been conducted in the vicinity of the property to identify it as a source property? Yes No

Specify. For samples collected in the public right-of-way, show the nexus to the subject property as clearly as possible. Attach maps or pictures and coordinates (if applicable).

13. Were any Federal, State, or Local regulatory agencies involved with the site abatement?

Yes No

If yes, provide as much of the information below as known:

Agency	Involvement	Contact Name	Phone Number

14. Describe the type and extent of abatement that has occurred.

15. Describe how the property abatement has effectively eliminated the transport of PCBs offsite and from entering the MS4 infrastructure for all transport mechanisms that apply to the site (e.g., stormwater runoff via sheet flow or through a storm drain, wind, or vehicle tracking).

16. Describe any available water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4.

Attach: Site Location Map, Site Diagram, and any pertinent sampling & analyses data

APPENDIX E

BASMAA Regional Stressor/Source Identification (SSID) Project Final Report PCBs from Electrical Utilities in San Francisco Bay Area Watersheds

PCBs from Electrical Utilities in San Francisco Bay Area Watersheds Stressor/Source Identification (SSID) Project

Prepared in support of provision C.8.e.iii of

NPDES Permit # CAS612008

Project Report

Prepared for:

Bay Area Stormwater Management Agencies Association (BASMAA)

Prepared by:

FINAL June 30, 2020

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ACCWP	Alameda Countywide Clean Water Program
Bay	San Francisco Bay
Bay Area	San Francisco Bay Area
Basin Plan	San Francisco Bay Basin (Region 2) Water Quality Control Plan
BASMAA	Bay Area Stormwater Management Agencies Association
BMPs	Best Management Practices
BOD	BASMAA Board of Directors
Cal OES	California Office of Emergency Services
CCCWP	Contra Costa Clean Water Program
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPUC	California Public Utilities Commission
CPAU	City of Palo Alto Utilities
CWA	Clean Water Act
dba	Doing Business As
DTSC	California Department of Toxic Substances Control
FERC	Federal Energy Regulatory Commission
FSURMP	Fairfield-Suisun Urban Runoff Management Program
kg/yr	kilogram per year
lb.	Pound
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
MT	Metric Tons
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System

PCBs	Polychlorinated Biphenyls
RMC	Regional Monitoring Coalition
ROW	right-of-way
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SVP	Silicon Valley Power
OFEE	Oil-filled Electrical Equipment
PG&E	Pacifica Gas and Electric Company
ppm	parts per million
PMT	BASMAA Project Management Team
RQ	reportable quantity
RCRA	Resource Conservation and Recovery Act
Regional Water Board	San Francisco Bay Regional Water Quality Control Board
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SOP	Standard Operating Procedure
SOW	Scope of Work
SPCC Plan	Spill Prevention Control and Countermeasure Plan
SSID	Stressor/Source Identification
TMDL	Total Maximum Daily Load
TSCA	Toxic Substances Control Act
UCMR	Urban Creeks Monitoring Report
US EPA	United States Environmental Protection Agency
VFWD	Vallejo Flood and Wastewater District
WQOs	Water Quality Objectives
WQS	Water Quality Standard

1.0 Introduction

This project report supports the requirement to implement a Stressor/Source Identification (SSID) Project as required by Provision C.8.e.iii of the San Francisco Bay (Bay) Region Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Stormwater Permit (MRP) (Order No. R2-2015-0049, SFRWQCB 2015). Per MRP Provision C.8.e.ii, the Bay Area Stormwater Management Agencies Association (BASMAA) Regional Monitoring Coalition (RMC)[1] members are working to initiate eight SSID projects during the five-year term of the MRP (i.e., 2016 – 2020). The RMC programs have agreed that seven SSID projects will be conducted to address local needs (for Santa Clara, Alameda, San Mateo, Contra Costa, Fairfield/Suisun and Vallejo counties), and one project (this project) will be conducted regionally (on behalf of all RMC members). SSID projects follow-up on monitoring conducted in compliance with MRP Provision C.8 (or monitoring conducted through other programs) with results that exceed trigger thresholds identified in the MRP. Trigger thresholds are not necessarily equivalent to Water Quality Objectives (WQOs) established in the San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan) (SFRWQCB, 2017) by the San Francisco Bay Regional Water Quality Control Board (Regional Water Board); however, sites where triggers are exceeded may indicate potential impacts to aquatic life or other beneficial uses.

BASMAA submitted a Regional SSID Work Plan to the Regional Water Board in March 2019. The SSID work plan described the steps that would be taken to investigate sources of polychlorinated biphenyls (PCBs) from electrical utility equipment in watersheds draining to the San Francisco Bay Basin. The Work Plan focused on Pacific Gas and Electric Company (PG&E), the largest electrical utility operating in the MRP area, and the only utility that is not owned by a municipality. The project team developed a letter requesting assistance from the Regional Water Board and outlining the specific data that are needed from PG&E to complete this project. The letter was ultimately approved by the BASMAA Board of Directors (BOD) and sent to the Regional Water Board in June 2019. The letter specifically asked the Regional Water Board to use their regulatory authority under Section 13267 of the Clean Water Act to compel PG&E to provide the needed data. However, PG&E is currently in bankruptcy proceedings, and the outcomes of that process have not yet been determined. As such, the Regional Water Board has delayed sending a “13267 letter” to PG&E, and is currently considering other options for moving forward with PG&E on this issue.

The BASMAA MRP 3.0 C.11/12 workgroup met with and discussed the issue of PCBs in electrical utility equipment with representatives of several municipally-owned electrical utilities in the permit area. Based on the information gained during these discussions, and given the current situation with PG&E, BASMAA requested the project team develop a revised scope of work (SOW) for Task 2 of the Regional SSID Work Plan.

BASMAA submitted a Regional SSID Revised Scope of Work to address PCBs in electrical utility applications in March 2020 to the Regional Water Board. The revised SOW would

[1] The BASMAA RMC is a consortium of San Francisco Bay Area municipal stormwater programs that joined together to coordinate and oversee water quality monitoring and several other requirements of the MRP. Participating BASMAA members include the Alameda Countywide Clean Water Program (ACCWP), Contra Costa Clean Water Program (CCCWP), Fairfield-Suisun Urban Runoff Management Program (FSURMP), San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), and City of Vallejo and Vallejo Flood and Wastewater District (VFWD).

implement the Regional SSID work plan, but would focus on municipally-owned electrical utilities in the San Francisco Bay Area (Bay Area), rather than PG&E. The Regional Water Board staff agreed[2] to a revised approach which focused on data gathering from municipally-owned electrical utilities. The Regional Water Board staff further acknowledged that revision of the work plan submitted in March 2019 is not needed to satisfy SSID project requirements. They also agreed the Regional SSID project will be considered complete based on the outcomes of the work described in this report, which focuses on data from municipally-owned electrical utilities instead of PG&E.

BASMAA retained EOA, Inc., of Oakland, CA to develop the work plan and implement the SSID project under the direction of a BASMAA Project Management Team (PMT). All work on this project is supported by funding provided by BASMAA.

1.1 Overview of SSID Project Requirements

SSID projects focus on taking action(s) to identify and reduce sources of pollutants, alleviate stressors, and address water quality problems. MRP Provision C.8.e.iii requires SSID projects to be conducted in a stepwise process, as described below.

Step 1: Develop a work plan that includes the following elements:

- Define the water quality problem (e.g., magnitude, temporal extent, and geographic extent) to the extent known;
- Describe the SSID project objectives, including the management context within which the results of the investigation will be used;
- Consider the problem within a watershed context and examine multiple types of related indicators, where possible (e.g., basic water quality data and biological assessment results);
- List potential causes of the problem (e.g., biological stressors, pollutant sources, and physical stressors);
- Establish a schedule for investigating the cause(s) of the trigger stressor/source which begins upon completion of the work plan. Investigations may include evaluation of existing data, desktop analyses of land uses and management actions, and/or collection of new data; and
- Establish the methods and plan for conducting a site-specific study (or non-site specific if the problem is widespread) in a stepwise process to identify and isolate the cause(s) of the trigger stressor/source.

Step 2: Conduct SSID investigations according to the schedule in the work plan and report on the status of the SSID investigation annually in the Urban Creeks Monitoring Report (UCMR) that is submitted to the Regional Water Board on March 31 of each year.

[2] Per Jan O'Hara at the BASMAA Monitoring and Pollutants of Concern Committee meeting held on March 3, 2020

Step 3: Follow-up actions:

- If it is determined that discharges to the municipal separate storm sewer system (MS4) contribute to an exceedance of a water quality standard (WQS) or an exceedance of a trigger threshold such that the water body's beneficial uses are not supported, submit a report in the UCMR that describes Best Management Practices (BMPs) that are currently being implemented and additional BMPs that will be implemented to prevent or reduce the discharge of pollutants that are causing or contributing to the exceedance of WQS. The report must include an implementation schedule.

- If it is determined that MS4 discharges are not contributing to an exceedance of a WQS, the SSID project may end. The Executive Officer must concur in writing before an SSID project is determined to be completed.

- If the SSID investigation is inconclusive (e.g., the trigger threshold exceedance is episodic or reasonable investigations do not reveal a stressor/source), the Permittee may request that the Executive Officer consider the SSID project complete.

1.2 SSID Project Report Organization

Step 1 of the SSID process described above in Section 1.1 was completed with the submittal of the BASMAA Regional SSID Work Plan in March 2019 and subsequent Revised Scope of Work (SOW) in March 2020.

The Work Plan and revised SOW identified the following tasks:

1. Conduct desktop analysis of data from Bay Area electrical utilities;
2. Develop Source Control Framework that summarizes the results of the desktop analysis and recommends approach to manage and control releases;
3. Develop data inputs that can be used to account for load reductions from new source control measures;
4. Develop Report that addresses management questions.

As described above, the revised SOW would implement the Regional SSID work plan, but would focus on municipally-owned electrical utilities in the Bay Area, rather than PG&E.

This Regional SSID Project Report provides background information, describes the work conducted in the desktop analysis, and proposes a source control framework to account for past load reductions and to further reduce ongoing loads of PCBs from electrical utility practices.

2.0 Problem Definition, Study Objectives, and Regulatory Background

2.1 Background

PCBs are commercially synthesized oily compounds consisting of carbon, hydrogen, and chlorine atoms. There are 209 possible arrangements of the atoms in PCB compounds. These are referred to as the 209 PCB congeners. PCBs were first manufactured in the United States (US) in 1929 and US production peaked in 1970. PCBs are non-flammable, chemically stable, have a high boiling point, and have electrical insulating properties. Therefore, they were used in hundreds of industrial and commercial applications. Most PCBs were manufactured as a mixture of several individual PCB congeners. The most common name for these mixtures in the US was the Aroclor series produced by Monsanto Company. There were more than ten common Aroclor mixtures.

Due to concern about their persistence in the environment, toxicity, and potential to cause cancer, the US Environmental Protection Agency (US EPA) banned the production and new use of PCBs in 1979. However, PCBs continue to be found in water and sediment collected from the San Francisco Bay, and urban stormwater runoff has been identified as a major source of PCBs to the Bay. Thus, PCBs are considered a legacy pollutant.

2.2 Problem Definition

Fish tissue monitoring in the Bay has revealed the bioaccumulation of PCBs in Bay sportfish at levels thought to pose a health risk to people consuming these fish. As a result, in 1994, the state of California issued a sport fish consumption advisory cautioning people to limit their consumption of fish caught in the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act (CWA) "Section 303(d) list" due to elevated levels of PCBs. In response, in 2008, the Regional Water Board adopted a Total Maximum Daily Load (TMDL) water quality restoration program targeting PCBs in the Bay[3]. The general goals of the TMDL are to identify sources of PCBs to the Bay, implement actions to control the sources, restore water quality, and protect beneficial uses.

The PCBs TMDL estimates baseline loads to the Bay from various source categories. The largest source category, at 20 kilograms (kg) per year, was estimated to be stormwater runoff. This category includes all sources to small tributaries draining to the Bay. The PCBs TMDL indicates that a 90% reduction in PCBs from stormwater runoff to the Bay is needed to achieve water quality standards and restore beneficial uses. The TMDL states that the wasteload allocation for stormwater runoff of 2 kg per year shall be achieved within 20 years (i.e., by March 2030). The PCBs TMDL is being implemented through NPDES permits to discharge stormwater issued to municipalities and industrial facilities in the Bay Area (e.g. the MRP).

This SSID project was triggered by monitoring conducted over the past 15+ years by BASMAA members that demonstrates municipal stormwater runoff is a source of PCBs to the Bay. PCBs were historically used in many applications, including electrical utility equipment and caulks and sealants used in building materials. However, the greatest use by far was in electrical

[3] The PCBs TMDL was approved by the US Environmental Protection Agency (US EPA) on March 29, 2010 and became effective on March 1, 2010.

equipment such as transformers and capacitors (McKee et al. 2006). Existing electrical utility equipment, which is often located in the public right-of-way (ROW), may still contain PCBs that can be released to the MS4 when spills and leaks occur. Due to past leaks or spills of PCBs oil from electrical equipment, properties owned and operated by electrical utilities may potentially have elevated concentrations of PCBs in surrounding surface soils that can be released to the MS4. Because the cumulative releases of PCBs-laden soils from these properties, and spills or leaks of PCBs oils from electrical equipment to MS4s across the Bay Area may occur at levels that exceed the 2 kg per year TMDL waste load allocation, this potential source of PCBs may limit the ability of municipalities to meet the goals of the PCBs TMDL for the Bay. Therefore, this potential source warrants further investigation.

2.3 SSID Project Objectives

The overall goal of this SSID project is to investigate electrical utility equipment as a source of PCBs to urban stormwater runoff and identify appropriate actions and control measures to reduce this source. Building on the information presented by SCVURPPP (2018), this project is designed to achieve the following three objectives:

1. Gather information from Bay Area municipally-owned utility companies to improve estimates of current PCBs loadings to MS4s from electrical utility equipment, and document current actions conducted by utility companies to reduce or prevent release of PCBs from their equipment;

2. Identify opportunities to improve municipal spill response, cleanup protocols, or other programs designed to reduce or prevent releases of PCBs from electrical utility equipment to MS4s;

3. Develop an appropriate mechanism for municipalities to ensure adequate clean-up, reporting and control measure implementation to reduce urban stormwater loadings of PCBs from municipally-owned electrical utility equipment.

In addition, an outcome of the project was to provide data inputs that could be used in the accounting methodology presented in the BASMAA Source Control Load Reduction Accounting Methodology and Reasonable Assurance Analysis (RAA) (BASMAA, 2020). The methodology was developed to account for PCBs load reductions that may be achieved due to source control measures implemented through a regional control measure program for electrical utilities.

2.4 Management Questions

This SSID project work plan identified a number of key management questions regarding electrical utility applications as sources of PCBs to MS4s to address, including:

1. What is the current magnitude and extent of PCBs stormwater loadings from electrical utility equipment and operations in the San Francisco Bay Area region?

2. What aspects of equipment or operational procedures should electrical utilities be required to report to the Regional Water Board?

3. Are improvements to spill and cleanup control measures needed to reduce water quality impacts from the release of PCBs in electrical utility equipment?

4. Are additional proactive management practices needed to reduce releases of PCBs from electrical utility equipment?

5. What are the PCBs load reductions that can be achieved through implementation of a regional reporting and control measure program?

This SSID project was implemented to provide the information needed to address these management questions.

3.0 Background

3.1 Study Area

The study area for this SSID project is the portion of the San Francisco Bay Area region subject to the MRP. This section provides an overview of electrical utility systems and companies currently operating in the study area, and describes how and where PCBs are used within those systems.

Electrical utilities produce or buy electricity from generating sources, and then distribute that electricity to users through two networks: the transmission system and the distribution system. The **transmission system** carries bulk electricity at high voltages, often across long distances, directly from generation sources to substations via high voltage power lines. Substations connect the transmission and distribution systems. Substations may increase the voltage from nearby generating facilities for more efficient transmission over long distances or lower the voltage for transfer to the distribution system. Electricity at a typical substation flows from incoming transmission lines, to circuit breakers, to transformers (which step down the voltage), to voltage regulators and cut out switches (which protect the system from overvoltage), and finally to outgoing distribution lines.

The **distribution system** delivers lower voltage electricity from substations directly to homes and businesses over shorter distances. This system includes pole-mounted equipment, equipment in underground vaults, and aboveground equipment on cement pads that are often in green boxes in the public ROW. This equipment is smaller, but more numerous in terms of the number of units.

Electrical utility equipment and facilities in both the transmission and distribution systems are distributed across the entire Bay Area region. In the past, PCBs were routinely used in electrical utility equipment that contained dielectric fluid as an insulator. This is because prior to the 1979 PCBs ban, dielectric fluid was typically formulated with PCBs due to a number of desirable properties they have (e.g., high dielectric strength, thermal stability, chemical inertness, and non-flammability). Electrical equipment containing dielectric fluid is typically identified as Oil-Filled Electrical Equipment (OFEE). Any OFEE that contained PCBs in the past could still potentially be in use and contain PCBs today. The most common types of OFEE that may contain PCBs are transformers, capacitors, circuit breakers, reclosers, switches in vaults, substation insulators, voltage regulators, load tap changers, and synchronous condensers (PG&E 2000).

In the Bay Area, there are eight electric utility companies operating as of February 2015 (State Energy Commission 2015):

<u>Investor-Owned Utilities (IOUs)</u>

1. Pacific Gas and Electric Company (PG&E)
   77 Beale Street
   San Francisco, CA 94105
   (415) 973-7000 (tel)

<u>Publicly Owned Load Serving Entities (LSEs) and Publicly Owned Utilities (POUs)</u>

2. Alameda Municipal Power
   2000 Grand Street

Alameda, CA 94501-0263
510.748.3905 (tel)

3. CCSF (also called the Power Enterprise of the San Francisco Public Utilities Commission)
   1155 Market Street, 4th Floor
   San Francisco, CA 94103
   209.989.2063 (tel)
4. City of Palo Alto, Utilities Department
   P.O. Box 10250
   Palo Alto, CA 94303
   650.329.2161 (tel)
5. Pittsburg Power Company Island Energy-City of Pittsburg,
   65 Civic Drive
   Pittsburg, CA 94565-3814
   925.252.4180 (tel)
6. Port of Oakland
   530 Water Street, Ste 3
   Oakland, CA 94607-3814
   510.627.1100 (tel)
7. Silicon Valley Power (SVP) - City of Santa Clara
   1500 Warburton Avenue
   Santa Clara, CA 95050
   408.615.2300 (tel)

Community Choice Aggregators

8. Marin Clean Energy (MCE)
   781 Lincoln Ave Ste 320
   San Rafael, CA 94901-3379
   888.632.3674 (tel)

PG&E is by far the largest electrical utility company in the Bay Area. PG&E is an investor-owned company that is not under the jurisdiction of any Bay Area municipality[4]. Three small publicly-owned utilities in the Bay Area (Alameda Municipal Power, City of Palo Alto Utilities Department, and Silicon Valley Power owned by the City of Santa Clara) maintain their own substations and distribution lines. The other public utilities partner with PG&E to deliver energy through PG&E's equipment. PG&E owns and operates several hundred electrical substations in the Bay Area, in addition to the smaller electrical utility equipment that is widely disbursed throughout urbanized areas and along rural corridors (e.g., small transformers on utility poles or in utility boxes). The total number of pieces of equipment that is in use across the Bay Area and that contains PCBs is not known but is likely in the range of tens to hundreds of thousands (see Section 3.3).

[4] PG&E is regulated by the California Public Utilities Commission (CPUC) and the Federal Energy Regulatory Commission (FERC).

3.2 Regulatory Controls on PCBs in Electrical Utility Equipment

In California, both federal and state laws regulate in-use PCBs, PCB wastes, and PCB clean-up. At the federal level, the Toxic Substances Control Act (TSCA) and the Resource Conservation and Recovery Act (RCRA) are used to regulate PCBs and PCB wastes. PCB cleanup sites may also be subject to regulation by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In addition, discharges from electrical utility applications are regulated under the NPDES program authorized by the CWA and implemented through the State and Regional Water Quality Control Boards. State PCB regulations are primarily implemented under the California Health and Safety Code.

TSCA is the primary regulatory tool that addresses most aspects of PCB management and cleanup. Passed into law in 1976, TSCA banned the continued manufacture and commercial distribution of PCBs in the US after July 2, 1979, and prohibited the continued use of PCBs outside of totally enclosed systems. TSCA also governs the ongoing management of PCBs that remain in use that are present at 50 ppm or greater, including labeling, handling, distribution, storage, cleanup of contaminated properties, spill response and disposal (Title 40 CFR Part 761). The federal TSCA regulations are enforced by the US EPA.

In addition to the TSCA regulations, other federal regulations under authority of the Clean Water Act are in place to prevent oil spills from reaching navigable waters, and provide for appropriate and efficient cleanup of any oil spills that do occur (40 CFC part 112). These regulations require Spill Prevention Control and Countermeasure (SPCC) Plans for facilities that could potentially discharge oils to navigable waters (including storm drains and drainage ditches) if the facility also meets one or more of the following criteria: aboveground oil storage > 1,230 gallons; and/or underground oil storage > 42,000 gallons; and/or storage of containerized PCB-contaminated liquid wastes for disposal between 50 and 500 ppm. Electrical utility substations may fall into the category of facilities that require such SPCC plans.

In California, hazardous waste regulations detailed in the California Code of Regulations (CCR) Title 22 are more stringent for PCBs than federal rules. CCR Title 22 designates oils or other liquids containing PCBs concentrations ≥ 5 ppm as non-RCRA hazardous waste requiring special handling and disposal. The California Department of Toxic Substances Control (DTSC) enforces the additional hazardous waste rules that apply to PCBs less than 50 ppm, including spill cleanup, disposal and reporting requirements. DTSC also regulates closure requirements for PCB sites under CERCLA.

3.2.1 PCB Classification and Labeling Requirements

Under both federal and state regulations, all required management of in-use PCBs and PCB-containing equipment, including labeling, disposal, site cleanup, spill response, and reporting is based on classifications of PCB concentrations. Table 3.1 defines the federal and state PCB classifications.

- TSCA regulations apply to PCBs 50 ppm or greater, while California regulations apply to PCBs between 5 and 50 ppm. Under TSCA, PCB concentrations greater than 500 ppm are classified as high PCBs, while PCB concentrations between 50 ppm and 500 ppm are classified as low PCBs. PCB concentrations below 50 ppm are classified by TSCA as non-PCB.

- In California, PCB concentrations in liquids between 5 ppm and < 50 ppm are classified as non-RCRA hazardous waste and governed by state regulations.
- If PCB concentrations are not known, neither federal nor state regulations require testing of in-use equipment or materials for PCB concentrations to determine the appropriate classification. Instead, a number of assumptions are applied to determine the appropriate PCBs classification.

Table 3.1 Current Federal and State Regulatory Classifications of PCBs Concentrations.

PCBs Concentration (known or assumed)	Label	Classification	Regulatory Requirements
Federal Requirements			
≥ 500 ppm (in original source)	PCB	TSCA - High PCB Concentration	Waste remediation required by federal law
50 to < 500 ppm (in original source)	PCB-Contaminated	TSCA - Low PCB Concentration	Waste remediation required by federal law
> 0 to < 50 ppm	Non-PCB	Non-PCB	No waste remediation required
0 ppm	No PCBs	Contains no PCBs, and was manufactured after July 1, 1978	No waste remediation required
State Requirements			
≥ 5 ppm (liquid) ≥ 50 ppm (solids)	PCB-Contaminated	California Hazardous Waste	Waste remediation required by State Law
< 5 ppm (liquid) < 50 ppm (solid)	Non-PCB	California Non-PCB	No waste remediation required

PCB-containing equipment is required to be labeled according to its PCB classification. When removed from service, all transformers, large capacitors (high and low voltage), and voltage regulators that are known or assumed to have PCB concentrations equal to or greater than 500 ppm at the time of manufacture require a "PCB" label. Other electrical equipment known or assumed to contain PCBs between 50 and <500 ppm are labeled according to the federal regulations as "PCB-Contaminated". In California, equipment determined to have PCBs < 5 ppm can be labeled as "Non-PCB"; however, because federal regulations were enacted prior to state regulations, some "Non-PCB" labels may have been applied to equipment that fit the non-PCB category for federal regulations (< 50 ppm). This lends uncertainty to the "Non-PCB" label if other information is not also available. Electrical equipment that was manufactured after July 1, 1978, and that does not contain any concentration of PCBs can be labeled as "No PCBs".

3.2.2 Spill Response and Site Cleanup

Both state and federal regulations require cleanup of releases of hazardous materials. As required under both federal and state regulations, the appropriate response to a PCB release is dictated by the known or assumed PCB classification of the equipment responsible for the release. Concentrations are determined based on the source of the release, not on the spilled concentration. For PCBs and PCB-contaminated materials that are 50 ppm PCBs or greater, federal regulations under TSCA govern spill response and cleanup. TSCA requires spill cleanup for releases from equipment or materials that are classified as low or high PCBs (i.e., ≥ 50 ppm PCBs). California hazardous waste regulations require spill cleanup and reporting for releases of PCB-contaminated liquids that fall below the federal regulations (i.e., ≥ 5 ppm but < 50 ppm). Equipment labels are used to identify PCBs and PCB-containing equipment. However, if equipment labels are not present and/or do not provide full information, assumptions about PCB concentrations are often necessary during the initial spill response. For example, any release of untested mineral oil from electrical equipment is assumed to be PCB-contaminated per federal regulations (i.e., ≥ 50 ppm but < 500 ppm).

The first step when a hazardous material release occurs is notification. Under both federal and state rules, the responsible party is required to immediately notify the California Office of Emergency Services (Cal OES) state warning center hotline, and/or 911 when a hazardous material release occurs. This initial reporting is typically a verbal notification (i.e., by telephone). Materials that are 50 ppm PCBs or greater are considered hazardous per federal regulations and liquids that are 5 ppm PCBs or greater are considered hazardous per state regulations. Therefore, any released liquids that are 5 ppm PCBs or greater should be reported to Cal OES.

TSCA hazardous materials spill cleanup requirements (i.e., for releases of PCBs ≥ 50 ppm) are summarized here:

- Low PCB Concentrations (< 500 ppm): excavate all soil within the spill area and backfill with clean soil. Double wash/rinse solid surfaces.
- High PCB Concentration (≥ 500 ppm): notify National Response Center; cordon off the area with a minimum 3-ft buffer and post warning signs; document and record area of visible contamination; excavate all soil within the spill area and backfill with clean soil. Remove all contaminated porous surfaces (e.g., wood asphalt, cement, concrete, etc.). Double wash/rinse non-porous solid surfaces; properly dispose of all PCBs or PCB-contaminated materials from the cleanup site (e.g., soils, solvents, rags, etc.);
- Soils must be remediated to background levels (i.e., detection limits) where practicable.

Federal and state regulations also restrict the allowable concentrations of PCBs remaining in any post-cleanup soils and/or materials, based on the risk categories identified in Table 3.2. For example, in low occupancy areas (i.e., restricted access areas such as electrical substations), PCBs must be below 25 ppm, or the area can have up to 50 ppm PCBs if the appropriate notification is posted at the site. In high occupancy areas (e.g., unrestricted access areas), PCBs must be below 10 ppm. Clean fill used to replace soil removed during the cleanup process must contain less than 1 ppm PCBs. (Note that all of these allowable remaining concentrations are potentially above the thresholds required to meet TMDL goals.) Post cleanup verification sampling is required only for high concentration spills and low-concentration spills involving 1 pound (lb.) or more of PCBs by weight (>270 gallons of untested mineral oil)[5].

Table.3.2 Federal and State Regulatory Classifications of PCB Concentrations and Cleanup Levels.

Risk Category	Allowable PCBs Concentration
PCB waste remediation required	≥ 50 ppm in original source
Low Human health risk from direct exposure	< 50 ppm
High occupancy areas (i.e., non-restricted access areas)	≤ 10 ppm in remaining material
Low occupancy areas (i.e., restricted access areas, such as electrical substations) Low occupancy areas IF the area contains a label or other visible notification of the contamination Low occupancy areas with a cap	≤ 25 ppm in remaining material ≤ 50 ppm in remaining material 25 to < 100 ppm in remaining material
Clean fill	< 1 ppm

In addition, as required by US EPA regulations to prevent oil pollution (40 CFR, Part 112 and 761), utilities must prepare Spill Prevention Control and Countermeasure (SPCC) Plans for facilities that could potentially discharge oils to navigable waters (including storm drains and drainage ditches). SPCC plans are prepared if the facility also meets one or more of the following criteria: aboveground oil storage > 1,230 gallons; and/or underground oil storage > 42,000 gallons; and/or storage of containerized PCB-contaminated liquid wastes for disposal between 50 and 500 ppm. The purpose of the SPCC Plan is to ensure oil spills are minimized, and if any oil spills do occur, to prevent spilled oils from leaving the property and provide maximum cleanup efficiency.

3.2.3 Spill Reporting

In addition to the initial verbal notification, both state and federal regulations may also require submission of follow-up written reports for releases of hazardous materials that are at or above the federal reportable quantities (RQs), or for discharges of oil to navigable waters. For PCBs, the federal RQ is 1 lb. (0.454 kg), while for oil spills, the federal RQ is 42 gallons. Thus, under federal regulations, a follow-up written report must be submitted for any release of 1 lb. or more of PCBs at concentrations ≥ 50 ppm, or for "Non-PCBs" mineral oil spills of 42 gallons or more.

[5] See 40 CFR 761 Subpart G PCB Spill Cleanup Policy for post cleanup verification sampling requirements. EPA provides guidance for sampling in *Verification of PCB Spill Cleanup by Sampling and Analysis* (EPA 560/5-85-026 August 1987), *Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup* (EPA-560/5-86-017 May 1986), and *Wipe Sampling and Double Wash and Rinse Cleanup as Recommended by the Environmental Protection Agency PCB Spill* Cleanup Policy (EPA Revised and Clarified on April 18, 1991).

In California, state regulations only require submission of follow-up written reports if the amount of the hazardous material released is at or above the federal RQ.

Spill reporting requirements for releases of 1 lb. or more of PCBs ≥ 50 ppm are detailed here:

- Identification of the source
- Spill date and time (actual or estimated)
- Clean-up date and time completed or terminated
- Identification of spill locations and contaminated material/surfaces, including identification of restricted access or non-restricted access location
- Pre-clean-up sampling data used to establish spill boundaries, if required
- Description of solid surfaces cleaned
- Depth of soil excavation and quantity of soil removed
- Post-clean-up sampling data
- Estimated cost of clean-up (not required)

3.2.4 Regulation of Utility Vault Discharges

There are additional regulatory requirements for short-term intermittent discharges from electrical utility vaults to surface waters of the U.S. An electrical utility vault is an underground room that provides access to subterranean electrical equipment, which may include PCB transformers or other PCB-containing equipment. These are commonly found throughout the electrical system across the Bay Area. Water may collect in these vaults, requiring utility companies to dewater subsurface vaults and underground structures to protect equipment, and provide safe worker conditions for installation, maintenance, or repair of equipment. Compliance with a general NPDES permit is required for these discharges. In California, the General NPDES permit is issued by the California State Water Resources Control Board (Order WQ 2014-0174-DWQ). To be covered under the general permit, a utility company must submit an application to both the State Water Board and their Regional Water Quality Control Board. The permit application includes a Notice of Intent (NOI) and a Pollution Prevention Plan. PG&E has applied for coverage under the General Permit and PG&E's most recent Pollution Prevention Plan submitted to the San Francisco Bay Regional Water Quality Control Board (Region 2) in compliance with the general permit requirements is available on the State Water Board website (https://www.waterboards.ca.gov/water_issues/programs/npdes/docs/utilityvaults/ppplans/pger2_noi_ppp.pdf). It is estimated that approximately 150 to 200 utility vaults are dewatered in the San Francisco Bay Region each year. The State Water Board's website showing utilities that have applied for coverage under the General Permit did not identify any other electrical utilities, other than PG&E, in the San Francisco Bay Region (Region 2).

Regulation of utility vault discharges is included in this section because unplanned spills or releases from PCBs equipment within a vault may occur due to equipment failure. However, although utility vault discharges could potentially result in release of PCBs, chemical analysis of the liquid in the vault is only required at vaults discharging > 10,000 gallons. Instead, if the vault contains equipment from prior to January 1, 1985 and there is any noticeable oil or sheen, the water is containerized and hauled offsite for analysis and disposal. At all other vaults, liquid samples are collected in a jar, allowed to sit for 5 minutes, and then the appearance (color/opacity) of the liquid in the jar is compared to pictures of three example sample jars that vary in the levels of contamination from green (low contamination) to red (high contamination). The appropriate disposal method for the liquid from the vault is determined by the appearance of the sample. If the sample collected looks similar to the green zone samples, then the liquid from the vault can be discharged through a filter sock into the storm drain or waterway. If the sample collected looks similar to the red zone sample, then the liquid from the vault must be collected and disposed of off-site. This qualitative evaluation provides no information on PCB concentrations that may be present in the liquid.

During the first year of coverage under the general NPDES permit, in compliance with the Notice of Applicability (dated September 22, 2016), PG&E collected samples at fifteen of their utility vault dewatering projects. Samples were analyzed for PCBs using EPA Method 1668. The monitoring results were summarized in an email from Regional Water Board staff. PCBs were detected in 11 out of 15 samples. In samples with detections, PCBs concentrations ranged from 0.5 ng/L to 3.4 ng/L.

3.2.5 Chemical Analysis Methods for PCBs

For compliance purposes, TSCA regulations recommend the use of EPA Method 8082 (i.e., the “Aroclor Method”) to determine PCB concentrations with a quantifiable level of detection at 2 ppm. Aroclors are the most common PCB formulations that were produced and used commercially in the US. Aroclors are composed of 1 to 7 primary congeners, plus trace levels of other congeners. EPA Method 8082 identifies and quantifies total PCB concentrations based on comparison with the gas chromatograph patterns (referred to as fingerprints) for known Aroclor formulations. Although widely used for determination of PCB concentrations since the 1970’s, this method has a number of limitations.

- First, PCBs in a given sample may not match up well with the Aroclor standards that are used for comparison in the analysis. Typically, a group of five to seven Aroclors are used as technical standards. While these are selected to represent the most commonly used formulations, there were many more Aroclor formulations that were produced and used over the years, including slight variations in the formulations produced from year to year. While Aroclors represent the largest mass of PCBs used commercially in the US, they do not represent all PCB products.
- Second, samples that contain mixed Aroclors or that have undergone weathering are not expected to have the same fingerprint as Aroclor standards. Fitting these samples to a set of standard Aroclor fingerprints may not provide accurate information.
- Third, this method does not detect certain PCB congeners, including some of the most toxic.
- Finally, the Aroclor Method has relatively high method detection limits compared with concentrations of concern for water quality.

TSCA regulations allow the use of an alternative analytical method for PCB determination if it is validated as described in 40 CFR 761, Subpart Q. Alternative analytical methods for PCBs, such as EPA Method 1668, or a revised version of Method 8082 that allows for individual congener analysis provide lower detection and reporting limits, and can be used to detect all 209 individual PCB congeners. However, these methods require more specialized laboratory equipment and expertise to perform, and are therefore considerably more expensive than the “Aroclor” method. Although these improved methods are more appropriate for stormwater control purposes because they are not required, they are unlikely to be used in place of the easier and less expensive “Aroclor” method when responding to mineral oil spills.

3.3 PCBs Remaining in Electrical Utility Equipment

Although use of PCBs is highly restricted currently, McKee et al. (2006) estimated that 12.3 million kilograms of PCBs were used in the San Francisco Bay Area between 1950 and 1990. Roughly 65% (8 million kg) was used in electrical transformers and large capacitors (McKee et al. 2006). How much of this mass was released to the environment and how much remains in electrical equipment distributed across the Bay Area today is unknown. While the 1979 ban of PCBs did not require the immediate removal of PCBs from current applications, electrical utilities have made substantial efforts over the past 35+ years to reduce the amount of PCBs still used in their applications in the Bay Area. According to PG&E, the majority of OFEE containing PCBs in the Bay Area has already been removed or refurbished with dielectric fluids that do not contain PCBs through the following actions:

- Voluntary replacement programs;
- Ongoing removal of PCBs from OFEE as units are serviced or replaced due to routine maintenance programs; and
- OFEE replacement due to unplanned actions (e.g., transformer leaks and fires).

Voluntary actions conducted by PG&E, primarily in the mid-1980s, included the PCBs Distribution Capacitor Replacement Program and the PCBs Network Transformer Replacement Program (PG&E 2000). In addition, in the 1990s, PG&E implemented a program to remove oil-filled circuit breakers and replace them with equipment that contains sulfur hexafluoride gas (PG&E 2000). Current ongoing PG&E efforts to remove PCBs-containing equipment are conducted primarily through maintenance programs. Past maintenance of older equipment may have included draining PCBs-containing oils and refilling the equipment with oils that did not contain PCBs. These refurbished OFEE may still contain PCBs at levels of concern to municipalities due to residual contamination from the original PCB-oil. Currently, as maintenance staff identify older equipment in-use, it is scheduled for replacement. However, PG&E has provided limited documentation of their past and current PCBs removal efforts. There remains much uncertainty on where PCBs transformers, PCBs capacitors, oil-filled circuit breakers, and PCBs-containing distribution system equipment were originally located, and which ones have already been removed or replaced.

Despite the removal efforts described above, PCBs may still be found in older and refurbished OFEE, and particularly OFEE located throughout the distribution system. In a recent meeting with Regional Water Board Staff, PG&E noted that any equipment installed prior to 1985 could contain PCBs, as it would have come from equipment stockpiled prior to the 1979 ban and was installed prior to the voluntary replacement programs (*personal communication*, Sanchez 2016). Because OFEE are not typically tested for PCBs until the fluid is removed during servicing or disposal, or in the event of a spill, the total number of PCBs-containing OFEE that remain in use is unknown. However, in a letter to the Regional Water Board in 2000, PG&E provided information that can be used to make some preliminary estimates, including the following (PG&E 2000):

- There are over 900,000 pieces of OFEE in service in the distribution system;

- In 1999, 22,000 pieces of equipment were serviced at the main PCBs-handling facilities in Emeryville;
- Approximately 10 percent of the units serviced and tested annually contain PCBs at concentrations of 50 parts per million (ppm) or greater, and fewer than 1 percent contained PCBs at concentrations of 500 ppm or greater; and
- The number of pieces of equipment containing PCBs concentrations > 50 ppm has declined over time.

The information above was used to calculate the following:

- Assuming the count of equipment processed in 1999 in Emeryville represents an average annual processing rate throughout the region and that there are at least 900,000 pieces of equipment in PG&E's distribution system it would take over 40 years at a minimum for all of this equipment to be replaced;
- Assuming the 1999 processing rate and 900,000 pieces of equipment in PG&E's distribution system in 1985, approximately 175,000 pieces would not yet have been serviced or replaced as of 2018; and
- Of the approximately 175,000 pieces of equipment remaining in-use in 2018, approximately 17,500 (10%) may contain PCBs concentrations > 50 ppm.

Although based on limited information, the above estimates demonstrate that a potentially large number of pieces of equipment containing PCBs over 50 ppm (i.e., 17,500 as of 2018) may remain in-use in PG&E's electrical utility distribution system. And the remaining 90% (roughly 157,000 pieces of equipment) may contain lower concentrations of PCBs that could still be of concern to Permittees in their efforts to meet TMDL requirements.

3.4 Estimated PCBs Loads from Electrical Utility Equipment to MS4s

McKee et al. (2006) developed a PCBs mass balance model that estimated the total loads to stormwater from all major sources during the peak period of PCBs production and use (i.e., 1950 – 1990), and in the period of the study (i.e., 2005). The mass balance model started with the total mass of PCBs that was used in the region between 1950 and 1990 and apportioned that mass to the major source categories. The largest PCBs-use category was transformers and large capacitors (i.e., oil-filled electrical equipment, OFEE). The total mass used in transformers and large capacitors between 1950 and 1990 was estimated at 7,600 metric tons (MT). Although most of this PCBs mass remains contained within the equipment, a small percentage of PCBs are released each year due to spills and leaks. These releases are the primary source of PCBs to stormwater conveyances from OFEE. Using literature values and the assumptions outlined below, McKee et al. (2006) estimated the following:

- Between 1950 and 1990 (the peak period of production and use of PCBs in the U.S.) 120 – 520 kg of PCBs entered stormwater conveyances due to releases from transformers and large capacitors. On average, this equated to a stormwater load of 8 kg/yr to the San Francisco Bay from electrical utility equipment during that time period.
- In 2005, the mass of PCBs entering stormwater conveyances due to releases from transformers and large capacitors was 1.2 to 4.3 kg/year (average = 2.8 kg/yr). The assumptions and literature data that were used to calculate the 2005 load included the following:

- 0.05% was estimated to leak from transformers and 0.35% from large capacitors each year over an assumed 30-year service life (Harrad 1994, EIP Associates 1997).
- When spills occur, 99% of the spilled PCBs are cleaned up and only 1% of the remaining PCBs are left on erodible surfaces and available for wash off;
- Assumed runoff coefficients based on land-use classifications were used to approximate the fraction of PCBs on erodible surfaces that can enter local storm drains each year; and
- A small fraction (0.3%) of PCBs released to the environment enter the atmosphere (Keeler et al. 1993); McKee et al. (2006) estimated 2% to 6% of these PCBs are subsequently captured in stormwater through wet deposition.

McKee et al. (2006) estimated a stormwater load of 2.8 kg/yr to the Bay from transformers and large capacitors in 2005.

4.0 Desktop Analysis

The purpose of the desktop analysis is to better understand the extent and magnitude of municipally-owned electrical utility equipment as a source of PCBs to urban stormwater runoff, document past and current efforts to reduce PCBs releases from electrical utility equipment during spills or other accidental releases, and document measures already taken or underway to remove PCBs-containing oils and electrical equipment from active service across the Bay Area.

PG&E, the largest electric utility company in the Bay Area, was likely the largest single user of PCBs in the Bay Area, and as such, likely remains the largest current source of PCBs releases to MS4s from electrical utility equipment. However, the project was revised in early 2020 to focus the desktop analysis on information provided by municipally-owned electrical utilities in the Bay Area on their OFEE inventories, and any other readily available data, such as the data provided previously by PG&E on voluntary replacement programs for PCBs-containing OFEE and spill reporting records presented in Sections 3.3 and 3.4, respectively.

The BASMAA project team identified representatives from municipally-owned electrical utilities in the Bay Area and discussed the project information needs with those representatives. The Project team sent the identified representatives a *Request for Information from Municipal Electrical Utilities*. The requested information included a description of the agency's electrical utility transmission and distribution systems, description of OFEE in the systems and PCBs-containing OFEE in the systems, past and current replacement and maintenance programs for OFEE and current and past protocols for OFEE spill response and cleanup.

4.1 Overview of Participating Municipally-Owned Electrical Utilities

In the MRP Area, there are five municipally-owned (public) electrical utilities, including:

1. Alameda Municipal Power
2. City of Palo Alto Utilities
3. Pittsburg Power Company, doing business as (dba) Island Energy – City of Pittsburg
4. Port of Oakland
5. Silicon Valley Power - City of Santa Clara

Three of these public utilities participated in this project and submitted data on their OFEE inventories and spill response protocols for evaluation, including: City of Palo Alto Utilities (CPAU), Pittsburg Power Company dba Island Energy (Island Energy) – City of Pittsburg, and Silicon Valley Power (SVP) – City of Santa Clara.

Additional information about each of the three participating municipally-owned electrical utilities and the information provided on OFEE in their systems is presented below.

4.1.1 City of Palo Alto Utilities

The City of Palo Alto Utilities (CPAU) have been operating a municipal electric power system in that city for over 100 years. CPAU serves the City of Palo Alto with an area of approximately 16,640 acres (including ~11,000 acres of urban area and ~5,500 acres of open space) and a population of approximately 67,082 people.

CPAU provided data on their inventory of OFEE through December 2019, including counts of equipment that are currently active in the system and equipment that have been removed from the system. OFEE counts were provided by the following equipment types:

- Poletop transformers
- Padmount single phase transformers
- Padmount three phase transformers
- Padmount substation transformers
- Underground commercial and residential distribution transformers
- Regulators
- Padmount switches
- Vault/box switches

For each type of equipment, CPAU provided an average volume of oil in each piece of equipment. The OFEE counts were further divided into the following categories:

- All active OFEE (equipment that are currently in active service within electrical transmission or distribution systems);
- Active OFEE that were purchased or installed prior to 1985 (pre-1985 OFEE);
- All inactive OFEE (equipment that have been removed from service);
- Inactive pre-1985 OFEE that were removed from service prior to 2002;
- Inactive pre-1985 OFEE that were removed from service in 2002 or later.

CPAU did not provide any data on measured PCBs concentrations in their OFEE inventory. However, they did identify OFEE that were labeled as “Non-PCBs” by the manufacturer.

4.1.2 Silicon Valley Power

Silicon Valley Power (SVP) has been operating in the City of Santa Clara for more than 100 years. As of December 2019, SVP includes 25 substations, 55 miles of transmissions lines, and 186 miles of overhead distribution lines. The total coverage area is 11,782 acres, and the population served is 129,488 people.

SVP provided data on their inventory of OFEE through December 2019, including counts of equipment that are currently active in the system and equipment that have been removed from the system. OFEE counts were provided by the following equipment types:

- Poletop transformers
- Padmount single phase transformers
- Padmount three phase transformers
- Padmount substation transformers
- Underground commercial and residential distribution transformers
- Regulators
- Padmount switches
- Vault/box switches

For each type of equipment, SVP provided an average volume of oil in each piece of equipment. The OFEE counts were further divided into the following categories:

- All active OFEE (equipment that are currently in active service within the electrical transmission or distribution systems);
- Active OFEE that were purchased or installed prior to 1985 (pre-1985 OFEE);
- All inactive OFEE (equipment that have been removed from service);
- Inactive pre-1985 OFEE that were removed from service prior to 2002;
- Inactive pre-1985 OFEE that were removed from service in 2002 or later.

SVP also provided equipment counts and oil volumes for a number of OFEE that comprised approximately 12% of the oil mass in their inventory, for which no information on equipment status (active or inactive) and no information on equipment age (pre-1985 or post-1985) were available at the time this report was prepared. These data were excluded from the main analysis presented in Section 4.2. However, a sensitivity analysis was conducted in order to understand potential implications of excluding these data. The results of the sensitivity analysis are presented in Section 4.2.3. Based on those results, the unknown data were included in the estimated ranges of PCBs mass and stormwater loads as described further in Section 4.2.3 and Table 4.4.

SVP did not provide any data on measured PCBs concentrations in their OFEE inventory.

4.1.3 Pittsburg Power Company, Island Energy

Pittsburg Power Company is a joint powers authority and department within the City of Pittsburg, California. Since 1997, Pittsburg Power has been operating an electric utility distribution system at Mare Island in Vallejo under the name “Island Energy”. Mare Island was formerly the location of a US Naval shipyard that was decommissioned in 1996. Following decommissioning, the Pittsburg Power Company acquired the electrical utility distribution rights on Mare Island from the US Navy. The distribution system on Mare Island that is operated by Island Energy consists of one substation and approximately 11 miles of distribution lines that serve an area of ~1,200 acres. The Mare Island zip code has a population of approximately 900 people.

Island Energy provided detailed inventories for the transformers that were part of both the historic (US Navy) inventory and the current (Island Energy) inventory of OFEE on Mare Island. The historic inventory documents each piece of OFEE that was part of the US Naval shipyard on Mare Island until 1996. At that time, the US Navy removed the bulk of pre-1985 OFEE and sent them to hazardous waste facilities for proper disposal. However, some pre-1985 OFEE remained on the island. The current inventory identifies each piece of OFEE on Mare Island that has been operated by Island Energy since 1997 through December 2019. The data provided in both the current and historic inventories includes the volume of oil, installation date, and (if applicable) removal date for each transformer in the historic or current system on Mare Island. In addition, measured concentrations of PCBs were provided for most OFEE in these inventories. Island Energy noted that there are gaps in the historic records, and the data provided may be incomplete. The current inventory identifies all OFEE that have been or are currently active and operated by Island Energy on Mare Island between 1997 and 2019 (i.e., since Island Energy began operating the electrical distribution system on Mare Island). The data analysis focused on the PCBs-containing OFEE in the historic and current inventories.

4.2 Analysis of Municipally-Owned Electrical Utility Data

The overall goal of the analysis of municipally-owned electrical utility OFEE inventories was to develop improved estimates of both the load of PCBs to stormwater from OFEE, and the load reductions that have been achieved over time due to ongoing equipment maintenance and replacement programs. The data analysis was also intended to provide data inputs that could be used in the accounting methodology presented in the BASMAA Source Control Load Reduction Accounting for RAA (BASMAA 2020) to calculate the PCBs load reductions achieved since the start of the PCBs TMDL, and the expected PCBs load reductions in the future due to the ongoing removal and proper disposal of PCBs-containing OFEE. To accomplish these goals, the project evaluated the OFEE inventories provided by participating municipally-owned electrical utilities to characterize the magnitude of PCBs-containing OFEE in these systems and document the rate of removal of PCBs-containing OFEE over time. The data were used to calculate the annual average removal rates of PCBs-containing OFEE from participating municipally-owned electrical utility systems since the start of the PCBs TMDL (i.e., 2002). This information was then scaled-up to the larger MRP area in order to provide a rough, first-order estimate of the potential magnitude of the current OFEE load of PCBs to stormwater across the area.

4.2.1 OFEE Inventory Data Analysis Approach and Assumptions

The OFEE inventory data were analyzed to generate estimates of the following:

- The potential mass of PCBs in active OFEE within each municipally-owned electrical utility system at the start of the PCBs TMDL (i.e., 2002) and currently (i.e. 2020).
- The potential mass of PCBs in OFEE that has been removed from each of these systems due to ongoing maintenance and replacement programs before and after 2002.
- The annual average reduction rate achieved since the start of the PCBs TMDL due to removal of PCBs-containing OFEE from these systems.
- The potential PCBs stormwater load from OFEE in these systems at the start of the PCBs TMDL and currently.
- The expected PCBs stormwater load reductions in the future due to continued removal of PCBs-containing OFEE from these systems.

Because information on measured PCBs in these OFEE was limited, the mass of oil in OFEE was used as the primary metric to characterize OFEE within each system, to estimate the magnitude of potentially PCBs-containing OFEE in each system, and to calculate equipment removal rates. The age of the OFEE, based on the purchase or installation date provided, was used as the primary metric to identify potentially PCBs-containing equipment as follows:

- Pre-1985 OFEE. All equipment that was installed prior to 1985 (i.e., pre-1985 OFEE) were assumed to potentially contain PCBs. 1985 was selected as the appropriate cut-off date to identify equipment that may contain PCBs because the installation of PCBs-containing equipment that had been stockpiled prior to the 1979 PCBs ban continued for several years after the ban[6].

- Post-1985 OFEE. All equipment installed after 1985 (i.e., post-1985 OFEE) were assumed to contain zero PCBs.

The potential mass of PCBs in pre-1985 OFEE was calculated from the mass of oil in these OFEE multiplied by a range of assumed PCBs concentrations in that oil. The PCBs concentrations in all pre-1985 OFEE were based on the following assumptions:

- Measured PCBs concentrations were used, if available.
- If no PCBs measurement data were provided, the range of PCBs concentrations was estimated as follows:
  - Pre-1985 OFEE with "PCBs" labels are assumed to have PCBs concentrations ≥ 500 ppm (i.e., PCBs Transformers). However, because PCBs transformers must be registered with the US EPA transformer registry, and none of the participating municipally-owned utilities have registered any PCBs transformers in this database, all PCBs concentrations in any equipment in the current OFEE inventories were assumed to be less than 500 ppm.
  - Pre-1985 OFEE with "Non-PCBs" on the label have PCBs concentrations < 50 ppm. All OFEE with these labels were assumed to have PCBs between 1 and 49 ppm, unless otherwise noted.
  - Pre-1985 OFEE that were not labeled, or that did not have measured PCBs concentrations were assumed to contain PCBs between 50 and 499 ppm.

Because this report is focused on OFEE that contain or may contain PCBs, the data analysis focused primarily on pre-1985 OFEE.

4.2.2 Data Analysis Methods

Analysis of the OFEE inventory data proceeded through the following seven steps:

1. Calculate the total mass of oil in all active OFEE within each system and the total mass of oil in active pre-1985 OFEE. Use this information to estimate the mass of oil and current abundance of potentially PCBs-containing OFEE within each system.

The total mass of oil in all active OFEE was calculated from the volume of oil in each piece of equipment multiplied by the density of the oil. The OFEE inventories provided by the participating municipally-owned electrical utilities provided either the actual volume of oil in each piece of equipment in their inventory, or the average volume of oil per piece of equipment for each type of equipment and the total counts of active equipment of that type. The density of the

[6] Personal communication, Sanchez 2016. This assumption is based on statements made to Regional Water Board staff at a meeting with PG&E representatives that equipment stockpiled prior to the 1979 ban continued to be put into service after the ban until voluntary replacement programs were instituted around 1985.

oil in all OFEE was based on the density of highly refined mineral oil used as a dielectric fluid in transformers of 0.9 mg/l[7].

Pre-1985 OFEE were identified based on information provided by the municipally-owned electrical utilities on either the installation date for each piece of equipment in their inventory, or the counts of all equipment within each category that were installed before 1985 and are currently active in their system.

2. Calculate the mass of oil in pre-1985 OFEE that has been removed from active service since the start of the PCBs TMDL in 2002.

Only pre-1985 OFEE were included in this calculation because this category comprises all OFEE that may contain PCBs. Each participating municipally-owned electrical utility provided slightly different data on equipment removal dates. Both CPAU and SVP provided direct counts of pre-1985 OFEE within each equipment category that were removed from service in 2002 or later. Island Energy identified all pre-1985 OFEE in their current inventory as either active or inactive as of 2019 but did not provide removal dates for inactive equipment. However, Island Energy's current OFEE inventory only includes OFEE that were active in 1997. At this step in the process, in order to simply this calculation and provide information needed for Step #3, this calculation assumed all equipment in Island Energy's current inventory were active until at least 2002 (i.e., all inactive OFEE were removed from service in 2002 or later).

3. Calculate the overall equipment removal rate and annual average equipment removal rate for pre-1985 OFEE since the start of the PCBs TMDL in 2002. Use this estimate to calculate the future date by which all pre-1985 OFEE will be removed from each participating municipally-owned electrical utility system.

The overall equipment removal rates for pre-1985 OFEE that were achieved between 2002 and 2019 were calculated based on the total mass of oil in pre-1985 OFEE that were removed from each system during that time period, divided by the total mass of oil in all pre-1985 OFEE that were active in 2002. The annual average removal rates were then calculated by dividing the overall removal rate by the number of years between 2002 and 2019 (17 years).

For CPAU and SVP, the overall removal rates since the start of the PCBs TMDL in 2002 were calculated directly from the data provided on removals between 2002 and 2019. However, because of the way the data were provided for Island Energy, an additional step was needed to estimate the overall removal rate since 2002. Island Energy identified all equipment in their current inventory, which spans the time period between 1997 and 2019, as active or inactive in 2019. However, specific removal dates for inactive equipment in the current inventory were not provided. Therefore, in order to estimate the overall removal rate since 2002, first, the annual average removal rate between 1997 and 2019 was calculated by dividing the overall removal rate for this period by the number of years between 1997 and 2019 (22 years). This annual average removal rate was then multiplied by the number of years between 2002 and 2019 (17 years) to estimate the overall removal rate since the start of the PCBs TMDL in 2002.

[7] Based on the reported density of Shell Diala Oil AX manufactured by SOPUS Products. Island Energy identified this as the dielectric oil used in the large transformers at their substation and provided a Material Safety Data Sheet (MSDS) for this product in their Spill Prevention, Control and Countermeasure (SPCC) plan.

Both the annual average removal rates and the overall removal rates since 2002 were compared across participating municipally-owned utilities. These data were also compared with the rates proposed in the accounting methodology for calculating the load reductions due to ongoing removal of PCBs-containing OFEE since the start of the PCBs TMDL and into the future. These removal rates were also used to estimate the future date by which all pre-1985 OFEE will be removed from each system. This calculation assumes the annual average removal rate for each system that has been achieved since 2002 will continue until all pre-1985 OFEE have been removed from each system. The starting point for this calculation was the mass of oil in all pre-1985 OFEE that were active in each system in 2020 (calculated in step #1). This 2020 value was then multiplied by the annual average removal rate for each system to estimate the total mass of pre-1985 OFEE oil removed each year. The number of years to reduce this mass to zero was then estimated by dividing the total mass of oil in active pre-1985 OFEE in 2020 by the mass of oil that would be removed each year.

4. Calculate the potential range of PCBs mass in active OFEE in 2020.

The potential range of PCBs mass (kg) in currently active pre-1985 OFEE was estimated for each system based on the total mass of oil in active pre-1985 OFEE in 2020 multiplied by the measured or assumed PCBs concentrations based on previously described assumptions (see Section 4.2.1).

