CONTRA COSTA
CLEAN WATER
PROGRAM

Program Manager
Courtney Riddle

September 30, 2018

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

Patrick Pulupa, Executive Officer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Dear Mr. Wolfe and Mr. Pulupa:

Enclosed is the Contra Costa Clean Water Program's (CCCWP's) Fiscal Year 2017/18 Annual Report. The report documents permit compliance activities conducted during the previous FY (July 1, 2017 to June 30, 2018), conducted collectively by Contra Costa Permittees in accordance with National Pollutant Discharge Elimination System (NPDES) Permit No. CAS612008 (R2-2015-0049) issued by the San Francisco Bay Regional Water Quality Control Board (Water Board), and NPDES Permit No. CA0083313 (Order R5-2010-0102) issued by the Central Valley Water Board, and consists of the following:

- ***Volume I – Group Activities Annual Report****: Compliance activities conducted collectively as a group by all 21 CCCWP Permittees;*
- ***Volume II – Individual Municipal Annual Reports****: Compliance activities conducted by each individual Permittee within their jurisdiction;*
- ***BASMAA Regional/CASQA Statewide Supplemental Reports****: BASMAA will submit separately the following regional/statewide supplemental reports directly to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB):*
    - *Regional Supplement for New Development and Redevelopment;*
    - *Regional Supplement for Training and Outreach; and*
    - *CASQA, Pesticides Subcommittee Annual Report and Effectiveness Assessment*

With the approval and direction from each duly authorized representative of each Permittee, I have been authorized to submit and certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Courtney D. Riddle

Courtney Riddle, Program Manager
Contra Costa Clean Water Program

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Enclosures

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CONTRA COSTA
CLEAN WATER
PROGRAM

FISCAL YEAR 2017/18
ANNUAL REPORT

VOLUME 1:
GROUP ACTIVITIES

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VOLUME 1 – List of Acronyms and Abbreviations

Acronym	Term
ACCWP	Alameda Countywide Clean Water Program
BASMAA	Bay Area Stormwater Management Agencies Association
BMPs	Best Management Practices
CALTRANS	California Department of Transportation
CASQA	California Stormwater Quality Association
CCC	Contra Costa County
CCCSD	Central Contra Costa Sanitary District
CCCWP	Contra Costa Clean Water Program
CCWF	Contra Costa Watershed Forum
CCHS	Contra Costa Health Services
CVRWQCB	Central Valley Regional Water Quality Control Board
DDSD	Delta Diablo Sanitation District
E_P	Erosion Potential
FY	Fiscal Year
GBP	Green Business Program
GE	General Electric
GI	Green Infrastructure
GIS	Geographic Information System
HHW	Household Hazardous Waste
HM	Hydromodification Management
HMP	Hydrograph Modification Management Plan
IDDE	Illicit Discharge Detection and Elimination
IGP	Industrial General Permit
IPM	Integrated Pest Management
LID	Low Impact Development
MOC	Municipal Operations Committee
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
MTC	Metropolitan Transportation Commission
NPDES	National Pollutant Discharge Elimination System
OPP	Oil Payment Program
OWOW	Our Water Our World
PAPA	Pesticide Applicators Professional Association
PCBs	Polychlorinated Biphenyls
PCOs	Pest Control Operators
PIP	Public Information and Participation
PLDA	Private Lands Drainage Area
PMT	Project Management Team
PMU	Priority Margin Units

Acronym	Term
POC	Pollutants of Concern
POTW	Publicly Owned Treatment Works
PSA	Public Service Announcement
RAA	Reasonable Assurance Analysis
RMP	Regional Monitoring Program
S&T	Status and Trends
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SUA	Stormwater Utility Assessment
SWRP	Stormwater Resource Plan
TAC	Technical Advisory Committee
TAG	Technical Advisory Group
TMDL	Total Maximum Daily Loads
UCMR	Urban Creeks Monitoring Report
WCCIWMA	West Contra Costa Integrated Waste Management Authority
WLA	Waste Load Allocation
WMAs	Watershed Management Areas

SECTION 1 – INTRODUCTION

Introduction

The Contra Costa Clean Water Program (CCCWP) comprises Contra Costa County (CCC), its 19 incorporated cities/towns[1], and the Contra Costa County Flood Control & Water Conservation District (District). These 21 public agencies are collectively referred to as "Permittees". The Permittees submit their CCCWP Fiscal Year (FY) 2017/18 Annual Report to the San Francisco Bay and Central Valley Regional Water Quality Control Boards (Regional Water Boards) as required by the Joint Municipal National Pollutant Discharge Elimination System (NPDES) Permits (see "Municipal Stormwater Permits" discussed further on Page 1-2. The report documents permit compliance activities conducted during the previous fiscal year (July 1, 2017 to June 30, 2018), and consists of the following:

- **Volume I – Group Activities Annual Report**: This Volume I report documents permit compliance activities conducted collectively as a group by all 21 Permittees.
- **Volume II – Individual Municipal Annual Reports**: Volume II is a compilation of the Permittees' individual Municipal Annual Reports, which document compliance activities conducted by each individual Permittee within their jurisdiction.
- **BASMAA Regional/CASQA Statewide Supplemental Reports**: These reports document compliance activities conducted regionally (Bay Area-wide) in coordination with the Bay Area Stormwater Management Agencies Association (BASMAA)[2] and statewide in coordination with the California Stormwater Quality Association (CASQA)[3]. On behalf of the CCCWP Permittees, BASMAA will

1 Cities of Antioch, Brentwood, Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, and Walnut Creek, and Towns of Danville and Moraga.

2 BASMAA is a consortium of municipal stormwater programs representing over 90 agencies, including 79 cities and 6 counties. BASMAA was started by local governments in the Bay Area to share information and combine resources to develop products and programs that would be more cost-effective if done regionally. In FY 2008-2009, BASMAA reorganized as a 501(c)(3) non-profit organization. This allows BASMAA to enter into contracts and seek grant funds on behalf of its members. BASMAA is focused on regional challenges and opportunities to improving the quality of stormwater that flows to our local creeks, San Francisco Bay and delta, and the ocean.

3 Formed in 1989, the California Stormwater Quality Task Force was a quasi-governmental organization, which advised the State Water Resources Control Board on matters related to developing stormwater regulations - more specifically, it was intended to help California comply with the municipal and industrial NPDES stormwater mandates of the federal Clean Water Act. The Task Force officially became CASQA in September 2002, when its formal 501 (c)(3) non-profit organization status was approved.

submit separately the following regional/statewide supplemental reports directly to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB)[4]:

1. *BASMAA Annual Reporting for FY 2017-2018, Regional Supplement for New Development and Redevelopment*;
2. *BASMAA Annual Reporting for FY 2017-2018, Regional Supplement for Training and Outreach; and,*
3. *CASQA, Pesticides Subcommittee Annual Report and Effectiveness Assessment 2017-2018.*

Municipal Stormwater Permits

The SFBRWQCB reissued its *Municipal Regional Stormwater NPDES Permit* to 76 Phase I[5] municipalities within the San Francisco Bay Region on November 19, 2015 (NPDES Permit No. CAS612008, Order No. R2-2015-0049). This reissued permit, which took effect on January 1, 2016, is hereinafter referred to as “MRP 2.0”. The previous permit (NPDES Permit No. CAS612008, Order No. R2-2009-0075), which was superseded by MRP 2.0 on January 1, 2016, is hereinafter referred to as “MRP 1.0”. MRP 2.0 is in effect for five years ending on December 31, 2020.

MRP 1.0 and 2.0 exclude East County Permittees: the cities of Antioch, Brentwood, Oakley, and the eastern portions of CCC and the District. These agencies are within the jurisdiction of the Central Valley Regional Water Quality Control Board (CVRWQCB) and are covered under a separate joint municipal NPDES permit titled “East Contra Costa County Municipal NPDES Permit” (East County Permit), which was last reissued in September 2010 (NPDES Permit No. CAS083313, Order No. R5-2010-0102). The East County Permit expired on September 1, 2015; however, it remains in force and effect until a new permit is reissued. In October 2016, the East County Permittees requested that the CVRWQCB designate the SFBRWQCB as the permitting authority

4 CCCWP submitted these reports directly to the CVRWQCB.

5 Phase I regulations were promulgated in 1990 and require medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges.

for municipal separate storm sewer systems (MS4) discharges in eastern CCC. In response to this request, the CVRWQCB provided a letter, dated January 6, 2017, that documents written agreement by both Regional Water Boards to designate the SFBRWQCB to regulate MS4 discharges from the East County Permittees under MRP 2.0 and any successor orders. Until the effective date of the amendment to MRP 2.0, the East County Permittees continue to implement their existing stormwater management programs.

MRP 2.0 Permittees include all Phase I Municipal Stormwater Programs[6] in the San Francisco Bay Region. Each Permittee is individually responsible for complying with the permit mandates; however, MRP 2.0 allows and encourages Permittees to collaborate in the design, development, and/or implementation of certain mandates collectively (countywide, region-wide and/or statewide). Activities conducted collectively are referred to as "group activities" and are documented in this Volume I report and in the regional and statewide supplemental reports noted on Page 1-2.

Unless specified otherwise, hereinafter all group activities reported below will reference activities conducted by all CCCWP Permittees in accordance with MRP 2.0. Copies of both the MRP and East County permits can be downloaded from the CCCWP website at: https://www.cccleanwater.org/resources/permit.

CCCWP Overview

Program Agreement

The Permittees operate under a "Program Agreement", which was first entered into in 1991 and was last updated in 2010. The roles and responsibilities of CCCWP staff and the 21 Permittees are outlined within the Program Agreement (2010-2025).

6 Phase I Municipal Stormwater Programs include: 17 public agencies comprising the Alameda Countywide Clean Water Program (ACCWP); 21 public agencies comprising the CCCWP; 15 public agencies comprising the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP); 22 public agencies comprising the San Mateo Countywide Stormwater Pollution Prevention Program; the cities of Fairfield and Suisun City comprising the Fairfield-Suisun Urban Runoff Management Program; and, the City of Vallejo and the Vallejo Sanitation and Flood Control District.

Program Staffing

Staff to the CCCWP is provided by CCC. During the first half of FY 2017/18, the program had four (4) full-time staff positions and one (1) 32-hour staff member. In January 2018 a permanent full-time Program Manager was hired to fill the vacancy created by the retirement of the previous Program Manager. Additional technical and temporary staff support was provided, as needed, by consultants/contractors. See Attachment 1.1 for a listing of staff positions and consultants/contractors retained in FY 2017/18.

Organizational Structure

The Management Committee, which consists of one designated representative from each of the 21 Permittees, is the decision-making body of the CCCWP and provides direction to CCCWP staff and subcommittees. The Management Committee meets monthly, and directs and monitors the implementation of all group activities. Five (5) subcommittees: Administrative, Development, Monitoring, Municipal Operations and Public Information and Participation (PIP) Committees review, research, and make recommendations to the Management Committee. CCCWP staff and designated municipal representatives participate on similar BASMAA subcommittees, which are focused on the implementation of tasks and projects conducted regionally. Attachment 1.2 outlines the CCCWP's organizational structure. Attachment 1.3 shows CCCWP Permittees' participation and attendance on the CCCWP's Management Committee and its subcommittees. In accordance with the Program Agreement, designated Permittee representatives are required to attend at least 80% of the CCCWP's regularly scheduled meetings.

Funding Stormwater Compliance Programs

Most CCCWP Permittees' stormwater activities are funded by a stormwater utility assessment (SUA). The assessments were authorized in 1993 and range from $25 to

$45 a year for a single-family home, depending on the municipality. Assessments for properties are based on estimates of stormwater runoff based on impervious area. The cities of Richmond and Brentwood do not have a SUA. In those municipalities, stormwater pollution prevention activities are funded by other revenues, including the general fund. In addition, most Permittees that have the assessment for stormwater pollution prevention supplement those revenues from other sources.

Revenues from the SUAs are collected by the CCC Tax Collector with the property tax bill. The District is responsible for the administration and disbursement of the assessment revenues, which in FY 2017/18 totaled approximately $15,088,427. The assessment revenue may only be used for NPDES program activities including, but not limited to, construction of pollution control improvements and drainage system maintenance. Approximately 20% of these revenues are used to fund permit compliance activities that municipalities choose to conduct collectively (i.e., Group Activities). The remaining 80% of the revenue is “returned-to-source” (i.e., returned to the local jurisdiction from which it originated). The return-to-source revenue pays for permit compliance activities conducted at the municipal level. Each Permittee’s cost share of Group Activities is apportioned by population. CCCWP staff, consultants, and contractors assisted Permittees in compliance with MRP 2.0 by providing technical support and guidance, staff training, and implementation of a variety of activities, including public education and outreach and water-quality monitoring. These activities are more effectively and cost-efficiently implemented as Group Activities. The CCCWP’s FY 2017/18 budget was $4,070,432 and is available on the CCCWP’s website at: https://www.cccleanwater.org/resources/budget.

Within this budget, the CCCWP pays dues on behalf of the Permittees to: BASMAA, the San Francisco Bay Regional Monitoring Program (RMP) for Trace Substances, the Bay Friendly Landscape Coalition, to the Green Business Program (GBP), and CASQA. These groups provide water quality monitoring and research activities that are mandated under the NPDES permits, and/or provide representation, guidance and/or staff training at the regional or state levels.

Permittees' authority to raise taxes or assessment fees to pay for governmental activities has been sharply constrained by voter initiatives such as Proposition 13[7] and Proposition 218[8]. CCCWP Permittees' SUA rates have a maximum limit, which was established in 1993. All municipalities reached their maximum rate by FY 2009/10, when the SFBRWQCB adopted MRP 1.0. Since then, Permittees have been supplementing their SUA revenues with funding from other sources, including the general fund, to finance the ever-increasing stormwater compliance mandates.

Complying with the unfunded federal and state mandated stormwater permit compliance programs continues to be the Permittees' most significant challenge. In the absence of new revenues for stormwater pollution prevention, Permittees have repeatedly advocated for the need to prioritize actions that have proven most beneficial to water quality, and have asked that permit requirements that are less beneficial be eliminated or reduced. However, the Permittees ultimately have no authority over permit conditions, and cannot guarantee that permit conditions are reasonable or implementable, or that the prescribed actions are effective or worthwhile. CCCWP Permittees continue to explore ways to improve cost recovery and to assign costs for controlling certain pollutant sources that originate on private property. Permittees also continue to seek community partners for trash cleanup and other watershed stewardship activities, and aim to align available stormwater grant funding with transportation funding and grant programs for integrated transportation and drainage infrastructure improvements.

7 Proposition 13 - In 1978 California voters passed Proposition 13, reducing property tax rates by about 57%. The basis for property tax calculation was rolled back to the 1976 assessed value. Reassessment of property value was allowed only upon change in property ownership and the assessment was limited to 1% of the sales price. Revenue for stormwater management agencies, such as a Flood Control Zone, was reduced significantly and the tax rate was locked in at the 1976 adopted rate. As time went on, stormwater management agencies could not raise revenue to keep up with needed construction, major maintenance, or replacement of failed drainage facilities.

8 Proposition 218 - After Proposition 13 was passed, many stormwater management agencies turned to assessments and other measures to help fund services. In 1996, California voters passed Proposition 218, expanding the protection against property tax increases established by Proposition 13. Voter approval was now required for all new or increased assessments, charges or fees proposed by a stormwater management agency. Assessment proponents also had to demonstrate the specific benefit to properties before initiating or increasing the assessment. Fees and charges established or increased by agencies providing water or sewer services were expressly exempted from obtaining voter approval.

Highlights of Group Program Activities for FY 2017/18

Methylmercury Control Study

In FY 2017/18 CCCWP completed the methylmercury control study established through Provision C.11.i of Regional Board Order No. R5-2010-0102 (East County Permit) regulating the discharge of urban runoff. CCCWP began implementation of the methylmercury control study in 2012 in response to Provision C.11 to 1) evaluate the effectiveness of existing BMPs for the control of methylmercury; 2) evaluate additional or enhanced BMPs and reduce mercury and methylmercury discharges to the Delta; and, 3) determine the feasibility of meeting methylmercury waste load allocations (WLAs).

This study established that receiving waters downstream of the East County MS4 consistently exceed the implementation goal of 0.06 ng/L. The study also established that variability of suspended sediment concentration (SSC) accounts for about a third of the variability in methylmercury concentrations. The results show that natural background concentrations of suspended sediment in water with background, normal methylmercury concentrations that could be found anywhere in waters of the United States, will tend to cause surface waters and storm water to exceed the 0.06 ng/L methylmercury implementation goal. This finding of infeasibility for the implementation goal is supported by data from the study, assessments of Bay Area stormwater by the San Francisco Estuary Institute, and assessments of stormwater treatment effectiveness by BASMAA.

Receiving waters of The West and Central Delta sub-areas meet (or are close to) the 0.06 ng/L implementation goal and are therefore not subject to methylmercury load reduction requirements for regulated discharges. Discharges from the City of Antioch to the West Delta were evaluated and verified that the current allocated load for urban runoff discharges to the West Delta appears to be attained. They still exceed 0.06 ng/L,

but are below the assumed 0.24 ng/L threshold that was used to allocate methylmercury loads to the West Delta from urban runoff.

Contra Costa Watersheds Stormwater Resource Plan (SWRP)

In FY 2016/17, the CCCWP Management Committee made a strategic decision to apply for a Proposition 1 Storm Water Grant Program planning grant to develop a SWRP for CCC. There were several reasons for this decision. For CCCWP Permittees to compete for Proposition 1 implementation grants and any future bond monies for stormwater and dry weather capture projects, they must develop a SWRP. The requirements for development of a SWRP are also very similar to the required elements of the MRP 2.0 mandated Green Infrastructure (GI) Plans (Provision C.3.j). For example, both call for: 1) focusing water quality priorities based on watersheds, management areas or specific drainage areas; 2) identifying and prioritizing projects using quantitative measures or metrics; 3) prioritizing projects that provide multiple benefits; 4) establishing procedures for tracking progress and implementation of performance measures; and 5) conducting outreach and encouraging public participation. CCCWP Permittees made the decision to apply for funding for a SWRP and to leverage the SWRP planning process and deliverables to develop components for the MRP 2.0 mandated GI Plans and provide a framework for the GI Reasonable Assurance Analysis (RAA).

In summer 2016, the CCCWP was awarded a Proposition 1 planning grant for development of the *Contra Costa Watersheds Stormwater Resource Plan – Greening the Community for Healthy Watersheds.* The committed grant amount for the project is $499,180 with a match amount of $500,760. To meet MRP 2.0 compliance deadlines, CCCWP launched the SWRP planning process on an accelerated schedule in February 2017, while the grant agreement documents were being finalized by the California State Water Resources Control Board. The final grant agreement was signed on May 2, 2017. The FY 2016/17 Annual Report reports grant tasks that were accomplished in FY 2016/17 and contain the final grant agreement as an Appendix.

Grant tasks accomplished in FY 2017/18 include:

- Finalized the Stakeholder Engagement Plan and conducted five stakeholder workshops, in the North, South, East, West and Central areas of the County, to gather input and potential projects for inclusion in the SWRP. These outreach efforts generated over 500 projects, from concepts to those being planned to those in progress;
    - Provided updates to the Contra Costa Watershed Forum (CCWF) and to the Bay Area and East Contra Costa Integrated Regional Water Management (IRWM) groups;
- Submitted quarterly Progress Reports to the state grant manager;
- Held three meetings of the Technical Advisory Group (TAG) to review key project deliverables; and,
- Completed all of the preliminary information collection, data gathering, planning, and technical evaluations required by grant and needed for the SWRP including:
    - Completed data collection and watershed descriptions;
    - Developed the SWRP annotated outline;
    - Developed the SWRP implementation strategy;
    - Evaluated modeling tools and developed the recommended modeling approach;
    - Developed and completed the screening process for stakeholder-submitted projects;
    - Completed geospatial modeling to identify potential projects based on geography, hydrology, drainage patterns, land uses, available parcels;
        - This effort generated 18,000 potential project opportunities;
    - Scored the projects opportunities based on SWRP multiple benefits criteria. Permittees reviewed and prioritized the project opportunities;
    - Selected 10 projects and developed them into GI BMP project concepts; and,
- Completed the SWRP Administrative Draft and submitted to State Water Resourses Control Board.

The Draft SWRP was released for public review in September 2018. The final SWRP will be completed in early 2019. Project opportunities and tools developed for the SWRP will be utilized by Permittees in the development of their GI Plans and will be used for the development of the RAA.

The SWRP forms a connection between regional water quality and water resources planning goals. The SWRP identifies projects that can support municipal GI planning and implementation driven by water quality regulations. The SWRP also reflects the goals of and will be incorporated into Integrated Regional Water Management plans within CCC, providing a link between stormwater and management of other water resources. The implementation of multiple benefit SWRP projects will help protect and improve water bodies in CCC, which provide important environmental, community, health, and economic benefits within CCC. The SWRP also represents progress towards treating stormwater as a valuable local water resource.

MRP 2.0 requires Permittees to develop GI Plans, as part of the new development and redevelopment provisions for implementation of GI projects and requires RAAs demonstrating that pollutant load reductions for the San Francisco Bay Polychlorinated Biphenyls (PCBs) and Mercury Total Maximum Daily Loads (TMDLs) will be met through a combination of implementation of the GI Plans and other stormwater management measures focused on source control. The SWRP was developed considering regional regulatory requirements for stormwater dischargers, particularly the GI planning requirements. The projects identified in the SWRP will be used to help the Permittees meet their GI planning requirements. Projects were also evaluated in a manner consistent with the RAA requirements in the MRP to assess load reductions for compliance with the Mercury and PCBs TMDLs WLAs. CCC municipalities and other stakeholders will ultimately have the option of pursuing future implementation grant funding for multiple benefit projects included in their GI Plans.

GI Plan Development

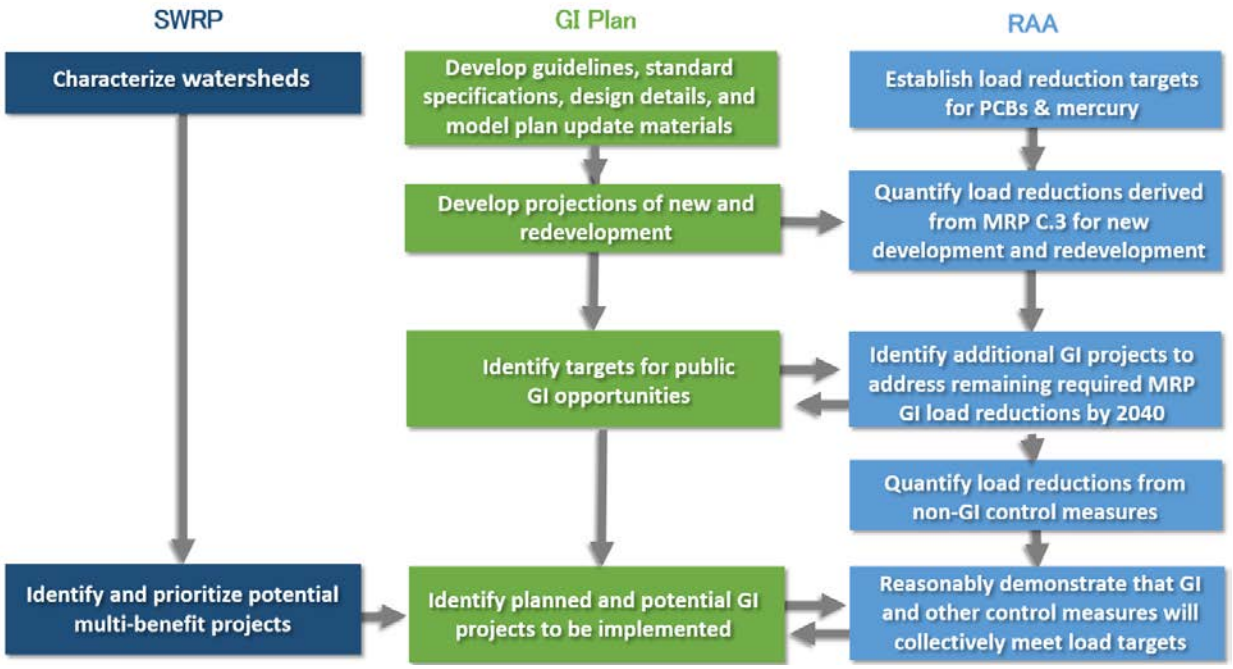
During FY 2017/18, under direction of its Development Committee, CCCWP assisted CCC municipalities with GI planning. CCCWP brought the SWRP to the Administrative Draft stage and assisted municipalities with using project lists as input for preparing their GI Plans. CCCWP developed and distributed a GI Plan template, developed a methodology for projecting the amount of impervious surface to be retrofitted with GI through public and private land development projects (Regulated Projects), and conducted outreach to public works directors, city engineers, and planning directors.

Interrelationship of SWRP, RAA and GI Plans

The MRP 2.0 requires Permittees to develop and implement GI Plans and further requires the Permittees to complete a RAA to demonstrate that required PCBs and mercury load reductions will be achieved by the TMDL deadlines through implementation of the GI Plans and other permit-required control measures.

The SWRP forms the foundation for water quality improvement strategies through GI implementation, which are expected to be an essential part of the Permittees' approach to meet the TMDL and permit-mandated water quality improvement goals. The SWRP incorporated water quality metrics into the process of selecting project opportunities, prioritizing them and evaluating their benefits. A primary goal for this SWRP was to identify multiple benefit GI projects that could be included in municipal GI Plans and help CCC's jurisdictions meet their TMDL and MRP requirements. CCC jurisdictions and other stakeholders will ultimately have the option to pursue future implementation grant funding for multiple benefit projects included in the SWRP.

The interrelationship of the SWRP, GI Plans, and RAA is illustrated below:



<u>GI Planning and RAA</u>

MRP Provision C.3.j requires Permittees to develop a GI Plan for inclusion in the 2019 Annual Report. The GI Plan must be developed using a mechanism to prioritize and map areas for potential and planned GI projects, both public and private, on a drainage-area-specific basis, for implementation by 2020, 2030, and 2040. The SWRP's project opportunity analyses provided a foundation for the Permittees' GI planning efforts. See Section 3 for further details on Program and Permittee activities related to GI planning.

MRP Provisions C.11.c and C.12.c require the Permittees to prepare a RAA for inclusion in the 2020 Annual Report that quantitatively demonstrates that mercury load reductions of at least 10 kg/yr. and PCBs load reductions of at least 3 kg/yr. will be achieved by 2040 through implementation of GI throughout the MRP area.

The RAA should also do the following:

- Quantify the relationship between the areal extent of GI implementation and mercury and 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 GI strategies likely to be implemented;
- Estimate the amount and characteristics of land area that will be treated by GI by 2020, 2030, and 2040;
- Estimate the amount of mercury and PCBs load reductions that will result from GI implementation by 2020, 2030, and 2040; and,
- Ensure that the calculation methods, models, model inputs, and modeling assumptions used have been validated through a peer review process.

Additionally, 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 an RAA demonstrating that sufficient control measures will be implemented to attain the mercury TMDL wasteload allocations by 2028 and the PCBs TMDL wasteload allocations by 2030.

In FY 2015/16, the Program in collaboration with the AACWP and the SCVURPPP, prepared a *Bay Area Reasonable Assurance Analysis White,* which was used to inform the FY 2016/17 BASMAA regional project that developed the *Bay Area Reasonable Assurance Analysis Guidance Document.* This guidance document established a regional RAA framework and provided guidance for conducting PCBs and mercury RAAs in the San Francisco Bay Area. A regionally-representative project management team (PMT) and a Technical Advisory Committee (TAC) were convened for the development of the RAA Guidance Document. CCCWP representatives participated on both the PMT and the TAC, which provided technical and regulatory peer review for the document. The *Bay Area Reasonable Assurance Analysis Guidance Document* was finalized in June 2017.

In FY 2017/18, the CCCWP and Permittees launched the RAA process in CCC. Tasks conducted this fiscal year included:

- Compiled information for conducting the GI RAA, such as geographic information system (GIS), pollutant monitoring, and flow monitoring data relevant for modeling;
- Participated in a BASMAA RAA Workgroup that provided a forum for collaborative and collegial input from BASMAA member agencies in an effort to create transparent and consistent assumptions and approaches to the development of the countywide RAAs;
- Prepared a technical memorandum describing in detail the proposed GI RAA modeling methodology. The methodology was vetted in several meetings with the Permittees, the Management Committee, the BASMAA RAA Workgroup, and the Regional Water Board;
- Began conducting baseline hydrologic modeling; and,
- Conducted modeling to calculate the PCBs and mercury load reductions attributable to capture and treatment of runoff for typical GI facilities and documented these results in the *Quantitative Relationship between GI and PCBs/Mercury Load Reductions* Report (Attachment 12.2).

See Sections 11 and 12 for further details on Program and Permittee activities related to implementation of mercury and PCBs control programs.

<u>Development Subcommittee</u>

CCCWP continued its work furthering the implementation of Low Impact Development (LID) drainage design on Regulated Projects, by publishing templates and examples of submittals, and by sponsoring a workshop for municipal staff and land development professionals. CCCWP completed and submitted a Technical Report and applicability maps related to implementation of Hydromodification Management (HM) requirements.

During FY 2017/18, CCCWP sponsored a biennial training workshop for municipal construction inspectors. The workshop provided a review of MRP Provision C.6 requirements, reviewed the principles of construction site stormwater management and BMP resources, and reviewed inspections and documentation best practices and tools. An interactive exercise involved participants in reviewing photographs of installed BMPs and identifying how the situation should be documented on the inspection form.

Development and Refinement of the Countywide GIS Platform

In FY 2017/18, while there was on going work to enhance and refine the existing trash reporting and analysis application, under direction of its Municipal Operations Committee (MOC), CCCWP assisted CCC Permittees with development of a GIS application to identify and map private lands greater than 10,000 square feet that drain to the MS4. CCCWP worked with its GIS consultant to create a Private Lands Drainage Area (PLDA) Editor application that would initially screen qualifying lands for desktop review by Permittees, establish preliminary PLDAs as based on the outcome of the desktop review, allow for recording and tracking of outreach to respective property owners/mangers of qualifying lands, and track progress of agreed to trash management actions to reduce trash loads. CCCWP also worked with the consultant to develop Collector applications to accompany the PLDA application. The Collector applications allow Permittees to map private storm drain inlets, conduct assessments on the PLDAs, and record events such as various types of contacts with property owners.

Receiving Water Trash Monitoring Program Plan (Trash Monitoring Plan)

CCCWP also continued to oversee implementation of the Receiving Water Trash Monitoring Plan. CCCWP worked with its monitoring contractor to identify and secure permissions of public agency and private property owners whose lands would need to be accessed in order to reach the probabilistic monitoring sites. This work included developing outreach material and permission forms to be sent to agency and property owners, tracking permissions, responding to inquiries about the Receiving Water Trash

Monitoring Plan, and ensuring that monitoring requirements for probabilistic sites were met. CCCWP was also heavily engaged in coordinating the logistics for monitoring of targeted sites (i.e., subset of Permittees' trash hot spots) and overseeing development and completion of the Progress Report on the Receiving Water Trash Monitoring Plan, which is submitted as an attachment in this Annual Report (Attachment 10.1).

Public Information and Participation

One of the CCCWP PIP Committee's major accomplishments in FY 2017/18 was the complete redesign of the Program's website. The website is used to help educate residents, community organizations, watershed stakeholders, businesses, schools, and the general public about the CCCWP's programs and activities, stormwater quality requirements, pollution prevention practices, and water quality-related community events.

A Summary of Other Group Program Activities for FY 2017/18

In addition to the activities and programs highlighted above, CCC Permittees collectively conducted a broad range of other activities and programs designed to reduce or eliminate the discharge of stormwater pollutants (i.e., anything other than stormwater) into and from municipal storm drain systems. This Volume I report documents the other activities conducted or coordinated collectively as follows:

Table 1-1: Group Program Activities

MRP 2.0 Provisions	Section
C.2 Municipal Operations – Controls to reduce non-stormwater discharges and polluted stormwater to storm drains and watercourses during operation, inspection, and routine repair and maintenance activities of municipal facilities and infrastructure.	2
C.3 New Development and Redevelopment – Source controls, site design, and stormwater treatment measures in new development and redevelopment projects to address both soluble and insoluble stormwater runoff pollutant discharges, and controls to prevent increases in runoff flows from new development and redevelopment projects.	3
C.4 Industrial and Commercial Site Controls – Inspections and enforcement of stormwater pollution prevention measures at businesses to prevent pollutant exposure and discharges into and from municipal storm drain systems.	4
C.5 Illicit Discharge Detection and Elimination (IDDE) – Surveillance, spill and complaint investigations, control of mobile sources, and enforcement and case follow-up.	5
C.6 Construction Site Controls – Inspections and enforcement of construction site stormwater pollution prevention to reduce and eliminate pollutant discharges into and from municipal storm drain systems.	6
C.7 Public Information and Outreach – Information and outreach to increase knowledge and encourage behavior changes of target audiences regarding the impacts of stormwater pollution on receiving water and of pollution prevention solutions to mitigate the problems, respectively.	7
C.8. Water Quality Monitoring – Water quality monitoring activities including, but not limited to: 1) San Francisco Estuary receiving water monitoring; 2) creek status monitoring; 3) stressor source identification investigation; 4) Pollutants of Concern (POC) monitoring; and, 5) pesticides and toxicity monitoring.	8

MRP 2.0 Provisions	Section
C.9 Pesticide Toxicity Control – Actions to prevent impairment of urban streams by pesticide-related toxicity including implementation of Integrated Pest Management (IPM); outreach and training to municipal employees, pest control operators (PCOs), and residents; and, outreach to consumers on less-toxic methods of pest prevention and control.	9
C.10 Trash Load Reduction – Implementation of control measures and other actions to reduce trash loads discharged into municipal storm drainage systems and receiving water bodies.	10
C.11 Mercury Controls – Implementation of control measures to reduce total mercury and methylmercury loads in accordance with load reduction allocations established for urban runoff in the San Francisco Bay Mercury and the Sacramento San Joaquin Delta Methylmercury TMDLs.	11
C.12 Polychlorinated Biphenyls Controls – Implementation of control measures to reduce PCBs loads in accordance with load reduction allocations established for urban runoff in the San Francisco Bay PCBs TMDL.	12
C.13 Copper Controls – Implementation of source control Best Management Practices[9] (BMPs) to reduce and eliminate discharges containing copper into and from municipal storm drainage systems.	13
C.15 Exempted and Conditionally Exempted Discharges – Implementation of control measures to eliminate any adverse impacts to receiving waters from exempted unpolluted non-stormwater discharges, such as flows from natural springs; and, conditionally exempted non-stormwater discharges that are potential sources of pollutants, such as swimming pools and spas and irrigation water.	14

9 A BMP is defined as any program, technology, process, siting criteria, operating method, measure, or device which controls, prevents, removes, or reduces pollution.

SECTION 2 – PROVISION C.2 MUNICIPAL OPERATION

Introduction

CCCWP staff, consultants and municipal staff participate on the MOC, which assists in the review and preparation of guidance and training for municipal staff with respect to Provisions C.2 (Municipal Operations), C.4 (Industrial Commercial Site Controls), C.5 (Illicit Discharge Detection and Elimination), C.9 (Pesticide Toxicity Control), C.10 (Trash Load Reduction), C.13 (Copper Controls), and C.15 (Exempted and Conditionally Exempted Discharges) of the MRP. CCCWP staff also participates in the BASMAA MOC, which coordinates related regional activities. This section of the Annual Report will focus on municipal operation activities (Provision C.2). Reporting related to Provisions C.4, C.5, C.9, C.10, C.13, and C.15, are covered in Sections 4, 5, 9, 10, 13 and 14, respectively, in this Volume I Report.

In FY 2017/18, Rinta Perkins (City of Walnut Creek) and Bob Cellini (City of Martinez) served as Chair and Vice Chair, respectively, of the CCCWP MOC. The regular MOC typically meets the first Monday of each month and special trash MOC meetings typically meet the third Monday of the month on an as needed basis. In FY 2017/18, the regular MOC met in all months except July, October, January, and March. The MOC meetings devoted to trash only met in the months of February, March, April, and May.

Perkins, Michele Mancuso (Unincorporated Contra Costa County), and Beth Baldwin (CCCWP staff) represented the CCCWP at the BASMAA Trash Subcommittee. Work undertaken by this committee is discussed in Section C.10. The BASMAA MOC did not meet in FY 2017/18.

A listing of Contra Costa municipal representatives on the CCCWP MOC is included in Attachment 1.3. Summary minutes of these meetings are available in the FY 2017/18 Management Committee agenda packets provided on the CCCWP website at http://www.cccleanwater.org/meetings/.

FY 2017/18 Accomplishments

The monthly MOC meetings provide an opportunity to further train and educate Permittees on subjects that are relevant to municipal operations and permit compliance. The meetings also serve as a forum to discuss municipal operations such as pest management or illicit discharge response. There are also opportunities to hear from guest speakers, share audit findings of stormwater programs relative to municipal operations, or identify the need for new or updated public outreach material based on findings from stormwater inspections. Below are some of the highlights from MOC activities for FY 2017/18.

Presentations by Guest Speakers

As part of an ongoing effort to build relationships with agencies whose work may potentially intertwine with MOC's activities, guest speakers are invited to give presentations on their respective programs to this committee. In FY 2017/18, presentations were given by the following persons:

Martin Sum with Contra Costa Health Services (CCHS), Division of Environmental Health, gave a presentation on CCHS's permitting and inspection process for mobile food facilities. Permittees learned about the different kinds of facilities that are permitted (trucks, carts, etc.) and their equipment requirements including potable and wastewater tanks. This information is important since there are potential non-stormwater discharges that could arise from improper discharge from either type of tank. Permittees also learned about the types of activities that occur at the commissaries where these facilities are serviced. In the future, the commissaries may be used for disseminating CCCWP outreach material to reach food truck vendors.

Luis Agurto Jr., President and Chief Executive Officer of Pestec gave a presentation on BASMAA's Healthy Buildings Pilot Project: IPM Focus on Multi-Unit Housing. The

project was designed to address stormwater pollution prevention challenges by combining water quality messages associated with outdoor use of pesticides with public health messages associated with indoor pest control methods. Agurto's overview included a description of the location and number of participating units, list of services provided to residents and property managers/owners during the course of the study, and outcome of the project itself. He noted that while the project was designed to look at both water quality and public health impacts arising from pesticide usage, the public health component ultimately had a more prominent role in the study.

Larry Yost and Beth Slate, both with CCC Department of Agriculture, gave a presentation on some of the department's activities. Permittees were provided with a greater understanding of what pesticide usage information is collected, how pests are monitored in CCC, the inspections conducted by the department, and what enforcement tools are at their disposal.