5. Calculate the 2002 and 2020 loads of PCBs to stormwater from OFEE in the participating municipally-owned electrical utility systems and load reductions achieved over time due to equipment removals.

The starting point for this calculation was the current PCBs mass in active OFEE (step #5 above) for each participating municipally-owned electrical utility system. The following assumptions used by McKee et al., (2006) were then applied to estimate the fraction of PCBs in OFEE that are released to MS4s annually.

- 0.05% was estimated to leak from transformers and 0.35% from large capacitors each year (Harrad 1994, EIP Associates 1997); For this analysis, the value for transformers was used for all OFEE;
- When leaks occur, 99% of the materials leaked are cleaned up and only 1% remain on erodible surfaces and available for wash off.

6. Estimate the stormwater loads from OFEE across the larger MRP area and the potential load reductions that can be achieved through continued equipment removal.

This calculation extrapolated the stormwater loads estimated for the participating municipally-owned electrical utility system OFEE (developed in step #5) to the larger Bay Area.

4.2.3 Data Analysis Results

Summary of Municipally-Owned Electrical Utility Data

Figure 4.1 presents a summary of the distribution of OFEE in each of the participating municipally-owned electrical utility systems' inventories. Additional information about these distributions is provided in the following sections.

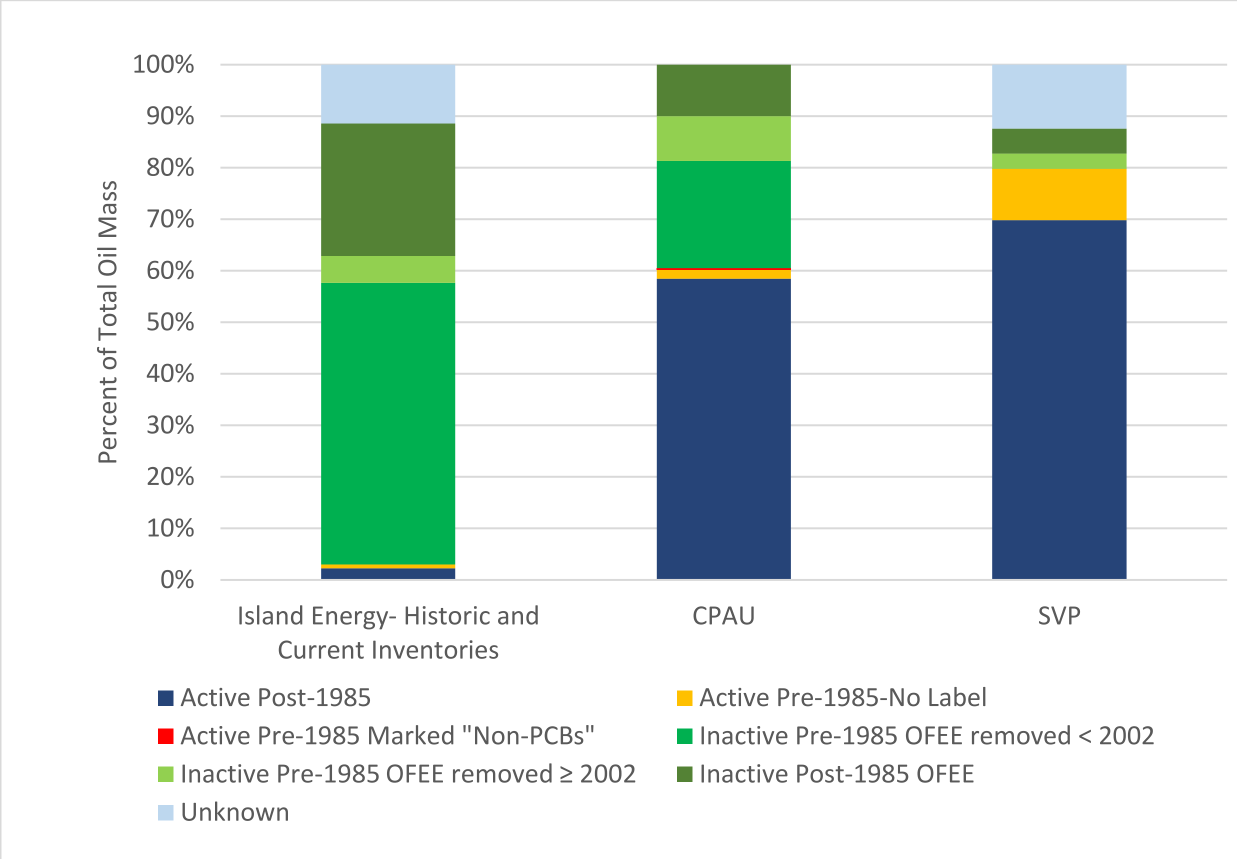

Figure 4.1 Distribution of the mass of oil in oil-filled electrical equipment (OFEE) in three municipally-owned electrical utility systems.

Active Equipment - including both Pre-1985 and Post-1985 OFEE

Table 4.1 presents the mass of oil in all OFEE that are currently active in each participating municipally-owned electrical utility system, divided between pre-1985 OFEE and post-1985 OFEE. Where available, the data are also presented by equipment type. Across all 3 systems, there are more than 4.8 million kilograms (kg) of oil in active OFEE.

Combined, there are nearly 500,000 kg of oil in active pre-1985 OFEE in these systems, which is 10% of the oil in active OFEE (Table 4.1). CPAU has the lowest abundance of active pre-1985 OFEE oil, which comprises 3.4% of their OFEE. Approximately 12% of SVP's active equipment, and 25% of Island Energy's active equipment are comprised of pre-1985 OFEE. Additional pre-1985 OFEE may be active in the system that cannot be verified at this time (see Section 4.1.2 on SVP OFEE identified as "unknown status and age"). Detailed equipment type was not provided by Island Energy, but for both CPAU and SVP, 64% of the pre-1985 OFEE oil is contained in padmount transformers, and about 25% is contained within pole-top transformers. The remainder is either in underground transformers or switches.

Table 4.1 Mass of dielectric oil in oil-filled electrical equipment (OFEE) that are currently active in three municipally-owned electrical utility systems.

Utility System	Equipment Type	Oil in ACTIVE OFEE (kg)			Percent of Active OFEE that are pre-1985
		Pre-1985 OFEE	Post-1985 OFEE	TOTAL	
City of Palo Alto Utilities (CPAU)	Padmount Single Phase Transformer	988	57,798	58,786	1.7%
	Padmount Three Phase Transformer	33,336	609,353	642,689	5.2%
	Poletop Transformer	4,923	121,608	126,531	3.9%
	Regulator	0	920	920	0%
	Underground Commercial Distribution Transformer	0	108,560	108,560	0%
	Underground Residential Distribution Transformer	204	62,584	62,789	0.3%
	Padmount Oil Switch	0	1,090	1,090	0%
	Padmount Vacuum Switch	0	99,038	99,038	0%
	Vault/Box Oil Switch	0	0	0	0%
	Vault/Box Vacuum Switches	0	63,027	63,027	0%
	Subtotal - CPAU	**39,452**	**1,123,977**	**1,163,429**	**3.4%**
Silicon Valley Power (SVP) – City of Santa Clara[1]	Padmount Single Phase Transformer	2,044	23,201	25,245	8.1%
	Padmount Three Phase Transformer	189,333	1,147,357	1,336,690	14%
	Poletop Transformer	111,551	139,338	250,889	44%
	Underground Residential Distribution Transformer	0	1,635	1,635	0%
	Padmount Oil Switch	7,645	9,444	17,089	45%
	Padmount Vacuum Switch	51,880	154,999	206,879	25%
	Padmount Vacuum-Disconnect Switch	0	249,764	249,764	0%
	Padmount Substation Transformer	91,985	1,460,593	1,552,578	6%
	Subtotal - SVP	**454,439**	**3,186,330**	**3,640,76**	**12%**
Island Energy[2]	**Current Inventory of Transformers**	**3,669**	**10,882**	**14,551**	**25%**
	TOTAL (All Systems Combined)	**497,560**	**4,321,189**	**4,818,749**	**10%**

[1]SVP identified incomplete records for OFEE that contain approximately 566,000 kg or oil. The current status of these OFEE (active or removed) and the installation dates were unavailable at the time of this report. Therefore, these OFEE were not included in any of the totals above. See Section 4.1.2 for additional information.

[2]Since 1997, Pittsburg Power Company has been operating the electrical distribution system on Mare Island in the City of Vallejo under the name Island Energy.

Pre-1985 OFEE Removed from Active Service

Table 4.2 presents the total mass of oil in all pre-1985 OFEE that have been removed from service since they were originally installed, divided between the pre-1985 OFEE that were removed before 2002, and those that were removed in 2002 or later (i.e., since the start of the PCBs TMDL). Across the three systems, nearly 1 million kilograms of oil in pre-1985 OFEE have been removed from active service due to ongoing equipment removal and maintenance programs. This represents approximately 67% of the oil from all pre-1985 OFEE in these inventories.

Both CPAU and Island Energy have already removed the bulk of their pre-1985 OFEE from active service (94% and 88%, respectively). When the pre-1985 OFEE in the historic inventory on Mare Island were factored into the calculation, the removal rate on Mare Island increased to over 99% removal of all pre-1985 OFEE. SVP has removed at least 23% of their documented pre-1985 OFEE from active service. Additional removals from the SVP system may have occurred that cannot be verified at this time (see Section 4.1.2 on SVP OFEE identified as “unknown status and age”).

In addition, since the start of the PCBs TMDL in 2002, more than 320,000 kg of oil in pre-1985 OFEE have been removed from service across all three systems (Table 4.2). This represents an overall 39% removal rate, and an average removal rate of 2.3% per year. The overall removal rates for each individual system over this same time period were 81% (CPAU), 68% (Island Energy) and 23% (SVP). These overall removal rates equate to average removals of 4.8% (CPAU), 4.0% (Island Energy), and 1.3% (SVP) per year. Based on these annual average removal rates, the project estimates it will take between 21 and 75 years for all pre-1985 OFEE to be removed from these systems due to continued equipment maintenance and removal programs.

Table 4.2 Mass of dielectric oil in oil-filled electrical equipment (OFEE) that have been removed from active service in three municipally-owned electrical utility systems.

Utility System	Equipment Type or	Pre-1985 OFEE Oil in Inactive/Removed OFEE (kg)			Pre-1985 OFEE Removed Between 2002 and 2019		Pre-1985 OFEE removed since installation	Estimated time to remove all pre-1985 OFEE (years)
		Removed prior to 2002	Removed in 2002 or Later	TOTAL REMOVED	Overall Removal Rate	Annual Average Removal Rate		
City of Palo Alto Utilities	Padmount Single Phase Transformer	2,998	3,475	6,473	**81%**	**4.8%**	**94%**	**21**
	Padmount Three Phase Transformer	98,953	79,431	178,384				
	Poletop Transformer	204,165	47,100	251,265				
	Regulator	0	0	0				
	Underground Commercial Dist.Transformer	39,162	19,879	59,041				
	Underground Residential Dist. Transformer	54,374	17,971	72,345				
	Padmount Oil Switch	0	0	0				
	Padmount Vacuum Switch	0	0	0				
	Vault/Box Oil Switch	0	0	0				
	Vault/Box Vacuum Switches	0	0	0				
	Subtotal - CPAU	**399,651**	**167,856**	**567,508**				
Silicon Valley Power - City of Santa Clara[1]	Padmount Single Phase Transformer	0	1,635	1,635	**23%**	**1.3%**	**23%**	**75**
	Padmount Three Phase Transformer	944	108,642	109,585				
	Poletop Transformer	327	21,801	22,128				
	Underground Residential Dist. Transformer	0	664	664				
	Padmount Oil Switch	0	0	0				
	Padmount Vacuum Switch	0	0	0				
	Padmount Vacuum-Disconnect Switch	0	0	0				
	Padmount Substation Transformer	0	0	0				
	Subtotal - SVP	**1,271**	**132,742**	**134,013**				
Island Energy[2]	**Current Inventory**	**5,276**	**21,161**	**26,437**	**68%**	**4.0%**	**88%**	**25**
	Historic Inventory	**266,192**	**NA[3]**	**266,192**	**NA[3]**		**100%**	
TOTALS (All Systems Combined)		**672,391**	**321,759**	**994,150**	**39%**	**2.3%**	**67%**	**43**

[1]SVP identified incomplete records for OFEE that contain approximately 566,000 kg or oil. The current status of these OFEE (active or removed) and the installation dates were unavailable at the time of this report. Therefore, these OFEE were not included in any of the totals above. See Section 4.1.2 for additional information.
[2]Since 1997, Pittsburg Power Company has been operating the electrical distribution system on Mare Island in the City of Vallejo under the name Island Energy.
[3]NA=not applicable; the historic inventory only covers the period up to 1996.

Sensitivity Analysis – SVP Data

As described in Section 4.1.2, about 12% of the equipment in the SVP inventory did not have information on the status (active or inactive) or age (pre- or post-1985) of the OFEE. In order to evaluate the potential impact of excluding these unknown data, additional analyses were conducted to account for the following three scenarios:

1- All "unknown" OFEE are assumed to be active, pre-1985 OFEE;
2- All "unknown" OFEE are assumed to be pre-1985 OFEE that were removed from service after the start of the PCBs TMDL in 2002;
3- All "unknown" OFEE are assumed to be pre-1985 OFEE that were removed from service prior to 2002.

The results of the sensitivity analysis conducted under each of these three scenarios are shown in Table 4.3. The default scenario excluded all "unknown" oil from all calculations. For each alternative scenario, the mass of "unknown" oil was added to the value for the cell highlighted in blue in the table. The minimum and maximum values calculated for each of the percentage columns are bolded in the table.

This analysis indicates that under Scenario 1, the percent of active OFEE that are pre-1985 increases from 12% to 24%, and the percent of pre-1985 OFEE that have been removed since installation decrease from 23% to 12%.

Under Scenarios 2 and 3, the percent of active pre-1985 OFEE remain the same, but the percent of pre-1985 OFEE that have been removed since installation increases from 23% to 61%, which is more in line with the rates observed for the other two systems. Scenario 3 also increases the annual average removal rate since the start of the TMDL from 1.3% to 3.6% per year.

The primary impacts of these alternative scenarios include the following:

- Under Scenario 1, the pre-1985 OFEE currently in the system more than doubled, which would result in an increase in the current PCBs loads to stormwater from this source;
- Under Scenario 3, the mass of pre-1985 OFEE removed since the start of the TMDL was nearly tripled, which would result in an increase in the PCBs stormwater loads reduced during this time period accordingly. Also under Scenario 3, because of the increased annual removal rate, all pre-1985 OFEE would be removed within 28 years (compared to 75 years in the default scenario).

Because these impacts are potentially large, the results for SVP presented in the next section used the ranges presented in Table 4.3 for Scenario 1 and Scenario 2. The results for these two scenarios provide the upper and lower limits for all values across the default and alternative scenarios.

Table 4.3 Sensitivity analysis conducted to evaluate the impacts of unknown status and age of oil-filled electrical equipment (OFEE) identified in the Silicon Valley Power (SVP) OFEE inventory on the evaluation of pre-1985 as a source of PCBs to urban stormwater.

Scenario	Oil in Active OFEE (kg)		Oil in Inactive/Removed OFEE (kg)			Oil in OFEE with Unknown Status and Age (kg)	Total Oil in OFEE Inventory (kg)	Percent of all Active OFEE that are Pre-1985	Percent of Pre-1985 OFEE Removed Since Installation	Pre-1985 OFEE Removed Between 2002 and 2019	
	Post-1985 OFEE	Pre-1985 OFEE	Pre-1985 OFEE removed before 2002	Pre-1985 OFEE removed in 2002 or later	Post-1985 OFEE					Overall Removal Rate	Annual Average Removal Rate
Default: "Unknown" not included in calculations	3,186,330	454,439	1,271	132,742	221,460	566,026	4,562,268	**12%**	23%	23%	1.3%
1. All "unknown" = Active, Pre-1985 OFEE	3,186,330	1,020,465	1,271	132,742	221,460		4,562,268	**24%**	**12%**	**12%**	**0.7%**
2. All "unknown" = Pre-1985 OFEE Removed in 2002 or Later	3,186,330	454,439	1,271	698,768	221,460		4,562,268	12%	**61%**	**61%**	**3.6%**
3. All "unknown" = Pre-1985 OFEE Removed Prior to 2002	3,186,330	454,439	567,296	132,742	221,460		4,562,268	12%	61%	23%	1.3%

Potential PCBs Mass in Active OFEE and Estimated Stormwater Loads

Table 4.4 provides the calculated PCBs mass in the Island Energy historic and current OFEE inventories, and estimates of the potential PCBs mass in the CPAU and SVP OFEE inventories. Only Island Energy provided data on measured PCBs concentrations in their OFEE oil. Concentrations of PCBs in Island Energy's current inventory of OFEE ranged from 1 to 37 ppm. Concentrations in the historic inventory ranged from <1 up to nearly 900 ppm. About 20% of the OFEE in the historic inventory had PCBs concentrations > 500 ppm. Based on these measured PCBs concentrations and the volumes of oil in each piece of equipment, the historic inventory documents OFEE containing more than 70 kg of PCBs. By comparison, Island Energy's current inventory of both active and inactive OFEE had 0.088 kg of PCBs. Of that total, 0.040 kg of PCBs remain in active OFEE, and 0.048 kg of PCBs were from OFEE that have been removed from active service. This represents a three-order of magnitude decrease in PCBs mass from the historic inventory. One interesting detail about the PCBs concentration data was that nearly one-third of the PCBs in the current inventory were contained in post-1985 equipment. All of these equipment were from 1986 or 1987. PCBs concentrations were generally low in these OFEE, ranging from 1 to 4 ppm. However, the potential contribution from these OFEE could still be important. For example, in the Island Energy current inventory, there is one piece of equipment from 1987 that contains 600 gallons of oil at 1 ppm PCBs, or 2 g of PCBs in total. If this quantity of PCBs were released to the environment, this could have a detrimental impact on stormwater quality.

Because CPAU and SVP did not provide measured PCBs concentrations for OFEE in their inventories, the potential PCBs mass in pre-1985 OFEE was estimated based on the assumptions described in Section 4.2.1. For CPAU, these estimates suggest active pre-1985 OFEE may contain between 1.7 and 17 kg of PCBs, while pre-1985 OFEE that have been removed potentially contained between 28 kg and 284 kg. These estimates suggest an order of magnitude reduction in PCBs mass in the active OFEE inventory. For SVP, active pre-1985 OFEE may contain between 23 kg and 227 kg. If the "unknown" OFEE were assumed to be active pre-1985 OFEE, then the total estimated mass of PCBs in active OFEE doubles to 51 kg to 510 kg. PCBs in pre-1985 OFEE that have been removed were estimated to range from 6.7 to 67 kg, which would increase up to 35 kg to 350 kg if the "unknown" OFEE were assumed to be pre-1985 OFEE that have been removed from service. Across all three systems, the total potential mass of PCBs in active OFEE ranged from 24 kg up to 527 kg. The upper value assumes the "unknown" mass is contained within active, pre-1985 OFEE.

Table 4.4 Estimated potential mass of PCBs in municipally-owned electrical utilities oil-filled electrical equipment (OFEE) inventories

OFEE Category	PCBs (kg)				
	CPAU	SVP	Island Energy - Current	Island Energy - Historic	TOTAL (All Systems)
All Active	1.7 - 17	23 - 227	0.040		24 - 244
All Removed	28 - 284	6.7 - 67	0.048	70	105 - 421
Removed since 2002	8.4 - 84	6.6 - 66	0.048		15 - 150
Removed prior to 2002	20 - 200	0.1 - 0.6		70	90 - 271
Unknown		28 - 283			28 - 283

Based on the approximate population of the MRP area of ~6 million people, if the active OFEE in all the participating municipally-owned electrical utility systems were representative of the PCBs contained in OFEE across the larger MRP area (i.e., 24 to 527 kg), the estimated mass of PCBs would range from roughly 730 kg up to 16,000 kg of PCBs. Based on acres, the estimated mass of PCBs across the larger MRP area of nearly 3 million acres would range from 2,400 kg up to 53,000 kg of PCBs in active OFEE.

Table 4.5 presents the estimated loads of PCBs to stormwater from active OFEE in the three participating municipally-owned electrical utility systems. Across all three systems, the estimated PCBs stormwater load in 2002 from active OFEE was between 197 mg/yr to 3,390 mg/yr. The low end of this range is the sum of the minimum values for all active OFEE and all OFEE removed since 2002. The upper end of this range is the sum of the maximum values for all active OFEE, all OFEE removed since 2002, and all unknown OFEE. In 2020, the total estimated PCBs stormwater loads from active OFEE were estimated to range from 122 mg/yr up to 2,640 mg/yr. The low end of this range is the sum of the minimum value for all active OFEE. The upper end of this range is the sum of the maximum values for all active OFEE and all unknown OFEE. Scaling these estimates up to the MRP area of roughly 3 million acres gives a stormwater load of between 20,000 mg/yr up to 340,000 mg/yr in 2002, and 12,000 mg/yr up to 260,000 mg/yr in 2020. These estimates are highly uncertain due to all the assumptions that were used in the calculations.

Table 4.5 Estimated range of PCBs loads to stormwater from oil-filled electrical equipment within three municipally-owned electrical utility systems.

OFEE Category	PCBs Stormwater Loads (mg/yr)				
	CPAU	SVP	Island Energy - Current	Island Energy - Historic	TOTAL
All Active OFEE	8.3 - 84	114 - 1,136	0.199	0	122 - 1,220
All Active OFEE - assume "unknown" = active	8.3 - 84	255 - 2,551	0.199	0	264 - 2,636
All Removed OFEE	142 - 1,419	34 - 335	0.241	352	527 - 2,106
Removed since 2002	42 - 420	33 - 332	0.241	0	75 - 752
Removed prior to 2002	100 - 999	0.3 - 3.2		352	452 - 1,354
All Removed OFEE - assume "unknown" = removed	142 - 1,419	175 - 1,750	0.241	352	317 - 3,169
Unknown		142 - 1,415			142 - 1,415

4.3 Spill Response and Cleanup

Although the bulk of PCBs remain contained within OFEE until the equipment is removed from use and transported to proper hazardous waste disposal facilities, releases of PCBs to the environment can and do occur.

4.3.1 Summary of OFEE Release Data for Bay Area

In order to document spills, publicly available data in the California Office of Emergency Services (Cal OES) spill report database (Cal OES 2017), as well as internal spill records (PG&E 2000) supplied by PG&E to the Regional Water Board in September 2000 (that were provided pursuant to a California Water Code §13267 request for information) were reviewed. The Cal OES database and available PG&E spill records were searched for reports of spill releases related to OFEE in the Bay Area between 1994 and 2017. Over 1,200[8] reported release incidents from OFEE in the Bay Area were identified. The information provided by these records and a summary of the important issues identified for water quality concerns are summarized in the remainder of this section. It is important to note that current regulations do not require reporting of all releases from OFEE. The information provided below is based only on the reported releases for which records were available, and likely represents an underestimate of actual OFEE releases during the time period of review. However, these reports clearly demonstrate that PCBs may still be present in the electrical transmission and distribution systems in the Bay Area, and that releases from these systems can and do continue to occur.

Generally, the publicly available spill release records provide information about the spill release date, time, location, chemical, quantity released, actions taken, known or anticipated risks posed by the release, and additional comments. Other information that is sometimes reported for OFEE releases includes a description of the causes of the release and the equipment affected, and the concentrations of PCBs in that equipment (if known). Concentration information reported is likely assumed from equipment labels, as ranges are most often provided rather than specific values. Typically, the reports are limited to the information that was available at the time the spill was initially reported. In some cases, follow-up information such as the results of analytical testing of the spilled materials is also provided, but this is not typical.

Number of Reported OFEE Releases

Between 1994 and 2017, over 1,000 spills from electrical equipment were reported to Cal OES. PG&E records contain information about 200 additional releases that were not reported to Cal OES between 1994 and 2000. A count of these reports by year is presented in Figure 4.2.

[8] The records span 24 years of spill reports, and include PG&E's own record of releases from 1994 thru 1999 and a portion of 2000. The number of reports PG&E submitted in 2000 represents less than half the number of reports for that year. Records did not include all the districts in the Bay Area. District documents submitted reported releases prior to June of 2000, with the exception of one district that submitted a June report. As a result, the number of additional reports from PG&E's records are assumed to be less than half the number of incidents for 2000.

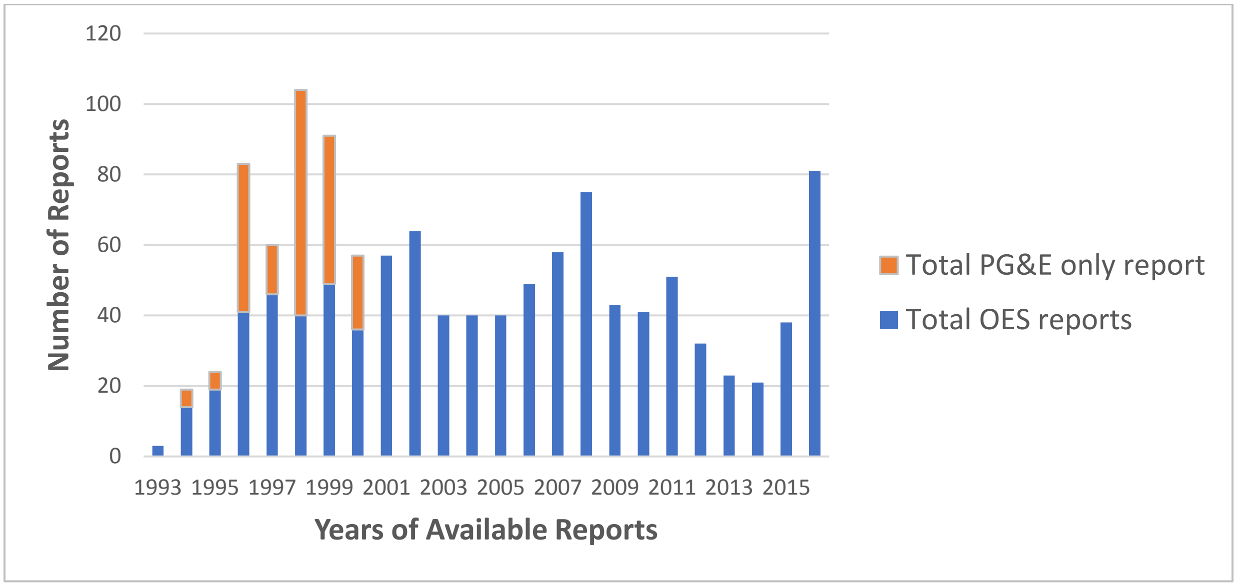

Figure 4.2 Oil-filled electric equipment spills reported to the California Office of Emergency Services (Cal OES) and/or identified through internal Pacific Gas & Electric (PG&E) reports between 1993 and 2017.

Volume of OFEE Releases

The total volume of material released from all reported OFEE spills in a given year in the Bay Area is presented in Figure 4.3. Mineral oil or transformer oil are the substances identified in over 99% of reported releases from OFEE in the Cal OES spill report database. In a phone conference with Regional Water Board staff in 2012, PG&E said they submit written reports to Cal OES for all PCBs spills that meet or exceed the mineral oil federal reportable quantities (RQ) of 42 gallons (*personal communication*, Jan O'Hara 2012). However, the reports reviewed indicate written reports are sometimes submitted for spills that are much less than 42 gallons.

The reported volumes of oil released during a single incident range from less than one gallon up to 5,000 gallons. Nearly half of all OFEE spill reports identify the volume of oil spilled as 5 gallons or less, and more than 90% of all spill reports identify the volume of fluid spilled as less than 100 gallons. Releases as large as 500 gallons from the distribution system and 5,000 gallons from the transmission system have been reported. Only five incidents reported releases that exceeded 1,000 gallons of oil. Nearly all (~99%) of reports provided information on the volume of oil released.

The reported volumes released do not necessarily equate to the volume of the oil that may have reached storm drains or local creeks. Estimates of those volumes were not available.

Location of OFEE Releases

Cal OES and PG&E records show releases occurred in all Bay Area counties. Leaks and spills of PCBs from electrical equipment have occurred onto roads, sidewalks, pervious areas, vegetation, structures, vehicles, and even people (Cal OES 2017). Most releases occurred in the distribution system, often from equipment installed in the public ROW such as pole-mounted transformers installed along roadways.

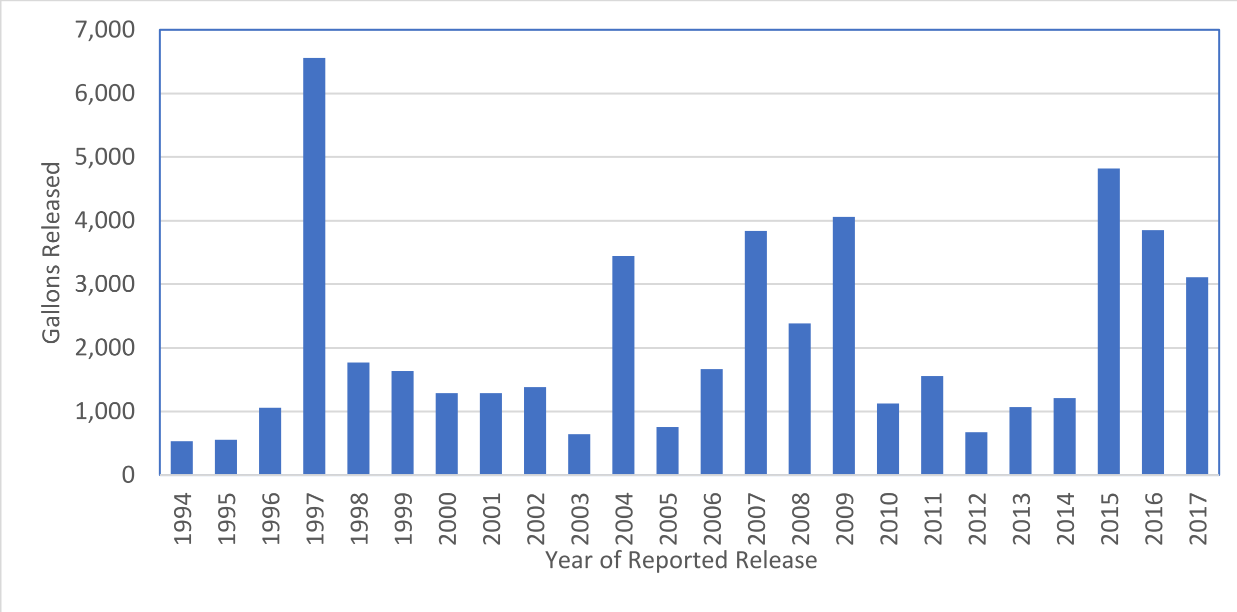

Figure 4.3 Total reported gallons of oil released each year (1994 – 2017) from spills from PG&E electrical utility equipment in the Bay Area.

A number of reports document direct releases from OFEE to the MS4, and potentially a downstream waterbody (e.g., creek). There are at least 17 incidents identified during the past 15 years that involved direct releases from OFEE directly to a waterbody or to storm drains that discharge to local creeks (Table 4.6). The majority of these releases were reported as having unknown PCBs concentrations, and no reports provide any follow-up information on the concentration of PCBs in the spilled materials based on chemical analysis.

It is important to note that in addition to the incidents identified in Table 4.6, materials spilled during any of the numerous other incidents may (or may not) have entered the MS4 and/or receiving waters such as local creeks directly or been washed into the MS4 and/or creeks by stormwater or irrigation runoff. Generally, the spill reports lack any details regarding this type of information.

Table 4.6 Examples of Information Reported on Releases of PCBs to Bay Area Storm Drains and Creeks.

Date	Gallons	Reported Concentration	Water Body	Municipality
1/24/2016	Unknown	<50 ppm	Coyote Creek	San José
2/17/2016	Up to 18	Unknown	Los Gatos Creek	Los Gatos
3/7/2016	10	Unknown	Culvert	Concord
8/16/2016	Unknown	<50 ppm	Guadalupe River	San José
11/17/2015	Unknown	Unknown	Cerrito Creek	Richmond
10/4/2015	5	Unknown	Creek	Los Gatos
5/3/2015	30	<2 ppm	Cerrito Creek	Richmond
3/2/2011	30	Unknown	Unknown Marsh	Menlo Park
6/2/2007	40	Unknown	Pond, Marsh Area	Vallejo
2/28/2006	20	<50 ppm	Calara Creek	Pacifica
5/27/2006	1	Unknown	Unknown Creek	Orinda
10/10/2005	Unknown	Unknown	Coyote Creek	San José
7/23/2005	<15	Unknown	Nearby Creek	Walnut Creek
12/8/2004	Small amount	<50 ppm	Moraga Creek	Orinda
3/7/2004	Unknown	Unknown	Blossom Creek	Calistoga
7/14/2003	8	< 50 ppm	Coyote Creek	San José
2/16/2002	15	Unknown	Napa River	Napa

Causes of OFEE Releases

Cal OES release reports and PG&E records document a number of causes of PCBs releases from OFEE. Most releases can be attributed to one of the following:

- **Equipment Failure**. This is the cause of the majority of the reported releases. Equipment failure in utility vaults has additional potential as an important source of PCBs because OFEE in these vaults may contain more than 100 gallons of oil. More than 50 release incidents were reported for equipment contained in electrical utility vaults during the time period reviewed. A number of these reports noted the presence of water in the vaults in addition to the PCBs oil released. Releases from equipment failure in utility vaults are mostly contained, but Cal OES spill reports document releases of PCBs oil that breached containment, including discharges that reached water bodies.

- **Accidents**. Approximately 20% of reported releases resulted from equipment knocked over by accident. In the distribution system, reports document 50 to 500 gallons released from poles knocked over during car accidents, by construction equipment, and during tree trimming. On rare occasion PCBs releases have occurred during accidents while equipment is in transport.

- **Storms, Fires, and Overheating from High Summer Temperatures**. These factors are the reported cause of more than 10% of the releases from the distribution system.

- **Field Repairs and Fluid Replacement**. The Cal OES database contains records that indicate draining fluids in the field may have been ongoing as recently as 2007, when a report documented that a valve left open from draining a transformer in the field caused a release. In 2016, Daniel Sanchez, who at the time was PG&E's Manager of Hazardous Materials and Water Quality Environmental Management Programs, informed Regional Water Board staff that PG&E does not drain and refill pole mounted PCB transformers in the field any longer; however, it is unclear when this practice ceased, and/or if it still occurs with equipment not mounted on poles.

- **Vandalism**. Between 1997 and 2015, there were at least 25 separate reported incidents of vandalism that resulted in PCBs releases. For example:
  - In 1997, gunshot damage caused the release of 5,000 gallons of oil from a substation transformer and regulators in San Mateo County;
  - In 2011, copper theft at a substation released 750 gallons of oil in Contra Costa County;
  - In 2013, vandalism of pad-mounted transformers resulted in the release of possibly 1,000s of gallons of oil before discovery in San José.

PCBs Concentrations in OFEE Releases

Of the more than 1,200 spill reports that were reviewed, approximately one-third identified the PCBs concentration as unknown or did not provide any information on the PCBs concentration of the spilled material (Figure 4.4). Releases with high PCBs concentrations (> 500 ppm) were infrequently reported, accounting for only 1% of reported spills. Concentrations above 50 ppm represent about 8% of the reported spills. As recently as 2016, failure of a pole-mounted transformer resulted in release of mineral oil with 280 ppm PCBs to surrounding soils and brick structures. For approximately 44% of the reported releases, the PCBs concentration was identified as less than 50 ppm, based primarily on assumptions associated with a "Non-PCB" label. For these 44% of reports, no additional information was provided on PCBs concentrations other than a designation of "< 50 ppm". According to labeling requirements, a "Non-PCB" label indicates the PCBs concentrations in the oil are assumed to be below hazardous waste thresholds of 50 ppm (federal regulations, see Section 3.2.1). However, in most cases, no additional information was provided in the spill reports to indicate how the "Non-PCB" category was arrived at, or whether the federal (> 50 ppm) or state (> 5 ppm in liquid) "Non-PCB" category was assumed.

For the vast majority of these reports, no follow-up chemical analysis results were provided that confirmed the "Non-PCB" designations. In a limited number of reports, follow-up PCBs analysis results were provided for materials that were identified as "Non-PCB" during initial reporting. Generally, these results found PCBs concentrations between 5 and 49 ppm, suggesting that the labels were correctly applied. However, any concentration of PCBs in electrical equipment oils is potentially significant in terms of water quality impacts and implementation of the PCBs TMDL. These results clearly demonstrate that the "Non-PCB" designation represents a threshold that is far too high to necessarily be protective of water quality.

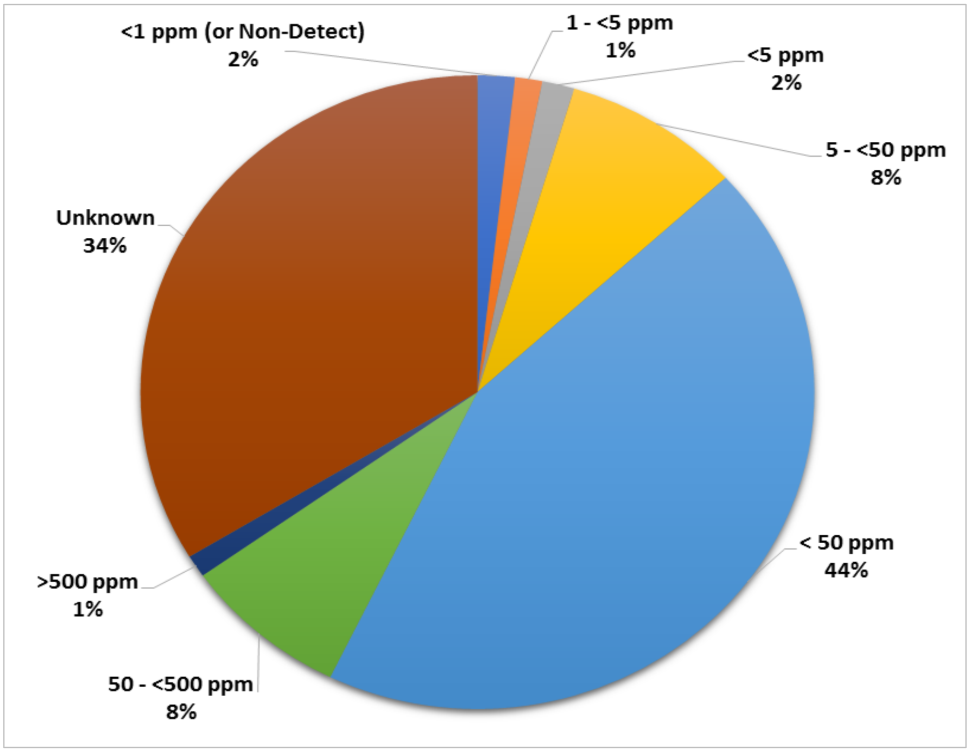

Figure 4.4 PCB Concentration data reported for releases from PG&E electrical equipment between 1993 and 2016. Each category identified above is independent (e.g., the "< 50 ppm category" does not include reports that provided more specific concentration data that was < 50 ppm).

Only 1% of the reported releases identified the PCBs concentrations as either below 1 ppm, or below detection limits. Although the quality of the PCBs concentration data in the release reports varies widely, these results clearly demonstrate that electrical equipment in the Bay Area can still contain PCBs at concentrations of concern for water quality protection programs.

Recommendations

Based on review of reports in the Cal OES database, while they meet the current regulatory notification requirements, the current spill notification and reporting procedures are not adequate to address TMDL goals, and do not provide the Regional Water Board or Bay Area MS4s with the information needed to better quantify and control releases to the MS4.

Review of two municipally-owned utilities' procedures for spill response indicates that all spills, even those of a low PCBs concentration or low volume release, are internally documented even if there is no OES notification requirements. Given that PG&E provided spill reports (pursuant to a 2000 California Water Code §13267 request for information) that were not submitted to OES indicates PG&E also internally documents spills even if they do not need to be reported. Therefore, it is likely that the municipally-owned utilities already have procedures for documenting and recording all spills.

More stringent requirements to address PCBs TMDL goals should include spill response and reporting for all spills/releases from municipally-owned utility OFEE unless there is clear and sufficient evidence available when the spill is initially discovered that unequivocally identifies the equipment involved as having been installed after 1985. This more stringent requirement will ensure that all releases from equipment that could potentially contain PCBs will be reported.

In addition, the information reported in Cal OES database typically captures only the data that were available at the time the spill occurred. Although these reports may provide some preliminary information on the mass of PCBs released (i.e., volume and concentration spilled), these reports rarely provide any corroborating measurement data or any follow-up information on the effectiveness of cleanup activities. This information is needed to quantify PCBs from OFEE releases, or to track where PCBs remain in use in the system. As discussed in Section 3.2.5, any chemical analysis methods should follow the recommendations of the Regional Water Board for congener analysis at sufficiently low reporting levels to capture all concentrations of concern and congeners of concern to address water quality issues (SFBRWQCB 2016).

Bay Area MS4s do not receive timely notification of releases from OFEE. Even for releases that must be reported to Cal OES, electrical utilities do not typically notify local agencies directly. Instead, Bay Area MS4s are responsible for reviewing Cal OES reports in order to identify spills or releases that have occurred in their jurisdictions. This delay is problematic because clean-up actions have likely been completed by the time reports are submitted to Cal OES. Bay Area MS4s should be notified of releases within their jurisdiction as soon as possible so they can provide oversight during initial cleanup efforts, as well as any follow-up that is needed to ensure cleanup was completed to the desired levels. The appropriate local agency staff understand their municipal storm drain systems and how storm drain inlets connect to creeks and water bodies in their jurisdictions. Better communication between utilities and municipal stormwater programs can result in more efficient responses and less impact to waterways.

In summary, to better quantify the amount of PCBs released from OFEE spills, and to help ensure that adequate cleanup actions are being implemented, the following improvements to current reporting and notification requirements could be made:

- Notify Bay Area MS4s of releases within their jurisdiction as soon as possible so they can provide oversight during initial cleanup efforts, as well as any follow-up that is needed to ensure cleanup was completed to the desired levels.
- Respond and report to Bay Area MS4s for all spills/releases from OFEE unless there is clear and sufficient evidence available when the spill is initially discovered that the equipment involved was installed after 1985.
- Any chemical analysis methods should follow the recommendations of the Regional Water Board for congener analysis at sufficiently low reporting levels to capture all concentrations of concern and congeners of concern to address water quality issues.

4.3.2 Spill Response Protocols

Electrical utility companies typically address spills or leaks from their OFEE with Standard Operating Procedures (SOPs) that should conform to both TSCA requirements and the more stringent California hazardous waste rules. The SOPs describe the steps to be taken by field crews in the event of an OFEE leak or spill, which should generally include the following:

- Notify Supervisor or compliance Manager
- Stop and contain the leak
- Determine the spill area (i.e., the area with visible traces of oil plus 1 foot beyond)

- Determine the PCB classification
- Notify property owner
- Notify Cal OES when required

Response to a specific release incident is determined by the PCBs classification of the responsible equipment. The state response level (5 to <50 ppm PCBs) requires immediate clean-up by next business day. The federal response level requires immediate clean-up until clean for spills of 50 to < 500 ppm, and the additional use of all resources to clean the spill immediately for spills > 500 ppm.

The disposal of all materials removed from a cleanup site or used to clean the site are handled according to the TSCA hazardous waste classifications (50 to <500 ppm; and ≥500 ppm in solids or liquids), or the state non-RCRA hazardous waste classification (5 to <50 ppm PCBs in liquids). The allowable post-cleanup concentrations of remaining soils and other surface materials typically range from 10 to 25 ppm, depending on site-specific evaluations of human health risk. As a result, current efforts to control and cleanup PCBs releases from electrical utility equipment are focused on these thresholds.

By comparison, Bay Area municipalities are concerned with much lower concentrations of PCBs. For example, currently Bay Area municipalities generally designate a site as a *potential* PCBs source to stormwater runoff if soil or sediment concentrations are ≥0.5 ppm and designate a site as a *confirmed* PCBs source to stormwater runoff if soil or sediment concentrations are ≥1.0 ppm. Control of PCBs sources at these substantially lower concentrations has been deemed necessary to make progress towards meeting the stringent stormwater runoff wasteload allocations called for in the PCBs TMDL. In addition, post cleanup verification sampling is only required for high concentration spills or high volume spills.

The Cal OES reports provide almost no information on actions taken to stop active spills, or the methods used to cleanup spilled materials from surrounding surfaces, storm drain infrastructure, or creeks. Municipalities need this type of information to better understand any potential risks that remain following initial cleanup. Because of the challenges with achieving the stormwater runoff wasteload allocation in the PCBs TMDL, additional remedial actions may be warranted in some cases.

According to information supplied to the Regional Water Board (PG&E 2000), PG&E spill response is guided by internal documents, including:

- ***Utility Operations Standard D-2320*** - for PCB spills in the distribution system;
- ***PCB Management at Substations -*** for PCB spills in the transmission system.

These documents were not available for review. However, PG&E staff presented the basic elements of their spill response protocol during a public presentation to CCCWP in 2013. PG&E's spill response protocol, as described during this presentation, is summarized here. First, PG&E's spill response is based on the following three guiding principles:

1. Personnel and public safety: isolate or barricade the area from the public; do not do anything to put yourself and others in harm's way.
2. Reporting: report the incident to electric operations.
3. Containment: prevent the spill from spreading using diking or applying absorbents.

Two municipally-owned utilities provided spill response procedures for review. The procedures followed the general guidelines discussed above. In one procedure the cleanup activities included double wash/rinse affected area of the pole and associated equipment. The other procedure expanded this to all solid surfaces such as walls, sidewalks, streets, cars, etc. One procedure called for removing all *visibly* contaminated soil plus one foot buffer zone or to a depth where there are no detectible PCBs. The other procedure called for removing all visibly contaminated soil but only included a one foot buffer for Federal low concentration PCB spills (50-499 ppm). One procedure called for collecting a sample after cleanup activities were completed for all categories of spills but there were no guidelines provided for the sample methods or results. The other procedure only called for cleanup sampling of Federal high concentration PCBs spills (>500 ppm) for comparison with the regulatory cleanup levels. The procedures do discuss containing spills, however, there was no discussion about specific procedures when the spill enters a storm drain system.

Recommendations

Bay Area MS4s need access to all electrical utility spill cleanup procedures to review and provide suggested revisions to ensure all necessary measures and precautions are included to achieve consistency across spill cleanups. Additional spill cleanup procedures suggested by MS4s may also depend on the location and type of spill (e.g., impervious surface vs soil; public right of way vs utility property; proximity to storm drain). Clean-up investigations should not only determine the spill area but determine if soils may have migrated off-site. In addition, samples for cleanup sites should be required for all spills unless there is clear and sufficient evidence available when the spill is initially discovered that the equipment involved was installed after 1985. The samples collected should be compared to thresholds identified by MS4s for *confirmed* PCBs source to stormwater runoff (e.g., soil or sediment concentrations are ≥ 1.0 ppm) in addition to the federal and state post cleanup levels required.

Improved notification of spills/releases to Bay Area MS4s discussed in Section 4.3.1 would also allow municipal stormwater program staff to field verify appropriate spill cleanup procedures as needed.

5.0 Source Control Framework

The overall approach for this SSID Investigation was to conduct a desktop analysis to evaluate electrical utility equipment in municipally-owned electrical utility systems in the Bay Area and propose a source control framework for electrical utility equipment to reduce ongoing PCBs loads to the Bay in stormwater runoff. The elements of the proposed source control framework include development of a new regional Electrical Utilities Management Program which identifies specific actions to reduce the release of PCBs to MS4s, estimates of PCBs loads to stormwater from electrical utility equipment, and development of data inputs that can be used to calculate the PCBs loads reduced through implementation of the new program. This section describes each element of the proposed source control framework for electrical utility equipment. This framework is consistent with MRP Provision C.8.e.iii.(3)(a) requirements for SSID project closure. Implementation of this source control framework will prevent or reduce the discharge of PCBs from electrical utility equipment in the Bay Area.

5.1 Electrical Utilities Management Program

Electrical utility applications present special challenges for source identification and abatement[9] due to the quantity of equipment and facilities, their dispersed nature, and difficulty in sampling discharges when they occur. In addition, municipalities lack control over the vast majority of these properties and equipment. Permittees have no jurisdiction over many large electrical utilities, including PG&E, and therefore no control over the cleanup of PCBs-containing spills (e.g., dielectric fluids from transformers), or prompt notification when they happen. To date, neither Permittees nor the Regional Water Board have been able to verify that a sound and transparent cleanup protocol is used consistently by all electrical utilities for PCBs spills from their electrical equipment across Bay Area cities. Moreover, current state and federal regulatory levels for reporting and cleanup of PCBs spills (e.g., cleanup goals for soils) are higher than cleanup levels recommended by the Regional Water Board to meet the objectives of the PCBs TMDL (SFBRWQCB 2016). There are currently potential missed opportunities to account for load reductions that have been and continue to occur due to the removal of PCBs-containing OFEE through ongoing equipment removal and replacement programs. Furthermore, there are missed opportunities to cleanup spills to the stringent levels that would be more consistent with the PCBs TMDL requirements, and to reduce the loads of PCBs from MS4s to the Bay. Given these constraints and the potential opportunities to reduce PCBs loads from electrical utility equipment, a new regional control measure program is proposed to manage the release of PCBs from OFEE. The Electrical Utilities Management Program described here identifies actions that address OFEE as a source of PCBs to stormwater at a regional level. The Program includes components that can address both municipally-owned and non-municipally-owned electrical utility OFEE in the Bay Area. However, the Regional Water Board will need to use their authority to compel non-municipally-owned electrical utilities (i.e., PG&E) to participate in the Program.

[9] Source identification and abatement is one type of stormwater control measure that Permittees use to reduce loads of PCBs in urban runoff. This control measure involves investigations of properties with elevated PCBs in stormwater or sediment to identify sources that contribute a disproportionate amount of PCBs to the MS4, and cause the properties to be abated, or refer the properties to the San Francisco Bay Water Board or other regulatory authority for follow-up investigation and abatement. This control measure is described in more detail in the BASMAA Source Control Load Reduction Accounting for RAA (BASMAA 2020).

Actions under the new Electrical Utilities Management Program would include the following:

- Action 1: Electrical utilities will document the removal of PCBs-containing OFEE since the start of the TMDL and in the future until all PCBs-containing OFEE have been removed from active service. The documentation should include data to support calculations of the associated stormwater load reductions due to these efforts;
- Action 2: Electrical utilities will implement enhanced spill response and reporting protocols, as needed, to further reduce the mass of PCBs released to stormwater due to accidental releases from PCBs-containing OFEE. The enhanced spill response and reporting protocols should include data gathering requirements that will support calculations of the associated stormwater load reductions due to these efforts.

Implementation of these actions would provide the following benefits: (1) document PCBs loads that have already been avoided due to removal of PCBs-containing OFEE, (2) reduce PCBs loads released to stormwater when spills do occur, and (3) provide information that can be used to determine when this potential source of PCBs to stormwater has been eliminated due to removal of all PCBs-containing equipment from service.

5.2 Estimated PCBs Loads to Stormwater from Electrical Utility Equipment

The starting point for documenting the load reductions that have been and will continue to be achieved through implementation of the new program is an estimate of the PCBs loads to stormwater from electrical utility equipment at the start of the PCBs TMDL. As described in more detail in Section 3.4, McKee et al. (2006) developed a PCBs mass balance model that estimated the total loads to stormwater from all major sources during the peak period of PCBs production and use (i.e., 1950 – 1990), and in the period of the study (i.e., 2005).

The estimated stormwater load of 2.8 kg/yr to the Bay from transformers and large capacitors in 2005, developed by McKee et al. (2006) as part of their PCBs mass balance model described in detail in Section 3.4, is the starting point for estimating load reductions that have been achieved since the PCBs TMDL was established. As shown in Table 5.1, the McKee et al. (2006) mass balance model presents the best estimate for the total PCBs stormwater load from all sources in 2005 as 52 kg/yr. The PCBs TMDL for the San Francisco Bay identifies the total stormwater load at that time as 20 kg/yr (SFBRWQCB 2008). For consistency with the TMDL, the McKee et al. (2006) best estimate for stormwater loads from various sources were normalized to a total stormwater load of 20 kg/yr (Table 5.1). As shown in Table 5.1, the TMDL-normalized PCBs load to stormwater conveyances in 2005 from electrical utility equipment is assumed to be 1.1 kg/yr. This value is one to two orders of magnitude larger than the estimated stormwater loads that were developed in this project based on extrapolation of the municipally-owned electrical utility data presented in Section 4.0 to the larger Bay Area (0.02 – 0.34 kg/yr). However, the stormwater load estimates extrapolated from the participating municipally-owned electrical utility data have some important limitations. There is currently no information available to determine if these estimates, representative of electrical utilities operating across small service areas, would be appropriate as representative of the OFEE and associated PCBs mass across the much larger MRP area. These utility systems service a population of less than 200,000 people, again a tiny fraction (about 3%) of the larger MRP area population of nearly 6 million people. These utility systems also serve an area of less than 30,000 acres, which is (1%) of the entire MRP area of nearly 3 million acres. Almost all of the remaining area is served by PG&E, a large private company that may not be well-represented by data from the three small municipally-owned electrical utilities that participated in this project. There are likely substantial differences between PG&E equipment, operations, and practices, especially in the past, that preclude extrapolating the municipally-owned utility data from this project to PG&E service areas across the Bay Area. The number, type and range of transmission and distribution OFEE that make up a small service area system may not be representative or scalable to the number, type and range of transmission and distribution OFEE that make up a large service area system where electricity must be delivered over larger distances.

There was also considerable variability in the quality and quantity of the OFEE inventory data provided across the three participating municipally-owned utility systems that was used to develop the load estimates in Section 4.0. Island Energy provided complete information on their current inventory but acknowledged there were gaps in the historic data and they could not verify the accuracy or completeness of those data. Neither CPAU nor SVP had information on measured PCBs concentrations in any of their OFEE. SVP, the largest among the three participating utilities, had large uncertainty in their data because of the “unknown” OFEE category. SVP indicated it may be possible in the future to resolve some of these uncertainties. However, within the time frame of this project, SVP provided the data they were able to access. One of the limitations was that compiling these data, especially during the COVID-19 pandemic and shelter-in-place orders, was extremely challenging for the utility staff. This was especially true for data that were limited to hard copies or available only on computer servers located at the electrical utility offices. Under these conditions, SVP was still able to provide useful data on a large portion of their OFEE inventory.

Given the limitations described here, the use of the municipally-owned electrical utility OFEE inventory data to represent OFEE beyond the boundaries of each of the participating systems may not be appropriate. The McKee et al. (2006) TMDL-normalized stormwater load estimate of 1.1 kg/yr remains the best currently available estimate of the PCBs load from electrical utility equipment to the Bay at the start of the PCBs TMDL.

Table 5.1 PCBs mass input to stormwater conveyances in the San Francisco Bay Area from all sources based on the mass balance model presented in McKee et al. (2006). Transformers and Large Capacitors represent the oil-filled electrical utility equipment source.

Source	McKee et al., (2006) PCBs Load (kg/yr)	PCBs Load Normalized to TMDL Stormwater Load (kg/yr)
Watershed Surface Sediment Erosion	30	12
Building Demolition and Remodeling	4.1	1.6
PCBs Still in Use	4	1.5
Bed and Bank Erosion	2.9	1.1
Transformers and Large Capacitors	**2.8**	**1.1**
Atmospheric Deposition	2.8	1.1
Identified Industrial Contaminated Areas	2	0.77
Plasticizers	1.1	0.43
Railway Lines	1.1	0.43
Small Capacitors	0.5	0.19
Auto-Recycling	0.4	0.15
Other Dissipative Uses	0.06	0.023
Lubricants	0	0
Landfills	0	0
Total Stormwater Load (kg/yr)	**52**	**20**

5.3 Data Inputs to Calculate PCBs Loads Reduced

The proposed new Electrical Utilities Management Program identifies actions to document PCBs load reductions that have occurred since the start of the TMDL and will continue to occur in the future due to removal of PCBs-containing OFEE, until all of these equipment have been removed from active service in electrical utility systems in the Bay Area (Action 1). The new Program also identifies actions to document PCBs load reductions due to implementation of enhanced spill response and reporting procedures (Action 2). One of the objectives of the analysis of the municipally-owned electrical utility system OFEE inventory data was to provide information and data inputs that could be used to calculate PCBs loads reduced due to implementation of the Electrical Utilities Management Program. These data inputs are presented below.