FY 2018/19 Planned Activities

In FY 2018/19, the CCCWP MOC will continue to review and provide assistance to municipal maintenance and operations staff, where necessary, to ensure consistent and effective BMPs are implemented during the operation, inspection, and routine repair and maintenance activities of municipal facilities and infrastructure. This includes, but is not limited to: graffiti removal, implementation of Corporation Yard Stormwater Pollution Prevention Plans, municipal stormwater pump station inspection, operation, maintenance, and monitoring, implementation of appropriate BMPs during road, parking lot and bridge repair and maintenance work; and, complying with the reporting requirements in Provision C.2 and other relevant provisions to municipal operations.

In particular, the MOC will consider conducting two workshops during the fiscal year. The first workshop would focus on the growing issue of managing illegal encampments and its effects on stormwater especially trash related impacts. The second workshop would potentially be in conjunction with Development Committee and focus on

municipal maintenance of bioretention and other C.3 facilities.

SECTION 3 – C.3 NEW DEVELOPMENT AND REDEVELOPMENT

Introduction

During FY 2017/18, under direction of its Development Committee, CCCWP assisted CCC Permittees with GI planning. CCCWP brought the SWRP to the Administrative Draft stage and assisted municipalities with using project lists as input for preparing their GI Plans. CCCWP developed and distributed a GI Plan template, developed a methodology for projecting the amount of impervious surface to be retrofitted with GI through Regulated Projects, and conducted outreach to Public Works Directors/City Engineers and Planning Directors.

CCCWP also continued its work furthering the implementation of LID drainage design on Regulated Projects, by publishing templates and examples of submittals, and by sponsoring a workshop for municipal staff and land development professionals. CCCWP completed and submitted a Technical Report and applicability maps related to implementation of HM requirements.

FY 2017/18 Objectives

The Development Committee's FY 2017/18 work was guided by the following objectives:

- Facilitate member agencies' compliance with MRP Provision C.3;
- Facilitate implementation of permanent controls on new developments in CCC;
- Organize and implement all required C.3 group activities and submittals;
- Integrate MRP requirements and BASMAA MRP submittals into existing training and guidance;
- Negotiate permit requirements and interpretations that protect water quality and are implementable and cost-effective;

- Continuously improve Program outreach and guidance on development controls; and,
- Continue CCCWP's regional and statewide role as an exemplar and leader in implementation of development controls.

FY 2017/18 Accomplishments

The CCCWP's Development Committee facilitated Permittees' implementation of MRP Provision C.3 requirements and provided direction to CCCWP staff and consultants. The Development Committee was chaired by Kevin Marstall (City of Concord). Rod Wui (City of San Ramon) served as vice-chair. These two individuals also served as CCCWP representatives to BASMAA's Development Committee. Staff from Antioch, Brentwood, Clayton, Concord, CCC, Hercules, Pittsburg, Pleasant Hill, San Ramon, and Walnut Creek were voting members of the Committee. Staff from Danville actively participated as a non-voting Committee member. The Committee met in August, October, and December 2017, and in January, February, April, May, and June 2018.

CCCWP's FY 2017/18 accomplishments for C.3 New Development and Redevelopment included:

- A GI Plan template;
- A methodology for projecting impervious surface to be retrofit with GI via land development;
- Templates and example submittals for Stormwater Control Plans as ancillary documents to the *Stormwater C.3 Guidebook;*
- A workshop for municipal staff and land development professionals;
- Completion and submittal of a HM Technical Report following a consensus process with Water Board staff; and,
- Completion and submittal of HM Applicability Maps.

Additional detail on each of these major accomplishments follows.

GI Planning (Provision C.3.j.) Background and Previous Years' Activities

In 2013, CCCWP staff and consultants initiated discussions within BASMAA, of GI as a unifying theme for the reissued MRP. CCCWP staff and consultants participated in a BASMAA-sponsored GI work group that was launched in early 2014. During FY 2014/15, CCCWP staff and consultants helped draft a proposed GI provision. Following discussions within BASMAA and with Water Board staff, some elements of the draft were incorporated into MRP Provision C.3.j.

During FY 2015/16, CCCWP focused on assisting Permittees to implement the early implementation-"no missed opportunities"-requirements of MRP C.3.j.ii. CCCWP initiated and drafted the BASMAA Development Committee's *Guidance for Identifying Green Infrastructure Potential in Municipal Capital Improvement Projects* and assisted Contra Costa municipalities to implement routine procedures to assess their capital projects.

During FY 2016/17, CCCWP created for Contra Costa permittees a template and guidance for preparing a GI Plan Framework along with a sample PowerPoint presentation to be used by local staff in creating presentations to their council or board. CCCWP also created a table, "Green Infrastructure Planning Tasks, Roles, and Timeframes," identifying local, countywide, and regional roles, setting a preliminary schedule, and noting available and expected resources for preparing GI Plans. This table was adapted by Permittees and included in their GI Plan frameworks, which were adopted by each Permittee by June 30, 2017, as required by Provision C.3.j.i.(1). In cooperation with the ACCWP, CCCWP initiated a project to develop a GIS to track and report implementation of GI measures, including implementation of LID on private development projects subject to Provision C.3.b. CCCWP also initiated, through BASMAA, investigation of sizing criteria for GI street projects.

FY 2017/18 GI Activities and Accomplishments

The “Green Infrastructure Planning Tasks, Roles, and Timeframes” table was updated in October 2017.

During FY 2017/18, CCCWP continued work on the SWRP, funded through the Storm Water Grant Program. Outcomes of the SWRP will assist Permittees with GI Planning, including a mechanism to locate, prioritize, and map areas for potential and planned public projects on a drainage-area-specific basis (Provision C.3.j.i.(2)(a)) and to develop a list of prioritized projects (Provision C.3.j.i.(2)(b)).

CCCWP staff and consultants conducted five SWRP stakeholder workshops around the County, and generated a list of over 500 projects, ranging from concepts to in-progress. In addition, the project team completed geospatial modeling to identify potential projects based on geography, hydrology, drainage patterns, land uses, and available parcels. This effort generated approximately 18,000 potential project opportunities. Ten projects were selected and developed into GI project conceptual designs.

To project the amount of impervious surface that will be retrofitted with GI via Regulated Projects (Provision C.3.b.), CCCWP staff and consultants investigated using the Metropolitan Transportation Commission’s (MTC’s) process for creating transportation demand projections. Finding that recent MTC projections were based on a region-wide parcel-level simulation of future development, generated by a program called UrbanSim, CCCWP staff and consultants engaged with Contra Costa Transportation Authority and MTC staff to learn more about the process and the program. CCCWP then engaged GIS experts under an existing on-call contract to investigate obtaining and using this information. CCCWP developed a process and workflow for using UrbanSim output data to meet the requirements of MRP Provision C.3.j.i.(c) as it applies to Regulated Projects. The process and workflow were presented to other countywide programs at the December 2017 BASMAA Development Committee meeting. CCCWP is currently

implementing the process and workflow to provide these projections to Contra Costa Permittees for incorporation into their GI Plans and for use in the RAA.

CCCWP consultants assisted BASMAA to develop sizing guidance for GI Facilities in Street Projects per MRP Provision C.3.j.i.(2)(g). As background, during FY 2015/16, CCCWP assisted BASMAA by drafting a scope for a project to analyze bioretention sizing criteria. In December 2016, BASMAA issued a request for proposal for a modeling study. Dubin Environmental Consultants was selected and delivered a report in December 2017. Beginning in January 2018, CCCWP contributed to the BASMAA effort by preparing a memorandum with background, analysis, and sizing guidance based on Dubin's analysis. Successive drafts were prepared and discussed in BASMAA's Development Committee during the remainder of FY 2017/18.

CCCWP's Development Committee considered options for preparing the "general guidelines for overall streetscape and project design and construction" required by Provision C.3.j.i.(e) and the "standard specifications and, as appropriate, typical design details… necessary for the Permittee to incorporate green infrastructure into projects…" required by Provision C.3.j.i.(f). A work group was formed in March 2018 and met on May 8, 2018. The work group concluded that it would work best to start with the information in CCCWP's *Stormwater C.3 Guidebook* and adapt it to the needs of GI projects. The work group also recommended making use of design information published by others, including the City of Dublin, the Central Coast LID Institute, the San Francisco Public Utilities Commission, and California Department of Transportation (Caltrans). A list of applicable urban design guidance and engineering details was compiled and distributed to Permittees and was posted on the CCCWP website. CCCWP prepared a 9-question survey, requesting input on needs for GI Planning and Design, and legal assistance related to GI. The survey was distributed to Public Works Directors and city engineers via the Contra Costa City/County Engineering Advisory Committee, and to planning directors.

CCCWP staff and consultants prepared a GI Plan Template for Permittee staff and consultants to use when preparing their GI Plans. The template was distributed in April 2018.

CCCWP staff and consultants' outreach on GI included a presentation to Contra Costa Planning Directors on May 10, 2018, a presentation at the CASQA Quarterly meeting in Sacramento on May 10, 2018, and a presentation to the Contra Costa City/County Engineering Advisory Committee on June 21, 2018. A GI Planning Resources page was added to the CCCWP website.

The CCCWP Development Committee reviewed and provided input to development of the countywide RAA mandated by MRP Provisions C.11 and C.12, focusing on aspects of the RAA connected to GI planning and implementation. This work included receiving a presentation and reviewing and commenting on the planned RAA modeling methodology.

Stormwater C.3 Guidebook, 7th Edition—Templates and Examples

The 7th Edition of the *Stormwater C.3 Guidebook* was published during FY 2016/17. As a follow-up, CCCWP's consultant worked with the Development Committee during FY 2017/18 to prepare the following ancillary documents, published to the CCCWP website in February 2018:

- Stormwater Control Plan Template;
- Example Stormwater Control Plan for a Commercial Project;
- Example Stormwater Control Plan for a Residential Subdivision;
- Stormwater Facilities Operation and Maintenance Plan Template;
- Example Stormwater Facilities Operation and Maintenance Plan for a Commercial Project; and,
- Example Stormwater Facilities Operation and Maintenance Plan for a Residential Subdivision.

Outreach and Training

Since 2004, the Program has sponsored a C.3 compliance workshop each fiscal year (except FY 2016/17). Workshops typically include an overview of C.3 requirements, implementation procedures, and design guidance in accordance with the Program's *Stormwater C.3 Guidebook.* This year's workshop was held April 24, 2018 at the City of Walnut Creek's Shadelands Civic Arts Auditorium. A total of 33 private-sector land development professionals and 74 municipal staff attended. About half the participants had previously attended a CCCWP C.3 workshop.

Presentations included a review of the basics of Provision C.3 compliance and LID Design, an update on regulatory changes, and an overview of GI planning. These presentations were followed by an interactive discussion of eight key topics in LID implementation. These topics were the subject of frequent requests for CCCWP technical assistance from applicants and from municipal staff over the course of the year.

Participants were asked to complete a feedback form. A total of 53 responses were received. The Development Committee had a post-mortem discussion on April 25, 2018. Based on the participant responses and Committee discussion, the interactive portion of the workshop was found to be especially useful for experienced practitioners. Participants who were newer to C.3 implementation gained from the review of basics. The workshop agenda and slides were posted to the CCCWP website.

Design and Engineering Assistance to Municipal Staff and to Applicants for Development Project Approvals

Throughout the fiscal year, CCCWP made the services of the Program's C.3 consultant, Dan Cloak, P.E., available to its member Permittees and to the community of land development professionals for consultation on C.3 compliance and LID design and

construction. Cloak provided technical assistance on dozens of development projects during FY 2017/18.

Preparing Updates to HM Criteria Background and Previous Years' Activities

A 2003 permit amendment required CCCWP to prepare a Hydrograph Modification Management Plan (HMP). Similar requirements were added to the Santa Clara permit in 2001. Contra Costa's HMP was developed in FY 2003/05 and emphasizes the use of LID to mitigate changes in runoff caused by land development. The SFBRWQCB approved the HMP in mid-2006. The HMP includes requirements for monitoring of some bioretention facilities and for calibration and verification of the model used to calculate the bioretention sizing factors. The 3rd Edition of the *Stormwater C.3 Guidebook* (October 2006) incorporated HM requirements, including the sizing factors, into criteria for LID design on projects subject to the HM requirements.

Designs for bioretention facilities were further developed and refined in FY 2006/08. The *Guidebook* 4th Edition (2009) included variations on bioretention designed and incorporated sizing factors for all facilities based on limiting flow exiting via facility underdrains to two-tenths of 2-year event (0.2Q2). MRP 1.0 (2009) imposed 0.1Q2, but allowed Contra Costa to continue to use 0.2Q2 for the permit term. MRP 1.0 also renewed the requirement for a model calibration and verification study.

The study proceeded in FY 2011/12 and FY2012/13. Tony Dubin of Dubin Environmental Consulting conducted the model calibration and verification. CCC Flood Control District staff conducted the monitoring. A report was completed and submitted with the 2013 Annual Report. Monitoring data showed that exfiltration from the bioretention facilities was 0.24 inches per hour, an order of magnitude higher than the rate assumed in the original model. Largely because of this difference, using the calibrated model, sizing factors would not need to increase even if the 0.1Q2 flow limit were to be met.

For MRP 2.0, CCCWP sought to also change criteria in Provision C.3.g that favor the use of flow duration control basins rather than LID. This effort started with developing potential alternatives to the curve-matching criteria in Provision C.3.g.ii.(2). In early 2015, following discussions with SFBRWQCB staff, BASMAA retained Judd Goodman of Geosyntec Consultants to develop a memorandum describing how the potential for downstream stream bed and bank erosion (erosion potential, or E_P) could be estimated directly, rather than relying on the matching of flow-duration curves. Goodman collaborated with Dubin. The modeling results from the 2013 CCCWP report were used as input for Goodman's calculations of E_P.

Also in MRP 2.0, the Water Board required Contra Costa permittees to submit a technical report, due with the 2017 Annual Report, describing how CCCWP's criteria will be updated. The update was to be implemented by January 3, 2018.

Following the November 19, 2015 adoption of MRP 2.0, CCCWP began planning to meet this requirement for a technical report. Funding for the project was included in CCCWP's FY 2016/17 budget. A team of Dubin Environmental Consulting and Geosyntec Consultants was contracted to produce the technical report. Meetings and correspondence with SFBRWQCB staff continued throughout FY2016/17 and into FY 2017/18.

<u>FY 2017/18 HM Technical Report Activities</u>

Results of bioretention performance modeling were incorporated into and information package provided to SFBRWQCB staff on July 13, 2017 and reviewed at a meeting with Keith Lichten, Dale Bowyer, and Selina Louie on July 20, 2017. At this meeting, CCCWP consultants demonstrated how three "sensitive" parameters—lower threshold for sediment movement, facility exfiltration rate to native soils, and projected future increases in watershed imperviousness—interact to affect minimum sizing factors. It was shown how a selected value for sizing factor could be fully protective for a broad variety of reasonable combinations of Qcp, facility exfiltration rate, and assumed future

increase in watershed imperviousness. It was proposed to use this approach rather than using the “most conservative” values for all three sensitive parameters.

It was further proposed that this report would recommend an appropriate sizing factor for the “base case” of a bioretention facility in Hydrologic Soil Group “D” soils, which represents most future development in Contra Costa. Representative values for the three sensitive parameters that correspond to this selected sizing factor would then be used to generate the remaining sizing factors (for other facility types and other soil groups).

CCCWP staff emailed SFBRWQCB staff on September 7, 2017, reviewing these proposed steps, stating that CCCWP anticipated being able to prepare updated sizing factors by January 3, 2018, if CCCWP received notice of the SFBRWQCB’s acceptance of the technical report by October 31, 2018, and also stating CCCWP’s understanding that Contra Costa Permittees would not be penalized for continuing to use the current sizing factors until any issues are resolved. Water Board staff responded the following day that “this sounds acceptable,” and the technical report was submitted as required on September 30, 2017.

CCCWP staff followed up with an email on November 15, 2017, noting that comments had not been received, that CCCWP Permittees would be guided to continue implementing HM criteria in the Stormwater C.3 Guidebook beyond that January 3, 2018 date, and suggesting a meeting once SFBRWQCB staff had reviewed and commented on the technical report.

<u>HM Applicability Maps Background and Previous Years’ Activities</u>

MRP 2.0 also requires Contra Costa Permittees to prepare HM applicability maps by September 2017. The maps are to show locations where projects may be exempted because they are in a catchment that drains to pipes or a hardened channel that extend continuously to the Bay, Delta, or a flow-controlled reservoir, or drain to channels that

are tidally influenced, or are located in a catchment or subwatershed that is 70% or more impervious.

CCCWP initiated this work by including the effort in the Program's FY 2016/17 budget and by negotiating a scope with the Program's GIS Consultant, PSOMAS, for completing the work. PSOMAS used a digital elevation model to delineate sub-basins (catchments). The sub-basins were overlayed on a national land cover dataset to determine sub-basins with imperviousness equal to or greater than 70%. Channel hardening was determined using ortho-imagery, and the initial determination was reviewed and corrected by Permittee staff. Sub-basins draining to hardened channels all the way to the Bay/Delta were manually coded as exempt.

FY 2017/18 Activities

The maps were submitted, along with PSOMAS' technical report, on September 30, 2017, as required. Because MRP Provision C.3.g.vi. requires that new HM Applicability Maps be "acceptable to the Executive Officer," and no response to the submittal was received, Contra Costa Permittees have been guided to implement existing policies (consistent with Attachment C in the 2009 MRP) in the interim.

FY 2018/19 Planned Activities

The Development Committee's work in FY 2018/19 will include the following activities related to implementation of Provision C.3, Provision's C.3.a. through C.3.i:

- Following the Executive Officer's approval of the HM Technical Report, implement updated sizing factors for Integrated Management Practices (IMPs) via an addendum to the *Stormwater C.3 Guidebook,* 7th Edition;
- Updates to the CCCWP Integrated Monitoring Plan Sizing Calculator to incorporate the updated sizing factors and improve usability;

- Following the Executive Officer's approval of the HM Applicability Maps, implement the maps via online publication;
- Update guidance on planning stormwater facilities operation and maintenance (Chapter 5 in the *Stormwater C.3 Guidebook*);
- Sponsor a half-day countywide training on implementation of the *Stormwater C.3 Guidebook;*
- Integrate the outcomes of the BASMAA stormwater treatment facility sizing study into guidance for private and public land development projects;
- Compile new and updated guidance into draft sections of the *Stormwater C.3 Guidebook,* 8th Edition;
- Further develop the countywide GIS and database capabilities to integrate tracking and reporting of Regulated Projects in accordance with Provisions C.3.b. (Project approvals), C.3.e. (Special Projects), and C.3.h. (Operation and Maintenance);
- Continue discussions of C.3 implementation examples, problems and issues at Development Committee meetings; and,
- Provide consulting on request to assist local staff and land development professionals with C.3 implementation on land development projects.

Provision C.3.j. (GI):

- Receive and compile responses to the survey of municipal engineers and planning directors regarding needs for GI facilities design guidance and standard specifications and details;
- Hold a GI Planning workshop for Permittee staff involved in preparing GI Plans and GI Projects. Participate in countywide and regional GI outreach and education efforts, including general outreach and targeted outreach and training for professionals involved in infrastructure planning and design (Provisions C.3.j.i.(4) and C.3.j.iii.);

- Assist municipalities to create or adopt a mechanism, incorporating the results of the SWRP to locate, prioritize, and map areas for potential and planned public projects on a drainage-area-specific basis (Provision C.3.j.i.(2)(a));
- Assist municipalities with a methodology to identify targets for the amount of impervious surface to be retrofitted by 2020, 2030, and 2040 (Provision C.3.j.i.(2)(c));
- Assist municipalities to implement the UrbanSim-based methodology to project the amount and locations of private development (Provision C.3.j.i.(2)(c));
- Assist municipalities with a methodology to identify and prioritize areas for potential projects for implementation by 2020, 2030, and 2040, consistent with the RAA (Provisions C.3.j.i.(2)(b) and C.3.j.iv.(1));
- Prepare an analysis of potential funding options for GI projects (Provision C.3.j.i.(2));
- Develop regionally consistent methods to track and report implementation of GI measures, including load reductions achieved (Provision C.3.j.iv.(1));
- Compile new and updated guidance into draft sections of the *Stormwater C.3 Guidebook,* 8th Edition;
- Further develop the countywide GIS and database capabilities to integrate tracking and reporting of Regulated Projects in accordance with Provisions C.3.b. (Project approvals), C.3.e. (Special Projects), and C.3.h. (Operation and Maintenance); and,
- Additional support to Permittees with development of the required components of their GI Plans including further development of the SWRP.

SECTION 4 – PROVISION C.4 INDUSTRIAL AND COMMERCIAL SITE CONTROLS

Introduction

During FY 2017/18, CCCWP municipalities implemented their business inspection programs as follows:

- Antioch, Clayton, Concord, Danville, El Cerrito, Hercules, Lafayette, Martinez, Moraga, Orinda, Pittsburg, Pleasant Hill, San Pablo, San Ramon, and Walnut Creek contract for business inspection services with local sanitary district inspectors or Publicly Owned Treatment Works (POTW) inspectors. This institutional arrangement of using local POTW inspectors to conduct municipal stormwater inspections was initiated soon after the CCCWP was issued its first Joint Municipal NPDES Permit in 1993. This arrangement has been praised by SFBRWQCB staff for its effectiveness, and has served as a model for other municipalities throughout California. Business inspections conducted by POTW inspectors are referred to in this Annual Report collectively as the “Group Inspection Program”. The CCCWP provides administrative support to the Group Inspection Program. This includes management of the contracts, agreements, invoices and reporting; and, assistance in review and development of annual inspection lists, plans, and goals.
- Brentwood, Oakley, Pinole and CCC currently conduct their own business inspection programs.
- Richmond uses a combination approach for its business inspection program. Stormwater inspections are conducted by municipal staff as well as contracted POTWs inspectors.

FY 2017/18 Accomplishments

During FY 2017/18, CCCWP staff and the CCCWP's MOC assisted Permittees with implementation of Provision C.4 by:

- Administering the CCCWP's Group Inspection Program;
- Chairing the Ad Hoc Stormwater Inspector Workgroup;
- Hosting one Industrial Commercial Stormwater Inspector Training Workshop;
- Supporting and participating in the Contra Costa GBP; and,
- Providing Outreach Resources to Businesses.

The following is a detailed account of each activity listed above:

<u>Administering the CCCWP's Group Inspection Program</u>

CCCWP staff administers and manages the various inspection agreements for the Group Inspection Program involving the 16 municipalities and three local POTWs (Central Contra Costa Sanitary District (CCCSD), Delta Diablo Sanitary District (DDSD), and West County Wastewater District. Administration of the Group Inspection Program includes: 1) coordinating the review of amendments and revisions to the inspection agreements, when necessary; 2) receipt and payment of POTW invoices on behalf of the 16 municipalities; 3) assistance to the Permittees and POTW staff in developing inspection goals, ensuring MRP compliance concerns are integrated into business inspections (e.g., identification and proper management of POC, such as PCBs); 4) training of inspectors to promote consistent inspection services countywide; and, 5) field support to inspectors and municipal staff when needed.

CCCWP staff meets with the participating municipalities and POTW staff annually to: assess the services provided; set inspection goals for the upcoming fiscal year; distribute documentation needed for preparation of municipal annual reports; and, review any special issues or enforcement problems that have occurred.

Chairing the Ad Hoc Stormwater Inspector Workgroup

As mentioned in FY 2015/16 Annual Report, Management Committee approved creation of a permanent Ad Hoc Stormwater Inspector Workgroup. The workgroup is composed of inspectors from each of the three contracted POTWs, the Contra Costa Hazardous Materials Programs, the cities of Brentwood and Richmond, CCC, and CCCWP staff.

Due to staff shortages at the CCCWP and competing priorities, the workgroup met only once in FY 2017/18 but also communicated via email. The workgroup continued to refine guidance for stormwater inspectors on inventorying PCBs-containing equipment and working with industrial sites to identify past PCB spill incidents. The workgroup will continue to share their inspection and enforcement experiences including those on mobile businesses, and to identify other aspects of the inspection program that could benefit from greater consistency or outreach.

Stormwater Inspector Training Workshop

The CCCWP hosted one Commercial/Industrial Stormwater Inspection Training Workshop in FY 2017/18. The workshop was held on May 3, 2018 at Richmond's Bermuda Room at 403 Civic Center Plaza. The focus of the workshop was enforcement and included several presentations followed by a mock inspection at the BNSF Railroad Maintenance yard. Presentations focused on elements of an effective enforcement program, regulatory requirements for business inspection and enforcement response plans, and the inspection and enforcement process for facilities subject to the Statewide General Permit for Storm Water Discharges Associated with Industrial Activities, Order 2014-0057-DWQ Industrial General Permit (IGP).

The workshop had 49 participants. The workshop agendas and presentation materials are available on the CCCWP website at http://www.cccleanwater.org.

Green Business Program (GBP)

The CCCWP is one of the largest contributing partners to the GBP and in FY 2017/18, provided $6,000 to support the GBP to assist with carrying out its program mission. The GBP is designed to publicly recognize private businesses and public agencies that take extra steps, beyond baseline compliance with environmental regulations, to prevent pollution and save resources (e.g., conserve water and energy, reduce waste through reuse and recycling, and prevent stormwater pollution through good housekeeping practices). This program encourages and helps business managers and inspectors strengthen and sustain the quality of the environment in the County through a collaborative partnership.

Since its inception in 1998, more than 585 businesses have been certified as Green Businesses in the County. There are 289 currently certified businesses, including three new businesses that were certified in FY 2017/18, as well as 13 businesses that were recertified. The types of businesses being certified are diverse and include business offices, solar electric companies, auto repair shops, landscapers, printers, restaurants, small manufacturers, home remodelers and cleaning services, and wastewater treatment facility.

Municipal stormwater and POTW inspectors assist the GBP by encouraging business to become Green Business candidates. Each certified Green Business must complete a checklist section with pollution prevention and stormwater specific measures. CCCWP staff members serve on the GBP's "Partners Committee," and actively engages in development of the Green Business checklist (i.e., the stormwater pollution prevention section that each business needs to complete before becoming certified as a Green Business).

For FY 18/19, the GBP will be focusing primarily on the certification and recertification of 100 businesses. To accomplish this, the GPB has hired a temporary Pollution Prevention Specialist to actively engage businesses in the certification process.

Providing Outreach and Resources to Businesses

With CCCWP MOC input and direction, CCCWP staff develops and/or updates a variety of business outreach materials, including BMPs brochures and posters, a website, and a telephone hotline. Stormwater inspectors promote these resources during their inspections.

Throughout FY 2017/18, CCCWP staff responded to businesses and residents requesting copies of such outreach materials. Business owners use the CCCWP website at http://www.cccleanwater.org/business/ to find information on stormwater pollution prevention practices and how they can make their stormwater inspections as easy as possible. Businesses and residents also use the CCCWP's 1-800-No-Dumping hotline to report illegal dumping in their area to help their business communities prosper from a cleaner environment for their customers. A growing awareness of stormwater BMPs has stemmed from use of these resources and this awareness may help to eliminate non-stormwater discharges.

FY 2018/19 Planned Activities

For over 20 years, the CCCWP and local POTWs have consistently maintained a strong Group Inspection Program. Many of the MRP requirements were already part of Permittees' existing business inspection programs. To promote continuous improvement of the municipal inspection programs, the CCCWP MOC established as planned goals for FY 2018/19 the following activities:

- Finalize the draft version of the updated model Business Inspection Plan for consistency with inspections of facilities subject to the IGP;
- Conduct an annual training workshop for industrial and commercial stormwater inspectors;
- Provide training on POC source identification and management;
- Develop other outreach materials as needed; and,
- Continue to participate in, and support, the GBP.

SECTION 5 – PROVISION C.5 ILLICIT DISCHARGE DETECTION AND ELIMINATION

Introduction

The majority of MRP requirements related to IDDE are being addressed directly by Permittees. The CCCWP MOC oversees IDDE Group Activities.

FY 2017/18 Accomplishments

The following IDDE Group Activities were initiated or ongoing during FY 2017/18:

- Managed the 1-800-No-Dumping Hotline and Hazmat Incident Reports;
- Continued with BASMAA and CCCWP activities related to mobile surface cleaners;
- Continued to respond to notifications of potential IDDE incidents and direct notifications to the respective municipality and provide guidance on response; and,
- Continued to promote and offer stormwater pollution prevention car washing kits for charity car washing events.

Provided below is a brief summary of each activity listed above:

<u>1-800-NO-DUMPING Hotline and Hazmat Incident Reports</u>

The CCCWP continues to operate the 1-800-NO-DUMPING Hotline. The Hotline is used by the public to report illegal dumping and to obtain stormwater information. All Hotline calls are referred to the appropriate municipality for follow-up and, if necessary, enforcement**.** Calls have been logged since FY 2004/05.

The CCCWP received 339 Hotline calls during FY 2017/18. The number of calls this year represents an approximate 6% decrease from FY 2016/17. This decrease may be in response to the public contacting the municipality itself rather the Hotline on the location of dumped materials or illicit discharge.

The most common dumped materials reported in these calls include garbage, mattresses and box springs, and miscellaneous items. Other reported dumped materials included furniture and sofas, appliance, yard and landscaping waste, building/construction debris, and household goods. Each Permittee uses the information from the Hotline to identify problem areas that need to be addressed.

The CCCWP also continues to collaborate with the CCC Hazardous Materials Programs Division (HazMat). HazMat's countywide 24-hour spill response is a vital component of Permittees' IDDE programs. Each month, the CCCWP disseminates the Hazmat spill response reports (also known as "Incident Reports") to Permittees. These reports inform each Permittee of Hazmat incident responses within their jurisdiction. Permittees use this information to track the type and locations of spills and dumping incidents, and to conduct appropriate follow-up. More information on each Permittee's IDDE program is provided in the individual Municipal Annual Reports compiled in Volume II of this Report.

BASMAA and CCCWP Activities Related to Mobile Surface Cleaners

BASMAA's Mobile Surface Cleaner Program is a training and certification program for mobile surface cleaners. BASMAA has continued to work on these efforts in FY 2017/18. For a list of activities and accomplishments and additional details, see BASMAA's "*Annual Reporting for FY 2017-18 Regional Supplement for Training and Outreach.*"

To augment BASMAA's efforts to address mobile businesses, the CCCWP continued with its own set of actions. First, as stated in last year's annual report, members of the Ad Hoc Stormwater Workgroup notify the CCCWP of any enforcement actions taken on mobile businesses throughout the fiscal year. CCCWP enters this information into tracking spreadsheet which is then disseminated to all Workgroup members. This information may then be disseminated to stormwater inspectors and municipal staff

throughout the county. The tracking spreadsheet also serves to identify businesses that have received two or more citations and may warrant an escalation in enforcement action. In addition, as stated in Section C.2, the CCCWP MOC invited Martin Sum from the CCHS to present on permitting and inspection process for food truck vendors. This presentation helped MOC Committee members to better understand the types of equipment that each truck or cart is required to be outfitted with, how that equipment is maintained and cleaned, and how wastewater and solid waste from these operations is managed.

Charity Car Wash Kits

In FY 2007/08, the CCCWP created and implemented a charity car wash pilot campaign to help charity car wash sponsors avoid illegal discharges of wash water to storm drains. The charity car washing campaign included the creation of a brochure and several car washing kits containing: one submersible pump; one 50 ft. electrical extension cord; one 3 ft. X 4 ft. rubber mat; one 50 ft. garden hose; one metal spray nozzle; three collapsible safety cones, and tape. The brochure instructs charity car wash organizers on how to conduct a car washing event without discharging wash water into the storm drain system. The brochure instructs organizations to: 1) contact the CCCWP; 2) make sure that charity car washes are legal within their municipality; and 3) use the car washing kit in accordance with the instructions provided.

The charity car wash kits were not used in FY 2017/18 and used only once in the previous year. The drop in usage of the kit may be in response to previous drought conditions and may indicate that organizations have transitioned to other types of fundraising activities. The CCCWP will continue to promote and track the use of these charity car wash kits in FY 2018/19.

FY 2018/19 Planned Activities

The main focus for CCCWP for this fiscal year will be assisting Permittees in meeting FY 2018/19 reporting requirements under Provision C.5.e. Control of Mobile Sources. This work will include an updating of the mobile business inventory developed in FY 2016/17 and a potential expansion of that inventory by adding landscaping companies, solar panel cleaning companies, or other mobile business types. Through its MOC, CCCWP will also consider if any changes to minimum standards or BMPs are necessary and whether new outreach material should be developed to target specific mobile business types. Once the inventory had been updated and outreach material developed or revised (if necessary), CCCWP will conduct outreach to these businesses in the spring of 2019.

Other planned Program activities for FY 2018/19 include:

- Continuing to staff the 1-800-No-Dumping Hotline;
- Distributing the CCC Hazmat Division's incident response reports to Permittees;
- Promoting the charity car wash kit;
- Revisiting the model IDDE response plan for further review and finalization;
- Assisting Permittee in their responses to illicit discharges and spills; and,
- Providing input and support for BASMAA's expanded mobile surface cleaners program and associated work efforts.

SECTION 6 – PROVISION C.6 CONSTRUCTION SITE CONTROLS

Introduction

The CCCWP's Development Committee facilitates Permittees' implementation of MRP Provision C.6 requirements and provides direction to CCCWP staff and consultants. During FY 2017/18, the Development Committee was chaired by Kevin Marstall (City of Concord). Rod Wui (City of San Ramon) served as vice-chair. Staff from Antioch, Brentwood, Clayton, Concord, CCC, Hercules, Pittsburg, Pleasant Hill, San Ramon, and Walnut Creek were voting members of the Committee. Staff from Danville actively participated as a non-voting Committee member. The Development Committee's FY 2017/18 goals were:

- Facilitate member agencies' compliance with MRP Provision C.6;
- Facilitate member agencies' efforts to reduce erosion and sedimentation, and discharge of pollutants, from construction sites;
- Continuously improve Program outreach and guidance on construction-phase controls; and,
- Facilitate member agencies' compliance with the Construction General Permit (for agency-sponsored projects).

<u>Construction Inspector Training</u>

To assist permittees to comply with MRP Provision C.6.f.ii., CCCWP sponsors training for permittee construction inspection staff biennially. During FY 2017/18, CCCWP sponsored a training workshop that was held at the City of Walnut Creek Shadelands Art Center.

The workshop provided a review of the C.6 requirements, reviewed the principles of construction site stormwater management and BMP resources, and reviewed inspection The workshop included the following modules:

- Stormwater Protection Principles for Construction Site Management;
- MRP Provision C.6 Refresher;
- BMPs and Resources;
- Inspections and Documentation Best Practices and Tools; and,
- BMPs Using the Inspector's Eye (an interactive exercise using photographs to identify how BMP implementation should be documented on the form).

The effectiveness of this workshop was evaluated by conducting pre and post workshop knowledge surveys. Pre- and post-workshop knowledge surveys provided insights into the knowledge of the participants before and after the workshop. In addition, the results of the 2018 workshop were compared with the 2016 workshop for similar questions.

The 2018 pre-workshop showed a good understanding of the key topics and was generally consistent with the level of understanding at the end of the 2016 workshop. The 2018 pre-workshop survey had an overall correct response rating of 71% that improved to 84% in the post-workshop survey. The assessment demonstrated a significant increase in knowledge regarding the frequency of hillside inspections and understanding of the correction timeframe for violations.

The workshop had 56 municipal staff participants. The workshop agendas and presentation materials are available on the CCCWP website at: https://www.cccleanwater.org/construction-business/construction.

FY 2018/19 Planned Activities

The Development Committee's work in FY 2018/19 will be to investigate and discuss whether to refine inspection forms and reporting procedures on a countywide basis and other activities related to implementation of Provision C.6.

SECTION 7 – PROVISION C.7 PUBLIC INFORMATION AND OUTREACH

Introduction

The CCCWP PIP Committee, with assistance from CCCWP staff and consultants, is responsible for overseeing the development of materials and products, information dissemination, marketing and public outreach related to stormwater pollution prevention. Most of the public information and outreach requirements in the MRP are contained in Provision C.7; however, additional outreach activities are required or encouraged in other MRP provisions as well. The CCCWP PIP Committee works to identify and coordinate these public information and outreach mandates conducted as a group and/or regionally through BASMAA's PIP Committee. Attachments 1.2 and 1.3 provide a list of CCCWP representatives to BASMAA's PIP Committee, and participation and attendance at CCCWP PIP Committee meetings, respectively. In FY 2017/18, Laura Wright (City of Pittsburg) and Julie Haas-Wajdowicz (City of Antioch) served as Chair and Vice-Chair, respectively, of the CCCWP PIP Committee.

The CCCWP's public information and outreach budget for FY 2017/18 was $235,595. This was supplemented by CalRecycle Oil Payment Program (OPP) Grant funds totaling approximately $74,900 for a combined budget of approximately $324,483.

One of the CCCWP PIP Committee's major accomplishments in FY 2017/18 was the complete redesign of the Program's website. The website is used to help educate residents, community organizations, watershed stakeholders, businesses, schools, and the general public about the CCCWP's programs and activities, stormwater quality requirements, pollution prevention practices, and water quality-related community events.

CCCWP representatives also participated in BASMAA's PIP meetings and outreach efforts. For further details of the CCCWP's outreach activities implemented regionally,

see *BASMAA's "Annual Reporting for FY 2017/18 Regional Supplement for Training and Outreach"*.

The remainder of this section documents public education and outreach activities conducted collectively in CCC.

FY 2017/18 Accomplishments

C.7.b – Outreach Campaigns

- Implementation of a county-wide outreach campaign in partnership with Caltrans' "Protect Every Drop" campaign;

C.7.c – Stormwater Pollution Prevention Education

- Launched updated CCCWP website; The CCCWP's website provides a "Municipality Contact List" (i.e., each Permittee's stormwater point of contact, including the stormwater representative's phone number and e-mail, and a link to the Permittee's website) under the "Resources" table at: http://www.cccleanwater.org/municipality-contact-list/. CCCWP staff updates the Municipality Contacts List page when notified of a change by a Permittee representative. The CCCWP website is also accessible from the "Links" page on the BASMAA website at http://www.basmaa.org/links;
- In addition, the CCCWP provides a 1-800-No Dumping Hotline where people can call and report illegal dumping, as well as obtain stormwater information. Calls regarding illegal dumping are forwarded to the appropriate Permittee for follow-up as needed. Further details regarding these calls are provided in Section 5 of this Volume I report;
- Continued IPM engagement through Our Water Our World (OWOW) outreach in retail locations;

- Continued outreach to school-age children with the OPP/Mr. Funnelhead programs; and,
- Utilized the watershed diorama with over 2,135 viewers at five community events.