5.3.1 Data Inputs to Calculate PCBs Loads Reduced for Action 1

For Action 1 (PCBs-containing equipment removal), the accounting methodology described in the BASMAA Accounting (2020) calculates the PCBs loads reduced by multiplying the PCBs load to stormwater from electric utility equipment by the assumed rate of load reduction achieved over a given period of time due to equipment removals. The data inputs needed for this calculation include the following two terms:

Term 1.1 (L_0) = Estimated annual load of PCBs that enters MS4 from OFEE in the starting year of the time period of interest (i.e., the year that accounting begins, kg/yr).

Term 1.2 (R_1) = Estimated annual average percent of PCBs loads prevented from entering the MS4 due to OFEE removal (percent per year).

Term 1.3 (Y_i) = Number of years in the time period of interest.

The values that are recommended for each of these terms are presented in Table 5.2.

Table 5.2 Recommended values for each of the terms required to account for the PCBs load reductions achieved through implementation of Action 1, removal of PCBs-containing equipment from active service, between 2005 and 2020..

Term	Description	Value	Units	Source
1.1	Annual PCBs Stormwater Load in 2005 (i.e., the assumed load at the start of the PCBs TMDL)	1.1	kg/yr	McKee et. al. (2006)
1.2	Annual average % of loads prevented from entering MS4 due to equipment removals.	1.3 to 4.8 (average = 2.3)	%	Section 4.2.3 (this report)
1.3	Number of years in the time period of interest.	varies	years	N/A

For Term 1.1 the estimated PCBs load of 1.1 kg/yr in 2005 (described in Section 5.2) is the recommended starting value for the annual load of PCBs to stormwater at the start of the PCBs TMDL. This value is currently the best available estimate of PCBs loads to the Bay from electrical utility equipment at that time.

For Term 1.2, the recommended value for the annual average percent of PCBs prevented from entering the MS4 due to OFEE removal ranges from 1.3 % to 4.8 % per year, with an average value of 2.3 % per year (Table 5.2). These values represent the annual average equipment removal rates for the participating municipally-owned electrical utilities presented in Section 4.2.3. These annual average equipment removal rates were calculated based on the mass of oil in pre-1985 OFEE that was removed from service between 2002 and 2019. Use of these values for Term 1.2 assumes the rate of load reduction achieved over the time period of interest is approximately equivalent to the equipment removal rate achieved during that same time period. Further, these values also assume the equipment removal rates for the municipally-owned electrical utilities (Section 4.2.3) reasonably represent the equipment removal rates at other Bay Area electrical utilities (i.e., PG&E). As a check on these assumptions, the load reduction rate between 1990 and 2005 based on the estimate in the McKee et al (2006) mass balance models presented in section 3.4 was compared with the equipment removal rates calculated for municipally-owned electrical utilities that were reported in Section 4.2.3.

The McKee et al. (2006) mass balance models provide PCBs stormwater load estimates for electrical utilities in 2005, and during the peak period of PCBs production and use (1950 – 1990). Based on these estimates, the PCBs load to stormwater from OFEE in 2005 was 65% lower than the average annual load in1990. That equates to a PCBs load reduction of 4.33%

per year during the fifteen-year period between 1990 and 2005. This annual average PCBs load reduction rate compares well with the equipment removal rates at the participating municipally-owned electrical utilities reported in Section 4.2.3. This finding supports the assumption that the equipment removal rates at the participating municipally-owned electrical utilities reasonably approximate the load reduction rates over time. This finding further supports the assumption that most of this load reduction was likely the result of the removal and proper disposal of PCBs-containing OFEE. As described in Section 3.3, during the late 1980s and 1990s, electrical utilities implemented voluntary equipment replacement programs specifically designed to remove PCBs-containing OFEE. Past statements provided to the Regional Water Board by PG&E support the assertion that the majority of PCBs-filled equipment had been replaced by the early 2000's (PG&E 2000). Additional removals have continued to occur, albeit at a slower pace, due to routine maintenance programs that replace older electrical equipment that is more likely to contain PCBs with newer equipment that does not contain PCBs. Information provided to the Regional Water Board by PG&E on maintenance records from their Emeryville processing facility supports this assertion (PG&E 2000). Those data indicate that in 1999, approximately 10% of the 22,000 pieces of OFEE that were dismantled and disposed of at the Emeryville site had PCBs at concentrations at or above 50 ppm. This information further supports the assertion that a large mass of PCBs that were in use during the peak period have since been removed. However, this information also indicates there are still large numbers of equipment that contain PCBs at high concentrations in active service across the Bay Area. Although no information was provided on the percent of equipment that contained PCBs at lower concentrations (i.e., below 50 ppm), equipment with these lower concentrations are also potential sources to stormwater. Current spill reports in Cal OES records further corroborate that PCBs-containing equipment are still in use across the Bay Area, both at concentrations above and below 50 ppm (see Section 3.4.1).

The value for Term 1.3 will vary, depending on the number of years during the time period of interest. For example, to calculate the PCBs loads that have already been reduced due to equipment removals since the start of the PCBs TMDL and the current date (i.e., between 2005 and 2020), the value for Term 1.3 is 15 years.

Assuming the annual average PCBs-containing equipment removal rate remains constant over time, then the current (2020) and future stormwater loads of PCBs from electrical equipment can be estimated along with the associated timeframe to achieve removal of all PCBs-containing equipment. The results are presented in Table 5.3. The calculation starts with the assumed TMDL baseline load of 1.1 kg/yr, multiplied by the annual average load reduction rates presented in Table 5.2 and the 15-year period since the TMDL baseline load estimates in 2005. The results of this calculation demonstrate PCBs loads to stormwater have been reduced by **0.215 kg/yr to 0.792 kg/yr (average = 0.380 kg/yr)**. The resulting Bay Area PCBs stormwater loads from electrical equipment in 2020 ranges from 0.308 kg/yr to 0.886 kg/yr (average = 0.721 kg/yr). Based on these current loading estimates, it will take between 20 and 80 years before all of the PCBs-containing OFEE in the Bay Area have been removed from service.

Table 5.3 Estimated PCBs loads to Stormwater from PCBs-containing oil-filled electrical equipment (OFEE) in the San Francisco Bay Area in 2005 and 2020, based on assumed load reduction rates, and the additional time before all PCBs-containing OFEE are removed from active service.

Equipment Removal Scenario	Estimated PCBs Load to Stormwater in 2005 (kg/yr)	Average Load Reduction Rate per Year (%/year)	Estimated PCBs Loads Reduced since 2005 (kg/yr)	Estimated PCBs Load to Stormwater in 2020 (kg/yr)	Time to Remove all PCBs-containing OFEE from active service (Years)
Low Reduction Rate	1.1	1.3%	0.215	0.886	77
Average Reduction Rate	1.1	2.3%	0.380	0.721	43
High Reduction Rate	1.1	4.8%	0.792	0.308	21

5.3.2 Data Inputs to Calculate PCBs Loads Reduced for Action 2

PCBs loads reduced due to enhanced spill cleanup and reporting (Action 2) can be calculated by multiplying the current annual mass of PCBs released to MS4s due to spills by an enhanced cleanup efficiency rate. The data inputs needed for this calculation include the following 3 terms:

Term 2.1(M_{sp}) = Average annual mass of PCBs released in spills (kg/yr).

Term 2.2 (SW_i) = Estimated percent of spilled PCBs mass that enters the MS4 without the enhanced spill cleanup and reporting protocols.

Term 2.3 (E_f) = Efficiency of the enhanced spill cleanup and reporting protocols to reduce spilled PCBs released to MS4s (percent).

The recommended values for each of the terms above are presented in Table 5.4.

Table 5.4 Recommended values for each of the terms required to account for the PCBs load reductions achieved through implementation of Action 2, enhanced spill cleanup and reporting.

Term	Value	Units	Source
2.1	2.3	kg/yr	Section 5.3.2 (this report)
2.2	1	%	McKee et. al. (2006)
2.3	10	%	Section 5.3.2 (this report)
	25		
	50		

The values in Table 5.4 were developed as described here. First, the ten most recent years of Cal OES spill reports for OFEE in the Bay Area from the 1993-2017 reports discussed in

Section 3.4.1 were reviewed. Between 2008 and 2017, a total of 507 spills of electrical equipment oils were reported. The reports document the total volume of oil spilled as approximately 24,300 gallons. However, most of the reports provided limited or no information on PCBs concentrations. Nearly 50% of the reports identified the PCBs concentration as unknown, and 40% of the reports identified PCBs concentrations as < 50 ppm based on equipment labels. Only 9% of the reports provided information on measured PCBs concentrations in the spilled oils. The reported concentrations spanned a range from 1 ppm up to 720 ppm, with an average of 110 ppm. Given the limited data on concentrations of PCBs in the spilled oils, the mass of PCBs released in these spills is uncertain. Using the average measured PCBs concentration of 110 mg/kg, the average annual mass of PCBs released in spills was calculated as 0.9 kg/yr. However, not all spills are reported to Cal OES. Review of internal PG&E spill reports that were provided to the Regional Water Board for a 7-year period from 1994 to 2000 (PG&E 2000) showed that only 40% of the spills identified in internal records had also been reported to Cal OES during that time period. For the spills not reported to Cal OES, ~30% had measured PCBs concentrations ranging from 1 ppm to 700 ppm, with an average of 113 ppm. Based on this information, the Cal OES reports between 2008 and 2017 represent only 40% of spills, and accordingly increase the estimated total mass of PCBs released during spills to 2.3 kg/yr.

Applying the McKee et al. (2006) assumption that 99% of PCBs released during spills are successfully cleaned, and 1% remain in the environment, then 0.023 kg/yr of spilled PCBs remain in the environment and available for removal in stormwater. Enhanced cleanup protocols that increase the cleaning efficiency by 10%, 25%, and 50% would result in additional removal of between **0.002 and 0.012 kg/yr** of PCBs. These estimates are summarized in Table 5.5. This project did not identify any additional information that could be used to further refine or improve the data inputs shown in Table 5.4 that were used to calculate the potential load reductions due to implementation of enhanced cleanup protocols shown in Table 5.5.

Table 5.5 Estimated annual PCBs load reduction for implementing enhanced spill response and reporting for oil-filled electrical equipment (Action 2).

Scenario	Annual Mass of PCBs released in spills (kg/yr)	Current cleanup efficiency	Current PCBs Load to Stormwater due to spills (kg/yr)	Assumed Improved Cleanup Protocol Efficiency	Annual Load Reduction Due to Improved Cleanup Protocol (kg/yr)
Low	2.3	99%	0.023	10%	0.002
Mid	2.3	99%	0.023	25%	0.006
High	2.3	99%	0.023	50%	0.012

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APPENDIX F
Load Reduction Credit for PCBs in Roadway and Storm Drain Infrastructure Management Program

F.1 BACKGROUND

The BASMAA study *Evaluation of PCBs in Caulk and Sealants in Public Roadway and Storm Drain Infrastructure* (BASMAA, 2018) sampled caulk and sealant materials from public roadway and storm drain infrastructure around the Bay Area. The overall approach to the sampling program was to work cooperatively with multiple Bay Area municipal agencies to identify public right-of-way locations where PCBs were potentially used in caulk or sealant applications on roadway and storm drain infrastructure. These locations were identified primarily based on the time period that the infrastructure was originally constructed and/or repaired, with a focus on the 1970's - the most recent time period PCBs were still in widespread use. The project team collected 54 caulk or sealant samples from public infrastructure in these locations; 11 of these were collected from concrete bridges or overpasses. The Project Team then reviewed the information collected about each sample to determine how to group the samples for compositing prior to PCBs analysis. A total of 20 composite samples were then analyzed for PCBs concentrations. Ten of these composites were associated with concrete roadways, sidewalks, or bridges.

F.2 TOTAL ESTIMATED PCBS LOAD IN OLDER BRIDGES

The U.S. Department of Transportation Federal Highway Administration National Bridge Inventory (USDOT, 2019) was used to estimate the total potential PCBs load contained in older bridges located within the jurisdictions subject to the MRP.

F.2.1 Equations Used to Estimate PCBs Load

The equation used to estimate the total PCBs load contained in bridges built and/or reconstructed prior to 1981 within the jurisdictions subject to the MRP is as follows:

$$\text{Total Load}_{\text{PCBs, Bridges}} = \text{Density}_{\text{sealant}} * \text{Concentration}_{\text{PCBs}} * \sum \text{Volume}_{\text{sealant, bridges}}$$

Where:

$\text{Density}_{\text{sealant}}$ = average sealant density [kg/m^3]

$\text{Concentration}_{\text{PCBs}}$ = empirically derived concentration of PCBs [mg/kg]

$\sum\text{Volume}_{\text{sealant, bridges}}$ = Volume of sealant in all applicable bridges [m^3]

The volume of joint sealant was calculated using an assumed cross-section of sealant, multiplied by the assumed length of applied sealant:

$$\text{Volume}_{\text{sealant, bridges}} = \text{Cross-Section}_{\text{sealant}} * \text{Length}_{\text{sealant}}$$

Where:

$\text{Cross-Section}_{\text{sealant}}$ = Cross-section of applied sealant

$\text{Length}_{\text{sealant}}$ = Length of applied sealant

F.2.2 Data Used to Estimate Load

Data used to estimate load were obtained from BASMAA, 2018; a study of Bay Bridge sealant summarized by Hardeep Takhar of the California Department of Transportation (Caltrans) in 2013; and bridge dimensional information available from the National Bridge Inventory (USDOT, 2019). A summary of the data inputs is provided in Table F-1 below.

Table F-1: Bridge Load Calculation Data Inputs

Input	Result	Units	Source
Density of Sealant	1,100	kg/m^3	Takhar, 2013
Cross-Section of Sealant	1	square inch	Caltrans, 2007
PCBs Concentration	184	mg/kg	See Section 2.2.1

The derivation of the representative concentration of PCBs in sealant applied to bridges is described below.

F.2.2.1 PCBs Concentration

In order to compute a reasonable estimate of the expected PCBs concentration in caulking material in bridges in the MRP area, a data set consisting of 20 composite samples from BASMAA (2018) and four grab samples from the demolition of the Bay Bridge (Takhar, 2013) was analyzed.

Of the 20 BASMAA composite samples, 10 were identified as representative of caulking used on bridges based on the location from which the samples were taken (i.e., five of the composite samples were taken from bridges and five were from concrete roadway surfaces, sidewalks, and curbs and gutters). The remaining composite samples were judged to be non-representative, as they were taken from storm drain structures, asphalt roadways, metal pipes, and electrical utility poles and boxes. Table F-2 below summarizes the BASMAA study results for the concrete roadway, sidewalk, and bridge composite samples (BASMAA, 2018). Table F-3 summarizes the Bay Bridge caulk measurements (Takhar, 2013).

Table F-2: Sample Descriptions and PCBs Concentrations for Roadway and Bridge Composite Samples from the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program (BASMAA, 2018)

Composite ID	Total PCBs (mg/kg)	Type of Structure(s) Sampled	Caulk/Sealant Application	Sample Appearance (Color/ Texture)	# of samples in composite	Sample ID's in composite	Structure Construction Date
A	4,967	Concrete Bridge	Caulk between expansion joints	Black Pliable Foam	2	10	1960-70's
						13	<1960
B	4,150	Concrete Bridge	Caulk between expansion joints	Black Pliable	3	9	1960-70's
						30	1960-70's
						31	<1960

Composite ID	Total PCBs (mg/kg)	Type of Structure(s) Sampled	Caulk/Sealant Application	Sample Appearance (Color/ Texture)	# of samples in composite	Sample ID's in composite	Structure Construction Date
C	0.78	Concrete Bridge	Caulk between expansion joints	Brown Fibrous	2	20	1960-70's
						26	1960-70's
D	0.70	Concrete Bridge	Sealant between concrete surfaces or between concrete and wood surface	Black Hard/Brittle	3	27	<1960
						29	1960-70's
						32	<1960
E	ND	Concrete Roadway Surface	Caulk between expansion joints	Black Hard/Brittle	5	35	<1980
						36	<1980
						37	<1980
						38	<1980
						39	<1980
F	ND	Concrete Sidewalk	Caulk between expansion joints	Black Hard/Brittle	3	2	<1960
						7	<1960
						46	<1980
G	ND	Concrete Sidewalk	Caulk between joints	Brown Fibrous	2	16	1960-70's
						17	1960-70's
H	ND	Concrete Sidewalk /Curb/Gutter	Caulk between joints	White/Gray Hard/Brittle or Pliable	3	1	<1980
						8	1960-70's
						18	1960-70's
I	0.06	Concrete Sidewalk /Curb/Gutter	Crack Sealant	White Hard/Brittle or White Pliable	2	23	<1980
						24	<1980
S	2.5	Concrete Bridge	Prefabricated joint filler	Black Pliable	1	12	<1960

A photo log of the samples taken from concrete bridges is provided in Attachment 1.

Table F-3: Concentrations of PCBs in Caulks Measured from the Bay Bridge

Description	Result (mg/kg)
PCBs Concentration (Bay Bridge Upper Roadway Sample)	1.01
PCBs Concentration (Bay Bridge Upper Roadway Sample)	1.65
PCBs Concentration (Bay Bridge Upper Roadway Sample)	0.705
PCBs Concentration (Bay Bridge Roadway Barrier Wall)	3.71
Bay Bridge Average Concentration	1.77

Source: Takhar, 2013

The complete dataset (i.e., results summarized in Table F-2 and F-3 and other non-representative samples) contains 10 non-detect (all in the BASMAA (2018) dataset) and 14 detected values.

After removing the 10 data points considered unrepresentative of bridges, the representative dataset contains 4 non-detect and 10 detected values (i.e., Table F-2 and Table F-3 summarized values). For the purposes of this analysis, both the complete and the presumed representative subset of the PCBs-in-caulk datasets were analyzed independently.

The non-detect values were imputed using a regression-on-order statistics method prior to estimating summary statistics using a maximum likelihood estimation approach as described in the sections below.

F.2.2.2 Handling Censored (Non-Detect) Results

Since estimation of common descriptive statistics of censored datasets can be heavily biased with simply substituted values, a robust regression-on-order statistics (ROS) method, as described by Helsel and Cohn (1988), was utilized to provide probabilistic estimates of non-detects (NDs). When applying the ROS method, ND values are imputed based on their plotting positions relative to the probability distribution estimated from the detected data. Imputed values are always less than their detection limits, but if the dataset includes multiple detection limits, some imputed values may be larger than some of the detected values. For the PCBs-in-caulk dataset, method detection limits (MDLs) for individual samples were not reported, but an overall MDL of 0.05 µg/kg was included in the BASMAA report and NDs are only reported for samples when every individual congener was not detected.

Maximum Likelihood Estimation

The lognormal probability distribution is often used to represent positively skewed contaminant concentrations (Singh et al., 1997). As such, the PCBs-in-caulking dataset has been assumed to arise from a population that is lognormally distributed, which implies that the standard deviation is proportional to the mean and the data are bounded by zero. A random variable, x, is said to be lognormally distributed if the distribution of $y = \ln(x)$ is normally distributed with a mean, μ_y, and variance, σ_y^2. The mathematical equation for lognormal distribution is:

$$f_x(x) = \frac{1}{\sqrt{2\pi}\sigma x} \exp\left[-\frac{1}{2}\left(\frac{lnx-\mu}{\sigma}\right)^2\right] \; x > 0 \qquad \textbf{Equation 1}$$

Where:

- μ is mean of the untransformed random variable x,
- σ^2 is the variance of the untransformed random variable x, and
- x is the variable of interest.

The lognormal distribution parameters of x are related to the normal parameters of y with the following equations:

$$\mu_x = \exp\left(\mu_y + 0.5\sigma_y^2\right) \qquad \textbf{Equation 2}$$

$$\sigma_x{}^2 = \mu\sqrt{\exp(\sigma_y^2) - 1} \qquad \textbf{Equation 3}$$

When a dataset is a random sample from a lognormal distribution, the Maximum Likelihood Estimate (MLE) of the parameter, μ_y, is simply the sample mean of the log-transformed data

(Singh et al., 1997). Similarly, the MLE of the parameter, σ_y^2, is the sample variance of the log-transformed data. However, for small sample datasets with a few extreme values, such as the PCB-in-caulk dataset, severe transformation bias can occur when estimating the arithmetic mean, μ_x, and arithmetic standard deviation, σ_x. Because of this, an alternative method for computing the expected value is needed as described below.

Advancing the assumption that the sample data arise from a lognormal distribution, a probability weighted mean can be computed as:

$$\hat{\mu}_x = \frac{\sum_{i=1}^{n}(x_i * w_i)}{\sum_{i=1}^{n} w_i} \qquad \textbf{Equation 4}$$

Where:

- $\hat{\mu}_x$ is probability-weighted mean of the untransformed random variable x;
- x_i is the ith sample value; and
- w_i is weight of the ith sample value, which is assumed equal to the probability of occurrence, $p(x_i)$, and can be computed by fitting the data to a lognormal probability density function (PDF).

The lognormal PDF can be constructed by computing the theoretical percentiles and plotting against the probability of a standard lognormal PDF. Any percentile, P_k, of x can be computed using the parameters of y as follows:

$$P_k = \exp(\mu_y + z_k \sigma_y) \qquad \textbf{Equation 5}$$

Where:

- z_k is the kth percentiles of the standard normal distribution.

Results and Conclusions

As stated above, the available data was evaluated in two separate dataset configurations:

1. All data including the potentially unrepresentative values (*N = 24)*
2. Roadway and bridge-only data excluding the potentially unrepresentative values (*N = 14)*.

In both configurations, lognormal distributions were fit to datasets where the non-detect values had been imputed with ROS. Figure F-1 below shows lognormal probability plots along with a best-fit line demonstrating the lognormality of the data.

Table F-4 provides summary statistics after applying ROS to the datasets. As shown, the data mean and data median are significantly different, which again supports the lognormal distribution assumption. The arithmetic mean values computed from Equation 2, however, are unrealistic considering the values are larger than any of the sample values – this is a result of transformation bias. The probability weighted mean values are believed to be the most accurate representation of the central tendency of PCBs in caulk for bridges in the MRP area based on the two datasets because this adjusts for the likely probability of occurrence of the extreme values observed in the data while preserving all sample data in the calculation.

Figure F-2 and Figure F-3 show the PDFs of the best-fit lognormal distributions. Each observed or imputed value drawn along the PDF is used to indicate the probabilities of occurrence, which were used to determine the weights for the probability weighted mean values.

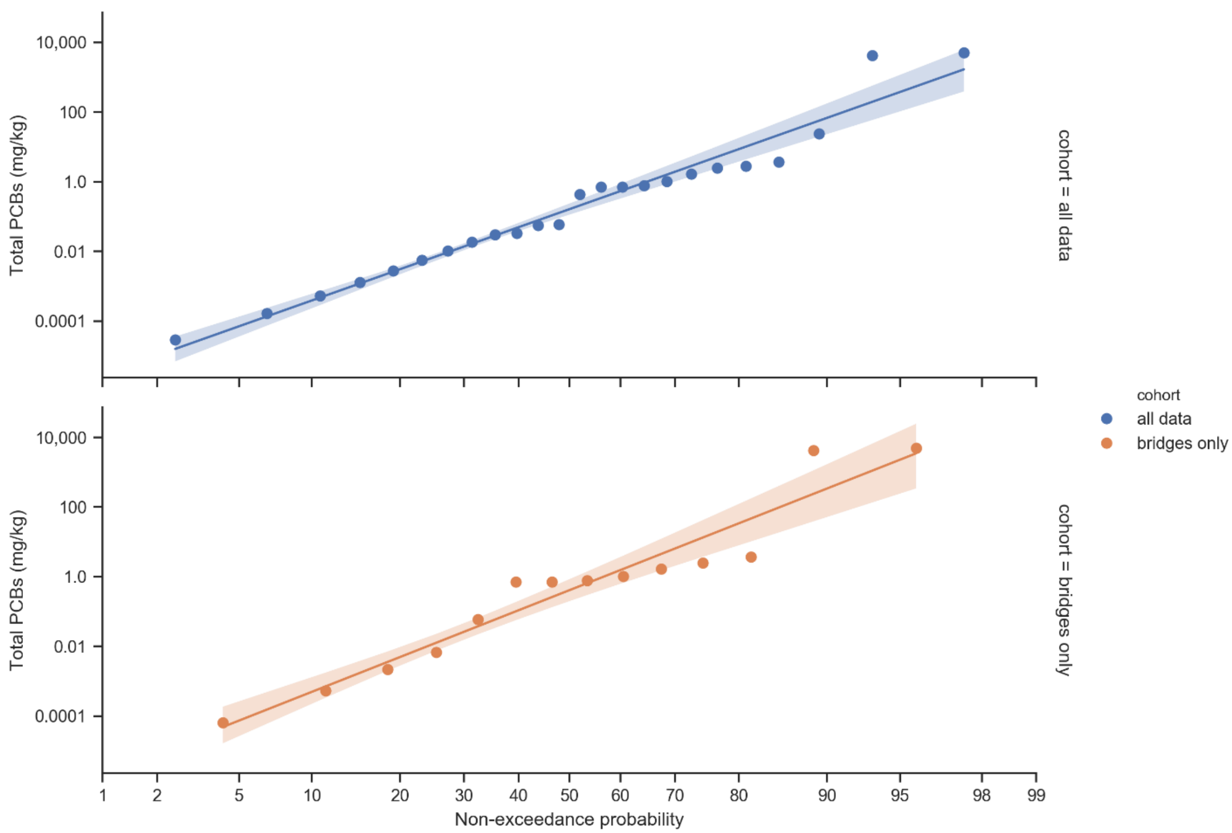

Figure F-1 - Lognormal probability plots. The shaded bands indicate the 95% confidence interval around the best-fit lines.

Table F-4: Summary Statistics

Statistic	Dataset	
	All Data	Roadway/Bridge Only
Sample Count (Total; NDs)	24; 10	14; 4
Data Mean, mg/kg	381	652
Data Standard Deviation, mg/kg	1292	1663
Data Median, mg/kg	0.25	0.74
Lognormal Mean (μy)	-1.82	-0.891
Lognormal Standard Deviation(σy)	4.57	5.02
Arithmetic Mean (μx), mg/kg	8,927	334,514
Probability Weighted Mean ($\hat{\mu}_x$), mg/kg	49.5	184

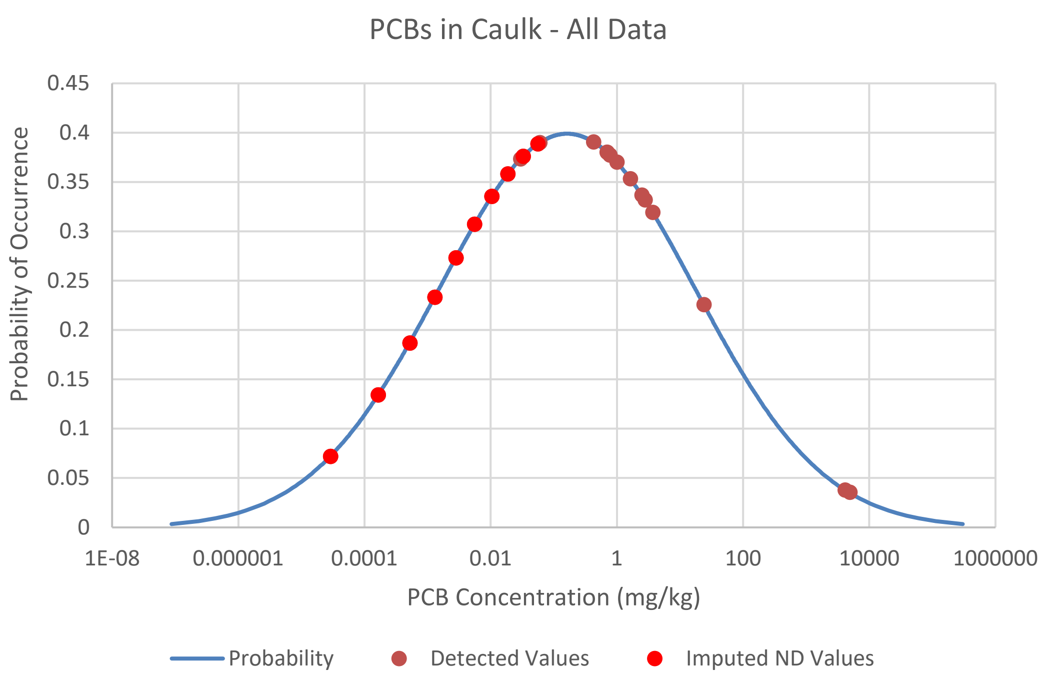

Figure F-2: Lognormal distribution plot for all available Total PCBs data, showing the weights of the detected and imputed values

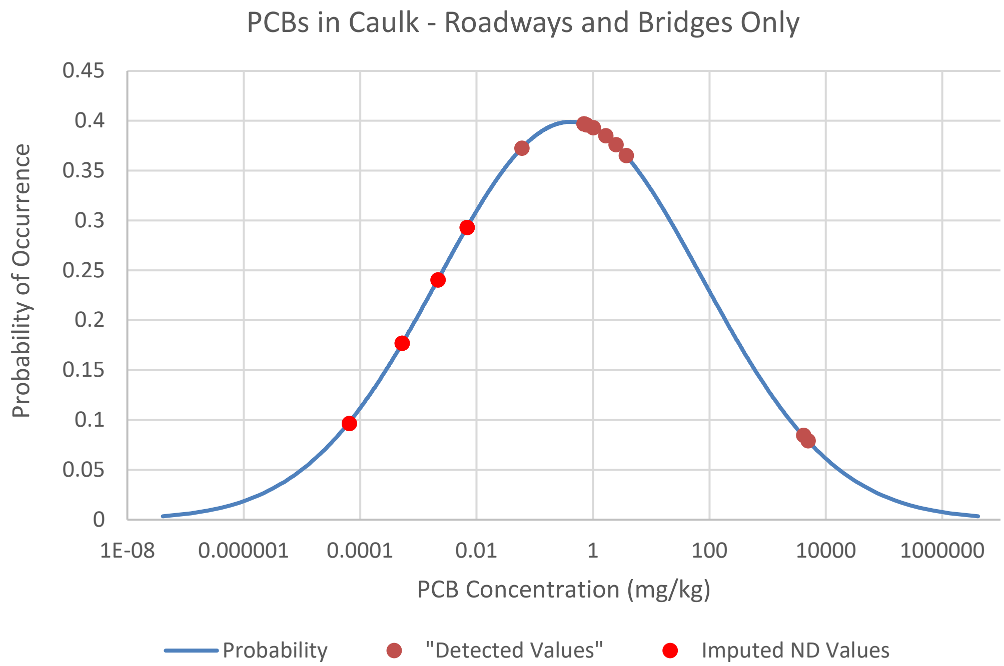

Figure 3: Lognormal distribution plot for Total PCBs data from roadways and bridges only, showing the weights of the detected and imputed values

F.2.2.2 Length of Applied Sealant

While it is evident from the BASMAA (2018) study photos that sealant may be applied to many concrete connections within any given bridge, this estimate focuses on the locations most exposed to weather and traffic and therefore most likely to leach into the environment. The sealant application locations of focus in this study include the bridge expansion joints (e.g., at connections between bridge spans), and the longitudinal seam between the bridge deck and the sidewalk and/or bridge side rail.

The federal bridge database used for this analysis contains information about dimensions of bridges located within the MRP jurisdictions. The length of sealant used to calculate total potential PCBs mass was estimated using database values as follows:

$$\text{Length}_{\text{sealant, joints}} = (N_{\text{span}} + 1) * \text{Width}_{\text{deck}}$$

Where:

N_{span} = The number of bridge spans

$\text{Width}_{\text{deck}}$ = Bridge deck width

Assuming there are seams along either side of the bridge at the sidewalk or wall, the longitudinal seam was calculated as:

$$\text{Length}_{\text{sealant, longitudinal seam}} = 2 * \text{Length}_{\text{bridge}}$$

F.2.3 Total Estimated PCBs Load in Bridges

A summary of the total calculated loads for bridges within the MRP coverage boundary, built and/or reconstructed prior to 1981, and specific bridge types[11], per the Nation Bridge Inventory, is provided in Table F-5.

Table F-5: Total Calculated Loads for Bridges within the MRP Area, Built and/or Reconstructed Prior to 1981

County	Total Sealant PCBs Mass - Joints Only (kg)	Total Sealant PCBs Mass - Joints and Longitudinal Seal (kg)	Number of Bridges
Alameda	3.8	11.2	340
Contra Costa	1.7	7.3	277
San Mateo	2.5	7.2	254
Santa Clara	3.7	10.1	473
Solano	0.9	3.2	133
Total	**12.6**	**39.0**	**1,477**

The average mass of PCBs in MRP bridges with the characteristics described, based on the calculation, is approximately 8.5 grams, accounting for joint sealant only, and 26 grams, accounting for both joint and longitudinal sealant.

F.3 LONG TERM LOAD REDUCTION ESTIMATE

F.3.1 Methodology

To estimate the load reduction associated with long-term bridge or expansion joint replacement, it is assumed that an ongoing PCBs release rate from bridge joints is mitigated through bridge joint maintenance and whole bridge replacement projects. The load reduction estimation is based on the assumption that PCBs in caulk are leaching from bridge joints and longitudinal seals over their lifetime. When that PCBs-containing caulk is replaced or removed through maintenance or replacement projects, the source of PCBs release is removed, and the associated annual released load is also removed. PCBs leaching from the material could occur through incremental wear or through larger damage (e.g., pieces of caulk torn out) over the lifetime of the caulk.

While volumetric or mass-based losses of joint seals over time were not found in literature, publications that describe joint maintenance and failure were reviewed to justify the assumption of leaching over time. Compression and strip seal type joints, which could potentially be expected to consist of PCBs-containing material, have an expected lifetime of 8 to 16 years, according to a survey conducted for an NCHRP study on bridge joints (NCHRP, 2016). Despite this recommended lifetime, an extrapolated rate of joint replacement in the Bay Area demonstrates that joints are being replaced at a much lower frequency. According to three

[11] 0 – Other; 01 – Slab; 02 – Stringer/Multi-beam or Girder; 03 – Girder and Floorbeam System; 04 – Tee Beam; 05 – Box Beam or Girders – Multiple; or 06 – Box Beam or Girders – Single or Spread.

Permittee preventative maintenance plans available on Caltrans' Highway Bridge Program funding website (Caltrans, 2019), approximately 3% of bridges meeting the characteristics described above are scheduled for joint replacement over the next five-year funding period. An additional 1.5% of bridges are scheduled for replacement over the same five-year period (presumptively replacing the joints). At this rate, replacing the joints via joint maintenance or bridge replacement projects in all 1,477 bridges would take over 110 years.

The concept that older, likely PCBs-containing joints persist in the older MRP bridges is borne out through the findings of the BASMAA (2018) study, which found very high PCBs concentrations in composite samples from a random selection of representative bridge infrastructure. This outcome is also consistent with a finding from a 2003 NCHRP report (NCHRP, 2003), which found through interviews with transportation agencies that "agencies indicated that they tend not to respond to joint problems unless there is a safety hazard or when the deck is being rehabilitated or replaced. Other than reactive efforts, joint repair and rehabilitation, in most agencies, is associated with deck rehabilitation." Additionally, while guidance documents typically define joint replacement needs in terms of visual degradation of the joint, along with other factors, the NCHRP study stated that agencies often defined failure of a deck joint as leakage, physical damage, or traffic hazard. These conditions could be taken to interpret that agencies are only replacing severely damaged or degraded joints (NCHRP, 2003).

Older joints could be considered more likely to leach into the environment, as the sealant material accumulates damage over time. Typical types of joint seal damage described by the Wyoming Department of Transportation, Aeronautics Division Airport Pavement Management Program (2020) include: (1) stripping of joint sealant, (2) extrusion of joint sealant, (3) weed growth, (4) hardening of the filler (oxidation), (5) loss of bond to the slab edges, and (6) lack or absence of sealant in the joint. These damage types are also consistent with those described in NCHRP (2016). Most of these damage types either directly refer to stripping of the sealant from the joint or create a condition in which the sealant is more likely to be released from the joint when subjected to traffic loads (i.e., conditions such as extrusion, hardening/becoming more brittle, loss of bond). Examples of damaged joint seals from this source are provided in Attachment 2.

F.3.2 Load Reduction Calculation

Lacking a literature-based release rate of sealant over time, two potential annual release rates are provided for the load reduction calculation. Based on the assumption that the joint seal may become degraded over time, it is possible that the sealant releases little during the initial operation period and more as the joint sealant ages. Another possible release pathway is through leaching into surrounding concrete and subsequent degradation of the concrete. Two potential average annual release rates (i.e., average over the life of the seal) were assumed to calculate an estimated load reduction from removing the joint seal – 1% and 0.5%. These average annual release rates were applied to the estimated mass for the 1,477 bridges meeting the identified age criteria (Table F-6). These releases would be eliminated through removal of the joint seal through joint replacement or bridge replacement.

Table F-6: Long-Term Load Reduction (i.e., Replacement of PCBs-Containing Joints in All Older Bridges)

County	Total Sealant PCBs Load Reduced - Joints Only (g/year)		Total Sealant PCBs Load Reduced - Joints and Longitudinal Seal (g/year)	
	1% annual loss rate over life	0.5% annual loss rate over life	1% annual loss rate over life	0.5% annual loss rate over life
Alameda	38	19	112	56
Contra Costa	17	8	73	37
San Mateo	25	12	72	36
Santa Clara	37	19	101	50
Solano	9	5	32	16
Total	126	63	390	195

This is the assumed load reduction by 2080, based on the assumption that all older joints will be removed/replaced within 100 years of installation (this is consistent with recent Caltrans replacement frequency calculated above).

F.4 REFERENCES

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Attachment 1: BASMAA Bridge Sample Photos

Composite A

Composite B

Composite S

Composite C

Composite D

Attachment 2: Images of Joint Seal Damage

Joint sealant damage is any condition that enables soil or rocks to accumulate in the joints or allows significant infiltration of water. Accumulation of incompressible materials prevents the slabs from expanding and may result in buckling, shattering, or spalling. A pliable joint filler bonded to the edges of the slabs protects the joints from accumulation of materials and also prevents water from seeping down and softening the foundation supporting the slab. Typical types of joint seal damage are: (1) stripping of joint sealant, (2) extrusion of joint sealant, (3) weed growth, (4) hardening of the filler (oxidation), (5) loss of bond to the slab edges, and (6) lack of absence of sealant in the joint..

Source: Wyoming Department of Transportation, Aeronautics Division Airport Pavement Management Program (https://www.appliedpavement.com/hosting/wyoming/pavement-inspection/pci-review/distresses-pcc/joint-sealant-damage.html)

Severity	Distress Example	Description
Low		Joint sealer is in generally good condition throughout the sample. Joint seal damage is at low severity if a few of the joints have sealer which has debonded from but is still in contact with the joint edge. This condition exists if a knife blade can be inserted between sealer and joint face without resistance.
Medium		Sealant needs replacement within two years. Joint seal damage is at medium severity if a few of the joints have any of the following conditions: (a) joint sealer is in place, but water access is possible through visible openings no more than 1/8 in (3 mm) wide. If a knife blade cannot be inserted easily between sealer and joint face, this condition does not exist; (b) pumping debris are evident at the joint; (c) joint sealer is oxidized and "lifeless" but pliable (like a rope), and generally fills the joint openings; or (d) vegetation in the joint is obvious, but does not obscure the joint opening.

Severity	Distress Example	Description
High		Joint sealer is in generally poor condition over the entire surveyed sample. Sealant needs immediate replacement. Joint seal damage is at high severity if 10% or more of the joint sealer exceeds limiting criteria listed above, or if 10% or more of sealer is missing.

APPENDIX G

Enhanced Inlet Cleaning Efficiency Factor Data Analysis for Storm Drain Inlets with and without Inlet-based Full Trash Capture Devices

G.1 PURPOSE AND APPROACH

The purpose of this appendix is to document findings of analysis conducted to determine the enhanced efficiency factors (EE_f) for sediment removal associated with enhanced storm drain inlet maintenance, including increasing the frequency of storm drain inlet cleaning, and the use of small (inlet-based) full trash-capture (FTC) devices, that are expected to capture larger amounts of trash, sediment and vegetation. First, the pollutant removal efficiency was calculated for the baseline control measure, which was assumed to be annual cleanout of storm drain inlets without FTC devices. The efficiency factors were then developed for the following enhancements: (1) increased frequency of cleanouts at inlets without FTC devices; and (2) twice yearly cleanouts at inlets with FTC devices.

Based on a review of available literature, there are limited data available on the reductions of pollutants (including sediment) associated with different storm drain inlet maintenance frequencies. No studies were found that assessed the reduction of either PCBs or mercury due to enhanced inlet cleaning frequencies. Two studies in particular, Woodward Clyde (1994) and Caltrans (2003), however evaluated the increase in the removal of material (i.e., sediment, vegetation, and trash) from inlets under different cleaning frequencies. Results from both studies indicated that the annual volume of material removed from inlets increased with cleaning frequency.

The Caltrans (2003) *Drain Inlet Cleaning Efficacy Study* was designed to measure the potential increases in material volume/mass and water quality benefits due to increased inlet cleaning frequencies on freeways. The study was conducted from 1996 through 2000. The volume and mass of material removed under annual, biannual, and three times per year cleaning frequencies at 55 to 90 inlets, depending on the year, were measured.

The Woodward Clyde (1994) *Storm Inlet Pilot Study* was conducted in Alameda County in 1993. This study was also designed to measure the potential increases in material volume and mass due to increased inlet cleaning frequencies. A total of 15 inlets draining residential, industrial, or commercial land uses were monitored. The volume and mass of material removed under annual, biannual, quarterly, and monthly cleaning frequencies were measured.

None of the inlets in the two studies identified above were equipped with FTC devices. To evaluate pollutant reductions associated with cleanouts of storm drain inlets equipped with small FTC devices, a recent study (SCVURPPP, 2016) documented cleanout volumes of materials removed from inlets equipped with FTC devices. The SCVURPPP (2016) *Storm Drain Trash Monitoring and Characterization* study focused on litter/trash, but also removed and measured other debris (defined as sediment and vegetation) from 119 inlets equipped with small FTC devices. These devices typically require cleaning frequencies of at least twice per year. Each of the 119 inlets was initially cleaned at the start of the project. The volume of trash and debris that accumulated within the inlets was removed and measured during two subsequent monitoring events. The accumulation period between each monitoring event ranged from four to five months. The data were used to estimate the annual average volumes of trash and debris captured in each inlet. The annual volume of debris removed was converted to a mass using the average density of debris removed from inlets during the Woodward Clyde (1994) study, which was 38 pounds per cubic foot.

The percent increase of annual mass of debris removed from storm drain inlets during cleanouts, as measured in each of the three studies described above, is presented in Figure G-1. Caltrans removals for inlet cleaning without FTC devices appear to be much greater than removal efficiencies measured during the Woodward Clyde study, and therefore may not be realistic for the purposes of developing conservative efficiency factors for load reduction accounting. The Woodward Clyde study results were used to represent the enhanced efficiency due to increased cleanout frequency of storm drain inlets without FTC devices. The results of the SCVURPPP (2016) study indicate that the use of inlet-based FTC devices, combined with an increased cleaning frequency of twice annually, appears to substantially increase the annual mass of debris that is captured and removed from these storm drain inlets during cleanouts.

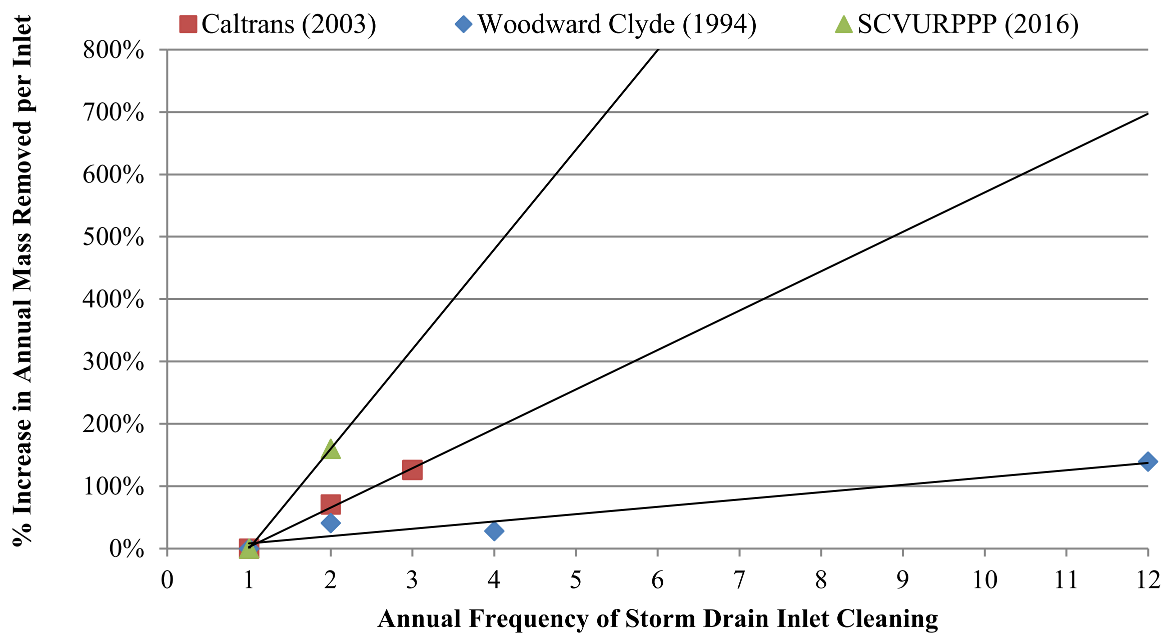

Figure G.1: Reported results of increases in annual mass of debris (e.g., sediment and vegetation) removed as a result of increased cleaning frequency for storm drain inlet with and without small full trash-capture (FTC) devices.

Based on the above findings, Table G-1 presents a conservative estimate of the enhanced efficiency factors for more frequent cleaning of storm drain inlets without FTC devices, and the enhanced efficiency factors for cleaning storm drain inlets equipped with inlet-based FTC devices at least twice per year. For the purposes of load reduction accounting, the method assumes the following:

- Based on an analysis of 36 Alameda County and San Mateo Permittee storm drain inlet cleaning datasets from 1996 through 2009, on average, municipalities clean their inlets once per year (annually);

- Based on the same dataset, an average of 100 kg of material (sediment, vegetation, and litter) is removed from each inlet annually (see descriptive statistics below);

Statistic	Mass (Kg) of Material Removed Annually per Inlet
Maximum	4,049
90th Percentile	476
75th Percentile	284
Mean	268
Geometric Mean	100
Median	91
25th Percentile	41
10th Percentile	21
Minimum	5
# of Municipalities in Dataset	36

- Each inlet (on average) receives drainage from a catchment of 1 acre (BASMAA, 2014), equating to a unit material removal rate of 100 kg per acre per year;
- The mass fraction of material associated with PCBs and mercury yields (i.e., sediment <63um) is approximately 15% on average (McKee et al., 2006);
- The annual suspended sediment load to each inlet is roughly 134 kg per year on average based on the modeled value for Old Urban land use (Paradigm Environmental, 2020, see attachment to Appendix A); and
- Based on the assumptions above, roughly 15 kg of sediment associated with PCBs and mercury is removed from each inlet cleaned on an annual frequency, equating to about a 11% reduction of PCBs and mercury via annual cleaning (i.e., 15 kg / 134 kg). This is the control measure effectiveness of annual cleaning of storm drain inlet without FTC devices.

Assuming the baseline control measure effectiveness for annual cleaning of 11%, data from the studies cited above were used to calculate the enhanced efficiency factors for storm drain inlet cleaning at increasing frequencies for inlets without FTC devices, and twice-yearly cleaning of inlets that have been equipped with small FTC devices, as shown in Table G-1.

Table G-1: Enhanced efficiency factors (EE_f) for increased storm drain inlet cleaning frequencies for storm drain inlets both with and without small full trash-capture (FTC) devices.

Original Cleaning Frequency		Enhanced Cleaning Frequency for Inlets without FTC devices				Enhanced Cleaning Frequency for Inlets with FTC Devices
		Annually	Biannually	Quarterly	Monthly	Biannually
	No Cleaning or New Inlet	0.11	0.16	0.16	0.27	0.29
	Annually		0.05	0.05	0.16	0.18

E.2 References

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APPENDIX H
Enhanced Street Sweeping Efficiency Factors

H.1 DESCRIPTION OF THE ANALYSIS

The Clean Watersheds for Clean Bay (CW4CB)[12] Task 4 pilot projects evaluated enhancements of municipal operation and maintenance activities that remove sediments and associated pollutants, including PCBs and mercury. This objective coincided with Municipal Regional Stormwater NPDES Permit (MRP, Order R2-2009-0074) Provision C.12.d, which required MRP Permittees to evaluate at the pilot scale in five drainages, ways to enhance existing sediment removal and management practices such as municipal street sweeping, curb clearing parking restrictions, inlet cleaning, catch basin cleaning, stream and stormwater conveyance system maintenance, and pump station cleaning via increased effort and/or retrofits. MRP Provision C.12.d also required Permittees to evaluate existing information on high-efficiency street sweepers, with the goal of evaluating the cost-effectiveness of high-efficiency street sweeping relative to reducing pollutant loads.

Appendix B-1 of the CW4CB Final Report summarizes the results of the Task 4 enhanced street sweeping pilot project that occurred in four pilot study areas (two sites in Richmond and one each in San Jose and Sunnyvale). This study entailed collecting monitoring data in each pilot study area representative of the baseline sweeping condition. The monitoring data were then used to calibrate the Windows Source Loading and Management Model (WinSLAMM) to evaluate sediment, PCBs, and mercury in the pilot study areas. Once WinSLAMM calibrated using the pilot study data, it was used to model street sweeping performance in the pilot study areas during the baseline condition for sediment, PCBs, and mercury. WINSLAMM was also used to model the effectiveness of various street sweeping scenarios for the pilot study areas for removing sediment, PCBs, and mercury. The modeled scenarios included (1) different sweeper types, (2) sweeping frequencies, and (3) street roughness values. The modeled scenarios assumed parking controls were in effect.

The results of the scenario analysis are presented in Tables H-1 and H-2 below for PCBs and mercury, respectively.

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[12] For more information, see: http://basmaa.org/Clean-Watersheds-for-a-Clean-Bay-Project.

Table H-1: Change in PCBs Mass Removal Efficiency (%) from Initial Street Sweeping Scenario to Final Scenario

				Final Scenario							
			Sweeper Type	Vacuum							
			Street Roughness	Rough	Intermediate	Rough	Intermediate	Rough	Intermediate	Intermediate	Rough
	Sweeper Type	**Street Roughness**	**Frequency**	Once per 4 weeks	Once per 4 weeks	Once per 2 weeks	Once per 2 weeks	Once per week	Once per week	Twice per week	Twice per week
Initial Scenario	None	None	None	9.9%	14%	15%	18%	19%	21%	21%	22%
	Vacuum	Intermediate	Once per week	-11%	-7%	-6%	-3%	-2%	0%	0%	1%
		Intermediate	Once per 2 weeks	-8%	-4%	-3%	0%	1%	3%	3%	3%
		Intermediate	Once per 4 weeks	-4%	0%	1%	4%	5%	7%	7%	8%
		Intermediate	Twice per week	-11%	-7%	-6%	-3%	-2%	0%	0%	1%
		Rough	Once per week	-9%	-5%	-4%	-1%	0%	2%	2%	2%
		Rough	Once per 2 weeks	-5%	-1%	0%	3%	4%	6%	6%	6%
		Rough	Once per 4 weeks	0%	4%	5%	8%	9%	11%	11%	12%
		Rough	Twice per week	-12%	-8%	-6%	-3%	-2%	-1%	-1%	0%

Notes:

1. Change in efficiency resulting from change in sweeping scenario shown in red (reduction in efficiency) and blue (increase in efficiency).

Table H-2: Change in Mercury Mass Removal Efficiency (%) from Initial Street Sweeping Scenario to Final Scenario

				Final Scenario							
			Sweeper Type	Vacuum							
			Street Roughness	Rough	Intermediate	Rough	Intermediate	Rough	Intermediate	Intermediate	Rough
	Sweeper Type	**Street Roughness**	**Frequency**	Once per 4 weeks	Once per 4 weeks	Once per 2 weeks	Once per 2 weeks	Once per week	Once per week	Twice per week	Twice per week
Initial Scenario	None	None	None	9.1%	10%	10%	10%	10%	11%	11%	11%
	Vacuum	Intermediate	Once per week	-1%	0%	0%	0%	1%	2%	2%	2%
		Intermediate	Once per 2 weeks	0%	0%	0%	0%	1%	2%	2%	2%
		Intermediate	Once per 4 weeks	0%	0%	1%	1%	1%	2%	2%	2%
		Intermediate	Twice per week	-1%	0%	0%	0%	1%	2%	2%	2%
		Rough	Once per week	-2%	-2%	-2%	-2%	-1%	0%	0%	0%
		Rough	Once per 2 weeks	-2%	-2%	-2%	-2%	-1%	0%	0%	0%
		Rough	Once per 4 weeks	-1%	-1%	-1%	-1%	0%	1%	1%	1%
		Rough	Twice per week	-2%	-2%	-2%	-2%	-1%	0%	0%	0%

Notes:

Change in efficiency resulting from change in sweeping scenario shown in red (reduction in efficiency) and blue (increase in efficiency).

APPENDIX I
Large Trash Capture Device Unit Efficiency Factor Data Analysis

I.1 Purpose and Approach

The purpose of this appendix is to document findings of studies and analyses conducted to determine the effectiveness for removing total suspended solids (TSS), PCBs, and mercury by large (non-inlet-based) trash capture devices, including hydrodynamic separator (HDS) units, gross solids removal devices (GSRDs), and baffle boxes. Other types of non-inlet-based trash capture devices, such as trash netting devices and trash booms, are assumed to remove negligible amounts of sediment, PCBs, and mercury, so are not included in this appendix. Inlet-based devices, including inlet baskets and connector pipe screens, are discussed in Appendix G. For the purposes of load reduction accounting, the method assumes that HDS units, GSRDs, and baffle boxes reduce PCBs and mercury concentrations in direct proportion to TSS reduction.

I.2 HDS Units

Percent Removal of TSS. Percent removal of TSS in HDS units was calculated from the BASMAA Clean Watersheds for a Clean Bay (CW4CB) Task 5 Leo Avenue pilot project data (BASMAA 2017a). For this project, a prefabricated Contech HDS unit called the Continuous Deflective Separator (CDS) was retrofitted into the existing storm drain system in the Leo Avenue Watershed in San Jose.

Influent and effluent water quality was sampled at four events as summarized in Table I-1 below. The CDS unit removed an average of 30% of TSS coming into the unit.

Table I-1: Percent Removal of TSS at Leo Ave CDS Unit

Event	Date	Sample Location	TSS (mg/L)	% Removal
1	28-Feb-14	Inflow	110	17%
		Outflow	91	
2	29-Mar-14	Inflow	230	17%
		Outflow	190	
3	31-Oct-14	Inflow	62	88%
		Outflow	7.5	
4	02-Dec-14	Inflow	82	-3%
		Outflow	84.5	
Average				**30%**

The International Stormwater BMP Database (http://bmpdatabase.org/) was evaluated for potentially useful studies. Twenty studies of manufactured devices were identified as useful for analysis. These studies had a total of 334 paired inflow/outflow data points for TSS. Percent removal was calculated for each paired data point and then averaged for the BMP. The results for these studies along with descriptions of land use type and watershed size and imperviousness are presented in Table I-2 below. Average percent removal ranged from -85% (i.e., an increase in TSS concentration in outflow compared to inflow) to 73% and averaged 19% across all studies (including the City of San Jose's Leo Avenue unit).

The dataset was also analyzed by removing BMPs that were treating just roads or highways, parking lots, or college campuses. In this scenario, ten studies remained that had mixed, other, or unknown land use type. The average percent removal of TSS from the BMPs evaluated in this group of studies was slightly higher at 22%.