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

CCCWP Permittees conducted several public outreach efforts and citizen involvement events as a group in order to reach a broad spectrum of the community with both general and specific stormwater runoff pollution prevention messages. Several efforts were conducted countywide, and are described below:

- **Bringing Back the Natives Garden Tour** – This public outreach and citizen involvement event promotes the idea of water-saving, pesticide-reduced gardening through planting of native species. CCCWP Permittees sponsored the 13th Annual Bringing Back the Natives Garden Tour, which took place on Sunday, May 6, 2018, with 140 volunteers showcasing 37 gardens and 6 native nurseries located in 19 cities and unincorporated areas of Alameda and Contra Costa counties. There were 3,137 registrants who participated in over 50 talks and demonstrations, and purchased $24,000 of native plants at the spring Native Plant Sale. For a detailed report about the Tour, see Attachment 7.1 of this Volume 1 report.

- **OWOW** – As in past years, CCCWP Permittees partnered with the OWOW Program to help raise awareness of the connection between pesticide use and water quality, and to provide information to consumers (at the point of purchase) about IPM and less-toxic alternatives that reduce or eliminate impacts to water quality. Thirty-four stores participated in this public outreach program, with 88 store staff receiving formal trainings, and 65 additional staff trained in-aisle during informal, mentoring visits. Nineteen outreach/tabling events reached over 760 people. Additional outreach/community events reached over 5,550 people. For a

detailed report on this year's efforts, see Section 9 and see Attachment 9.1 of this Volume 1 report.

- **CCCWP Community Calendar** – The CCCWP Community Calendar is a tool which facilitates both citizen involvement and public outreach. CCCWP promotes watershed-related community events, activities and volunteer opportunities on the CCCWP Community Calendar webpage at www.cccleanwater.org/community-calendar/. A secondary goal in maintaining the Community Calendar is to increase traffic to, and use of, the CCCWP website and its information resources to increase awareness of stormwater quality and pollution prevention practices.

- **Volunteer Field Monitoring Equipment Maintenance Support** – CCCWP budgets for an annual contribution of $1,000 to maintain field monitoring equipment used by creek groups and volunteer field monitors. This equipment is housed by the CCC Department of Conservation and Development.

C.7.e – Watershed Stewardship Collaborative Efforts

- **Contra Costa Watershed Forum (CCWF)** – CCCWP staff attends and participates in CCWF meetings, an open committee of some 50 organizations, including state and local agencies, local non-profit environmental and education organizations, community volunteer groups, and private citizens. The CCWF operates on the premise that actions in a watershed are inter-related, and that broad participation and cooperation is needed to effect change. Concerned with urban, suburban, and rural areas in the San Francisco Bay Delta area, the CCWF facilitates local agency and citizen collaboration, fosters innovative strategies for stewardship and protection of watershed resources, and encourages regional capacity building in Contra Costa and neighboring areas.

In FY 2017/18, the CCCWP conducted presentations on September 13, 3017 and November 8, 2017 on the development of the SWRP. The CCCWP uses the CCWF as a primary venue for regular community updates about the Contra Costa Watersheds SWRP and stakeholder education and engagement throughout the planning process.

- **GBP** – CCCWP continued to provide staff support and financial assistance to the GBP to help with its outreach activities to the business community, including the certification and recertification of Green Businesses. CCCWP continues to be a major contributor to the GBP. Strategic meetings are held quarterly. For more details on the GBP, see Section 4 of this Volume 1 report.

- **CCCWP Community Calendar** - Refer to Section C.7.d for information on this program.

C.7.f – School Age Children

This provision requires Permittees to individually or collectively implement outreach activities designed to increase awareness of stormwater and/or watershed messages in school-age children. In FY 2017/18, the Permittees, individually and collectively, implemented several youth-oriented outreach programs, which are discussed below:

- **OPP Grant & Mr. Funnelhead** – The OPP strives to reach across all age groups, but places particular emphasis on youth for two reasons: (1) teaching positive behaviors to young children early can result in the behavior being a part of their daily lives; and (2) children can influence behavior change in their parents and other adults. Several CCCWP Permittees provided their allocation of OPP grant funds to the CCCWP for implementation of an ongoing, countywide comprehensive effort in FY 2017/18. There are several components of the OPP: 1) certifying and recertifying used-oil recycling centers throughout the County; 2) providing educational programs targeted to elementary schools throughout the

County; 3) providing outreach at community events countywide; 4) providing programming to educate and entertain people about the importance of recycling used motor oil; and, 5) providing outreach through a cable advertising component. A "Mr. Funnelhead" website exists as an additional outreach tool at www.funnelhead.com. A summary of OPP activities are reported below.

- **Used Oil Collection Center Certification** - A total of four new oil collection centers were certified. Four centers did not recertify. There are now a total of 93 certified oil collection sites in CCC.

- During FY 2017/18, the CCCWP's Used Oil Recycling Program aired Public Service Announcements (PSAs) entitled "The Filter Crush" in English and Spanish on Comcast Spotlight. These pieces were done in cooperation with the West Contra Costa Integrated Waste Management Authority (WCCIWMA) (also known as RecycleMore) and were updated in FY 2017/18 based on the State's OPP 7 Guidelines. They focused on oil filter recycling and featured Ruby Lopez, a bilingual Spanish-speaking professional actress who has worked throughout the Bay Area, and hosts in-house TV spots for the Golden State Warriors. In the PSAs, Lopez plays an auto mechanic showing how much oil can be left in an oil filter after draining, followed by a shot of an oil filter being crushed in a clear filter crusher to show the amount of residual oil. These PSAs can be seen at https://www.youtube.com/watch?v=BulmUlfSvxQ (English version).

- **Mr. Funnelhead** - Matt Bolender is CCCWP's OPP Grant consultant, using the Mr. Funnelhead character to provide educational outreach. Now in its 21st year, the Mr. Funnelhead School Education Program visited 15 schools educating 4,730 students about the importance of used oil and filter recycling. These appearances continue to have a long-lasting effect on the children who recount their experience years later when they see Mr. Funnelhead at community events. The Mr. Funnelhead School

education program continues to be the heart of the Used Oil Education Project.

- **Mr. Funnelhead Annual Art Contest -** Mr. Funnelhead also holds an annual art contest where children incorporate Mr. Funnelhead into their own message about recycling used oil. To see this year's contest winners and their artwork, visit http://www.funnelhead.com Prizes are given to the top three artists.

- In addition to school education events, new "Oil Busters" PSAs were also created starring both characters from the school education shows and the winners from the Mr. Funnelhead Annual Art Contest. These PSAs were aired on Comcast Cable Spotlight Channels such as Nickelodeon, Turner Broadcasting System, American Movie Classics, Cartoon Network and others. To view one of these PSAs, please visit https://www.youtube.com/watch?v=XkXcDEN6uyY.

- **CCCWP Watershed Diorama** - The CCCWP's Watershed Diorama is provided to, and used by, Permittees and stakeholder organizations for youth-education programs and various public outreach events. The Watershed Diorama is a hands-on model which shows how rain becomes stormwater runoff carrying dirt, garbage, and other pollutants found in the urban environment into storm drains, which flow untreated to local creeks, the Delta, and the Bay. In FY 2017/18, the diorama was seen by more than 2,135 people and used for six events as follows:

Table 7-1: Watershed Diorama Use

Use Date	Entity	Event
7/19/17	CCC Watershed Group	Bay Point Watershed Class
9/23/17	CCCWP-Mr. Funnelhead	Pear Festival
5/22/18	City of Brentwood	Brentwood Public Work's Open House
5/24/18	City Of Oakley	Public Work's Event
5/26 - 5/27/18	CCCWP-Mr. Funnelhead	Kid's Fest

FY 2018/19 Planned Activities

- Expanded Protect Every Drop Partnership;
- Partner with OPP outreach events for shared materials;
- Expand partnership with rescape.org (formerly Bay-Friendly Landscaping and Gardening Coalition) advocates and experts in the creation of sustainable landscapes for commercial, multi-family, and public spaces as well as single-family residences. Offers certifications for landscapers and resources for homeowners;
- Increase awareness of and expand partnership with Friend of the Creek organizations and clean-up events;
- Use expanded social media to promote involvement at events;
- Increase awareness of the Bringing Back the Natives Garden Tour partnership including program ad and recognition;
- Create branded "Do-doo" pet waste bags to encourage proper disposal of waste to distribute through animal shelters, rescues, and at dog events;
- Create a custom packet of education/information to provide to shelters and rescues (to include in adoption/foster packets) ad at dog/community events;
- Continue providing grant support to the Contra Costa Fish and Wildlife Propagation Fund, which uses fines to support fish and wildlife issues affecting the County;

- Increase partner participation with Friends of the Creek groups with shared calendars, social media posts, email blasts;
- Partner with and promote the conservation programs of the Contra Costa Resource Conservation District which works with individuals, growers, ranchers, public agencies, nonprofits and corporations;
- Support planning of 2019 Quadrennial Symposium with CCWF;
- Engage and partner with CCHS which is actively addressing and tracking pesticide use issues, but offers no information on their site regarding Mercury/PCBs in fish;
- Continue to generate awareness and participate in the Mr. Funnelhead Program targeting Oil Recycling messaging;
- Expand partnerships with Kids for the Bay which offers in-school materials that are aligned with Next Generation Science Standards and the Common Core Curriculum, encourage parent participation, and also meets Watershed Requirements;
- Create an activity book for restaurants and afterschool programs that provides educational information on keeping water clean;
- Conduct an annual rate presentation with elected officials;
- Explore partnership with Contra Costa Transportation Authority on shared stormwater concerns and outreach efforts;
- Provide less/non-toxic info to use in the home and home garden as well as no-till gardening (which does not require herbicides) distributed through website, e-newsletter, social media, and any approved long-form outreach materials;
- Tag garden societies and nurseries with less/non-toxic information posted to social media about no-till gardening which does not require herbicides) for no-cost message sharing and potential to grow social audience; and,
- Partner with local Air Resources District and Spare the Air resource team.

SECTION 8 – PROVISION C.8 WATER QUALITY MONITORING

Reporting on implementation of the Provision C.8 Water Quality Monitoring requirements is provided in the Urban Creeks Monitoring Report, Water Year 2017 (UCMR) submitted to the Water Boards on March 31, 2018. This report is available at: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/UCMR/WY_2017_CCCWP_Urban_Creeks_Monitoring_Rept.pdf.

Provision C.8.h.iv requires a POC Monitoring Report which is due and will be submitted in October 2018 describing the planned allocation of sampling effort for POC monitoring for the forthcoming Water Year 2019 beginning October 1, 2018, and what was accomplished for POC monitoring during WY 2018 (i.e., October 1, 2017 to September, 30, 2018) and the report will include monitoring locations, number and types of samples collected, purpose of sampling, and analytes measured for WY 2018 and projected for WY 2019 as stated in Provision C.8.f, POC Monitoring. Data from the monitoring efforts in WY 2018 will be included in the UCMR due on March 31, 2019.

SECTION 9 – PROVISION C.9 PESTICIDES TOXICITY CONTROLS

Introduction

BASMAA and CCCWP staff, consultants and MOC members provided the following assistance to Contra Costa Permittees' efforts to reduce pesticide toxicity in local creeks during FY 2017/18:

- Tracking and participating in pesticide regulatory initiatives;
- Promoting opportunities for training events for municipal employees and contractors on IPM and similar programs;
- Providing outreach to residents and the general public on less-toxic pesticides and proper pesticide use and disposal; and,
- Coordinating with, and reporting to, the CCC Agricultural Commissioner on improper pesticide use.

FY 2017/18 Accomplishments

CCCWP's MOC provides a forum for Permittees to share information on common issues and lessons learned related to reducing pesticide toxicity in the County's urban creeks. A summary review of activities conducted as a Group Activity is provided below.

<u>C.9.b. – Train Municipal Employees on IPM Practices</u>

CCCWP did not sponsor workshops for municipal staff and their contracted employees during FY 2017/18. However, throughout the fiscal year, CCCWP notified Permittees about IPM trainings being conducted in the Bay Area and recommended that if Permittees have municipal staff that apply or use pesticides and need training, to sign up for these workshops.

C.9.d – Interface with CCC Agricultural Commissioner

During FY 2017/18, at the June MOC meeting, Deputy Commissioner Larry Yost and Agriculture Biologist Beth Slate, both with CCC Department of Agriculture, gave a presentation on some of the Department's high priority activities. Yost discussed the agency's enforcement programs, types of pesticide usage information that is collected, and reviewed some of the pest detection and identification work. He also discussed their regulations of Farmer's markets and provided some information on the work with they do with respect to weed and rodent management.

In August 2018, as follow up to their June presentation, CCCWP contacted Deputy Yost to inquire as to whether there had been any reports of improper pesticide usage that occurred in FY 2017/18 and there had not.

C.9.e – Public Outreach

- Point of Purchase Outreach: The CCCWP funds and participates in the OWOW Program, which provides educational outreach directly to the consumer/user at the point of purchase (i.e., in the store). The OWOW Program is implemented both regionally and locally. Further details regarding regional implementation of the OWOW Program are provided in the BASMAA's *"Annual Reporting for FY 2017-2018 Regional Supplement for Training and Outreach,"* submitted separately by BASMAA on behalf of Contra Costa Permittees.

  Locally, the CCCWP distributes OWOW educational literature to schools, at community events, and in addition to the general public when requested. CCCWP staff promotes OWOW through its website and direct interactions with citizens, schools, and businesses. In addition, many Permittees provide educational flyers at their city of county offices (public counters). A total of 34 Contra Costa stores participated in the OWOW Program in FY 2017/18. All 34 stores were set up with literature racks, fact sheets, and shelf talkers.

- Store Staff Training: Training on the OWOW Program was provided to staff at 14 key stores in FY 2017/18. There were 88 trained at formal staff training events and an additional 65 staff were trained in-aisle during informal mentoring visits. Trainings included information on:
    - The connection between pesticide pollution and water quality; how pesticides enter water through storm drains and sewers; pesticides of particular concern; how and where to dispose of pesticide products no longer wanted;
    - Common beneficial insects in the landscape; resources for identifying pests/beneficial insects and how to use them; incorporating insectary plants into the landscape to attract beneficial insects; and new and invasive pests/diseases;
    - The benefits of organic fertilizers (especially during drought years), compost and mulch; nutrient run-off; chemical salt build-up from fertilizers and the importance of building up the soil food web;
    - Techniques and resources for managing specific pest problems; tips for working with customers on how to use products; basic less-toxic chemical ingredients and how they work on pests; and tips for using/selling the less toxic products and working with customers; and,
    - Using online resources, including the OWOW 'Ask the Expert' feature and the University of California IPM website.

Each training participant received a packet of information and resources, including: background on the OWOW store partnership program; IPM basic techniques; information on how products work and how to read a pesticide label; a laminated bug identification guide; information on lawn reduction projects; a chart for identifying pest damage; OWOW fact sheets; *The 10 Most Wanted Bugs in Your Garden* brochure, and a list of resources and helpful websites. Trainees also receive pre- and post-training surveys to determine effectiveness of training on the connection of pesticides to water quality and proper disposal of pesticides.

Stores that participated in trainings were also given a hand lens, *Landscape Pest Identification Cards*, and a set of cards to help customers on identifying pests, diseases and beneficial insects.

- Outreach to Consumers: When in stores, customers see or experience several components of the OWOW Program, which include:
    - Store staff or OWOW representatives answering questions in store aisles during and after store set ups;
    - Recently redesigned shelf-talkers (labels) placed next to product price labels, promoting less-toxic products;
    - Display racks containing the OWOW Fact Sheets for general distribution;
    - End caps (end of aisle displays) featuring less-toxic products; and,
    - In-store OWOW table events that provide: help with identifying and solving pest problems; advice on less-toxic products, including the proper way to use and dispose them; and other informational materials.

- Increased Involvement/Interest: OWOW added to the store list in FY 2017/18 by adding back two Ace Hardware stores in Walnut Creek and adding Ace Hardware in Lafayette, Home Depot in Martinez, and Orchard Supply Hardware in Moraga. Also this year, OWOW distributed a *Fall and Winter Garden Checklist*, with information on the best time to apply dormant spraying to minimize chemical use. Due to awareness of the Zika virus and growing interest in managing mosquitos, OWOW's *Fight the Bite* handout has seen increased distribution. Each year the *Monthly Pest Calendar* is revised to reflect changes in products stocked by the stores and pests/problems of concern. For additional information on this year's OWOW activities, see Attachment 9.1 in this Volume 1 report.

- Pest Control Contracting Outreach

  In FY 2017/18, CCCWP continued its pesticide reduction campaigns from previous years and continued to promote the Pesticides Linger website. The site encourages CCC residents who contract for pest control services to hire eco-certified PCOs who practice environmentally sound pest management practices.

- Outreach to PCOs

  During FY 2017/18, the CCCWP promoted the Pesticide Applicators Professional Association (PAPA) training workshop held in Concord on July 27, 2017. The CCCWP sent a letter promoting the workshop to approximately 160 pesticide applicator businesses licensed in CCC, and also promoted the workshop to Permittee staff.

C.9.f – Track and Participate in Relevant Regulatory Processes

In recent FYs, the CCCWP, along with other BASMAA members and stormwater programs statewide, invested considerable efforts in tracking and participating in the United States Environmental Protection Agency and Department of Pesticide Regulation actions related to urban uses of pesticides to reduce the amount of toxic pesticides impacting urban waterways.

The most recent efforts in this area may be found in CASQA's "*Pesticides Subcommittee Annual Report and Effectiveness Assessment 2017-2018*" submitted separately by BASMAA on behalf of Contra Costa Permittees.

FY 2018/19 Planned Activities

One of the planned activities for FY 2018/19 is to evaluate implementation of the pesticide source control actions to gauge how effective the actions have been to achieve TMDL targets and avoid future pesticide-related toxicity in urban creeks.

Other Planned activities for FY 2018/19 may include:

- In conjunction with the MOC, determining if training of municipal employees and their contractors on landscape and/or structural IPM should be conducted by CCCWP or left to the individual municipalities;
- Continuing to support BASMAA and CCCWP's OWOW Programs; continuing to track and participate in relevant pesticide-related regulatory processes and initiatives through BASMAA and CASQA; and,
- Continuing to provide outreach to PCOs by promoting PAPA seminars held in CCC or identifying other meaningful ways to promote IPM to PCOs.

SECTION 10 – PROVISION C.10 TRASH LOAD REDUCTION

Introduction

In FY 2017/18, CCCWP directed its efforts to address Provision C.10 requirements in four areas as well as continuing to expand and improve upon its GIS platform to assist Permittees in meeting their trash load reduction requirements. These efforts include assisting Permittees with meeting the requirement to identify and map private lands greater than 10,000 square feet that are directly plumbed to their MS4s, implementing the Receiving Water Monitoring Program Plan; participating in the regional and statewide efforts on trash-related issues affecting stormwater; and continuing to coordinate efforts with Caltrans to identify mutually beneficial projects that reduce trash loads.

FY 2017/18 Accomplishments

<u>Identifying and Mapping Private Lands Greater than 10,000 Square Feet Directly Plumbed to MS4s</u>

As described in FY 2015/16 Annual Report, CCCWP launched a Pilot Project that allowed Permittees to use the web-based GIS system to track and monitor their progress towards meeting trash load reduction requirements. The Pilot Project was deemed a success, and CCCWP determined to move forward with further development and refinement of the GIS platform. In FY 2016/17, CCCWP continued to work with the GIS consultant on the trash applications to resolve outstanding issues identified during the Pilot Phase and during its transition to full deployment stage.

In FY 2017/18, while there was on going work to enhance and refine the existing trash reporting and analysis application, CCCWP primarily focused on developing an application to assist Permittees with identifying and mapping private lands greater than 10,000 square feet that are directly plumbed to MS4s and not under full trash capture

and have a moderate or higher trash generation rate and tracking their trash control status.

Working with its GIS consultant, CCCWP developed a PLDA Editor multi-component application. The application included a screening tool that identifies contiguous lands greater than 10,000 square feet that are jurisdictional, have a moderate or higher trash generation rate, and are not under full trash capture. These lands are considered potential PLDAs. Permittees use the results of the screening to conduct a desktop review of the potential PLDAs. During the desktop review, Permittees evaluate whether the 10,000 square feet criteria is still applicable once building footprints were deducted. If building footprints reduce the candidate area to less than the 10,000 square feet threshold, Permittees are able to exclude it from further analyses. The desktop review also allows Permittees to exclude potential PLDAs based on other reasons that are documented in the application. These reasons include the absence of any private storm drain inlets or having a low trash generation rate as based on assessments even though the baseline rate assigned to those lands is moderate or higher.

Once candidate areas are excluded, Permittees create preliminary PLDAs from the remaining potential PLDAs. These lands are still considered preliminary because further exclusion may occur based on results of site visits. In the GIS, Permittees trace the applicable areas of the preliminary PLDA and the GIS creates a polygon of that area and clips it to the parcel layer. The clipping allows the identification of the property owners of the qualifying parcels. This information will be used to conduct outreach to property owners and/or property managers.

Permittees are including with their FY 2017/18 Annual Reports, their respective PLDA maps as well as their baseline trash generation rate maps. Both of these 11” x 17” maps provided as attachments. The PLDA maps provide information on the number of acres identified in the initial screening as potential PLDAs, the number of acres excluded, and the number of acres identified as preliminary PLDAs. A URL link to

larger size PLDA maps has been provided to Water Board staff and is included in Permittees' annual reports as well as provided here: http://arcg.is/1eGu15.

For FY 2018/19, using the Collector application that is linked to the PLDA Editor application, Permittees will conduct site visits to the preliminary PLDAs and map private storm drain inlets and conduct assessments. If during the course of these site visits, no private storm drain inlets are identified and it is determined that stormwater runoff flows to the public right-of-way the preliminary PLDA will be excluded from any further analyses or future tracking. Once again, the application records the reason for any exclusion.

Along with the mapping of storm drain inlets and conducting assessments; Permittees will begin to conduct outreach to the property owners using both the Collector application and the PLDA Editor application. As part of the development of these applications, Permittees will be able to record and track their contact with property managers and/or owners and the agreed to trash management actions and schedule of implementation.

Implementation of a Receiving Water Monitoring Program Plan for Trash

Provision C.10.b.v of MRP 2.0 requires Permittees to develop a monitoring program plan for trash in receiving waters. Permittees agreed to meet this requirement at the regional level as a BASMAA project. In FY 2016/17, the development of BASMAA's Receiving Water Trash Monitoring Plan (Trash Monitoring Plan) was completed and the plan was submitted to SFBRWQCB's Executive Officer on June 30, 2017.

Subsequently, in FY 2017/18, SFBRWQCB staff provided comments on the Trash Monitoring Plan in late July 2017. The BASMAA PMT convened to address the comments and revise the Trash Monitoring Plan accordingly. The revised document was submitted in October 2017 and final approval of the Trash Monitoring Plan was received on January 30, 2018.

In addition to its work as a member on the PMT overseeing revision of the Trash Monitoring Plan, CCCWP was also heavily involved with implementing the plan in FY 2017/18. Working with its monitoring contractors, CCCWP developed an information sheet in early fall of 2017. The information sheet described the nature of the Trash Monitoring Plan. CCCWP also drafted a permission form to accompany the information sheet. The permission form, if signed and returned, would allow CCCWP's monitoring contractors to access private property in order to reach monitoring sites. A mass mailing of the information sheet with permission form was conducted and sent to approximately 500 property owners and public agencies. Permissions were recorded and tracked, and a second mass mailing was conducted in an attempt to secure more permissions.

As permissions were granted and sites secured, CCCWP's monitoring contractors conducted the qualitative assessments at the 30 probabilistic sites during the wet weather season with the first assessments being conducted in November 2017 after a qualifying storm event. CCCWP tracked the progress of the monitoring contractors and their findings. All wet weather assessments were completed by March 2018.

CCCWP worked with its Permittees and its monitoring contractors to secure the 19 targeted sites that are required to be qualitatively assessed and quantitatively monitored during the dry season (between May 1 and September 30) for both FY 2017/18 and FY 2018/19 as per the Trash Monitoring Plan. Targeted sites were a subset of Permittees trash hot spots and in order to access these sites, CCCWP had to secure encroachment permits and business licenses from the respective municipalities where necessary. While monitoring at the targeted sites did not occur until after the start of FY 2018/19, coordinating the logistics so this work could be undertaken required CCCWP to act as a liaison between Permittees and monitoring contractors to ensure that all applicable permits and licenses have been obtained, Permittees were kept informed of the scheduled monitoring dates, and Permittees were notified when the trash pickup had been completed so they could collect the bagged trash and dispose of it properly.

The last work effort associated with implementation of the Trash Monitoring Plan was refinement of the qualitative assessment protocol and accompanying assessment form. Once the first round of qualitative assessments had been completed, the monitoring contractors of the respective stormwater programs shared their experiences with the protocol and recommended revisions to the form and protocol. These revisions were reviewed by CCCWP through the BASMAA Trash Committee with SFBRWQCB being kept informed of the edits. Once finalized, the revised protocols and forms were distributed to stormwater program staff including CCCWP and their respective monitoring contractors.

All the work associated with implementation of the Trash Monitoring Plan is captured in the Progress Report in Attachment 10.1. The report includes information on location of probabilistic and targeted monitoring sites, assessment methodology, lessons learned, and next steps.

Chairing and Participating in the BASMAA Trash Subcommittee and Statewide Efforts

In FY 2017/18, CCCWP staff completed its two-year tenure as Chair of the BASMAA Trash Committee. As Chair of this committee through January 2018, CCCWP was heavily involved in creating the agenda, facilitating discussions on permit requirements, and drafting concepts for potential regional projects.

With respect to participation in statewide efforts to reduce trash being conveyed in MS4 and reaching receiving waters, CCCWP has been engaged on two fronts. First, CCCWP staff attended the two-day SWRCB-sponsored training on the On-Land Visual Trash Assessment & Full Capture Equivalency Training, which was offered to assist Permittees subject to the statewide Trash Amendments. Since trash requirements are included in MRP 2.0, the amendments are not directly applicable to MRP and East County Permittees. However, certain aspects of this training, such as the area-based visual assessment protocol, are of potential interest to Contra Costa Permittees and may be used to address PLDA requirements.

CCCWP staff is participating in the Ocean Protection Council's 3-year project to evaluate and test trash monitoring for receiving waters. The *Statewide Trash Monitoring Methods Project* is being conducted in collaboration with the State Water Board, the San Francisco Estuary Institute, and the Southern California Coastal Water Research Project. CCCWP has reviewed meeting notes and presentations from the January 2018 first meeting of the TAC overseeing this project. CCCWP is a stakeholder in this endeavor and will be attending future stakeholder meetings as they occur.

Coordinating Trash Reduction Efforts with Caltrans

In FY 2017/18, CCCWP continued to serve as a liaison between Caltrans and Permittees. CCCWP arranged for Caltrans to present at the October 2018 Management Committee and assisted Permittees with their submittal of candidate projects they had identified that would benefit both Caltrans and their municipalities. CCCWP provided information to Permittees on the criteria that Caltrans required for candidate projects to qualify for assistance and identified factors that would help a project's overall ranking and what minimum information they should include with their project submittal.

FY 2018/19 Planned Activities

CCCWP staff and consultants will continue to coordinate and support Contra Costa Permittees in refining and implementing their Long-Term Trash Load Reduction Plans and meeting MRP 2.0 trash load reduction requirements including the 80% reduction mandate due July 1, 2019. This support will include further refinement and development of the countywide GIS Platform and associated applications; continued implementation of the Trash Monitoring Plan; continued involvement in the BASMAA Trash Committee and stakeholder meetings from the Ocean Protection Council; and exploring project and funding opportunities with Caltrans.

SECTION 11 – PROVISION C.11 MERCURY AND METHYLMERCURY CONTROL PROGRAM

Introduction

MRP Provision C.11, which implements the urban runoff requirements of the San Francisco Bay mercury TMDL, requires that the Permittees implement a control program for mercury that includes source control, treatment control, and pollution prevention control measures in order to make substantial progress toward achieving the urban runoff mercury load allocations established for TMDL. The San Francisco Bay mercury TMDL's urban runoff WLA for CCC is 11 kg/yr. The TMDL implementation plan calls for attainment of the allocation by February 2028. Mercury TMDL compliance can be demonstrated through three different approaches:

1. Show mercury concentrations are below 0.2 milligrams per kilogram (mg/kg) on a countywide level (i.e., monitoring-based compliance demonstration);
2. WLA (i.e., monitoring and/or modeling-based compliance demonstration); and,
3. Demonstrate the required load reductions can be achieved (i.e., modeling-based compliance demonstration).

East County Permit Provision C.11, Total Mercury and Methylmercury Control Program, implements the urban runoff requirements of the Delta methylmercury TMDL and requires the East County Permittees to reduce inorganic mercury loads to make substantial progress toward achieving the urban runoff methylmercury load allocation established by the TMDL. The methylmercury WLAs for these Permittees by Delta subregion are: Central Delta 0.75 grams/year; Marsh Creek 0.30 grams/year; and West Delta 3.2 grams/year. The final compliance date for the WLAs is 2030. The East County Permittees are complying with the requirements of this East County Permit provision through a collaborative effort with the MRP Permittees.

Most of the requirements of MRP Provision C.11 for mercury are identical to those of Provision C.12 for PCBs. The sections below, which are labeled to indicate the respective Permit and/or provision that they address, report on those implementation measures that are specific to mercury control and refer to Section 12 for the implementation actions that address both mercury and PCBs.

FY 2017/18 Accomplishments

C.11.a. Mercury Collection and Recycling Implemented Throughout the Region (East County Permit)

During FY 2017/18, the CCCWP continued to coordinate with Permittees and local household hazardous waste (HHW) collection facilities to implement mercury collection and recycling in accordance with MRP 1.0 and East County Permit Provision C.11.a. These efforts are no longer required to be reported in MRP 2.0, but will be tracked for mercury loads reduced through implementation of pollution prevention measures.

CCCWP Permittees collect HHW at three regional facilities in the County:

- CCCSD;
- DDSD; and,
- WCCIWMA.

CCCSD serves the communities of Concord, Clayton, Martinez, Pleasant Hill, Orinda, Lafayette, Moraga, Walnut Creek, Danville, San Ramon and Unincorporated County. DDSD serves Pittsburg, Antioch and Bay Point. WCCIWMA serves Richmond, Pinole, El Sobrante, El Cerrito, San Pablo, and Unincorporated County.

In addition to the above mercury collection activities, a large number of municipally-owned and maintained non-decorative street lights in CCC have been and continue to be converted from mercury and/or high-pressure sodium vapor street lights to Light

Emitting Diode street lights. The old fixtures included the high pressure sodium vapor lamps (bulbs) at various wattage sizes. Each street lamp is reported to have from 1 to 22 mg of mercury, with an average of 16 mg/bulb for a 100 Watt bulb. This street light replacement is removing significant amounts of mercury from the environment.

C.11.b. Monitor Methylmercury (East County Permit)

CCCWP monitors and reports mercury and methylmercury in runoff discharges for this East County Permit provision at the same time as the monitoring for MRP Provision C.8.f. Pollutants of Concern Monitoring. An *Alternative Approach to POC Monitoring,* which was accepted by CVRWQCB in July 2014, outlines the monitoring planned to satisfy both Permits' Provisions. Descriptions of sampling allocations and accomplishments (in addition to and in support of the Methylmercury Control Study) are included in the Pollutants of Concern Monitoring Report, required by the MRP to be submitted annually on October 1. The sampling data are submitted to both the Central Valley and San Francisco Bay Water Quality Control Boards, on March 31, annually, which corresponds with the timing of the MRP data reporting schedule.

C.11.l. Methylmercury Control Study (East County Permit)

CCCWP has been conducting a Methylmercury Control Study in response to Provision C.11.l.i of the East County Permit, which states: "Permittees shall conduct methylmercury control studies to monitor and evaluate the effectiveness of existing BMPs on the control of methylmercury, and shall develop and evaluate additional BMPs as needed to reduce mercury and methylmercury discharges to the Delta and meet methylmercury WLAs…"

The *Methylmercury Control Studies Progress Report* was submitted to the Central Valley Water board on October 30, 2015 and can be found on the CCCWP website http://www.cccleanwater.org/surveys-studies-annual-report/. The Methylmercury Control Study Final Report will be submitted by October 20, 2018.

Mercury Mine Cleanup

In 2007, Congress appropriated $517,000 to the Mount Diablo Mercury Mine, which allowed the Army Corps of Engineers (Corps) to begin a planning process to clean up the mine. Several years later the Corps identified Sonoco as a Responsible Party with a legal obligation to clean up the mine. As a result, the Corps' planning process evolved from a mine-specific analysis to a watershed-wide analysis to include the downstream Marsh Creek Reservoir. The State Water Board issued a Cleanup and Abatement Order to Sonoco to clean up the mine site. Sonoco appealed and after several years of hearings and court proceedings the parties entered into a Settlement Agreement. The agreement required Sonoco to construct improvements that would capture water seeping from the base of the tailings and waste piles that would normally flow into the down-slope pond and direct it to an infiltration gallery upstream of the pond site where soils have a decent permeability rate. The obligation to build improvements was capped at $200,000. The infiltration gallery and drainage would be sized to handle a steady-state flow of seep water, but not excess flows that might occur after winter rains build up groundwater pressure and increase seepage. The project objective is to remove some of the heavy metal loading that currently drains into the pond. During 2017, Sonoco consultants prepared the plans and developed a report.[10] Sonoco began construction in August and substantially completed the work by September 2017. Some minor modifications were completed in late December and an inspection report by the SFBRWQCB completed in January 2018 found all work had been constructed and completed in accordance with the Work Plan.

C.11.a. Implement Control Measures to Achieve Mercury Load Reductions (MRP)

MRP 2.0 Provisions C.11.a.iii.(2) and C.12.a.iii.(2) require reporting a list of the watershed/management areas where mercury and PCBs control measures are currently

10 Work Plan for Construction of Interception Trench and Infiltration Gallery, Mount Diablo Mercury Mine, Clayton, California. Prepared for Sunoco, Inc. by SGI Environmental Apex. July 12, 2017.

being implemented and those in which new control measures will be or have the potential to be implemented during the term of this permit, along with the specific control measures and an implementation schedule. Although many of the control measures may be selected primarily for the purpose of achieving PCBs load reductions during this permit term, substantial mercury load reductions may result as a tangential benefit and will be accounted for in tracking mercury load reductions. Refer to Section C.12.a for further information on implementation actions related to this permit requirement.

C.11.b. Assess Mercury Load Reductions from Stormwater (MRP)

MRP Provision C.11.b and C.12.b require the Permittees to develop and implement an assessment methodology and data collection program to quantify mercury and PCBs loads reduced through implementation of pollution prevention, source control, and treatment control measures. These provisions also require the Permittees to submit, in 2018 and subsequent Annual Reports, refinements to the mercury and PCBs load reduction assessment methodology to assess load reductions in the next permit term. Refer to Section C.12.b for further information on implementation actions related to this permit requirement.

C.11.c. Plan and Implement GI to Reduce Mercury Loads (MRP)

Permittees are tracking private GI projects and implementing early action public GI projects, if feasible, during the term of the permit to achieve the mercury load reductions performance criteria in MRP Table 11.1 (9 kg/yr.) by June 30, 2020. Permittees must conduct a RAA to estimate the amount of mercury and PCBs load reductions that will result from GI implementation by 2020, 2030, and 2040. MRP Provisions C.11.c and C.12.c also require the Permittees to submit in the 2018 Annual Report, as part of reporting for C.11.b.iii(2), the quantitative relationship between GI implementation and mercury and PCBs load reductions that will be used for the RAA and to assess loads reduced in the next permit term. Refer to Section C.12.c for further information on implementation actions related to these permit requirements.

C.11.d. Prepare Implementation Plan and Schedule to Achieve TMDL Allocations (MRP)

MRP Provision C.11.d requires the Permittees to prepare a plan and schedule for mercury control measure implementation and an RAA demonstrating that sufficient control measures will be implemented to attain the mercury TMDL WLAs by 2028. This plan will be combined with a similar plan developed for PCBs according to Provision C.12.d. to be submitted with the 2020 Annual Report.

C.11.e./C.11.i Implement a Risk Reduction Program (MRP/ East County Permit)

Refer to Section C.12.h for information on implementation actions in the Central Valley and San Francisco Bay Regions related to this permit requirement.

SECTION 12 – PROVISION C.12 POLYCHLORINATED BIPHENYLS CONTROLS

Introduction

MRP Provision C.12, which implements the urban runoff requirements of the San Francisco Bay PCBs TMDL, requires the Permittees to implement a control program for PCBs that includes source control, treatment control, and pollution prevention control measures where benefits are most likely to accrue (i.e., focused implementation). The San Francisco Bay PCBs TMDL's urban runoff WLA for CCC is 0.3 kg/yr. The TMDL implementation plan calls for attainment of the allocation by 2030. The Permittees are required to achieve a portion of this load reduction during this permit term (see Section C.12.a). Many MRP requirements related to PCBs are being addressed regionally through BASMAA regional projects and/or collaborations.

The East County Permit does not contain a provision for PCBs as MRP 2.0 does; however, the East County Permittees are implementing control measures for PCBs and mercury along with the MRP Permittees for consistency within the Clean Water Program and because their discharges also enter the San Francisco Bay Delta Estuary.

FY 2017/18 Accomplishments

<u>C.12.a. Implement Control Measures to Achieve PCBs Load Reductions</u>

MRP Provision C.12.a., similar to Provision C.11.a., requires the Permittees to report the Watershed Management Areas (WMAs) where PCBs control measures are currently being implemented and where new control measures will be implemented during the term of this permit, the specific control measures, and an implementation schedule. The Permittees are required to update the list of control measures annually as needed.

MRP Provision C.12.a. also requires the Permittees to implement sufficient control measures to achieve the PCBs load reductions specified in MRP Table 12-1 (90 kg/yr. by June 30, 2018 and 560 kg/yr. by June 30, 2020).

A *Mercury and PCBs Watershed/Management Areas*, *Control Measures, and Load Reduction – Update 2018* report was prepared by the CCCWP to fulfill the requirement of MRP Provision C.11.a.iii.(3) and C.12.a.iii.(3) for updating the list of control measures reported annually as necessary to account for new control measures. This report is provided as Attachment 12.1.

Previous studies indicate that old industrial areas are the most likely land use type to contain high PCBs concentrations. CCCWP is continuing the source property identification process until all Old Industrial areas are screened and characterized for the likelihood of pollutant load removal and potential referral to the SFRWQCB for further action. Screening results provided by the Permittees are being incorporated into the CCCWP's GIS database to create and revise data layers and source area maps for development and tracking in Watershed Management and GI Plans. In FY 2017/18, CCCWP continued to use its GIS platform for data management and analysis determining actual and potential load reductions, and as a tracking and reporting tool for Provisions C.11 and C.12 implementation work.