Table I-2: Percent Removal of TSS for Studies in BMP Database

Site and BMP	Device Model	Land Use Type	Watershed % impervious	Watershed Area (ac)	Average TSS % Removal[1]
OP Soccer Complex: PMSU56_40_40	Contech CDS, Model PMSU56_40_10	Parking lots adjacent to soccer fields.	90	3.98	-85%
NW Birch Place CDS unit: Continuous Deflective Separation unit	CDS Unit	Low Density Residential: 47.4% Office Commercial: 42.2% Multi-Family Residential: 10.3%	--	45.0	-14%
Broadway Outfall: CDS Unit	CDS			132	-6%
University of New Hampshire F3: Continuous Deflective Separation	CDS	College Campus: 100%	100	0.32	-5%
Lake O Sediment Demo: CDS Unit	PSW56_53		--	--	-3%
I-210 / Orcas Ave: Orcas	CDS	Roads/Highway: 100%	100	1.11	-3%
USGS_WI_HSD_DD: Hydrodynamic Settling Device	Downstream Defender®, manufactured by Hydro International.		84	1.90	-1%
I-210 / Filmore Street: Filmore CDS	CDS	Roads/Highway: 100%	100	2.50	2%
University of New Hampshire F2: Environment 21 V2B1	Environment 21 V2B1	College Campus: 100%	100	0.32	5%
University of New Hampshire F1: Vortechnics	Vortechnics	College Campus: 100%	100	0.32	13%
USGS_WI_HSD: HSD	Hydrodynamic Settling Device, Contech	The HSD treats a 0.25-acre deck section of the westbound I–794 freeway	100	0.25	26%
Harrisburg Public Works Yard: PAYardTerreKleene	Terre Kleen	--	90	3.21	28%
SC_StructBMP3: BMP3	Vortechnics	BMP3 is located along the westbound lane of S.C. Highway 802	--	--	29%

Site and BMP	Device Model	Land Use Type	Watershed % impervious	Watershed Area (ac)	Average TSS % Removal[1]
Indian River Lagoon CDS Unit: CDS Unit	CDS	Open Space: 38% Light Industrial: 32% Office Commercial: 19%	11	61.5	30%
Leo Avenue: HDS Unit[2]	Contech CDS	--	--	--	30%
SC_StructBMP1&2: BMP2	CDS Technologies	BMP2 is located along the southbound lane of U.S. Highway 21	100	1.11	39%
University of New Hampshire E1: Aqua Swirl	Aqua Swirl	College Campus: 100%	100	0.99	40%
Timothy Edwards Middle School: Vortechs No 5000	Vortechs	--	80	1.95	45%
VC: VC	Vortcapture	Residential area with lots of organic matter/leaf litter loading	--	--	53%
Marine Village Watershed: VortechsTM Stormwater Treatment System	Vortechs	Office Commercial: 50% Medium Density Residential: 45% Unknown: 5%	95	9.34	72%
NJ Manasquan Bank: NJManasquanCDS	High Efficiency Continuous Deflective Separator (CDS), Model 20_25	--	79	0.89	73%

Notes: -- indicates information was not provided.

1. Based on analysis of paired inflow/outflow results.
2. Leo Ave CW4CB study. Not a BMPDB Study.

The manufacturer's removal efficiency claims and the tested removal efficiencies of six of the BMPs evaluated in the studies were summarized as reported in the Massachusetts Stormwater Technology Evaluation Project (MASTEP) clearinghouse database (Table I-3).

Table I-3: Percent Removal of TSS for Six Manufactured Devices from MASTEP

Product (BMP)	Manufacturer	Manufacturer's Removal Efficiency claim	Tested Removal Efficiency
Aqua-Swirl	Aqua Shield	85%	84-87%
CDS	Contech	70%	65-95%
Vortechs	Contech	35-85%	35-64%
Downstream Defender	Hydro International	90%	70%
V2B1	Environment 21	80%	65%

Product (BMP)	Manufacturer	Manufacturer's Removal Efficiency claim	Tested Removal Efficiency
Terre Kleen	Terre Hill	78%	17-50%
Average[1]			56%

Notes: 1. Average based on low end of reported efficiency range.

Based on the above findings, 20% is a conservative estimate of the average percent removal of TSS by HDS units.

Percent Removal of PCBs and Mercury. To further evaluate the pollutant removal performance of HDS units, BASMAA (2019) conducted a combined monitoring and modeling study in 2017 and 2018 based on the removal of solids captured within HDS unit sumps. The Project collected samples of the solids captured and removed from eight different HDS unit sumps during cleanouts. The solid samples were analyzed for PCBs and mercury concentrations. Maintenance records and construction plans for these HDS units were reviewed to develop estimates of the average volume of solids removed per cleanout and the typical number of cleanouts per year. This information was combined with the measured pollutant concentrations to calculate the annual mass of PCBs and mercury captured in the sumps and removed during cleanouts. Next, the annual pollutant loads discharged from each HDS unit catchment were estimated using two different load calculation methods. Method #1 used the land use-based pollutant yields described in the BASMAA Interim Accounting Methodology (BASMAA 2017b) to estimate catchment loads. Method #2 used the Regional Watershed Spreadsheet Model (RWSM, Wu et al. 2017) to estimate runoff volumes and stormwater concentrations and calculate catchment-specific loads. Finally, HDS unit performance was evaluated for both catchment load estimates by calculating the average annual percent removal of PCBs and mercury due to the annual mass removal of solids from the HDS unit sumps. Results are presented in Table I-4.

For catchment loads calculated using Method #1 (land use-based yields), the median percent PCBs removal across all eight units ranged from 5% to 10%, while the mean ranged from 17% to 28%. For catchment loads calculated using Method #2 (RWSM runoff volume x concentration), the median percent PCBs removal ranged from 15% to 32%, while the mean ranged from 23% to 36%. Variability in removal rates was high between individual units, ranging from almost no removal to 100% removal of the estimated loads. For mercury, across all eight units, the median percent removal for catchment loads calculated using Method #1 (land use-based yields) ranged from 3% to 4%, while the mean ranged from 5% to 8%. For all units under Method #1, the removal rates were lower for mercury than for PCBs. For catchment loads calculated using Method #2 (RWSM runoff volume x concentration) the median removal ranged from 13% to 19%, while the mean ranged from 28% to 35%. Similar to PCBs, removal rates for mercury in individual HDS units were highly variable (Table I-4).

Table I-4. HDS Unit Performance - Annual Percent Removal Calculated for Two Catchment Load Estimates.

HDS Unit ID	PCBs Removal				Mercury Removal			
	Method #1		Method #2		Method #1		Method #2	
	Low	High	Low	High	Low	High	Low	High
1	80%	100%	100%	100%	26%	40%	100%	100%
2	8%	18%	10%	22%	4%	6%	65%	98%
3	4%	9%	21%	45%	2%	3%	8%	12%
4	38%	83%	27%	59%	5%	7%	17%	26%
5	0.06%	0.13%	0.21%	0.46%	0.1%	0.2%	1.1%	1.6%
6	5%	11%	20%	43%	0.01%	0.02%	0.1%	0.2%
7	0.6%	1.4%	0.5%	1.1%	0.06%	0.09%	2%	3%
8	1.4%	3.1%	7%	16%	3%	4%	27%	41%
Median	5%	10%	15%	32%	3%	4%	13%	19%
Mean	17%	28%	23%	36%	5%	8%	28%	35%

The BASMAA study results were highly variable and limited by the small sample size. However, pollutant load reductions achieved by HDS units, on average, approach or even exceed 20%, the value identified as a conservative estimate of TSS removal by HDS units in the analysis presented previously. These results support the continued use of a 20% efficiency factor for calculating the annual average PCBs and mercury loads reduced by HDS units.

I.3 Gross Solids Removal Devices

Caltrans conducted the Gross Solids Removal Devices (GSRDs) Pilot Program to develop and evaluate the performance of non-proprietary, full trash capture devices that could be retrofitted into existing highway drainage systems or incorporated into new highway projects (Sobelman et al.). The GSRD Pilot Program consisted of multiple phases with each phase representing one pilot study. The pilot studies consisted of one or more devices that were developed from concept through design and installation, with two years of pilot testing of overall performance. Five phases were constructed and monitored covering eleven designs. Four general types of GSRDs were developed and studied: linear, inclined screen, baffle box, and v-screen. Of the many configurations tested, the most promising devices, based on considerations of particle capture, clogging, passing design flow, drainage, stage capacity and maintenance requirements, were the Linear Radial (louvered modular well casing), the Inclined Screen (parabolic wedgewire screen) and the Inclined Screen (sloped flat wedge-wire screen). The linear radial and inclined screen devices have been certified by the Los Angeles Regional Water Quality Control Board as being full capture devices. Standard designs were developed for these screen systems that provided the best solids removal performance in the pilot tests.

The results of the first phase of the pilot program, which tested the linear radial and inclined screen devices, are summarized in Table I-5 below.

Table I-5. GSRD Unit Performance Observed by Caltrans (2003)

Device Type	Gross Solids Capture Efficiency by Wet Weight (%)	
	2000 – 2001	2001 – 2002
Linear Radial 1 (I-10)	100[1]	100
Linear Radial 2 (I-210)	97	87
Linear Radial 2 (I-5)	94	100
Inclined Screen 1 (SR-170)	100	100
Inclined Screen 2 (I-210)	83[2]	100
Inclined Screen 2 (US-101)	86[2]	73[2]
Average	**93%**	**93%**

Notes:

1 Material collected in the bypass bag was presumed to be windblown.

2 GSRD overflowed. Gross solids escaped the overflow structure and were unaccounted for. As a result, the calculated capture efficiencies are overstated.

Source: Caltrans, 2003.

Based on the above findings and assuming that the mass fraction of material associated with PCBs and mercury yields (i.e., sediment <63 µm) is approximately 15% on average of the captured debris (McKee et al., 2006), then the percent removal of PCBs and mercury by GSRDs is approximately 14% (93% gross solids removal x 15% of captured debris that is associated with PCBs and mercury).

I.4 Baffle Boxes

Baffle boxes are subsurface rectangular vaults that are placed inline in the stormwater system to reduce pollutant loadings by capturing sediments, gross solids, and associated pollutants. Treatment mechanisms typically include filtration, hydrodynamic separation, and adsorption. Several different types of baffle boxes are available commercially and have footprints that vary in size from approximately 10 square feet to over 200 square feet. These subsurface vaults are commonly subdivided into a series of chambers by vertical baffles that interrupt the stormwater flow and promote capture of suspended particles by sedimentation.

The treatment effectiveness of the Nutrient Separating Baffle Box ® (NSBB) by Suntree Technologies has been recently evaluated by the manufacturer to assess the suspended sediment removal efficiency under controlled conditions (Suntree Technologies, 2018). The NSBB contains an additional basket screen that is located above the top of the chamber baffles. The screen captures floating and suspended solids and holds them out of the water column during nonflow periods (Suntree Technologies, 2018). The performance evaluation was conducted on the NSBB model 3-6-72, which has an effective sedimentation area (i.e., footprint) of 18 square feet (6 feet by 3 feet). Additional details of this and other models can be found on the Suntree Technologies, Inc. website. Influent suspended sediment concentrations were measured at 200 mg/L with a median particle size of 100 µm; influent flow rates ranged from 0.35 to 1.75 cfs. Resulting annualized TSS removal efficiency ranged from approximately 51 to 68 percent, with a weighted annualized TSS removal efficiency of 62.9%. The annualized TSS removal efficiency for different flow rates is shown in Table I-6 below.

Table I-6: Nutrient Separating Baffle Box (Model 3-6-72) TSS Removal Efficiency

Mean Flow Rate Tested (cfs)	Measured Removal Efficiency	Annual Weighting Factor	Weighted Removal Efficiency
0.35	67.9%	0.25	16.98%
0.70	65.8%	0.3	19.74%
1.05	63.1%	0.2	12.62%
1.40	56.4%	0.15	8.46%
1.75	50.6%	0.1	5.06%
Weighted Annualized TSS Removal Efficiency			**62.9%**

Source: Suntree Technologies, Inc., 2018

A similar baffle box, the Debris Separating Baffle Box, is sold by Bio Clean. It is assumed that the unit processes in the two proprietary baffle box devices are similar, thus the expected removal efficiencies would be the same.

Based on the above study and assuming that the mass fraction of material associated with PCBs and mercury yields (i.e., sediment <63 µm) is approximately 63% of the captured sediment, then the percent removal of PCBs and mercury by baffle boxes is approximately 40% (63% TSS removal with a median particle size of 100 µm x 63% of material that is associated with PCBs and mercury). Given the limited data available on the effectiveness of baffle boxes in reducing PCBs and mercury, however, and the similarity of the baffle box to the mechanistic removal processes used in HDS systems, a conservative estimate is being used for PCB and mercury reduction for baffle boxes. The pollutant removal efficiency that will be used for baffle boxes is 20%, the same as HDS systems.

I.5 References

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Appendix 12

- Managing PCBs in Building Demolition – Regional Collaboration for a Data Collection and Assessment Program
- PCBS in Building Materials Management Program – Regional Data Summary

MEMORANDUM

TO: BASMAA MPC Committee

FROM: Lisa Sabin and Jon Konnan, EOA, Inc.

DATE: September 23, 2020

SUBJECT: Managing PCBs in Building Demolition – Regional Collaboration for a Data Collection and Assessment Program

1. BACKGROUND

The San Francisco Bay Area Municipal Regional Stormwater Permit (SFBRWQCB 2015, referred to as the MRP) Provision C.12.f requires Permittees to manage PCBs-containing materials and wastes during building demolition activities. Provision C.12.f.ii(3) requires development of a data collection and assessment methodology program by July 1, 2019 to quantify PCBs loads reduced through implementation of the new program for controlling PCBs during building demolition, which began implementation on that date. Provision C.12.f.iii requires Permittees to submit the data collection and assessment methodology with their Fiscal Year (FY) 2019/20 Annual Reports, and states that this reporting should be at the regional level on behalf of all Permittees.

This technical memorandum provides administrative and technical support at the regional level for ongoing efforts by MRP Permittees to comply with data collection, evaluation, and reporting requirements under MRP Provision C.12.f. by:

- Documenting the regional process to collect data from the new program for controlling PCBs during building demolition;
- Presenting the assessment methodology to calculate PCBs loads reduced via the building demolition program;
- Documenting the results of additional literature searches and data gathering efforts conducted to set the stage for refining and reducing uncertainty in the parameters of the assessment methodology equation;
- Describing how data generated from the new demolition control program will be incorporated into the assessment methodology, including providing conversion factors needed for the load reduction calculations; and
- Addressing the MRP Provision C.12.f.iii requirement to submit the data collection and assessment methodology with their FY 2019/20 Annual Reports.

This technical memorandum was developed by the countywide stormwater management programs in the MRP area working together through the Bay Area Stormwater Management Agencies Association (BASMAA) Monitoring and Pollutants of Concern (MPC) Committee (via an informal regional collaboration). The information provided builds upon a previous BASMAA effort that outlined a conceptual approach for the regional data collection process and assessment methodology (BASMAA 2018).

2. REGIONAL DATA COLLECTION PROCESS

This section documents the regional data collection process for the new programs to manage PCBs-containing building materials during demolition that began on July 1, 2019. This process was developed through a collaborative effort by municipalities subject to the MRP, the associated countywide stormwater management programs, and BASMAA. The regional data collection process focuses on collecting, compiling, and evaluating the data generated by the new programs on a regional basis. In addition, when sufficient amounts of new data have been collected, the data will support:

- Development of a revised estimate of the reduction in PCBs loading to stormwater runoff resulting from implementation of the new program.
- Evaluation of various aspects of the PCBs management program and the effectiveness of potential future refinements.

The regional data collection process involves collection of data from individual permit applicants at the municipal level, followed by compilation of data for applicable structures[1] at the countywide level, and data evaluation and reporting at the regional level. The process is described below.

1. The municipality informs demolition permit applicants that their projects are subject to the MRP Provision C.12.f requirements, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.
2. For every demolition project, applicants complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality. For non-applicable buildings, applicants simply check the boxes, certify, and submit to the municipality.
3. The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
4. The municipality then issues the demolition permit or equivalent, according to its procedures.
5. The countywide programs compile the completed Screening Forms and any supporting documents (at a minimum annually, but quarterly is preferred). Municipalities submit forms for applicable structures only to the countywide program; forms for exempt sites need not be submitted. The countywide program compiles the forms and works with the other MRP countywide programs to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

To facilitate a regional approach, the countywide programs developed a regional data management system to compile and evaluate all the data generated by the new programs to manage PCBs during building demolition. The data management system also provides a mechanism for Permittees to gather

[1] Applicable structures are buildings built or remodeled from January 1, 1950 through December 31, 1980, with the following exemptions: single-family residential buildings, wood-framed buildings, and partial building demolitions.

and store the data needed for other closely related reporting requirements, such as submitting the number of applicable structures that applied for a demolition permit that reporting year and a running list of those structures that had materials with PCBs concentrations ≥ 50 ppm, including addresses and estimated demolition dates, with their FY 2019/20 Annual Reports.

The regional data management system is an Excel spreadsheet-based tool for storing and managing the data from each Permittee. The tool also calculates the estimated loads avoided throughout the region via implementation of the new management program, using the assessment methodology and data inputs described below.

3. ASSESSMENT METHODOLOGY

This section describes the assessment methodology and refined data inputs for estimating the loads of PCBs to municipal separate storm sewer systems (MS4s) that are avoided due to implementation of new controls to manage PCBs in building materials during demolition activities. To-date, the load of PCBs reduced through management of PCBs during demolition has been calculated using Equation 1:

Equation 1. $$Load\ of\ PCBs\ Reduced = N \bullet M \bullet SW \bullet E_f$$

Where:

- N = Number of applicable structures with PCBs concentrations ≥ 50 ppm demolished each year (structures/yr)
- M = Average mass of PCBs per applicable structure with PCBs concentrations ≥ 50 ppm (kg/structure)
- SW = Average fraction of PCBs that enters the MS4 due to demolition without new demolition program controls (dimensionless fraction)
- E_f = Average fraction of PCBs prevented by new demolition program controls from entering MS4 (dimensionless fraction)

The MRP 2.0 Factsheet (SFBRWQCB 2015) provides values for each of the four terms in Equation 1 that were used to stipulate the load reduction for implementing the new demolition control program across the MRP area, which was a total of 2 kg/yr. Table 1 presents the values used for each of the four terms in the Factsheet to derive the 2 kg/yr PCBs load reduction credit. The Factsheet notes that each of the terms could be represented by a range of values and the information available to estimate the values of these terms shown in Table 1 was limited.

BASMAA (2018) summarized the above MRP 2.0 Factsheet approach and other previous efforts to estimate PCBs loads from demolition and potential loads reduced by control programs. It also presented a conceptual approach to refining the 2 kg/year PCBs load reduction estimate by describing methods to potentially refine the values of each of the four Equation 1 parameters shown in Table 1. Building upon the approach described in that document, additional literature searches and data gathering efforts were conducted to set the stage for refining and reducing uncertainty in the values of the four terms. For the first two parameters, data will be incorporated as they are generated from the new demolition control programs. The results of these efforts are presented below.

Table 1. Terms in MRP 2.0 Factsheet (SFBRWQCB 2015) equation used to stipulate the loading of PCBs to MS4s avoided by implementing demolition control measures.

Term	Symbol	Term Definition	Value	Units
1	*N*	Number of applicable structures demolished per year with PCBs concentrations ≥ 50 ppm	50	structures/year
2	*M*	Average mass of PCBs per applicable structure with PCBs concentrations ≥ 50 ppm	5	kg/structure
3	*SW*	Average fraction of PCBs that enters MS4s due to demolition without controls[1]	0.01	dimensionless fraction
4	E_f	Average fraction of PCBs prevented by controls[1] from entering MS4 (i.e., assumed effectiveness of controls)	0.8	dimensionless fraction

1. The term "controls" refers to the proposed new demolition management program, not existing construction controls.

Term 1: Number of Applicable Structures Demolished Per Year

Current Basis

A study conducted by the San Francisco Estuary Institute (SFEI) reported a medium estimate of 521 building demolitions per year in commercial and industrial land uses in the study area, based on Bay Area Air Quality Management District (BAAQMD) asbestos abatement permitting data.[2] The SFEI study also reported the following medium estimates: 46% of the demolished buildings were built between 1950 and 1980 and 36% had PCBs concentration in caulks/sealants greater than 50 ppm (Klosterhaus et al. 2011). Multiplying (521) x (0.46) x (0.36) results in an estimated 86 commercial and industrial buildings demolished per year that were built between 1950 and 1980 and had PCBs concentration in caulks/sealants greater than 50 ppm.

Based upon information in the SFEI study and considering that the scope of the program to manage PCBs during demolition is limited to exclude wood frame buildings, the MRP Factsheet assumed 50 applicable structures with PCBs concentrations ≥ 50 ppm are demolished per year in the Bay Area (SFBRWQCB 2015).

Basis for Refinement

Data gathered during the new demolition control programs will be used to document the number of applicable structures with PCBs concentrations ≥ 50 ppm that are demolished each year throughout the MRP area. These data will be used to calculate a regional annual average number of applicable

[2] The BAAQMD regulations require that a "J Number" be applied for and obtained before applying for a building permit for demolition of an existing structure or renovations removing greater than 100 square feet of asbestos material within the San Francisco Bay air basin.

structures with PCBs concentrations ≥ 50 ppm that are demolished. This regional annual average value will be used for Term 1 in Equation 1 (see Table 1).

As part of implementing the new demolition controls that began in July 2019, applicants for demolition permits are required to submit a Screening Form to the municipality with jurisdiction for each applicable structure. Permittees will submit these forms to their countywide stormwater programs, which will document the number of applicable structures with PCBs concentrations ≥ 50 ppm within each jurisdiction that are demolished each year. This information will be compiled in the regional database described previously (Section 2) and used to calculate an annual average number of applicable structures with PCBs concentrations ≥ 50 ppm that are demolished each year in the region. Use of these real-world data collected in the MRP area will substantially reduce the uncertainty that is currently associated with the estimated value for Term 1 that was used in the MRP 2.0 Factsheet.

Term 2: Average Mass of PCBs per Applicable Structure

Current Basis

The SFEI study included estimating the mass of PCBs in caulks in Bay Area buildings and releases to stormwater runoff during renovation and demolition (Klosterhaus et al. 2011). Using a blind sampling approach, the SFEI study collected 25 caulk samples from the exterior of ten commercial and industrial buildings constructed in the study area between 1950 and 1980. The study area was the portion of the San Francisco Bay Area covered by the MRP: Alameda, Contra Costa, Santa Clara, and San Mateo Counties, and the cities of Fairfield, Suisun, and Vallejo. The caulk samples were analyzed for PCBs, which were detected in 88% of the samples, with 40% exceeding 50 ppm, the concentration at which caulk falls under U.S. Environmental Protection Agency (USEPA) regulations (Federal Register 2010). Detectable PCBs concentrations ranged over six orders of magnitude, from 1 to 220,000 ppm. These data were consistent with previous studies in other cities (Klosterhaus et al. 2011).

A geographic information system (GIS)–based approach was then used to estimate the number, area, and volume of currently standing buildings in the study area that were built during the era of greatest PCBs use in caulk. The approach used historical imagery and contemporary land use and involved characterization of randomly selected buildings within the study area, with the result scaled up to extrapolate total building counts and areas in the MRP footprint. Various assumptions, including the frequency of anticipated PCBs detection and PCBs concentrations in the caulk, average mass of caulk per unit building volume, and average building volume, were then applied to calculate an estimate of the total PCBs mass in building caulk in the study area. The evaluation resulted in a mid–range estimate of 10,500 kg PCBs in caulk in buildings located in the study area (low and high estimates were 767 and 46,000 kg, respectively), which equated to an average of 4.7 kg PCBs per building (low and high estimates were 0.6 and 16 kg per building, respectively). The estimate included caulk located on both the interior and exterior of buildings (Klosterhaus et al. 2011). Based upon the information in the SFEI study, the MRP Factsheet assumed an average applicable structure with PCBs concentrations ≥ 50 ppm in the Bay Area contains 5 kg of PCBs (SFBRWQCB 2015).

Basis for Refinement

Data gathered as part of the new demolition control programs will be used to document the quantities and associated PCBs concentrations of priority materials in each applicable structure with PCBs concentrations ≥ 50 ppm. These data will be used to calculate a regional average mass of PCBs per applicable structure with PCBs concentrations ≥ 50 ppm in priority materials. This calculated regional average mass will be used for the value of Term 2 in Equation 1 (see Table 1).

Because of the new program to manage PCBs in building materials during demolition activities, Permittees have the opportunity to gather real-world data to estimate the mass of PCBs in priority materials in each applicable structure with PCBs concentrations ≥ 50 ppm that is demolished in the region. Over time, these data will be compiled into a dataset that can be used to calculate a regional average mass. This calculated average will account for five priority building materials that potentially contain PCBs previously identified for the program (caulk, rubber window gaskets, thermal insulation, fiberglass insulation, and mastic adhesives), while the estimate in the MRP Factsheet (Table 1) is based upon caulk only.

The information provided in the Screening Form includes two types of data that are needed to calculate the mass of PCBs per applicable structure with PCBs concentrations ≥ 50 ppm: (1) the quantity of each priority material in the structure, and (2) the concentration of PCBs in each priority material in the structure. These data will be used as inputs in Equation 2 to calculate the total mass of PCBs in the five priority materials for each applicable structure with PCBs concentrations ≥ 50 ppm that undergoes demolition beginning July 1, 2019.

Equation 2. $$Mass\ of\ PCBs\ per\ Structure\ (mg) = \left[\sum_{i=1}^{n}(C_i \bullet Q_i \bullet F_i)\right]$$

Where:

C_i = Concentration of PCBs in priority material i (mg/kg)

Q_i = Quantity of priority material i (linear feet or square feet)

F_i = Conversion factor – mass of priority material per linear foot of priority material i (kg/ft) or mass of priority material i per square foot of priority material i (kg/ft^2)

Equation 2 only accounts for the PCBs mass associated with the five priority building materials, so may represent an underestimate of the total PCBs mass in a given building. However, the extent of the underestimate would be small if the five priority materials contain most of the PCBs mass in a building.

The PCBs concentrations in each priority material (C_i) that will be used in Equation 2 is provided on the Screening Form for each applicable structure in units of mg of PCBs per kg of priority material (mg/kg).[3]

[3] Please note that this memorandum does not provide guidance on determining a representative PCBs concentration when multiple samples are collected from a single homogeneous area of a building material, per the sampling protocol (e.g., applying average vs. geomean vs. median to determine central tendency when multiple sample results are available). This type of determination should be made once sufficient data are available about PCBs concentration distributions in building material samples (e.g., after two or three years of data have been collected).

The quantity of each priority material (Q_i) that will be used in Equation 2 is provided on the Screening Form in units of linear feet (ft) for caulk and rubber window gaskets, and square feet (ft^2) for thermal or fiberglass insulation and mastic adhesives. Conversion factors (F_i) for each priority material i were developed to provide the mass of priority material per linear foot or per square foot using Equation 3.

Equation 3. $$\boldsymbol{F_i = (D_i \times \rho_i)}$$

Where:

F_i = mass of priority material i per linear foot (of caulk or rubber window gaskets) of i (kg/ft) or mass of priority material i per square foot (of insulation or mastic) of i (kg/ft^2)

D_i = Assumed dimensions of priority material i (ft^2 or ft)

- For caulk and rubber window gaskets, this represents the assumed cross-sectional area of the caulk bead or the gasket in square feet.
- For insulation and mastic, this represents the thickness of the layer of material in feet.

ρ_i = Assumed density of priority material i (kg/ft^3)

Conversion factors that were developed for each priority building material are shown in Table 2. For caulk and rubber window gaskets, the conversion factors estimate the mass of material per linear foot (kg/ft). For thermal or fiberglass insulation and mastic adhesives, the conversion factors estimate the mass of material per square foot (kg/ft^2). Table 2 identifies typical applications for each priority material and the associated conversion factors that were developed for that application. The conversion factors are presented as a range of values and a “Best” value based on the average or mid-range value.

To develop the conversion factors shown in Table 2, data on common priority material dimensions and densities used in typical building construction were gathered through literature review, product technical specifications, building construction guidelines, and other relevant resources (Panke and Cook 1992, Scheffler and Connolly 1996, Jester 1995). The ranges of assumed dimensions and densities that were used to develop the conversion factors are shown in Table 3. Additional information on the assumptions and data used to populate Table 3 and develop the conversion factors shown in Table 2 is presented below.

Product Dimensions

Multiple construction guides were consulted to identify typical dimensions for common applications of priority materials in building construction. For caulk or rubber gaskets, Table 3 provides a range of typical heights and widths of applications around windows and doorframes, and for caulk, also between concrete expansion joints. For fiberglass or thermal insulation, Table 3 provides a range of typical thicknesses for applications used around HVAC systems, heathers, boilers, and pipes, and inside walls or crawl spaces. For mastic adhesives, Table 3 provides typical thicknesses of the material used under or between roofing material and flashing or used on surfaces between carpet and floor tiles. These dimensions apply to newly applied or installed products and may not reflect the dimensions of an aged/weathered product but represent the best information currently readily available.

Table 2. Conversion factors developed to calculate the mass of each priority material per building.

Priority Material Category	Descriptions of typical application	Material[1,2,3]	Conversion Factors				
			Range			Best (Average or mid-range value)	Units
Caulk	Around windows or window frames; around door frames	polysulfide caulk	0.009	-	0.04	0.02	kg/ft
	Expansion joints between concrete sections (e.g., floor segments)	polysulfide caulk	0.01	-	0.15	0.04	kg/ft
Rubber Window Gaskets	Around windows or window frames	Butyl Rubber	0.02	-	0.06	0.03	kg/ft
Thermal or Fiberglass Insulation	Around HVAC systems/ heaters/boilers	Felt Insulation	0.09	-	2.3	0.82	kg/ft^2
		Unfaced Blanket Fiberglass	0.03	-	0.28	0.16	kg/ft^2
	Around heated transfer piping	Fiberglass Pipe Insulation	0.06	-	0.62	0.26	kg/ft^2
	Inside walls or crawl spaces	Loose Fiberglass Fill/Batting	0.17	-	0.24	0.21	kg/ft^2
		Rigid Fiberglass Foam Board	0.03	-	0.45	0.17	kg/ft^2
Adhesive Mastics	Below carpet and floor tiles	Floor Mastic	0.06	-	0.13	0.10	kg/ft^2
	On, under or between roofing materials and flashing	Roof Mastic	0.30	-	0.74	0.50	kg/ft^2

1. Panke and Cook, 1992.
2. Scheffler, M. and Connolly, J. 1996.
3. Jester, T.C. 1995.

Product Densities

The density information reported in Table 3 was gathered from readily available commercial literature on a range of reported densities for the five priority materials. Where possible, information on products that were used in the 1950s to 1980s time period and that were known to contain PCBs were used. However, because this type of product-specific information was not readily available, much of the information used to estimate typical product densities (and dimensions) was based on commercially available products that are currently in use for similar types of building and construction applications. For example, prior to 1980, polysulfide caulks and sealants were frequently formulated with PCBs and are commonly found in buildings constructed between 1950 and 1980. Although currently available polysulfide sealants do not contain PCBs, the densities of these types of sealants were used in Table 3 as reasonable approximations of the densities of polysulfide sealants used in the past. Similarly, the densities for other priority materials shown in Table 3 are primarily based on current use products that are similar to products used in the past.

In addition to the lack of technical data on products in use during the 1950s – 1980s, there is a lack of data about the impact of age and weathering on priority material densities. Loss of volatile material will reduce product densities over time, while other weathering factors, such as compression or stretching, may increase or decrease densities over time. In an attempt to better account for age and weathering, available literature was reviewed to identify information on the densities of priority materials in construction and demolition debris and wastes. This type of information was not found on the specific priority materials of interest. However, US EPA (2016) provides estimates for the weight to volume ratios (i.e., densities) of a number of construction and demolition (C&D) waste categories. These categories include concrete, asphalt paving, roofing, wood, gypsum board, metal, rock/gravel/dirt and sand, and bulk waste. The bulk waste category is a generic catchall grouping for the remainder of C&D debris that does not fit into one of the other categories. Although the materials that are included in this generic category are not specified, the priority materials would likely all fall into the generic bulk waste category when disposed.

Therefore, in the absence of other data, the density for C&D bulk waste may be somewhat comparable to the densities of aged/weathered priority materials and can be compared to the densities of new products provided in Table 3. The average priority material densities in Table 3 range from about 1 kg/ft^3 to 40 kg/ft^3, with an average of 12 kg/ ft^3 across all priority materials. The C&D bulk waste density of 8 kg/ft^3 fits within the range of the priority material densities reported in Table 3 and is about 30% less than the average density across all priority materials. This comparison is limited because of the unknown composition of C&D bulk waste but suggests the densities in Table 3 are reasonable approximations for aged/weathered materials.

Average Conversion Factors

Use of the conversion factors shown in Table 2 requires information on the application and material type of the priority building material. It is anticipated that in some cases the available data may be incomplete or may not match the categories in Table 2. Conversion factors that are not specific to the priority building material's application or material type were therefore developed by averaging across applications/types (Table 4). When calculating the mass of PCBs removed from a demolition site, conversion factors from Tables 2 and/or 4 should be selected as appropriate given the level of information available about the associated sample(s).

Table 3. Dimensions and densities for typical construction applications of priority materials used to develop conversion factors.

Priority Material Category	Descriptions of typical application	Material	Typical Product Dimensions (Inches)						Typical Product Density (kg/ft^3)		
			Width			Depth/Thickness					
			Low	Mid	High	Low	Mid	High	Low	Mid	High
Caulk[1,2,3,4,5]	Around windows or window frames; around door frames	polysulfide caulk	0.25	0.38	0.50	0.13	0.19	0.25		42	
	Expansion joints between concrete sections (e.g., floor segments)	polysulfide caulk	0.25	0.5	1	0.125	0.25	0.5		42	
Rubber Window Gaskets[5]	Around windows or window frames	butyl rubber	0.30	0.40	0.50	0.20	0.30	0.40		41	
Thermal/Fiberglass Insulation[5]	Around HVAC systems/ heaters/boilers	felt insulation[6]	n/a			1.0	3.0	5.0	1.1	3.3	5.4
		unfaced blanket fiberglass[7]				0.5	2.8	5		0.68	
	Around heated transfer piping	fiberglass pipe insulation[8]				1.0	2.0	3.0	0.68	1.6	2.5
	Inside walls or crawl spaces	loose fiberglass fill/batting[9]					3.5		0.59	0.70	0.82
		rigid fiberglass foam board[10]				1.0	2.5	4.0	0.32	0.84	1.4
Adhesive Mastics[5]	Below carpet and floor tiles	floor mastic[11]	n/a			0.13	0.19	0.25		6.2	
	On, under or between roofing materials and flashing	roof mastic[12]				0.13	0.19	0.25	29	32	36

1 Pfeiffer M.J., Darwin, D., 1987.
2 Panke, J.R. and John P. Cook. 1992.
3 Hammer & Hand. 2016.
4 M. Scheffler, M. and J. Connolly, J. 1996.
5 Jester, T.C. 1995.
6 Owens-Corning Thermafiber Industrial Felt
7 Owens-Corning unfaced fiber glass blanket
8 Owens-Corning fiberglass pipe insulation
9 Owens-Corning Loose fill insulation and NIST Fiberglass Batt (wall and ceiling insulation)
10 Owens-Corning Foamular Products - rigid polyurethane foam (PUR/PIR)
11 Latricrete Premium Mastic
12 Henry Company Pro-Grade Flashing Cement, Pro-Grade Plastic Cement and Pro-Grade Repair Cement

Table 4. Average conversion factors developed to calculate the mass of each priority material per building.

Priority Material Category	Conversion Factor	Units
Caulk	0.03	kg/ft
Rubber Window Gaskets	0.03	kg/ft
Thermal/Fiberglass Insulation	0.32	kg/ft^2
Adhesive Mastics	0.30	kg/ft^2

Term 3: Average fraction of PCBs that enters MS4 due to demolition without controls

Current Basis

The average fraction of PCBs that enters the MS4 due to demolition without controls has been estimated at 0.01, based upon professional judgment (i.e., 1% of PCBs in building materials enter MS4s due to demolition without additional controls beyond standard construction site controls). The MRP 2.0 Factsheet (SFBRWQCB 2015) used this value in Equation 1 for Term 3 (see Table 1).

The one percent value presumably incorporates losses to the environment both at the site and during disposal and recycling. Conceptually, this approach assumes that without controls, the transport and fate of the PCBs–containing materials that were in the demolished building fall within three general categories:

1. Released during the demolition (e.g., as part of an initially airborne plume of small particles) and settled in a "halo" around the site. Any wash waters used during the demolition (e.g., during cleaning of equipment, onsite or offsite) that are not fully contained and treated or disposed of could also transport PCBs–containing materials to the MS4.
2. Removed from the site and disposed of as part of the general waste stream (e.g., at a landfill), with some fraction potentially released to the environment during the handling, transport, and disposal process (e.g., during transportation of waste materials by truck to a landfill).
3. Removed from the site with recycled materials, with some fraction potentially released to the environment during the handling, transport, and recycling process (e.g., during transportation of waste materials by truck to a transfer station or recycling facility) or returned to the environment with recycled materials.

This methodology assumes that all PCBs–containing materials released into the environment via any of the above three categories eventually enter the MS4. For example, permanent storage in onsite or offsite pervious areas is assumed to be negligible. All three transport and fate categories are presumably incorporated into the third term of Equation 1, the average fraction of PCBs that enters MS4s due to demolition without controls.

This methodology also assumes that the effectiveness of any existing controls (e.g., proper offsite disposal of PCBs–containing materials, erosion and sediment controls, and other routine construction site controls) is incorporated into the third term of Equation 1.

Basis for Refinement

BASMAA (2018) summarized the readily available information and studies on the release of PCBs to stormwater from building materials during demolition activities. Building upon those efforts, a follow-up literature review was conducted in 2019 to identify any additional information that could be used to refine the assumed fraction of PCBs that enters MS4s due to demolition without controls in Equation 1, Term 3 (see Table 1). This literature review was also conducted to identify new information that could be used to refine Term 4 (i.e., the fraction of PCBs prevented by controls from entering MS4s). This section summarizes the literature review efforts and identifies the outcomes for Term 3. The literature review outcomes for Term 4 are presented in the next section.

Literature Review

The literature review conducted in 2019 built upon the information summarized in BASMAA (2018). The Google search engine as well as specific scientific literature databases and government websites were searched, including:

- Google Scholar
- Google Books
- SpringerLink
- Wiley Online Library
- American Chemical Society
- ScienceDirect.com
- Elsevier
- US EPA Website

Major search terms (and similar variations or combinations of these terms) that were used included the following:

- PCBs transport and fate
- PCBs in soils/stormwater/demolition/building materials/building demolition/building renovation
- PCBs in caulk/rubber window gaskets/thermal insulation/fiberglass insulation/mastic
- PCBs contaminated sites/cleanup sites/remediation sites
- PCBs in school buildings
- Remediation of PCBs in buildings/building materials
- Construction and Demolition Debris/Waste

- Demolition dust and stormwater impacts
- Soil contamination from PCB-containing caulk/materials/buildings
- PCBs in soil after demolition
- PCB contamination from polysulfide sealants
- PCB-contaminated soil/demolition dust
- Mass of PCBs in Building materials
- Fate of PCBs in the environment/urban environment/caulk/building materials
- PCBs Source apportionment
- PCBs Waste characterization
- Accumulation rates of PCBs in soils
- PCB cleanup and disposal programs
- Managing remediation waste from PCB cleanups
- Handling and disposal of PCBs waste
- Improved recycling practices/BMP effectiveness and stormwater impacts
- PCBs sources/emissions/releases from caulk/buildings/schools
- PCBs emissions during demolition/renovation/abatement/replacement/removal of caulk
- Dust from demolition and construction sites

In addition, online searches were performed to identify any new research that had cited one or more of the studies previously described in BASMAA (2018). These citations were reviewed to identify any relevant studies that may have occurred more recently and relied upon these earlier studies.

Literature Review Outcomes

The 2019 literature review did not find any new information to validate, refine, or further reduce uncertainty in the assumed value that was used in the MRP 2.0 Factsheet for the fraction of PCBs entering MS4s due to demolition activity without controls in Equation 1, Term 3 (see Table 1). To date, the vast majority of research on the release of PCBs contained in building materials has focused on human health risks and quantifying human exposures via air, ingestion, and/or dermal pathways. It appears the release of PCBs to stormwater from building materials in general, and specifically during demolition or renovation activities has not been quantitatively studied, outside of the limited studies reported previously in BASMAA (2018). These earlier studies developed conceptual models and thought experiments to estimate the fraction of PCBs released based on the limited measurement data available. Without new measurement data, however, further attempts to improve upon these efforts and reduce uncertainty in the current estimate of Term 3 are not warranted.

BASMAA (2018) recommends exploring whether disposal and/or recycling practices have improved in recent years such that less PCBs would be lost to the environment via these pathways. Evidence was not found during the literature review of improved recycling or disposal practices implemented in the Bay Area in recent years that would result in reduced releases of PCBs to MS4s from demolition materials.

This finding is further supported by anecdotal information about recycling facilities in the South Bay Area. Over the past 5+ years Santa Clara Valley MRP Permittees have been investigating sources of PCBs to public ROWs in industrial areas and have frequently targeted facilities where demolition materials are brought on site for recycling. These investigations have documented poor housekeeping practices, visible scrap material and soils tracking off sites, and general lack of appropriate stormwater BMPs at many of these types of facilities which have resulted in citations during municipal stormwater inspections. Overall, these investigations have found large inconsistencies in materials handling practices across facilities, and even at the same facility over time. Although not a quantitative assessment, this information suggests that it is unlikely consistent improvements in recycling practices across facilities have occurred in recent years.

Term 4: Average fraction of PCBs prevented by new controls from entering MS4

Current Basis

The estimated fraction of PCBs prevented by new controls from entering MS4s has been estimated at 0.8, based mainly upon professional judgment (i.e., 80% of PCBs are prevented from entering MS4s due to the new programs to manage PCBs during building demolition). The MRP 2.0 Factsheet (SFBRWQCB 2015) used this value in Equation 1 for Term 4 (see Table 1).

Basis for Refinement

As described above, a review of readily available literature was conducted in 2019 to identify any new information that could be used to refine the assumed effectiveness of controls to prevent PCBs from entering MS4s (Term 4). The literature review efforts are summarized in the above section on Term 3. This section presents the outcomes of the literature review for Term 4.

Literature Review Outcomes

The 2019 literature review did not find any new information to validate, refine, or further reduce uncertainty in the assumed value that was used in the MRP 2.0 Factsheet for the fraction of PCBs prevented by new controls from entering MS4s. However, BASMAA (2018) identified two earlier studies that estimated 99% capture of PCBs contained in caulk removed from buildings using appropriate abatement measures (high power vacuums and power washing during removal). Based on these data, a reasonable assumption is that the new control programs will be similarly effective at capturing PCBs in priority materials that, prior to demolition, are removed from a building using appropriate abatement methods. Given the new programs are focused on controlling PCBs in priority materials only, the use of a lower (80%) value for the overall effectiveness of the controls at preventing PCBs from entering MS4s (Term 4) appears reasonable.

Using Data from New Program on PCBs Mass in Priority Building Materials

The new management program implemented by Permittees as of July 1, 2019 requires that demolition project proponents identify priority materials in applicable buildings, collect representative samples for analysis, and report the concentrations of PCBs. When a sample concentration is equal to or greater than 50 ppm, the estimated amount of material in the building associated with that sample (and presumably removed and properly disposed of before the demolition occurs) is also reported. These concentration and quantity data can be combined to determine the mass of PCBs presumably removed from the building before demolition. These data represent an estimate of the mass of PCBs removed from the building via removal of the priority materials (rather than the estimate provided in the MRP 2.0

Factsheet of the total mass of PCBs in the building in all PCBs-containing materials). Thus, the value of Term 4 in Equation 1 and Table 1 may be set to 1 when evaluating the PCBs load avoided using PCBs mass in priority building materials data from the new program, since it may be assumed that the program removes 100% of the priority materials with PCBs ≥ 50 ppm that were identified by the sampling protocol.

4. POTENTIAL FUTURE REFINEMENTS TO THIS METHODOLOGY

It should be noted that the new program for controlling PCBs during building demolition is in its early stages, having begun implementation only recently (i.e., on July 1, 2019). The data generated during the first fiscal year of the program have not yet been compiled and evaluated. As experience is gained in implementing the program and the associated data are collected and evaluated, and/or new information becomes available from any other source, the need may arise to revise the data collection and assessment methodology presented in this memorandum. As needed, staff from the countywide programs in the MRP area will work with MRP Permittee and Regional Water Board staff to make any future refinements to the program and methodology.

5. REFERENCES

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Memorandum

Date: September 18, 2020

To: BASMAA Monitoring and Pollutants of Concern Committee

From: Lisa Austin, Principal, and Kelly Havens, Senior Engineer

Subject: PCBS in Building Materials Management Program – Regional Data Summary
Geosyntec Project Number: LA0597/CWR0609

1. BACKGROUND

Municipal Regional Stormwater Permit (MRP; Order No. R2-2015-0049) Provision C.12.f requires Permittees to manage PCBs-containing materials and wastes during building demolition activities. The MRP Permittees have developed and implemented a process, beginning in July 2019, for managing materials with PCBs concentrations of 50 ppm or greater in applicable structures at the time applicable structures undergo demolition. Applicable structures include commercial, public, institutional, and industrial buildings constructed or remodeled between the years 1950 and 1980 undergoing full-building demolition. Single-family residential and wood frame structures are exempt.

This technical memorandum documents the following items as required by MRP Provision C.12.f.iii.(4):

a. The number of applicable structures that applied for a demolition permit during the reporting year; and

b. A running list of the applicable structures that applied for a demolition permit (since the date the PCBs control protocol was implemented) that had material(s) with PCBs at 50 ppm or greater, with the address, demolition date, and brief description of PCBs control method(s) used.

This memorandum was developed by the countywide stormwater management programs in the MRP area working together through the Bay Area Stormwater Management Agencies Association (BASMAA) Monitoring and Pollutants of Concern (MPC) Committee (via an informal regional collaboration).

2. NUMBER OF APPLICABLE STRUCTURE APPLICATIONS

The number of applicable structures that applied for a demolition permit during Fiscal Year 2019/20 (i.e., from July 1, 2019 – June 30, 2020), as well as the number of samples in those buildings that were equal to or greater than 50 ppm, is summarized in Table 1 below.

A list providing the same information, but for each Permittee, is provided in Attachment 1.

Table 1: Number of Applicable Structure Applications Received in FY 2019/20

County	# Applicable Applications	# Samples ≥ 50 ppm PCBs
Alameda	26	23
Contra Costa	3	6
San Mateo	12	3
Santa Clara	37	8
Solano	5	0
Total	**83**	**40**

3. LIST OF APPLICABLE STRUCTURES

A running list of the applicable structures that applied for a demolition permit since July 1, 2019 that had materials with PCBs at 50 ppm or greater, with the address and estimated demolition date, is provided in Attachment 2.

4. DESCRIPTION OF PCBS CONTROL METHOD

4.1 Permittee Control Method

On behalf of MRP Permittees, the BASMAA conducted a Regional Project that developed an implementation framework, guidance materials, and tools for local agencies to ensure that PCBs-containing materials and wastes are properly managed during building demolition; these materials are provided in Attachment 3. The Regional Project also provided training materials and a workshop for municipal staff and an outreach workshop for the industry on implementing the framework/protocols developed via the project.

Permittees have implemented the following process for this control measure:

- The municipality informs applicable demolition permit applicants that their projects are subject to the program for managing materials with PCBs, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.

- For every applicable demolition project, applicants implement the BASMAA protocol for identifying building materials with PCBs concentrations of 50 ppm or greater and then complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality.
- The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
- The municipality then issues the demolition permit or equivalent, according to its procedures.
- The municipality sends each completed Screening Form for applicable structures and any supporting documents to its countywide program. The countywide program compiles the forms and works with the other MRP countywide programs to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

4.2 Building Demolition Applicant Control Method

Applicants that determine, through implementation of the BASMAA protocol, that PCBs exist in priority building materials must follow applicable federal and state laws for handling and disposal. This may include reporting to U.S. Environmental Protection Agency (USEPA), the San Francisco Bay Regional Water Quality Control Board, and the California Department of Toxic Substances Control (DTSC). These agencies may require additional sampling and abatement of PCBs.

Depending on the approach for sampling and removing building materials containing PCBs, the applicant may need to notify or seek advance approval from USEPA before building demolition. Even in circumstances where advance notification to or approval from USEPA is not required before the demolition activity, the disposal of PCBs waste is regulated under Toxic Substances Control Act (TSCA). For example, TSCA requires manifesting the waste for transportation and disposal. (See 40 Code of Federal Regulations (CFR) 761 and 40 CFR 761, Subpart K.) TSCA-regulated does not equate solely to materials containing PCBs at or above 50 ppm. There are circumstances in which materials containing PCBs below 50 ppm are subject to regulation under TSCA. (See 40 CFR 761.61(a)(5)(i)(B)(2)(ii).). 40 CFR 761.3 provides information relative to disposal of PCBs-containing building materials, including definitions of PCBs bulk product wastes and PCBs remediation wastes. Further information is provided in a memorandum "PCB Bulk Product Waste Reinterpretation" from the Office of Resource Conservation and Recovery, EPA[1].

[1] Located here: https://www.epa.gov/sites/production/files/2016-01/documents/wste-memo_102412.pdf.

Additionally, the disposal of PCBs waste is subject to California Code of Regulations (CCR) California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

*****

Attachment 1
Number of Applicable Structure Applications by Permittee

Permittee	# Applicable Applications	# Samples ≥ 50 ppm PCBs
Alameda	0	0
Albany	0	0
Berkeley	0	0
Dublin	0	0
Emeryville	0	0
Fremont	2	1
Hayward	2	3
Livermore	0	0
Newark	0	0
Oakland	21	19
Piedmont	0	0
Pleasanton	0	0
San Leandro	1	0
Union City	0	0
Alameda County	0	0
Alameda County Total	**26**	**23**
Clayton	Exempt	Exempt
Concord	1	6
Danville	0	0
El Cerrito	0	0
Hercules	0	0
Lafayette	0	0
Martinez	0	0
Moraga	0	0
Orinda	0	0
Pinole	0	0
Pittsburg	0	0
Pleasant Hill	0	0
Richmond	2	0
San Pablo	0	0
San Ramon	0	0
Contra Costa County	0	0
Walnut Creek	0	0
Contra Costa County Total	**3**	**6**
Campbell	0	0
Cupertino	0	0
Los Altos	0	0

Permittee	# Applicable Applications	# Samples ≥ 50 ppm PCBs
Los Altos Hills	0	0
Los Gatos	0	0
Milpitas	0	0
Monte Sereno	0	0
Mountain View	2	0
Palo Alto	2	4
San Jose	4	0
Santa Clara	1	0
Santa Clara County	0	0
Saratoga	0	0
Sunnyvale	28	4
Santa Clara County Total	**37**	**8**
Atherton	0	0
Belmont	0	0
Brisbane	0	0
Burlingame	1	0
Colma	0	0
Daly City	0	0
East Palo Alto	0	0
Foster City	0	0
Half Moon Bay	0	0
Hillsborough	0	0
Menlo Park	1	1
Millbrae	0	0
Pacifica	0	0
Portola Valley	0	0
Redwood City	1	0
San Bruno	0	0
San Carlos	1	0
San Mateo	0	0
San Mateo County	1	0
South San Francisco	6	2
Woodside	1	0
San Mateo County Total	**12**	**3**
City of Vallejo	5	0
City of Fairfield	0	0
Suisun City	0	0

Permittee	# Applicable Applications	# Samples ≥ 50 ppm PCBs
Solano County Total	**5**	**0**
MRP Permittee Regional Total	**83**	**40**

Attachment 2
Number of Applicable Structure Applications by Permittee with PCBs at 50 ppm or Greater

Program	Permittee	Building ID	Address	Estimated Demo Date	# Samples ≥ 50 ppm PCBs	PCBs Concentration Range (mg/kg)
ACCWP	Oakland	AC - 14	5441 International Boulevard, Oakland, CA, 94601	June 2020	5	54 - 174
ACCWP	Oakland	AC - 15	5441 International Boulevard, Oakland, CA, 94601	June 2020	1	139.4
ACCWP	Oakland	AC - 16	5441 International Boulevard, Oakland, CA, 94601	June 2020	2	66.1 - 85
ACCWP	Oakland	AC - 17	5441 International Boulevard, Oakland, CA, 94601	June 2020	1	56
ACCWP	Oakland	AC - 18	5441 International Boulevard, Oakland, CA, 94601	June 2020	2	53 - 64
ACCWP	Oakland	AC - 19	5441 International Boulevard, Oakland, CA, 94601	June 2020	1	61
ACCWP	Oakland	AC - 21	5441 International Boulevard, Oakland, CA, 94601	June 2020	2	58 - 104
ACCWP	Oakland	AC - 26	5441 International Boulevard, Oakland, CA, 94601	June 2020	1	125
ACCWP	Oakland	AC - 31	7200 Earhart Rd, Oakland, CA, 94621	November 2019	4	190 - 537,000
ACCWP	Fremont	AC -32	39150 Fremont Bank, Fremont, CA, 94539	Jan 2020	1	50
ACCWP	Hayward	AC -34	22300 City Center Drive, Hayward, CA, 94541	April 2020	3	66 - 9,600
CCCWP	Concord	CCC-01	2292 Concord Blvd, Concord, CA, 94520	May 2020	6	140-550
SCVURPPP	Palo Alto	SC-005	180 El Camino Real, Palo Alto, CA, 94304	March 2020	4	676 - 14,250
SCVURPPP	Sunnyvale	SC-028	650 Vaqueros Ave, Sunnyvale, CA, 94085	July 2020	1	1,100
SCVURPPP	Sunnyvale	SC-031	525 Del Rey Ave, Sunnyvale, CA, 94085	July 2020	2	490 - 630
SCVURPPP	Sunnyvale	SC-043	390 Caribbean Dr., Sunnyvale, CA 94089	Unknown	1	91
SMCWPPP	Menlo Park	SMC-2	305 Constitution Dr., Menlo Park, CA, 94025	Jan 2020	1	54.5
SMCWPPP	South San Francisco	SMC-6	1 Chestnut Avenue, South San Francisco, CA, 94080	Jan 2020	2	247

Attachment 3
PCBs in Priority Building Materials: Model Screening Assessment Applicant Package

PCBs in Priority Building Materials: Model Screening Assessment Applicant Package

Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

Bay Area Stormwater Management Agencies Association

August 2018 (Revised July 2, 2019)

This document is a deliverable of the Bay Area Stormwater Management Agencies Association (BASMAA) project *Managing PCBs−Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training*. BASMAA developed guidance, tools, and outreach and training materials to assist with San Francisco Bay Area municipal agencies' efforts to address the requirements of Provision C.12.f. of the Bay Area Municipal Regional Stormwater Permit (referred to as the MRP). Provision C.12.f of the MRP requires Permittees to manage PCBs–containing building materials during demolition.

We gratefully acknowledge the BASMAA Steering Committee for this project, which provided overall project oversight, including during the development of this and other project deliverables:

- Reid Bogert, Stormwater Program Specialist, San Mateo Countywide Water Pollution Prevention Program (BASMAA Project Manager)
- Amanda Booth, Environmental Program Analyst, City of San Pablo
- Kevin Cullen, Program Manager, Fairfield-Suisun Urban Runoff Management Program
- Matt Fabry, Program Manager, San Mateo Countywide Water Pollution Prevention Program
- Gary Faria, Supervisor, Inspection Services, Building Inspection Division, Contra Costa County
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- Pam Boyle Rodriguez, Manager, Environmental Control Programs – Stormwater, City of Palo Alto
- Jim Scanlin, Program Manager, Alameda Countywide Clean Water Program
- Melody Tovar, Regulatory Programs Division Manager, City of Sunnyvale

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Stakeholder Group	Representative(s)
Regulatory – stormwater/PCBs	Luisa Valiela and Carmen Santos, U.S. EPA Region 9
Regulatory – stormwater/TMDL	Jan O'Hara, San Francisco Bay Regional Water Quality Control Board
Regulatory – experience with related program (asbestos management)	Ron Carey and Richard Lew, Bay Area Air Quality Management District
Industry – demolition contractors	Avery Brown, Ferma Corporation
Industry – remediation consultants	John Martinelli, Forensic Analytical Consulting John Trenev, Bayview Environmental Services, Inc.
MRP Permittee – large municipality	Patrick Hayes, City of Oakland
MRP Permittee – medium municipality	Kim Springer, San Mateo County Office of Sustainability
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PCBs in Priority Building Materials: Model Screening Assessment Applicant Package

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The material presented in this document is intended solely for the implementation of a municipal regulatory program required by the San Francisco Bay Area Regional Water Quality Control Board Municipal Regional Stormwater Permit for the protection of water quality under the Clean Water Act.

BASMAA prepared the tools and guidance herein to assist MRP Permittees' efforts to address the requirements of Provision C.12.f. of the MRP. The project team received input from a variety of stakeholders during development of the tools and guidance, including regulators (San Francisco Bay Regional Water Quality Control Board, U.S. EPA, and Bay Area Air Quality Management District staff), Bay Area municipal agency staff, and industry representatives.

This document does not address other environmental programs or regulations (e.g., PCBs regulations under the Toxic Substances Control Act (TSCA); federal, state, or local regulations for hazardous material handling and hazardous waste disposal; health and safety practices to mitigate human exposure to PCBs or other hazardous materials; recycling mandates; and abatement at sites with PCBs (or other contaminants). The applicant is responsible for knowing and complying with all relevant laws and regulations.

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Process Overview

This document provides a model PCBs in Priority Building Materials Screening Assessment process to be conducted by demolition project proponents (applicants). A flow chart illustrating the above processes is provided in **Attachment A**.