C.12.b. Assess PCBs Load Reductions from Stormwater

MRP Provisions C.11.b and C.12.b. require the Permittees to develop and implement an assessment methodology and data collection program to quantify mercury and PCBs loads reduced through implementation of pollution prevention, source control, and treatment control measures. The Permittees developed an *Interim Accounting Methodology for TMDLs Loads Reduced* report to document the load reduction accounting assessment methodology that is being used to demonstrate progress towards achieving the load reductions required in this permit term. This report was approved by the SFBRWQCB in May 2017. The Interim Accounting System is based on

relative mercury and PCBs yields from different land use categories. The method involves using default factors for PCBs and mercury load reduction credits resulting from foreseeable control measures implemented during this permit term.

The *Mercury and PCBs Watershed/Management Areas*, *Control Measures, and Load Reduction – Update 2018* report (Attachment 12.1) implements the Interim Accounting Methodology to estimate the mercury and PCBs loads reduced by the Permittees to date.

In FY 2015/16, the CCCWP began development of a countywide GIS pilot project focused on maintaining, analyzing, interpreting, displaying, and reporting relevant municipal stormwater program data and information related to Provisions C.10 (i.e., trash load reduction activities) and C.11/C.12 (i.e., mercury and PCBs source property identification and abatement screening activities). In FY 2016/17, the CCCWP worked with the ACCWP and its GIS consultant PSOMAS to expand the countywide GIS platform and create the GIS C.3 Project Tracking and Load Reduction Accounting Tool to support additional compliance activities related to: 1) C.3.b Regulated Projects reporting; 2) the C.3.j GI Planning and Implementation provisions; and, 3) the C.11 Mercury Controls and C.12 PCBs Controls provisions. In FY 2017/18, the CCCWP used the GIS C.3 Project Tracking and Load Reduction Accounting Tool to estimate the loads reduced that are reported in Attachment 12.1.

This tool is critical to Permittees' ongoing work to identify WMAs where multiple-benefit control measure implementation opportunities have been identified and prioritized for implementation during this permit term and over the coming decades. Additionally, this GIS database is being used to track and map existing and future C.3 projects, allow ease of ongoing review of opportunities for incorporating GI into existing and planned Capital Improvement Projects, assist in the development of GI plans, and to report mercury and PCBs loads reduced.

Provisions C.11.b and C.12.b require the Permittees to submit, in 2018 and subsequent Annual Reports, refinements to the Interim Accounting Methodology to assess load reductions in the next permit term. See the discussion in Section C.12.c below on the *Quantitative Relationship Between Green Infrastructure Implementation and PCBs/Mercury Load Reductions* report, which documents the methodology that will be used for estimating the mercury and PCBs loads reduced by GI in the next permit term. In addition, the CCCWP and Permittees are participating in a BASMAA Regional Project to refine the source control measure load reduction accounting methods for the next permit term. This project will begin in FY 2018/19 and will be complete in FY 2019/20.

C.12.c. Plan and Implement GI to Reduce PCBs Loads

Permittees are tracking private GI projects and implementing early action public GI projects, if feasible, during the term of the permit to achieve the PCBs load reductions performance criteria in MRP Table 12.2 (23 kg/yr.) by June 30, 2020.

The CCCWP and Permittees began preparation of a GI RAA, per the requirements in Provisions C.11.c and C.12.c, in FY 2017/18. The RAA will demonstrate that the control measures proposed in the Permittees' GI Plans and PCBs and Mercury Control Measure Implementation Plans, as required by MRP Provisions C.3, C.11, and C.12, will meet the PCBs and mercury TMDL WLAs for urban stormwater runoff. Additionally, the RAAs will provide a method for evaluating the type, size, number, location, and phasing of GI measures needed to most cost-effectively comply with the GI load reduction goals stated in MRP Provisions C.3.j and C.11/C.12.c. The MRP requires that both the GI RAA (C.11.c/C.12.c) and the WLA attainment RAA (C.11.d/C.12.d) be documented in the 2020 Annual Report.

A *Quantitative Relationship between Green Infrastructure Implementation and PCBs/Mercury Load Reductions* report was prepared by the CCCWP in cooperation with the ACCWP. This report fulfills the requirements of MRP Provisions C.11.b.iii.(3), C.11.c.iii.(3), C.12.b.iii.(3), and C.12.c.iii.(1) for submitting the quantitative relationship

between GI implementation and mercury and PCBs load reductions that will be used for the RAA required by MRP Provisions C.11.c.ii.(2), C.11.d.ii, C.12.c.ii.(2), and C.12.d.ii. The report describes the models and model input data relied on to establish this relationship and provides example modeling results. The RAA modeling described in the report will be conducted for both countywide programs and will use data inputs from both CCC and Alameda County. This report is provided as Attachment 12.2.

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

MRP Provisions C.11.d and C.12.d require the Permittees to prepare a plan and schedule for mercury and PCBs control measure implementation and RAA demonstrating that sufficient control measures will be implemented to attain the mercury TMDL WLAs by 2028 and the PCBs TMDL WLAs by 2030. This plan will be submitted with the 2020 Annual Report.

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

The CCCWP participated in the BASMAA Regional Project, described below, to evaluate PCBs presence in caulks/sealants used in storm drains and roadway infrastructure, and to quantify the potential PCB load reduction benefits that may result from public infrastructure improvements.

Provision C.12.e of the MRP requires Permittees to collect at least 20 composite samples (throughout the Permit area) to investigate PCBs concentrations in caulk and sealants from public roadway and storm drain infrastructure. To achieve compliance with this permit requirement, BASMAA implemented a regional sampling program on behalf of its member agencies. The goal of the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program was to evaluate, at a limited screening level, whether and in what concentrations PCBs are present in public roadway and storm drain infrastructure caulk and sealants in the portions of the Bay Area subject to the MRP.

This sampling program also contributes to partial fulfillment of POC monitoring required in Provision C.8.f of the MRP to address source identification, one of the five management information needs identified in the MRP. Source identification monitoring focuses on identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff.

In February 2017, BASMAA selected a consultant team to develop a study design for the caulk investigation and implement sampling for this investigation under the direction of a PMT consisting of members of the BASMAA Monitoring and Pollutants of Concern Committee. Together, this project team accomplished the following tasks through the end of FY 2017/18:

- Developed a final study design;
- Developed a final Sampling and Analysis Plan and Quality Assurance Project Plan;
- Developed screening criteria to inform selection of infrastructure for sampling;
- Conducted outreach efforts and recruited municipal partners to participate in the project;
- Collected 54 samples of caulk and sealant materials from ten types of roadway and storm drain infrastructure throughout the permit area;
- Determined how samples would be combined into 20 composites;
- Submitted the samples to the lab for compositing and analysis for the RMP-40 PCB congeners[11] using a modified EPA Method 8270C (Gas Chromatography/ Mass Spectroscopy-Selective Ion Monitoring, GC/MS-SIM); and,
- Prepared a project report presenting the full details of the investigation, including the PCBs concentrations of the 20 composite samples.

The final project report is provided as Attachment 12.3.

11 The 40 individual congeners routinely quantified by the RMP for Water Quality in the San Francisco Estuary include: PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203.

C.12.f Manage PCB-Containing Material 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 buildings at the time such buildings undergo demolition, so that PCBs do not enter municipal storm drain systems. Applicable buildings include, at a minimum, non-residential buildings constructed or remodeled between the years 1950 and 1980 with building materials such as masonry and concrete with PCBs concentrations of 50 parts per million or greater. Single-family residential and wood frame buildings are exempt. Also, 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.

Permittees are 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 buildings at the time such buildings undergo demolition;
- A method for identifying applicable buildings prior to their demolition; and,
- Method(s) for ensuring PCBs are not discharged to the municipal storm drain from demolition of applicable buildings.

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 buildings 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 buildings.

This section provides a report of the status of Permittee efforts to implement Provision C.12.f. On behalf of MRP Permittees, BASMAA is continuing to conduct a multi-year regional project to assist MRP Permittees to address Provision C.12.f. The project, which began in FY 2016/17, is developing guidance materials, tools and training materials and conducting outreach. The goal is 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, adopt the program (e.g., via local ordinance), and train local staff to implement the new program.

At the outset of the project, a BASMAA Steering Committee was convened to provide project oversight and guidance during the project. The Steering Committee includes BASMAA Directors, countywide stormwater program staff, and Permittee staff from various relevant municipal departments. The Steering Committee has and continues to meet periodically throughout the project. In addition, a project TAG was convened, a small balanced advisory group formed from industry, regulatory, and Permittee representatives to provide review and input on selected project work products. The TAG is 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.

Project deliverables completed to-date, which were made available to Permittees to use as appropriate given local procedures and needs, include:

- 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 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;
- An analysis to assist municipalities that pursue cost recovery; and,
- A conceptual approach for an assessment methodology and data collection program to quantify PCBs loads reduced through managing PCBs-containing materials during building demolition.

The above list of completed products comprises most of the major deliverables for the project. During the first half of FY 2018/19, the project will conclude by conducting the following remaining outreach and training tasks:

- Prepare training materials for municipal staff on adoption and implementation of the new program;
- Using the above training materials, conduct one pilot training workshop and one "train the trainer" session for key municipal and countywide stormwater program staff so that they may conduct subsequent trainings for other municipal staff;
- Develop 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; and,
- Develop a list of Bay Area opportunities, including contact information and dates, for municipal and/or stormwater program staff to conduct outreach to industry stakeholders using the above industry outreach materials.

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. Permittees submitted in their FY 2016/17 Annual Reports a workplan describing how these information needs will be accomplished, including the studies to be performed and a preliminary schedule. Permittees are required to report on status of the studies in their FY 2017/18 Annual Report. This section provides the status report.

Provision C.12.g is being addressed through a multi-year project by the San Francisco Bay RMP to develop a series of conceptual models of PCBs in Priority Margin Units (PMU). The project is:

- Identifying margin units that are high priority for management and monitoring;
- Developing conceptual models and mass budgets for margin units downstream of watersheds where management actions will occur; and,
- Conducting monitoring in these units as a performance measure.

This work will inform the review and possible revision of the PCBs TMDL and the reissuance of the MRP, both of which are tentatively scheduled to occur in 2020. During FY 2017/18, BASMAA representatives to the RMP continued to participate in the RMP PCBs Workgroup, which is providing ongoing oversight of the project. A general description and multi-year budget for this project is in the "PCBs" section of the RMP Multi-Year Plan, 2018 Annual Update (dated January 2018).[12]

Four urban embayments along the Bay shoreline with management actions planned or ongoing to address PCBs in the upstream watersheds were initially selected as PMU for conceptual modeling:

- Emeryville Crescent (Alameda County);
- San Leandro Bay (Alameda County);
- Steinberger Slough (San Mateo County); and,
- Richmond Harbor (Contra Costa County).

The conceptual models are intended to provide a foundation for future monitoring to track responses to load reductions and may eventually help guide planning of

12 This report is available at: www.sfei.org/sites/default/files/biblio_files/2018%20Multi-Year%20Plan%20Final%20Approved%20by%2020180117%20SC.pdf.

management actions. Three of the selected embayments (all except San Leandro Bay) receive drainage from pilot watersheds that were included in BASMAA's Clean Watersheds for a Clean Bay project.

Status of PMU Conceptual Models

The status as of July 2018 of conceptual model development for individual PMUs is provided in the following sections.

Emeryville Crescent

A final conceptual model report (dated April 2017)[13] has been completed. The key finding, which was based on a simple one-box model and dependent on assumptions made for input parameters, was that PCBs concentrations in sediment and the food web could potentially decline fairly quickly (within 10 years) in response to load reductions from the watershed.

San Leandro Bay

A conceptual model for San Leandro Bay is being developed in three phases. Reports for Phase 1 and Phase 2 have been completed. The Phase 1 report (dated June 2017)[14] presented analyses of watershed loading, initial retention, and long-term fate, including results of sediment sampling in 2016.

The Phase 2 report (dated December 2017)[15] is designated a data report and documented the methods, quality assurance, and all of the results of the 2016 field study.

13 The report is available here: www.sfei.org/sites/default/files/biblio_files/Emeryville%20Crescent%20Draft%20Final%20Report%2005-02-17%20Final%20Clean_0.pdf.

14 This report is available here: http://www.sfei.org/sites/default/files/biblio_files/Yee%20et%20al%202017%20Conceptual%20Model%20Report%20San%20Leandro%20Bay%20Phase%201.pdf

15 This report is available here: www.sfei.org/sites/default/files/biblio_files/San%20Leandro%20Bay%20PCB%20Study%20Data%20Report%20Final.pdf

A draft of the Phase 3 report has been developed and is currently under review. It incorporates all of the results of the 2016 field study and includes additional discussion of the potential influence of contaminated sites in the watershed, the results of passive sampling by Stanford researchers, and a comparative analysis of long-term fate in San Leandro Bay and the Emeryville Crescent. The Phase 3 report also includes a section on bioaccumulation and a concluding section with answers to the management questions that were the impetus for the work.

Steinberger Slough

A conceptual model for Steinberger Slough is currently under development. Like the other conceptual models, it will include results of monitoring in the PMU and watershed, analyses of watershed loading, development of a mass budget, and long-term fate modeling, including projected PCBs concentrations in sediment and the food web in response to load reductions from the watershed.

Richmond Harbor

Due to budget limitations and other efforts deemed higher priority (e.g., see below 2019 RMP Special Studies), development of a conceptual model for The Richmond Harbor PMU has been postponed.

Special Studies Related to PMUs

In addition to ongoing conceptual model development (as described above), and continuing technical and logistical support for the RMP PCBs Workgroup, the two PMU-related projects described in the following sections have been approved as 2019 RMP Special Studies.

PMU Stormwater PCBs Monitoring

This study will yield valuable information on PCBs concentrations and particle ratios in stormwater in watersheds draining to two PMUs. The study areas include the major subwatersheds draining into the Emeryville Crescent and one subwatershed draining into San Leandro Bay. The subwatershed draining into San Leandro Bay is downstream of a recently remediated hotspot, the former General Electric (GE) transformer and electrical equipment facility, where PCBs contamination was severe. The goals of the study are to better estimate current PCBs loads into these PMUs (a critical component of the PMU mass budgets) and to support tracking of the effectiveness of the major remediation action on the GE property. Sampling will be completed over two years, as storms allow.

Shiner Surfperch PMU Survey

Conceptual site models for PCBs in PMUs have been developed for the Emeryville Crescent and San Leandro Bay. The San Leandro Bay model was supported by an intensive field study. These conceptual site models identified shiner surfperch as a crucial indicator of impairment in these areas, due to their explicit inclusion as an indicator species in the TMDL, importance as a sport fish species, tendency to accumulate high concentrations, and site fidelity, and other factors. The conceptual site models recommend periodic monitoring of shiner surfperch to track trends in the PMUs, and as the ultimate indicator of progress in reduction of impairment. Shiner surfperch and other sport fish species will be monitored in 2019 as part of RMP Status and Trends (S&T) monitoring. A coordinated sampling of PCBs in shiner surfperch in PMUs will be conducted as an add-on to the 2019 S&T sport fish sampling. This coordination will yield significant cost savings in data management and reporting, because these efforts will leverage S&T activities resulting in minimal additional costs. In addition, a dataset for shiner surfperch will be obtained that is directly comparable across the PMUs and the five locations that are sampled in S&T.

During FY 2018/19 and future years, BASMAA representatives to the RMP will continue to participate in the RMP PCBs Workgroup to help provide ongoing oversight of PMU conceptual model development and the related RMP Special Studies.

C.12.h. Implement a Risk Reduction Program

The CCCWP Permittees in coordination with CCHS and the East Bay Regional Parks District work with CCCWP staff to collectively implement the following fish risk reduction activities to increase awareness of the risks of mercury and PCBs contamination when consuming fish caught in the San Francisco Bay/Delta:

- Kiosks and Pier Postings – CCHS and East Bay Regional Parks District post, inspect, and maintain fish consumption warning signs at fishing piers and harbor/marina kiosks around CCC. Replacement is often necessary when signs are vandalized or missing.
- Point-of-purchase outreach at fishing supply stores – In FY 2017/18, the CCCWP continued to work with marinas and local fishing supply stores throughout the county to make fish consumption warning information available to the public through displaying multi-lingual signage and brochures. The table below shows the locations where outreach materials were supplied in FY 2017/18.

Table 12-1: Participating Marinas and Bait and Tackle Shops

Business Name	Location	Business Type	Signage	Brochures
New Life Marina	Bethel Island	Marina	Yes	Yes
Sugar Barge Resort & Marina	Bethel Island	Marina	Yes	Yes
Orwood Resort Inc.	Brentwood	Marina	No	Yes
Discovery Bay Yacht Harbor	Discovery Bay	Marina	No	Yes
Martinez Marina	Martinez	Marina	Yes	Yes
Big Break Marina	Oakley	Marina	Yes	Yes
Rodeo Marina LLC	Rodeo	Marina	Yes	Yes
Dan's Delta Outdoors	Oakley	Bait and Tackle Shop	No	Yes
Gotcha Bait and Tackle Inc.	Antioch	Bait and Tackle Shop	Yes	Yes
Bay Tackle	El Cerrito	Bait and Tackle Shop	Yes	Yes
Gas & Save	Oakley	Bait and Tackle Shop	No	Yes
Hook Line & Sinker	Oakley	Bait and Tackle Shop	Yes	Yes
City Arms East LLC	Pleasant Hill	Bait and Tackle Shop	No	Yes
Creative Sports	Pleasant Hill	Bait and Tackle Shop	Yes	Yes
Rodeo Sports Liquors	Rodeo	Bait and Tackle Shop	Yes	No

Website Posting – Brochures and fish consumption warning signs are posted on the CCCWP's website https://www.cccleanwater.org/community/residents/sf-bay-fish-risk-project.

CCCWP estimates that the current program has the potential to reach over 3,000 individuals annually. The basis of the estimate is as follows: 16 fishing piers with signage multiplied by 200 views per pier annually = 3,200 individuals viewing the signage. This assumption is based on the estimate that each pier is visited by at least ten people per day, for 200 days out of each year (i.e., the estimate allows for 165 days of inclement weather when people are not fishing and/or days when signs are missing due to vandalism or other factors). If only ten percent of 2,000 individuals using a pier annually stop to read the signage, that would mean 200 individuals are potentially reached at each pier. This estimate does not include the effectiveness of the point of purchase outreach program at marinas and fishing supply stores or the website posting. CCCWP will evaluate more focused means of effectiveness assessment for completion of the 2020 Annual Report.

SECTION 13 – PROVISION C.13 COPPER CONTROLS

Introduction

Under MRP 2.0, Permittees need to report on efforts to control copper discharges from architectural copper; from pools, spas, and fountains that contain copper-based compounds; and from industrial sources. A review of these efforts specific to the CCCWP is provided here. Copper control activities conducted at the local level are reported in the Individual Municipal Annual Reports compiled in Volume II of this Report.

FY 2017/18 Accomplishments

Architectural Copper

In FY 2015/16, CCCWP finalized and approved a public outreach flyer entitled *Requirements for Copper Roofs and Other Architectural Copper.* Permittees continue to make this flyer available to the public at permit counters. CCCWP also encourages Permittees to include the flyer with applicable building permits and to incorporate the BMPs as conditions of approval for any discretionary projects with architectural copper features.

Pools, Spas and Fountains

Since many of the larger community pools within CCC are included in the inventory of facilities that have the potential to have non-stormwater discharges, these facilities are inspected on a regular basis as required by Provision C.4. During the inspection process, stormwater inspectors convey the requirements for managing discharges from pools relative to stormwater and wastewater regulations. For this reason, CCCWP has not had to devote significant additional resources to address this potential source of copper.

On occasion, as part of the 1-800-No Dumping Line or other complaint hotlines, municipal staff or their contracted stormwater inspectors have had to counsel residential owners of pools to instruct them on the proper procedure for discharging their pool water or cleaning of their filters. CCCWP has made available to municipal staff and their contracted inspectors the *Draining Pools and Spas* brochure to provide guidance to homeowners on managing their pool discharges.

Industrial Sources

The CCCWP has provided training to stormwater inspectors on industrial sources of copper. This training has been included in past annual C.4 commercial and industrial stormwater inspection workshops. As inspectors have been well trained in this area, CCCWP has not had to devote significant resources to address these particular sources.

FY 2018/19 Planned Activities

CCCWP will continue to assist Permittees with meeting Copper Control requirements. CCCWP will be working with Permittees to ensure they have established a robust procedure within their municipalities' planning and building departments to adequately address new potential sources of copper from architectural features and management of pools, spas, and fountains.

CCCWP is considering providing outreach to homeowners who have personal pools. For this task, CCCWP would work with Permittees to inventory residential pools and once inventoried, send outreach material to the pools owners to ensure they understand maintenance, filter cleaning, and draining requirements relative to stormwater regulations.

CCCWP will continue to work with stormwater inspectors to address industrial sources of copper identified during inspections and ensure that proper BMPs are in place at

such facilities to minimize discharge of copper to storm drains. It is anticipated that the FY 2018/19 stormwater inspector training required under Provision C.4 will include a revisiting of presentations on how to identify POC including Copper, PCBs, and Mercury at industrial facilities and BMPS for controlling these pollutants and preventing their discharge to stormwater.

SECTION 14 – PROVISION C.15 EXEMPTED AND CONDITIONALLY EXEMPTED DISCHARGES

Introduction

As outlined in Section 2, the CCCWP's MOC is tasked with the review, development and coordination of any countywide and/or regional tasks conducted to assist Permittees with implementation of the mandates in Provision C.15. CCCWP resources on this provision continue to be minimal. One of the primary reasons for limited focus on this provision is that MRP Permittees that are also water purveyors and use to report on their planned and unplanned drinking water discharges in their MRP Annual Reports are now reporting these discharges under their Statewide NPDES Permit for Drinking Water System Discharges (Order WQ 2014-0194-DWQ).

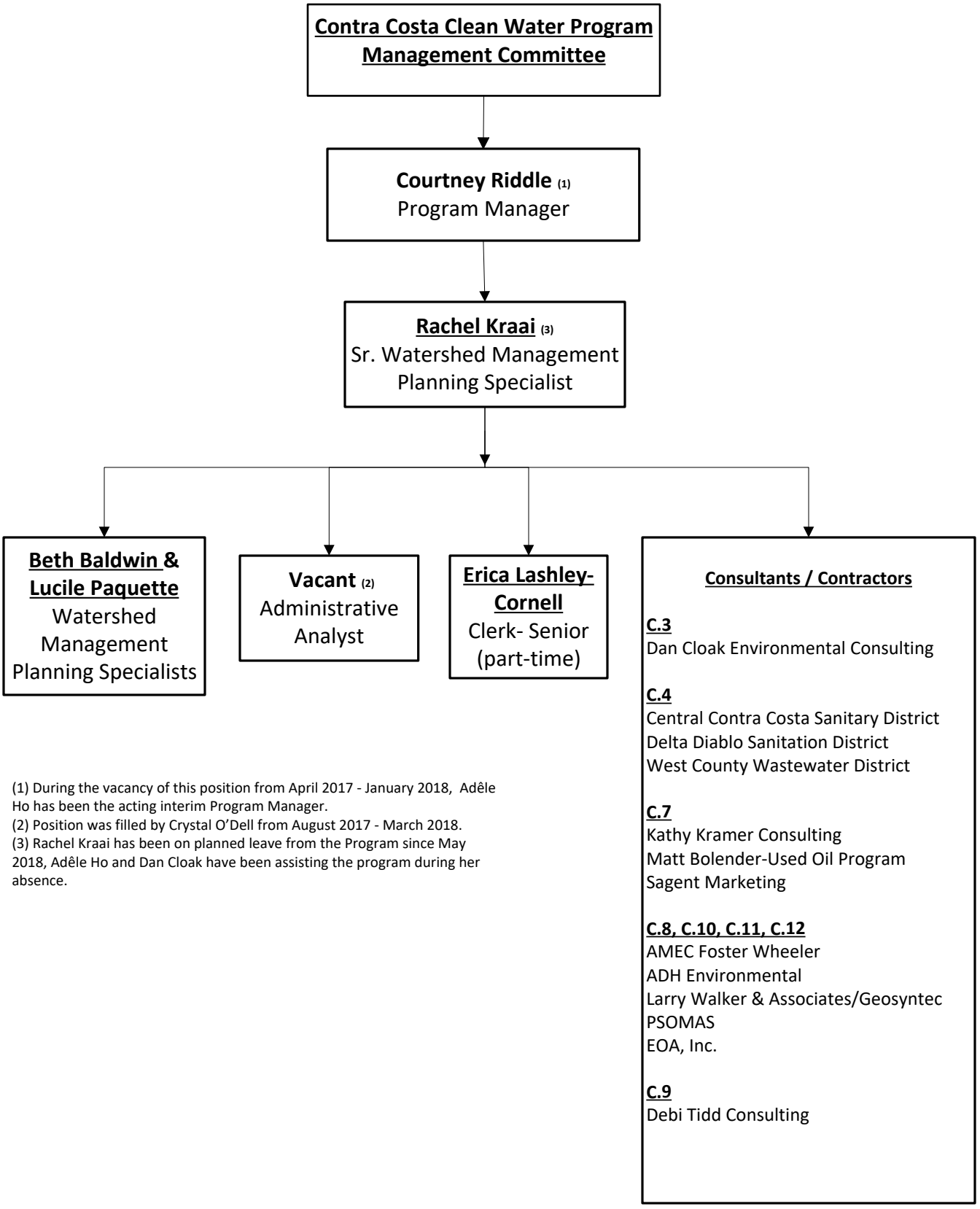
FY 2018/19 Planned Activities

In FY 2018/19, it is anticipated that Group Program activities related to Provision C.15 will continue to be minimal. Depending on staff resources, CCCWP staff may work with Permittees to improve outreach to address potable water discharges to the MS4s arising from large-scale landscape irrigation projects. This outreach may include working more closely with Contra Costa Water District and East Bay Municipal Utility District. Other issues under this provision will be addressed as needed.

Attachment 1.1

Contra Costa Clean Water Program, Staffing and Consultants/Contractors

Contra Costa Clean Water Program, Staffing and Consultants/Contractors



(1) During the vacancy of this position from April 2017 - January 2018, Adêle Ho has been the acting interim Program Manager.
(2) Position was filled by Crystal O'Dell from August 2017 - March 2018.
(3) Rachel Kraai has been on planned leave from the Program since May 2018, Adêle Ho and Dan Cloak have been assisting the program during her absence.

Attachment 1.2

Contra Costa Clean Water Program Organizational Structure

CONTRA COSTA CLEAN WATER PROGRAM
ORGANIZATIONAL STRUCTURE

Attachment 1.2

Participants -- Antioch, Brentwood, Clayton, Concord, Danville, El Cerrito, Hercules, Lafayette, Martinez, Moraga, Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, Walnut Creek, Contra Costa County, and Contra Costa County Flood Control & Water Conservation District

ADMINISTRATIVE COMMITTEE

DUTIES

- Administration
- Strategic Planning
- Personnel
- Budget
- Conflict Resolution

MANAGEMENT COMMITTEE

DUTIES

- Decision Making Body
- Strategic Planning
- Sets Policies / Directives
- Program Manager Evaluation
- Approves / Appropriates Budget

STAFF

Courtney Riddle, Program Manager
Rachel Kraai, Senior Watershed Management Planning Specialist
Beth Baldwin, Watershed Management Planning Specialist
Lucile Paquette, Watershed Management Planning Specialist
Erica Lashley-Cornell, Clerk - Senior Level

MONITORING COMMITTEE

DUTIES

- C.8 - Water Quality Monitoring
- C.9 - Pesticides Toxicity Control
- C.11 - Mercury Controls
- C.12 - Polychlorinated Biphenols (PCBs) Controls
- C.13 - Copper Controls
- C.14 - PBDEs, Legacy Pesticides and Selenium

DEVELOPMENT COMMITTEE

DUTIES

- C.3 - New Development and Redevelopment
- C.6 - Construction Site Control

PUBLIC INFORMATION / PARTICIPATION COMMITTEE

DUTIES

- C.7 - Public Information and Outreach
- C.9 - Pesticides Toxicity Control

MUNICIPAL OPERATIONS COMMITTEE

DUTIES

- C.2 - Municipal Operations
- C.4 - Industrial and Commercial Site Controls
- C.5 - Illicit Discharge Detection and Elimination
- C.9 - Pesticides Toxicity Control
- C.10 - Trash Load Reduction
- C.15 - Exempted and Conditionally Exempted Discharges

BASMAA MONITORING/ POC COMMITTEE

PROGRAM REPRESENTATIVES
Lucile Paquette, Program Staff
Amanda Booth, City of San Pablo
Michele Mancuso, Contra Costa County

BASMAA DEVELOPMENT COMMITTEE

PROGRAM REPRESENTATIVES
Rachel Kraai, Program Staff
Dan Cloak, Program Consultant
John Steere, Contra Costa County
Kevin Marstall, City of Concord

BASMAA PUBLIC INFORMATION/ PARTICIPATION COMMITTEE

PROGRAM REPRESENTATIVES
Courtney Riddle, Program Manager
Steven Spedowfski, City of San Ramon

BASMAA TRASH COMMITTEE

PROGRAM REPRESENTATIVES
Beth Baldwin, Program Staff
Rinta Perkins, City of Walnut Creek
Michele Mancuso, Contra Costa County

Attachment 1.3

Management Committee and Subcommittee Participation and Attendance

Management Committee FY 2017-18

MUNICIPALITY	REPRESENTATIVE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	INDIV% ATT	MUNI % ATT
City of Antioch	**Phil Hoffmeister**	1		1	1	1	1	1	1	1	1		1	83%	**83%**
	Lynne Filson													0%	
City of Brentwood	**Jack Dhaliwal**								1					8%	**92%**
	Meghan Laporta	1	1	1	1		1	1		1	1	1	1	83%	
	James Campero											1		8%	
City of Clayton	**Laura Hoffmeister**	1	1			1	1	1		1	1			58%	**67%**
	Mindy Gentry													0%	
	Scott Alman											1		8%	
	Rick Angrisani													0%	
City of Concord	**Robert Ovadia**	1	1	1	1	1	1	1						58%	**92%**
	Kevin Marstall							1		1		1	1	33%	
	Frank Kennedy										1			8%	
Town of Danville	**Chris McCann(1)**	1	1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Steven Jones													0%	
	Mark Rusch													0%	
	Steve Lake													0%	
City of El Cerrito	**Stephen Prée**					1								8%	**92%**
	Will Provost	1	1	1	1		1	1	1	1	1		1	83%	
	Yvetteh Ortiz													0%	
	Maria Sanders													0%	
City of Hercules	**Mike Roberts**													0%	**83%**
	Jeff Brown													0%	
	Jose Pacheco													0%	
	Frank Kennedy	1	1	1	1	1	1	1		1		1	1	83%	
City of Lafayette	**Donna Feehan(2)**	1	1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Alexandra Majoulet											1	1	17%	
	Mike Moran													0%	
City of Martinez	**Khalil Yowakim**	1	1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Tim Tucker													0%	
Town of Moraga	**Edric Kwan**								1		1	1	1	33%	**100%**
	Frank Kennedy	1	1	1	1	1	1	1		1				67%	
City of Oakley	**Billilee Saengchalern**	1	1	1	1	1		1	1	1	1	1	1	92%	**100%**
	Keith Coggins													0%	
	Frank Kennedy						1							8%	
City of Orinda	**Scott Christie**			1	1	1		1	1	1	1	1	1	75%	**83%**
	Larry Theis													0%	
	Jason Chen	1												8%	
City of Pinole	**Tamara Miller**								1					8%	**100%**
	Frank Kennedy	1	1	1	1	1	1	1		1	1	1	1	92%	
	Michelle Fitzer													0%	
City of Pittsburg	**Jolan Longway**	1	1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Fritz McKinley													0%	
City of Pleasant Hill	**Frank Kennedy**	1	1	1	1	1	1	1		1	1	1	1	92%	**92%**
	Mario Moreno													0%	
City of Richmond	**Joanne Le**	1	1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Ryan Smith													0%	
City of San Pablo	**Amanda Booth**		1	1	1	1	1	1	1	1	1	1	1	92%	**92%**
	Karineh Samkian													0%	
	Barbara Hawkins												1	8%	
	Jill Mercurio													0%	
City of San Ramon	**Steven Spedowfski**	1	1	1	1	1			1	1	1	1	1	83%	**83%**
	Robin Bartlett													0%	
	Maria Fierner													0%	
City of Walnut Creek	**Rinta Perkins**	1		1	1	1	1	1	1	1	1	1	1	92%	**100%**
	Steve Waymire													0%	
	Carlton Thompson		1											8%	
Contra Costa County	**Cece Sellgren**	1	1		1	1	1	1	1	1	1	1	1	92%	**100%**
	Tim Jensen												1	8%	
	Brian Balbas													0%	
	Mike Carlson			1		1	1	1	1	1	1	1	1	75%	
	Julie Bueren													0%	
Flood Control	**Mike Carlson**	1		1		1	1	1	1	1	1	1	1	83%	**100%**
	Cece Sellgren												1	8%	
	Tim Jensen		1	1	1	1	1	1		1	1	1	1	83%	
PROGRAM STAFF															
Rachel Kraai		x	x	x		x	x	x	x	x	x				
Beth Baldwin		x	x	x	x	x	x	x	x	x	x	x	x		
Lucile Paquette		x	x	x	x	x		x	x	x	x	x			
Erica Lashley-Cornell		x	x	x	x	x	x	x	x	x	x	x	x		
Crystal O'Dell				x	x	x	x								
Courtney Riddle								x	x	x		x	x		
Adêle Ho	Consultant		x	x	x	x	x	x	x	x			x		
Sandy Mathews	Consultant				x							x			
Lisa Austin	Consultant					x							x		
Dan Cloak	Consultant	x		x		x				x					

(1) Chairperson (2) Vice- Chairperson (3)Meeting Cancelled G:\NPDES\Management Committee\Minutes&Attend\MC Attendance 2017-18

**Both Primary and Alternate attended the same meeting; attendance credit goes to Primary representative.

ADMINISTRATIVE COMMITTEE FY 2017-18
Attendance Roster

MUNICIPALITY	REPRESENTATIVE	JUL [3]	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	INDIV% ATT	MUNI % ATT
City of Concord	**Robert Ovadia**		1			1	1	1						36%	**82%**
	Kevin Marstall				1				1	1	1	1		45%	
City of El Cerrito	**Will Provost**		1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Stephen Prée													0%	
Contra Costa County	**Cece Sellgren**			1	1	1	1		1	1	1		1	73%	**100%**
	Mike Carlson [2]		1	1	1	1	1	1	1		1	1	1	91%	
Contra Costa County FC	**Mike Carlson [2]**		1	1	1	1	1	1	1		1	1	1	91%	**100%**
	Tim Jensen			1	1	1	1	1		1	1	1		73%	
	Cece Sellgren			1	1	1	1		1	1	1		1	73%	
Town of Danville	**Chris McCann [1]**		1	1		1	1	1		1	1	1	1	82%	**82%**
	Mark Rusch													0%	
City of Martinez	**Tim Tucker**													0%	**18%**
	Khalil Yowakim			1						1				18%	
City of Oakley	**Billilee Saengchalern**		1		1	1	1	1	1	1	1		1	82%	**82%**
	Keith Coggins													0%	
City of San Pablo	**Amanda Booth**		1	1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Karineh Samkian													0%	
NON-VOTING															
City of Antioch	Phil Hoffmeister					x									
City of Brentwood	Jack Dhalilwal					x									
City of Hercules	Jeff Brown		x	x				x	x	x	x	x			
	Mike Roberts														
City of San Ramon	Steven Spedowfski		x		x		x	x	x	x	x	x			
City of Walnut Creek	Rinta Perkins		x									x			
PROGRAM STAFF															
	Courtney Riddle								x	x	x	x	x		
	Rachel Kraai		x	x	x	x	x	x	x	x	x	x			
	Beth Baldwin		x	x		x	x	x		x					
	Lucile Paquette				x	x	x		x	x					
	Erica Lashley-Cornell		x	x	x	x	x	x	x	x		x	x		
	Adêle Ho (Consultant)			x	x	x	x		x	x					

[1] Chairperson [2] Vice-Chairperson [3] Meeting cancelled

MUNICIPAL OPERATIONS COMMITTEE FY 17 - 18															
MUNICIPALITY	**REPRESENTATIVE**	**JUL (3)**	**AUG**	**SEP**	**OCT (3)**	**NOV (3)**	**DEC**	**JAN (3)**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**INDIV %ATT**	**MUNI % ATT**
City of Antioch	**Phil Hoffmeister**		1						1	1			1	50%	**50%**
	Cleveland Porter													0%	
City of Brentwood	**Meghan Laporta**		1				1		1	1		1	1	75%	**75%**
	Kelly Martinez													0%	
City of Concord	**Jeff Rogers**		1	1			1		1		1		1	75%	**100%**
	Jesse Crawford													0%	
	Justin Ezell													0%	
	Kevin Marstall									1		1	1	38%	
Contra Costa County	**Michele Mancuso**		1				1		1	1	1	1	1	88%	**100%**
	Margie Valdez		1											13%	
	Cece Sellgren			1						1				25%	
City of Lafayette	**Alexandra Majoulet**		1	1			1		1			1	1	75%	**88%**
	Francine Kuykendall										1	1		25%	
	Mike Moran													0%	
City of Martinez	**Bob Cellini (2)**		1	1			1		1				1	63%	**88%**
	Khalil Yowakim									1		1		25%	
	Alexandra Haisley			1										13%	
City of Richmond	**Joanne Le**		1	1			1		1	1	1	1	1	100%	**100%**
	Terri Mason													0%	
	Maxwell Potter													0%	
City of Walnut Creek	**Rinta Perkins (1)**		1	1			1		1	1	1	1	1	100%	**100%**
	Elisa Sarlatte													0%	
	Neil Mock			1										13%	
Non-Voting Members															
City of Clayton	Laura Hoffmeister									x					
City of Concord	Bill Gallagher									x					
Contra Costa County	Chris Hallford									x		x			
Town of Danville	Chris McCann									x					
City of El Cerrito	Stephen Prée						x		x	x		x			
	Will Provost														
City of Orinda	Scott Christie									x					
City of Pinole	Amelia Timbers									x					
City of Pittsburg	Jolan Longway		x	x			x		x	x		x	x		
City of San Pablo	Amanda Booth			x						x					
PROGRAM STAFF															
Beth Baldwin			x	x			x		x	x	x	x	x		
Erica Lashley-Cornell			x	x			x		x	x		x	x		
Courtney Riddle									x						
Crystal O'Dell				x											
Rachel Kraai															

(1) Chairperson, (2) Vice-Chairperson, (3) Meeting Cancelled

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DEVELOPMENT COMMITTEE FY 2017-18

MUNICIPALITY	REPRESENTATIVE	JUL (3)	AUG	SEP (3)	OCT	NOV (3)	DEC	JAN	FEB	MAR (3)	APR	MAY	JUN	INDIV % ATT	MUNI % ATT
City of Antioch	**Phil Hoffmeister**		1		1		1	1			1	1	1	88%	**88%**
	Julie-Haas-Wajdowicz													0%	
City of Brentwood	**Aman Grewal**		1		1		1				1	1	1	75%	**88%**
	Jack Dhaliwal								1					13%	
	Craig Drafton													0%	
City of Clayton	**Laura Hoffmeister**		1		1		1	1	1		1	1		88%	**88%**
	Scott Allman							1						13%	
	Mindy Gentry													0%	
City of Concord	**Kevin Marstall (1)**		1		1		1	1						50%	**100%**
	Robert Ovadia													0%	
	Mitra Abkeneri							1	1		1	1	1	63%	
	Frank Kennedy													0%	
Contra Costa County	**John Steere**							1	1			1	1	50%	**88%**
	Cece Sellgren		1				1		1		1	1	1	75%	
City of Hercules	**Jeff Brown**		1					1			1		1	50%	**88%**
	Mike Roberts											1		13%	
	Frank Kennedy								1					13%	
	AJ Kennedy				1									13%	
City of Pittsburg	**Jolan Longway**		1				1	1	1		1	1	1	88%	**88%**
City of Pleasant Hill	**Ananthan Kanagasundaram**													0%	**100%**
	Frank Kennedy		1				1	1	1		1	1	1	88%	
	AJ Kennedy				1									13%	
City of San Ramon	**Rod Wui (2)**		1		1			1			1		1	63%	**63%**
	Theresa Peterson													0%	
City of Walnut Creek	**Elisa Sarlatte**		1											13%	**100%**
	Carlton Thompson													0%	
	Rinta Perkins				1									13%	
	Ryan Cook							1	1		1	1	1	63%	
	Neil Mock				1		1							25%	
Non-Voting Members															
Contra Costa County	Michelle Mancuso										x				
Town of Danville	Chris McCann		x		x			x					x		
	Allison Candell		x												
City of El Cerrito	Stephen Prée		x												
	Will Provost						x	x	x		x		x		
	Steven Jones														
City of Orinda	Scott Christie												x		
City of San Pablo	Amanda Booth							x							
PROGRAM STAFF															
Dan Cloak (consultant)			x		x		x	x	x		x	x	x		
Adêle Ho (consultant)			x		x							x	x		
Rachel Kraai			x		x		x	x	x		x				

(1) Chairperson, (2) Vice-Chairperson, (3) Meeting Cancelled

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MONITORING COMMITTEE FY 17-18

MUNICIPALITY	REPRESENTATIVE	JUL	AUG (3)	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	INDIV % ATT	MUNI % ATT
City of Antioch	**Phil Hoffmeister**	1		1		1	1	1	1				1	64%	**64%**
	Julie Haas-Wajdowicz													0%	
County Flood Control	**Michele Mancuso** (2)			1	1	1	1	1	1	1	1	1	1	91%	**100%**
	Cece Sellgren	1				1	1			1				36%	
City of Pinole	**Amelia Timbers**			1	1	1	1	1	1	1	1	1	1	91%	**100%**
	Tamara Miller													0%	
	Frank Kennedy	1												9%	
City of Richmond	**Joanne Le**	1		1	1	1	1	1	1	1		1	1	91%	**91%**
	Terri Mason													0%	
	Maxwell Potter													0%	
City of San Pablo	**Amanda Booth** (1)	1		1	1	1	1	1	1	1	1	1	1	100%	**100%**
	Karineh Samkian													0%	
City of Walnut Creek	**Neil Mock**								1	1	1	1	1	45%	**73%**
	Elisa Sarlatte													0%	
	Rinta Perkins				1	1		1						27%	
NON-VOTING															
City of Pittsburg	Jolan Longway	x		x	x	x	x	x				x	x		
PROGRAM STAFF															
Lucile Paquette		x		x	x	x	x	x	x	x	x	x	x		
Crystal O'Dell				x											
Courtney Riddle										x	x				
Rachel Kraai		x		x	x	x	x	x		x					
Beth Baldwin									x						
Adêle Ho				x	x	x		x							
Robert Alexander													x		
Erica Lashley-Cornell				x	x	x	x	x	x	x	x	x			

(1) Chair (2) Vice Chair (3) Meeting Cancelled

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PUBLIC INFORMATION/PARTICIPATION COMMITTEE FY 17-18

MUNICIPALITY	REPRESENTATIVE	JUL (3)	AUG	SEP	OCT	NOV	DEC (3)	JAN	FEB	MAR	APR (3)	MAY	JUN (3)	INDIV % ATT	MUNI % ATT
City of Antioch	**Julie Haas-Wajdowicz (2)**		1	1	1			1	1	1		1		88%	**88%**
	Phil Hoffmeister													0%	
CCC Flood Control District	**John Steere**													0%	**75%**
	AJ Iroko					1		1	1	1		1		63%	
	Cece Sellgren				1	1								25%	
Town of Moraga	**Edric Kwan**													0%	**75%**
	KC Bowman		1		1			1	1	1		1		75%	
City of Orinda	**Scott Christie**			1	1	1		1		1		1		75%	**88%**
	Larry Theis													0%	
	Jason Chen								1					13%	
City of Pittsburg	**Laura Wright (1)**		1	1	1	1		1	1	1		1		100%	**100%**
City of San Ramon	**Steven Spedowfski**		1	1		1		1						50%	**50%**
NON-VOTING															
PROGRAM STAFF															
Crystal O'Dell				x	x	x		x	x						
Courtney Riddle								x	x	x		x			
Rachel Kraai												x			
Erica Lashley-Cornell			x	x	x	x		x	x	x		x			
Adêle Ho (Consultant)			x	x	x			x							

(1) Chairperson, (2) Vice-Chairperson, (3) Meeting Cancelled

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Attachment 7.1

Bringing Back the Natives Garden Tour – 2018 Final Report

Bringing Back the Natives Garden Tour
1718 Hillcrest Road
San Pablo CA 94806
(510) 236-9558
mailto:Kathy@KathyKramerConsulting.net
http://www.BringingBackTheNatives.net

2018 Final Report

A nine-year study of water use, green waste generation, maintenance hours, and maintenance labor costs between a traditional garden and a California native plant garden was conducted by the City of Santa Monica between 2004 and 2013. ***The results of this study showed that the native garden used 83% less water; generated 56% less green waste, and required 68% less maintenance hours than the traditional garden.***

From the City of Santa Monica's garden/garden study

Why a Native Plant Garden Tour?
The spring 2018, Bringing Back the Natives Garden Tour was held in order to showcase pesticide-free, water-conserving gardens that provide habitat for wildlife, reduce solid waste, and contain 60% or more native plants.

The tour enlists local residents to demonstrate by example that seasoned and novice gardeners can garden with good results without the use of synthetic chemicals, and with minimal supplemental water, while providing food, shelter, and nesting areas for wildlife. The gardens on this tour show that it is possible to implement sustainable garden practices and still have beautiful places for people to relax in and enjoy. The goals of the Bringing Back the Natives Garden Tour are to motivate attendees to eliminate pesticide use, reduce water use, generate less solid waste, and provide habitat for wildlife in their own gardens.

Why California natives? Once established in the garden setting, California native plants need little or no summer water, as they survive naturally with only fall-to-spring rainfall. In addition to being water-conserving, California natives are hardy, and they do not require the use of pesticides and fertilizers, as many non-natives do. Native plants need less pruning than many non-natives, such as lawn, ivy, or cotoneaster, thus generating less green waste. As this terrific article

demonstrates, native plants also provide the best habitat for birds, butterflies, beneficial insects, and other forms of wildlife. (The article, "The Chickadees Guide to Gardening" will also be found at the bottom of this report.)

A nine-year study of water use, green waste generation, maintenance hours, and maintenance labor costs between a traditional garden and a California native plant garden was conducted by the City of Santa Monica between 2004 and 2013. ***The results of this study showed that the native garden uses 83% less water; generates 56% less green waste, and requires 68% less maintenance than the traditional garden.***

Bringing Back the Natives Garden Tour gardens contain minimal or no lawn. This is of particular value since the majority of the chemicals purchased by homeowners support lawn care, and the majority of water used in home gardens is applied to lawns. According to the U.S. Fish and Wildlife Service in their, "Homeowner's Guide to Protecting Frogs—Lawn and Garden Care," homeowners use up to ten times more chemical pesticides per acre on their lawns than farmers use on crops. In addition, half of the water used by the average household is applied to the landscape—with most of that water being used to keep turf green.

2018 Bringing Back the Natives Garden Tour events:
Garden Tour, Native Plant Sale Extravaganzas, and Workshops

The Bringing Back the Natives Garden Tour has now expanded its offerings to include not only the spring Tour, but also three Native Plant sales (October, Valentines Day, and the week-end of the Tour), as well as a series of workshops that are offered throughout the year. These are described below.

Garden Tour
The Fourteenth Annual Bringing Back the Natives Garden Tour, which took place on Sunday, May 6, 2018, showcased thirty seven gardens and six native plant nurseries located in seventeen cities and unincorporated areas in Alameda and Contra Costa counties (Alameda, Albany, Berkeley, Clayton, Concord, Danville, Dublin, Hayward, Kensington, Lafayette, Livermore, Moraga, Oakland, Orinda, Richmond, San Leandro, and San Lorenzo).

A variety of gardens were featured on the tour. The gardens ranged from Al Kyte's forty five year old wildlife habitat to a number of gardens that had been recently installed, and from large lots in the hills to small front gardens in the flats. Tour gardens contained everything from local native plants to the horticulturally available suite of natives from throughout California. Eleven of the gardens were designed and installed by owners, and the rest were designed

and installed by professionals. Most the gardens were landscaped with between 80% and 100% native plants.

3,137 people registered for the Tour. On the day of the event 7,575 garden visits were made. See the end of this report for a list of the number of visitors counted at each garden.

145 volunteers and 37 hosts were stationed at gardens on the day of the tour, or helped with tour preparation and clean-up. The volunteers contributed more than 600 hours of time to the tour. The hosts put in countless hours preparing for the tour, and more than 200 hours on the day of the event.

Native Plant Sale Extravaganzas
More than $24,000 worth of native plants were sold at the three Native Plant Sale Extravaganzas.

Workshops
In the fall of 2017and the spring of 2018 about a dozen native plant propagation and sustainable gardening workshops were held.

Garden Talks
50 garden talks and demonstrations on a plethora of topics were given throughout the weekend of the Tour, May 5 and 6, 2018. Talk topics included how to: retain storm water on-site; remove a lawn; design and install a drip irrigation system; select and care for native plants; design and install native plant garden; attract wildlife; choose appropriate natives; create a low-maintenance native plant garden; and receive rebates from water districts for removing lawns, among other topics.

The website
The website contains numerous photographs of all of the gardens that have ever been on the tour (information on prior tours remains accessible on the website for future reference), extensive garden descriptions, plant lists for each garden, and some garden-specific bird, butterfly, mammal, reptile, and amphibian lists, as well as resource information on how to garden with California natives. The resource information includes contact information for landscaper designers with gardens on the tour, a list of Easy-to-Grow East Bay Natives, lists of nurseries that carry native plants, lists of reference books, "How I got started gardening with native plants" essays by a number of the host gardeners, and more.

In order to attract hosts and volunteers, and to thank them for their time, two Garden Soirees—free, private tours of native plant gardens—were held in 2018. Garden Soirees offer host gardeners and volunteers the opportunity to see tour

gardens that they would otherwise miss. They also create a feeling of camaraderie between hosts and volunteers, and provide a venue for people who are both knowledgeable and passionate about gardening with natives to meet and exchange information. One Soiree was held at a garden in Contra Costa County's unincorporated area; the other took place in Moraga.

Tour Partnerships

The Bringing Back the Natives Garden Tour has created partnerships with a variety of organizations that share common values—that chemical-free and water conserving gardening preserves water quality and quantity, and creates wildlife habitat. The list of major sponsors and supporters of this year's tour includes a flood control district, one county stormwater program, three water districts, five cities, an unincorporated area, a recycling agency, and the local Fish and Wildlife Commission. The list of tour sponsors is provided below.

Sponsors of the 2018 tour

$15,000
Contra Costa Clean Water Program

$10,000
Alameda County Flood Control and Water Conservation District

$7,500
The JiJi Foundation

$5,000
Contra Costa Watershed Program

$4,000
Contra Costa Water District

$3,250
East Bay Municipal Utility District

$2,000
Bay Area Water Supply and Conservation Agency

$1,500
City of El Cerrito
City of Pittsburg

$1,350

California Native Plant Society (East Bay Chapter)

$1,000
City of Antioch
City of Walnut Creek
RecycleSmart

$750
Zone 7 Water Agency

The 2018 Tour was publicized through the following media outlets:

California Native Plant Society (East Bay Chapter)
California Native Plant Society (State office "Virtual Garden Tour)
Clayton Pioneer (April 2, 2018 issue, cover article)
Concord Pioneer (April 20, 2018 issue, page 24)
East Bay Times (April 23, 2018)
Lamorinda Weekly (April 18, 2018)
Livermore Independent (March 15, 2018)
Markets Insider (April 10, 2018)
PlantRight Interview (March 30, 2018)
Pleasanton Weekly (April 22, 2018)

The Golden Gate Audubon Blog featured an article on Tour gardens in "Gardening for the Birds" (April 6, 2018)

The 2018 Tour was also included in numerous calendar listings and on websites:
510 Families
Alden Lane Nursery
Association of Professional Landscape Designers
Bay Nature
Bonnie Bonner, Artist
California Center for Natural History
City of El Cerrito website
City of Livermore website
City of Pittsburg website
Contra Costa Water District
East Bay Municipal Utility District
Ecology Center
Garden Design On-Line

Hacienda Business Park
Independent News
Leslie Buck, Author
Mercury NewsNatural History Wanderings
Organization of Women Architects and Design Professionals
Ploughshares Nursery
Pleasanton Weekly
Recycle Smart
See California
Sustainable Contra Costa County
Yerba Buena Nursery

In addition, a webinar on the Tour was presented to the Invasive Species Council of BC. (May 1, 2018).

A PowerPoint presentation on the Tour was given to the Berkeley Rotary Club on May 2.

Art and Music in the Gardens
This year the theme of the Tour was "Art and Music in the Gardens." Numerous art activities, talks, and sales took place on the day of the tour.

Banners featuring native plants were loaned by artists from an art school in San Francisco and displayed at four gardens. On the day of the Tour, budding artists were invited to sketch Leslie Buck's Berkeley garden with the art materials provided, and hang their artwork on the house. Artist Katherine Rudebusch gave the talk "Getting started with nature journaling" in an Orinda garden. Alameda garden host Robin Heyden gave a talk on how to create mosaics for the garden.

Artwork was available for sale at a dozen gardens located in gardens in Orinda, Berkeley, Oakland, Lafayette, Alameda, Hayward,

Beautiful gardens are wonderfully complemented by live music and delicious food, and this year's Tour had options for both.

This year musicians and singers performed at a dozen gardens on Sunday, May 6.

In Richmond, at Anni Jensen and Carol Manahan's garden, Richard Morrison started the day off with a morning raga on sitar. Kensington hosts
Seibi Lee and Joel Schoolnik hosted a duo of woodwinds, with Fern Burch on clarinet and Kara Koffron on flute, who performed under a magnificent oak.

Mardi and Jeff Mertens' Berkeley garden featured musicians throughout the day. In the morning, Nina Bailey and friends played early baroque music on harpsichord, baroque oboes, and bass viol. In the early afternoon, the Redwood Renaissance Trio, Ron Cohen, and Jeff and Mardi Mertens, played on period instruments. In the later afternoon, the award-winning Barefoot Quayles performed rollicking bluegrass music.

In the Oakland gardens of Sue Duckles and Cherie Donahue visitors listened to flute duets performed by Larry Duckles and Ben Borson. Also in Oakland, gifted vocalist, guitar, banjo, cello, and piano player Helen Casabona played blues, folk, and classical music in Alan Harper and Carol Baird's garden.

Guests at Maria Sargent's Danville garden enjoyed Mike Thelen playing acoustic guitar and sing songs from the '60s and '70s.

Finally, the award-winning Stanley Middle School's "Jazz Messengers" performed in Martha and Kerwin Lee's Lafayette garden.

Host Gardeners

The gardens selected to take part in the tour are chemical-free and water-conserving landscapes that provide habitat for wildlife. Hosts were chosen because of their willingness to be on site on the day of the tour to talk with visitors about their gardens, and their enthusiasm for, and commitment to, educating others about how to garden in environmentally sensitive ways.

Host gardener recruitment began in the spring of 2017 for the 2018 tour. Potential candidates completed an application, and applicants who met the criteria received a site visit. Host criteria were as follows:

- Gardener must reside in Alameda or Contra Costa County.
- Gardener must use organic and/or natural techniques for pest control rather than synthetic pesticides.
- Garden must demonstrate water conservation techniques. Examples include mulches, groundcover plants, drip or soaker hose irrigation, and the use of plants that do not require excessive watering during the dry part of the growing season.
- Gardener must be a good ambassador for chemical-free, water-conserving gardening: enjoy educating the public; and have the knowledge base to employ natural gardening techniques and share this information with the public.
- Garden must provide food, shelter and nesting areas for wildlife.
- Garden must contain 60% or more California native plants.

- No invasive plants are found in the garden.

Host's gardening experience ranged from native plant novices to professional landscape designers. All of the host gardeners were good ambassadors for natural gardening techniques.

Host Comments from the 2018 evaluations:

1000% of the hosts who completed the on-line Tour evaluation rated the Tour "Excellent" and believed the Tour inspired and teaches people about how to garden without pesticides, while using less water.

Each tour I've been involved with has always been gratifying and reassuring in that I have done something positive.

It was nice to have so many visitors to our garden and see so much interest in native plant gardening.

This was a great experience and I just loved doing it!

Kathy you have this going like a smooth machine, good work!

I'm sure your work helps expose thousands to natives, inspiring the next generation.

Volunteer Comments from the 2018 evaluations:

98% of the volunteers who completed the on-line Tour evaluation rated the Tour "Excellent" or "Good."

76% of the volunteers who completed the on-line Tour evaluation said they had changed their gardening practices as a result of participating in the Tour.

The directions are good, the booklet is beyond excellent, the tour is so well coordinated. This garden tour is a role model for the rest of the country.

I was a greeter at the Heyden Garden in Alameda and I can tell you that the tour brought joy to lots of attendees. It was also an educational experience for them. Plenty of people taking notes about specific plants and specific landscaping best practices. Robin Heyden's talk on "Mosaics in the Garden" was very well attended and very well received.

I volunteered at Glen Schneider's garden and it was a great day! I loved my co-volunteers, I really enjoyed listening to Glen explain his garden to the visitors, I enjoyed answering the many well thought out questions including "Why should I care about planting natives in my yard?" A perfect question!

This Tour is one of the highlights of the year.

The garden where I volunteered had a photo essay of building the garden. It was a big hit and very educational.

It's fun talking to people with like interests, especially those who are just getting started with natives and are surprised at the beautiful diversity of plants we are blessed to have in California.

I am so glad to see the longevity of the tour and increasing awareness about native plants!

I learn something new every year. Last year I was inspired by the homeowners who replaced their swimming pool with water storage. This year it was the rain garden.

Excellent communications. The tour and related events are a great way to promote/grow the native plant community.

Good variety of gardens in Alameda. They gave me lots of good ideas. The hosts were so generous with their time and knowledge!

Keep up the good work. Several visitors to the garden lingered, took pictures, were planning native gardens of their own. Lots of inspiration here.

I enjoyed the many people who came by Leslie's house, and all the activities she prepared for visitors.

I loved the garden I volunteered at, Carol Baird and Alan Harper's garden, it was full of native plants galore! I learned a lot and enjoyed teaching others about the plants and some taught me as well. The hosts were pleasant and welcoming, they even provided food for volunteers.

I saw only the Niemeyer garden, where I volunteered, and it was beautiful. The clever signage she created made my volunteer assignment so much easier. The garden in full bloom was a lesson in native plant design. I feel many look at natives as majoring in green with little color. Nancy's floral display was

outstanding. While there I talked with many of the over 100 visitors. I hope to volunteer with my colleague again.

.I enjoyed the garden where I was stationed, as I could interact with multiple visitors, there was nice live music, and nature art was being sold.

I enjoyed that Mardi is so informative about everything in her garden. It's a learning experience to just be around her and listen to her responses to people's questions.

It's always a pleasure to help out at Alan and Carol's house - they're very organized, the garden is spectacular, and the visitors are delightful.

It was a privilege to help at this extraordinary garden.

Tour Survey and Evaluation

Two surveys were offered to Tour participants. The first was available as part of the registration process; it asked what people wanted to learn from the Tour.

Responses by Tour year

What do you want to learn from the tour?	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
How to select native plants	72%	83%	69%	71%	69%	59%	58%
How to reduce water use	51%	58%	57%	62%	49%	36%	37%
How to garden for wildlife	51%	56%	45%	46%	49%	46%	45%
How to reduce or eliminate pesticide use	30%	33%	25%	25%	24%	22%	21%

How to replace a lawn with a garden	30%	33%	30%	33%	26%	22%	19%
How to compost	19%	23%	18%	17%	16%	15%	15%

Post-Tour Evaluation

The second survey was e-mailed out the morning of the Tour. There were 265 responses. Below are statistics taken from the post-tour survey.

98% of those filling out the evaluations rated the tour "Excellent" or "Good."

Motivation and Behavior Change
The registrant evaluations were split up into two groups—those who had attended the tour before, and those who had not. The data for repeat registrants and first-time registrants was tabulated separately. Both categories are discussed below.

Repeat Registrants
The first column below shows the percentages of the repeat registrants who changed their gardening behaviors after attending the Bringing Back the Natives Garden Tour. The second column shows the percentage of repeat registrants who plan to change their gardening behaviors.

How do you manage your garden? (This information was taken from evaluations filled out by repeat registrants.)

ITEM	Began after participation in a previous BBTN Tour	Plan to do this
Incorporate native plants into our garden	17%	13%
Tolerate some insect damage to plants	13%	8%
Group plants of similar water needs	11%	27%
Increase the density of plantings to out-compete weeds	10%	30%
Encourage birds, butterflies, etc. with plant choices, food, shelter, and water	9%	19%
Group plants of similar water needs	9%	22%

Reduce the size of our lawn	9%	11%
Install efficient irrigation (such as drip, timers, soaker hoses)	8%	21%
Mulch with leaves, grass, wood chips, etc	6%	13%
Reduce/eliminate insecticide/herbicide use	4%	5%
Minimize hardscapes (patios, decks)	4%	8%
Compost yard waste and kitchen scraps at home	4%	10%
Grasscycle (leave grass clippings on the lawn)	4%	6%
Amend soil with compost	4%	14%

First-time registrants
The tour was highly motivating to the first time registrants who completed the evaluation.

The question was, "How do you manage your garden?" The following are the percent of people who responded that they planned to begin managing their garden in a more environmentally sound way.

ITEM	Plan to
Group plants of similar water needs	52%
Increase the density of plantings to out-compete weeds	50%
Incorporate native plants into our garden	46%
Encourage birds, butterflies, etc. with plant choices, food, shelter, and water	40%
Group plants of similar water needs	40%
Reduce the size of our lawn	38%
Install efficient irrigation (such as drip, timers, soaker hoses)	30%
Tolerate some insect damage to plants	24%
Amend soil with compost	24%
Mulch with leaves, grass, wood chips, etc	18%

Reduce/eliminate insecticide/herbicide use	16%
Minimize hardscapes (patios, decks)	14%
Grasscycle (leave grass clippings on the lawn)	12%
Compost yard waste and kitchen scraps at home	12%

Number of garden visits made on the day of the Tour
More than 7,500 garden visits were made on Sunday, May 6, 2018, the day of the Tour.

2018 Tour Gardens and Number of Visits Made

	AM visits	PM visits	Total visits
Alameda			
Susan Decker and Michael Kreuger	135	134	269
Robin and Neil Heyden	135	120	255
Michelle Minor and Milt Friedman	120	102	222
Natalie and Armand	126	82	208
Christopher Richard	117	109	226
Albany			
Sue Mellers	85	72	157
Leslie Zander	78	105	183
Berkeley			
Sallie Bryan	134	217	351
Leslie Buck			280
Steve and Judy Lipson	208	282	490
David Loeb	158	153	311
Mardi and Jeff Mertens	141	171	312
Glen Schneider	68	78	146
Delia and John Taylor	196	220	416
Wayne Whitney	101	138	239
Hayward			
Natalie Forrest	61	55	116
Kensington			
Seibi Lee and Joel Schoolnik	134	87	221

Oakland			
Carol Baird and Alan Harper	115	138	253
Sue Duckles and Cherie Donahue	91	134	225
Richmond			
Annie Jensen and Carol Manahan	155	70	225
Debbie Rheuark	80	39	119
San Lorenzo			
San Lorenzo High School's Garden and Native Plant Nursery			182
Inland Gardens			
Clayton			
Karen and Jeremy Amos	155	62	217
Lauren Kindorf	116	97	213
Kelly Marshall and Mike Weidner	117	123	240
Nancy Niemeyer	118	89	207
Danville			
Maria Sargent	55	80	135
Dublin			
Nancie Ryan	65	46	111
Lafayette			
Martha and Kerwin Lee	279	190	469
Livermore			
Cindy and David Angers	80	42	122
Carol Bruton	103	65	168
Heather and Ryan Day	100	51	151
Moraga			
Al and Barbara Kyte	201	169	370
Orinda			
Leesa Evans and Steve Danziger	317	209	526
Elizabeth O'Shea and Richard Howard	202	232	434
Pat Rudebusch	158	168	326

Totals	3708	3405	7575

When planning for a year, plant corn. When planning for a decade, plant trees.

When planning for life, train and educate people.
(Chinese proverb)

Comments from 2018 Tour attendees
The tour is amazing. Just keep it going please! It's one of the highlights of my year!

This was fantastic. This is only my second tour and I thought it was very well organized. The garden guide and descriptions were fabulous. The gardeners were warm, friendly and willing to engage. I gathered useful resources. I attended the Judith Adler talk and am very inspired to educate folks about water conservation. This was clearly well thought out and organized. Thank you. I loved it all!

The tour was super-helpful and awesome!

The gardens were amazing. I'm so inspired!!! All the owners I visited were incredibly generous with their time. They answered questions and explained some of the factors that I didn't know I should ask about (particularly: reusing the old concrete walkway in a bench, how the gray-water system worked). I really appreciated the posters with photos before, during, as things grew, and how the features are used.

Well organized, wonderful volunteers, great, friendly garden owners!

This tour increases the publics understanding of the environments we live in and how to improve them one by one.

Thank you for putting this tour on. Your efforts and the efforts of the tour hosts are greatly appreciated!

Great day! Thank you for all the hard work that must go into this spectacular event!

I love the tour each year. People are wonderful and so happy to share information!

Inspirational tour! big thanks to all the gardeners, volunteers and organizers!

Keep up the good work. We told a lot of people about this event and hopefully they'll attend next year.

This is our second tour and we loved both. Such a great opportunity to learn so much! Thank you!

Really impressed by how well organized everything was.

My husband and I have really enjoyed the tour the past 3 years we have attended. We have narrowed our focus to using native plants and yard designs to what is compatible to the amount of sunshine our yards receive and the amount of work we are willing to put into the projects. With the help of this tour, our yard will look incredible because we now know what we want.

The tours gave me ideas on how to replace grass with native low water and lowe maintenance groundcover plants instead of hardscape.

We look forward to this tour every year! Once again, job well done! We loved listening to music in the garden.

Amazing booklet!! Like that plant lists are available. Landscape architect friend loved it.

My compliments to the organizer, home owners and volunteers. Great job!

So much fun, I loved all the gardens. I am so appreciative of people who open up their homes to us!!

Thank you to all the gardeners that make the effort to beautify our area with native and low water need plants and to those who go to the extra effort of gray water use and reducing rain run-off. Thanks for letting us tour your gardens and being there to explain about your accomplishments. You are an inspiration.

Thank you so much - you've done an outstanding job!!

Excellent tour - very well organized.

Attachment:

The Chickadee's Guide to Gardening:
In Your Garden, Choose Plants That Help the Environment

By DOUGLAS W. TALLAMY MARCH 11, 2015

Credit
Courtney Wotherspoon

OXFORD, Pa. — I GREW up thinking little of plants. I was interested in snakes and turtles, then insects and, eventually, birds. Now I like plants. But I still like

the life they create even more.

Plants are as close to biological miracles as a scientist could dare admit. After all, they allow us, and nearly every other species, to eat sunlight, by creating the nourishment that drives food webs on this planet. As if that weren't enough, plants also produce oxygen, build topsoil and hold it in place, prevent floods, sequester carbon dioxide, buffer extreme weather and clean our water. Considering all this, you might think we gardeners would value plants for what they do. Instead, we value them for what they look like.

When we design our home landscapes, too many of us choose beautiful plants from all over the world, without considering their ability to support life within our local ecosystems.

Last summer I did a simple experiment at home to measure just how different the plants we use for landscaping can be in supporting local animals. I compared a young white oak in my yard with one of the Bradford pears in my neighbor's yard. Both trees are the same size, but Bradford pears are ornamentals from Asia, while white oaks are native to eastern North America. I walked around each tree and counted the caterpillars on their leaves at head height. I found 410 caterpillars on the white oak (comprising 19 different species), and only one caterpillar (an inchworm) on the Bradford pear.

Was this a fluke? Hardly. The next day I repeated my survey on a different white oak and Bradford pear. This time I found 233 caterpillars on the white oak (comprising 15 species) and, again, only one on the Bradford pear.

Playing God in the Garden

By planting productive native species, we can create life.

Why such huge differences? It's simple: Plants don't want to be eaten, so they have loaded their tissues with nasty chemicals that would kill most insects if eaten. Insects do eat plants, though, and they achieve this by adapting to the chemical defenses of just one or two plant lineages. So some have evolved to eat oak trees without dying, while others have specialized in native cherries or ashes and so on.

But local insects have only just met Bradford pears, in an evolutionary sense, and have not had the time — millennia — required to adapt to their chemical defenses. And so Bradford pears stand virtually untouched in my neighbor's yard.

In the past, we thought this was a good thing. After all, Asian ornamentals were planted to look pretty, and we certainly didn't want insects eating them. We were happy with our perfect pears, burning bushes, Japanese barberries, porcelain berries, golden rain trees, crape myrtles, privets, bush honeysuckles and all the other foreign ornamentals.

But there are serious ecological consequences to such choices, and another exercise you can do at home makes them clear. This spring, if you live in North

America, put up a chickadee nest box in your yard. If you are lucky, a pair of chickadees will move in and raise a family. While they are feeding their young, watch what the chickadees bring to the nest: mostly caterpillars. Both parents take turns feeding the chicks, enabling them to bring a caterpillar to the nest once every three minutes. And they do this from 6 a.m. until 8 p.m. for each of the 16 to 18 days it takes the chicks to fledge. That's a total of 350 to 570 caterpillars every day, depending on how many chicks they have. So, an incredible 6,000 to 9,000 caterpillars are required to make one clutch of chickadees.

And chickadees are tiny birds: just a third of an ounce. What if you wanted to support red-bellied woodpeckers in your yard, a bird that is about eight times heavier than a chickadee? How many caterpillars would that take?

What we plant in our landscapes determines what can live in our landscapes. Controlling what grows in our yards is like playing God. By favoring productive species, we can create life, and by using nonnative plants, we can prevent it.

An American yard dominated by Asian ornamentals does not produce nearly the quantity and diversity of insects needed for birds to reproduce. Some might argue that we should just let those birds breed "in nature." That worked in the past, but now there simply is not enough "nature" left. And it shows. Many bird species in North America have declined drastically in the past 40 years.

Fortunately, more and more gardeners are realizing that their yards offer one of the most empowering conservation options we have, and are sharing their properties with the nature around them.

By the way, you might assume that my oak was riddled with unsightly caterpillar holes, but not so. Since birds eat most of the caterpillars before they get very large, from 10 feet away the oak looked as perfect as a Bradford pear.

Douglas W. Tallamy, a professor of entomology and wildlife ecology at the University of Delaware, is the author of "Bringing Nature Home: How You Can Sustain Wildlife With Native Plants."

Bringing Back the Natives Garden Tour

Sunday May 6, 2018

Summary Statistics for the 2018 Bringing Back the Natives Garden Tour

- 37 gardens and 6 nurseries were showcased on the Tour
- 50 talks and demonstrations were given
- 140 volunteers made the tour possible
- 3,137 registrants
- $24,000 worth of natives sold through the spring Native Plant Sale Extravaganzas
- 7,575 garden visits were made

What do you want to learn from the tour?	
How to select native plants	58%
How to reduce water use	37%
How to garden for wildlife	45%
How to reduce or eliminate pesticide use	21%
How to replace a lawn with a garden	19%
How to compost	15%

Information taken from evaluations

98% rated the tour “Excellent” or “Very Good.”

Attachment 7.2

2017-2018 Year 1 Review - Sagent Marketing

2017-2018: Year 1: Review

Following are the year 1 goals and year 1 accomplishments. These accomplishments took place between the start of Sagent's contract, October 15, 2018 through the end of the fiscal year, June 30, 2018.

Goal 1: C.7: Broad Audience Outreach

A. *Purchase Facebook promoted posts supporting CCCWP attended events*
   a. Sagent promoted the May 24 Tarp and Secure Your load event on May 25 in partnership with Caltrans' Protect Every Drop
B. *Create social media presence on Twitter and Instagram and post timely social media content to grow social audience including Facebook and YouTube*
   a. Per program's direction, a Twitter and Instagram pages were placed on hold. It is recommended we bring these platforms up for PIP instruction and approval in Year 2.
   b. Sagent posted timely social media content on Facebook
   c. Sagent grew social audience on Facebook organically and through a "likes" campaign. Likes increased by 7.8% (from 1,242 to 1,339). *More details can be found in the appendix.*
   d. Sagent will recommend a strategy to grow YouTube channel audience
C. *Run co-branded messages on message/reader boards controlled by the County*
   a. *This effort was completed by members of the PIP committee*
D. *Purchase advertising messages on Pandora, a music streaming and automated music recommendation service with broad reach*
   a. Sagent purchased advertising messages on the music streaming service, Pandora. The ads ran from April 23 – May 28. The campaign messages on the platform encourage Contra Costa County residents to properly dispose of trash to prevent litter. **The ads delivered 555,556 impressions**. *More details can be found in the appendix.*
   b. Additionally, per PIP's request, Sagent purchased out of home advertising through gas pump toppers. The ads ran from April 23 – May 28. The campaign messages displayed on the gas pumps at 27 gas stations throughout Contra Costa County encourage Contra Costa County residents to properly dispose of their trash to prevent litter. **These ads delivered 4,188,150 impressions**. *More details can be found in the appendix.*

E. *Encourage residents and businesses to use eco-certified pest control companies employing social media, website, promoted posts, and co-branded message boards*
   a. The paid media campaign's main message is: *Pesticides Linger. Use eco-friendly products to help keep water clean.* These messages are posted to the CCCWP's Facebook page and the ads are on Pandora streaming radio targeted to lawn and garden enthusiasts, Contra Costa Times local digital paper including a 700-word article about the benefits of eco-friendly yard and garden care products and methods, and on Entercom (media vendor) digital ads targeted to

home improvement, garden, and nursery stores**. These messages delivered 1,396,790 impressions through our paid media channels**. *More details can be found in the appendix.*

F. *Partner with Caltrans "Protect Every Drop" campaign on messaging outreach materials, shared social media, and events*
    a. CCCWP adopted the Caltrans Protect Every Drop campaign. CCCWP chose to adopt the campaigns' litter and pesticides messaging and customized the messages and graphics for their own campaign efforts.
    b. Additionally, Caltrans' Spring 2018 campaign specifically targeted the Contra Costa County area for their **digital billboard and geotargeted digital ads for 1,629,593 additional impressions at no cost to CCCWP.** *More details can be found in the appendix.*
    c. Caltrans Headquarters and Caltrans District 4 invited CCCWP to their properly tarp and secure your load press event. The location for the press event was specifically chosen to be in Contra Costa County. The event will take place on Thursday, May 24 and will include a demonstration on how to properly tarp and secure truck loads.
    d. Sagent coordinated a Caltrans and CCCWP joint community clean up event at the Radke-Martinez Shoreline held on April 28, 2018. Twenty-two community volunteers showed up to the event and approximately 30 cubic yards of trash was collected from the site.

Goal 2: C.7: Place and Maintain Stormwater Issues, Watershed Characteristics, and Stormwater Pollution Prevention Alternatives on Website and Publicize

A. *Add social media links to the new homepage of the CCCWP website to build social audiences*
    a. Sagent drafted website content including recommendations for links for the community, events, get involved, residents, and schools webpages.
B. *Publicize CCCCWP on all outreach and partner materials and social media; Explore opportunities to share messages through other relevant county programs such as the Sanitation Department*
    a. The CCCWP logo and URL are included on paid media creative including the gas pump toppers and digital ads. Visiting the CCCWP website is also included as the call to action for many of the Facebook posts.
    b. Sanitation Department: This effort was completed by members of the PIP committee
C. *Ensure the resources to update and maintain content and links on the new CCCWP website.*
    a. This effort was completed by members of the Program
D. *Organize and group Pollutants of Concern on the website for ease of access to information*
    a. This effort was completed by members of the PIP committee

Goal 3. C.7: Public outreach and citizen involvement events around a variety of pollution prevention messages

A. *Identify and encourage nextdoor.com advocates to share CCCWP web and social content to educate others within their community*

CONTRA COSTA CLEAN WATER PROGRAM

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   a. This effort was completed by members of the PIP committee

B. *Partner with OPP outreach events for shared materials*
   a. This effort was completed by members of the PIP committee

C. *Continue to support Our Water Our World (OWOW) in-store POP partnership and outreach*
   a. This effort was completed by members of the PIP committee

D. *Explore partnerships with (re-established) ownyourstreets.org for oil and filter recycling in Antioch, Pittsburg, and Brentwood*
   a. This effort was completed by members of the PIP committee

E. *Increase awareness of and expand partnership with Friend of the Creek organizations and clean-up events*
   a. Sagent developed and publish Facebook posts about CCCWP's partnership with the Friends of the Creek organization and promoted the organization's clean up event including a tag/@mention of the program for increased visibility and engagement.