Applicants proposing to demolish buildings must conduct the PCBs screening assessment. Through the PCBs screening assessment applicants will:

1) Determine whether the building proposed for demolition is likely to have PCBs-containing building materials (see discussion of applicable structure); and
2) Determine whether PCBs are present at a concentration equal to or greater than 50 parts per million (ppm) in building materials.

Use the *PCBs Screening Assessment Form* (**Attachment B**) to summarize and certify the information required by the municipality to issue the demolition permit. The form is divided into four parts:

- **Part 1** provide applicant information and project location.
- **Part 2** complete the questions to identify whether the project involves an *applicable structure.* If the demolition does not involve an applicable structure, the form may be certified and submitted without completing Part 3.
- **Part 3** complete the questions to provide the concentrations of PCBs in any *priority building materials*.
- **Part 4** certify the information being submitted.

> Water quality within the San Francisco Bay Region is regulated by the San Francisco Bay Area Regional Water Quality Control Board (Regional Water Board).
>
> In 2015, the Regional Water Board reissued the Municipal Regional Permit (MRP)[1] that regulates discharges of stormwater runoff. The MRP includes provisions for reducing discharges of polychlorinated biphenyls (PCBs) in stormwater runoff and requires municipalities to develop a program to manage priority PCBs–containing building materials during demolition and implement the program by July 1, 2019.
>
> Existing federal and state regulations create the framework for managing PCBs in building materials once those PCBs are identified through this program and for disposing of wastes containing PCBs.

Note that fluorescent light ballasts, polyurethane foam furniture, and Askarel fluid used in transformers, all of which may contain PCBs, are typically managed during pre-demolition activities under current regulations and programs that require removal of universal waste and outdated transformers. For this process it is assumed that those materials will be evaluated and managed under those existing programs.

> This screening process is part of a program for water quality protection and was designed in accordance with requirements in the MRP. [1] It does not address other environmental programs or regulations (e.g., PCBs regulations under the Toxic Substances Control Act (TSCA); federal, state, or local regulations for hazardous material handling and hazardous waste disposal; health and safety practices to mitigate human exposure to PCBs or other hazardous materials; recycling mandates; or abatement at sites with PCBs (or other contaminants). **The applicant is responsible for complying with all relevant laws and regulations. See the Notices to Applicants section for additional information.**

[1] A National Pollutant Discharge Elimination System (NPDES) permit, Order No. R2-2015-0049, issued to municipalities in the counties of Alameda, Contra Costa, San Mateo, and Santa Clara, and the Cities of Fairfield, Suisun City, and Vallejo.

Applicant Instructions for Completing the PCBs Screening Assessment Form

Applicants for demolition permits or other permits that involve the complete demolition of a building must conduct an assessment to screen for PCBs in *priority building materials*. *Use the PCBs Screening Assessment Form*, to summarize and certify the information needed by the municipality to issue a demolition permit. The form is provided in **Attachment B**. If the project includes the demolition of multiple buildings complete one form for each building to be demolished.

Key Definitions

Demolition means the wrecking, razing, or tearing down of any building. The definition is intended to be consistent with the demolition activities undertaken by contractors with a C-21 Building Moving/Demolition Contractor's License.

Priority Building Materials are:

1. Caulk;
2. Thermal insulation;
3. Fiberglass insulation;
4. Adhesive mastics; and
5. Rubber window gaskets.

Buildings are structures with a roof and walls standing more or less permanently in one place. Buildings are intended for human habitation or occupancy.

Applicable Structures are defined as buildings constructed or remodeled between January 1, 1950 and December 31, 1980. Wood framed buildings and single-family residential buildings are not applicable structure regardless of the age of the building.

Part 1. Owner and project information

Complete the owner and consultant information and the project location information.

For the Type of Construction select one of the following options:

- **Wood Frame** (Buildings constructed with lumber or timbers, which make up the studs, plates, joists, and rafters.)
- **Masonry Construction** (Buildings constructed with concrete blocks or bricks as the load bearing walls typically with the floors and ceilings constructed with wooden joists.)
- **Steel Frame Construction** (Buildings constructed with steel studs or steel columns and steel joists or trusses to support floors and roofs. Includes light gauge steel construction and high-rise steel construction.)
- **Concrete Frame** (Buildings constructed with reinforced concrete columns, concrete beams, and concrete slabs.)
- **Pre-Engineered** (Buildings constructed with pre-engineered parts bolted together.)

Part 2. Is building subject to the screening requirement based on type, use, and age of the building?

Part 2 documents the determination of whether the proposed demolition will affect an *applicable structure*. If the demolition does not affect an *applicable structure*, then the assessment is complete, and the form can be certified.

This determination screens out buildings that are a lower priority with regard PCBs-containing materials and provides an off-ramp from the rest of the screening process.

Question 2.a: Is the building to be demolished wood framed and/or single family residential?

- If YES the PCBs Screening Assessment is complete, skip to the certification in Part 4.
- If NO, continue to Question 2.b.

Question 2.b: Was the building to be demolished constructed or remodeled between January 1, 1950 and December 31, 1980?

- If YES continue to Question 2.c.
- If NO, the PCBs Screening Assessment is complete, skip to the certification in Part 4.

> Studies have found the highest concentrations of PCBs in building materials in buildings that were built or remodeled from 1950 to 1980.
>
> For this process, the date that the building permit was issued will be used to determine applicability.

Question 2.c: Is the proposed demolition a complete demolition of the building (as defined in key definitions of this document)?

- If YES continue to Part 3.
- If NO, the PCBs Screening Assessment is complete, skip to the certification in Part 4.

Part 3. Report concentrations of PCBs in priority building materials

Part 3 documents the results of the assessment of PCBs concentrations in *priority building materials*. Part 3 is only required for proposed demolition of an *applicable structure*, as determined in Part 2. Check the option used.

- **Option 1** Conduct representative sampling and analysis of the *priority building materials* per the *Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition* (August 2018) provided in **Attachment C**.
- **Option 2** Use existing sampling results of the *priority building materials.* Applicants who have conducted sampling prior to the publication of the protocol may use that data provided it is consistent with the protocol (e.g., analytical methods, sample collection frequency, QA/QC). It is anticipated that prior sampling results will rarely be available and that most Applicants will need to use Option1.

3.a Option 1 – Conduct representative sampling

Check this box if you conducted representative sampling and analysis of the *priority building materials* per the *Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition* (August 2018) (**Attachment C**).

- Complete the applicable tables for each priority building material.
- Attach the contractor's report[2] documenting the evaluation results.
- Attach (or include in the contractor's report) the QA/QC checklist (see **Attachment C**, Section 3.2.4).
- Attach copies of the analytical data reports.

---

[2] The contractor's report of the findings of the PCBs building material evaluation. See section 3 of Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition (Attachment C).

3.a Option 2 – Use existing sampling records

In some cases, a property owner may have conducted sampling of the *priority building materials* for PCBS. If such data exist, you may use these data to demonstrate the concentration of PCBs in the *priority building materials* for the PCBs screening. However, if the sampling must be consistent with the *Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition.*

- ➢ Complete the applicable tables for each priority building material.
- ➢ Attach the contractor's report/statement that the results are consistent with the *Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition*.
- ➢ Attach copies of the analytical data reports.

Part 3 Tables Summarize concentrations of PCBs in priority building materials

Use these tables to summarize the concentrations of PCBs in the *priority building materials*.

- Each page of the table is for a different material. Duplicate the pages as needed to report all concentration data.
- A blank page is provided. Applicants have the option of submitting PCBs concentration data on other materials in addition to the *priority building materials*.

Column 1: required for all priority building material PCBs concentrations

- ➢ Use column 1 to report all PCBs concentrations in the *priority building materials*. Provide short description of the sample location, concentration.

Column 2: only required for PCBs concentrations ≥50 ppm

- ➢ Use column 2 to estimate the amount of material associated with each sample.

Part 4. Certification

- ➢ Complete the certification. The certification must be signed by the property owner or the owner's agent or legal representatives and the consultant who complete the application form.

Notices to Applicants Regarding Federal and State PCBs Regulations

Applicants that determine PCBs exist in priority building materials must follow applicable federal and state laws. This may include reporting to U.S. Environmental Protection Agency (USEPA), the San Francisco Bay Regional Water Quality Control Board, and the California Department of Toxic Substances Control (DTSC). These agencies may require additional sampling and abatement of PCBs.

Depending on the approach for sampling and removing building materials containing PCBs, you may need to notify or seek advance approval from USEPA before building demolition. Even in circumstances where advance notification to or approval from USEPA is not required before the demolition activity, the disposal of PCBs waste is regulated under Toxic Substances Control Act (TSCA).

Additionally, the disposal of PCBs waste is subject to California Code of Regulations (CCR) California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

Building owners and employers need to consider worker and public safety during work involving hazardous materials and wastes including PCBs.

Federal and State Regulations

See 40 Code of Federal Regulations (CFR) 761.3 for important information relative to disposal of PCBs-containing building materials, including definitions of PCBs bulk product wastes and PCBs remediation wastes. Also see the memorandum dated October 24, 2012 “PCB Bulk Product Waste Reinterpretation” from Suzanne Rudzinski, Director, Office of Resource Conservation and Recovery, EPA.

Disposal of PCBs wastes are subject to TSCA requirements such as manifesting of the waste for transportation and disposal. See 40 CFR 761 and 40 CFR 761, Subpart K.

TSCA-regulated does not equate solely to materials containing PCBs at or above 50 ppm. There are circumstances in which materials containing PCBs below 50 ppm are subject to regulation under TSCA. See 40 CFR 761.61(a)(5)(i)(B)(2)(ii).

Disposal of PCBs wastes are subject to California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

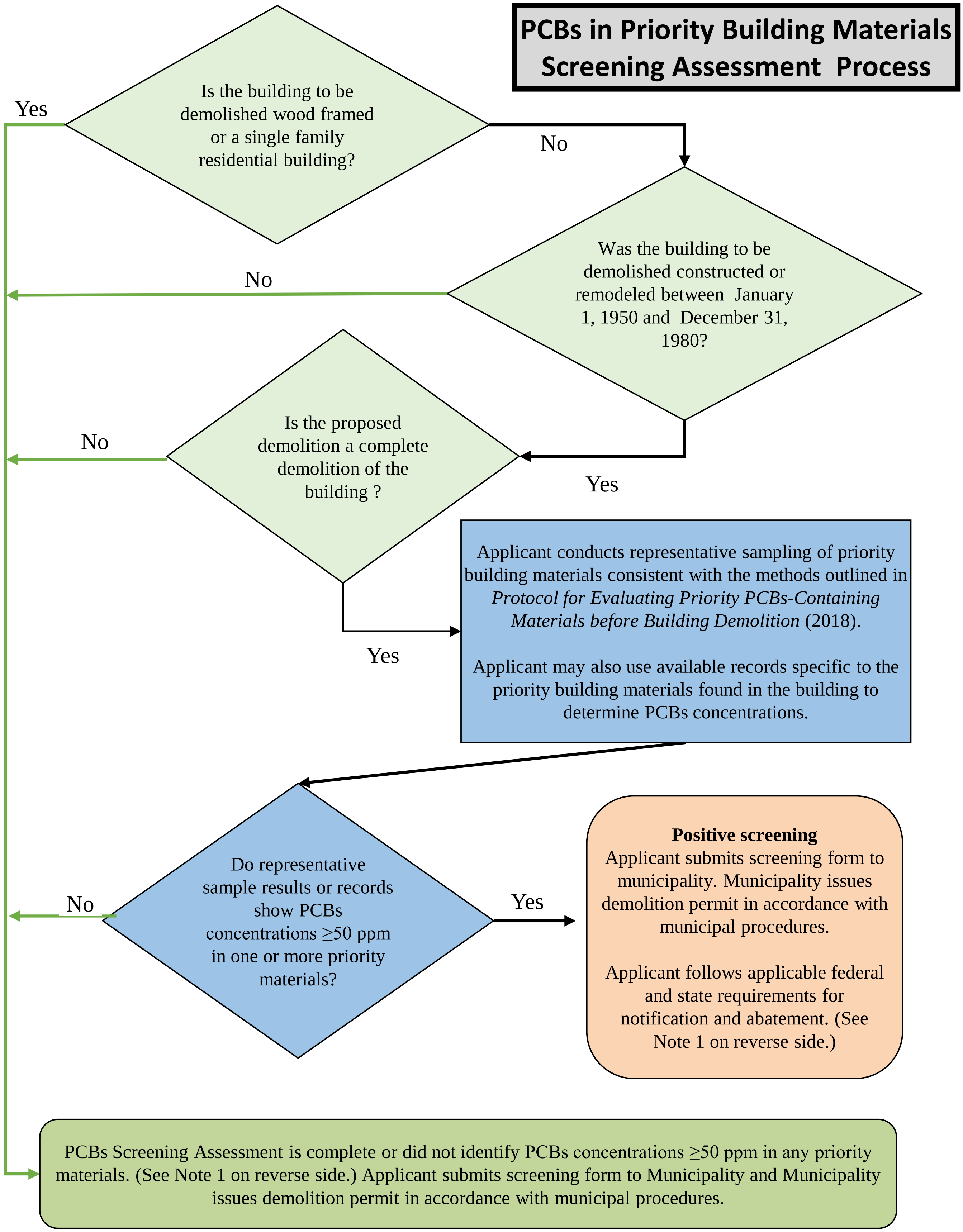
California hazardous waste regulatory levels for PCBs are 5 ppm based on the Soluble Threshold Limit Concentration test and 50 ppm based on the Total Threshold Limit Concentration test, see CCR, Title 22, Section 66261.24, Table III.

Agency Contacts

Applicants should contact the appropriate agencies and review the relevant guidance and information about PCBs in building materials. Municipal staff are not able to advise you on the requirements of the applicable federal and state laws.

Agency	Contact	Useful Links
US Environmental Protection Agency	Steve Armann (415) 972-3352 armann.steve@epa.gov	https://www.epa.gov/pcbs (EPA PCB website) https://www.epa.gov/pcbs/questions-and-answers-about-polychlorinated-biphenyls-pcbs-building-materials (PCBs in Building Materials Fact Sheet and Q/A Document) https://www.epa.gov/pcbs/pcb-facility-approval-streamlining-toolbox-fast-streamlining-cleanup-approval-process (USEPA PCB Facility Approval Streamlining Toolbox (PCB FAST)) https://www.epa.gov/pcbs/polychlorinated-biphenyls-pcbs-building-materials#Test-Methods (See Information for Contractors Working in Older Buildings that May Contain PCBs)
San Francisco Bay Regional Water Quality Control Board	Jan O'Hara (510) 622-5681 Janet.O'Hara@waterboards.ca.gov Cheryl Prowell (510) 622-2408 Cheryl.Prowell@waterboards.ca.gov	https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbstmdl.shtml https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/sitecleanupprogram.html
Department of Toxic Substances Control	Regulatory Assistance Office 1-800-72TOXIC RAO@dtsc.ca.gov	http://www.dtsc.ca.gov/SiteCleanup/Brownfields/upload/PUB_SMP_Guide-to-Selecting-a-Consultant.pdf
California Division of Occupational Safety and Health (known as Cal/OSHA)	CalOSHA Consultations Services 1-800-963-9424	https://www.dir.ca.gov/dosh/consultation.html

Attachment A
Process Flow Chart


PCBs in Priority Building Materials Screening Assessment Process
Is the building to be demolished wood framed or a single family residential building?
Yes
No
Was the building to be demolished constructed or remodeled between January 1, 1950 and December 31, 1980?
No
Yes
Is the proposed demolition a complete demolition of the building ?
No
Yes
Applicant conducts representative sampling of priority building materials consistent with the methods outlined in *Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition* (2018).
Applicant may also use available records specific to the priority building materials found in the building to determine PCBs concentrations.
Do representative sample results or records show PCBs concentrations ≥50 ppm in one or more priority materials?
No
Yes
Positive screening
Applicant submits screening form to municipality. Municipality issues demolition permit in accordance with municipal procedures.
Applicant follows applicable federal and state requirements for notification and abatement. (See Note 1 on reverse side.)
PCBs Screening Assessment is complete or did not identify PCBs concentrations ≥50 ppm in any priority materials. (See Note 1 on reverse side.) Applicant submits screening form to Municipality and Municipality issues demolition permit in accordance with municipal procedures.

Note 1

- ❖ Building materials containing PCBs at or above 50 ppm that were manufactured with PCBs (e.g., caulk, joint sealants, paint) fall under the category of PCBs bulk product wastes. See 40 Code of Federal Regulations (CFR) 761.3 for a definition of PCBs bulk product wastes.

- ❖ Building materials such as concrete, brick or metal contaminated with PCBs are PCBs remediation wastes (e.g., concrete contaminated with PCBs from caulk that contains PCBs). 40 CFR 761.3 defines PCBs remediation wastes.

- ❖ Disposal of PCBs wastes are subject to TSCA requirements such as manifesting of the waste for transportation and disposal. See 40 CFR 761 and 40 CFR 761, Subpart K.

- ❖ TSCA-regulated does not equate solely to “materials containing PCBs at or above “50 mg/kg.” There are circumstances in which materials containing PCBs below 50 mg/kg are subject to regulation under TSCA. See 40 CFR 761.61(a)(5)(i)(B)(2)(ii).

- ❖ Disposal of PCBs wastes are subject to California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

- ❖ California hazardous waste regulatory levels for PCBs are 5 ppm based on the Soluble Threshold Limit Concentration test and 50 ppm based on the Total Threshold Limit Concentration test, see CCR, Title 22, Section 66261.24, Table III.

Attachment B
PCBs in Priority Building Materials Screening Assessment Form

PCBs Screening Assessment Form

For Municipality Use Only	
Date Received	
File #	

This screening process is part of a program for water quality protection and was designed in accordance with requirements in the Bay Area regional municipal stormwater NPDES permit (referred to as the Municipal Regional Permit). This process **does not** address other environmental programs or regulations (e.g., PCBs regulations under the Toxic Substances Control Act (TSCA); federal, state, or local regulations for hazardous material handling and hazardous waste disposal; health and safety practices to mitigate human exposure to PCBs or other hazardous materials; recycling mandates; or abatement at sites with PCBs or other contaminants). **The applicant is responsible for knowing and complying with all relevant laws and regulations. See Notices to Applicants section in the Applicant Instructions and at the end of this form.**

Complete all applicable parts of the PCBs Screening Assessment Form and submit with your demolition permit application.

All Applicants must complete Part 1 and Part 2.

Part 1. Owner/Consultant and project information		
Owner Information		
Name		
Address		
City	State	Zip
Contact (Agent)		
Phone	Email	
Consultant Information		
Firm Name		
Address		
City	State	Zip
Contact Person		
Phone	Email	
Project Location		
Address		
City	State CA	Zip
APN (s)		
Year Building was Built	Type of Construction Select	
Estimated Demolition Date		

Part 2. Is building subject to the PCBs screening requirement based on type, use, and age of the building?

2.a	Is the building to be demolished wood framed and/or single family residential?	◯Yes ◯No

If the answer to question 2.a is **Yes**, the PCBs Screening Assessment is complete, skip to Part 4. If the answer is **No**, continue to Question 2.b.

2.b	Was the building to be demolished constructed or remodeled between January 1, 1950 and December 31, 1980?	◯Yes ◯No

- If the answer to Question 2.b is **No** the PCBs Screening Assessment is complete, skip to Part 4. If the answer is **Yes**, continue to Question 2.c.

2.c	Is the proposed demolition a complete demolition of the building?	◯Yes ◯No

- If the answer to Question 2.c is **No** the PCBs Screening Assessment is complete, skip to Part 4. If the answer is **Yes**, complete Part 3.

All applications affecting applicable structures and demolitions must complete Part 3 and the Part 3 Tables.

Part 3. Report concentrations of PCBs in priority building materials

Option 1. *Applicants conducted representative sampling and analysis of the priority building materials per the Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition (2018) (Attachment C).*

Option 2. *Applicants possess existing sample results that are that are consistent with the Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition (2018) (Attachment C).*

3.a Select option and report PCBs concentrations in the priority building materials and the source of data for each of the priority building materials. Provide the required supporting information

◯Option 1 Conduct Representative Sampling

- Summarize results on Part 3 Tables; and
- Provide the following supporting information:
  - ☐ Contractor's report documenting the assessment results;
  - ☐ *QA/QC checklist (see Attachment C, section 3.2.4); and*
  - ☐ Copies of the analytical data reports.

◯Option 2 Use Existing Sampling Records

- Summarize results on Part 3 Tables; and
- Provide the following supporting information:
  - ☐ Contractor's report/statement that the results are consistent with the *Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition.*
  - ☐ Copies of the analytical data reports.

All Applicants must complete Part 4.

Part 4. Certification

I certify that the information provided in this form is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that I understand my responsibility for knowing and complying with all relevant laws and regulations related to reporting, abating, and handing and disposing of PCBs materials and wastes. I understand there are significant penalties for submitting false information. I will retain a copy of this form and the supporting documentation for at least 5 years.

Signature:______________________________ Date: ____________
(Property Owner//Agent/Legal Representative)

Print/Type:______________________________
(Property Owner/Agent/Legal Representative Name)

Signature:______________________________ Date: ____________
(Consultant Completing Application Form)

Print/Type:______________________________
(Consultant Completing Application Form)

Notices to Applicants Regarding Federal and State PCBs Regulations

Applicants that determine PCBs exist in building materials must follow applicable federal and state laws. This may include reporting to U.S. Environmental Protection Agency (USEPA), the San Francisco Bay Regional Water Quality Control Board, and the California Department of Toxic Substances Control (DTSC). These agencies may require additional sampling and abatement of PCBs. Depending on the approach for sampling and removing building materials containing PCBs, you may need to notify or seek advance approval from USEPA before building demolition. Even in circumstances where advance notification to or approval from USEPA is not required before the demolition activity, the disposal of PCBs waste is regulated under TSCA and the California Code of Regulations. (See Note 1)

Note 1 - Federal and State Regulations

Building materials containing PCBs at or above 50 ppm that were manufactured with PCBs (e.g., caulk, joint sealants, paint) fall under the category of PCBs bulk product wastes. See 40 Code of Federal Regulations (CFR) 761.3 for a definition of PCBs bulk product wastes.

Building materials such as concrete, brick, metal contaminated with PCBs are PCBs remediation wastes (e.g., concrete contaminated with PCBs from caulk that contains PCBs). 40 CFR 761.3 defines PCBs remediation wastes.

Disposal of PCBs wastes are subject to TSCA requirements such as manifesting of the waste for transportation and disposal. See 40 CFR 761 and 40 CFR 761, Subpart K.

TSCA-regulated does not equate solely to materials containing PCBs at or above 50 ppm. There are circumstances in which materials containing PCBs below 50 ppm are subject to regulation under TSCA. See 40 CFR 761.61(a)(5)(i)(B)(2)(ii).

Disposal of PCBs wastes are subject to California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

California hazardous waste regulatory levels for PCBs are 5 ppm based on the Soluble Threshold Limit Concentration test and 50 ppm based on the Total Threshold Limit Concentration test, see CCR, Title 22, Section 66261.24, Table III.

Agency	Contact	Useful Links
US Environmental Protection Agency	Steve Armann (415) 972-3352 armann.steve@epa.gov	https://www.epa.gov/pcbs (EPA PCBs website) https://www.epa.gov/pcbs/questions-and-answers-about-polychlorinated-biphenyls-pcbs-building-materials (PCBs in Building Materials Fact Sheet and Q/A Document) https://www.epa.gov/pcbs/pcb-facility-approval-streamlining-toolbox-fast-streamlining-cleanup-approval-process (USEPA PCB Facility Approval Streamlining Toolbox (PCB FAST)) https://www.epa.gov/pcbs/polychlorinated-biphenyls-pcbs-building-materials#Test-Methods (See Information for Contractors Working in Older Buildings that May Contain PCBs)
San Francisco Bay Regional Water Quality Control Board	Jan O'Hara (510) 622-5681 Janet.O'Hara@waterboards.ca.gov Cheryl Prowell (510) 622-2408 Cheryl.Prowell@waterboards.ca.gov	https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbstmdl.shtml https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/sitecleanupprogram.html
Department of Toxic Substances Control	Regulatory Assistance Office 1-800-72TOXIC RAO@dtsc.ca.gov	http://www.dtsc.ca.gov/SiteCleanup/Brownfields/upload/PUB_SMP_Guide-to-Selecting-a-Consultant.pdf
California Division of Occupational Safety and Health (Cal/OSHA)	CalOSHA Consultations Services 1-800-963-9424	https://www.dir.ca.gov/dosh/consultation.html

Part 3 Caulk Applications Table			
Column 1. *Report all PCBs concentrations for each homogenous area of caulking area (see Attachment C, Section 3.2.2). Use sample designators/descriptions from laboratory report.*		***Column 2.*** *Complete for each concentration ≥ 50 ppm*	
Caulk Application Sample Description	**Concentration (mg/kg)**	**Estimate Amount of Material**	**Units**
Example:			
Caulk Sample 1	*320*	*48*	*Linear Feet*
1.			Linear Feet
2.			Linear Feet
3.			Linear Feet
4.			Linear Feet
5.			Linear Feet
6.			Linear Feet
7.			Linear Feet
8.			Linear Feet
9.			Linear Feet
10.			Linear Feet

Duplicate page if additional space is needed.

Part 3 Fiberglass Insulation Applications Table			
Column 1. *Report all PCBs concentrations for each homogenous area of fiberglass insulation (see Attachment C, Section 3.2.2). Use sample designators/descriptions from laboratory report.*		***Column 2.*** *Complete for each concentration ≥ 50 mg/kg*	
Fiberglass Insulation Application Sample Description	**Concentration (mg/kg)**	**Estimate Amount of Material**	**Units**
Example: *Fiberglass Insulation Sample 1*	*78*	*86*	*Square Feet*
1.________________________________	________________	____________	Square Feet
2.________________________________	________________	____________	Square Feet
3.________________________________	________________	____________	Square Feet
4.________________________________	________________	____________	Square Feet
5.________________________________	________________	____________	Square Feet
6.________________________________	________________	____________	Square Feet
7.________________________________	________________	____________	Square Feet
8.________________________________	________________	____________	Square Feet
9.________________________________	________________	____________	Square Feet
10._______________________________	________________	____________	Square Feet

The area of insulation wrapped around a pipe may be estimated using the following formula:
Area (square feet) = 2Πrh; where r is the pipe radius (feet) and h is the pipe length (feet).

Duplicate page if additional space is needed.

Part 3 Thermal Insulation Applications Table			
Column 1. *Report all PCBs concentrations for each homogenous area of thermal insulation (see Attachment C, Section 3.2.2). Use sample designators/descriptions from laboratory report.*		***Column 2.*** *Complete for each concentration ≥ 50 mg/kg*	
Thermal Insulation Application Sample Description	**Concentration (mg/kg)**	**Estimate Amount of Material**	**Units**
Example:			
Thermal Insulation Sample 1	*20*		*Square Feet*
1.			Square Feet
2.			Square Feet
3.			Square Feet
4.			Square Feet
5.			Square Feet
6.			Square Feet
7.			Linear Feet
8.			Square Feet
9.			Square Feet
10.			Square Feet

The area of of insulation wrapped around a pipe may be estimated using the following formula:
Area (square feet) = 2Πrh, where r is the pipe radius (feet) and h is the pipe length (feet).

Duplicate page if additional space is needed.

Part 3 Adhesive Mastic Applications Table			
Column 1. *Report PCBs concentrations for each homogenous area of mastic (see Attachment C, Section 3.2.2. Use sample designators/descriptions from laboratory report.)*		***Column 2.*** *Complete for each concentration ≥ 50 mg/kg*	
Adhesive Mastic Application Sample Description	**Concentration (mg/kg)**	**Estimate Amount of Material**	**Units**
Example: *Adhesive Mastic Sample 1*	*87.4*	*800*	*Square Feet*
1.______	______	______	Square Feet
2.______	______	______	Square Feet
3.______	______	______	Square Feet
4.______	______	______	Square Feet
5.______	______	______	Square Feet
6.______	______	______	Square Feet
7.______	______	______	Linear Feet
8.______	______	______	Square Feet
9.______	______	______	Square Feet
10.______	______	______	Square Feet

Duplicate page if additional space is needed.

Part 3 Rubber Window Gasket Applications Table			
Column 1. *Report PCBs concentrations for each gasket (see Attachment C, Section 3.2.2). Use sample designators/descriptions from laboratory report.*		***Column 2.*** *Complete for each concentration ≥ 50 mg/kg*	
Rubber Window Gasket Application Sample Description	**Concentration (mg/kg)**	**Estimate Amount of Material**	**Units**
Example:			
Window Gasket Sample 1	*70*	*75*	*Linear Feet*
1.			Linear Feet
2.			Linear Feet
3.			Linear Feet
4.			Linear Feet
5.			Linear Feet
6.			Linear Feet
7.			Linear Feet
8.			Linear Feet
9.			Linear Feet
10.			Linear Feet

Duplicate page if additional space is needed.

Part 3 Other Materials Table			
Column 1. *Optional: Use this form to report PCBs concentration data from materials other than priority building materials. Report PCBs concentrations for each material and homogeneous area. Use sample designators/descriptions from laboratory report.*		***Column 2.*** *Complete for each concentration ≥ 50 mg/kg*	
Material Sample Description	**Concentration (mg/kg)**	**Estimate Amount of Material**	**Units**
Example:			
Wall paint Sample 1	*228*	*1500*	*Square Feet*
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Duplicate page if additional space is needed.

Attachment C
Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition

Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition


Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

Bay Area
Stormwater Management
Agencies Association

August 2018
(Revised November 2019)

This document is a deliverable of the Bay Area Stormwater Management Agencies Association (BASMAA) project *Managing PCBs−Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training*. BASMAA developed guidance, tools, and outreach and training materials to assist with San Francisco Bay Area municipal agencies' efforts to address the requirements of Provision C.12.f. of the Bay Area Municipal Regional Stormwater Permit (referred to as the MRP). Provision C.12.f of the MRP requires Permittees to manage PCBs–containing building materials during demolition.

We gratefully acknowledge the BASMAA Steering Committee for this project, which provided overall project oversight, including during the development of this and other project deliverables:

- Reid Bogert, Stormwater Program Specialist, San Mateo Countywide Water Pollution Prevention Program (BASMAA Project Manager)
- Amanda Booth, Environmental Program Analyst, City of San Pablo
- Kevin Cullen, Program Manager, Fairfield-Suisun Urban Runoff Management Program
- Matt Fabry, Program Manager, San Mateo Countywide Water Pollution Prevention Program
- Gary Faria, Supervisor, Inspection Services, Building Inspection Division, Contra Costa County
- Napp Fukuda, Deputy Director - Watershed Protection Division, City of San José
- Ryan Pursley, Chief Building Official, Building Division, City of Concord
- Pam Boyle Rodriguez, Manager, Environmental Control Programs – Stormwater, City of Palo Alto
- Jim Scanlin, Program Manager, Alameda Countywide Clean Water Program
- Melody Tovar, Regulatory Programs Division Manager, City of Sunnyvale

We also gratefully acknowledge the project Technical Advisory Group, which provided feedback from a variety of project stakeholders during development of selected project deliverables:

Stakeholder Group	Representative(s)
Regulatory – stormwater/PCBs	Luisa Valiela and Carmen Santos, U.S. EPA Region 9
Regulatory – stormwater/TMDL	Jan O'Hara, San Francisco Bay Regional Water Quality Control Board
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DISCLAIMER

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The material presented in this document is intended solely for the implementation of a municipal regulatory program required by the San Francisco Bay Area Regional Water Quality Control Board Municipal Regional Stormwater Permit for the protection of water quality under the Clean Water Act.

BASMAA prepared the tools and guidance herein to assist MRP Permittees' efforts to address the requirements of Provision C.12.f. of the MRP. The project team received input from a variety of stakeholders during development of the tools and guidance, including regulators (San Francisco Bay Regional Water Quality Control Board, U.S. EPA, and Bay Area Air Quality Management District staff), Bay Area municipal agency staff, and industry representatives.

This document does not address other environmental programs or regulations (e.g., PCBs regulations under the Toxic Substances Control Act (TSCA); federal, state, or local regulations for hazardous material handling and hazardous waste disposal; health and safety practices to mitigate human exposure to PCBs or other hazardous materials; recycling mandates; and abatement at sites with PCBs (or other contaminants). The applicant is responsible for knowing and complying with all relevant laws and regulations.

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Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition

1. INTRODUCTION

The San Francisco Bay Region Municipal Regional Stormwater NPDES permit, referred to as the Municipal Regional Permit (MRP)[1], includes provisions that implement stormwater-related aspects of the Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs) in the Bay. Provision C.12.f. requires that Permittees develop and implement or cause to be developed and implemented an effective protocol for managing materials with PCBs concentrations of 50 milligrams per kilogram (mg/kg) (equivalent to parts-per-million, or ppm), the target management level, or greater in applicable structures at the time such structures undergo demolition[2], so that PCBs do not enter municipal storm drain systems. Applicable structures include, at a minimum, non-residential structures constructed or remodeled between the years 1950 and 1980 with building materials such as caulking and thermal insulation with PCBs concentrations of 50 ppm or greater. Single-family residential and wood frame structures are exempt. Also, a Permittee is exempt from this requirement if it provided evidence acceptable to the Executive Officer in its 2016/17 Annual Report that the only structures that existed pre-1980 within its jurisdiction were single-family residential and/or wood-frame structures.[3]

Permittees were required to develop a protocol by June 30, 2019 that includes each of the following components, at a minimum:

1. The necessary authority to ensure that PCBs do not enter municipal storm drains from PCBs-containing materials in applicable structures at the time such structures undergo demolition;
2. A method for identifying applicable structures prior to their demolition; and
3. Method(s) for ensuring PCBs are not discharged to the municipal storm drain from demolition of applicable structures.

By July 1, 2019 and thereafter, Permittees are required to:

- Implement or cause to be implemented the PCBs management protocol for ensuring PCBs are not discharged to municipal storm drains from demolition of applicable structures via vehicle track-out, airborne releases, soil erosion, or stormwater runoff.
- Develop an evaluation methodology and data collection program to quantify in a technically sound manner PCBs loads reduced through implementation of the protocol for controlling PCBs during demolition of applicable structures.

On behalf of MRP Permittees, the Bay Area Stormwater Management Agencies Association (BASMAA) conducted a regional project to assist MRP Permittees to achieve compliance with

[1] The Municipal Regional Stormwater Permit, Order No. R2-2015-0049, was adopted November 19, 2015.
[2] Demolition means the wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations (40 CFR., Part 61, Subpart M).
[3] The City of Clayton provided evidence to support an exemption from the requirement.

Provision C.12.f. The regional project developed guidance materials, tools, protocols and training materials and conducted outreach. The goal was to assist Permittees to develop local programs to prevent PCBs from being discharged to municipal storm drains due to demolition of applicable buildings. Local agencies will need to tailor the BASMAA products for local use and train local staff to implement the new program.

This document is the deliverable for Task 3 of the regional project, which is to develop a protocol for the assessment of prioritized PCBs-containing building materials prior to demolition. The full scope of work for the regional project is presented in the Project team's *Proposal for Tools, Protocol, Outreach & Training Work Plan: PCBs Materials Management during Building Demolition Project* (dated January 31, 2017; revised March 2017). If materials are found or known to contain PCBs, those materials must be managed appropriately and according to all applicable local, state, and federal requirements. Guidance on the management of PCBs-containing materials is beyond the scope of this document.

To establish the PCBs protocol, currently established protocols were evaluated that are widely accepted in the building demolition industry for other Federal- and State-regulated constituents of concern. This document provides applicable examples of sampling and evaluation procedures for building materials potentially contaminated with asbestos-containing material (ACM)[4] and lead-based paint (LBP)[5], which are summarized and referenced in Appendix C. These components include guidance on sampling frequencies, laboratory sample analysis, quality assurance and quality control procedures, and reporting.

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[4] Asbestos-containing material (ACM) means any material or product which contains more than one percent asbestos.

[5] Lead-based paint (LBP) is any paint, varnish, shellac, or other coating that contains lead equal to or greater than 1.0 mg/cm² as measured by XRF device or laboratory analysis, or 0.5 percent by weight (5,000 ppm or 5,000 mg/kg) as measured by laboratory analysis.

2. PCBS BUILDING MATERIAL EVALUATION PROTOCOL

This section presents the evaluation protocol for identifying building materials in structures constructed or remodeled between the years 1950 and 1980[6] that may contain a significant mass of PCBs. Once identified as containing PCBs at concentrations exceeding 50 ppm, these materials should be properly managed prior to building demolition, to ensure PCBs are not discharged to the municipal storm drain system.

This protocol is not intended to address all PCBs-containing materials that may be disturbed during building demolition. Additional sampling is likely to be required to comply with USEPA and Cal/OSHA regulations pertaining to the management, removal and disposal of PCBs-containing materials.

For this program, it is assumed that organizations and staff qualified to sample, test, remediate, and dispose of PCBs at the building site will coordinate processes for other hazardous building materials at the building site, to ensure proper sampling, testing, remediation, and disposal or all statutorily required hazardous materials handling.

2.1 Priority Building Materials to be Tested

A prioritized list of PCBs-containing materials is provided in Appendix A. Building materials were evaluated based upon the following criteria:

- **Source Material** – Does the building material contain PCBs through the original product manufacturing process or was the building material contaminated (impregnated) with PCBs from an adjacent building material that already contained PCBs? For the evaluation, building materials originally manufactured with PCBs at or above 50 mg/kg were prioritized.
- **Concentration** – Building materials were evaluated based on readily available existing data regarding ranges of PCBs concentrations identified in the materials.
- **Prevalence –** A prevalence factor was assigned based upon best professional judgement of the prevalence of occurrence of the PCBs-containing materials in buildings, which ranged from highly prevalent to low prevalence.
- **Ease of Removal –** Building materials were evaluated based on their attachment to the building, which ranged from "very easily removed" to "difficult to remove," under the assumption that higher ease of removal results in higher feasibility and lower costs for removing a material before demolition.

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[6] Single-family residential and wood frame structures are exempt.

- **Flaking/Crumbling –** Building materials were evaluated based on their tendency to flake or crumble during disturbance or demolition, which could lead to a higher likelihood of entering stormwater as a result of building demolition.

- **PCBs Removed by Other Waste Program –** This factor addresses materials that are removed from buildings because of other waste management programs (e.g., Universal Waste Rule). Fluorescent light ballasts[7], polyurethane foam furniture, and Askarel fluid used in transformers, all of which may contain PCBs, are typically managed during pre-demolition activities under current regulations and programs that require removal of universal waste and outdated transformers. For this program it is assumed that those materials will be evaluated and managed under those existing programs.

Material prioritization was conducted by assigning a score on a scale of 1 to 5 (low to high) for each criterion. The final score for each material type was calculated as the average of the scores assigned to the six criteria. The materials given the highest scores through the prioritization analysis are shown below, along with their typical locations in a building. For this evaluation, thermal insulation and fiberglass insulation were grouped together as they tend to be co-located and are typically managed together.

Many building materials may contain PCBs. The building owner is responsible for identifying and handling all hazardous materials in accordance with all applicable laws, including all materials with 50 ppm or more PCBs. For purposes of obtaining a demolition permit, the building owner must sample at least the limited number of priority building materials listed below[8] (along with typical locations where they are found) using the protocols described in Section 2.2. This protocol is only for sampling of priority building materials. Building materials coming into contact with priority building materials are not the focus of this protocol.

1. Caulks and Sealants:
    a. Around windows or window frames (e.g., window glazing putty, window caulking, etc.);
    b. Around door frames; and
    c. Expansion joints between concrete sections (e.g., floor segments).
2. Thermal/Fiberglass Insulation and Other Insulating Materials:
    a. Around HVAC systems,

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[7] Fluorescent light ballasts that contain PCBs are not required to be managed under the Universal Waste Rule Program but are recommended by the EPA to be identified in a pre-demolition survey of a structure and to be managed with the removal of other required wastes in the abatement process.

[8] Applicants may use existing sampling results of the priority building materials. Applicants who have conducted sampling prior to the publication of this protocol may use that data provided it is consistent with this protocol (e.g., analytical methods, sample collection frequency, and QA/QC).

   b. Around heaters,
   c. Around boilers,
   d. Around heated transfer piping, and
   e. Inside walls or crawls spaces.

3. Adhesive/Mastic:
   a. Below carpet and floor tiles;
   b. On, under, or between roofing materials and flashing.

4. Rubber Window Seals/Gaskets:
   a. Around windows or window frames.

Examples of the prioritized PCBs-containing building materials and what they may look like in a building planned for demolition are provided in Appendix B.

It should be noted that some materials that are being evaluated for PCBs in this protocol may also be associated with asbestos, lead, or other hazardous substances. Since this protocol follows pre-established asbestos management program guidelines and procedures, the sampling frequency, types of building materials, and surveying techniques overlap with the PCBs survey protocol. If a material has been determined to contain asbestos, lead or other hazardous substances and will be abated under an associated waste program, that material need not be sampled for PCBs under this program.

2.2 PCBs Sampling Procedures

2.2.1 Sampling Equipment

Building materials that are planned to be collected for laboratory analysis should be placed in laboratory-supplied glass jars with Teflon-sealed lids following procedures established in USEPA Method 8082 / 8082A. Samples should be collected with either factory-sealed or decontaminated equipment that will be used to remove a representative building material sample (i.e., scissors, tweezers, pliers, spoons, or putty knife).

For sampling equipment (i.e., scissors, tweezers, pliers, spoons, putty knife, etc.) that will be decontaminated, the following three bucket wash procedure should be performed, which is in general accordance with standard decontamination procedures defined in SESDPROC-205-R3 (USEPA, 2015):

- In the first bucket, mix a residue free cleaning detergent (e.g., Alconox®), with distilled water to generate the recommended detergent concentration specified in the product directions;

- Fill the second bucket with distilled water;
- Fill the third bucket with distilled water;
- Clean the equipment in the first bucket with the cleaning detergent, then rinse in the second and then the third bucket. If the second bucket becomes slightly discolored during the rinse, change the contents of the second bucket with distilled water. Change the third bucket, if any dirt or material is observed in the water, since the third bucket needs to stay clean as it is the final rinse; and
- At the end of cleaning, let the equipment air dry in a clean area before use in sample collection. The rinse water should then be drummed and sampled for disposal. The planned disposal facility should be contacted to determine the required sample analysis for the rinse water characterization and profiling and that the disposal procedures comply with state and federal regulations.

If disposable sampling tools are used, the above decontamination procedures do not apply. Additionally, decon with certain solvents (e.g., hexane) may be utilized for cleaning of tar-like substances, followed with the standard decontamination procedures listed above. It is recommended that equipment is air-dried per the procedure above, but it is up to the discretion of the environmental professional to use alternative drying methods if time constraints for air-drying is prohibitive.

2.2.2 Sample Collection Frequency

For the four prioritized building materials, the following collection techniques and frequency should be followed.

Caulking

Three different types of caulking should be evaluated:

1. Window caulking;
2. Door frame caulking; and
3. Floor and expansion joint caulking.

For each type of caulking material identified, the following number of samples should be collected:

- Collect at least one sample from each homogenous area that contains less than 50 linear feet of caulking;
- Collect at least three samples from each homogenous area that contains between 50 and 250 linear feet of caulking;
- Collect at least five samples from each homogenous area that contains between 250 and 1,000 linear feet of caulking;

- Collect at least seven samples from each homogenous area that contains between 1,000 and 2,500 linear feet of caulking; and
- Collect at least nine samples from each homogenous area that contains greater than 2,500 linear feet of caulking.

If homogenous caulking material is found throughout the building, samples should be spatially distributed so as to not collect the required number of samples from one area. In addition, the width or cross-sectional area of the caulking bead is not relevant for determining the linear footage to be sampled. It is also recommended that the sampler performing the evaluation inspect the entire building prior to sample collection to insure proper distribution is performed.

Thermal/Fiberglass Insulation

For thermal/fiberglass insulation:

- Collect at least one bulk sample from each homogeneous area.

Adhesive/Mastic

For each type of adhesive/mastic material identified, the following number of samples should be collected:

- Collect at least three samples from each homogenous area less than 1,000 square feet;
- Collect at least five samples from each homogenous area between 1,000 and 5,000 square feet; and
- Collect at least seven samples from each homogenous area greater than 5,000 square feet.

If homogenous adhesive/mastic material is found throughout the building, samples should be spatially distributed so as to not collect the required number of samples from one area. It is recommended that the sampler performing the evaluation inspect the entire building prior to sample collection to insure proper distribution is performed.

Rubber Window Seals/Gaskets

For rubber window seals/gaskets identified, the following number of samples should be collected:

- Collect at least one sample from each homogenous area that contains less than 50 linear feet of caulking (of any width or cross-sectional are of bead);
- Collect at least three samples from each homogenous area that contains between 50 and 250 linear feet of caulking;
- Collect at least five samples from each homogenous area that contains between 250 and 1,000 linear feet of caulking;

- Collect at least seven samples from each homogenous area that contains between 1,000 and 2,500 linear feet of caulking; and
- Collect at least nine samples from each homogenous area that contains greater than 2,500 linear feet of caulking.

If homogenous rubber window seals/gaskets are found throughout the building, samples should be spatially distributed so as to not collect the required number of samples from one area. It is also recommended that the sampler performing the evaluation inspect the entire building prior to sample collection to insure proper distribution is performed.

2.2.3 Sample Analysis and Preservation

Samples collected to evaluate building materials for PCBs should be analyzed for Aroclors by EPA Method 8082/8082A[9] by an accredited analytical laboratory. The reporting limit goal should be 500 micrograms per kilogram (µg/kg).[10] The laboratory should be contacted before sampling to confirm that it can meet the reporting limit objectives.

Samples should be chilled and then kept cool between 0 and 6 degrees Celsius (32 and 42.8 degrees Fahrenheit) during storage and transportation to the laboratory following procedures established in USEPA Method 8082/8082A. Proper chain-of-custody[11] procedures should be followed from the time the samples are collected until they are delivered to the laboratory for analysis. Holding times for EPA Method 8082/8082A are sample extraction within 14 days of sample collection and analysis of the extract within 40 days of extraction. <u>However, PCBs are very stable in a variety of matrices and holding times may be extended to as long as one year. Once extracted, analysis of the extract should take place within 40 days.</u>

2.2.4 Quality Assurance and Quality Control

For this program, general quality assurance and quality control (QA/QC) procedures will be utilized. The following checklist should be used by the contractor performing the evaluation:

- QA/QC Checklist:
    - Proper specified sampling equipment was used (pre-cleaned or other, stainless steel);

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[9] Provision C.12.f. requires that Permittees develop and implement or cause to be developed and implemented an effective protocol for managing materials with PCBs concentrations of 50 ppm. EPA Method 8082/8082A is an acceptable method to quantify PCBs. Analysis of PCBs congeners is not required to meet the permit requirement.

[10] The reporting limit can be modified to account for necessary dilutions or interferences, as determined by the laboratory. This reporting limit, which is below the target management level of 50 mg/kg, was selected to allow for data to be collected on the concentration of PCBs in building materials.

[11] Chain-of-custody is the procedure to document, label, store, and transfer samples to personnel and laboratories. For a detailed list of procedures, refer to the *Sample and Evidence Management,* Operating Procedure (SESDPROC-005-R2), January 29, 2013

- Proper decontamination procedures were followed;
- Sampling collection spatial frequency was met;
- A National Environmental Laboratory Accreditation Program (NELAP) laboratory or a California-ELAP (CA-ELAP) were utilized;
- Samples were received by the laboratory within proper temperature range;
- Samples were extracted and analyzed within the method holding time for EPA Method 8082/8082A; and
- Sample reporting limit met data quality objectives.

2.3 Reporting and Notifications

The following considerations are applicable to reporting and notification:

- Assessment results must be submitted to the applicable Permitting Authority by the project applicant;
- Applicants that determine PCBs exist in priority building materials must follow applicable federal and state laws. This may include reporting to USEPA, the San Francisco Bay Regional Water Quality Control Board, and the California Department of Toxic Substances Control (DTSC). These agencies may require additional sampling and abatement of PCBs.
- Depending on the approach for sampling and removing building materials containing PCBs, applicants may need to notify or seek advance approval from USEPA before building demolition. Even in circumstances where advance notification to or approval from USEPA is not required before the demolition activity, the disposal of PCBs waste is regulated under TSCA.
- The disposal of PCBs waste is subject to California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.
- Building owners and employers need to consider worker and public safety during work involving hazardous materials and wastes including PCBs.

For further information, applicants should refer to the *PCBs in Priority Building Materials Screening Assessment Applicant Package*, BASMAA, July 2018.

3. REFERENCES

Guidelines for Asbestos Sampling:

- https://www.epa.gov/asbestos/asbestos-laws-and-regulations

Guidelines for Lead-Based Paint Evaluations:

- Environmental Protection Agency (EPA) - Created the Renovation, Repair, and Painting (RRP) Rule which requires training and certification for anyone working for compensation in pre-1978 residential structures, day care centers, and schools where known or assumed lead-based paint is impacted. The EPA website with complete information on this regulation is https://www.epa.gov/lead/renovation-repair-and-painting-program.
- California Department of Public Health (CDPH) - Created "Title 17" which includes lead testing and abatement provisions in residential and public structures in California. Several important definitions are contained in Title 17 including Abatement, Clearance Inspection, Containment, Lead-Based Paint.
- Lead Contaminated Dust and Soil, Lead Hazard, and Lead Hazard Evaluation. Title 17 establishes that lead testing be performed using XRF equipment or by paint chip sample analysis in California. Lead test kits are not accepted. It also establishes testing in California be performed by a State certified lead inspector/assessor if the testing is related to a project involving compensation.
- Department of Housing and Urban Development (HUD) - Created the HUD Guidelines which contain protocols for lead testing and abatement.

EPA Method 8082A – Polychlorinated Biphenyls (PCBs) by Gas Chromatography

- https://www.epa.gov/sites/production/files/2015-07/documents/8082a.pdf

SESDPROC-205-R3, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R2. December 18, 2015

- https://www.epa.gov/sites/production/files/2016-01/documents/field_equipment_cleaning_and_decontamination205_af.r3.pdf

SESDPROC-005-R2, *Sample and Evidence Management*, Operating Procedure, January 29, 2013

- https://www.epa.gov/sites/production/files/2015-06/documents/Sample-and-Evidence-Management.pdf

APPENDIX A

PCBs Building Material Prioritization Worksheet

Appendix A - PCBs Building Materials Prioritization

Material	Material Class	Median/Average/Single Reported Concentration (ppm)	Minimum (ppm)	Maximum (ppm)	PCBs Source Material? (Rating values: source = 5, or not source = 1)	Concentration (Rating values: 1 to 5, higher value means higher concentration)	Prevalence of PCBs Containing Material in Buildings (Rating values: high = 5, medium = 3, or low = 1)	Ease of Removal (Rating values: 1 to 5, higher value means easier to remove)	Flaking/ Crumbling (Rating values: 1 to 5, higher value means more likely to flake/crumble)	PCBs Removed by Other Waste Program? (Rating values: not removed by other = 5, or removed = 1)	Prioritization Score
Caulking (sealant, plaster)	**Caulk/sealant/tape/glue**		**0.001**	**752,000**	**5**	**5**	**5**	**3**	**5**	**5**	**4.67**
Thermal insulation	**Insulation**			**73,000**	**5**	**5**	**5**	**4**	**4**	**5**	**4.67**
Fiberglass insulation	**Insulation**			**39,158**	**5**	**4**	**5**	**4**	**4**	**5**	**4.50**
Adhesives/mastic	**Caulk/sealant/tape/glue**			**3,100**	**5**	**3**	**5**	**3**	**5**	**5**	**4.33**
Rubber gaskets	**Gaskets/Rubber**			**84,000**	**5**	**5**	**3**	**3**	**4**	**5**	**4.17**
Wool felt gaskets	Gaskets/Rubber			688,498	5	5	3	3	4	5	4.17
Cloth/paper insulating material	Insulation			12,000	5	4	3	4	4	5	4.17
Foam rubber insulation	Insulation			13,100	5	4	3	4	4	5	4.17
Ceiling tiles coated w/flame resistant sealant	Internal nonstructural surface		53	110,000	5	5	5	3	2	5	4.17
Backer rod	Caulk/sealant/tape/glue			99,000	1	5	5	3	5	5	4.00
Roofing/siding material	External nonstructural surface		0	30,000	5	4	5	3	2	5	4.00
Paint (complete removal)	Paint/pigment/coatings		0.001	97,000	5	5	5	1	3	5	4.00
Insulating materials in electric cable	Electrical		0	280,000	5	5	3	4	1	5	3.83
Adhesive tape	Caulk/sealant/tape/glue			1,400	5	3	1	3	5	5	3.67
Surface coating	Paint/pigment/coatings			255	5	3	5	1	3	5	3.67
Coal-tar enamel coatings	Paint/pigment/coatings			1,264	5	3	5	1	3	5	3.67
Grout	Caulk/sealant/tape/glue			9,100	5	4	1	2	5	5	3.67
Cove base	Internal nonstructural surface			170	5	3	3	4	2	5	3.67
Plastics/plasticizers	Electrical			13,000	5	4	3	3	1	5	3.50
GE silicones	Caulk/sealant/tape/glue	<1.9	0	1.8	5	1	3	2	5	5	3.50
Glazing	Caulk/sealant/tape/glue	Up to 100% liquid PCBs		51	5	2	3	3	3	5	3.50
Flooring and floor wax/sealant	Internal nonstructural surface	Maximum likely >50		51	5	2	3	3	2	5	3.33
Light ballast	Light ballasts	Minimum likely <50	49	1,200,000	5	5	3	5	1	1	3.33
Anti-fouling compounds	Paint/pigment/coatings			59,000	5	4	1	1	3	5	3.17
Polyurethane foam (furniture)	Caulk/sealant/tape/glue			50	5	2	1	5	5	1	3.17
Askarel fluid/cutting oils/hydraulic fluid	Oils/dielectric fluids			450,000	5	5	1	5	2	1	3.17
Fire retardant coatings	Paint/pigment/coatings			59,000	5	4	1	1	3	5	3.17
Waterproofing compounds	Paint/pigment/coatings			59,000	5	4	1	1	3	5	3.17
Electrical wiring	Electrical			14	5	1	3	4	1	5	3.17
Concrete	Concrete/stone	2.5	0.001	17,000	1	4	3	1	4	5	3.00
Foam rubber	Gaskets/Rubber			1,092	1	3	1	3	4	5	2.83
Soil/sediment/sand	Soil/dust	0.15	0.001	581	1	3	1	2	5	5	2.83
Brick/mortar/cinder block	Concrete/stone			1,100	1	3	3	1	4	5	2.83
Wood	Wood			380	1	3	3	3	2	5	2.83
Door frame	Internal nonstructural surface			102	1	2	3	4	2	5	2.83
Metals surfaces in contact with caulk/sealant	Metal surfaces	448	51	448	1	3	1	2	4	5	2.67

Appendix A - PCBs Building Materials Prioritization

Material	Material Class	Median/Average/Single Reported Concentration (ppm)	Minimum (ppm)	Maximum (ppm)	PCBs Source Material? (Rating values: source = 5, or not source = 1)	Concentration (Rating values: 1 to 5, higher value means higher concentration)	Prevalence of PCBs Containing Material in Buildings (Rating values: high = 5, medium = 3, or low = 1)	Ease of Removal (Rating values: 1 to 5, higher value means easier to remove)	Flaking/ Crumbling (Rating values: 1 to 5, higher value means more likely to flake/crumble)	PCBs Removed by Other Waste Program? (Rating values: not removed by other = 5, or removed = 1)	Prioritization Score
Asphalt	Concrete/stone			140	1	2	1	2	4	5	2.50
Carpet	Internal nonstructural surface		0.46	9.7	1	1	1	5	2	5	2.50
Stone (granite, limestone, marble, etc.)	Concrete/stone			130	1	2	1	1	4	5	2.33
Air handling system	Air system		0.46	9.7	1	1	1	3	1	5	2.00

APPENDIX B

Priority Building Materials

Photographic Log

Appendix B

Priority Building Materials to be Tested for PCBs

Photograph 1 **<u>Window Caulking</u>:** **Damaged caulking around a window.**	
Photograph 2 **<u>Window Caulking</u>:** **Worn and cracked caulking around a window.**	

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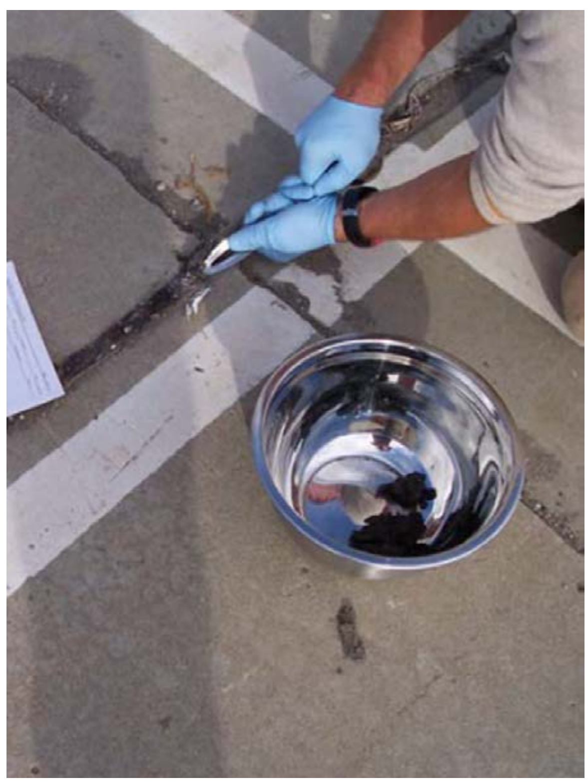
Priority Building Materials to be Tested for PCBs

Photograph 3	
<u>Door Frame Caulking</u>: **Caulking on an interior door or window frame.**	
Photograph 4	
<u>Floor and Expansion Joint Caulking</u>: **Caulking material placed in concrete expansion joints.**	

Appendix B

Priority Building Materials to be Tested for PCBs

Photograph 5	
<u>**Thermal Insulation**</u>**:** **Foam-style thermal insulation material along wall.**	

Photograph 6	
<u>**Thermal Insulation**</u>**:** **Damaged floor foam insulation.**	

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Priority Building Materials to be Tested for PCBs

Photograph 7

<u>Thermal Insulation</u>:

Damaged felt-style thermal insulation.

Photograph 8

<u>Thermal Insulation</u>:

Exposed/damaged fiberglass insulation.

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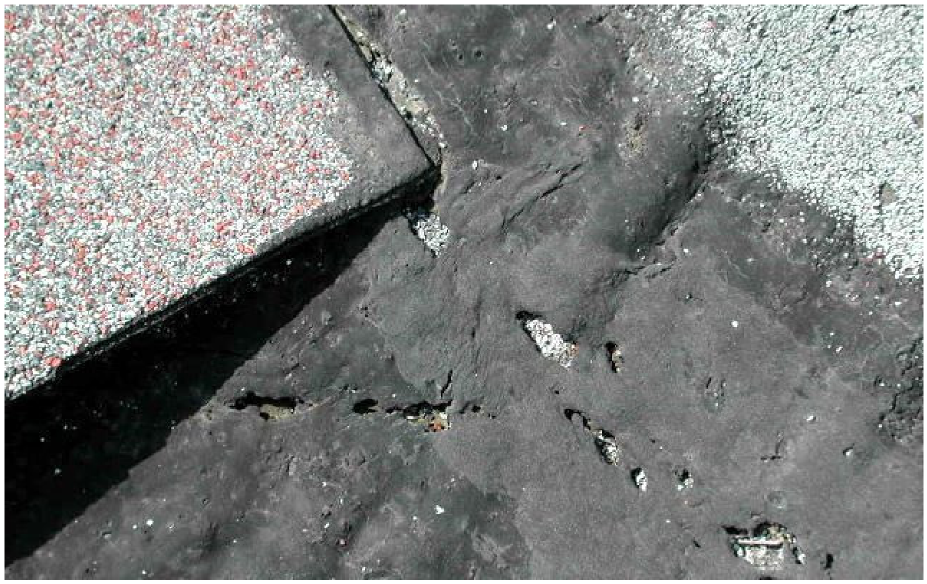
Priority Building Materials to be Tested for PCBs

Photograph 9	
<u>Thermal Insulation</u>: **Exposed and damaged pipe insulation.**	
Photograph 10	
<u>Thermal Insulation</u>: **Pipe insulation.**	

Appendix B

Priority Building Materials to be Tested for PCBs

Photograph 11 **<u>Adhesive / Mastic</u>:** **Adhesive/mastic on a roof surface.**	
Photograph 12 **<u>Adhesive / Mastic</u>:** **Adhesive beneath a carpet.**	

Appendix B

Priority Building Materials to be Tested for PCBs

Photograph 13 **<u>Adhesive / Mastic:</u>** **Adhesive remnants on flooring.**	
Photograph 14 **<u>Adhesive / Mastic:</u>** **Exposed adhesive on roofing.**	

Appendix B

Priority Building Materials to be Tested for PCBs

Photograph 15	
<u>Rubber Window Seal/Gasket:</u> **Grey rubber window seal/gasket in a wood type frame.**	

Photograph 16	
<u>Rubber Window Seal/Gasket:</u> **Off white rubber window seal/gasket in an aluminum type frame.**	

APPENDIX C

Currently Established Building Material Evaluation Protocols

1. CURRENTLY ESTABLISHED BUILDING MATERIAL EVALUATION PROTOCOLS

This section presents evaluation protocols for ACM and LBP, which provide a foundation for the PCBs protocol summarized in Section 3. This section includes guidance on sampling frequencies, laboratory sample analysis, quality assurance and quality control procedures derived from regulatory procedures for ACM and LBP.

1.1 Asbestos Containing Material Evaluation Procedures

Asbestos bulk sampling procedures are specified in several Federal regulations, implemented primarily by the United States Environmental Protection Agency (EPA) as well as the Occupational Safety and Health Administration (OSHA). The Consumer Product Safety Commission (CPSC) and the Mine Safety and Health Administration (MSHA) specify additional regulations and procedures, but these are generally less applicable to evaluation procedures.

The foundational regulations pertaining to asbestos sampling in buildings are the Asbestos Hazard Emergency Response Act (AHERA; Toxic Substances Control Act [TSCA] Title II) (15 U.S.C. § 2641-2656) as well as the Asbestos School Hazard Abatement Reauthorization Act (ASHARA). EPA promulgated regulations under AHERA to require inspection of schools for asbestos-containing building materials, and to perform resultant corrective actions. Furthermore, AHERA tasked the EPA with developing a plan for accreditation of asbestos inspectors. ASHARA extended funding for asbestos programs at schools and expanded accreditation requirements to cover asbestos abatement at commercial buildings other than schools.

Pursuant to AHERA, the Asbestos-Containing Materials in Schools rule (40 CFR Part 763, Subpart E) details specific requirements for building material inspections at schools, preparation of asbestos management plans, and implementation of response actions. EPA regulation on asbestos related to structure demolition is specified in subpart M of the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations (40 CFR Part 61, Subpart M).

The following sections summarize the evaluation procedures specified in the Asbestos-Containing Materials in Schools rule as well as the Asbestos NESHAP regulations. Both OSHA and EPA worker protection requirements are also discussed.

1.1.1 Asbestos-Containing Materials in Schools Rule

The following sections summarize the inspection, re-inspection, sampling, analysis, and evaluation procedures specified in the Asbestos-Containing Materials in Schools rule (40 CFR Part 763, Subpart E).

Evaluation

For each inspection and re-inspection of asbestos-containing building material (ACBM)[12], the local education agency shall have an accredited inspector provide a written evaluation of all friable known or assumed ACBM. The evaluation shall consider the following:

- Location and amount of material, both in total quantity and as a percentage of the functional space;
- Condition of the material, specifying:
  - Type of damage or significant damage (e.g., flaking, blistering, water damage, or other signs of physical damage);
  - Severity of damage (e.g., major flaking, severely torn protective jackets, as opposed to occasional flaking, minor tears to jackets);
  - Extent or spread of damage over large areas or large percentages of the homogeneous[13] area;
- Whether the material is accessible;
- The material's potential for disturbance;
- Known or suspected causes of damage or significant damage (e.g., air erosion, vandalism, vibration, water); and
- Preventive measures that could potentially eliminate the reasonable likelihood of undamaged ACBM from becoming significantly damaged.

The inspector shall classify and give reasons in the written evaluation for classifying the ACBM and suspected ACBM assumed to be ACM into one of the following categories:

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[12] Asbestos-containing building material (ACBM) means surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

[13] Homogenous refers to a substance or area that is uniform in texture, color, and general physical appearance and properties.

1. Damaged or significantly damaged thermal system insulation ACM;
2. Damaged friable surfacing ACM;
3. Significantly damaged friable surfacing ACM;
4. Damaged or significantly damaged friable miscellaneous ACM;
5. ACBM with potential for damage;
6. ACBM with potential for significant damage; and
7. Any remaining friable ACBM or friable suspected ACBM.

Inspection and Re-inspection

Inspect any building that is to be used as a school, prior to such use, by an accredited inspector. In emergency situations, inspect the building within 30 days of commencement of such use.

For each area of the building, complete the following inspection procedure:

- Visually inspect the area to identify suspected ACBM;
- Touch suspected ACBM to determine friability (Friable material is material that may be crumbled or pulverized by hand pressure alone. Note that thermal system insulation that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release shall be treated as non-friable.);
- Categorize all areas into homogenous areas of friable suspected ACBM and non-friable suspected ACBM;
- Assume that some or all the homogeneous areas are ACBM, and for each homogeneous area that is not assumed to be ACBM, collect and submit samples for bulk analysis. Do not sample areas that an accredited inspector assumes to contain ACBM. For uncertain areas, collect and bulk samples and submit for analysis (see Sampling below);
- Assess friable material in areas where samples are collected, in areas where samples are not collected but ACBM is assumed to be present, and in areas identified in previous inspections;
- Record the following information and submit a copy for inclusion in an asbestos management plan, within 30 days of the inspection:

- An inspection report including the signature, state of accreditation, and accreditation number of each inspector, as well as the date of the inspection;
- A comprehensive inspection inventory, including the date and locations of samples, locations of areas assumed to contain friable ACBM, and locations of areas assumed to contain non-friable ACBM;
- A description of the manner used to determine sampling locations;
- A list of all categorized and identified homogenous areas into surfacing material, thermal system insulation, or miscellaneous material; and
- Evaluations made of friable material.

Repeat this process as a re-inspection at least once every 3 years after a management plan is in effect. Reassess the condition of friable known or assumed ACBM previously identified. Identify any homogenous areas with material that has become friable since the last inspection or re-inspection and collect and submit samples of the material.

Sampling

Collect samples in a statistically random manner that is representative of each homogeneous area.

- For surfacing material, the number of samples to be collected is as follows:
  - Collect at least three samples from each homogenous area less than 1,000 square feet;
  - Collect at least five samples from each homogenous area between 1,000 and 5,000 square feet; and
  - Collect at least seven samples from each homogenous area greater than 5,000 square feet.
- For thermal system insulation:
  - Collect at least one bulk sample from each homogeneous area that is not assumed to be ACM;
  - Collect at least one bulk sample from each homogeneous area of patched insulation that is not assumed to be ACM, if the patched section is less than six linear or square feet;

  - Where cement or plaster is used on fittings such as tees, elbows or valves, collect samples to determine if material is ACM or not;
  - If the accredited inspector determines that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM, samples are not required to be collected;
- For miscellaneous material, collect bulk samples from each homogeneous area of friable material that is not assumed to be ACM.

Analysis

Samples should be analyzed by laboratories accredited by the National Bureau of Standards (NBS). The laboratories must have received interim accreditation for polarized light microscopy (PLM) analysis under the EPA Interim Asbestos Bulk Sample Analysis Quality Assurance Program until the NBS PLM laboratory accreditation program for PLM is operational.

Samples should be analyzed for asbestos content by PLM using the "Interim Method for the Bulk Determination of Asbestos in Bulk Insulation Samples", found at Appendix E to Subpart E of 40 CFR Part 763. Samples should not be composited.

A homogenous area is considered not to contain ACM only if the results of all samples from that area show asbestos in concentrations of 1 percent or less. An area is considered to contain ACM if at least one sample from the area shows asbestos in concentrations greater than 1 percent.

Submit the name and address of each laboratory performing the analysis, the date of the analysis, and the person performing the analysis for inclusion into the management plan within 30 days of the analysis.

1.2 Lead-Based Paint (LBP) Evaluation Procedures

Lead-Based Paint (LBP) evaluation procedures are codified in various federal and state regulations.

Title IV of the Toxic Substances Control Act (TSCA) as well as other authorities in the Residential Lead-Based Paint Hazard Reduction Act of 1992 directs the EPA to regulate lead-based paint hazards. The primary Federal regulations and guidelines related to LBP evaluation procedures include:

- The Lead Renovation, Repair and Painting Program (RRP) Rule (40 CFR 745, Subpart E);
- The National Lead Laboratory Accreditation Program (TSCA Section 405(b)); and
- The Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (2012 Edition) (pursuant to Section 1017 of the Residential Lead-Based Paint Hazard Reduction Act of 1992, A.K.A. "Title X")

Furthermore, the California Department of Public Health (CDPH) Title 17, California Code of Regulations, Division 1, Chapter 8 "Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards," specifies some LBP evaluation procedures as part of the accreditation program.

The HUD Guidelines provide the most comprehensive procedures for LBP evaluations and are referenced by many other regulations.

There are three primary methods of performing LBP evaluation: test kits, X-ray Fluorescence (XRF) devices, and laboratory testing of paint chips. Sampling procedures for each method are detailed in the following sections.

Under CDPH Title 17, certified Lead Inspector/Assessors are required to use XRF devices or laboratory analysis, and not test kits.

1.2.1 LBP Sampling Procedures: Test Kits

In 2008, the EPA published the RRP rule, which, among other things, established criteria for lead test kits for use in LBP evaluation. Lead test kits recognized by EPA before September 1, 2010, must meet only the negative response criterion outlined in 40 CFR 745.88(c)(1):

> *For paint containing lead at or above the regulated level, 1.0 mg/cm^2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a negative response less than or equal to 5% of the time must be met.*

Lead test kits recognized after September 1, 2010, must meet both the negative response and positive response criteria outlined in 40 CFR 745.88(c)(1) and (2). The positive-response criterion states:

For paint containing lead below the regulated level, 1.0 mg/cm^2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a positive response less than or equal to 10% of the time must be met.

To date, no lead test kit has met both criteria[14]. However, three lead test kits recognized before September 1, 2010, exist and are recognized by EPA:

- 3M™ LeadCheck™, manufactured by the 3M Company, for use on wood, ferrous metal, drywall, and plaster surfaces;
- D-Lead®, manufactured by ESCA Tech, Inc., for use on wood, ferrous metal, drywall, and plaster surfaces; and
- The Commonwealth of Massachusetts lead test kit, for use only on drywall and plaster surfaces.

Test kits cannot determine the concentration of lead, only presence or absence at best. For this reason, test kits are best used by homeowners or other non-professionals as a preliminary evaluation before using an XRF device or laboratory analysis of paint chips.

In California, test kits are not utilized as XRF is shown to be more reliable for testing of lead concentrations in paint.

There are currently no detailed sampling procedures for test kits that would be applicable to PCBs evaluation. However, test kit technology may be a useful paradigm for PCBs evaluation if a kit can be developed to test PCBs at an acceptable concentration that uses a repeatable methodology to meet the data quality objectives.

1.2.2 LBP Sampling Procedures: XRF Devices

The following sections summarize LBP evaluation procedures for XRF devices, including description of sampling equipment, collection techniques and frequency, sample analysis, and quality assurance.

LBP Analyzers

According to the HUD Guidelines, portable XRF devices are the most common primary analytical method for inspections in housing because of their versatility in analyzing a

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[14] US EPA, Lead Test Kits, https://www.epa.gov/lead/lead-test-kits, accessed September 19, 2017.

wide variety of surface types, non-destructive measurement, high speed, and low cost per sample. Each XRF device must have a HUD-issued XRF Performance Characteristic Sheet (PCS), which contains information about XRF readings taken on specific surface types, calibration check tolerances, and interpretation of XRF readings.

Collection Techniques and Frequency

HUD Guidelines provide separate sampling techniques for single- and multi-family housing. However, the general approach to sampling is the following seven-step procedure:

- List all testing combinations of building components and substrates (e.g., wood doors, metal doors, plaster walls, concrete walls);
- Select testing combinations. A numbering system, floor plan, sketch or other system may be used to document which testing combinations were tested;
- Perform XRF testing, including calibration;
- Collect and analyze paint-chip samples as needed;
- Classify XRF and paint-chip results;
- Evaluate the work and results to ensure the quality of the inspection; and
- Document the findings in a summary and in a complete technical report.

Because of the large surfaces and quantities of paint involved, and the potential for spatial variation, HUD Guidelines recommend taking at least four readings per room, with special attention paid to surfaces that clearly have different painting history. The selection of test locations should be representative of locations most likely to be coated with old paint or other lead-based coatings, such as areas with thick paint; areas with worn or scraped off paint should be avoided.

For large buildings with many similar units, HUD Guidelines recommend testing a designated sample of units to provide 95% confidence that most units are below the lead standard. The sample size should be carefully chosen using statistical techniques (see HUD Guidelines, Table 7.3).

Sample Analysis

Portable XRF devices expose a surface to X-ray or gamma radiation and measure the emission of characteristic X-rays from each element in the analyzed surface. The XRF reading is compared with a range specified in the PCS for the specific XRF device being used and the specific substrate beneath the painted surface.

When discrepancies exist between the PCS, HUD Guidelines, and the XRF device's manufacturer's instructions, the most stringent guideline should be followed.

Quality Assurance

HUD Guidelines provide several techniques for evaluation of inspection quality.

A knowledgeable observer independent of the inspection firm should be present for as much XRF testing as possible, especially if they have knowledge of LBP evaluation and/or the paint history of the facility.

The client should ask the inspector to provide copies of the results as soon as possible, or daily, allowing for immediate review.

Data from HUD's private housing lead-based paint hazard control program show that it is possible to successfully retest painted surfaces without knowing the exact spot which was tested. Therefore, the client may consider selecting 10 testing combinations for retesting at random from the already compiled list of all testing combinations, using the XRF device used for the original measurements, if possible. The average of the 10 repeat XRF results should not differ from the 10 original XRF results by more than the retest tolerance limit. The procedure for calculating the retest tolerance limit is specified in the PCS. If the limit is exceeded, the procedure should be repeated using 10 different testing combinations. If the retest tolerance limit is exceeded again, the original inspection is considered deficient.

Currently XRF technology and methods are not applicable to PCBs building material evaluation, as the precision is not adequate to provide a concentration that could be relied upon for this program.

1.2.3 LBP Sampling Procedures: Laboratory Testing of Paint Chips

The following sections summarize LBP evaluation procedures for XRF devices, including the description of sampling equipment, collection techniques and frequency, sample analysis, and quality assurance.

Laboratory analysis of paint chip samples is only recommended by HUD for inaccessible areas or building components with irregular (non-flat) surfaces that cannot be tested using

XRF devices, for confirmation of inconclusive XRF results, or for additional confirmation of conclusive XRF results.

Unlike XRF analysis, paint chip collection techniques may be more directly applicable to potential PCBs collection techniques.

Sampling Equipment

Common hand tools can be used to scrape paint chips from a surface; specialized equipment is not necessary. However, HUD Guidelines recommend that samples should be collected in sealable rigid containers rather than plastic bags, which generate static electricity and make laboratory transfer difficult.

Collection Techniques

HUD Guidelines, which are consistent with ASTM E1729, Standard Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination, recommend that only one paint chip needs to be taken for each testing combination, although additional samples are recommended for quality control.

The paint chip sample should be taken from a representative area that is at least 4 square inches in size. The dimensions of the surface area must be accurately measured to the nearest $1/16^{th}$ of an inch so that laboratory results can be reported in units of mg/cm^2. Paint chip collection should include collection of all the paint layers from the substrate, but collection of actual substrate should be minimized. Any amount of substrate included in the sample may cause imprecise results.

Sample Analysis

A laboratory used for LBP analysis must be recognized under EPA's National Lead Laboratory Accreditation Program (NLLAP) for the analysis of lead paint; however, States or Tribes may operate an EPA-authorized lead-based paint inspection certification program with different requirements.

There are several standard laboratory techniques to quantify lead in paint chip samples, including Atomic Absorption Spectroscopy, Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES), Anodic Stripping Voltammetry, and Potentiometric Stripping Analysis.

For analytical methods that require sample digestion, samples should be pulverized so there is adequate surface area to dissolve the sample before laboratory instrument measurement. In some cases, the amount of paint collected from a 4-square-inch area may exceed the amount of paint that can be analyzed successfully. It is important that the actual sample mass analyzed not exceed the maximum mass the laboratory has successfully tested using the specified method. If subsampling is required to meet analytical method specifications, the laboratory must homogenize the paint chip sample (unless the entire sample will eventually be analyzed, and the results of the subsamples combined). Without homogenization, subsampling would likely result in biased, inaccurate lead results. If the sample is properly homogenized and substrate inclusion is negligible, the result can be reported as a loading, in milligrams per square centimeter (mg/cm^2), the preferred unit, or as percent by weight, or both.

Quality Assurance

Laboratory reference materials processed with the paint chip samples for quality assurance purposes should have close to the same mass as those used for paint-chip samples (refer to ASTM methods E1645, E1613, E2051, and E1775).

Reporting

The laboratory report for analysis of paint chip samples should include at a minimum, the information outlined in the EPA National Lead Laboratory Accreditation Program Laboratory Quality System Requirements, Revision 3.0, section 5.10.2, Test Reports[15]. In addition to those minimum requirements, test reports containing the results of sampling must include specified sampling information, if available.

[15] National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements https://www.epa.gov/sites/production/files/documents/lqsr3.pdf, accessed September 20, 2017.

APPENDIX D

Document Revision History

Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition

Summary of Revisions November 2019

1. The description of currently established building material evaluation protocols for asbestos and lead-based paint were moved from Section 2 to Appendix C.
2. Both window glazing putty and window caulking were added as examples within the “Caulks and Sealants” category to the list of priority materials to sample in Section 2.1.
3. Added clarification in Section 2.1 that sampling of the priority building materials listed in the protocol is required at a minimum. Sampling of building materials coming into contact with priority building materials is not required specifically by this protocol, but may or may not be part of any subsequent remediation. Also clarified that applicants who have conducted sampling prior to the publication of the protocol may use that data provided it is consistent with the protocol.
4. California-ELAP was added to Section 2.2.4 as an acceptable accreditation for a laboratory used to analyze priority building materials for PCBs (in addition to the national NELAP accreditation).
5. Added a clarification to Section 2.2.1 that decontamination with certain solvents (e.g., hexane) may be utilized for cleaning of tar-like substances off of sampling tools, followed with the standard decontamination procedures listed in the protocol. It is recommended that equipment is air-dried, but it is up to the discretion of the environmental professional to use alternative drying methods if time constraints for air-drying are prohibitive.
6. Section 2.2.3 was revised to increase the reporting limit from 50 to 500 micrograms per kilogram and to allow for the reporting limit to be modified to account for necessary dilutions or interferences, as determined by the laboratory.
7. Minor edits were made to the text throughout to correct typographical errors and improve clarity. In addition, clarifying edits to nomenclature were made to the photo log in Appendix B.

Appendix 13

- Annual Reporting for FY 2019-2020, Regional Supplement for Training and Outreach
- Pesticides Subcommittee Annual Report and Effectiveness Assessment - 2019-2020, California Stormwater Quality Association, Final Report
- Annual Reporting for FY 2019-2020, New Development and Redevelopment

Annual Reporting for FY 2019-2020

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 2020

B A S M A A

Alameda Countywide Clean Water Program

Contra Costa Clean Water Program

Fairfield-Suisun Urban Runoff Management Program

Marin County Stormwater Pollution Prevention Program

Napa Countywide Stormwater Pollution Prevention Program

San Mateo Countywide Water Pollution Prevention Program

Santa Clara Valley Urban Runoff Pollution Prevention Program

Sonoma County Water Agency

Vallejo Flood & Wastewater District

To Whom It May Concern:

We certify under penalty of law that this document was prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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Table of Contents

LIST OF ATTACHMENTS:

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.e., Control of Mobile Sources,
- Provision C.7.c.ii.(1), Stormwater Point of Contact, and
- Provision C.9.e.ii.(1), 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 2019-2020 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.e. Control of Mobile Sources

This provision requires:

Each Permittee shall implement a program to reduce the discharge of pollutants from mobile businesses.

(1) The program shall include the following:

(a) Implementation of minimum standards and BMPs for each of the various types of mobile businesses, such as automobile washing, power washing, steam cleaning, and carpet cleaning.

(b) Implementation of an enforcement strategy that specifically addresses the unique characteristics of mobile businesses.

(c) Regularly updating mobile business inventories.

(d) Implementation of an outreach and education strategy to mobile businesses operating within the Permittee's jurisdiction.

(e) Inspection of mobile businesses, as needed.

(2) Permittees may cooperate county-wide and/or region-wide with the implementation of their programs for mobile businesses, including sharing of mobile business inventories, BMP requirements, enforcement action information, and education.

BASMAA's long-standing Surface Cleaner Training and Recognition Program addresses the BMP and training 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.

Cleaners that take the web-based 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. Cleaners can use the website to get trained and recognized for the first time or renew their training and recognition, as required annually. Recognized cleaners can also download marketing materials from the website. Potential customers, including Permittees can use the site to verify the recognition status of any cleaner, as can municipal inspectors.

In July 2014, the State Water Board adopted a temporary Emergency Regulation for Statewide Urban Water Conservation that directly affected some of the surface cleaning activities and best management practices of the Surface Cleaner Training and Recognition Program. Among other actions, the emergency regulations "prohibited, except where necessary to address an immediate health and safety need:…

2) The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle or device attached to it that causes it to cease dispensing water immediately when not in use;

3) The application of potable water to driveways and sidewalks;"

The regulation was to remain in effect for 270 days, unless extended by the State Water Board due to ongoing drought conditions.

Of particular concern was item 3), which prohibited many of the activities conducted by surface cleaners if an immediate health and safety need could not be demonstrated and would require significant changes in the Surface Cleaner Training and Recognition Program. However, both the term and content of the emergency regulations were temporary, and the State Water Board might need to change either with minimal notice. Given the uncertain long-term future of the emergency regulations, BASMAA adopted a two-part strategy:

1) track the status of the emergency regulations with a plan to make the necessary changes to the Surface Cleaner Training and Recognition Program if the regulations became permanent, and

2) alert the cleaners that are in the Surface Cleaner Training and Recognition Program to the emergency regulations.

To effect part 2), in August 2014, BASMAA sent a notice to all the Recognized Cleaners alerting them to the emergency regulations. Part 1) progressed along the following chronology of events:

- May 2015, the State Water Board amended and readopted the emergency regulation extending its effectiveness to February 2016.
- February 2016, the State Water Board extended the emergency regulation through October 2016 (into FY 16-17).
- May 2016, the State Water Board replaced the emergency regulation adopted in

February 2016 and extended the regulation through February 2017.

- February 2017, the State Water Board extended the emergency regulation for 270 days until November 25, 2017.
- April 2017, the Governor issued Executive Order B-40-17, which builds on actions taken in Executive Order B-37-16, including the State Water Board maintaining prohibitions on wasteful practices such as hosing off sidewalks. And as directed by the Governor in Executive Order B-37-16, the State Water Board is to separately take action to make wasteful water practices permanent.
- February 2018, the State Water Board attempted to make wasteful water practices permanent but after receiving significant opposition from water agencies before the adoption meeting, postponed adoption to allow more time to address comments.

In discussions with BASMAA, State Water Board staff have indicated that the regulations would regulate water use and not the discharge, and the regulations would regulate the use of potable water. BASMAA continues to track any developments and will work with the State Water Board as they develop and adopt a permanent regulation to try to ensure that necessary outdoor surface cleaning activities can be conducted in accordance with both stormwater regulations and urban water conservation regulations.

Public Information and Outreach

C.7.c.ii.(1) Stormwater Point of Contact

This provision requires:

Each Permittee shall maintain and publicize one point of contact for information on stormwater issues, watershed characteristics, and stormwater pollution prevention alternatives. This point of contact can be maintained individually or collectively and Permittees may combine this function with the spill and dumping complaint central contact point required in C.5.

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 (https://baywise.org/about/).

Pesticides Toxicity Control

C.9.e.ii.(1) 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.*

MRP Regional Supplement for Training and Outreach
Annual Reporting for FY 2019-2020

The Annual Reporting provision requires:

> *Outreach conducted at the county or regional level shall be described in Annual Reports prepared at that respective level; reiteration in individual Permittee reports is discouraged. Reports shall include a brief description of outreach conducted…, including level of effort, messages and target audience. (The effectiveness of outreach efforts shall be evaluated only once in the Permit term, as required in Provision C.9.f. [Ed. C.9.g]).*

Below is a report of activities and accomplishments of the *Our Water, Our World* program for FY 2019-2020. For a detailed report of activities, see the attached Consultant's Final Report.

- Coordinated program implementation with major chains Home Depot and Ace Hardware National.
    - Home Depot Corporate (Atlanta) directed support of the program with their stores (see letter attached).
- Completed the development and creation of two new fact sheets for Bed Bugs (in English and Spanish) and Moles, Voles, and Gophers. There are now 22 fact sheets – 18 in English and 4 in Spanish.
- Maintained an inventory of the following: fact sheets, shelf tags, literature rack display signage, *10 Most Wanted* brochures, *Pest or Pal Activity Guide for Kids*, custom-designed product guide dispensers, and two versions of product guides (Home Depot and generic), from which participating agencies could purchase materials.
- Recruited for, developed, planned, and conducted an IPM Advocates training course to qualify 5 new Advocates, almost doubling the IPM Advocates corps to 12 individuals.
- Conducted monthly seasonal pests meetings with IPM Advocates for month / season ahead.
- Updated less-toxic Product List by-manufacturer.
- Coordinated employee trainings and tabling events at *Our Water, Our World* stores.
- Maintained *Our Water, Our World* website.
- Provided Ask-the-Expert service—in which the Bio-Integral Resource Center (BIRC) provides 24-hour turnaround on answers to pest management questions. BIRC researched and provided answers to about 28 questions in FY 19-20.
- Provided and staffed exhibitor booths and made presentations to attendees:

  - Central Trade Show, Las Vegas (August 2019)
  - L&L Dealer Show, Reno (October 2019)
  - NorCal trade show, San Mateo (February 2020)

- Participated in UCIPM Continuing Education for IPM Advocates.

Below are some outputs and outcomes for FY 19-20:
- 36 *Our Water, Our World* Store Trainings[1]
- 301 employees trained at *Our Water, Our World* stores[2]
- 54 outreach events at *Our Water, Our World* stores[3]
- 3,146 customers contacted by Advocates at tabling events at stores and virtual events[4]
- 28 questions researched and answered by technical expert
- Over 30% increase in sales of eco-pesticide categories and an overall 8% increase in sales of eco-products over the previous year (Home Depot Corporate)
- Doubling of Sluggo sales over the previous year
- Over 29% growth in sales of Ortho Ground Clear, a newer eco-herbicide (Scotts Miracle-Gro)
- Over 22% growth in sales of Ortho 3-in-1, pyrethrin and sulfur combination

[1,2,3,4] Funded by permittees at local level.

Attachments

Point of Purchase Outreach

Home Depot Letter of Support

Interoffice
MEMORANDUM

DATE: January 1, 2020

TO: California Store Managers, D28 ASMs and Department Heads

FROM: Ron Jarvis

CC: Steve Knott, Scott Jacobson

SUBJECT: Our Water Our World training

OUR WATER, OUR WORLD is a coalition of organizations whose purpose is to encourage consumers to use less toxic pest controls in and around their homes. They specialize in retail friendly education. Their goal is not to alienate consumers by telling them what they can't use, but instead their information focuses on less toxic pest management and ties into products currently on our shelves.

An Our Water, Our World (OWOW) representative will be in your store to help train employees and label less-toxic products with shelf-talkers. The representative may also schedule a tabling event to educate consumers. This ties in well with "How-to" weekend events. The representative will display a sampling of excellent less toxic and Eco Options products off our shelves. They will provide free informational literature and a wealth of knowledge and experience. Please enjoy this additional help in your store.

A representative will contact you before the training or demonstration date to arrange details. Please contact Suzanne Bontempo at (415) 317-0475 if you have any questions.

Thank you

Ron Jarvis

from the desk of........
Ron Jarvis
Merchandising Vice President – Sustainability
THE HOME DEPOT USA, INC.
2455 Paces Ferry Road
Atlanta, GA 30339
(770) 384-4835
Fax (770) 384-4411

Attachments

Point of Purchase Outreach

Our Water, Our World Consultant's Summary Report

OUR WATER - OUR WORLD

BASMAA

Our Water Our World Retail Partners Summary Report
July 2019 – June 2020

prepared by Suzanne Bontempo, Plant Harmony - July 2020

Program Annual Overview:

The fiscal year started off by attending the Central Trade Show in August, then the L&L show in October, where we saw some changes among the vendors. Safer Brand is rebranding many of their products, transitioning both the Concern and some Havahart branding to Safer branding. I saw that Ferti-lome has OMRI certification for its eco-pesticide line. Miracle-Gro has expanded the Performance Organics fertilizer line and the EcoSmart line has new labeling and branding image.

The focus during August – December was preparing for the IPM Advocate training I conducted in January. This involved many hours of collaboration with Debi Tidd and Karey Windbiel-Rojas. I gave my full attention to recruiting, following up with these new recruits, preparing the curriculum, finding a location for the training, scheduling the dates and times of our classes to meet.

As October came, PG&E began exercising the power shut offs, that impacted many residences as well as the retailers throughout the Bay Area. Then the Kincade Fire ignited on October 23rd, halting OWOW services throughout the North Bay Area for the weeks that followed. As soon as the fire was behind us, the retail holiday season was in full swing, which meant OWOW services didn't resume until mid-December.

In January the new IPM Advocates attended and completed their training. This was a wonderful accomplishment. The new Advocates bring wonderful support to the OWOW program and are open to moving the program forward where possible. They come with insightful ideas and dynamic energy.

In February I began working with the new Advocates, having them shadow me with each store visit and OWOW task. I also joined the NorCal Trade Show with the help of IPM Advocate Lisa Ratusz. The NorCal show invited me to give a presentation on IPM to the garden industry professionals. The Department of Pesticide Regulations qualified my class for one continuing education unit for the garden industry professionals. The new IPM Advocates were invited to come experience the show which Charlotte Caner, Sherri Sunahara, and Emily Holly were each available to do.

Then March arrived and life as we knew it went sideways. I cannot express enough how challenging this spring season became because of the Covid-19 pandemic. The retailers were stressed beyond measure. I, and all of the IPM Advocates servicing the OWOW program did our best to provide OWOW services while sheltering in place. Many of the retailers, including the Home Depot Corporate, requested that we pause our services during that time, which we did. I certainly did what I could to provide the retailers relevant pest problem solving support remotely.

Though these challenges have been significant, this has been a year of transitions. With more IPM Advocates retiring last year, I am happy to include our new, recently training IPM Advocates to the group this year. Next I am finding ways to offer public education to the public remotely. I have been able to transition OWOW public education and outreach to virtual platforms through Zoom.[1] And I am happy to say that I have been able to navigate this new approach to public outreach with success. Two incredible triumphs for the 2019-2020 contract year.

Moving forward, I am currently working with Debi Tidd to develop virtual OWOW trainings that are best suited for the retailers and OWOW. I am also supporting the IPM Advocates with OWOW Pest of the Month social media posts, IPM educational videos, and written articles that expand the OWOW message to a broader reach[2]. I am extremely inspired looking forward to what is possible for delivering the OWOW message to the public in new ways.

We, the IPM Advocates have continued our focus on problem pesticide reduction by educating and mentoring the associates and consumers about alternative approaches to pest problem solving.

- Throughout the year, we continue to provide educational support and resources for the Asian Citrus Psyllid. We share the message of "Inspect, detect and then report'" to the CDFA or local agricultural department.
- The public's concerns around Roundup and glyphosate continues, however with the influence of the IPM Advocates, every retailer has at least one eco-herbicide alternative for sale.
- Rats and mice continue to be the most prevalent pest problem that people are battling. Working with exclusion and trapping is the message for success the we encourage.
- Then with the recent Sheltering in Place gardening trend, we have heard from most retailers that the sales of eco-pesticides and "organics" is up. This is wonderful to see during such a challenging time.
- Other pests that have been in the focus this year are; yellowjackets, spiders and fleas. We have provided additional education and support with eco-management solutions.

Educational retail trainings and public outreach[3]:

- **Total number of OWOW retailer trainings in the 2019-2020 fiscal year = 36**
  - Out of this total, 16 were at the Home Depot Stores

- **Total number of associates trained at these OWOW trainings = 301**
  - Out of this total, 148 were Home Depot associates

- **Total number of OWOW public outreach events in the 2019-2020 fy = 54**
  - Out of this total, 9 were at the Home Depot Stores

[1, 2, 3] Funded by permittees at local level.

- **Total number of people reaches at both in-people + virtual OWOW events = 3,146**
  - Out of this total, 351 were reached at the Home Depot store
  - Out of this total, 943 were reached through virtual classes

These numbers reflect a 220% decrease in trainings conducted over the previous year and a 192% decrease in the number of public outreach events.

Most of the OWOW events are scheduled during the spring retail season, per the request of the retailer and to capture the larger crowds that the spring retail season brings. Unfortunately, the pandemic paused these services with all trainings and in-person outreach events during this time subsequently canceled. I can also add that I didn't receive the Sacramento OWOW contract NTP until January 1st, which was 3 months of opportunities lost.

The encouraging piece we are seeing is with the virtual education webinars. The OWOW IPM educational webinar events were created in lieu of in-person public outreach. Due to the health measures related to Covid, lower staffing levels left customers unsupported in the aisle at the point of purchase. These webinars are intended to introduce the OWOW program, the OWOW & UCIPM websites, and how to use these websites as a tool to properly identify pest problems with less toxic solutions.

Each webinar shares the common goal of introducing IPM Practices and over all healthy garden practices, to pre-educate consumers for their instore purchase decisions. Each participating agency assisted by promoting these events. The attendance rate for these no fee webinars averages 50%, which are encouraging numbers since 20% is the average for no fee webinars. Moving forward I plan to expand this remote outreach education.

Retailer support and sales overview:

- Home Depot Corporate provided a letter of 'Thanks' and "Support" for the OWOW program partnership in October, which Geoff sent to the agencies
- Home Depot Corporate provided a letter to BASMAA for the IPM Advocates outlining this program partnership and participation
- Home Depot Corporate, the sales of the eco-pesticide categories have increased over 30% with an overall increase of 8% of eco-products over the previous year.
- Sluggo sales is reported to have doubled over the previous year. This is a reflection of the recent gardening trend due to the pandemic, working from home and sheltering in place and the efforts of the IPM Advocates
- Ortho Ground Clear, a newer eco-herbicide Scotts Miracle-Gro was showcasing for 2020, has seen a growth of over 29%
- Ortho 3-in-1, pyrethrin and sulfur combination, has seen a growth in sales of over 22%

Throughout the 2020 year, Scott's Miracle Gro's newest organic fertilizer under the name of 'Performance Organics' continues to sell at an amazing rate.

Final comments:

As I mentioned in my review of the 2019-2020 fiscal year, this may have been the most challenging year we will ever see. With the fires and power shutoffs in the fall, the hardware and home improvement stores were faced with many retail stresses. Then, as March arrived, I cannot express enough how challenging this season became because of the pandemic. The immediate challenge I was then faced with was how to reach the public when we were restricted to Sheltering in Place. How do I transition a public outreach program virtually? With the wonderful support and encouragement of a few agencies, I dove into the virtual training world through Zoom. Moving forward I see the value of providing OWOW education to the public through Webinar style classes. Also, to develop a virtual training platform that is best suited for the retailers and OWOW, this will only broaden our reach with OWOW education. Though it is very disappointing to me to end the year on this note, I am inspired looking forward to what is possible for delivering the OWOW message to the public in a new way.

The other encouraging discovery we witnessed once we began again to provide in-person OWOW services to the retailers is that many of the retailer's shelves were emptied of product from sell through, primarily the eco-products. This was from the supplier's inability to keep up with the consumer's demand. Retail teams also reported that their customers were asking for organic alternatives over the traditional products. A remarkable transition for the marketplace.

In addition, I am encouraged to hear that upgrading OWOW website is currently being discussed. This seems to be more relevant than ever before given the current state of affairs. As I have shared before, the OWOW website has the potential to be a valuable vital tool for the IPM Advocates, the retailers, and the public.

Alameda Countywide
Clean Water Program

Contra Costa
Clean Water Program

Fairfield-Suisun
Urban Runoff
Management Program

Marin County
Stormwater Pollution
Prevention Program

Napa Countywide
Stormwater Pollution
Prevention Program

San Mateo Countywide
Water Pollution
Prevention Program

Santa Clara Valley
Urban Runoff Pollution
Prevention Program

Sonoma County
Water Agency

Vallejo Flood &
Wastewater District

B A S M A A

September 30, 2020

Michael Montgomery, Executive Officer
California Regional Water Quality Control Board, San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: FY 2019-20 Annual Report: MRP Provision C.9.f - Track and Participate in Relevant Regulatory Processes

Dear Mr. Montgomery:

This letter and attachments are submitted on behalf of all 76 municipalities subject to the requirements of the Municipal Regional Stormwater NPDES Permit (MRP).

The essential requirements of provision C.9.f (text attached) 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) – an approach the Permittees have engaged in for a number of years. Recognizing this approach is the most likely to result in meaningful changes in the regulatory environment, Permittees elected to continue on this course in FY 2019-20 to achieve compliance with this provision. Oversight of this provision is the purview of the BASMAA Board of Directors.

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. FY 2019-20 was another productive year for the Subcommittee. The CASQA Pesticides Subcommittee's annual report for FY 2019-20 (attached) provides a comprehensive and detailed accounting of efforts to track and participate in relevant regulatory processes as well as accomplishments related to pesticides and stormwater quality.

We certify under penalty of law that this document was prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Bay Area
Stormwater Management
Agencies Association
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Menlo Park, CA 94026
650.365.8678
info@basmaa.org

Jim Scanlin, Alameda Countywide Clean Water Program

Karin Graves, Contra Costa Clean Water Program

Kevin Cullen, Fairfield-Suisun Urban Runoff Management Program

Matthew Fabry, San Mateo Countywide Water Pollution Prevention Program

Adam Olivieri, Santa Clara Valley Urban Runoff Pollution Prevention Program

Jennifer Harrington, Vallejo Flood & Wastewater District

Attachments

MRP Provision C.9.f

Pesticides Subcommittee Annual Report and Effectiveness Assessment 2019-2020; California Stormwater Quality Association; August 2020

MRP Provision C.9.f states:

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

i. Task Description – The Permittees shall conduct the following activities, which may be done at a county, regional, or statewide level:

(1) The Permittees shall track U.S. EPA pesticide evaluation and registration activities as they relate to surface water quality and, when necessary, encourage U.S. EPA to coordinate implementation of the Federal Insecticide, Fungicide, and Rodenticide Act and the CWA and to accommodate water quality concerns within its pesticide registration process;

(2) The Permittees shall track DPR pesticide evaluation activities as they relate to surface water quality and, when necessary, encourage DPR to coordinate implementation of the California Food and Agriculture Code with the California Water Code and to accommodate water quality concerns within its pesticide evaluation process;

(3) The Permittees shall assemble and submit information (such as monitoring data) as needed to assist DPR and county agricultural commissioners in ensuring that pesticide applications comply with WQS; and

(4) As appropriate, the Permittees shall submit comment letters on U.S. EPA and DPR re-registration, re-evaluation, and other actions relating to pesticides of concern for water quality.

ii. Reporting – In their Annual Reports, the Permittees shall summarize participation efforts, information submitted, and how regulatory actions were affected. Permittees who contribute to a county, regional, or statewide effort shall submit one report at the county or regional level. Duplicate reporting is discouraged.

Pesticides Subcommittee Annual Report and Effectiveness Assessment 2019-2020

California Stormwater Quality Association

Final Report

August 2020

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

Pesticides Subcommittee Annual Report and Effectiveness Assessment

2019-2020

California Stormwater Quality Association

August 2020

Preface

The California Stormwater Quality Association (CASQA) is comprised of stormwater quality management organizations and individuals, including cities, counties, special districts, industries, and consulting firms throughout California. CASQA's membership provides stormwater quality management services to more than 22 million people in California. This report provides CASQA's members with focused information on its efforts to prevent pesticide pollution in urban waterways. It is a component of CASQA's Source Control Initiative, which seeks to address stormwater and urban runoff pollutants at their sources. This report was funded by CASQA, BASMAA, the Sacramento Stormwater Quality Partnership, and Alameda Countywide Clean Water Program.

This report was prepared by Stephanie Hughes under the direction of the CASQA Pesticides Subcommittee Co-Chair Dave Tamayo, with input from Dr. Kelly Moran and Tammy Qualls of Qualls Environmental Consulting.

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Abbreviations Used in this Report

BACWA – Bay Area Clean Water Agencies

BE – Biological Evaluation

CASQA – California Stormwater Quality Association

CEQA – California Environmental Quality Act

CCRWQCB – Central Coast Regional Water Quality Control Board

CVRWQCB – Central Valley Regional Water Quality Control Board

CWA – Clean Water Act

DPR – California Department of Pesticide Regulation

EPA – United States Environmental Protection Agency

ESA – Endangered Species Act

FWS – U.S. Fish and Wildlife Service

FY – Fiscal Year (July 1 through June 30)

IPM – Integrated Pest Management

MAA – Management Agency Agreement between DPR and the Water Boards

MS4 – Municipal Separate Storm Sewer System

NACWA – National Association of Clean Water Agencies

NPDES – National Pollutant Discharge Elimination System

OPP – U.S. EPA Office of Pesticide Programs

OW – U.S. EPA Office of Water

PAH – Polycyclic aromatic hydrocarbon

PEAIP – Program Effectiveness Assessment and Improvement Plan

PMAC – Pest Management Advisory Committee

PPI – Pests, Pesticides, and Integrated Pest Management DPR initiative

PMP – Pesticides-specific Management Practice

PSC – CASQA Pesticides Subcommittee

SPCB – Structural Pest Control Board

SFBRWQCB – San Francisco Bay Regional Water Quality Control Board

STORMS – Strategy to Optimize Resource Management of Storm Water (a program of the State Water Board)

SWAMP – California Water Boards Surface Water Ambient Monitoring Program

SWRCB – State Water Resources Control Board or State Water Board

TMDL – Total Maximum Daily Load (regulatory plan for solving a water pollution problem)

UP3 – Urban Pesticides Pollution Prevention Partnership

UPA – Urban Pesticide Amendments

UPCMP – Urban Pesticides Coordinated Monitoring Program

USGS – U.S. Geological Survey

Water Boards – California State Water Resources Control Board together with the California Regional Water Quality Control Boards

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Executive Summary

This report by the Pesticides Subcommittee (PSC) of the California Stormwater Quality Association (CASQA) describes CASQA's activities related to the goal of preventing pesticide pollution in urban waterways from July 2019 through June 2020.

To address the problems caused by pesticides in California's urban waterways, CASQA collaborates with the California State Water Resources Control Board and the California Regional Water Quality Control Boards (Water Boards). By working with the Water Boards and other water quality organizations, we address the impacts of pesticides efficiently and proactively through the statutory authority of the California Department of Pesticide Regulation (DPR) and EPA's Office of Pesticide Programs (OPP). More than 17 years of collaboration with Urban Pesticides Pollution Prevention (UP3) Partnership, as well as EPA and DPR staff, has resulted in significant changes in pesticide regulation. CASQA's activities and outcomes are described in Section 2. This year's highlights include continued progress on the State Water Board's Urban Pesticides Amendments (UPA) project as well the pesticide regulator actions described below.

Near term/Current problems – Are actions being taken by State and Federal pesticides regulators and stakeholders expected to end pesticide-caused toxicity or exceedances of pesticide water quality objectives in surface waters receiving urban runoff?

- In Fall 2019, DPR finalized regulations to restrict carbaryl use and end sale of carbaryl consumer products. This action makes all carbaryl products in California restricted materials, except for baits labeled only for agricultural use. This regulation was filed with the Secretary of State this spring and will become effective on August 1st.
- CASQA identified a product registration application containing novaluron and successfully requested this product be routed by DPR for surface water review. The subsequent evaluation did not support registration. DPR subsequently issued a Notice of Proposed Decision to Deny the product.
- CASQA shared its urban runoff expertise with pesticide regulators by preparing comment letters to EPA for seven pesticide reviews, providing the Water Boards and other Partners with information that triggered additional letters on two more pesticide reviews, and participating in meetings and conference calls focused on priority pesticides and long-term regulatory structure improvements. *(See Tables 3, 4 and 5 and the Appendix.)*
- CASQA provided feedback to EPA regarding their Framework for Pesticides Risk Assessments Incorporating Endangered Species Act Biological Evaluations (and eventually all pesticides risk evaluations for conventional pesticides) requesting that outdoor impervious surfaces be included in the list of areas that receive pesticide treatment.
- In response to continued requests from CASQA and Partners, EPA has begun following a precedent for improved label language for pool, spa, and fountain chemicals that was established by the decisions for lithium hypochlorite and copper.
- CASQA/UP3 reviewed scientific literature in order to update and prioritize the Pesticide Watch List, which it shared with pesticides regulators and with government agency and university scientists to stimulate generation of surface water monitoring and aquatic toxicity data for the highest priority pesticides. *(See Table 2.)*

Long term/Prevent future problems – Do pesticides regulators have an effective system in place to exercise their regulatory authorities to prevent pesticide toxicity in urban water bodies?

- DPR continues to demonstrate its commitment to addressing pesticide impacts on receiving waters through timely mitigation and implementation of improved evaluation procedures.
- The State Water Board continued to work toward adoption of the UPA. These amendments would institutionalize the State's strategy of utilizing pesticide regulations as the primary mechanism for addressing pesticide water quality problems associated with urban runoff, serving as a TMDL

alternative. Implementation will be supported by a new statewide urban runoff pesticides monitoring program intended to coordinate with existing Water Board and DPR urban pesticides and toxicity monitoring programs.

- In concert with the development of UPA, the Urban Pesticides Coordinated Monitoring Program (UPCMP) continued progress to establish the initial framework of the monitoring program via the Steering Committee and Technical Committee.
- CASQA continued to be an active participant in the UPCMP and recruited members to serve on both the Steering Committee and Technical Committee. CASQA organized a meeting of DPR, Water Board, and CASQA representatives for July 24th for DPR to provide details to senior Water Board management on DPR's capacity and progress for addressing urban pesticide issues.
- A paper was published that was co-authored by Dr. Kelly Moran, and staff from DPR, the State Water Board, and UC Davis, describing many of the key elements of the coordination between DPR and the State Water Board.
- Although many improvements have been made by OPP since the early 2000s, improvement in scientific evaluations supporting OPP's regulatory efforts and better understanding of urban runoff management systems are still necessary to adequately protect urban surface waters from pesticide impairments. In recent years, the regulatory climate has changed, limiting support of progress by OPP in addressing these concerns.

In FY 2020-2021, CASQA plans to continue to address near-term pesticide concerns and seek long-term regulatory change. Future near-term and long-term tasks are identified in Section 3, Tables 5 and 6. Key topics include:

- Continued support of the eventual completion and adoption of the UPA by the State Water Board
- Continued development of the UPCMP in partnership with the Water Boards, DPR, and EPA Region 9
- Registration review-related activities at EPA for pyrethroids and fipronil (the only such opportunity for the next 15 years)
- DPR registration applications and proposed decisions for new products

Section 1. Introduction

1.1 IMPORTANCE OF CASQA'S EFFORTS TO IMPROVE PESTICIDE REGULATION

For decades now, the uses of certain pesticides in urban areas – even when applied in compliance with pesticide regulations – have adversely impacted urban water bodies. Currently used pesticides are the primary cause of toxicity in California surface waters, including urban water bodies.[1] Under the Clean Water Act (CWA), when pesticides impact water bodies, local agencies may be held responsible for costly monitoring and mitigation efforts. To date, some California municipalities[2] have incurred substantial costs to comply with pesticides-related Total Maximum Daily Loads (TMDLs) and additional permit requirements. In some cases (e.g., diazinon, chlorpyrifos), municipal compliance costs have continued more than a decade after termination of virtually all urban use. In the future, more municipalities throughout the state could be subject to similar requirements, as additional TMDLs and Basin Plan amendments are adopted (Table 1). Meanwhile local agencies have no authority to restrict or regulate when or how pesticides are used[3] in order to proactively prevent pesticide pollution and avoid these costs.

Under federal and state statutes, EPA and DPR have the authority and responsibility to regulate pesticides and protect water bodies from adverse effects (including impacts from pesticides in urban runoff). Unfortunately, until the relatively recent past these agencies did not recognize the need, nor did they possess the institutional capacity to exercise their authority to protect urban water quality. As a result, past registration actions have allowed a number of pesticides (such as pyrethroids and fipronil) to be used legally in ways that have resulted in widespread pollution in urban water bodies. This situation is depicted in Figure 1.

To change this situation CASQA is actively engaged with state and federal regulators in an effort to develop an effective pesticide regulatory system, based primarily on existing statutes, that includes timely identification and mitigation of urban water quality impacts, and proactively prevents additional problems through the registration and registration review processes (Figure 2).

Table 1. California TMDLs, Statewide Water Quality Control Plans, and Basin Plan Amendments Addressing Currently Registered Pesticides and/or Toxicity in Urban Watersheds[4]

Water Board Region	Water Body	Pesticide	Status
Statewide	All MS4s/All Urban Waterways: Statewide Water Quality Control Plan amendments for urban pesticides reduction ["Urban Pesticides Amendments"] (Inland Surface Waters, Enclosed Bays & Estuaries, and Ocean)	All Pesticides/All pesticide-related toxicity	In preparation
	Sediment Quality Objectives (Enclosed Bays & Estuaries)	Sediment Toxicity [5]	Approved
	Toxicity Provisions (Inland Surface Waters and Enclosed Bays & Estuaries)	Toxicity [5]	In preparation

[1] See reports from the California Surface Water Ambient Monitoring Program Sediment Pollution Trends Program including Anderson, B.S., Hunt, J.W., Markewicz, D., Larsen, K., 2011. Toxicity in California Waters, Surface Water Ambient Monitoring Program. California Water Resources Control Board. Sacramento, CA.
[2] For example, Sacramento-area municipalities spent more than $75,000 in the 2008-2013 permit term on pyrethroid pesticide monitoring alone; Riverside-area municipalities spent $617,000 from 2007 to 2013 on pyrethroid pesticide chemical and toxicity monitoring.
[3] Local agencies in California have authority over their own use of pesticides but are pre-empted by state law from regulating pesticide use by consumers and businesses.
[4] Excludes pesticides that are not currently registered in California, such as organochlorine pesticides.
[5] These TMDLs/Plan provisions can trigger toxicity testing stressor source identification studies, and additional follow up, even when toxicity is linked to current pesticides.

Water Board Region	Water Body	Pesticide	Status
San Francisco Bay (2)	All Bay Area Urban Creeks	All Pesticide-Related Toxicity	Approved
Central Coast (3)	Santa Maria River Watershed	Pyrethroids, Toxicity	Approved
	Lower Salinas River Watershed	Pyrethroids, Toxicity	Approved
		Malathion, Chlorpyrifos, Diazinon [6]	In development
	San Lorenzo River Watershed (Santa Cruz)	Chlorpyrifos [6]	Approved
Los Angeles (4)	Marina del Rey Harbor	Copper (Marine antifouling paint) [7]	Approved
	Oxnard Drain 3 (Ventura County)	Bifenthrin, Toxicity	EPA-Adopted Technical TMDL
	Calleguas Creek, its Tributaries and Mugu Lagoon	Water & Sediment Toxicity [5]	Approved
	McGrath Lake (Ventura County)	Diazinon & Chlorpyrifos [6]	Approved
	Colorado Lagoon (Long Beach)	Sediment Toxicity [5]	Approved
	Dominguez Channel and Greater Los Angeles and Long Beach Harbors Waters	Sediment Toxicity [5]	Approved
	Ballona Creek Estuary	Sediment Toxicity [5]	Approved
Central Valley (5)	Sacramento River and San Joaquin River Basins	Pyrethroids	Approved
	Sacramento-San Joaquin River Delta Waterways	Diazinon & Chlorpyrifos [6]	Approved
	Sacramento & Feather Rivers	Diazinon & Chlorpyrifos [6]	Approved
	Sacramento County Urban Creeks	Diazinon & Chlorpyrifos [6]	Approved
	Lower San Joaquin River	Diazinon & Chlorpyrifos [6]	Approved
Lahontan (6)	Pesticide Discharge Prohibition	All Pesticides	Approved
Santa Ana (8)	Newport Bay	Copper (Marine antifouling paint) [7]	In preparation
	San Diego Creek, and Upper and Lower Newport Bay	Toxicity (Diazinon & Chlorpyrifos) [6]	EPA-Adopted Technical TMDL
San Diego (9)	Shelter Island Yacht Basin (San Diego Bay)	Copper (Marine antifouling paint) [7]	Approved
	Chollas Creek	Diazinon [6]	Approved

[6] Use prohibited in urban areas (diazinon) or no meaningful use due to use limitations (chlorpyrifos).
[7] Primarily addresses pesticides that are directly discharged and should not ordinarily appear in stormwater (marine antifouling paint).