F. *Use expanded social media to promote involvement at events*
   a. Sagent posted messages and images about the Tarp Your Load vehicle demonstration and press event that took place together with CCCWP and Caltrans on Thursday, May 24, 2018.

G. *Increase awareness of the Bringing Back the Natives Garden Tour partnership including program ad and recognition*
   a. This was noted as a Year 2 recommendation in the strategic plan. Our *Pesticides Linger* campaign creative ran as an ad in the Bringing Back the Natives Garden Tour program. Additionally, the images used on to accompany social media posts included a copyright and mention of the Bringing Back the Natives Garden Tour program. These social media posts reached 142 people on Facebook and the ad was sent to 3,137 registrants in Contra Costa County. *More details can be found in the appendix.*

Goal 4. C.7: Encourage and support watershed collaborative stewardship efforts of community groups

A. *Continue providing grant support to the Contra Costa Fish and Wildlife Propagation Fund, which uses fines to support fish and wildlife issues affecting the County*
   a. This effort was completed by members of the PIP committee

B. *Increase partner participation with Friends of the Creek groups with shared calendars, social media posts, email blasts*
   a. Sagent developed and published Facebook posts about CCCWP's partnership with the Friends of the Creek organization and promoted the organization's clean up event including a tag/@mention of the program for increased visibility and engagement.

C. *Engage and partner with Contra Costa Health Services which is actively addressing and tracking pesticide use issues, but offers no information on their site regarding Mercury/PCBs in fish*
   a. The Contra Costa Health Services department is listed as an existing partner with CCCWP. As per the direction of PIP, existing partners in Year 1, communicated directly with PIP members. We recommend further communication, engagement, and outreach to this partner in Year 1. This extended engagement will include a strategic plan to address the pesticides issues and Mercury/PCBs in fish. During year 1, some social media messages were drafted and posted about Mercury/PCBs, but year 2 will include more messaging and shared messages with the Contra Costa Health Services.

Goal 5: C.7: Implement activities designed to increase awareness of stormwater and watershed messages targeting school-age children K-12

A. *Continue to generate awareness and participate in the Mr. Funnelhead Program targeting Oil Recycling messaging*
   a. This effort was completed by members of the PIP committee
B. *Create a separate section on the CCCWP website that communicates in youth-friendly language and branding with information, education, and activities for youth and families*
   a. This effort was completed by members of the PIP committee
C. *Create posters for display in school cafeterias*
   a. Sagent presented strategies for developing posters for display at school cafeterias. The PIP committee decided on a different approach for youth outreach. This strategy will be readdressed during year 2.

Goal 6: C.7: Conduct outreach to municipal officials

A. *Conduct an annual rate presentation with elected officials*
   a. This effort was completed by members of the PIP committee

Goal 7: C.9: Public Outreach- Pesticide Focused

A. *Provide less/non-toxic info to use in the home and home garden as well as no-till gardening (which does not require herbicides) distributed through website, e-newsletter, social media, and any approved long-form outreach materials*
   a. Sagent created a print ad promoting the use of ecofriendly garden products which was published in January in the Bringing Back the Natives Garden Tour program guide. The guide was distributed to XX people.
   b. Sagent created and published social media posts promoting the use of less or nontoxic and ecofriendly garden products and methods such as companion planting and integrated pest management and other methods. These posts were linked to the CCCWP's webpage about landscaping where the public can receive more information about this topic. These posts reached 424 people with 617 impressions. *More details can be found in the appendix.*

B. *Tag garden societies and nurseries with less/non-toxic information posted to social media about no-till gardening which does not require herbicides) for no-cost message sharing and potential to grow social audience*

a. Sagent posted images from Bringing Back the Natives garden tours in creative pieces used in our social media posts relating to using ecofriendly pesticides. These images reached 142 people through Facebook.

C. Partner with local Air Resources District and Spare the Air resource team

a. A partnership with the local Air District or Spare the Air team was not performed this fiscal year. Sagent will recommend a strategy to secure these partnerships during the next fiscal year.

Attachment 7.2

CONTRA COSTA CLEAN WATER PROGRAM

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Appendix

CONTRA COSTA CLEAN WATER PROGRAM

Spring 2018

Campaign Results

April – May

CONTRA COSTA CLEAN WATER PROGRAM

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Spring 2018 Campaign Summary

Campaign Overview

The Contra Costa County Water Program used Integrated Pest Management messages and Anti-Litter messages to drive awareness and engagement within Contra Costa County. Campaign messages were delivered to the residents of Contra Costa County using geo-fenced digital ads, keyword targeted ads, digital display, native advertising and streaming :30 audio.

Additionally, through a partnership with Caltrans, Contra Costa Clean Water Program logo was included on Protect Every Drop campaign messages on display outdoor billboards at no charge to CCCWP. This media ran during Caltrans paid media flight in March – May of 2018.

Paid Media Results

Total Impressions: 9,396,844

Total Cost: $48,738

Total Value: $67,783

Vendor	Asset	Impressions Ordered	Impressions Delivered	Cost	Total Value
All Over Media	Pump toppers	4,188,150	4,188,150	$21,706	$21,706
Entercom	Digital display	1,140,000	1,626,755	$12,500	$15,000
Contra Costa Times	Native ads and digital display	1,265,000	1,396,790	$8,650	$14,077
Pandora	:30 Streaming radio and digital display	501,255	555,556	$5,882	$6,000
Caltrans Partnership	Protect Every Drop Digital	-	515,042	-	$6,000
Caltrans Partnership	Protect Every Drop Outdoor		1,114,551		$5,000
Total	**-**	**7,094,405**	**9,396,844**	**$48,738**	**$67,783**

CONTRA COSTA CLEAN WATER PROGRAM

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Digital Media Summary

Integrated Pest Management and Anti-litter campaign messages were delivered to the residents of Contra Costa County using geo-fenced digital ads, keyword targeted ads, digital display, native advertising and streaming :30 audio.

Insights

- Top performing keyword search results were: landscaping, tree, trees, garden, hedge, plants, plant.
- Geo-fenced mobile display provided the highest CTR, indicating the target audience was reached while receptive to campaign messages.
- Caltrans PED campaign used continually optimizing display networks to deliver high engagement rates
- Contra Costa Times ran into difficulty delivering their native advertising impressions in the campaign flight window so they provided significant bonus display impressions to make good the inventory shortage.

Digital Results Summary

Ad Category	Impressions	Clicks	CTR
Geo fenced Mobile Display	776,061	984	0.13%
Keyword Targeted Display	568,528	485	0.09%
Contra Costa County Digital Display	282,166	183	0.06%
Contra Costa Times Display	552,386	423	0.08%
Contra Costa Times Native Ad	844,404	298	0.04%
Pandora Streaming Radio and Display	555,556	82	0.01%
Caltrans PED Digital Display Partnership	515,042	4,926	0.96%
Total	4,094,143	7,381	0.18%

CONTRA COSTA CLEAN WATER PROGRAM

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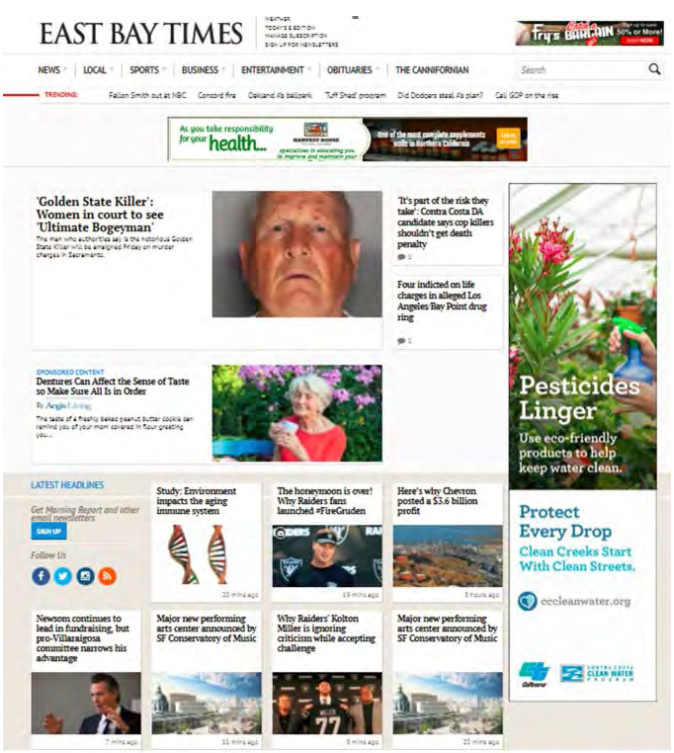
Geo-fenced Mobile Display

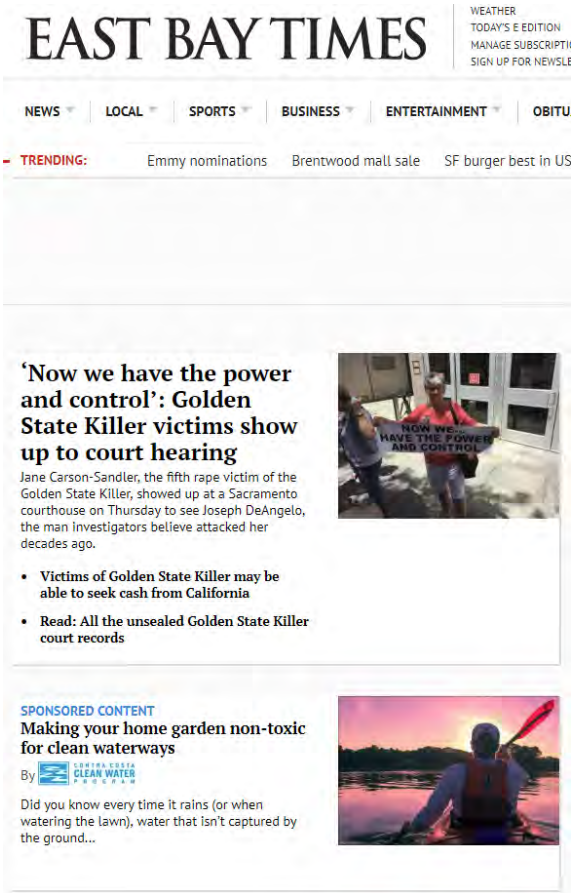
Mobile Display Ads with the integrated pest management campaign messages were geo-fenced to the following Home Improvement and Garden centers/Nurseries in Contra Costa County.

Geo Fence Location	Impressions	Clicks	CTR
The Home Depot 2090 Meridian Park Blvd Concord CA 94520	165,506	198	0.12%
Clarks Home Improvement 2863 Draper St San Pablo CA 94806	141,336	199	0.14%
Lowes Home Improvement 1935 Arnold Industrial Way Concord CA 94520	70,627	85	0.12%
Lowes Home Improvement 1951 Auto Center Dr Antioch CA 94509	69,793	103	0.15%
Lowes Home Improvement 5503 Lone Tree Way Antioch CA 94531	59,835	70	0.12%
Walmart 4893 Lone Tree Way Antioch CA 94531	48,925	61	0.12%
Orchard Supply Hardware 2227, 1440 Fitzgerald Dr Pinole CA 94564	47,443	68	0.14%
Orchard Supply Hardware 155 Crescent Plaza Pleasant Hill CA 94523	33,142	44	0.13%
The Home Depot 5631 Lone Tree Way Brentwood CA 94513	26,236	27	0.10%
The Home Depot 1037 Arnold Dr Martinez CA 94553	26,190	29	0.11%
Sloat Garden Center 2895 Contra Costa Blvd Pleasant Hill CA 94523	22,843	23	0.10%
Ace Hardware 2044 Mt Diablo Blvd Walnut Creek CA 94596	15,502	12	0.08%
Sloat Garden Center 1555 Kirker Pass Rd Concord CA 94521	13,769	18	0.13%
Ace Hardware 501 Sunset Dr Antioch CA 94509	9,389	13	0.14%
Ace Hardware 4071 San Pablo Dam Rd El Sobrante CA 94803	7,354	6	0.08%
Sloat Garden Center 6740 Alhambra Ave Martinez CA 94553	4,887	11	0.23%
Ace Hardware 3610 Pacheco Blvd Martinez CA 94553	4,827	3	0.06%
Sloat Garden Center 828 Diablo Rd Danville CA 94526	4,007	6	0.15%
Morgan's Home and Garden Center 2555 E 18th St Antioch CA 94509	2,060	6	0.29%
Perez Nursery 2601 Walnut Blvd Brentwood CA 94513	1,944	1	0.05%
The Watershed Nursery 601 Canal Blvd Richmond CA 94804	446	1	0.22%
	776,061	984	0.13%

Contra Costa Times

The Contra Costa Times used native advertising and digital display to reach residents in the county. The native advertising consisted of an article with information and links to the Contra Costa Clean Water Program's website and was used to educate and inform residents about Integrated Pest Management. Additionally, display banner ads complimented the native advertising and ran on the Contra Costa Times website and family of news properties targeted to residents of Contra Costa County. A live example of the native article can be viewed here: https://www.mercurynews.com/sponsor-content/?prx_t=CqsDAxccgArbEPA&prx_ro=s





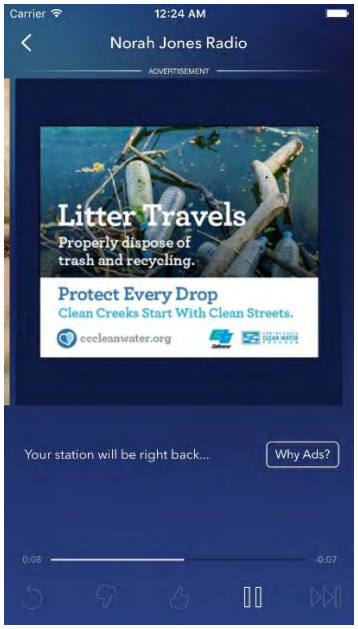
Digital Display

The Contra Costa County Water Program received additional digital display impressions through the Caltrans Protect Every Drop campaign partnership via logo inclusion on display ads in Contra Costa County.

Campaign Message	Impressions	Clicks	CTR
Tarp Your Load messaging	126,230	1,474	1.16%
General Messaging	132,501	1,211	0.91%
Trash Messaging	256,311	2,241	0.87%
Total	**515,042**	**4,926**	**0.96%**

Pandora Screenshots

Streaming :15 audio spots with companion banners ran in-app and on streaming browsers, targeted to residents in Contra Costa County.



CONTRA COSTA CLEAN WATER PROGRAM

sagent MARKETING THAT MATTERS

Outdoor media

Gas Station Pump Toppers (All Over Media)

The Contra Costa County Water Program anti-litter messaging was displayed on a total of 41 pump toppers throughout Contra Costa County.

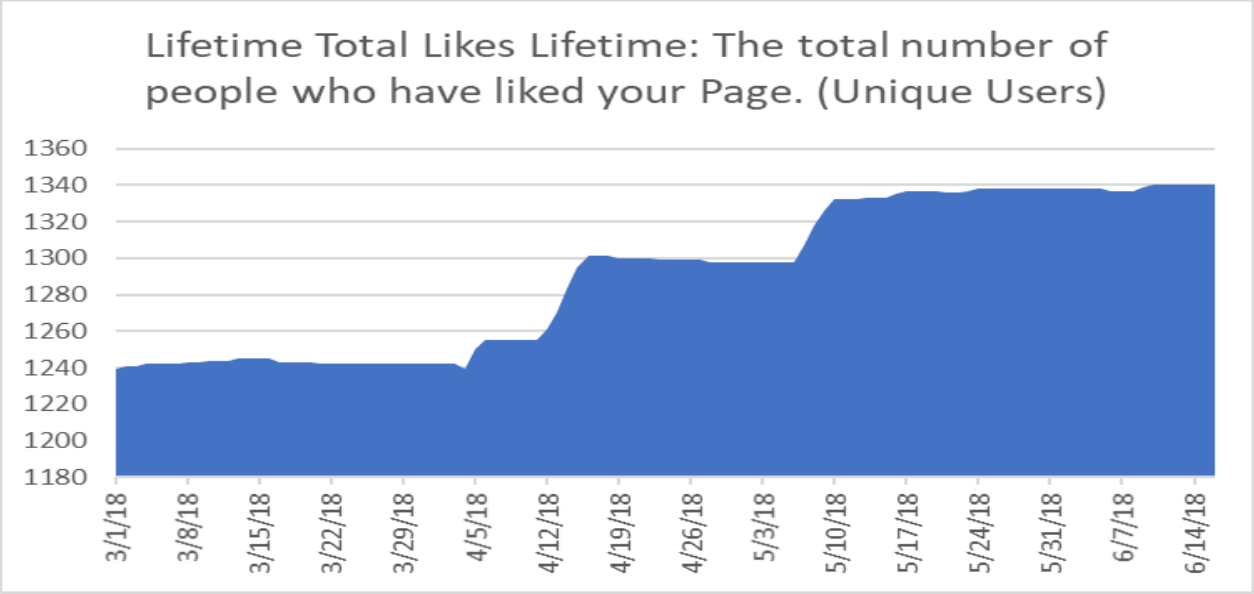
Caltrans Protect Every Drop Partnership - Billboard

As a partner to the Caltrans Protect Every Drop campaign, Caltrans provided a digital billboard display in Contra Costa County in March. The display received significant added value bonus in override plays.

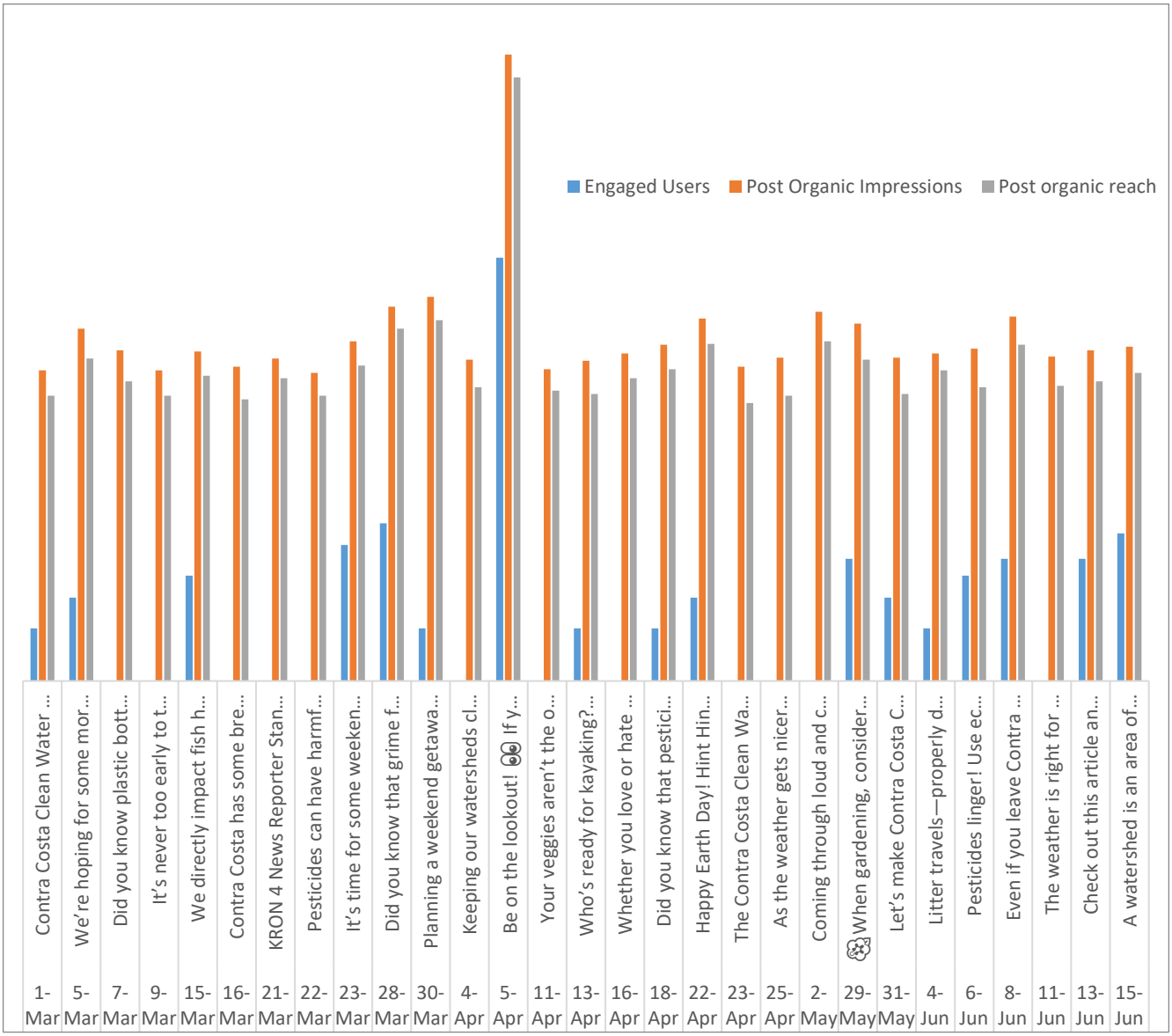
Market	Type	Location	# OF WEEKS	Planned Imps	Override Plays	Delivered Imps
Contra Costa County	Digital Bulletin	I-680 S/O Benicia Bridge F/SE	4 (March)	595,636	37,561	**1,114,551**

Facebook Analysis

Page Followers: Steady increase with spikes around campaign flight windows start.



Facebook posts were consistently received with one boosted post on 4/5 skewing reach, impressions and engagement high.



Attachment 9.1

Contra Costa Clean Water Program Our Water Our World Store Partnership Program Report, 2017-2018

OUR WATER — OUR WORLD

Contra Costa Clean Water Program

Our Water Our World Store Partnership Program Report

2017 - 2018

Report prepared by Debi Tidd

"I appreciate having access to information in the aisles as well as how beneficial natural and organic products are."
From training evaluation, OSH, Moraga

"I personally will use and read all of the info in training packet."
From training evaluation, Ace, Martinez

TABLE OF CONTENTS

OUR WATER — OUR WORLD

PROGRAM OVERVIEW

Thirty-four stores throughout Contra Costa participated in this year's OWOW Store Partnership Program. Debi Tidd was the lead on the contract, with sub-contractors Patrice Hanlon, Sheri Stoppa and Steve Griffin working at some stores and events.

Overall tasks for the program included:

- Setting up stores with shelf talkers and fact sheet racks. This includes re-setting all of the shelves at participating stores once they have received new products and re-organized their shelves.
- Providing trainings for store staff, both formal trainings and in-aisle trainings during mentoring visits for new staff.
- Mentoring store on a regular basis: replacing shelf talkers and fact sheets, working with staff and customers, following up on staff questions and bringing in new resources and seasonal handouts.
- Providing outreach: tablings and classes at stores for customers and presentations/booths at public events.
- End cap displays: Developing and/or labeling end caps and less-toxic product displays, including working with vendors on their displays.
- Providing program assessment through evaluations and surveys.

NUMBERS AT A GLANCE

- 34 stores participating in the partnership.
- 34 store set-ups with shelf talkers, fact sheet racks and supplemental materials.
- 14 store trainings provided with staff from 19 stores
- 88 staff trained at formal staff trainings; 65+ additional staff trained in-aisle during informal, mentoring visits.
- 19 outreach/tabling events for stores (approximately 760 people reached at tablings (plus an additional 500+ customers we worked with in-aisle while mentoring stores).
- Additional outreach/publicity events (5550 people reached; see locations and numbers of additional programs below).

NEW IPM ADVOCATES ADDED TO PROGRAM

Several IPM Advocates working as subcontractors retired at the end of this fiscal year. And with a growing need for more man-hours in stores, a new group of 5 IPM Advocates was trained this year. Annie Joseph and Debi Tidd led a training program for advocates in September, and then

mentored them in stores until June. Two of these new Advocates were mentored in Contra Costa stores and will continue to work on the program in the coming fiscal year.

LIST OF PARTICIPATING STORES

There were no changes to the list of partner stores this year. Here is the complete roster of stores participating in the 2017 – 2018 program:

Alamo

1. Ace Hardware

Antioch

2. Ace Hardware
3. Morgan's Home and Garden Center

Brentwood

4. Ace Hardware
5. Home Depot

Concord

6. Orchard Supply Hardware
7. Bills Ace Hardware
8. Sloat Garden Center
9. Home Depot

Danville

10. Sloat Garden Center (Diablo Road)
11. Sloat Garden Center (Camino Ramon)

El Cerrito

12. Home Depot
13. Ace Hardware

Hercules

14. Home Depot

Lafayette

15. Orchard Nursery and Florist
16. Ace Hardware

Martinez

17. Bills Ace Hardware
18. Sloat Garden Center
19. Home Depot

Moraga

20. Moraga Garden Center
21. Orchard Supply Hardware

Oakley

22. Ace Hardware

Orinda

23. McDonnell Nursery

Pinole

24. Orchard Supply Hardware

Pittsburg

25. Home Depot

Pleasant Hill

26. Orchard Supply Hardware
27. Sloat Garden Center
28. Ace Hardware

Richmond

29. Annie's Annuals
30. Urban Farmer Store

San Ramon

31. Orchard Supply Hardware
32. Home Depot

Walnut Creek

33. Ace Hardware (Mt. Diablo)
34. Ace Hardware (Ygnacio Valley Road)

PROGRAM COMPONENTS

PROGRAM ADMINISTRATION AND DEVELOPMENT

Each year we make an inventory of all OWOW materials and place orders for the year. All of these materials are labeled and stored. In addition, all of the training materials and handouts are revised and updated, and new handouts are developed in response to customer and staff questions and new pests and products. Training packet materials are copied, collated and made into packets, and training powerpoints are revised for OSH, Home Depot, and general store trainings. New sets of labels for shelf talkers are prepared based on product changes in stores. Throughout the year, we research and follow up on questions from staff and customers regarding pest management strategies and new pests. We continue to work with store managers to update them on changes in the pesticide aisle, and submit a final report on our progress at the end of the fiscal year.

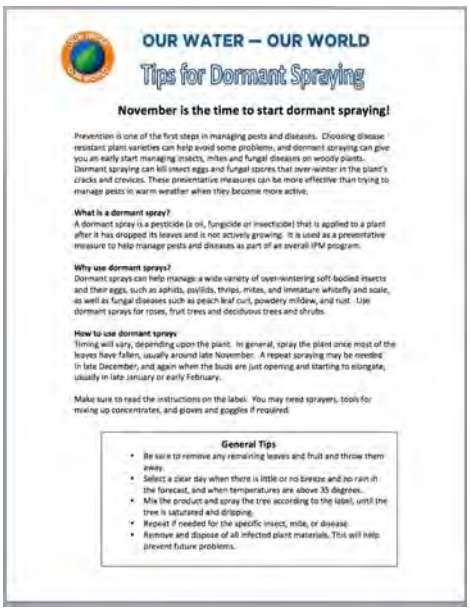
As part of the administrative tasks, supplemental handouts and materials are provided in response to store needs and seasonal changes. Some of the additional materials we developed/provided this year include:

- Dormant Spray – We have found that one of the most common problems in stores is when customers ask about peach leaf curl in Spring when it is too late to treat. We now highlight information on dormant sprays and when to spray in early fall, including adding dormant spray information to the fact sheet rack.

- Fall and Winter Garden Checklist – this handout focuses on reminding staff and customers about the correct timing for dormant spraying in hopes of reducing the use of chemicals when they are not effective. It also includes reminders about fertilizing, mulching and sanitation to reduce pests.

- Fight the Bite: Services Provided by the Contra Costa Mosquito and Vector Control District: This Contra Costa County specific handout alerts residents to the free services they can receive such as mosquito and yellowjacket management. This handout helps to reinforce less-toxic management techniques for mosquitoes, and reminds customers they can have ground yellowjacket nests removed for free by the county.

- Monthly Pest Calendar: Each year we revise the pest calendars to reflect changes in products stocked by our stores and pests/problems of concern. We have three different pest calendars - one for OSH, one for Home Depot and one general version.



OUR WATER – OUR WORLD

Tips for Dormant Spraying

November is the time to start dormant spraying!

Prevention is one of the first steps in managing pests and diseases. Choosing disease resistant plant varieties can help avoid some problems, and dormant spraying can give you an early start managing insects, mites and fungal diseases on woody plants. Dormant spraying can kill insect eggs and fungal spores that over-winter in the plant's cracks and crevices. These preventative measures can be more effective than trying to manage pests in warm weather when they become more active.

What is a dormant spray?
A dormant spray is a pesticide (a oil, fungicide or insecticide) that is applied to a plant after it has dropped its leaves and is not actively growing. It is used as a preventative measure to help manage pests and diseases as part of an overall IPM program.

Why use dormant sprays?
Dormant sprays can help manage a wide variety of over-wintering soft-bodied insects and their eggs, such as aphids, psyllids, thrips, mites, and immature whitefly and scale, as well as fungal diseases such as peach leaf curl, powdery mildew, and rust. Use dormant sprays for roses, fruit trees and deciduous trees and shrubs.

How to use dormant sprays:
Timing will vary, depending upon the plant. In general, spray the plant once most of the leaves have fallen, usually around late November. A repeat spraying may be needed in late December, and again when the buds are just opening and starting to elongate, usually in late January or early February.

Make sure to read the instructions on the label. You may need sprayers, tools for mixing up concentrates, and gloves and goggles if required.

General Tips
- Be sure to remove any remaining leaves and fruit and throw them away.
- Select a clear day when there is little or no breeze and no rain in the forecast, and when temperatures are above 35 degrees.
- Mix the product and spray the tree according to the label, until the tree is saturated and dripping.
- Repeat if needed for the specific insect, mite, or disease.
- Remove and dispose of all infected plant materials. This will help prevent future problems.

Handout on dormant spraying

OUR WATER – OUR WORLD

FIGHT THE BITE

Services Provided by the Contra Costa Mosquito and Vector Control District

Contra Costa Mosquito and Vector Control District
155 Mason Circle, Concord, CA 94520
925-685-9301/www.contracostamosquito.com

MOSQUITOES:
- Trained technicians will inspect your property for mosquito problems and provide advice on management.
- Free mosquitofish are available for pickup at the District's office.
- District entomologists will identify mosquito samples.

YELLOWJACKETS:
- District technicians will provide extermination of ground-nesting yellowjacket nests.

TICKS:
- The district will provide tick identification services for ticks mailed or brought into the District offices.

WILDLIFE:
- RATS AND MICE - Trained technicians will inspect your home to identify rodents and will advise you on prevention and control.
- SKUNKS – District staff will inspect for skunks, make recommendations on management strategies, and can loan you live-catch traps.

EDUCATION:
- View, download and print brochures on a number of pests from the website.
- Sign up for the on-line newsletter "Mosquito Bytes" full of information on protecting your home from insects and animals that can transmit disease.

Our Water Our World helps consumers find less-toxic products for use in their homes and gardens. For a copy of ***Controlling Mosquitoes Around Your Home*** and information on managing rats, yellowjackets and a wide variety of other pests, visit our web site at **www.ourwaterourworld.org**

Handout on help with yellowjackets, mosquitoes and rats

Our Water Our World
2018 OSH Monthly Pest-At-A Glance Calendar

Month	Pest/Disease	Notes	Resources	Products to Highlight
January	Dormant spray for diseases/over-wintering insects	Remove/dispose of infected plant material	OWOW Dormant Spray handout	Bonide Copper Fungicide Bonide All-Seasons Oil Monterey Liquicop
February	Rose Care	Mulch to prevent fungal diseases & conserve water	OWOW Rose Fact Sheet	Bonide All Seasons Oil Monterey Complete Disease Control
March	Snail/Slug Codling Moth	Water early morning to prevent wet foliage at night Monitor for codling moth	OWOW Snail & Slug Fact Sheet	Dragon Copper Tape Ortho Slug & Snail (pb) Codling moth trap/Codlemone (MPs)
April	Aphids	Look for ladybugs & other beneficials that eat aphids	OWOW Aphid Fact Sheet	Orchard Insecticidal Soap Orchard 8 in 1 Rose - Neem Oil Organocide Bee Safe Insect Killer and 3 in 1
May	Grubs	Buy beneficial nematodes on-line to manage young grubs	OWOW Grub Handout	Beneficial Nematodes
June	Mosquitoes	Check for standing water/screen windows	OWOW Mosquito Fact Sheet	Bonide Mosquito Plants Mosquito Bits and Dunks
July	Yellowjackets	Set traps at perimeter of yard, not near eating areas	OWOW Yellowjacket Fact Sheet	Yellowjacket traps/lures
August	Flies & Flies	Flies: remove gen waste & fallen fruit Flies: use nematodes in outdoor breeding areas	OWOW Flea Fact Sheet	Fly Traps Fly Tape Beneficial Nematodes
September	Ants- Citrus Leafminer	Use tools to seal entries Manage aphids to discourage ants Monitor for citrus leafminer	OWOW Ant Fact Sheet	Maggie's Farm No Spill Ant Kill Ortho Home Defense Crawling Bug Essential Oils Caprine jack's for leafminer
October	Rats/Mice	Pick up fallen fruit/nuts. Seal entries with foam	OWOW Rats and Mice Fact Sheet	Rat/Mouse Traps Rat X & Mouse-X
November	Dormant Spray	Use when roses and fruit trees have lost their leaves	OWOW Rose Fact Sheet	Bonide All Seasons Oil Bonide Copper Fungicide Monterey Liquicop
December	Bed Bugs	Use a monitoring tool to detect bed bugs	Bed Bugs Quick Tips	Bio-Care First Response Bed Bug Trap

Yearly pest calendar

Dormant spray signage

STORE SET-UPS

Once stores have received their new products for the year and have re-organized their shelves, usually in early spring, we do a complete re-set of all the shelf talkers. To determine which products are labeled we refer to the master "OWOW Less-Toxic Product List" which is revised each year. This list is posted on the OWOW web site and copies are also provided to stores. Fertilizers and pesticides are labeled as are some additional less-toxic pest management products that include traps, weed block, mulch, flamers, etc. During these store set-ups and re-sets, we also have the opportunity to introduce the program to new staff, answer staff questions and work with customers to answer their pest management and landscaping questions.

Each shelf talker includes a white label printed with the name of the specific product. This is to ensure that if products are moved around on shelves, there is less of a chance that the label will end up under a product not considered less-toxic. These new, smaller shelf talkers are easier to fit onto crowded shelves. With different logos on the front and back, we can still identify a product as 'eco-friendly' even when we have to put the label behind a price tag.

All of the stores have the new fact sheets and the fact sheet racks include a small display that holds the pocket guides. We currently have three different versions of the pocket guides: a general version, one for OSH and one for Home Depot. During the year we add seasonal information to the racks, and handouts with information requested by stores. In addition, we have started attaching insect identification cards and laminated sheets to racks to help staff and customers identify specific pest problems.

Shelf talkers, front and back sides

Shelf talkers in Ace store

Fact sheet rack in Ace, Concord

Shelf talker behind store label

Insect ID information attached to rack

STORE TRAININGS

Store trainings are an essential component of the OWOW program. Since the staff will be the ones to answer customer questions on a daily basis, we make sure they are comfortable directing customers to the shelf talkers, and that they are knowledgeable about the less-toxic products they carry to ensure the on-going success of the program. These trainings also help

staff to have buy-in to the program, and allow us to provide detailed information on pesticides and water pollution, identification of beneficials and pests, pest management strategies, and tips for using less-toxic products and working with customers. Trainings are often held in-aisle where we can focus on specific products.

With store staff sizes generally smaller this year, we usually train during the workday, but are sometimes able to provide trainings before or after store hours. To reach several staff members, we sometimes need to spend an entire morning or afternoon training individual staff in-aisle as they become available. Each staff member that goes through the training receives a training packet of materials, and additional packets are provided to stores as reference guides, or to be passed on to new store employees.

Every year stores order products new on the market, and store management usually request that we help familiarize staff with these new products. We provide information on how new products work and how to introduce them to customers. In addition, we provide tips on how to promote products during hot/dry years, including information on avoiding run-off during watering, utilizing efficient irrigation systems, the role of organic fertilizers, and the importance of mulch. We also discuss how dry weather impacts pest populations and plants, and the pests they were more likely to see during a drought year.

We provided 14 formal trainings to 19 key stores this year. Each training included information on:

- How pesticide pollution impacts water quality; how pesticides enter water through storm drains and sewers; pesticides of particular concern; how and where to dispose of pesticide products no longer wanted.
- Identifying common beneficials in the landscape, resources for identifying pests/beneficials and how to use them; beneficial insect plants and how these plants attract beneficials; new and invasive pests/diseases to watch for.
- The benefits of organic fertilizers, compost and mulch; nutrient run-off; chemical salt build-up from fertilizers; the importance of building up the soil foodweb.
- Techniques for managing specific pest problems and the less-toxic products they carry for these pests.
- How the basic less-toxic products and their active ingredients work, and tips for working with customers on how to choose and use products.
- How to find and use on-line resources, including the OWOW 'Ask the Expert' feature and the UC IPM website.

OSH, Moraga training

Store training Home Depot, Brentwood

STORE TRAINING PACKETS

All of the materials in the training packets are updated each year, and new handouts are added as needed. Each store that participated in training was also given a newsletter for retail stores from the UC Statewide Integrated Pest Program, laminated handouts on new pests to post, and information on new pests and seasonal concerns.

Here are the contents of the store training packets:

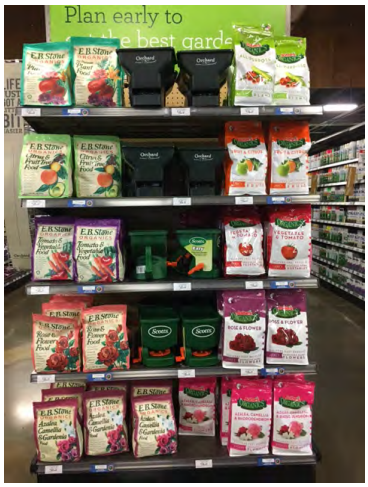
- An Introduction to the OWOW Store Partnership Program
- IPM Basics
- Reading a Pesticide Label
- How Less-Toxic Products Work
- *Ten Tips for Water-Wise Gardening* and *Protecting Landscapes During a Drought*
- Applying Beneficial Nematodes
- Laminated Good Bug/Bad Bug ID
- Lose Your Lawn the Bay-Friendly Way (sheet mulching instructions for lawn reduction projects)
- Monthly Pest-At-A-Glance Calendar
- *Pests Bugging You Pocket Guide*
- *10 Most Wanted Bugs in Your Garden* brochure
- Samples of some of the fact sheets
- Additional pest management information sheets on: citrus leaf miner, codling moth, dormant spraying, whitefly, beneficial nematodes, and bed bugs.
- OWOW Resources (websites, books, and the location of local Household Hazardous Waste Collection Sites.)