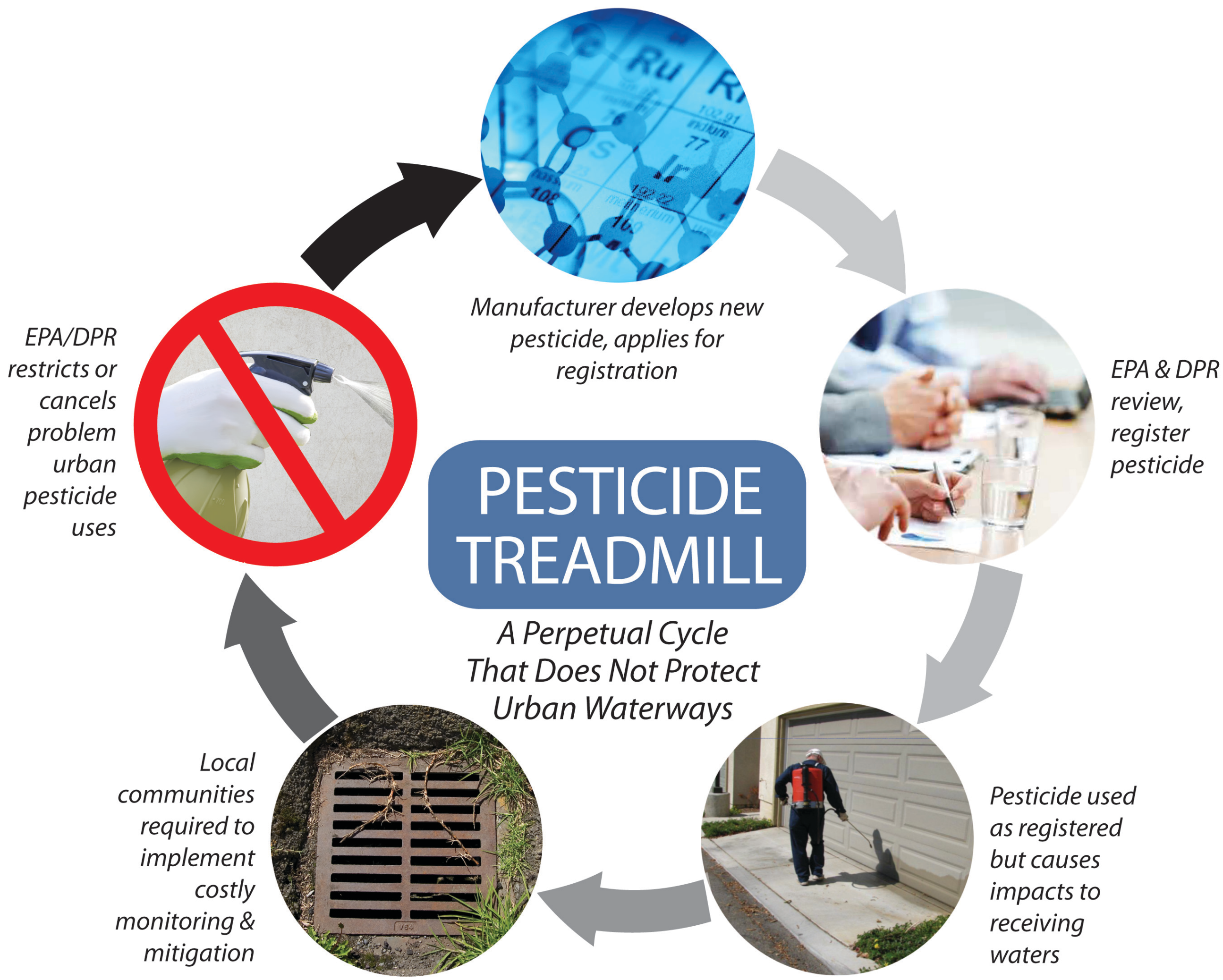

Figure 1. Current Pesticide Regulatory System.[8]

[8] Photos in Figures 1 and 2 of spraying pesticide along a garage was taken by Les Greenberg, UC Riverside

Figure 2. Proactive Use of the Pesticide Regulatory Structure to Restrict Pesticide Uses that have the Potential to Cause Urban Water Quality Problems.

1.2 CASQA'S GOALS AND APPLICATION TO PROGRAM EFFECTIVENESS ASSESSMENT

CASQA's Vision for Stormwater, first approved by the Board of Directors in 2015, is periodically updated to reflect developments in stormwater management. In August 2019, CASQA released an interim update to support the development of priorities for 2020.[9] CASQA's Vision, Action 1.3, is to "provide effective and efficient solutions through true source control." Among the three objectives described within Action 1.3 is "control toxicity in receiving waters from pesticide application." In support of this objective, the Vision identifies the following scope:

Anticipated Scope:

- Develop a regulatory system implemented by EPA OPP and California DPR to identify whether use of a pesticide poses a threat to water quality, and then restrict or disallow those uses proactively so that water quality impacts are avoided.
- Respond to the immediate need to participate in EPA pyrethroids, fipronil, and imidacloprid reviews (the only such opportunity for the next 15 years) and to support and encourage DPR steps toward expanded pyrethroids and new fipronil mitigation measures.
- Seek EPA risk mitigation for malathion and carbaryl in urban runoff and the continuation of traditional water quality risk assessments in tandem with Endangered Species Act (ESA) evaluations.
- Continue to leverage successes at the state level as a key stakeholder in the development of statewide Water Quality Control Plan Amendments for urban pesticides reduction.

The effectiveness of CASQA's efforts toward this scope can be expressed in relation to management questions established as part of Municipal Separate Storm Sewer Systems' (MS4s') program effectiveness assessments that are required in some MS4 permits. With respect to addressing urban pesticide impacts on water quality, the following two management questions, derived from the proposed scope for CASQA Vision Action 1.3, are suggested for inclusion in MS4s' program effectiveness assessment:

Question 1: (Near term/Current problems) – Are actions being taken by State and Federal pesticides regulators and stakeholders that are expected to end recently observed pesticide-caused toxicity or exceedances of pesticide water quality objectives in surface waters receiving urban runoff?

Question 2: (Long term/Prevent future problems) – Do pesticides regulators have an effective system in place to exercise their regulatory authorities to prevent pesticide toxicity in urban water bodies?

This report is organized to answer these management questions and is intended to serve as an annual compliance submittal for both Phase I and Phase II MS4s. It describes the year's status and progress, provides detail on stakeholder actions (by CASQA and others), and provides a roadmap/timeline showing the context of prior actions as well as anticipated end goal of these activities. This report may also be used as an element of future effectiveness assessment annual reporting.

[9] https://www.casqa.org/about/strategic-plan-vision

Section 2. Results of CASQA 2019-2020 Efforts

At any given time, there are dozens of pesticides with current or pending actions from the EPA or DPR. Addressing near term regulatory concerns is important because some pesticides may pose immediate threat to water quality that can lead to compliance liability for MS4s, and because some of the regulatory decisions made by EPA and DPR will last many years. For example, pesticide registration decisions are intended to be revisited on a fifteen-year cycle. To inform its engagement on near-term regulatory concerns, CASQA uses the pesticide “Watch List” created by the PSC and the UP3 Partnership. The Watch List aids CASQA and the UP3 Partnership in their prioritization of near-term efforts (Section 2.1).

Meanwhile, CASQA and the UP3 Partnership are also working on a parallel effort to effect long-term systemic changes in the regulatory process itself. By identifying inadequacies and inefficiencies in the pesticide regulatory process, and persistently working with EPA and DPR to improve the overall system of regulating pesticides, CASQA and the UP3 are gradually achieving results (Section 2.2).

2.1 NEAR-TERM REGULATORY CONCERNS

CASQA seeks to ensure that the Water Boards and EPA’s Office of Water (OW) work with DPR and the EPA’s OPP to manage problem pesticides that are creating near-term water quality impairments. These efforts address CASQA Vision Action 1.3 as well as Phase II MS4 Program Effectiveness Assessment and Improvement Plan (PEAIP) Management Question 1 regarding observed pesticide-caused toxicity or exceedances of pesticide water quality objectives in surface waters receiving urban runoff.

Assessment Question 1: (Near term/Current problems) – Are actions being taken by State and Federal pesticides regulators and stakeholders that are expected to end recently observed pesticide-caused toxicity or exceedances of pesticide water quality objectives in surface waters receiving urban runoff?

Answer: As detailed below, at the State level, significant progress has been made by DPR in addressing near-term and current problems with pesticides in surface waters receiving urban runoff. DPR continues to implement improved registration processes and responses to observed water quality problems. DPR also continues to implement and evaluate mitigation measures for observed problems with pyrethroids and fipronil.

At the Federal level, less progress has been made at addressing near term problems. Some early actions were taken to address pyrethroid and fipronil problems at the urging of CASQA and DPR However, EPA does not show a clear understanding of key urban uses in its analyses, and it is still unclear if its upcoming risk management decisions for pyrethroids, fipronil, and imidacloprid and other neonicotinoids will provide any additional protection of urban water bodies.

2.1.1 Updated Pesticide Watch List

A key tool for identifying near-term regulatory concerns is our pesticide “Watch List.” CASQA, working through the UP3 Partnership, reviews scientific literature, government reports, and monitoring studies as they are published. This information is used to prioritize pesticides based on the most up-to-date understanding of urban uses, pesticide characteristics, monitoring, and surface water quality toxicity (for pesticides and their degradates). The PSC uses these insights to update the Watch List each year (Table 2), which serves as a management tool to help us focus our efforts on the most important pesticides from the perspective of MS4 agencies.[10] Comparing the current Watch List to the version published in the 2018/19 PSC Annual Report, we see that the insecticides fipronil, imidacloprid, malathion, and pyrethroids remain as the Priority 1.

[10] The first Watch List was published by the UP3 in 2005.

Table 2. Current Pesticide Watch List (June 2020)

Priority	Basis for Priority Assignment	Pesticides		
1	Monitoring data exceeding benchmarks; linked to toxicity in surface waters; urban 303(d) listings	Pyrethroids (20 chemicals[11])	Fipronil	Imidacloprid (neonic) Malathion
2	Monitoring data approaching benchmarks; modeling predicts benchmark exceedances; very high toxicity and broadcast application on impervious surfaces; urban 303(d) listing for pesticide, degradate, or contaminant that also has non-pesticide sources	Carbendazim (Thiophanate methyl)[12] Chlorantraniliprole Copper pesticides	Creosote (PAHs) Indoxacarb Neonics (other than Imidacloprid)[13] Pendimethalin	Pesticides with dioxins impurity[14] Polyhexamethylenebiguanide Zinc pesticides (including Ziram)
3	Pesticide contains a Clean Water Act Priority Pollutant; 303(d) listing for pesticide, degradate, or contaminant in watershed that is not exclusively urban	Arsenic pesticides Chromium pesticides	Diuron Naphthenates	Simazine Silver pesticides Trifluralin
4	High or unknown toxicity (parent or degradate) and urban use pattern associated with water pollution; synergist for higher tier pesticide; on DPR priority list	Abamectin ADBAC pesticides[15] Azoxystrobin Bacillus sphaericus Bacillus thuringiensis (Bti) Bromacil N-Bromosulfamates Busan-77 Carbaryl Chlorinated isocyanurates Chlorine Chlorine dioxide Chlorfenapyr Chlorsulfuron DCOIT DDAC	Dichlobenil Dichlorvos (DDVP) Dithiopyr Halohydantoins Hydramethylnon Hypochlorites Imazapyr Isoxaben Mancozeb Methomyl Methoprene Methyl anthranilate Mineral bases, weak Mineral oil (aliphatic) MGK-264 Novaluron Oryzalin Oxadiazon Oxyfluorfen PCNB	Peroxyacetic acid Phenoxy herbicides[16] Piperonyl butoxide (PBO) Prodiamine Propiconazole Pyrethrins Pyriproxyfen Sodium bromide Sodium chlorite Sodium percarbonate Sodium tetraborate Spinosad/ Spinetoram Sulfometuron-methyl Tebuconazole Terbuthylazine Triclopyr Triclosan Trimethoxysilyl quats

[11] Allethrins, Bifenthrin, Cyfluthrin, Cyhalothrin, Cypermethrin, Cyphenothrin, Deltamethrin, Esfenvalerate, Etofenprox, Flumethrin, Imiprothrin, Metofluthrin, Momfluothrin, Permethrin, Prallethrin, Resmethrin, Sumethrin [d-Phenothrin], Tau-Fluvalinate, Tetramethrin, Tralomethrin.
[12] Carbendazim is a registered pesticide, and also a degradate of thiophanate-methyl
[13] Acetamiprid, Clothianidin, Dinotefuran, Thiamethoxam (degrades into Clothianidin)
[14] 2,4,-D, Chlorothalonil, Dacthal, Pentachlorophenol
[15] Alkyl Dimethyl Benzyl Ammonium Chlorides (ADBAC) includes a family of 21 different quaternary ammonium pesticides.
[16] MCPA and salts, 2,4-D, 2,4-DP, MCPP, dicamba

Priority	Basis for Priority Assignment	Pesticides		
5	Frequent questions from UP3 Partners	Chlorpyrifos (near zero urban use)	Diazinon (no urban use) Glyphosate	Metaldehyde
New	Priority determined on the basis of proposed urban use, aquatic toxicity, and other information in registration application.	Not known but may include the following:	Cyantraniliprole Cyclaniliprole Flupyradifurone	Nitenpyram (Neonic) Nithiazine (Neonic) Sulfoxaflor (Neonic)
None	Based on review of available data, no approved urban use or no tracking trigger as yet identified.	Most of the >1,000 existing pesticides		
Unknown	Lack of information. No systematic screening has been completed by UP3 for the complete suite of urban pesticides.	Unknown		

2.1.2 Description of Near-Term Regulatory Processes

Immediate pesticide concerns may arise from regulatory processes undertaken at DPR or EPA's OPP. For example, when EPA receives an application to register a new pesticide, there may be two opportunities for public comment that are noticed in the Federal Register, as depicted in green in Figure 3. EPA's process usually takes less than a year while DPR typically evaluates new pesticides or major new uses of active ingredients within 120 days. Now that DPR implements relatively robust surface water quality review procedures for new pesticide registrations, there is reduced need for CASQA to provide input to EPA on new pesticides.

Figure 3. EPA's Registration Process for New Pesticides

Another regulatory process, "Registration Review," depicted in Figure 4, is meant to evaluate currently registered pesticides about every 15 years, to account for new data available since initial registration. In general, it takes EPA five to eight years to complete the entire process. In addition to this process, pesticides are typically evaluated based on Endangered Species Act criteria. EPA regularly updates its schedule for approximately 50 pesticides that will begin the review process in a given year.[17]

Figure 4. EPA's Registration Review – Process to Review Registered Pesticides at a Minimum of Every 15 Years.

[17] See https://www.epa.gov/pesticide-reevaluation/registration-review-schedules for schedule information.

DPR also has an ongoing, but informal review process (called continuous evaluation) that can address pesticides water pollution. If it needs to obtain data from manufacturers, DPR can initiate a formal action, called "Reevaluation." These evaluations, mitigation measure development, and mitigation effectiveness evaluation have involved ongoing communication with CASQA and the UP3 Partnership.

While EPA must consider water quality in all of its pesticide registration decisions, at DPR this step is not yet fully established as standard (most outdoor urban pesticide registration applications are routinely routed by DPR for surface water review, but a few – notably antimicrobial products used in storm drains – do not automatically receive this review). CASQA monitors registration applications, to identify those relevant to urban runoff, based on the pesticide watch list in Table 2 and use pattern/toxicity analysis for pesticides that have not previously been reviewed.

2.1.3 Key Near-Term Regulatory Activities and Progress in 2019-20

Table 3 presents a summary of recent UP3 activities to address near-term regulatory concerns and their 2019-2020 results; for additional insight regarding on-going pesticide registrations, see the Appendix. The positive outcomes in Table 3 reflect the success of CASQA's teamwork in the UP3 Partnership. Some of this work occurs during formal public comment periods. To accomplish this, CASQA monitors the Federal Register and DPR's website for notices of regulatory actions related to new pesticide registrations and registration reviews. Since the Watch List is not based on a comprehensive review of all pesticides, CASQA watches for additional pesticides that appear to have any of the following characteristics: proposed urban, outdoor uses with direct pathways for discharge to storm drains, high aquatic toxicity, or containing a priority pollutant. Participating in these regulatory processes can take many years to complete.

In addition, the EPA OPP strives to update their Aquatic Life Benchmarks table on an annual basis.[18] Their 2019 update included two pesticides of interest to urban surface water (see inset at right).

EPA Aquatic Life Benchmarks – 2019 Update

In September 2019, US EPA's Office of Pesticide Programs, Environmental Fate and Effects Division updated its pesticides Aquatic Life Benchmarks table.[18] From the urban surface water quality perspective, this update included two minor changes for pesticides on the Watch List:

- The category "Copper compounds" was added to clarify the applicability of EPA's Office of Water (OW) copper water quality criteria (developed independent from OPP) to all copper-containing pesticides
- The OPP benchmarks for pendimethalin were updated based on the updated toxicity data used to support its 2018 Registration Review decision

Pesticides still awaiting benchmark updates include the many pyrethroids (other than new transfluthrin, which is not yet registered in California) and fipronil and its degradates. These are currently in EPA's Registration Review process.

[18] https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/aquatic-life-benchmarks-and-ecological-risk

Table 3. Latest Results of Efforts Communicating Near-Term Regulatory Concerns[19]

Regulatory Action or Concern	CASQA Efforts			Partner Support (Letters)	Outcomes and notes
	Letter(s)	Call(s) or emails	Mtg(s)		
DPR					
New product registration application for a rubber product containing zinc, thiabendazole and 2-pyridinethiol-1-oxide (potential tire use)				Sacramento County	***Pending.*** In response to a letter from Sacramento County, DPR stated that the product would not be allowed in rubber, correcting an error in the public notice. This correction was, unfortunately, not reflected in subsequent paperwork. DPR is requesting that the manufacturer correct the label to indicate that it may not be used in rubber in California.
New product registration for an indoxacarb product (Doxem Precise)	✓				***Pending.*** CASQA requested that DPR perform an evaluation of this product. Results pending.
New product registration for a novaluron product (TEKKO 0.2G)	✓				***Success!*** CASQA requested that DPR perform an evaluation of this product. The subsequent DPR evaluation (including modeling) did not support registration. DPR subsequently issued a Notice of Proposed Decision to deny registration.
EPA					
Pyrethroids Ecological Risk Mitigation Proposal for 23 Chemicals [Request for Extension of Comment Period]	✓			BACWA CCWQCB SFBRWQCB CVWQCB NACWA Cities of Cotati, Elk Grove, San Diego, Sacramento, Santa Barbara. County of Los Angeles, Marin County Stormwater PPP, Napa County FCWCD, Alameda	***Success.*** CASQA and Partners requested extension of comment period to provide adequate time for review in light of the complexity of the proposal, the year-end holiday timing, and its timing during the winter rainy season, when member agencies take on substantial extra duties in association with rain events. EPA granted the extension.

[19] Color coding in this table is meant to reflect the “Watch List” prioritization color coding in Table 2.

Regulatory Action or Concern	**CASQA Efforts**			**Partner Support (Letters)**	**Outcomes and notes**
	Letter(s)	**Call(s) or emails**	**Mtg(s)**		
				Countywide Clean Water Program, County of Orange, County of Sacramento, County of Santa Barbara, SCVURPPP	
Pyrethroids Ecological Risk Mitigation Proposal for 23 Chemicals	✓		✓	BACWA SFBRWQCB NACWA City of Salinas	***Limited Success.*** Following significant efforts by CASQA and Partners in prior fiscal years, including meeting with new EPA pyrethroid chemical managers, and substantial feedback on the Preliminary Risk Assessment, EPA released the Risk Mitigation Proposal. EPA used CASQA comments to counter arguments by others suggesting that there is not a significant ecological risk. EPA acknowledged the existence of monitoring data that appears to conflict with modeled runoff exposure results. EPA virtually omitted urban runoff from its CWA compliance discussion. EPA's benefits assessment did not distinguish between outdoor impervious surface applications and other types of applications nor did it distinguish among the 22 pyrethroids and pyrethrins, which have very different environmental fates and toxicity, and thus very different potential for aquatic impacts. EPA did not concur with CASQA regarding the need for urban runoff mitigation. Proposed label language changes would continue (and in some cases exacerbate) conflicts between product labels and California's surface water protection regulations for pyrethroids. No resolution in CASQA's request for California-specific labels.
Bifenthrin Proposed Interim Decision	✓			SFBRWQCB BACWA NACWA	***Pending***. CASQA concluded that special measures to address bifenthrin are an important part of a pyrethroids mitigation strategy because, from the urban water quality standpoint, bifenthrin is far more problematic than other pyrethroid pesticides. CASQA continues to request that EPA terminate urban outdoor use of bifenthrin. Letter prepared this FY for 2020-2021 submittal.

Regulatory Action or Concern	CASQA Efforts Letter(s)	Call(s) or emails	Mtg(s)	Partner Support (Letters)	Outcomes and notes
Pyrethroid Pesticides Cyfluthrin, Deltamethrin, Esfenvalerate, Permenthrin, Phenothrin, Prallethrin, and Tau-fluvalinate - Proposed Interim Decision	✓			BACWA NACWA SFBRWQCB	***Pending.*** Prior to the release of this Proposed Interim Decision, CASQA commented on the EPA's Ecological Risk Mitigation Proposal (above). CASQA continues to request that EPA's risk / benefit finding be revised to differentiate among the 23 pyrethroids and pyrethrins and among the various outdoor urban uses of the 23 chemicals. CASQA also requests that EPA's benefits assessment include urban runoff-related costs to municipalities. Letter prepared this FY for 2020-2021 submittal.
Fipronil Risk Assessment	✓			BACWA SFBRWQCB (anticipated) SWQCB (anticipated) NACWA (anticipated)	***Pending.*** Letter prepared this FY for 2020-2021 submittal. CASQA requested that EPA included updated California monitoring data and improvements to the urban risk assessment modeling methods. Also recommended additional mitigation to prevent urban surface water quality degradation.
Neonicotinoid Insecticides (Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, and Thiamethoxam) Proposed Interim Decision [Request for Extension of Comment Period]				BACWA, SFBWQCB City of Elk Grove, City of Sacramento, Orange County, Marin County Stormwater PPP, Riverside County FCWCD, SCVURPPP	***Success.*** Partners requested extension of comment period to provide adequate time for review in light of the complexity of the proposed decision and its timing during the winter rainy season, when member agencies take on substantial extra duties in association with rain events. EPA granted the extension.
Neonicotinoid Insecticides (Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, and Thiamethoxam) Proposed Interim Decision	✓			BACWA SFBRWQCB SWRCB	***Pending.*** In the Proposed Interim Decision released this year, EPA proposed label improvements but did not include significant label language requests. EPA also did not respond to CASQA's request to identify major sources of imidacloprid in urban runoff and expand modeling to include runoff from all outdoor uses including impervious surfaces. CASQA followed up to address unresolved issues.
Endangered Species Risk Assessment Process for Biological Evaluations of	✓			BACWA SFBRWQCB NACWA	***Partial Success.*** EPA acknowledged CASQA's comments and incorporated a significant request by CASQA- that they address pesticides that are applied on outdoor impervious surfaces in Biological Evaluations (BE). EPA also acknowledged CASQA's comment that Bes

Regulatory Action or Concern	CASQA Efforts			Partner Support (Letters)	Outcomes and notes
	Letter(s)	Call(s) or emails	Mtg(s)		
Pesticides - Draft Revised Method					must include invertebrate toxicity data. EPA partially incorporated other comments from CASQA and ignored one of the comments.
Zinc registration review Final Interim Decision	✓			SFBRWQCB BACWA NACWA	***Success!*** CASQA and its Partners sought that the zinc and zinc salts Registration Review decision follows the precedent for improved labels that was established by the decisions for other pool, spa, and fountain chemicals, such as lithium hypochlorite and copper. Further, for all swimming pool, spa, and hot tub products including those containing zinc and zinc salts, CASQA and Partners recommended that the "Environmental Hazards" label statements be applied on the basis of product use (end-use products vs technical grade and manufacturing use) rather than product size to avoid potential conflicting language on product labels. EPA fully incorporated both comments.
Methoprene Registration Review Work Plan				SFBRWQCB BACWA Sacramento County NACWA	***Pending.*** Due to uses for mosquito control that are made directly to neglected swimming pools, catch basins, and other elements of stormwater drainage systems, CASQA Partners called for the collection of data to inform reasonable mitigation measures that would minimize environmental impacts while maintaining the public health benefits of methoprene applications. Asked EPA to consider label language for mitigation measures, including label language for uses with abandoned pools that is consistent with language across pool, spa, and hot tub chemicals that would indicate minimum post-application holding times or other objective criteria that local and state authorities could use in their approval process for discharges to their systems. Further, Partners asked EPA to re-evaluate the aquatic ecological risk associated with discharges of methoprene to aquatic environments by utilizing data for aquatic Dipteran insect species that are more sensitive than the species used for the aquatic risk evaluations in the Preliminary Work Plan.
Chlorine gas/swimming pools Draft Risk Assessment	✓			SFBRWQCB BACWA NACWA	***Pending.*** The Proposed Interim Decision correctly identified potential impacts associated with emptying treated pools into storm drains and acknowledged that a requirement to contact local governments for direction prior to discharge would mitigate this risk (this reflects success of prior CASQA educational efforts related to other pool chemicals). Letters prepared this FY for 2020/2021 submittal supporting EPA's

Regulatory Action or Concern	CASQA Efforts			Partner Support (Letters)	Outcomes and notes
	Letter(s)	Call(s) or emails	Mtg(s)		
					acknowledgement and recommending that the Registration Review decision follows the precedent for improved labels for pool, spa, hot tub, and fountain products that was established by the decisions for similar end use chemicals.
Halohydantoins/pools, fountains, spas – Draft Risk Assessment	✓			BACWA SFBRWQCB NACWA	***Pending.*** The Draft Risk Assessment did not examine risks associated with discharges of swimming pool, spa, hot tub, and fountain water treated with halohydantoins. Letter prepared this FY for 2020-2021 submittal to request that the halohydantoins decision follow the precedent for improved labels for swimming pool, spa, hot tub, and fountain products that was established by the decisions for other antimicrobials with these uses.
Terbuthylazine/fountains Draft Risk Assessment	✓			Sacramento County SFBRWQCB	***Success.*** In January, CASQA Partners formally requested that language to address pool, spa, and fountain emptying be required to be placed on all such product labels. EPA acknowledged the importance of such communication and will be revising future label language on these products, which will require that the sewer/storm agency be notified prior to any discharge of terbuthylazine. Follow-up letter prepared by CASQA this FY for 2020-2021 submittal.
Inorganic Halides (Sodium Bromide) Draft Risk Assessment				BACWA Sacramento County	***Pending.*** Partners requested that the Registration Review decision follows the precedent for improved labels that was established by the decisions for other pool, spa, and fountain chemicals, such as lithium hypochlorite and copper. Such label language mitigates possible aquatic impacts from discharge of treated water while also providing consistency for label language across pool, spa, hot tub, and fountain chemicals.

2.2 LONG-TERM CHANGE IN THE PESTICIDES REGULATORY STRUCTURE

Since the mid-1990s, CASQA (and its predecessor organization the Storm Water Quality Task Force), have worked toward a future in which the pesticide regulatory structure at the state and federal level proactively restricts pesticide uses that have the potential to cause urban water quality problems. These efforts directly relate to Phase II MS4 PEAIP Management Question 2.

Assessment Question 2. (Long term/Prevent future problems) – Do pesticides regulators have an effective system in place to exercise their regulatory authorities to prevent pesticide toxicity in urban water bodies?

Answer: Improvements in processes at EPA and especially at DPR have moved us closer to that future. Many of these improvements are linked to the persistent work of CASQA and the UP3 Partnership to educate regulators on how previous process deficiencies did not adequately address urban pesticide problems.

As detailed below, at the State level, significant progress has been made by DPR and the Water Boards in establishing a comprehensive statewide approach to utilizing pesticide regulatory authorities to prevent pesticide toxicity in urban water bodies. Overall, DPR has a system in place that is reasonably effective at addressing pesticide toxicity in urban water bodies, although improvement is needed to better coordinate this with the requirements of the Clean Water Act and NPDES MS4 permits. DPR and the Water Board, along with CASQA and other stakeholders, are working diligently to strengthen this system and to institutionalize it. This is primarily embodied in the State's effort to establish the UPA and the Management Agency Agreement (MAA) between DPR and the State Water Board.

At the Federal level, OPP has implemented some improvements in how it evaluates and responds to water quality problems associated with pesticides, but it does not do this reliably and does not have a system in place to ensure that this will happen consistently and adequately. Meanwhile, scientific studies are being conducted by USGS and the EPA's Office of Research and Development to better understand the complexities of pollution in urban stormwater (see inset at right).

National Urban Stormwater Study Included Many Priority 1 and 2 Pesticides

In 2019, USGS and EPA scientists published a major scientific paper examining pollutants in urban runoff, entitled "*Urban Stormwater: An Overlooked Pathway of Extensive Mixed Contaminants to Surface and Groundwaters in the United States*." The authors indicate that this study "provides the most comprehensive representative snapshot of the urban stormwater-contaminant profile derived from randomly sampled sites and sampling days from across the U.S. to date." The study involved low-detection limit measurements of multiple pollutant classes (e.g., pesticides, pharmaceuticals, inorganics, PAHs, PCBs and other organochlorines) in undiluted urban runoff. Pesticides were the most frequently detected pollutant type. Further, organic chemical concentrations and loads were positively correlated with impervious surfaces and highly developed urban catchments.

The study involved 50 storm event urban runoff samples from 21 locations in 17 states, including 2 unnamed locations in California (the 2 largest watersheds sampled). Samples were collected primarily from highly urbanized watersheds, primarily from base-of-watershed discharge pipes and concrete-lined channels.

For current-use pesticides, these nationwide results were generally consistent with other scientific work published in the last decade (much of which is from California), indicating that current use pesticides like pyrethroids, fipronil (and its degradates), imidacloprid, and the fungicide carbendazim are common in urban runoff often at concentrations greater than aquatic life reference values. Multi-pesticide and multi-pollutant mixtures were the norm, raising questions about potential aquatic life effects from cumulative exposures.

While the study measured many Priority 1 and 2 pesticides on the Watch List, most other pesticides on the Watch List were omitted (due, in part, to the absence of standard or convenient low-detection limit analytical methods). For some current-use pesticides (like some pyrethroids and some fipronil degradates), reporting limits were higher than the lowest aquatic life reference values. Most pesticides samples were filtered, which affects reported concentrations of hydrophobic pesticides like pyrethroids that tend to be removed with the suspended solids filtered out of the sample; sediment was not analyzed.

Environ. Sci. Technol. 2019, 53, 17, 10070–10081. Publication Date: August 21, 2019. https://pubs.acs.org/doi/10.1021/acs.est.9b02867

Although more effective regulation of pesticides by EPA is still an important goal for CASQA,[20] due to the current regulatory climate at federal agencies, CASQA does not expect OPP to be very responsive to requests for additional improvements. Specific examples include the current administration's orders for a blanket reduction in regulations, chronic under-staffing at OPP, and lack of accessibility to OPP staff to share scientific information and stormwater expertise.

As a result, CASQA has decided for the time being to limit its efforts to affect long-term systemic change by EPA and other federal agencies. Instead, CASQA has focused more on solidifying advances made at the state level, which will leverage the considerable authority held by the State of California for regulating the use of pesticides.

2.2.1 Focus on MAA Between DPR and State Water Board

In 1997, just as pesticides were first discovered to be an important pollutant in urban waterways, DPR and the State Water Board adopted their first formal agreement to collaborate to address pesticides water pollution. That agreement focused on agricultural areas; the processes it envisioned did not work well in the urban context. CASQA (and its predecessor organization the Storm Water Quality Task Force) worked with DPR and the Water Boards for the next 20 years toward establishing pesticides water quality protection systems that would work in the urban context. During this time, DPR substantially updated its science-based pesticide registration procedures to include a "surface water protection program" review process, it initiated an urban watershed monitoring program, and it developed approaches to implementing mitigation measures addressing urban water pollution, as evidenced by its actions on pyrethroids and fipronil. The Water Boards engaged with DPR, providing scientific and regulatory information, receiving and using information from DPR to inform design of its regulatory programs (particularly TMDLs), and cooperating in monitoring programs. In mid-2019, DPR and the State Water Board received approval to sign a major update to their formal MAA that memorializes their existing systems and growing cooperation and lays out the steps they are taking toward a "unified and cooperative program to protect water quality related to the use of pesticides." The two agencies agree "to work cooperatively to address the discharge of pesticides that may cause or contribute to surface water or groundwater pollution, including surface water toxicity."

For example, DPR will evaluate surface water quality risks and consider these risks when making registration decisions; promote environmentally sound pest management; and respond to water quality concerns that pose significant adverse effects to aquatic organisms. Meanwhile, Water Boards will confer with DPR when developing regulatory programs related to pesticides; ensure waters are monitored (in coordination with DPR's monitoring and including permittee and State Water Board's own monitoring participation); and require and support use of best management practices relating to pesticides (structural management practices are not intended to be required in urban areas).

The Implementation Plan that accompanies the MAA describes opportunities for coordination and mutual enrichment (including cross-training), expectations for both staff and executive level communication (including an annual management-level meeting between the agencies), and current agency organization and interactions. Excerpts from the Implementation Plan:

> *"In the urban environment, pesticides are transported by the municipal wastewater collection system and the municipal separate storm sewer system (MS4). PMPs [pesticides-specific management practices] focus primarily on prevention through responsible use according to the pesticide label and DPR regulations and as a part of a holistic IPM [Integrated Pest Management] strategy. DPR conducts education and outreach efforts to ensure professional applicators are up to date on regulatory actions and label changes. Wastewater treatment plants and multi-benefit storm water treatment practices such as low impact development, runoff infiltration, constructed wetlands, and restoration of riparian buffers around waterways can provide some reductions. However, they are not designed for, nor implemented to address, complex mixtures of pesticides and the effectiveness of these practices to remove various pesticides from these systems is not well understood.*

[20] Long-term regulatory goals at the state and federal level are described in detail in Section 1.2.

DPR will work with the Water Boards to inform pesticide users on urban PMPs. The Water Boards, through their storm water permits, will continue to require PMPs from storm water permittees. Permittees must also include, as appropriate, education and outreach to inform residential and commercial pesticide users on responsible pesticide use and encourage municipal storm water permittees to provide local expertise into DPR's pesticide regulatory process.

The Water Boards and DPR will collaborate to assess the impacts of pesticides in the urban environment through collective and comprehensive monitoring efforts, which optimize the use of monitoring resources of Water Boards, dischargers, and DPR."

2.2.2 Focus on California's UPA

At the urging of CASQA, in 2014 the State Water Board made a strategically important decision to institutionalize its commitment to work closely with DPR and EPA to utilize pesticide regulatory authority as the primary mechanism for preventing and responding to impairments of receiving waters linked to current use pesticides in urban runoff. To accomplish this, it established an urban pesticides reduction project (now titled the Urban Pesticides Amendments or UPA) as a top priority project under the comprehensive stormwater strategy it adopted in December 2015, known as "Strategy to Optimize Resource Management of Storm Water" or STORMS.[21] In 2018/19, the State Water Board continued working towards developing the Urban Pesticides Amendments which will be changes to the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries, and the Water Quality Control Plan for Ocean Waters of California. It is important to note that a critical factor in the State Water Board's decision to move in this direction was DPR's demonstrated commitment and significant progress in addressing urban water quality issues caused by pesticides.[22] A 2020 paper co-authored by Dr. Kelly Moran and staff of DPR, State Water Board, and UC Davis, describes many of the key elements of this progress.[23] The abstract for that paper is presented on the following page.

CASQA representatives have been participating actively in the development of the Urban Pesticide Amendments since their inception, as members of the projects Core Team and various work groups, to ensure that they are consistent with CASQA's vision for pesticide control.[24] The key elements that we anticipate being in the amendments are listed below.

- Element 1: Establishment of a framework for the Water Boards to work with DPR and U.S. EPA to utilize pesticide regulatory authority as the primary means for addressing pesticides in urban runoff.
- Element 2: Adopt a program of implementation addressing urban pesticides water pollution that serves as a TMDL alternative and integrates a feasible compliance pathway for MS4s.

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[21] STORMS' overall mission is to "lead the evolution of storm water management in California by advancing the perspective that storm water is a valuable resource, supporting policies for collaborative watershed-level storm water management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests." (http://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/)

[22] As reported in previous CASQA Pesticide Subcommittee Annual Reports, DPR's accomplishments include improved modeling, active ingredient screening for urban water quality issues, monitoring, and regulatory mitigation of pyrethroids and fipronil.

[23] Moran, et al., 2020. Water Quality Impairments Due to Aquatic Life Pesticide Toxicity: Prevention and Mitigation in California, USA. Environmental Toxicology and Chemistry—Volume 39, Number 5—pp. 953–966, 2020

[24] These goals have been adapted from the CASQA document, "End Goals for Pesticide Regulatory Activities," 2014. Goal 3, above, is directly tied to Goals 2, 4, and 5 of that document.

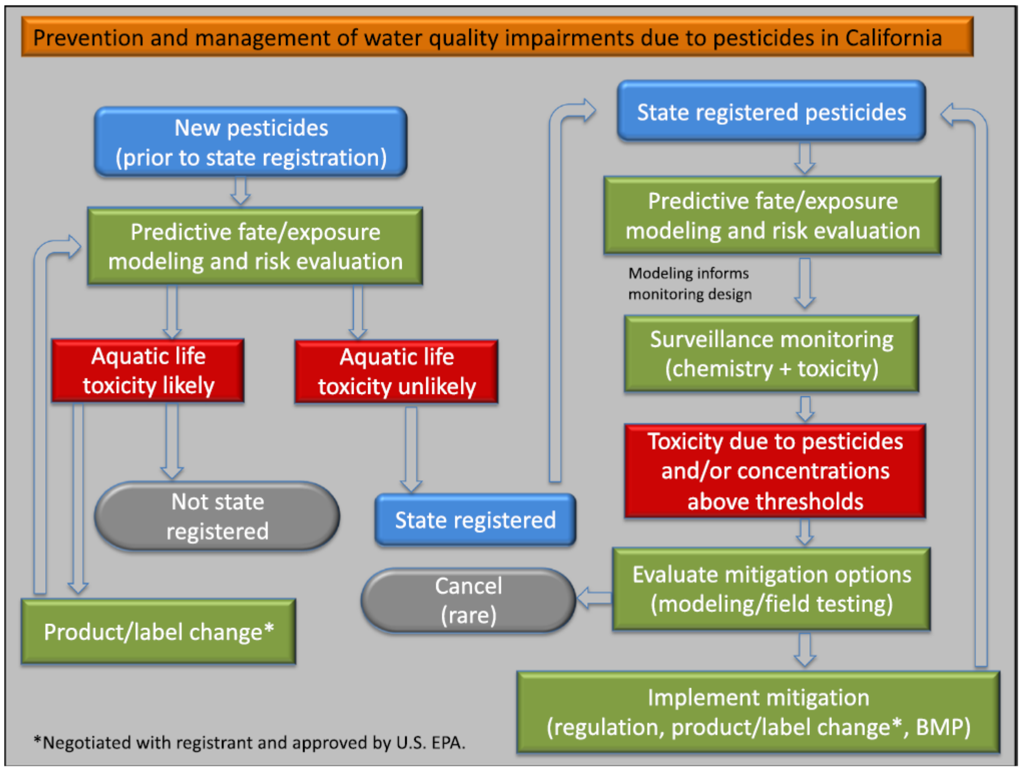
Water Quality Impairments Due to Aquatic Life Pesticide Toxicity: Prevention and Mitigation in California, USA

Kelly Moran, Brian Anderson, Bryn Phillips, Yuzhou Luo, Nan Singhasemanon, Richard Breuer, Dawit Tadesse, *Environ Toxicol Chem* 2020;39:953–966. https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/etc.4699.

This paper published in 2020 describes key elements of the current State water quality effort.

Abstract

The management of pesticides to protect water quality remains a significant global challenge. Historically, despite regulatory frameworks intended to prevent, minimize, and manage off-site movement of pesticides, multiple generations of pesticide active ingredients have created a seemingly unending cycle of pesticide water pollution in both agricultural and urban watersheds. In California, the most populous and most agricultural US state, pesticide and water quality regulators realized in the 1990s that working independently of each other was not an effective approach to address pesticide water pollution. Over the years, these California agencies have developed a joint vision and have continued to develop a unified approach that has the potential to minimize pesticide risks to aquatic life through a combination of prevention, monitoring, and management actions, while maintaining pesticide availability for effective pest control. Key elements of the current California pesticide/water quality effort include: 1) pesticide and toxicity monitoring, coupled with watershed modeling, to maximize information obtained from monitoring; 2) predictive fate and exposure modeling to identify potential risks to aquatic life for new pesticide products when used as allowed by the label or to identify effective mitigation measures; and 3) management approaches tailored to the different pesticide uses, discharge sources, physical environments, and regulatory environments that exist for agricultural runoff, urban runoff, and municipal wastewater. Lessons from this effort may inform pesticide management elsewhere in the world as well as other chemical regulatory programs, such as the recently reformed US Toxic Substances Control Act and California's Safer Consumer Products regulatory program. © 2020 SETAC



- Element 3: MS4 Monitoring program designed to coordinate with existing DPR and State Water Board pesticides and toxicity monitoring to support effective implementation of Elements 1 and 2.
- Element 4: Requirements for MS4s to support Elements 1 and 3 by contributing expertise on how pollutants present in urban environments enter and behave in urban runoff and water bodies.
- Element 5: Other actions that can reasonably be implemented by MS4s, such as IPM outreach, in support of pesticides reductions.

CASQA supports the State Water Board's stated goal of implementing the UPA "as an alternative to TMDL development to address pesticide and pesticide-related toxicity impairments in individual water bodies." Achievement of this goal would provide substantial savings of state and MS4 agency resources as compared to establishment of multiple TMDLs throughout the state.

Elements 1-4 are consistent with CASQA Vision Action 1.3. Water Board staff have indicated their intent that the Urban Pesticides Amendments, as shown in Element 5 should also establish a consistent set of "*minimum pesticides source control measures for MS4 dischargers."*

CASQA representatives have worked with the Water Boards to ensure that such requirements are reasonable and consistent with similar measures already in place in some regions. At this time, the list of potential minimum measures includes use of IPM, education of and outreach to residents and professional pesticide applicators, providing urban runoff scientific and management expertise to support pesticide regulatory processes, non-stormwater discharge prohibitions, and pesticide and toxicity monitoring.

CASQA supports the stated goal to "create a comprehensive, coordinated statewide monitoring framework for pesticides and toxicity in urban runoff and receiving water that improves resource efficiency, usefulness of data, and coordination of data collection to support management decisions."[25] A well-designed and managed monitoring framework that is properly representative of urban areas can simultaneously provide more useful information and improve the utilization of resources by eliminating unnecessary MS4 monitoring requirements that do not contribute to effective management of pesticides and pesticide-caused toxicity.

Monitoring. In the previous FY, agreement was reached regarding decision-making channels and membership for the UPCMP. CASQA is an active participant in the UPCMP and recruited members to serve on both the Steering Committee and Technical Committee. These committees have been convened by the Aquatic Science Center using grant funding from the State Water Board. The Steering Committee and Technical Committee are tasked with establishing the initial framework of the monitoring program, including a work plan for its first year of operation. It is intended to have the work plan in place upon adoption of the UPA. However, progress in this direction has been slowed this year by changes in staffing at the State Water Board, and by complications caused by COVID-19. One subsequent meeting of the Technical Group was held in June.

Key joint activities for the UPCMP this FY included:

- Initial meeting of UPCMP Steering committee, including 3 MS4 representatives recruited by CASQA. Each of these representatives are MS4 staff or consultants funded by CASQA municipal members[26].
- Initial meeting of UPCMP Technical Committee, including 3 MS4 representatives recruited by CASQA. Each of these representatives are MS4 staff or consultants funded by CASQA municipal members[27].

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[25] Informational Document, CEQA Public Scoping Meeting, State Water Resources Control Board, January 25, 2017

[26] MS4 representatives on the Steering Committee are from the Alameda Countywide Clean Water Program, Orange County, and Sacramento County.

[27] MS4 representatives on the Technical Group are from the Santa Clara Valley Urban Runoff Pollution Prevention Program, Orange County, and Sacramento County (jointly funded by the Sacramento Stormwater Quality Partnership).

Technical Support. CASQA continues to provide technical support to the Water Boards on numerous crucial and highly detailed items related to the UPA, Staff Report, CEQA Document, monitoring program, model permit language, and the relationship of these to the MAA. During June, CASQA organized a meeting of DPR, Water Board, and CASQA representatives on July 24th for DPR to provide detailed information to senior Water Board management on DPR's capacity and progress for addressing urban pesticide issues.

MS4 Input. CASQA Pesticides Subcommittee continued briefings for the MS4 community to explain, gather input, and obtain support for the Urban Pesticide Amendments in advance of their public release for comment. Briefings were provided to representatives of the following MS4 groups:

- Los Angeles County Permittee Group
- Central Valley MS4 Coordinating Committee
- Sacramento Stormwater Quality Partnership
- CASQA Watershed Management and Impaired Waterbodies Subcommittee
- CASQA Policy and Permitting Subcommittee
- CASQA Science and Monitoring Subcommittee
- Sonoma County MS4 Permittee Group

2.2.3 CASQA Participation in Other State Efforts

As presented in Table 4, CASQA has been actively involved with various State agencies and advisory groups that affect pesticide use and pest management in urban areas.

Table 4. Participation in Other State Efforts to Support CASQA's Goals

<table>
<tr><th>Agency or Conference</th><th>Latest Outcomes</th></tr>
<tr><td>DPR's Pest Management Advisory Committee (PMAC)</td><td>Participation on the PMAC has resulted in expanded focus by DPR on urban pest management and water quality issues and generated funding for urban IPM programs. This year the PMAC recommended funding for two IPM research projects that would address pesticides in urban runoff, and one project that would address copper antifouling pesticide impacts of water bodies that are receiving waters of interest to many MS4 agencies. The amount of funding recommended was approximately $570,000. The projects are listed below.
• IPM for local Sacramento farmers. [addresses commercial urban farms with high pesticide uses]
• Training for pest management professionals. [upgraded facilities and mass media channels for statewide structural pest control licensees]
• Training for hull cleaners and boaters. [addresses copper pollution in marinas]</td></tr>
<tr><td>California Structural Pest Control Board (SPCB)</td><td>A PSC member is an appointed member of the SPCB. The SPCB recognizes the potential for excessive pesticide application to impact water quality. The SPCB is in the process of adopting regulations to increase continuing education hours required in the IPM category. Finalization of these regulations has been slowed due to the need for California to reconcile its structural licensing requirements with newly adopted Federal regulations for this industry.

Five proposals were selected and collectively awarded $1.02 million to be funded by the SPCB Research Fund. Progress reports were provided at the February 2020 board meeting for five research projects funded in the previous FY by the SPCB The research topics are listed below, and detailed project updates are available online at https://www.pestboard.ca.gov/about/agenda/20200312_materials.pdf
• "Diet and Colony Structure of Two Emerging Invasive Pest Ants"
• "Investigation of Rodenticide Pathways in an Urban System Through the Use of Isotopically Labelled Bait"
• "Evaluation of bait station system efficacy for reduced-risk subterranean termite management in California"
• "Development and Evaluation of Baiting Strategies for Control of Pest Yellowjackets in California"
• "Improving Urban Pest Ants Management by Low-Impact IPM Strategies"

The SPCB is in the process of allocating funding for the 2021 FY.</td></tr>
</table>

Section 3. CASQA's Approach Looking Ahead

At any given time, EPA and DPR may be in the process of evaluating and registering various pesticides for urban use. CASQA will continue to track and engage in EPA and DPR activities, with a focus on top priority active ingredients (as identified in the annual Pesticide Watch List) and sharing relevant urban runoff information and CASQA's water-quality specific expertise with pesticides regulators. Key documents to be reviewed will include risk assessments and risk management proposals with an eye toward ensuring that pesticide regulators have and consider accurate information on relevant factors in urban areas such as pesticide use patterns, urban pollutant transport mechanisms, and receiving water conditions. CASQA strives to ensure that pesticide regulators have access to relevant information such as monitoring data, water quality regulatory requirements, and urban runoff agency compliance liabilities and cost information. As necessary, CASQA will continue to recommend changes in an individual pesticide's allowable uses or use instructions, request consideration of impacts on water bodies receiving urban runoff, or ask that regulators fill critical data gaps by obtaining more data from manufacturers. As resources allow and circumstances warrant, CASQA will collaborate with wastewater organizations (such as BACWA), other water quality stakeholders, and the Water Boards in commenting on EPA and DPR actions.

In the coming year, CASQA will continue to address near-term pesticide concerns and seek long-term regulatory change. Although changes at the federal level are important for fully achieving CASQA's goal of protecting water quality through the effective use of pesticide regulations, until there is a more favorable situation at that level, we will continue to focus our efforts on solidifying progress at the state level. In FY 2020-2021, we will continue engagement on specific regulatory actions for priority pesticides at the federal level, while continuing our strategic focus on supporting State adoption of the UPA. CASQA's current priority activities are as follows:

(1) Continue collaboration with DPR to address near-term regulatory concerns, while seeking OPP and OW actions to reduce inconsistencies:

- Ensure DPR action on fipronil water pollution is completed, including effective professional user education about restrictions on its outdoor urban use.
- Ensure DPR enforces mitigation measures for pyrethroids and fipronil, and adopts additional measures as necessary.
- Ensure the state continues to conduct surveillance monitoring to evaluate pyrethroids and fipronil mitigation effectiveness and to evaluate occurrence of new threats like imidacloprid and other neonicotinoid insecticides.
- Continue to encourage EPA to complete scientific groundwork and to identify and implement pyrethroids, fipronil, malathion, and imidacloprid mitigation measures, recognizing that it is likely that necessary mitigation cannot readily be implemented entirely by DPR.

(2) Seek long-term changes in the pesticide regulatory structure:

- Leverage our success at the state level and continue to be a key stakeholder in the STORMS project to adopt the statewide UPA. Through this process, CASQA will work with other stakeholders to implement the planned restructuring of California's urban surface water pesticides monitoring to increase its effectiveness and improve coordination.
- Seek procedure changes such that DPR continues to refine its registration procedures to address remaining gaps in water quality protection.
- Seek increased transparency of DPR regulatory activities, including timely access to scientific evaluation reports that are the basis of registration decisions.

CASQA will continue to seek opportunities to coordinate on high priority regulatory actions, with the Water Boards and other water quality stakeholders such as POTWs and non-profits, to take advantage of efficiencies, increase effectiveness, and ensure that the water quality community has a consistent message. Table 5 presents CASQA's activities and level of engagement anticipated for FY 2020-2021; CASQA will conduct these activities as priorities indicate and resources allow. Table 6 summarizes upcoming regulatory action items that are likely to proceed and may require CASQA attention in FY 2020-2021.

Table 5. CASQA Pesticide Subcommittee Activities

Activity		Purpose
Regulatory Tracking	Track Federal Register notices	Identify regulatory actions for high priority active ingredients that may require review.
	Track DPR notices of registration applications and decisions	Identify pesticides meriting surface water review that are not within DPR's automatic routing procedures, identify gaps or potential urban runoff-related problems with current DPR evaluation or registration plans other regulations, procedures & policies.
	Track activities at the Water Boards	Identify opportunities for improvements in TMDLs, Basin Plan Amendments, and permits.
	Review regulatory actions, guidance documents, and work plans	Identify potential urban runoff-related problems with current EPA evaluation or registration plans, other regulations, procedures, and policies.
Regulatory Communications	Briefing phone calls, informal in-person meetings, teleconference meetings, and emails with EPA and DPR	Information sharing about immediate issues or ongoing efforts; educate EPA and DPR about issues confronting water quality community. Provide early communication on upcoming proceedings that help reduce the need for time-intensive letters.
	Convene formal meetings, write letters and track responses to letters	Ensure current pesticide evaluation or registration process accurately addresses urban runoff and urban pesticide use and management contexts and take advantage of opportunities to formally provide information suggest more robust approaches to that could be used in future regulatory process. Request and maintain communication on mitigation actions addressing highest priority pesticides.
Advisory	Serve on EPA, DPR, and Water Board policy and scientific advisory committees	Provide information and identify data needs and collaboration opportunities toward development of constructive approaches for managing pesticides.
Educational	Presentations to and informal discussions with EPA, DPR, Water Board, CASQA members,	Educate EPA, DPR, Water Board, and CASQA members about the urban runoff-related shortcomings of existing pesticide regulatory process, educational efforts to support process improvements, and report on achievements. Encourage research and monitoring programs to address urban runoff data needs and priorities. Stimulate academic, government, or private development of analytical and toxicity identification methods to address anticipated urban runoff monitoring needs. Inform development of new pesticides by manufacturers and selection of pesticides by professional users.
	Developing and delivering public testimony	Educate Water Board members about the problems with existing pesticide regulatory process, encourage change, and report on achievements.

Activity		Purpose
Monitoring and Science	Update Pesticide Watch List based on new scientific and regulatory information	The Pesticide Watch List (Table 2) serves as a management tool to prioritize and track pesticides used outdoors in urban areas.
	Data analysis of DPR/SWAMP/USGS/MS4 monitoring, pesticide use data, and information from scientific literature	Summarize data to educate CASQA members and water quality community, Water Boards, DPR, and EPA.
Reporting	Prepare Monthly Action Plans	Coordinate CASQA's regulatory actions with Partners
	Prepare PSC Annual Report to describe the year's status and progress, provide detail on stakeholder actions, and the context of prior actions as well as anticipated end goal of these activities.	Provide CASQA's members with focused information on its efforts to prevent pesticide pollution in urban waterways. The document serves annual compliance submittal for both Phase I and Phase II MS4s. It may also be used as an element of PEAIPs and future effectiveness assessment annual reporting.

Table 6. Anticipated Opportunities for Pesticides Regulatory Engagement in 2020-2021

EPA Pesticide Registration Review (15-year cycle)

Environmental Risk Assessments

- Priority 2-4 pesticides: Busan 77, Chlorothalonil, Irgarol, Diuron, Dichlorvos (DDVP), Isothiazolinones (DCOIT, BIT, BBIT, MIT, OIT). o-Phenyl phenol, Peroxy Compounds (includes Peroxyoctanoic Acid; Sodium Percarbonate), Propiconazole, Tebuconazole, Ziram; others (schedule unknown)

Proposed Interim Decisions

- Priority 1 pesticides: Fipronil, Pyrethroids: Cyhalothrins, Cypermethrins, Allethrin, Etofenprox, Metofluthrin
- Priority 2-4 pesticides: Carbaryl, Chromated Arsenicals, Creosote, Dichromic acid, DBNPA, Dithiopyr, (phenoxy herbicide), MCPA, MGK-264 (synergist), Methomyl Novaluron, Oxyfluorfen, Pentachlorophenol (Pentachlorophenol, Dioxins), Piperonyl butoxide (PBO) (pyrethroids synergist), Pyrethrins, Simazine, Sodium bromide, Thiophanate methyl, Triclopyr; others (schedule unknown)

Other EPA-related Items

- U.S. EPA “Increasing Consistency and Transparency in Considering Costs and Benefits in the Rulemaking Process” affects how the U.S. EPA uses cost and benefit analysis in setting pollution standards. Rule proposal was expected in 5/19.
- Proposed rule to eliminate some OPP Federal Register Notices (was anticipated September 2018 according to U.S. EPA semi-annual regulatory agenda)
- U.S. EPA Update to Guidelines for Deriving Aquatic Life Water Quality Criteria. Draft scoping document external peer review is next step. Seeking OPP engagement.

DPR New Pesticide Registration Decisions

- Proposed new urban pyrethroids (momfluorothrin, alpha-cypermethrin, phenothrin and transfluthrin products)
- Proposed expansion of bifenthrin use in non-residential urban locations
- Proposed new fipronil products: fipronil-bifenthrin landscaping product, termite product, product for yellow jackets
- Proposed new aerated indoxacarb powder
- Proposed ant and termite product containing the proposed new pesticide broflanilide.
- Others (schedule unknown)

Other DPR-related Items

- Registration Application Surface Water Reviews – continue to follow up on communications requesting review of all storm drain products and outdoor antimicrobials

Water Boards

- State Water Board Provisions for Toxicity Assessment and Control, which include statewide numeric water quality objectives and implementation program
- STORMS Urban Pesticides Amendments
- Pesticides 303(d) listings
- Pesticide TMDL implementation requirements for permittees

Appendix

Regulatory Participation Outcomes
and
Effectiveness Assessment Summary Tables

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Pesticide: **Abamectin;** Docket: EPA–HQ–OPP–2013–0360
Use: Insecticide used for ants, mites, and spiders (among other uses).
Why we care: Highly toxic to aquatic invertebrates. Outdoor uses in urban environments have high potential impact MS4 and surface waters.
Actions taken: CASQA has been tracking this pesticide since 2013.
Status: EPA released the Final Interim Registration Review Decision in August 2019.