STORE MENTORING AND RETURN VISITS

Visiting stores on a continuing basis is essential – it helps us to maintain our relationship with stores and to make sure managers and staff remain committed to the program. Also, it allows us to keep all of the materials stocked and looking neat. During mentoring visits we add or replace shelf talkers, refill fact sheet racks, set-up end caps and displays, talk with store staff about new products and pests, make recommendations about new products, research and answer any staff questions, and work with customers in-aisle. At each visit we are able to keep up with moving or adding shelf talkers as the stores move or sell out of products, and gives us a chance to update staff on new and seasonal pests and to answer any questions that come up from staff and customers.

STORE DISPLAYS AND END CAPS/PARTNERSHIPS WITH VENDORS

In many stores we are able to work with the staff to recommend or choose products for end caps or displays. End caps usually focus on seasonal pest problems, and we try to make sure there are less-toxic options included. In some instances we are able to work with vendors, such as Bayer and Kellogg, to label their new lines of less-toxic products.



Organic fertilizer endcap at OSH

Rat X/Mouse X new product display at Home Depots

IN-STORE OUTREACH EVENTS

This year we participated in 19 in-store outreach events. This includes tablings where we answer customer questions, classes in stores on specific IPM topics, and outreach events like IPM days or fairs. Outreach events provide us with a wonderful opportunity to catch customers at the point of purchase. We can help them identify and manage specific pest and disease problems, direct them to less-toxic products and advise them on how to use products efficiently. We also provide a wide range of handouts and information on common pests and sustainable landscaping techniques that reduce the need for pesticides. These events keep us

visible to both staff and customers, and provide additional opportunities to work with staff and customers in-aisle.

Tables at events include a selection of products stocked by the stores, handouts on pests and beneficials, examples of water-wise and beneficial bug plants, fertilizers, supplemental seasonal materials, and sometimes live bugs. They often attract kids, which brings whole families to the table to talk about the displays.

Tabling at OSH, San Ramon

Tabling at OSH, Pinole

In addition to less-toxic pesticides, tablings promote organic fertilizers and insectary plants

Learning about 'good bugs' at a Home Depot tabling

WORKING ON THE BIG PICTURE – INCREASING PROGRAM AWARENESS AND LESS-TOXIC OPTiONS

In addition to working in the stores in the pesticide aisles, we work hard behind the scenes to partner with store managers and corporate offices. This allows us to make changes to a store's product choices on a large scale. By meeting with buyers, managers and department heads, we can introduce less-toxic products that are new on the market, and can make recommendations about toxic products they carry that could be phased out. This year has seen a rise in the

number of less-toxic products stores now stock. Here are some changes we have been working on:

- Working with Home Depot Corporate – We have been working with the staff in Home Depot's Corporate Office of Sustainability for several years to recommend which products to carry and which products to phase out. For example, we were able to get them to add Captain Jack's and Sluggo back into their stores this year. We are also able to meet with staff once a year when they visit the Bay Area to do a walk through of stores and to discuss projects we can work on for the coming year. Their staff is very appreciative of the work we do in their stores, and each year send a memo to all their store managers reminding them to support the program. This year they also sent a 'thank you' letter for the extra work we do in their stores. (Copies of both of these letters are provided at the end of this report.)

Meeting with Krissa Glasgow from Home Depot Corporate

New, green 'natural' labels being tried out in selected Home Depot stores

- Working with OSH Corporate – OSH Corporate has made a huge commitment this year to stocking and promoting less-toxic alternatives. We were able to meet with corporate buyer Andrea Kennedy and several of her staff members to help them come up with a list of products they carry to promote and to label. As part of this promotion, they have created some new shelf labels to denote organic or natural products. In addition, they have added some new signage to promote and IPM approach to pest management. They have also made the decision to stop selling any toxic products that are currently marketed under the OSH label.

Meeting with OSH Corporate buyer Andrea Kennedy

New organic labels in OSH stores

ADDITIONAL OUTREACH EVENTS

A number of special events come up each year which provide us with an opportunity to publicize and promote the OWOW Store Partnership program. While most of these events are not charged to the contract, they help us to promote and strengthen the OWOW program in several ways by helping to:

- Influence the choices store managers and buyers make in placing orders for less-toxic products for their shelves.
- Promote the stores that are part of the partnership in the community for more visibility.
- Work with the public to disseminate fact sheets and information on less-toxic products.
- Provide additional information and training to store managers and staff that have not gone through a formal training.
- Network with stores that would like to become a part of the store partnership program.

Here are some of the outreach events that we were able to be part of this year:

- <u>L & L Trade Show</u> (3,000+ participants)
  This trade show is one of the largest shows on the West Coast and is one of three trade shows we attend where stores order their pesticide, herbicide and fertilizer products for the coming year. We are the only non-vendor allowed to participate in this event, and our presence here allows us to work with many of our Bay Area stores to make recommendations before they order their pesticide products. Our OWOW booth includes fact sheets, sample shelf talkers and pocket guides, seasonal handouts, displays with photos of staff at our partner stores, samples of less-toxic product, new products on the market, and general information on less-toxic products. Each year we also make

a presentation to attendees on a less-toxic pest management topic and write an article for their trade magazine.

OWOW booth at the L&L Trade Show, Reno

OWOW booth at NorCal Trade Show, San Mateo

- NorCal Trade Show (1000+ participants)
  Many of our Bay Area stores attend this large trade show held in San Mateo. Our OWOW booth provided handouts and samples of products, highlighted new less-toxic products, directed attendees to less-toxic product manufacturers, and provided pest management solutions to questions.

- C&L Trade Show (1000+ participants)
  The third trade show we attend each year is held is Las Vegas. Since each trade show may carry different products, many of our Bay Area stores also attend this trade show to place their orders. The OWOW booth at this event highlighted new less-toxic products and provided handouts and information to store buyers.

- Sloat Garden Center –Vendor Night (60 participants)
  Every year Sloat's Corporate Office holds a vendor night. Staff from all of their stores attend to learn about products, pests and plants. We were invited again this year to set up a table where store managers and staff learned about new products and pest management strategies. We partner with 5 Sloat stores in Contra Costa County, so this event is always a great opportunity for us to meet new staff, promote the OWOW program and influence the buyer's choice of products to stock.

- IPM Summit (200 participants)
  In April, we were invited to speak on a panel at a Statewide IPM Summit held in Davis and sponsored by the UC Statewide IPM Program. IPM professionals from all over the state were in attendance. OWOW took part in a presentation and panel discussion on

the topic of successful IPM programs, and contributed to discussions on future IPM strategies.

OWOW presentation on successful IPM programs at IPM Summit

'Beneficial bugs' community outreach event at Bancroft Gardens

- Community Events and Classes (70 participants)
  Each year we speak at different events/classes in the community where we are able to provide OWOW materials and to emphasize less-toxic pest management. These events included teaching about insectary plants for Walnut Creek park volunteers, and on attracting pollinators and IPM for local cancer support groups.

- Sloat Garden Center Speaker Series (30 participants)
  Each year we provide a speaker for local Sloat stores on topics such as beneficial insects, sustainable pest management and soil health. At these talks we provide OWOW materials, promote the use of less-toxic products, and introduce customers to shelf talkers and fact sheets.

- Bay Area Pollution Prevention Group presentation (25 participants)
  In April, we were asked to give a presentation about OWOW for pollution prevention program agencies from several Bay Area countys. We were able discuss the program basics, materials and talk with individuals about the program in their county.

- Continuing Education for IPM Advocates (12 participants)
  Each year we organize continuing education classes for IPM Advocates. These additional classes cover new pests and products and up-to-date pest management strategies. These meetings also give Advocates a chance to get answers to their questions about products and pest from experts in the field. We had two Advocate meetings this year, including a full day with UC IPM in Davis.

IPM Advocate continuing education training with UC Davis Statewide IPM

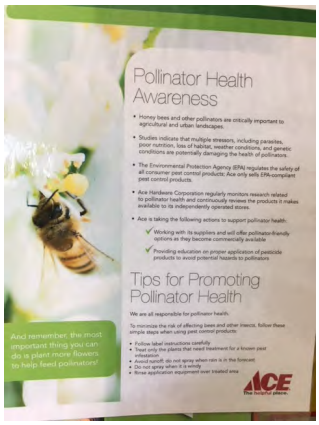
Partnering with EB Stone organic fertilizers at outreach event

GROWTH OF LESS-TOXIC PRODUCTS IN STORES

In the last couple of years we have seen a huge growth in the number of less-toxic products offered in stores. We saw several new additions again this year. Sloat stores continue to phase out the more toxic products, and to bring in the newest in less-toxic alternatives. This year they introduced a new series of less-toxic herbicides. Many of our stores expanded their rat/mouse products to include less-toxic baits like Rat X. In addition, we have seen most of our stores expand their selections of organic fertilizers, and scale back on more toxic chemical fertilizers.

Again this year, some of our stores have started to focus on promoting their less-toxic alternatives to customers, and to highlight their commitment to creating eco-friendly landscapes. Sloat nurseries celebrate a pollinator week, and have started labeling pollinator friendly plants. In selected Home Depot store, we are seeing the addition of large green shelf labels that mark a product as 'natural.' OSH stores have created new signage near their rat/mouse products that lists several IPM strategies for managing pests in addition to traps and baits. Ace stores have also started to raise awareness about pollinators and less-toxic gardening methods.

New IPM related signage in OSH stores



New pollinator awareness signage at Ace stores

PROGRAM ASSESSMENT METHODS

Each year we work on strategies for assessing the success of the OWOW program. We use a variety of methods to help us revise our program and materials, to strengthen our message, identify which products/pest management strategies we need to promote, and to determine the effectiveness of the program in disseminating information to both store staff and customers. Here are some of the tools we use:

- Pre-Training Surveys:
  Each staff member that attends training in a store is asked to fill out a brief pre-survey form before the training begins. These questions are designed to help us to determine their level of knowledge about water quality issues and less-toxic products before the information is covered in the training. We can then compare the answers to their answers on the post-training surveys to determine if the information we are presenting is clear and to add or expand information on topics that need more coverage. A summary of this year's pre-training survey results is included below.

- Post Training Surveys:
  Once staff have completed a training, they are asked to fill out a post-training survey form. This survey includes some of the same questions they were asked on the pre-survey along with additional questions to help us evaluate the effectiveness of the training, and suggestions for how the training can be improved. The results of these evaluations can be seen below, and were overwhelmingly positive.

- Numbers of customers reached by tablings and special events:
  When we provide tablings, outreach events and classes, we try to keep a tally of the number of customers we reach, the products and pests we are asked about the most, and which products we tend to recommended the most in-aisle. This year we reached about 760 customers at in-store tablings, and provided outreach at events where more than 5550 people were in attendance. In addition, whenever we are in stores, we take the time to work with customers in-aisle, which adds another 500+ contacts.

- Changing behavior around product purchases:
  Often we are able to change a customer's buying habits in aisle when we are able to get them to put more toxic pesticide choices back on the shelf in favor of less-toxic alternatives. We can also have an impact on customer buying/gardening behaviors by making sure store staff can quickly identify and direct customers to less-toxic products, and making sure that staff can easily recommend less-toxic products to their customers and explain how these products work.

- Trends/Sales of less-toxic products:
  Each year we study the trends we are seeing in new less-toxic products and influx of new pests. This helps us to influence store purchasing behavior and product choices. The numbers of less-toxic choices grew again this year in almost all of our stores,

especially in the areas of bio-pesticides, organic fertilizers and rat/mouse management. Whenever possible, we try to get an idea of sales numbers from participating stores so that we can see where there have been increases in less-toxic product sales. Past years have shown substantial rises in less-toxic product sales. We hope to be able to provide some of these numbers when they become available later in the year.

PROGRAM RECOMMENDATIONS

Here are last year's goal/recommendations, and how we followed up on them:

- Continue to update and develop all OWOW materials in stores to reflect all the new products carried by stores and seasonal pest management, including helping staff to understand how to use and sell new products.
  This year we developed and added new and seasonal information to fact sheet racks in response to staff and customer questions. Some of this information included sheets on dormant spraying, where to dispose of household hazardous waste, seasonal gardening checklists, how to plant native plants, and plants for gardening with deer. In addition, OWOW fact sheets on fleas and pest companies have been revised and will be available to add to fact sheet racks in the next couple of months.

- Continue to look for ways to promote the program and create greater visual awareness of the OWOW logo and shelf talkers.
  This year we worked at a number of community events to reach new audiences, promote the OWOW program, and to make our logo and materials more visible. In addition, we re-designed our fact sheet rack headers for OSH stores to match their new look in the aisle.

- Help stores promote seasonal products in a more efficient manner, so that customers are not applying products when they are not effective.
  This year we focused on seasonal reminders for dormant spraying by providing signage and handouts, and by helping them design end caps and displays to remind customers about the timing for spraying. We also focused on providing information on mosquitoes and the timing for management. In addition, we used our pest calendars to remind staff and customers about when to start looking for specific pests, the timing of management and the correct products to use.

Here are some tasks we will be working on for the 2017 to 2018 program:

- Continue to work with stores on promoting seasonal products to ensure customers are using the correct products only when they are effective.

- Continue to update and develop OWOW materials in stores, including developing a handout on gophers, moles and voles and revising pocket guides to reflect product changes in stores.

- Provide new resource materials for stores, including a new UC publication of laminated bug ID cards for vegetable gardens which reflects the growth in customer questions around growing edible gardens.

CLOSING

We had another great year in the stores. Each year customers seem to be more aware of the need for less-toxic alternatives, and are more receptive to our recommendations. Our work with store managers and corporate offices has grown again this year, and we were able to see the results of that work in the new products stores now stock, and in the expansion of signage and displays in store highlighting less-toxic products and beneficial insects. And we have noticed that in several stores the management have completely re-designed their pesticide sections and added new signage making products easier to find.

One of the most gratifying parts of out work in stores is seeing how grateful store staff is to have access to the information we provide both in trainings and in the fact sheet racks. Many stores have had to cut back on the size of the staff available on the sales floor, so they really appreciate the time we put in to answer customer questions in-aisle.

As always, I appreciate the opportunity to work with such a wonderful group of people!

Debi Tidd
dragonfly2010@hotmail.com
925-360-5425

"I actually really appreciated learning about our unique part of the world and that so much of our fresh water drains through our location."
Training evaluation, Sloat, Concord

APPENDIX

PRE AND POST SURVEY FORMS

A NOTE ON TRAINING ASSESSMENT FORMS

Each year we ask the store staff participating in trainings to fill out a pre and post survey form. These forms help us to assess the level of knowledge going into the training, how much of our information staff are able to process, and where we need to focus more attention. Having staff fill out these forms can be challenging. For example, some staff members come in and out of trainings because they have to leave to answer customer questions. And in some cases, English is a second language for many of the staff we work with so they have problems with the wording or complexity of the questions. But in general, the survey forms have helped us to refine the information we provide during trainings.

Again this year, the post survey evaluation forms show a substantial knowledge gain over initial question responses. For example, knowledge about local HHW locations went from 49% correct responses to 92% correct responses. Knowledge about sanitary sewer pollution jumped from 47% correct responses to 98% correct responses. The response to the trainings was overwhelmingly positive, with 100% of the trainees responding that they learned less-toxic management methods to use in-store.

Ace store staff filling out post-survey forms

Summary of Pre-Training Surveys

A total of 78 Pre-Training surveys were returned.
Here are the results of those surveys.

Survey Question	Yes	No	I Don't Know
When water enters a storm drain, does it go to a treatment plant before it reaches a creek?	9%	74%	17%
When water enters a sanitary sewer from a house drain like your sink or toilet, are pesticides removed at the sewage treatment plant before the treated water reaches a creek or Bay?	30%	47%	23%
Do you think it's more effective to treat an ant infestation with a bait station rather than a spray?	71%	9%	20%

Where is your local household hazardous waste collection facility located	49% know location (Street address and/or City)	51%

Which sentence best describes Integrated Pest Management (IPM) (choose one)

a. IPM only uses pesticides: 8 %
b. IPM uses pest identification, trapping, beneficial insects, and pesticides (only if needed): 85%
c. IPM does not rely on identifying pests/diseases before treating: 7%

Which of these is the most effective IPM method for managing aphids? (choose one)

a. Apply fast acting fertilizers: 9%
b. Spray insecticidal soaps and/or prevent ants from vegetation with tanglefoot or bait stations: 80%
c. Use products with pyrethroids: 11%

Summary of End of Training Evaluation Forms

A total of 75 Post-Training surveys were returned.
Here are the results of those surveys

Survey Question	Yes	No	I Don't Know
When water enters a storm drain, does it go to a treatment plant before it reaches a creek?	4%	96%	%
When water enters a sanitary sewer from a house drain like your sink or toilet, are pesticides removed at the sewage treatment plant before the treated water reaches a creek or Bay?	1%	98%	1%
Do you think it's more effective to treat an ant infestation with a bait station rather than a spray?	97%	3%	0%

Where is your local household hazardous waste collection facility located	92% know location (Street address and/or City)	8%

Which sentence best describes Integrated Pest Management (IPM) (choose one)

a. IPM only uses pesticides: 0%
b. IPM uses pest identification, trapping, beneficial insects, and pesticides (only if needed): 99%
c. IPM does not rely on identifying pests/diseases before treating: 1%

Which of these is the most effective IPM method for managing aphids? (choose one)

a. Apply fast acting fertilizers: 2%
b. Spray insecticidal soaps and/or prevent ants from vegetation with tanglefoot or bait stations: 96%
c. Use products with pyrethroids: 1%

Training Evaluation Questions	Disagree	Neutral	Agree
I learned at least one less-toxic management method today.	0%	0%	100%
The training will help me recommend and/or sell less-toxic products.	0%	4%	96%
I can comfortably share what I learned with customers and/or co-workers.	0%	9%	91%
I can easily use the Our Water Our World shelf-tags and fact sheets to inform customers about less-toxic pest management.	0%	4%	96%
	Too much info	Just right	Not enough info
Printed resource materials from this training were….	1%	98%	1%

Please use the back side of this survey and evaluation for additional comments or explanation.

What part of the Training was most helpful?

- Product information (how they work, which are less-toxic, what they carry): 36%
- All was helpful: 32%
- Insect/beneficial identification: 19%
- Hand outs/resources: 11%
- How and when to use to use pesticides/problem solving: 7%
- Hands on/being able to ask questions: 4%
- Info about mulch, compost and fertilizer: 4%
- Yellowjacket facts: 3%
- Rat/mouse info: 1%
- Visual aids: 1%
- New info: 1%

- Application of principles: 1%
- Knowing about the labeling system: 1%
- Access to info in aisle: 2%
- IPM basics: 1%
- Info about ant bait: 1%
- Pre and Post test to test knowl: 1%
- Info about citrus leaf miner: 1%

What part of the Training could be improved?

- Everything was good/nothing to improve: 28%
- More time: 16%
- More trainings: 3%
- More handouts: 1%
- Keep Explaining new products: 1%
- Summarize the training packets: 1%
- Bring in bugs for new employees to see: 1%
- More time for you to work with customers: 1%

COMMENTS:

- Great job
- Awesome
- Very informational
- I thought it was perfect
- Pertinent information was good
- Debi T is awesome

Thank you letter from Home Depot Corporate Office

2455 Paces Ferry Road NW • Atlanta, GA 30339
770-433-8211

Store Support Center

July 28, 2017

Geoff Brosseau
Executive Director
Bay Area Storm Water Management Agencies Association
P.O. Box 2385
Menlo Park, CA 94026

Geoff,

Thank you for the support again this year of the Our Water Our World program in our Home Depot Bay Area stores. Rainfall in the area increased gardening activity, but with that rainfall came additional pest concerns, so Annie Joseph and her team of IPM Advocates have been an important resource this selling season.

Annie and team have worked closely with our associates this year to raise awareness about the Asian Citrus Psyllid potential to spread the deadly Huanlongbing disease to citrus trees, as well as two invasive species of mosquitoes that can spread Zika Virus. The Advocates have made sure our associates are well versed in these pests, as well as services offered by local agricultural departments and local Mosquito and Vector Control Agencies. Our associates then shared this valuable information with our customers.

The team's engagement, commitment, and IPM expertise continues to make them an essential partner for our Lawn & Garden business.

On behalf of The Home Depot, thank you for your partnership and support.

Ron

Ron Jarvis
Vice President Sustainability/SER

Yearly Memo from Home Depot Corporate Office

Interoffice Memorandum

DATE: January 1, 2018

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, and may also schedule a tabling event to educate consumers. They will display a sampling of less toxic and Eco Options products off our shelves, and 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 Annie Joseph at (707) 373-9611 if you have any questions.

Thank you

Ron

Ron Jarvis
VP, Environmental Sustainability
(770) 384-4835

Attachment 10.1

Receiving Water Trash Monitoring Program Plan: 2018 Progress Report

Contra Costa Clean Water Program

Receiving Water Trash Monitoring Program Plan:
2018 Progress Report

Submitted to the San Francisco Bay Regional Water Quality Control Board

In Compliance with NPDES Permit Provision C.10.b.v Municipal Regional Stormwater Permit (Order No. R2-2015-0049)

September 2018

CONTRA COSTA CLEAN WATER PROGRAM
255 Glacier Drive • Martinez, California 94553
Tel (925) 313-2360 • Fax (925) 313-2301
www.cccleanwater.org

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Contra Costa Clean Water Program

Receiving Water Trash Monitoring Program Plan: 2018 Progress Report

September 2018

Submitted to

San Francisco Bay Regional Water Quality Control Board
In Compliance with NPDES Permit Provision C.10.b.v
Municipal Regional Stormwater Permit (Order No. R2-2015-0049)

Prepared for

Contra Costa Clean Water Program
255 Glacier Drive
Martinez, California 94553

Contra Costa Clean Water Program Participants

- Cities of: Antioch, Brentwood, Clayton, Concord, Danville (Town), El Cerrito, Hercules, Lafayette, Martinez, Moraga (Town), Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, and Walnut Creek
- Contra Costa County
- Contra Costa County Flood Control & Water Conservation District

Prepared by

ADH Environmental
3065 Porter Street, Suite 101
Soquel, California 95073

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Acronyms and Abbreviations

BASMAA	Bay Area Stormwater Management Agencies Association
Bay Area	San Francisco Bay Area
CCCWP	Contra Costa Clean Water Program
CVRWQCB	Central Valley Regional Water Quality Control Board
MRP	Municipal Regional Stormwater Permit
NPDES	National Pollutant Discharge Elimination System
RMC	Regional Monitoring Coalition
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
SOP	standard operating procedures

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1 INTRODUCTION

The Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP) (SFRWQCB, 2015) requires Permittees to develop and test a trash receiving water monitoring plan to address specific trash management questions. In fiscal year (FY) 2016-2017 (July 1-June 30), a regional receiving water trash monitoring program plan (Trash Monitoring Plan) (BASMAA, 2017) was developed by the Bay Area Stormwater Management Agencies Association (BASMAA) on behalf of all MRP Permittees. The Trash Monitoring Plan was overseen by a project management team, a stakeholder advisory group, and three technical advisors experienced in trash monitoring and monitoring program design. It was approved by the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) in January 2018 and Permittees began implementing the plan in FY 2017-2018.

This progress report provides an overview of the Trash Monitoring Plan and summarizes progress achieved by CCCWP during FY 2017-2018 in pilot testing monitoring protocols. This report also outlines future efforts to monitor the levels of trash in receiving waters of the San Francisco Bay Area (the Bay Area) through FY 2019-2020.

1.1 MRP Provision

Contra Costa County lies within the jurisdictions of both the San Francisco Bay (Region 2) and Central Valley (Region 5) Regional Water Quality Control Boards (SFRWQCB and CVRWQCB, respectively). Municipal stormwater discharges in Contra Costa County are regulated by the requirements of both the MRP for urban stormwater in Region 2 (Order No. R2-2015-0049), and the East Contra Costa County municipal NPDES permit (Central Valley Permit) in Region 5 (Order No. R5-2010-0102). This progress report is submitted in compliance with MRP Provision C.10.b.v.

1.2 Management Questions

To the extent possible, the Trash Monitoring Plan was designed to answer the following trash management questions posed in the MRP:

- Are trash discharges from a Permittee's jurisdiction causing or contributing to adverse trash impacts in receiving water(s)?
- Is trash present in receiving water(s), including transport from one receiving water to another (e.g., from a creek to a San Francisco Bay segment) at levels that may cause adverse water quality impacts?
- Are there sources outside of a Permittee's jurisdiction that are causing or contributing to adverse trash impacts in receiving water(s)?
- Have a Permittee's trash control actions effectively prevented trash within a Permittee's jurisdiction from discharging into receiving water(s)?

1.3 Reporting Requirements

In accordance with the MRP, Permittees are required to submit a Trash Monitoring Plan progress report with the FY 2017-2018 annual report. In addition, a preliminary report on the plan must be submitted to the SFRWQCB by July 1, 2019 and a final report by July 1, 2020.

In FY 2017-2018, BASMAA approved a regional project for reporting, data management, and data analysis. Reporting requirements for the regional project include preparation of the preliminary report by July 2019 and preparation of the final report by July 2020 (BASMAA, 2018a).

2 APPROACH

The Trash Monitoring Plan includes two monitoring approach methods:

- Probabilistic (random) monitoring
- Targeted monitoring

The probabilistic design is intended to establish baseline conditions in receiving waters at random locations. The targeted site design is intended to characterize receiving waters where known trash accumulation areas occur (BASMAA, 2017).

Using a combination of the two monitoring approaches, the Trash Monitoring Plan is intended to identify the full range of trash conditions present in all creeks, rivers, and channels flowing through urban areas subject to MRP trash reduction requirements, as well as to identify Bay Area shorelines possibly impacted by contributions of trash from municipal stormwater discharges (BASMAA, 2018b).

2.1 Assessment Methodology

Probabilistic and targeted monitoring approaches are subject to one or both of the following types of assessment methodologies:

- Qualitative assessment
- Quantitative assessment

Qualitative assessments are visual surveys where trained personnel are assigned to document trash levels within an assessment area. Field personnel then assign a score to a site based on the trash conditions in a defined area. In general, the qualitative method can provide a cost-effective approach to evaluate changes in trash conditions in receiving waters at numerous assessment areas at high frequencies over time (e.g., evaluating seasonal and annual changes). In addition, the qualitative method is best used when attempting to detect relatively substantial changes in the levels of trash observed over a defined period (BASMAA, 2018b).

Quantitative assessments are a more comprehensive approach, as they include the measurement of trash volume collected from a specific assessment area. This method entails removing, sorting, and measuring the volume of all trash found within the assessment area of a targeted site. The quantitative assessment method is more suitable for use at assessment sites that 1) will be the focus of specific management actions, 2) are situations requiring more refined estimates of trash volumes, or 3) are projects with the goal of detecting relatively small changes in the levels of trash observed in receiving waters (BASMAA, 2017).

Qualitative monitoring is conducted at both probabilistic and targeted monitoring sites, while quantitative monitoring is conducted at targeted monitoring locations only. Both the qualitative assessment and quantitative monitoring methodologies are used at targeted sites to allow for

comparison of the two data types. As qualitative trash assessments are inherently subjective, comparing the two surveys offers an opportunity to calibrate qualitative scores against quantitative measurement results (BASMAA, 2017). All surveys include documenting site characteristics of assessment areas that may affect trash deposition (e.g., channel composition, channel sinuosity, in-stream vegetative conditions, bank slope), estimating the relative contributions from trash pathways (litter/wind, illegal dumping, illegal encampments, unknown sources), and documenting and describing the most prevalent trash items observed on-site.

2.2 Site Selection

BASMAA member agencies are conducting qualitative trash assessments at 125 probabilistic sites in urban creeks, stormwater conveyance channels, and shorelines within the Bay Area. Additionally, both qualitative and quantitative assessments are being conducted at 100 targeted site locations (BASMAA, 2017). Of those locations, CCCWP is responsible for monitoring 30 probabilistic sites and 19 targeted sites, as presented in Table 1.

Table 1. Trash Monitoring Sites Where Regional Trash Monitoring Plan is Being Implemented During MRP 2.0

County	Probabilistic Sites	Targeted Sites	Trash Booms
Alameda	30	29	2
Contra Costa	30	19	0
San Mateo	30	15	3
Santa Clara	30	32	2
Solano (Vallejo, Suisun City and Fairfield)	5	5	0
Total	125	100	7

2.3 Probabilistic-Qualitative Assessment

Probabilistic sites were selected from the established BASMAA Regional Monitoring Coalition (RMC) creek status monitoring program statistically-based sample draw. Most of these sites were previously sampled by Permittees under the creek status monitoring program, and generally represent accessible locations where trash monitoring can occur. In addition to previously monitored locations, non-wadable and tidally influenced sites were added back into the list of eligible sites. These sites had previously been eliminated, since they did not meet the requirements of the creek status monitoring protocol. After reincorporation of non-wadable and tidally influenced locations, a total of 64 available probabilistic creek, channel and shoreline locations were presented in their original order and reevaluated for suitability of monitoring under the Trash Monitoring Plan (BASMAA, 2017).

Following the establishment of an available site list, office evaluations were conducted to re-establish private property permission and obtain encroachment permits, where needed. Field reconnaissance was

performed to confirm the assessment areas were physically accessible and safe, with special attention paid to high flow conditions during the wet season. Using GIS software and field reconnaissance results, 30 sites were finalized with four additional backup locations selected for monitoring over the course of the project. The finalized probabilistic site list is included in Section 3 as Table 3.

2.4 Targeted-Quantitative Monitoring

All targeted monitoring locations were selected by Permittees from an existing list of creek, channel, and shoreline locations where trash is known to regularly accumulate and is periodically removed via organized removal activities (BASMAA, 2017). Following the establishment of an assigned site list, office evaluations were performed to confirm no additional private property permissions were needed, and all necessary permits were obtained. Field crews performed field reconnaissance to verify assessment areas were physically safe, as well as to visually estimate the current trash volumes on-site for field staffing requirements and scheduling purposes. The finalized targeted site list is included in Section 3 as Table 5.

2.4.1 Hot Spots

As part of MRP Provision C.10.c, BASMAA member agencies are required to clean 193 trash hot spots at least once per year for the term of the permit. Trash hot spots are sections of creek or shoreline impacted by trash that are at least 300 feet of creek length or 600 feet of shoreline length. The sections of creek should be cleaned to a level of “no visual impact” and may overlap areas selected for targeted quantitative monitoring or be selected independently based on past hot spot locations or appropriately selected to address present management questions. Under the MRP, CCCWP Permittees are required to clean 37 trash hot spots annually. Under the East County Permit, CCCWP Permittees are required to clean 10 trash hot spots annually. A subset of these trash hot spots were selected for targeted monitoring (BASMAA, 2018a).

2.4.2 Trash Booms

Some Permittees have installed booms or barriers to control, contain, deflect or exclude floating trash and debris from entering downstream waterbodies (BASMAA, 2017). No trash booms are present in Contra Costa and therefore the Trash Monitoring Plan does not require CCCWP to conduct this type of monitoring.

2.5 Frequency/Schedule

Trash monitoring will be conducted during both wet and dry seasons, from October 2017 to February 2020. During this time, probabilistic site locations will be monitored a total of five times (two dry season and three wet season events), and targeted sites will be monitored a total of two times (two dry season events). Table 2 presents a summary of the planned timing and frequency of monitoring events at each probabilistic and targeted site.

Table 2. Method and Frequency of Monitoring Events

Season	Number of Qualitative Assessments at each Probabilistic Site (n=30 sites)	Number of Qualitative Assessments and Quantitative Monitoring Events at each Targeted Site (n=19 sites)
2017-2018 Wet Season (Oct 1-Apr 30)	1	-
2018 Dry Season (May 1-Sep 30)	1	1
2018-2019 Wet Season (Oct 1-Apr 30)	1	-
2019 Dry Season (May 1-Sep 30)	1	1
2019-2020 Wet Season[1] (Oct 1-Feb 29)	1	-
Totals	5	2

1 It is assumed monitoring will end by February 2020 to conduct data analysis and interpretation and prepare the final report due July 1, 2020 (BASMAA, 2017).

2.6 Training and Coordination

Data quality objectives for the Trash Monitoring Plan include a strong emphasis on training and oversight. An initial field training event to develop and test quantitative assessment protocols was conducted in collaboration with the City of San Jose on September 13, 2017 (BASMAA, 2018a). Over the course of the 2017-2018 wet season, individual field team members participated in various assessment and inter-calibration field training events. Quality assurance and quality control procedures implemented over the course of the project are described in more detail in Section 4.3.

3 PROGRESS TO DATE

CCCWP completed the first round of qualitative assessments at 30 probabilistic sites during FY 2017-2018. The second round of qualitative assessments began near the end of the fiscal year (10 of 30 probabilistic sites were completed prior to June 30, 2018). Additionally, targeted monitoring locations were selected for all 19 sites, with qualitative and quantitative assessments at targeted locations scheduled for completion during the 2018 dry season. A map displaying the spatial distribution of all finalized probabilistic and targeted monitoring locations is presented in Figure 1.

3.1 Qualitative Assessments

The first of five rounds of qualitative assessments was completed at all 30 probabilistic sites during the 2017-2018 wet season. The finalized probabilistic site list, position coordinates, and receiving water type (creek or shoreline) are presented in Table 3.

Probabilistic sites were established to define current baseline conditions in receiving waters. At these probabilistic locations, only visual qualitative assessments are required. Qualitative trash assessments were performed following various wet weather events (i.e., after storms that generated at least 0.5 inch of precipitation) between November 20, 2017 and March 20, 2018 (BASMAA, 2018b).

Qualitative assessments estimate the level of trash observed within a defined area at a site using a numerical scale ranging from 1 (low) to 12 (very high). Numerical trash scores are then separated into four trash condition categories: low (1-3), moderate (4-6), high (7-9), and very high (10-12). Table 4 presents definitions of the various trash condition categories.

The low trash level condition category is defined as having effectively no or very little trash. Sites designated with a low trash level score contain small amounts of trash upon closer inspections of stream banks, and the site could effectively be cleaned by one individual within 30 minutes (BASMAA, 2018b).

Moderate trash levels are considered predominantly free of trash except for a few littered areas. At first glance, trash is evident in low levels in some areas. After close inspection, small levels of trash are evident on stream banks and within the stream channel. On average, all trash could be cleaned up by two individuals within 30 minutes to one hour (BASMAA, 2018b).

Figure 1. Overview of Probabilistic and Targeted Monitoring Sites in Contra Costa County

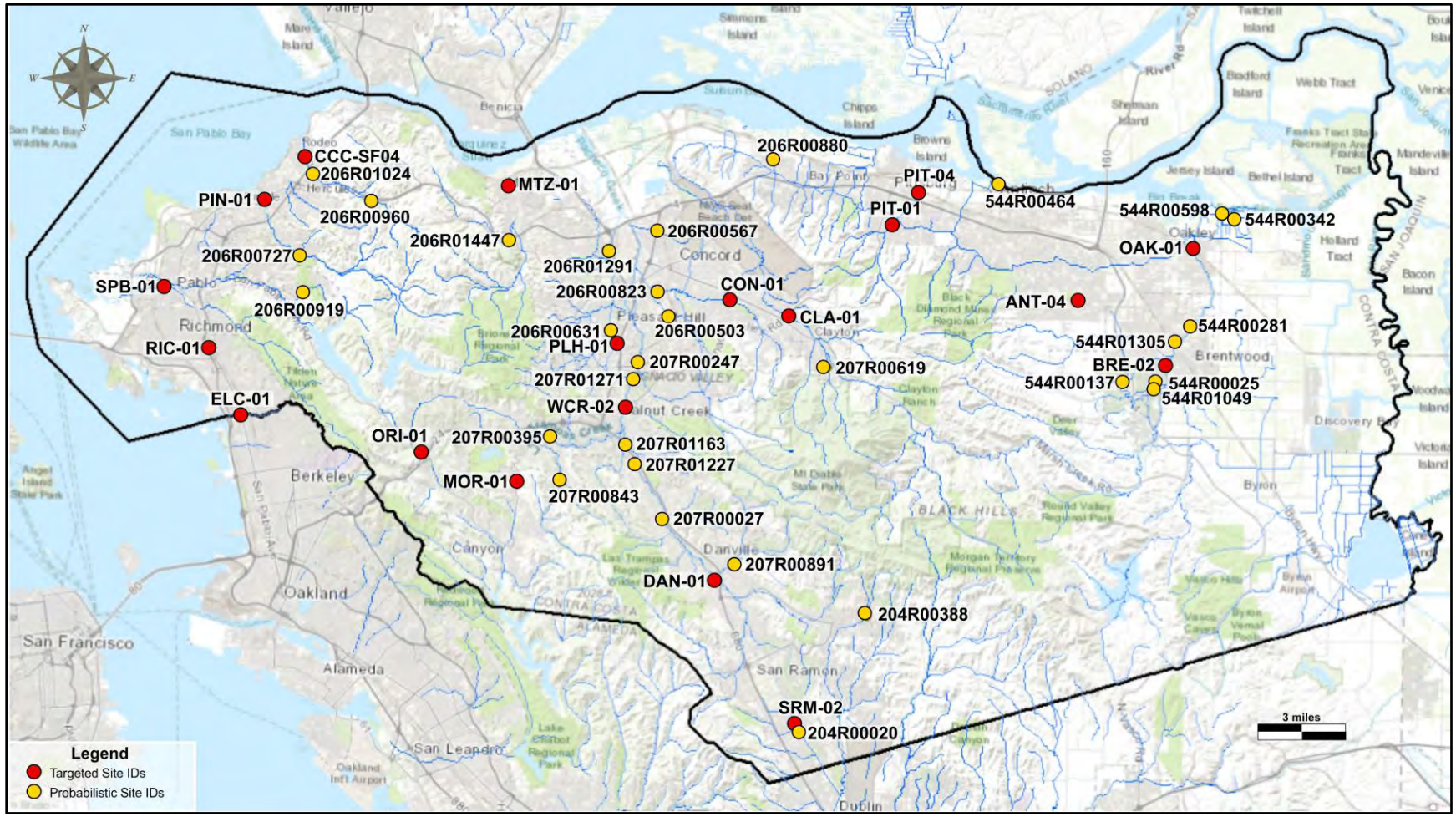

Table 3. Probabilistic Site Locations and Receiving Water Type in Contra Costa County

Permittee	Site ID	Site Name	Latitude	Longitude	Creek	Shoreline
Antioch	544R00464	Sacramento/San Joaquin Delta	38.02287	-121.82035		X
Brentwood	543R00137	Deer Creek	37.92211	-121.74002	X	
Brentwood	544R00025	Dry Creek	37.92297	-121.7189	X	
Brentwood	544R00281	Lower Marsh Creek	37.95238	-121.69678	X	
Brentwood	544R01049	Dry Creek	37.92213	-121.71938	X	
Brentwood	544R01305	Lower Marsh Creek	37.94454	-121.70527	X	
Clayton	207R00619	Donner Creek	37.92852	-121.92762	X	
Concord	207R00503	Pine Creek	37.95234	-122.02984	X	
Concord	207R00567	Tributary of Walnut Creek	37.99528	-122.03836	X	
Concord	207R00823	Galindo Creek	37.96493	-122.03602	X	
County	206R01024	Rodeo Creek	38.01993	-122.2592	X	
County	207R00027	San Ramon Creek	37.85048	-122.03107	X	
County	207R00880	Tributary of Suisun Bay	38.03292	-121.96469	X	
County	207R01291	Grayson Creek	37.98503	-122.06891	X	
Danville	204R00388	West Branch Alamo Creek	37.80352	-121.89936	X	
Danville	207R00891	Green Valley Creek	37.82838	-121.98444	X	
Hercules	206R00960	Rodeo Creek	38.00768	-122.22185	X	
Lafayette	207R00395	Las Trampas Creek	37.89066	-122.10258	X	
Lafayette	207R00843	Grizzly Creek	37.86806	-122.09589	X	
Martinez	207R01447	Franklin Creek	37.99012	-122.13346	X	
Oakley	544R00342	Dutch Slough	38.00704	-121.66883		X
Oakley	544R00598	Dutch Slough	38.00974	-121.67785		X
Pinole	206R00727	Pinole Creek	37.97913	-122.26646	X	
Pleasant Hill	207R00631	East Branch Grayson Creek	37.94515	-122.06595	X	
Richmond	206R00919	Castro Creek	37.9603	-122.2637	X	
San Ramon	204R00020	South San Ramon Creek	37.74518	-121.94104	X	
Walnut Creek	207R00247	Walnut Creek	37.92925	-122.04751	X	
Walnut Creek	207R01163	San Ramon Creek	37.88713	-122.05534	X	
Walnut Creek	207R01227	San Ramon Creek	37.87703	-122.04847	X	
Walnut Creek	207R01271	Walnut Creek	37.92031	-122.05124	X	

Table 4. Description of Trash Condition Categories

Trash Condition Category Numerical Score			
Low 1 2 3	**Moderate** 4 5 6	**High** 7 8 9	**Very High** 10 11 12
▪ Effectively no or very little trash ▪ On first glance, little or no trash is visible ▪ Little or no trash is evident when streambed and stream banks are closely examined for litter and debris ▪ One individual could easily remove all trash observed within 30 minutes	▪ Predominantly free of trash except for a few littered areas ▪ On first glance, trash is evident in low levels ▪ After close inspection, small levels of trash are evident in stream bank and/or streambed ▪ On average, all trash could be removed by two individuals within 30 minutes to one hour ▪ Approximately 2 to 3 times more trash than the low condition category	▪ Predominantly littered except for a few clean areas ▪ On first glance, trash is evident in moderate levels along streambed and banks ▪ Evidence of site being used by people: scattered cans, bottles, food wrappers, plastic bags, etc. ▪ On average, would take a more organized effort (more than two people, but less than five) to remove all trash from the area; removal of trash would take 30 mins to 2 hours ▪ Approximately 2 to 6 times more trash than the moderate condition category	▪ Trash is continuously seen throughout the assessment area ▪ On first glance, trash distracts the eye ▪ Substantial levels of litter and debris in streambed and banks ▪ Evidence of site being used frequently by people (e.g., many cans, bottles, food wrappers, plastic bags, clothing, piles of garbage and debris) ▪ On average, would take many people (more than five) during an organized effort to remove all trash from the area; removal of all trash would take > 2 hours ▪ Approximately 2 times more trash than the high condition category

High trash levels are predominantly littered except for a few clean areas. Trash is evident upon first glance in moderate levels along the streambed and banks. There is clear evidence of the site being used or occupied by people, such as scattered cans, bottles, plastic bags, and illegal encampments. On average, it would take a more organized effort to remove all trash from the area. Removal of trash would take 30 minutes to two hours for a crew of two to four people (BASMAA, 2018b).