Next steps: ESA Consultation is required but unlikely to begin before 2022.
Recommendation: No action is needed at this time. Keep on tracking list.

From EPA's Final Interim Decision:	**Response from CASQA's Perspective**:
EPA is adding a standard Runoff Prevention Advisory Statement to the label: *"RUNOFF PREVENTION* *To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help avoid run off to water bodies or drainage systems."*	The standard runoff prevention language that EPA has proposed could be further strengthened. For example, CASQA typically recommends not allowing pesticide use if rain is predicted in the next 48 hours (instead of 24 hours as is proposed by EPA). We should consider impact of "rinsing application over the treated area" which would be highly problematic on impervious surfaces hydraulically connected to MS4 and surface waters.
From EPA's response to comments in the "Abamectin. Response to Comments Regarding HED's [EPA OPP Health Effects Division] Human Health Risk Assessment in Support of Registration Review, it appears that new crack and crevice usages are being evaluated through a different process: HED notes that the human health draft risk assessment also included a separate new use action for a proposed use on crack and crevice and spot treatment for abamectin. Mitigation measures associated with the proposed new use are separate from the registration review action and are being addressed by the registrant petitioning for that particular use pattern.	To better assess the risks from a pesticide, EPA should evaluate pesticide uses in a comprehensive manner that includes the use patterns and mitigation measures proposed and/or approved after the initiation of Registration Review.

Action:	**Method for National Level Endangered Species Risk Assessment Process for Biological Evaluations of Pesticides**; Docket: EPA–HQ–OPP–2019–0185
Use:	Defines procedures for assessing pesticides risks to endangered species
Why we care:	EPA intends to use these procedures to replace its current ecological risk assessment procedures
Actions taken:	CASQA submitted a comment letter in 2019. CASQA's comments were echoed by UP3 partners including BACWA, NACWA, the SF Bay Water Board, Xerces Society, Northwest Center for Alternatives to Pesticides (and 8 other groups) and Center for Biological Diversity. DPR made comments similar to CASQA's.
Status:	EPA released its revised method in March 2020
Next steps:	EPA will be using the revised procedures to conduct ecological risk assessments for pesticides in its ESA pilot program.
Recommendation:	Review ecological risk assessments for ESA pilot pesticides and comment on procedural shortcomings as warranted.

CASQA 08/15/2019 Comments to EPA	EPA Response	Did EPA incorporate CASQA's comment?
Pesticides Are Applied on Outdoor Impervious Surfaces and Must Be Addressed in BEs	"EPA has corrected its discussion of applications to impervious surfaces in the Revised Method. The discussion was not meant to indicate that EPA would not evaluate applications to impervious surfaces. Rather, it was intended to generate a footprint for developed areas that was more realistic. In the Revised Method, for applications that are not intended to be made directly to impervious surfaces (e.g., to lawns), EPA will make a treated area assumption for the developed land cover class based on the percent of a typical lot that is not represented by impervious surfaces (e.g., footprints of houses, driveways are assumed to not be treated). In these cases, EPA acknowledges that overspray to impervious surfaces can occur, and, as such, the treated area will include a small percent of the impervious surface. For applications designed for impervious surfaces, EPA will model the application using the impervious PWC scenario, along with appropriate adjustments to account for the area treated." Response to Public Comments Received on Proposed Revised Method for National Level Endangered Species Risk Assessments for Biological Evaluations of Conventional Pesticides, p. 41.	**Yes.**
Clean Water Act Compliance Assessment Must Be an Integral Part of BEs and the Pesticide Endangered Species Act Consultation Process	"Office of Pesticide Programs and Office of Water work together on water issues to address issues under each of their statutes." Response to Public Comments Received on Proposed Revised Method for National Level Endangered Species Risk Assessments for Biological Evaluations of Conventional Pesticides, p. 50.	**No.**
BEs must evaluate all uses of a pesticide that EPA is approving – not just uses that have occurred historically. When EPA reviews a pesticide, it licenses each individual use of that pesticide as described on	"EPA will consider all uses allowed on product labels for the assessed pesticide that are registered under Sections 3, 24(c), and 18 of the Federal Insecticide Fungicide Rodenticide Act (FIFRA) when developing BEs. As stated above, the proposed Revised Method included usage data in the derivation of the Action Area. EPA has changed the	**Partially.** EPA will consider all legal uses in its first phase, but the actual risk assessment

product labels. If EPA restricts its analysis only to uses that have occurred historically, or to select geographic areas, EPA is effectively licensing uses that it is not evaluating, which is inconsistent with the ESA. This would be the effect of the usage data methodology proposal.	Revised Method so that usage data are no longer incorporated into Step 1. Therefore, all registered uses, even those without demonstrated usage are included in Step 1, definition of the Action Area. EPA incorporates usage data into Step 2 of the Revised Method. When usage data (i.e., PCT [Percent Crop Treated], average rate, application timings, etc...) are incorporated into the risk assessment, the best available, scientifically valid data are used. EPA believes that data on pesticide usage represent critical information for determining whether an individual of a listed species is likely to be exposed and adversely impacted, which is the goal of Step 2." Response to Public Comments Received on Proposed Revised Method for National Level Endangered Species Risk Assessments for Biological Evaluations of Conventional Pesticides, p. 14.	will leave out any allowed pesticide uses for which there are no usage data.
BEs must use chronic invertebrate toxicity data. The proposal to use only lethal toxicity (LC50) data for aquatic invertebrates deviates from the CWA regulation of aquatic ecosystems to protect food supplies for endangered species.	"EPA will consider effects to mortality, growth or reproduction and other sublethal endpoints linked to survival or reproduction of taxa relevant to a listed species' prey, pollination, habitat and/or dispersal." Response to Public Comments Received on Proposed Revised Method for National Level Endangered Species Risk Assessments for Biological Evaluations of Conventional Pesticides, p. 50.	**Yes.**
Urban pesticide use estimates could be greatly improved with use of reported urban use and sales data collected annually by California Department of Pesticide Regulation (CDPR). Each year, CDPR mandates reporting of pesticide product-specific sales and all professional pesticide use (including urban use). These data provide the quantity of active ingredients. The sales data are collected for every product brand-label combination. Reported use and total annual sales data are freely available and readily accessed from CDPR's online database at https://www.cdpr.ca.gov/dprdatabase.htm While CDPR considers its product-specific sales data as confidential, these data can be obtained upon request by EPA and consolidated (e.g., by use category) before publishing in risk assessments.	"EPA considers California Pesticide Use Reporting data in assessments, as appropriate. EPA agrees with CBD [Center for Biological Diversity] that pesticide sales data, including those available from California Department of Pesticide Regulation, are of limited use in characterizing the timing and location of pesticide usage. Pesticide sales data can provide some information regarding the scale of usage for a pesticide. For example, historical sales for an established pesticide may be useful in ground truthing the reasonableness of estimated usage that rely on multiple conservative assumptions. One example could be comparing sales data to usage modeled for a year and finding that the single year modelled exceeds the 20-year sales total for the AI. Such an outcome suggests that the model is highly conservative overall. Of course, at a local level, the model may be less conservative than indicated by the disparity between the sales and modelled usage estimates." Response to Public Comments Received on Proposed Revised Method for National Level Endangered Species Risk Assessments for Biological Evaluations of Conventional Pesticides, p. 11.	**Partially.**

Pesticide: **Imidacloprid**; Docket: EPA–HQ–OPP–2008–0844
Use: Outdoor treatments (impervious and pervious surfaces), impregnated materials (wood, siding, etc.), pet treatments, etc.
Why we care: Highly toxic to aquatic invertebrates. Monitoring data exceeds aquatic benchmark in many areas of California. Sales data show that use is increasing.
Actions taken: CASQA submitted a comment letter in 2017 on the Preliminary Aquatic Risk Assessment.
Status: EPA released the Proposed Interim Registration Review Decision (PID) per Fed. Reg. notice Feb. 3, 2020. Comments are due May 4, 2020.

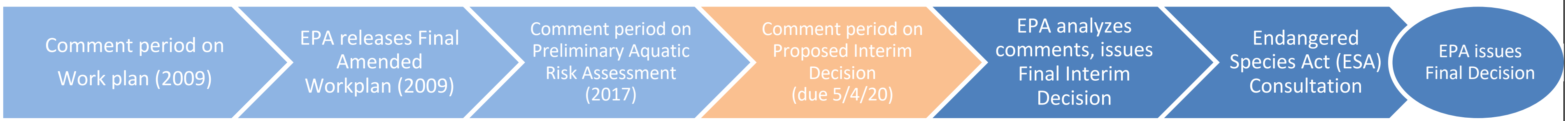
Next steps: EPA will analyze comments and issue a Final Interim Decision.
Recommendation: Send comment letter to EPA on the Proposed Interim Decision to address unresolved issues and concerns.

CASQA Members comments to EPA:	EPA Response:	Did EPA incorporate member comments?
CASQA Concurs with EPA's Finding of Significant Risk.	As in the Preliminary Aquatic Risk Assessment. The EPA found significant risk to aquatic life in the Proposed Interim Decision.	**Yes.**
CASQA Requests EPA Identify Major Sources of Imidacloprid in Urban Runoff. CASQA noted that EPA's PARA model omits most outdoor urban imidacloprid uses. CASQA Suggested Refinements to Imidacloprid Preliminary Risk Assessment: • Include modeling of runoff from impervious surfaces for both residential and commercial models. • Evaluate and then model the runoff from all permitted outdoor uses of imidacloprid • Include leaching of impregnated materials in the model. • Perform an urban-specific analysis, including analysis of monitoring results specific to urban areas.	"EFED's risk assessment indicated, using modeling and monitoring data, that neonicotinoids can potentially enter surface water and groundwater and affect aquatic invertebrates. Although EFED did not explicitly model urban runoff sources, EFED believes the concentrations would not exceed those modeled via agricultural sources. While field and monitoring data provide supporting evidence that neonicotinoids are present in surface waters, supporting metadata for the sampling (i.e., sampling frequency, vicinity of applications to monitoring sites, timing of sample collection relative to timing of applications, etc.) are not available, precluding the quantitative use of monitoring data. While monitoring data from habitats not designed to harbor aquatic organisms may not be directly relevant for ecological risk assessment, they may be indicative of sources that may discharge into aquatic organism habitats. Likewise, while monitoring data from other countries may not be indicative of uses or	**No.** Although EPA acknowledged that there is a pathway to the storm drain, they did not respond to CASQA's request to identify major sources of imidacloprid in urban runoff or improve modeling of sources.

	products in the United States, they provide a line of evidence that neonicotinoids can contaminate water sources." (PID p.14)	
CASQA Recommends Further Evaluation of Product Labels and Use Restrictions. (see specific requests below)	Although EPA made some small improvements to imidacloprid labels, they did not incorporate the majority of CASQA's label requests.	**Partially.**
1) Pre-construction termiticide label improvements: "…we request that EPA add a requirement that after a pre-construction termiticide treatment the applicator must post signage identifying sites that have been treated, stating the need to maintain the plastic cover until the foundation is poured, and to manage in accordance with water quality and hazardous waste laws any water that collects in the treated area before the foundation is poured. Such a requirement would bridge a gap between the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Clean Water Act water quality control programs associated with the NPDES stormwater construction permits."	EPA did not respond to this comment.	**No.**
2) Require that no applications be made when rainfall is forecast within 48 hours.	EPA partially incorporated CASQA's suggested idea, but only for 24 hours of forecasted rainfall and only for spray (not granular) products.	**Partially.**
3) Reduce size of perimeter treatment bands around structures for treating for termites and other structural pests to the smallest treated area that will achieve target pest control. Prohibit application on impervious surfaces.	EPA reduced the perimeter treatment area to up to seven feet (on permeable surfaces), up to two feet up a structure, and up to one inch on pervious surfaces.	**Partially.** A reduced treatment band is an improvement, but the suggested treatment bands do not appear to be based on scientific study. Use on impervious surfaces is still allowed.
4) Prohibit application of granular products to any impervious (non-soil or unvegetated) surface and prohibit application to any area where the product may contact any surface water, storm drain, or urban runoff conveyance system (e.g., gutter).	EPA did not respond to this comment.	**No.**
5) Reduce target area for granular fly bait, instead of allowing the quantity to be spread over "1,000 square feet".	EPA did not respond to this comment.	**No.**
6) Disallow all outdoor "paint-on" applications of imidacloprid, especially if painted surface is above impervious area that drains to storm drain system or surface	EPA did not respond to this comment.	**No.**

water body. If any outdoor uses continue to be allowed, consider reducing application frequency (currently every 4-6 weeks), setting a maximum allowable outdoor treated area, and establishing a total annual application rate.		
7) Disallow product application in cracks and crevices along surfaces that drain into the storm drain system. If allowed, request that EPA and registrants utilize efficacy data to determine the smallest treated area that will achieve target pest control. This will enable labels to limit the spot treatments and crack and crevice treatments – to only the amount necessary – instead of the current 2' x 2' dimensions for spot treatment, and unspecified dimensions for crack and crevice treatments.	EPA updated label requirements to not limit to a 2' x 1' areas as well as limit application to 10% of the treatment area.	**Partially.**
8) Disallow all usage inside sanitary sewers, storm drains, or inside or around manholes.	Although manholes are not mentioned, it appears that EPA is prohibiting use in sanitary sewers, manholes etc. as they are not in the list of permitted areas.	**Yes, but label would be clearer if it explicitly prohibited these uses.**
9) Impregnated Materials: (1) Require end use product labels for all products bearing pesticide claims consistent with the recently adopted California guidance for labeling pesticide-impregnated materials (California Notice 2017-08). (2) Consider limiting concentration and/or use locations for materials that show high washoff potential.	EPA did not respond to this comment.	**No.**

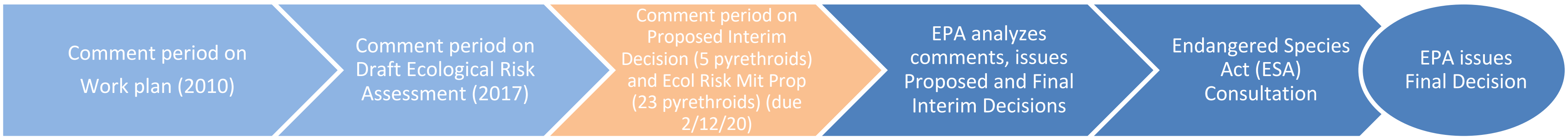
Pesticide:	**Neonicotinoid insecticides**; Dockets EPA–HQ–OPP–2012–0329, EPA–HQ–OPP–2011–0865, EPA–HQ–OPP–2011–0920, EPA–HQ–OPP–2008–0844, EPA–HQ–OPP–2011–0581
Use:	Outdoor treatments (impervious and pervious surfaces), impregnated materials (wood, siding, etc.), pet treatments, etc.
Why we care:	Highly toxic to aquatic invertebrates. Monitoring data exceeds aquatic benchmark in many areas of California
Actions taken:	In March 2020, the County of Sacramento sent a letter to EPA requesting a comment period extension. Other agencies also requested an extension including: BACWA, City of Elk Grove, City of Sacramento, Orange County, Marin County Stormwater PPP, Riverside County Flood Control and Water Conservation District, SCVURPPP, and the SF Bay Water Board.
Status:	EPA released Proposed Interim Decisions for Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, and Thiamethoxam.



Next steps:	EPA will analyze comments and issue a Final Interim Decision.
Recommendation:	Send comment letter to EPA on the Imidacloprid Proposed Interim Decision to address unresolved issues and concerns.

County of Sacramento Comments to EPA	EPA Response	Did EPA incorporate CASQA's comment?
On behalf of the County of Sacramento Department of Water Resources, I request that EPA extend the comment period for the Proposed Interim Registration Decisions (PIDs) for the subject neonicotinoids for one additional month, to May 4, 2020. This will provide adequate time for review in light of the complexity of the proposed interim decisions, the number of chemicals under consideration, and the occurrence of this comment period during our winter rainy season, when staff from our agency and the organizations we collaborate with take on substantial extra duties in association with monitoring of rainfall/runoff events.	EPA extended the review period from April 3, 2020 to **May 4, 2020**.	**Yes.**

Pesticide: **Pyrethroids**; Docket: EPA-HQ-OPP-2008-0331
Use: Insecticides
Why we care: Priority pesticide due to toxicity, use, and monitoring data. Multiple 303(d) listings as well as adopted and pending TMDLs.
Actions taken: CASQA commented on the Preliminary Ecological Risk Assessment for Pyrethroids in 2017.
Status: EPA released the "Pyrethroids and Pyrethrins Ecological Risk Mitigation Proposal for 23 Chemicals" in November 2019. EPA also released Proposed Interim Decisions for cyphenothrin, flumethrin, imiprothrin, momflurorthrin, and tetramethrin; decisions for the other 18 pyrethroids are forthcoming.



Next steps: EPA will analyze comments and issue Proposed and Final Interim Decision.
Recommendation: Send comment letter to EPA on the Pyrethroids and Pyrethrins Ecological Risk Mitigation Proposal for 23 Chemicals to address unresolved issues and concerns. Do not comment on the non-water quality topics covered by the 5 current proposed decision; evaluate the remaining 18 for potential comments.

CASQA 7/7/2017 Comments to EPA	EPA Response	Did EPA incorporate CASQA's comment?
Pesticide Discharges to storm drains can be costly and disruptive. Currently, EPA has listed 622 California water bodies as impaired by pesticides under Section 303(d) of the Clean Water Act; of those, 16 are listed for pyrethroids.	EPA discussed impacts, including Clean Water Act compliance challenges and costs for indoor discharges, but did not even mention these for stormwater, except a passing reference to TMDL compliance. Based primarily on market share, EPA asserted that the benefits of pyrethroids use are high.	**No**. It virtually omitted urban runoff from its Clean Water Act compliance discussion. EPA's benefits assessment did not distinguish between outdoor impervious surface applications and other types of applications (including underground It did not correctly identify alternatives for outdoor structural pest control.). It relied on an industry-supplied report on lawns/landscaping treatments as the data source for its outdoor urban benefits analysis. EPA also does not distinguish among the 22 pyrethroids and pyrethrins, which have very different environmental fates and toxicity, and thus very different potential for aquatic impacts.

CASQA Concurs with EPA's Finding of Significant Ecological Risk and Need for Mitigation	None. EPA used CASQAs comments to counter arguments by others suggesting that there is not a significant ecological risk.	**Yes.**
Mitigation addressing urban runoff is needed. To minimize ecological impacts and reduce the number of watersheds impacted by pyrethroid TMDLs and subsequent costs to state and local government agencies, we request that EPA implement mitigation measures as requested above. If these mitigation approaches are not deemed appropriate nationwide, please consider providing clear mechanisms for California-specific labels and sales restrictions.	"Outdoor urban uses of pyrethroids and pyrethrins are expected to result in potential risks of concern, primarily to aquatic invertebrates and fish. This potential risk is often a result of urban runoff, but may also be a result of spray drift or improper disposal of pyrethroid products. The potential for this risk to occur in the environment is supported by pyrethroid monitoring data from urban settings at levels that would be expected to result in potential risk to aquatic invertebrates. There has been a substantial concern from municipalities and states, particularly California, that urban pyrethroid usage adversely impacts water quality and, in the case of California, contributes to TMDL exceedances. As a result, the EPA is proposing measures to reduce to the urban footprint of the pyrethroid group while still allowing flexibility for the user community and retaining the benefits of efficacious pest control." "The potential ecological risks, which are expected to be reduced with the proposed mitigation, are outweighed by the high benefits associated with the use of pyrethroids for the control of pests with public health significance." EPA Proposed mitigation: (1) Indoor and Outdoor Use Site Clarification (2) Reduction in distance from building foundations that can be treated with pyrethroids from 10 feet to 7 feet. [California regulations prohibit applications >3 feet from building foundations] (3) Reduction in height above ground level of building treatments from 3 feet to 2 feet [this would make EPA labels consistent with this element of California regulations] (4) Prohibition on applications during rain. [California regulations already prohibit] (5) Unenforceable advisory statement to avoid applications if rain is forecast within 24 hours. [new] (6) Definition of spot treatment (2 sq. ft.)	**No.** Proposed mitigations are nice and might reduce slug discharges, but for California, they have no expected benefits for ongoing discharges. Proposed label language changes would continue (and in some cases exacerbate) conflicts between product labels and California's surface water protection regulations for pyrethroids. Text includes two useful mitigations are proposed for indoor products that are <u>not</u> proposed for outdoor products in the enforceable part of the proposal (the "label table in the appendix"): (a) Pictogram and new enforceable label statement: "Do not pour down the drain or sewer. Call your local solid waste agency for local disposal options." (b) New advisory label statements (English & <u>Spanish</u>): "Do not allow to enter indoor or outdoor drains" and "Follow proper disposal procedures on this label" EPA's proposal allows some impervious surface applications prohibited by California regulations: (a) Within 25 feet of an aquatic habitat located down gradient from an application site (b) Preconstruction termite site within 10 feet of a storm drain located down gradient (c) aquatic habitat protection excludes intermittent streams (which are included in California regulations) EPA mitigations cover all users (not just professional applicators) and include etofenprox, which is currently not covered by California regulations.

	(7) New requirement: "Do not allow the product to enter any drain during or after application." [No methods are specified as to how to prevent post-application washoff into storm drains] (8)Various other label clarifications.	
EPA's runoff modeling seems to underestimate some exposures as shown by the risk quotients (RQs) calculated from monitored concentrations that are generally higher than the RQs calculated from modeled concentrations (PRA, Part II, pp. 165-167).	EPA acknowledged the monitoring data and noted that it "did not agree with the PWG that it is inappropriate to compare modeled and monitored concentrations". EPA acknowledged the concerns from commenters from California concerning what is required under the Clean Water Act.	**Yes.**
CASQA agrees with EPA's use of all available aquatic toxicity data including those for sensitive organisms like Hyalella azteca and Americamysis bahia. The San Francisco Bay Regional Water Quality Control Board also commented on this in their 7/6/17 Letter to EPA, "It should be noted that H. azteca are not uniquely sensitive to pyrethroids. Of the few aquatic invertebrate species that have been tested for pyrethroids toxicity, several are similar to the sensitivity to H. azteca."	EPA considered arguments from both CASQA/SF Water Board and the registrant's lobbying group (Pyrethroid Working Group [PWG]) and ultimately agreed with the comments from CASQA/Water Board on this issue. EPA relied not only on these comments, but also on scientific papers submitted with the comments	**Yes.**
CASQA Recommends Additional Use Restrictions and Product Label Enhancements.		**No, except for improvements to label readability.**
1. Reducing overuse of active ingredient. We request that the EPA and registrants review such studies of application sites, applicator methods, and associated residual pesticides in runoff and coordinate with CDPR to develop additional mitigations and associated label restrictions to reduce over-application from creating regulatory and consequent financial burdens that must be borne by state and local governments.	"The EPA has worked extensively with registrants…to develop proposed mitigation to reflect what is practical while also maintaining the efficacy of these uses. The proposed mitigation is designed to reduce the pathway for these chemicals to get into surface waters and storm drainage systems. The language also informs consumers on how to prevent pyrethroids products from ending up in wastewater facilities."	**No.** EPA's proposal would not meaningfully expand the current California mitigations, which are proving insufficient to resolve pyrethroids water impairments.
2. Adding a minor label requirement for pre-construction (under foundation) termiticide treatments to bridge the gap between FIFRA and	"In following up on the labeling recommendations from CASQA, the EPA consulted with construction experts with specific experience with termiticide applications, regarding	**No.** EPA did not implement any changes to bridge the gap between FIFRA and the Clean Water act on termiticide treatments.

Clean Water Act regulatory programs. CASQA requests that EPA refine labels for pre-construction termiticide applications with the overall goal of preventing the discharge to water bodies of any water that contacts pesticide treated soil. Specifically, we request that EPA add a requirement that after a pre- construction termiticide treatment the applicator must post signage identifying sites that have been treated, stating the need to maintain the plastic cover until the foundation is poured and to manage in accordance with water quality and hazardous waste laws any water that collects in the treated area before the foundation is poured. Such a requirement would address a gap between FIFRA and Clean Water Act water quality control programs associated with the NPDES stormwater construction permits. CASQA would appreciate the opportunity to discuss the specifics of this recommendation with EPA and registrants and professional applicators as appropriate. We perceive this as a relatively minor change that would address an existing gap between FIFRA and Clean Water Act construction site regulatory programs.	the suggestion that a signage requirement on pyrethroid labels could reduce the amount of pesticides running off into the drainage system. The EPA also met with Dave Tamayo, an environmental specialist from CASQA, on February 25, 2019, to discuss these comments and recommendations. The EPA officials also attended the 2019 Termite Tour, organized by the Association of Structural Pest Control Regulatory Officials, which included discussions on pre- and post-construction termite application practices. There wasn't consensus on the potential effectiveness additional posting and covering of these pre-construction termite applications could be in reducing pesticides in surface water. Therefore, the EPA is not proposing these changes in the ecological risk mitigation proposal. However, the EPA welcomes additional comments on this topic during the public comment period."	
3. Enhancing overall readability and enforceability of label language. CASQA requests that EPA seek to eliminate all conflicting and unclear language by coordinating with CDPR and registrants in the development of label language that more clearly provide instructions that result in protection of water quality. If EPA does not concur that label enhancement is necessary on a nationwide basis, CASQA requests that EPA provide clear mechanisms for establishing California-specific label instructions. CDPR is unable to take this action on its own because CDPR does not have the authority to establish pesticide label language, which is under the sole authority of EPA.	"The EPA has made a significant effort to propose changes to pyrethroid labels to improve consistency and help users find adequate directions."	**Partially.** Proposed label language includes a few useful clarifications but maintains some language that is confusing and includes many statements that are unenforceable. No changes were made to bifenthrin labels, which have additional mitigation that has confusing wording.

4. California-Specific Labels. If EPA does not find it appropriate to make these changes on a nationwide basis, we request that EPA provide CDPR the ability to work with registrants to establish California specific instructions on product labels. Since EPA controls product labels – the most effective means of controlling product usage – EPA's explicit approval of state-specific label language is essential.	"The EPA has worked closely with CDPR in the past on adding state-specific labeling restrictions to many pesticide products, including products containing pyrethroids. The EPA will continue to discuss implementation options with states and stakeholders when geographic-specific restrictions may be needed."	**No resolution.** EPA's proposal differs significantly from California regulations, in ways that will further confuse applicators who tend to focus on product labels (in their hands) instead of regulations (not in their hands). EPA does not explicitly state whether it will allow or support California-specific labels.
CASQA Requests EPA Terminate Urban ("Residential") Use of Bifenthrin Due to Its Persistence in Aquatic Ecosystems. CASQA has concluded that special measures to address bifenthrin are an important part of a pyrethroids mitigation strategy because, from the urban water quality standpoint, bifenthrin is far more problematic than other pyrethroid pesticides. • Bifenthrin Exceeds EPA Aquatic Life Benchmarks More Often Than Any Other Pyrethroid • Bifenthrin Is Substantially More Persistent in Aquatic Environments Than Other Pyrethroids • Bifenthrin is among the most highly toxic pyrethroids • Bifenthrin is One of Multiple Insecticides Commonly Used in Urban Environments • Due to Bifenthrin's Unique Persistence, It Is Too Hazardous to Use in Urban Settings CASQA further requests that if EPA does not concur that this measure is appropriate on a nationwide basis, that EPA implement such a measure for California by adding California-specific statements to all residential bifenthrin product labels (e.g., "not for use in California"). CDPR is unable to take this action because CDPR does not have the authority to establish pesticide label language, which is under the sole authority of EPA. While the discussion above focuses on bifenthrin, CASQA requests that EPA provide similar controls to ensure that	"With regard to aquatic risk, bifenthrin is not so unique when compared to other pyrethroids that it warrants additional bifenthrin-specific mitigation… bifenthrin does not consistently have the highest RQ exceedances for aquatic invertebrates. The agency disagrees with CASQA that bifenthrin is more toxic to aquatic invertebrates than other pyrethroids. All pyrethroids are very highly toxic to aquatic invertebrates." "The EPA is not proposing ecological mitigation for bifenthrin beyond what is outlined for all pyrethroids in the Pyrethroids and Pyrethrins: Ecological Risk Mitigation Proposal For 23 Chemicals due to the benefits of its use (USEPA 2016), and the agency's expectation that greater detection frequencies and concentrations of alternative insecticides (including other pyrethroids and fipronil) would occur if bifenthrin were removed from the market, because these alternative insecticides would likely take its place in the market."	**No.** EPA is using a scientifically questionable basis for its assertion that bifenthrin is no more problematic than other pyrethroids. The datasets EPA is using and EPA's modeling have scientific errors that have been enumerated in other studies. Bifenthrin may not be the most toxic pyrethroid, but based on monitoring data it appears to be the most persistent pyrethroid in urban watersheds. The combination of toxicity and persistence is the issue (it does not need to be the "top ranked" in either category to merit removal from the market). EPA's RQs are admittedly scientifically incorrect, so they should not be cited as the basis of any decision. Other data sources – particularly DPR's environmental monitoring data - lead to the conclusion that bifenthrin is the main contributor to ecological risks from pyrethroids and that this contribution is high relative to its usage. This indicates that substitution by another pyrethroid would improve water quality. Interestingly, despite the assertion that there should be no difference in risk mitigation among the pyrethroids, EPA notes "Bifenthrin, cypermethrin, deltamethrin, and esfenvalerate had particularly high chronic RQs."

there is adequate mitigation for any other pyrethroid that has similar or greater persistence in aquatic environments.		
Pyrethroids Have Been Identified as a Contributor to the Decline of Important Delta Fish Because of their presence and toxic effects, both directly and through food-web impacts, pyrethroids have been identified as potentially playing a significant role in the decline of important fish species in the Sacramento-San Joaquin Delta Estuary (Delta)…As a result of concerns about pyrethroid impacts in the Delta, establishing control programs for the pyrethroid discharges to the Delta was prioritized in the Delta Stewardship Council's Delta Plan and the Central Valley Regional Water Quality Control Board's Delta Strategic Workplan (CRWCB-CVR 2014). (San Francisco Bay Regional Water Quality Control Board's 7/6/17 Letter to EPA)	EPA acknowledged the SF Water Board's concerns and noted that "pyrethroids are expected to result in risks to aquatic biota in many situations. EPA has considered water quality issues in developing its ecological risk mitigation proposal for the pyrethroids/pyrethrins."	**Partially.** Although EPA acknowledged the SF Water Board's concerns, the mitigations proposed by EPA are not enough to address the risk. EPA stated that it will address endangered species in individual risk management decisions. This seems to conflict with the concept of the single ecological risk management decision to cover all 23 chemicals, but what it will likely be is a description of next steps for Endangered Species Act Compliance, not a set of mitigation measures for aquatic endangered species.

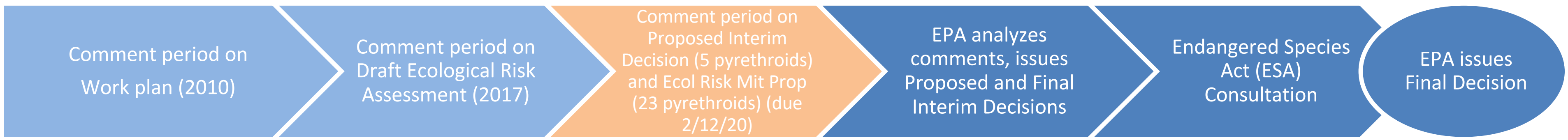
Pesticide: **Pyrethroids**; Docket: EPA-HQ-OPP-2008-0331

Use: Insecticides

Why we care: Priority pesticide due to toxicity, use, and monitoring data. Multiple 303(d) listings as well as adopted and pending TMDLs.

Actions taken: In November 2019, CASQA sent a letter to EPA requesting a comment period extension. Other agencies also requested an extension including: NACWA, BACWA, SF Bay Water Board, Central Coast Water Board, Central Valley Water Board, SCVURPPP, Sacramento County, Santa Barbara County, City of Santa Barbara, Alameda County, Napa County Flood & Water Conservation District, Orange County, City of Cotati, City of Sacramento, City of San Diego, LA County Public Works, Marin County Stormwater PPP, and City of Elk Grove.

Status: EPA released the "Pyrethroids and Pyrethrins Ecological Risk Mitigation Proposal for 23 Chemicals" in November 2019. EPA also released Proposed Interim Decisions for cyphenothrin, flumethrin, imiprothrin, momflurorthrin, and tetramethrin; decisions for the other 18 pyrethroids are forthcoming.



Next steps: EPA will analyze comments and issue Proposed and Final Interim Decision.

Recommendation: Send comment letter to EPA on the Pyrethroids and Pyrethrins Ecological Risk Mitigation Proposal for 23 Chemicals to address unresolved issues and concerns. Do not comment on the non-water quality topics covered by the 5 current proposed decision; evaluate the remaining 18 for potential comments.

CASQA 11/25/2019 Comments to EPA	**EPA Response**	**Did EPA incorporate CASQA's comment?**
On behalf of the California Stormwater Quality Association (CASQA1), we request that the comment period for the Pyrethroids and Pyrethrins Ecological Risk Mitigation Proposal be extended to **February 28, 2020** to provide adequate time for review in light of the complexity of the proposal, the year-end holiday timing of the review period, and its timing during the winter rainy season, when staff from our member agencies and the organizations we collaborate with take on substantial extra duties in association with rain events.	EPA extended the review period from January 13, 2020 to **February 12, 2020**.	**Yes.**

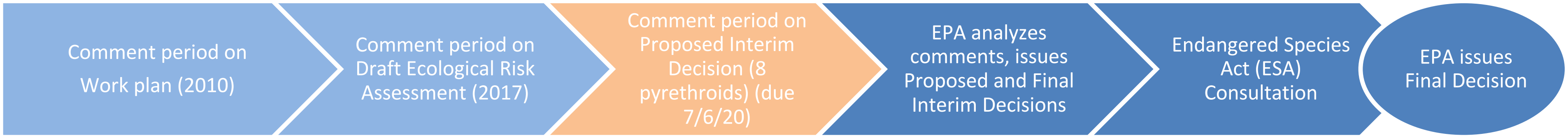
Pesticide: **Several pyrethroids**; Dockets: EPA-HQ-OPP-2008-0331. Docket includes: bifenthrin (EPA–HQ–OPP–2010–0384), cyfluthrin (EPA–HQ–OPP–2010–0684), deltamethrin (EPA–HQ–OPP–2009-0637), esfenvalerate (EPA–HQ–OPP–2009–0301), permenthrin (EPA–HQ–OPP–2011–0039), phenothrin (EPA–HQ–OPP–2011–0539), prallethrin (EPA–HQ–OPP–2011–1009), and tau-fluvalinate (EPA–HQ–OPP–2010–0915).

Use: Insecticides

Why we care: Priority pesticide due to toxicity, use, and monitoring data. Multiple 303(d) listings as well as adopted and pending TMDLs.

Actions taken: In February 2020, CASQA sent a comment letter to EPA on the Pyrethroids and Pyrethrins Ecological Risk Mitigation Proposal.

Status: EPA released Proposed Interim Decisions for bifenthrin, cyfluthrin, deltamethrin, esfenvalerate, permenthrin, phenothrin, prallethrin, and tau-fluvalinate.

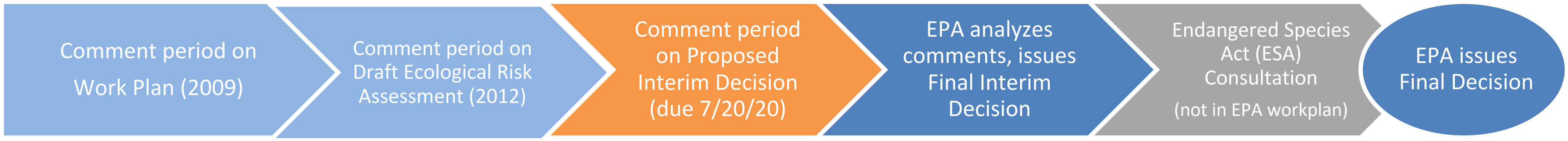


Next steps: EPA will analyze comments and issue Final Interim Decision on these eight pyrethroids.

Recommendation: Send comment letter to EPA on these eight Proposed Interim Decisions.

CASQA 2/12/2020 Comments to EPA	EPA Response	Did EPA incorporate CASQA's comment?
EPA's benefits assessment should include urban runoff-related costs to municipalities	No response. In the March 2020 PIDs EPA noted that they "had addressed" comments in a Joint Response issued on 11/12/2019, months before CASQA submitted its 2/12/20 comment letter.	**No.**
EPA's risk / benefit finding should be revised to differentiate among the 23 pyrethroids and pyrethrins and among the various outdoor urban uses of the 23 chemicals	EPA issued a single risk mitigation proposal with only one set of measures covering all 23 pyrethroids and pyrethrins, despite finding large differences in aquatic risks among the pyrethroids and pyrethrins.	**No.**
EPA should end outdoor urban use of bifenthrin	No response.	**No.**
EPA should provide California-specific labels for outdoor structural pest control products that are consistent with California regulations	No response.	**No.**
CASQA supports EPA-proposed label changes, with modifications	EPA kept the anti- dumping product label improvements but did not consider CASQA's suggested refinements from the February 2020 comment letter.	**Partially.**

Pesticide: **Terbuthylazine;** Docket: EPA-HQ-OPP-2010-0453
Use: Fountain algaecide / microbiocide / microbiostat.
Why we care: Highly toxic to aquatic invertebrates.
Actions taken: County of Sacramento (a CASQA member) sent EPA comments on the Draft Risk Assessment in January 2020, respectively.
Status: EPA released the Proposed Interim Decision in May 2020.



Next steps: EPA will review comments on the Proposed Interim Decision and issue a Final Interim Decision
Recommendation: Write a response letter, supporting the Sacramento County comments that EPA included in the Proposed Interim Decision.

Sacramento County comments to EPA (Jan. 2020):	EPA Response:	Did EPA incorporate member comments?
Our primary concern with the subject pesticides is that the Draft Risk Assessment neglected to consider storm drain discharges of terbuthylazine-containing fountain water and the ensuing risk to aquatic life. The Draft Risk Assessment assumed that there would be "*no significant exposure to aquatic organisms…from the decorative/ornamental fountain uses given that the label prohibits discharge of this product into lakes, streams, ponds, estuaries, oceans, or other waters, unless in accordance with the National Pollutant Discharge Eliminations Systems (NPDES) permit.*"	EPA made label changes (see below) that will help reduce the amount of terbuthylazine that is discharged into the storm drain by requiring notification to local sanitary sewer/ storm drain authorities.	**Yes.**
Sacramento County requests that the current language be changed to match the copper label, which would also provide consistency for label language across pool, spa, hot tub, and fountain chemicals, which follows: **"Before draining a treated pool, spa, hot tub, or fountain, contact your local sanitary sewer and storm drain authorities and follow their discharge instructions. Do not discharge treated pool, spa, hot tub, or fountain water to any location that flows to a gutter or storm drain or natural water body unless discharge is allowed by state and local authorities."**	"The agency agrees with the requested label changes and is proposing additional label changes to address the potential ecological risks by reducing exposure and clarifying the appropriate use methods, as described in Appendix B."	**Yes.**

Sacramento County also notes that the following language exists on several terbuthylazine labels: "*Experience will demonstrate the level of (product) is required."* We are concerned that this vague label language could lead to overuse these products. We are also concerned that label language states that users should maintain a concentration of product, cited in ppm, to get adequate algae control, but does not specify a practical, low-cost method for determining terbuthalyazine concentrations in treated fountain water. We respectfully request that EPA provide a dosing table, based on the size range (in volume of water) for fountains, to guide consumers in the application amount and frequency of application of the product.	EPA did not address this comment.	**No.**
For all fountain products, including those containing terbuthylazine, we also recommend that the "Environmental Hazards" label statements be applied on the basis of product end use rather than product size. This would mimic EPA's decision for lithium hypochlorite products. As explained in our attached lithium hypochlorite comments, this approach avoids potential conflicting language on product labels.	EPA did not address this comment.	**No.**

Pesticide:	**Zinc and Zinc Salts**; Docket: EPA–HQ–OPP–2009–0011
Use:	Swimming pool algicide, herbicide for moss, material preservative, wood preservative.
Why we care:	Highly toxic to aquatic invertebrates. High potential for significant discharges to MS4 and surface waters. 303(d) listings, TMDLs, CWA Priority Pollutant.
Actions taken:	County of Sacramento (a CASQA member) and NACWA sent EPA comments on the Draft Risk Assessment in March and January 2019, respectively.
Status:	EPA released the Proposed Interim Registration Review Decision in July 2019. Comments are due September 30, 2019.

Comment period on Work Plan (2009) → EPA releases Final Amended Workplan (2012) → Comment period on Draft Risk Assessment (2019) → Comment period on Proposed Interim Decision (due 9/30/19) → EPA analyzes comments, issues Final Interim Decision → Endangered Species Act (ESA) Consultation (omitted as EPA has mde a "no effect" determination) → EPA issues Final Decision

Next steps:	EPA will analyze comments and issue a Proposed Interim Decision. No ESA consultation is planned as EPA made a "no effect" determination.
Recommendation:	Send comments to EPA to declare support of the improved product label language.

CASQA Members comments to EPA:	**EPA Response:**	**Did EPA incorporate member comments?**
We are writing to request that the zinc and zinc salts Registration Review decision follows the precedent for improved labels that was established by the decisions for other pool, spa, and fountain chemicals, such as lithium hypochlorite and copper. In those Registration Review decisions, EPA worked carefully through the various issues to develop practical label language that mitigates possible aquatic impacts from discharge of treated pool, spa, and hot tub water, while preventing excess flows into sewer collection systems. Sacramento County requests that the current language be changed to match the lithium hypochlorite label, which would also provide consistency for label language across pool, spa, and hot tub chemicals, which follows: *"Before draining a treated pool, spa, or hot tub, contact your local sanitary sewer and storm drain authorities and follow their discharge instructions. Do not discharge treated pool or spa water to any location that flows to a gutter or storm drain or natural water body unless discharge is allowed by state and local authorities."*	"Due to the scenarios outlined in these public comments, the requested label language has been added as a proposed requirement." (p. 6)	**Yes.**
For all swimming pool, spa, and hot tub products including those containing zinc and zinc salts, we also recommend that the "Environmental Hazards" label statements be applied on the basis of product end use rather than product size… this approach avoids potential conflicting language on product labels.	"The requested changes to the uses triggering NPDES permit language have been considered by the Agency and are included as a proposed requirement. Both of the proposed changes are addressed in Appendix A of this document. The Agency thanks the submitters for their comments."	**Yes.**

Pesticide: **Zinc and Zinc Salts**; Docket: EPA–HQ–OPP–2009–0011
Use: Swimming pool algicide, herbicide for moss, material preservative, wood preservative.
Why we care: Highly toxic to aquatic invertebrates. High potential for significant discharges to MS4 and surface waters. 303(d) listings, TMDLs, CWA Priority Pollutant.
Actions taken: County of Sacramento (a CASQA member) and NACWA sent EPA comments on the Draft Risk Assessment in March and January 2019, respectively. CASQA commented on the Proposed Interim Decision in September 2019.
Status: EPA released the Interim Decision in February 2020.

Next steps: No ESA consultation is planned. EPA will likely proceed to issuing a Final Decision.
Recommendation: No action is needed at this time.

CASQA Members comments to EPA (September 2019):	EPA Response:	Did EPA incorporate member comments?
CASQA supports the following proposed label language for swimming pool, spa, and hot tub products: *"Before draining a treated pool, spa, or hot tub, contact your local sanitary sewer and storm drain authorities and follow their discharge instructions. Do not discharge treated pool or spa water to any location that flows to a gutter or storm drain or natural water body unless discharge is allowed by state and local authorities."*	The language in the Interim Decision exactly matches what was proposed in the Proposed Interim Decision. (p. 12)	**Yes.**
CASQA also supports EPA's clarification that Office of Pesticide Programs' standard NPDES permit label language is only for manufacturing-use products and is not suitable for end use products.	-For end-use products: NPDES permit language for pool, spa, or hot tub use is not required and must be removed if currently on the label associated with these uses. -For technical grade and manufacturing use products, the following NPDES statement must be included: "Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA." (p. 12)	**Yes.**

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Regional Supplement for New Development and Redevelopment

San Francisco Bay Area Municipal Regional Stormwater Permit

BASMAA

Bay Area Stormwater Management Agencies Association

September 2020

BASMAA

Alameda Countywide Clean Water Program

Contra Costa Clean Water Program

Fairfield-Suisun Urban Runoff Management Program

Marin County Stormwater Pollution Prevention Program

Napa Countywide Stormwater Pollution Prevention Program

San Mateo Countywide Water Pollution Prevention Program

Santa Clara Valley Urban Runoff Pollution Prevention Program

Sonoma County Water Agency

Vallejo Flood & Wastewater District

To Whom It May Concern:

We certify under penalty of law that this document was prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James Scanlin

James Scanlin, Alameda Countywide Clean Water Program

Karin Graves

Courtney Riddle, Contra Costa Clean Water Program

Kevin A. Cullen

Kevin Cullen, Fairfield-Suisun Urban Runoff Management Program

Matthew Fabry

Matt Fabry, San Mateo Countywide Water Pollution Prevention Program

Adam Olivieri, Santa Clara Valley Urban Runoff Pollution Prevention Program

Jennifer Harrington, Vallejo Flood & Wastewater District

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MRP Regional Supplement for New Development and Redevelopment
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INTRODUCTION

This Regional Supplement has been prepared to report on regionally implemented activities complying with portions of the Municipal Regional Stormwater Permit (MRP), issued to 76 municipalities and special districts (Permittees) by the San Francisco Bay Regional Water Quality Control Board (Water Board). The Regional Supplement covers new development and redevelopment activities related to the following MRP provision:

- C.3.j.iii. Participate in Processes to Promote Green Infrastructure.

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 2019-20 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.

GREEN INFRASTRUCTURE PLANNING AND IMPLEMENTATION

C.3.j.iii. Participation in Processes to Promote Green Infrastructure

This provision requires:

> *(1) The Permittees shall, individually or collectively, track processes, assemble and submit information, and provide informational materials and presentations as needed to assist relevant regional, State, and federal agencies to plan, design, and fund incorporation of green infrastructure measures into local infrastructure projects, including transportation projects. Issues to be addressed include coordinating the timing of funding from different sources, changes to standard designs and design criteria, ranking and prioritizing projects for funding, and implementation of cooperative in-lieu programs.*

The BASMAA activities described in this section provide compliance for MRP Permittees with this provision. This section describes: 1) activities and accomplishments during FY 19-20; and 2) a plan and schedule for new and ongoing efforts to participate in processes to promote green infrastructure (GI).

Activities and Accomplishments during FY 19-20

Grant – Urban Greening Bay Area

Urban Greening Bay Area is a large-scale, grant-funded effort to re-envision Bay Area urban landscapes to develop stormwater-friendly dense, green urban infrastructure that addresses challenges associated with climate change, infiltrates or captures stormwater and pollutants near their sources, and in turn, promotes improved water quality in San Francisco Bay. *Urban Greening Bay Area* is funded by an EPA Water Quality Improvement Fund grant awarded to the Association of Bay Area Governments (ABAG), a joint powers agency acting on behalf of the San Francisco Estuary Partnership (SFEP), a program of ABAG. The term of the *Urban Greening Bay Area* grant project was July 1, 2015 to June 30, 2018, but the term was extended to December 31, 2020 and additional funding provided to support follow-up implementation.

BASMAA is one of the subrecipients of the grant and took the lead on two of the grant project tasks – a Regional Green Infrastructure Roundtable process and a Design Charrette, both of which were implemented between May 2016 and May 2018.

The Regional Roundtable was a two-year process, with work groups as needed, to identify and develop a list of recommendations for integrating GI and stormwater management funding and investments with future climate change and transportation investments within the region. The Roundtable included convening meetings with local, regional, and state stakeholders, agencies, elected officials, and staff to produce draft and final task reports that identified and recommended possible legislative fixes, agency agreements, consolidated funding mechanisms, and other means and actions as appropriate. The Roundtable used innovative participatory processes that included key experts, regulators, decision-makers, and other stakeholders to share information, solicit and discuss ideas and solutions, and to identify next steps (i.e., develop a "roadmap"). The Final Roadmap of Funding Solutions for Sustainable Streets was completed in April 2018. Following completion of the Roadmap, BASMAA and SFEP formed a Roadmap Committee to guide future implementation of the Roadmap.

The Design Charrette task involved coordinating with the cities of San Mateo and Sunnyvale to conduct a Bay Area design charrette to develop cost-effective and innovative "typical" designs for integrating GI with bicycle and pedestrian improvements at roadway intersections. The overall goal of developing standardized, transferable designs was to make progress in addressing the high cost of design, implementation, operations, and maintenance that inhibits the widespread use of GI and LID features.

Work products of the Urban Greening Bay Area grant are posted at: http://www.sfestuary.org/urban-greening-bay-area/#planning . The Planning section includes documents related to the Regional Roundtable and the Implementation section includes documents related to the Design Charrette.

During FY 19-20, BASMAA's participation in activities to implement the Roadmap of Funding Solutions for Sustainable Streets included:

- Continued coordination with transportation agencies – including the Metropolitan Transportation Commission (MTC), the California Department of Transportation (Caltrans), the California Transportation Commission (CTC), and the Federal Highway Administration (FHWA) – to clarify GI eligibility in federal, regional, and state transportation grant programs (Roadmap Specific Actions 1-1, 1-2, and 1-3).

- In November 2019, BASMAA transmitted a memorandum to the above-listed regional and state agencies, documenting the eligibility of GI in applicable regional, state and federal transportation funding programs and requesting the agencies' participation in developing fact sheets that clarify eligibility for sustainable streets in two federal transportation funding programs – the Surface Transportation Block Grant Program (STP) and the Congestion Mitigation and Air Quality Improvement Program (CMAQ) – as well as the California Senate Bill 1 (SB 1) Road Maintenance and Rehabilitation Program.

- On February 4, 2020, BASMAA representatives met with staff from MTC and Caltrans District 4 (the Caltrans District for the nine-county Bay Area), to develop an approach for a regional fact sheet that focuses on the eligibility of GI in projects funded by the STP and CMAQ through the One Bay Area Grant (OBAG) program administered by MTC. The draft regional fact sheet was reviewed by MTC staff and is scheduled to be finalized by September 2020.

- On February 10, 2020, BASMAA held a conference call with CTC staff to develop an approach for a statewide fact sheet that focuses on the eligibility of GI in projects funded by Senate Bill 1. CTC staff provided comments on the draft statewide fact sheet but deferred further action pending documentation that there is interest in this topic beyond the San Francisco Bay Area. To address that information need, BASMAA drafted an online survey initially intended for distribution to stormwater programs within California. However, before it was distributed, BASMAA worked with the U.S. Environmental Protection Agency (USEPA) staff liaison to the Federal Highway Administration (FHWA) to have FHWA staff review BASMAA's November 2019 research memorandum. Similar to the CTC, FHWA questioned whether this issue is of interest beyond the San Francisco Bay Area and California. Accordingly, BASMAA is updating the draft online survey for national distribution through the Green Infrastructure Leadership Exchange. The SB 1 fact sheet is scheduled to be finalized by December 2020.

Other Participation and Comments

In addition to the *Urban Greening Bay Area* grant efforts described above, Countywide Program representatives participated in the following forums related to GI promotion:

- Matthew Fabry (C/CAG, representing SMCWPPP and BASMAA) continued to attend a series of meetings with RWQCB, BAFPAA, SFEP, and MTC to discuss ways to integrate stormwater issues into MTC efforts, including Plan Bay Area. To-date, five meetings have been conducted (March 19, 2019; June 12, 2019; July 16, 2019; October 15, 2019; and January 21, 2020). A meeting scheduled for early April 2020 was postponed due to the COVID-19 pandemic.

- Matthew Fabry (C/CAG, representing SMCWPPP) participated in the ReNUWIt "Stormwater for Water Supply" workshop on July 25-26, 2019, and presented information on efforts to manage stormwater via GI, including larger regional facilities that can help recharge groundwater. This workshop was part of a larger effort by ReNUWIt to create a "Bay Area One Water Network." He also participated as a panelist during a follow-on one-hour webinar on July 6, 2020. Relevant information can be found at www.bayareawater.org.

- Matthew Fabry (C/CAG, representing SMCWPPP) and Jill Bicknell (EOA, representing SCVURPPP) participated in ongoing meetings of the organization Transportation Choices for Sustainable Communities, a research and policy institute whose mission is to "advance understanding and support for sustainable transportation as an essential component of livable communities and cities," to plan a "Green Streets for Sustainable Communities" symposium. The event was originally scheduled for March 2020, and has now been rescheduled as a three-day virtual series of seminars on September and October 2020. The symposium will focus on multi-benefit approaches to rethinking streets, including Complete Streets, Green Streets, creating eco-corridors, and as people habitat for public gathering and interaction. Details can be found at http://transportchoice.org/events/.

- Matthew Fabry (C/CAG, representing SMCWPPP) participated in USEPA's Environmental Finance Advisory Board (EFAB) Stormwater Finance Workgroup to respond to a request from Congress in accordance with Section 4101 of the America's Water Infrastructure Act (AWIA) for a report looking at funding sources for stormwater and the adequacy of those sources to support the needs of stormwater management programs. The workgroup met twice – in April and October 2019 and held two public teleconferences in December 2019. On March 30, 2020, EFAB submitted its report, "Evaluating Stormwater Infrastructure Funding and Financing", to USEPA, which accepted the report on July 16, 2020 as satisfying the requirements of Section 4101 of AWIA.

Plan for New and Ongoing Efforts

The plan provided below shows how BASMAA will support its member agencies to collectively and regionally implement the requirements of MRP Provision C.3.j.iii during FY 20-21 and through the remainder of the current permit term. The requirements of Provision C.3.j.iii may change in the reissued MRP and may affect the planning and scheduling of participation in the promotion of GI during the next permit term.

Continue Ongoing Efforts to Participate in Processes to Promote GI

During FY 20-21 and through the end of the permit term for the current MRP (December 31, 2020 or later if extended), BASMAA will continue ongoing efforts to participate in processes to promote GI as described below.

Urban Greening Bay Area. BASMAA will continue to participate in the Urban Greening Bay Area Project's ongoing activities with regard to the implementation of prioritized specific actions in the 2018 Roadmap of Funding Solutions for Sustainable Streets (Roadmap). The Roadmap identifies specific actions to improve the funding of projects that include both complete streets improvements and GI, and is intended to assist relevant regional, State, and federal agencies to plan, design, and fund incorporation of GI measures into local infrastructure projects, including transportation projects. Various specific actions included in the Roadmap address coordinating the timing of funding from different sources, GI designs and design criteria, potential modifications of processes to evaluate projects for funding, and coordination regarding the potential development of cooperative in-lieu programs. The following ongoing activities are anticipated to continue during the period of July 2019 through December 2020:

O-1. Complete the ongoing coordination with the Metropolitan Transportation Commission (MTC) and Caltrans to clarify GI eligibility in federal transportation grants (Roadmap Specific Action 1-1).

O-2. Complete the preparation of a Roadmap fact sheet (Roadmap Specific Action 3-7). The fact sheet is anticipated to advise municipalities on how GI may be included in One Bay Area Grants (OBAG)-funded projects

O-5. Continue to participate in ongoing meetings with RWQCB, BAFPAA, SFEP, and MTC to discuss ways to integrate stormwater issues into MTC efforts, including Plan Bay Area.

O-X. Complete the ongoing coordination with the California Transportation Commission (CTC) to clarify GI eligibility in the Senate Bill 1 Local Streets and Roads Program (Roadmap Specific Action 1-3).

O-X Conduct an online survey for national distribution through the Green Infrastructure Leadership Exchange and continue coordinating with the FHWA liaison to EPA regarding the eligibility of GI in federal surface transportation programs (Roadmap Specific Action 1-1)

New Efforts to Participate in Processes to Promote GI

Between July and December 31, 2020, BASMAA may initiate the following new activities to further implement the Roadmap and participate in other ways to promote GI:

N-X: Coordinate with MTC to develop an approach for including information about the eligibility of GI in federally funded in guidance materials that MTC will provide to counties for OBAG's third round of funding (Roadmap Specific Action 1-2).

N-X: Coordinate with MTC to include a discussion of GI and green streets implementation in the anticipated update of Plan Bay Area (Roadmap Specific Action 3-8, Incorporate Roadmap specific actions in funding agencies' planning documents).

N-X: Coordinate with MTC regarding opportunities to present information about Sustainable Streets at statewide meetings of officials from Metropolitan Planning Organizations throughout California, in support of the ongoing coordination with MTC to clarify GI eligibility in federal transportation grants (Roadmap Specific Action 1-1), and ongoing coordination with the CTC to clarify GI eligibility in the SB 1 Local Streets and Roads Program (Roadmap Specific Action 1-3).