Very high trash levels are defined by substantial levels of litter and debris in streambeds and banks. The trash is continuously visible throughout the assessment area, and there is evidence the site is frequently being used or continuously occupied by people. On average, it would take many people (more than five) more than two hours to remove all trash in the assessment area (BASMAA, 2018b).

Following the designation of a site's trash level condition category and numerical score, field staff estimated the percent contribution from the four trash transport pathways: litter/wind, illegal encampments, illegal dumping, and other (e.g., stormwater and unidentifiable upstream sources).

3.2 Quantitative Assessments

No quantitative assessments took place during the 2017-2018 wet season. Quantitative assessments are scheduled to take place at targeted sites during the dry seasons of FY 2018 and 2019.

A targeted site list for quantitative assessments was finalized and is presented below in Table 5.

Table 5. Targeted Site Locations in Contra Costa County

Permittee	Site ID	Creek Name	Latitude	Longitude
Antioch	ANT-04	East Antioch Creek	37.96412	-121.76829
Brentwood	BRE-02	Lower Marsh Creek	37.93242	-121.71118
Clayton	CLA-01	Mt. Diablo Creek	37.95424	-121.95318
Concord	CON-01	Galindo Creek	37.96150	-121.99198
County	CCC-SF04	Rodeo Creek	38.02876	-122.26465
Danville	DAN-01	Tributary of San Ramon Creek	37.82000	-121.99700
El Cerrito	ELC-01	Cerrito Creek	37.89846	-122.30177
Martinez	MTZ-01	Alhambra Creek	38.01709	-122.13661
Moraga	MOR-01	Laguna Creek	37.86787	-122.12470
Oakley	OAK-01	Lower Marsh Creek	37.99157	-121.69598
Orinda	ORI-01	San Pablo Creek	37.88064	-122.18677
Pinole	PIN-01	Pinole Creek	38.00689	-122.28986
Pittsburg	PIT-01	Kirker Creek	38.00140	-121.88754
Pittsburg	PIT-04	Kirker Creek	38.01610	-121.87010
Pleasant Hill	PLH-01	East Branch Grayson Creek	37.93794	-122.06363
Richmond	RIC-01	Baxter Creek	37.93140	-122.32304
San Pablo	SPB-01	Wildcat Creek	37.96180	-122.35284
San Ramon	SRM-02	South San Ramon Creek	37.74690	-121.94232
Walnut Creek	WCR-02	Walnut Creek	37.90562	-122.05744

Quantitative assessments at targeted sites are intended to identify trash pathways, measure trash volumes, and document the five most prevalent trash items within targeted assessment areas. A schedule of proposed monitoring dates for quantitative assessments is presented in Section 4.

3.3 Summary of Lessons Learned

Based on slightly differing interpretations of the Trash Monitoring Plan by BASMAA Permittees, as well as consultants acting on behalf of the Permittees, minor revisions were made to the data collection forms of the qualitative assessments after the first round of monitoring at probabilistic sites. An important revision was made to clarify the description of trash source categories to ensure all Permittees' field crews assigned litter/wind sources versus other/unknown sources in the same manner. Refer to Section 4.4 for a description of additional modifications to protocols.

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4 NEXT STEPS

Trash monitoring and assessment data collection will continue during both wet and dry seasons through most of the permit term. The Trash Monitoring Plan schedule for key action items is presented in Table 6.

Table 6. Receiving Water Trash Monitoring Program Schedule

Date	Action
Dry Season 2018 (May 1, 2018-September 30, 2018)	1 qualitative assessment – 30 probabilistic sites 1 qualitative and 1 quantitative assessment – 19 targeted sites
September 30, 2018	Final progress report to be submitted
Wet Season 2018-2019 (October 1, 2018-April 30, 2019)	1 qualitative assessment – 30 probabilistic sites
Dry Season 2019 (May 1, 2019-September 30, 2019)	1 qualitative assessment – 30 probabilistic sites 1 qualitative and 1 quantitative assessment – 19 targeted sites
July 1, 2019	Submittal of preliminary program report to SFRWQCB
Wet Season 2019 -2020 (October 1, 2019-February 29, 2020)	1 qualitative assessment – 30 probabilistic sites
May 2020	Peer review of monitoring / assessment results
July 1, 2020	Submittal of final program report to SFRWQCB

4.1 Qualitative Trash Assessments

Qualitative trash assessments at probabilistic sites will continue over the course of two more wet seasons (2018-2019 and 2019-2020) and two more dry seasons (2018 and 2019). Qualitative trash assessments at targeted sites will begin during the 2018 dry season.

4.2 Quantitative Trash Monitoring

Quantitative trash monitoring will begin during the 2018 dry season. The start date of assessments was July 12, 2018. Quantitative trash assessments will continue through the dry season, with anticipated work dates at targeted locations presented below (Table 7).

Table 7. Site Location and Projected Assessment Date at Targeted Monitoring Sites in Contra Costa County

Permittee	Site ID	Creek Name	Anticipated Date of Assessment
Antioch	ANT-04	East Antioch Creek	08/16/18
Brentwood	BRE-02	Lower Marsh Creek	08/15/18
Clayton	CLA-01	Mt. Diablo Creek	08/14/18
Concord	CON-01	Galindo Creek	08/14/18
County	CCC-SF04	Rodeo Creek	07/12/18
Danville	DAN-01	Tributary of San Ramon	08/07/18
El Cerrito	ELC-01	Cerrito Creek	08/09/18
Hercules	HER-01	Ohlone Creek	08/22/18
Martinez	MTZ-01	Alhambra Creek	08/22/18
Moraga	MOR-01	Laguna Creek	08/08/18
Oakley	OAK-01	Lower Marsh Creek	08/15/18
Orinda	ORI-01	San Pablo Creek	08/08/18
Pinole	PIN-01	Pinole Creek	08/28/18
Pittsburg	PIT-01	Kirker Creek	08/16/18
Pittsburg	PIT-04	Kirker Creek	09/12/18
Pleasant Hill	PLH-01	East Branch Grayson Creek	08/21/18
Richmond	RIC-01	Baxter Creek	08/23/18
San Pablo	SPB-01	Wildcat Creek	08/29/18
San Ramon	SRM-02	South San Ramon Creek	08/07/18
Walnut Creek	WCR-02	Walnut Creek	08/21/18

4.3 Quality Assurance and Data Management

Trash monitoring assessments described in this progress report are managed and conducted by CCCWP, who maintains a role and responsibility to ensure the effective implementation of the Trash Monitoring Plan.

Qualitative trash assessments that began on November 20, 2017 followed quality assurance procedures defined in the Monitoring Program Plan before, during, and after data was collected. These procedures included, but were not limited to, the following:

- Specifying data definitions
- Training of field crew personnel on the various sampling protocols
- Secondary checking of data entered from field logs to electronic format
- Checking for missing or irregular data entries
- Checking for outliers via graphical displays of the recorded data

The recorded data was transferred to appropriately formatted Excel© spreadsheets and will eventually be transferred to California Environmental Data Exchange Network (CEDEN) trash data template files, as

specified in the Trash Monitoring Plan. With assistance from its monitoring contractor, a database for archival of the data is currently under development by CCCWP as well.

The Monitoring Program Plan requires that as a measure of precision, duplicate measurements be made at 10 percent of trash assessment events. During the first set of assessments, three duplicate measurements from the 30 assessed sites were performed. As the metric for precision of these duplicate assessments is not yet defined, the three duplicate measurements have not yet been analyzed quantitatively.

The plan also includes a section on training of volunteers in the trash assessment methods developed and tested as part of this monitoring program. Volunteers will be provided with the finalized versions of the qualitative and quantitative protocols and associated SOPs. It is anticipated that volunteers will receive training on these protocols at some future point in time.

4.4 Modifications to Protocol – Pathways and Vegetative Cover

Based on lessons learned from the first round of qualitative trash monitoring events, minor refinements were made to the qualitative assessment portion of the standard operating procedures (SOP) of the Trash Monitoring Plan (BASMAA, 2018b). The refinements primarily involved improving the data collection forms, adding data fields associated with site characterization and revising the categories for vegetative condition assessment. The assessment area section of the form was updated to include a measurement of bankfull width, and additional categories were added to include a more comprehensive list of nearby land uses that may impact the assessment area (BASMAA, 2018a). In addition, text was added to the SOP clarifying the delineation of assessment areas at shoreline locations. No changes to the quantitative monitoring portion of the data collection form and SOP had been made at this time. The revised data collection form and SOP were redistributed to field staff and all revisions will be applied for assessments conducted at both probabilistic and targeted sites during future monitoring events (BASMAA, 2018a).

4.5 Regional Project

In addition to conducting trash receiving water monitoring per MRP requirements, Permittees are also coordinating with San Francisco Estuary Institute and Southern California Coastal Water Research Project on the California Trash Monitoring Methods Project, which is funded by the California Ocean Protection Council. The goal of the three-year Trash Monitoring Methods Project is to develop and test processes for monitoring trash in California using a set of standardized practices to be established and used throughout the state. Project coordination between Permittees, San Francisco Estuary Institute, and Southern California Coastal Water Research Project is scheduled to continue at selected targeted sites through the project term to at least 2020 (BASMAA, 2018a).

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5 REFERENCES

BASMAA. 2017. Bay Area Stormwater Management Agencies Association. *Receiving Water Trash Monitoring Program Plan for the San Francisco Bay Region.* Version 1. October 2017.

BASMAA. 2018a. Bay Area Stormwater Management Agencies Association. Draft Progress Report Text – Trash Receiving Water Monitoring Program Plan. Prepared by EOA. July 2018.

BASMAA. 2018b. *Standard Operating Procedures and Data Collection Forms for Qualitative Trash Assessments and Quantitative Trash Monitoring in Receiving Waters*. Version 2. July 2018.

SFRWQCB. 2015. California Regional Water Quality Control Board, San Francisco Bay Region, Municipal Regional Stormwater NPDES Permit, Order No. R2-2015-0049, Permit No. CAS612008. November 19, 2015.

Attachment 12.1

Mercury and PCBs Watershed/Management Areas, Control Measures, and Load Reduction – Update 2018

CONTRA COSTA
CLEAN WATER
PROGRAM

MERCURY AND PCBS WATERSHED/MANAGEMENT AREAS, CONTROL MEASURES, AND LOAD REDUCTION – UPDATE 2018

Submitted in Compliance with Provision C.11.a.iii.(3), C.11.b.iii.(2), C.12.a.iii.(3), and C.12.b.iii.(2)

Municipal Regional Stormwater Permit
NPDES Permit No. CAS612008
Order No. R2-2015-0049

September 14, 2018

The Contra Costa Clean Water Program – A Municipal Stormwater Program consisting of Contra Costa County, its 19 Incorporated Cities/Towns, and the Contra Costa County Flood & Water Conservation District

This report is submitted by the agencies of the

CONTRA COSTA CLEAN WATER PROGRAM

Program Participants:

- Cities of: Antioch, Brentwood, Clayton, Concord, Danville (Town), El Cerrito, Hercules, Lafayette, Martinez, Moraga (Town), Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon and Walnut Creek
- Contra Costa County
- Contra Costa County Flood Control & Water Conservation District

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Report Prepared By:

Geosyntec Consultants

on behalf of the
Contra Costa Clean Water Program

LIST OF ACRONYMS

BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practices
CCCWP	Contra Costa Clean Water Program
GI	Green Infrastructure
GIS	Geographic Information System
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
PCBs	Polychlorinated Biphenyls
POC	Pollutants of Concern
POTW	Publicly Owned Treatment Works
ROW	Right-of-Way
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
TMDL	Total Maximum Daily Load
W/MA	Watershed / Management Area
WY	Water Year

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1 INTRODUCTION

1.1 Purpose

This *Mercury and PCBs Watershed/Management Areas*, *Control Measures, and Load Reduction – Update 2018* report was prepared by the Contra Costa Clean Water Program (CCCWP) per the Municipal Regional Permit (MRP) for urban stormwater issued by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB; Order No. R2-2015-0049). This report fulfills the requirements of MRP Provisions C.11.a.iii.(3), C.11.b.iii(2), C.12.a.iii.(3), and C.12.b.iii.(2) for updating the list of control measures reported in 2017 as necessary to account for new control measures and to report loads reduced by these control measures using the approved Interim Accounting Methodology (BASMAA, 2017).

The following MRP reporting requirements are addressed within this report:

- The list of Watershed/Management Areas (W/MAs) where control measures are currently being implemented or will be implemented during the term of the Permit;
- The number, type, and locations and/or frequency (if applicable) of control measures;
- A cumulative listing of all potentially PCBs-contaminated sites Permittees have referred to the SFBRWQCB to date, with a brief summary description of each site and where to obtain further information;
- The description, scope, and start date of PCBs control measures;
- For each structural control and non-structural best management practice (BMP), interim implementation progress milestones (e.g., construction milestones for structural controls or other relevant implementation milestones for structural controls and non-structural BMPs) and a schedule for milestone achievement;
- Clear statements of the roles and responsibilities of each participating Permittee for implementation of identified control measures; and
- Mercury and PCBs loads reduced using the approved assessment methodology to demonstrate cumulative mercury and PCBs load reduced from each control measure implemented since the beginning of the Permit term, including supporting data and information necessary to substantiate the load reduction estimates.

This report is organized into the following sections:

1. Introduction and Background – This section describes requirements for managing mercury and PCBs per the TMDLs and the MRP, followed by the management approach that will be implemented by the CCCWP Permittees. This approach includes delineation of W/MAs based on screening of priority parcels in Old Industrial land classification for likelihood of ongoing PCBs discharge and implementation of control measures. Roles and responsibilities are also described in this section.
2. Control Measures Overview – This section provides a general description of the types of control measures that are currently being implemented or will be implemented by the Permittees during this and future permit terms to control PCBs and mercury, and any specific assumptions used for load reduction accounting.
3. Watersheds/Management Areas, Control Measures, and Schedule for each Permittee – These sections describe the Permittee-specific W/MAs and control measures identified by the Permittee that are currently being implemented or will be implemented in each W/MA during this permit term.
4. Loads Reduced – This section presents the estimates of mercury and PCBs loads reduced by the control measures that are currently being implemented within Contra Costa County and within the MRP region.

1.2 Background

1.2.1 Mercury and PCBs Total Maximum Daily Loads

Fish tissue monitoring in San Francisco Bay (Bay) has revealed bioaccumulation of PCBs, mercury, and other pollutants. The levels found are thought to pose a health risk to people consuming fish caught in the Bay. As a result of these findings, California has issued an interim advisory on the consumption of fish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act "Section 303(d) list" due to PCBs, mercury, and other pollutants. In response, the SFBRWQCB has developed Total Maximum Daily Load (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 and restore water quality.

Municipal separate storm sewer systems (MS4s) are one of the PCBs and mercury source/pathways identified in the TMDL plans. Local public agencies (i.e., Permittees) subject to requirements via National Pollutant Discharge Elimination System (NPDES) permits are required to implement control measures in an attempt to reduce PCBs and mercury from entering

stormwater runoff and the Bay. These control measures, also referred to as BMPs, are the tools that Permittees can use to assist in restoring water quality in the Bay.

1.2.2 Municipal Regional Permit

NPDES permit requirements associated with Phase I municipal stormwater programs and Permittees in the Bay area are included in the MRP, which was issued to 76 cities, counties and flood control districts in 2009 and revised in 2015[1]. Consistent with the TMDL plans, Provisions C.11.a. and C.12.a. of the MRP require the implementation of source and treatment control measures and pollution prevention strategies to reduce mercury and PCBs in urban stormwater runoff to achieve specified load reductions throughout the permit area. Specifically, the MRP requires the Permittees to:

1. Identify the watersheds or portions of watersheds (management areas) in which PCBs control measures are currently being implemented and those in which new control measures will be implemented during the term of this permit;
2. Identify the control measures that are currently being implemented and those that will be implemented in each watershed/management area;
3. Submit a schedule of control measure implementation; and

[1] The cities of Antioch, Brentwood, and Oakley, and the eastern portions of unincorporated Contra Costa County and the Contra Costa County Flood Control & Water Conservation District (the East County Permittees) are located within the jurisdiction of the Central Valley Water Board and are covered under a separate Joint Municipal NPDES Permit titled "East Contra Costa County Municipal NPDES Permit" (East County Permit), which was last reissued in September 2010 (NPDES Permit No. CAS083313, Order No. R5-2010-0102). The East County Permit expired on September 1, 2015; however, it remains in force and effect until a new permit is reissued. In October 2016, the East County Permittees requested that the Central Valley Water Board designate the San Francisco Bay Water Board as the permitting authority for MS4 discharges in eastern Contra Costa County. In response to this request, the Central Valley Water Board provided a letter, dated January 6, 2017, that documents written agreement by both Water Boards to designate the San Francisco Bay Water Board to regulate MS4 discharges from the East County Permittees under MRP 2.0 and any successor orders. This East County Permittees are implementing PCBs and mercury control measures and this document reports those implementation efforts and the associated load reductions.

4. Implement sufficient control measures to achieve the mercury and PCBs load reductions stated in the permit[2].

Provisions C.11.b. and C.12.b. of the MRP require the Permittees to estimate loads reduced by the control measures that have been implemented since the beginning of the Permit term. The MRP allows for load reductions from control measures implemented prior to the effective date of the Permit to be counted toward the required reductions of this permit term if these control measures were established or implemented during the previous permit term, but load reductions from the activity were not realized or credited during the previous permit term (e.g., they were implemented after the 2014 Integrated Monitoring Report was submitted). Therefore, control measures implemented in Fiscal Year (FY) 2013/14, FY 2014/15, FY 2015/16, FY 2016/17, and FY 2017/18 (i.e., controls measures implemented between July 1, 2013 and June 30, 2018) may be reported herein.

1.3 Approach

1.3.1 Control Measures

The urban stormwater runoff wasteload allocation for PCBs represents a 90 percent reduction from the estimated existing load. The TMDL implementation plans set roughly 20-year timelines for achieving the reductions but also incorporate an adaptive implementation planning approach. The adaptive approach consists of the development of a plan that includes early implementation actions based on existing knowledge that have a reasonable probability of success and an overview of options for future actions. For PCBs and mercury in the Bay, the immediate or early implementation actions are not expected to completely eliminate the Bay impairment. Therefore, future actions must be evaluated based on continued monitoring and response to the early implementation actions, as well as based on well-designed studies used for model refinement.

The MRP Fact Sheet notes that the initial focus of provisions C.11/12 is on measures designed to reduce PCBs, while also evaluating opportunities for mercury reduction. Implementation

[2] Table 12.1 of the MRP lists interim PCB load reduction performance criteria that Permittees should achieve during the current permit term. Provision C.11 does not list interim mercury load reduction performance criteria, except for green infrastructure implementation.

actions may fall into four categories depending on the available knowledge and confidence in a control measure's effectiveness (listed in decreasing order of confidence):

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

During the previous MRP term, Permittee effort was largely focused on gathering necessary information about control measure effectiveness through pilot projects and some focused implementation of the most effective control measures. In this term of the MRP, the emphasis has shifted towards focused and some full-scale implementation of the most effective control measures. Progress will be measured through accounting for specific load reductions as described in the report: *Interim Accounting Methodology for TMDL Loads Reduced* (BASMAA, 2017).

The Permittees, countywide stormwater programs, Bay Area Stormwater Management Agencies Association (BASMAA), SFBRWQCB, and other interested parties (e.g., the Regional Monitoring Program) began gathering data and developing an understanding of the sources and pathways for mercury and PCBs in the Bay in the late 1990's. These same parties developed a framework to address these pollutants throughout the following decade.

The Regional Stormwater Monitoring and Urban BMP Evaluation: A Stakeholder-Driven Partnership to Reduce Contaminant Loadings project funded by a State of California Proposition 13 grant and conducted by the San Francisco Estuary Institute (SFEI) defined conceptual models of sources and pathways of mercury and PCBs in Bay Area urban watersheds (McKee et al., 2006). The SFEI Proposition 13 project compiled PCBs and mercury chemical analysis results from about 600 sediment samples collected at over 360 locations throughout the Bay Area from roadways and stormwater drainage infrastructure (e.g., storm drain inlets, pump house wet wells, piping beneath manholes, and open channels) (Yee and McKee, 2010). These data supported the general hypothesis that concentrations of PCBs and mercury are elevated in specific parts of the urban landscape and showed that:

- Pollutant concentrations are highly patchy, even at moderate to small spatial (sub-kilometer) and temporal (approximately annual) scales. This patchiness reflects the episodic nature of many release and transport events and processes.
- Concentrations at sites within three kilometers of one another showed similarities in concentration, which may be due to similarities in land use, activities, or transport of shared pollutant sources.
- Individual sites and areas most contaminated with PCBs are often not those with high mercury, which is a logical finding given the different use histories and original pollutant sources.

Another outcome of the SFEI Proposition 13 project was a desktop evaluation of control measures for PCBs and mercury load reductions (Mangarella et al., 2010).

Building upon the efforts of the SFEI Proposition 13 project, BASMAA conducted an EPA grant-funded project called Clean Watersheds for a Clean Bay (CW4CB). The CW4CB project, which began in May 2010 and was completed in May 2017, is a collaboration among the MRP Permittees designed to evaluate the effectiveness of stormwater controls for PCBs and mercury. The CW4CB Project implemented a number of pilot projects for various control measures called for by the Bay PCBs and mercury TMDLs and the first-term MRP. The CW4CB work products can be found on the BASMAA webpage, http://basmaa.org/Clean-Watersheds-for-a-Clean-Bay-Project and included the following:

- Selecting five high priority subwatersheds that discharge urban runoff with PCBs and other pollutants to the Bay;
- Identifying PCBs and mercury source areas within the project subwatersheds and referring these sites to regulatory agencies for cleanup and abatement;
- Developing methods to enhance removal of sediment with PCBs and other pollutants during municipal operation and maintenance that remove sediment from streets and storm drain system infrastructure (e.g., street sweeping and storm drain cleaning);
- Treatment control measure retrofits were designed and constructed in the public right-of-way, roadways, and easements;
- Facilitating development and implementation of a regional risk communication and exposure reduction program that focuses on educating the public about the health risks

of consuming certain species of Bay fish that contain high levels of PCBs and mercury; and

- Creating public education outreach materials, project web portal, guidance manual, and technical workshops.

Monitoring data were collected for most of the pilot projects conducted as part of this project. The Permittees used the information gathered and lessons learned through the CW4CB project and the earlier projects as the basis to identify the W/MAs and control measures listed in this report.

In FY 2015/16, the CCCWP began development of a countywide Geographic Information System (GIS) pilot project focused on maintaining, analyzing, interpreting, displaying, and reporting relevant municipal stormwater program data and information related to Provisions C.10 (i.e., trash load reduction activities) and C.11/C.12 (i.e., PCBs source property identification and abatement screening activities).

With the adoption of the current MRP, the CCCWP has expanded the countywide GIS C.3 Project Tracking and Load Reduction Accounting Tool to support additional compliance activities related to: 1) C.3.b Regulated Projects reporting; 2) the C.3.j Green Infrastructure Planning and Implementation provisions; 3) the C.11 Mercury Controls and C.12 PCBs Controls provisions; and 4) C.10 Trash Load Reductions provision that provide shared benefits. This tool is critical to Permittees' ongoing work to identify watersheds and management areas where multiple-benefit control measure implementation opportunities have been identified and prioritized for implementation during this permit term and over the coming decades. Additionally, this GIS database is being used to track and map existing and future C.3 projects, allow ease of ongoing review of opportunities for incorporating GI into existing and planned Capital Improvement Projects (CIPs), and assist in the development of GI plans.

The CCCWP's stormwater GIS platform features web maps and applications created using Esri's ArcGIS Online for Organizations environment, which access GIS data, custom web services and reports that are hosted within an Amazon cloud service running Esri's ArcGIS Server technology. The CCCWP anticipates its expanded stormwater GIS platform will be an important tool for maintaining relevant stormwater data; reviewing, analyzing and displaying data geography; accounting for and assessing compliance with load reduction performance goals; and reporting. The data used for this platform originated from many sources over the last decade and is being

reviewed and updated as needed to reflect current land uses and implementation of C.3 projects as new and redevelopment occurs.

1.3.2 Watershed /Management Area Delineation

Each Permittee has created a list of W/MAs and control measures (i.e., a control measure plan that describes what, where, and when control measures will be implemented) for PCBs and mercury, provided in the sections below. The ultimate goal for the listed control measures is to achieve the Contra Costa countywide PCBs load reductions listed in MRP Tables 12.1 and Table 12.2 during this MRP term:

- 90 g/yr PCBs by 6/30/18,
- 560 g/yr PCBs by 6/30/2020, and
- 23 g/yr PCBs using green infrastructure by 6/30/2020.

A W/MA is an area where load reduction credit will be sought for PCBs or mercury control measures. The W/MAs cover all Old Industrial and Old Urban areas but may include some New Urban areas where appropriate. W/MAs were delineated using the maps showing the 2015 PCBs source property screening results (i.e. high, moderate, and low/no likelihood), known PCBs source properties (from the CW4CB Task 3 referrals, DTSC EnviroStor, and the State Water Board Geotracker), and land use categories (i.e., Old Industrial, Old Urban, New Urban, Open Space, and Other) from the Mercury and PCBs Control Measures Implementation Status Report (CCCWP, 2016). These factors were used to create approximate delineations based on the geography within each Permittee's jurisdiction. If applicable, a city's General Plan, Specific Plans, and/or Redevelopment Plans were used to form a W/MA boundary. Categorical W/MAs were also created for the non-municipally owned electrical utility (i.e., PG&E) and railroad properties (note, the categorical W/MAs can exist within or create "holes" in the other geographically-based W/MAs). The categorical W/MAs shown on the figures are preliminary and may change over time.

The W/MAs and identified control measures may also evolve over time as the Permittees learn more about these areas through implementation of the control measures. The Permittees will be developing Green Infrastructure Plans per MRP Provision C.3.j and the delineations of W/MAs in this report may also be revised as part of that planning process. Additionally, the Permittees may adjust preliminary control measure selections as lessons are learned throughout the permit term.

1.3.3 Roles and Responsibilities for Implementation of Control Measures

Table 1-1 below summarizes, for each control measure, the roles and responsibilities of the Permittees, CCCWP, and BASMAA. In a general sense, screening/sampling will primarily be conducted by the CCCWP, establishment of regional frameworks will be conducted by BASMAA, and adoption and implementation of control measures will be conducted by the Permittees.

Table 1-1: Control Measure Roles and Responsibilities

Control Measure Category	Roles and Responsibility		
	Permittee	Program	BASMAA
Source Property Identification and Abatement	• Work with Program to design monitoring program. • Prepare referral forms, including identification of enhanced O&M. • Implement enhanced O&M for referred properties.	• Design and conduct POCs monitoring. • Compile and submit referrals to SFBRWQCB in Region 2 and the CVRWQCB in Region 5. • Coordinate with BASMAA on ongoing control measure adaptive management.	• Discuss ongoing control measure implementation and adaptive management at Monitoring / Pollutants of Concern (MPC) Committee.
Green Infrastructure / Treatment Control Measures	• Prepare a GI Plan. • Implement GI projects. • Gather data on C.3 projects.	• Support GI planning. • Compile data on C.3 projects.	• Coordinate GI planning at Development Committee. • Discuss control measure implementation and adaptive management at MPC Committee.
Managing PCBs in Building Materials	• Participate in BASMAA Regional Project. • Adopt Framework.	• Assist BASMAA Regional Project.	• Develop Framework through Regional Project.
Managing PCBs in Infrastructure	• Participate in BASMAA Regional Project.	• Assist BASMAA Regional Project. • Conduct monitoring.	• Develop monitoring plan and report monitoring results via Regional Project.
Enhanced O&M	• Implement enhanced O&M where identified.	• Coordinate with BASMAA on ongoing control measure adaptive management.	• Discuss ongoing control measure implementation and adaptive management at MPC Committee.
Diversion to POTW	• Implement diversion where identified.	• Coordinate with BASMAA on ongoing control measure adaptive management.	• Discuss ongoing control measure implementation and adaptive management at MPC Committee.
Mercury Load Avoidance and Reduction	• Conduct collection events.	• Compile and track data.	• Discuss ongoing control measure implementation and adaptive management at MPC Committee.
Illegal Dumping Cleanup	• Identify illegal dumping sites. • Conduct/coordinate cleanup.	• Compile and track data.	• Discuss ongoing control measure implementation and adaptive management at MPC Committee.

Control Measure Category	Roles and Responsibility		
	Permittee	Program	BASMAA
Stockpiles, Spills, and Disposal of PCBs	• Identify facilities through routine inspections. • Conduct/coordinate cleanup. • Track OES reports and follow-up on spills with PGE.	• Compile and track data. • Coordinate w/ Permittees, BASMAA partners, SFBRWQCB, and PGE as needed.	• Discuss ongoing control measure implementation and adaptive management at MPC Committee.

In addition, the Permittees are tracking control measure implementation and reporting load reductions using the GIS C.3 Project Tracking and Load Reduction Accounting Tool, which incorporates the Interim Accounting Methodology to estimate load reductions. This report compiles and reports the county-wide list of green infrastructure projects, site referrals, and overall load reductions as well as the MRP permit area-wide overall load reductions.

Although each Permittee's administrative structure is unique, Table 1-2 summarizes, in general, the roles and responsibilities of the various city, town, or county departments that may be related to implementation of selected control measures:

Table 1-2: Permittee Department Roles and Responsibilities

Department	Typical Role / Responsibility
Public Works	• Creeks, watersheds, and stormwater management • Public facility services and maintenance • Engineering and construction services • Capital improvement projects
Community Development / Planning Department	• Planning/zoning/General Plan development • Development project review & approvals • Construction and building inspections

1.3.4 Load Reduction Methodology

MRP Provisions C.11.a and C.12.a require the Permittees to demonstrate cumulative Bay Area-wide and Program area-specific mercury and PCBs load reductions over the current permit term. MRP 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 PCBs loads reduced through implementation of pollution prevention, source control, and treatment control measures. The Permittees developed an *Interim Accounting Methodology for TMDLs*

Loads Reduced report (BASMAA, 2017) to document the load reduction accounting assessment methodology that will be used to demonstrate progress towards achieving the load reductions required in this permit term. This report was approved by the SFBRWQCB in May 2017. The Interim Accounting *Methodology* is based on relative mercury and PCBs yields from different land use categories. The method involves using default factors for PCBs and mercury load reduction credits resulting from foreseeable control measures implemented during this permit term. This report implements the Interim Accounting System to estimate the mercury and PCBs loads reduced presented in Section 23.

2 DESCRIPTION OF CONTROL MEASURES

This section provides a general description of the types of control measures that are currently being implemented or will be implemented by the Permittees during this and future permit terms to control PCBs and mercury.

2.1 Source Property Identification and Abatement

Source property 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 where sediment concentrations have been found at levels significantly above urban background levels[3]. The source property identification and abatement control measure begins with performing investigations of these "High Likelihood" areas to identify PCBs sources to the municipal storm drain system. 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 SFBRWQCB for investigation and abatement by the SFBRWQCB or another appropriate regulatory agency with investigation and cleanup authority. Source properties may include sites that were previously remediated or are currently being remediated but have PCBs soils cleanup levels that are elevated above urban background levels or may be newly identified source properties.

The Permittees will validate the existence of significantly elevated PCBs concentrations through surface soil/sediment sampling in the right-of-way or stormwater sampling in the storm drain system 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 PCBs concentrations (e.g., a sediment concentration equal to or greater than 1.0 mg/kg or a concentration greater than 0.5 mg/kg plus other lines of evidence) are present in soil/sediment from a potential source property or in stormwater samples, the Permittees will take actions to cause the property to be abated or will refer that property to the SFBRWQCB to

[3] The *Interim Accounting Methodology for TMDL Loads Reduced* report (BASMAA 2017) (see Attachment 11.1 to the CCCWP Fiscal Year 2016/17 Annual Report) 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 1,204 PCBs samples and 952 mercury samples taken within the street right-of-way, storm drain conveyance system, and private properties from 1999 through 2015.

facilitate the issuance of orders for further investigation and remediation of the subject property.

For each confirmed source property, the Permittee will implement or cause to be implemented, where appropriate, one or a combination of interim enhanced operation and maintenance (O&M) measures in the street or storm drain infrastructure adjacent to the source property during the source property abatement process to remove historically deposited sediment and/or to prevent further contaminated sediment from entering the storm drain. These enhanced O&M measures will be described in the source property referral that is sent to the SFBRWQCB. If the Permittee finds that enhanced O&M measures are not justified, the Permittee must discuss these findings with the SFBRWQCB prior to submitting the source property referral. The SFBRWQCB will review the source property referral and provide comments to the Permittee within 30 days (if needed).

For those source properties that are self-abated (i.e., by the Permittee or the property owner), the Permittee will provide the Regional Water Board with sufficient documentation that source property abatement has effectively eliminated the transport of PCBs or mercury offsite and from entering the MS4 infrastructure for all transport mechanisms that apply to the site (e.g., stormwater runoff, wind, vehicle tracking). This documentation will include information on the type and extent of abatement that has occurred (e.g., have the sources of PCBs to the MS4 been completely eliminated via capping, paving, walls, plugging/removal of internal storm drains, etc.) and any water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4, if available. The Permittees' self-abatement reports are provided in Appendix A.

The CCCWP, in collaboration with the Permittees, are conducting ongoing targeted investigation and monitoring for known or suspected source properties. Source identification is one of five priority POC management information needs required by MRP provision C.8.f. The allocation of sampling effort for POC monitoring will be described in the POC Monitoring Report, due October 15 of each year, as required by MRP provision C.8.h.iv.

The properties that have been referred to the SFBRWQCB or self-abated as of September 2018 are listed in Table 2-1 below. The Permittees' referral reports are provided in Appendix A.

Table 2-1: Contaminated Sites Referred to the SFBRWQCB and Self-Abated Properties

SITE NAME	LOCATION/APN	PROPERTY SIZE (ACRES)	YEAR REFERRED	REFERRAL OR SELF-ABATEMENT
Sims Metal Management Richmond Facility	600 South 4th Street, Richmond / 560-240-040, 560-250-027, 560-250-025	19.3	FY 2017-18	Referral
World Corp	1014 Chesley Ave., Richmond	10.44	FY 2017-18	Referral
Port of Richmond	Point Potrero Marine Terminal, Richmond	0.72	FY 2017-18	Self-Abatement
San Diego St. Transformer Spill	R.O.W. San Diego St., Richmond	0.08	FY 2017-18	Self-Abatement
Larkey Pool Renovation Project	2771 Buena Vista Ave., Walnut Creek/171-110-021	<0.01	FY 2017-18	Self-Abatement
Radiant Avenue	Radiant Avenue, North Richmond; 408-082-030	19.5	FY 2016-17	Self-Abatement
Former Molino Enterprises. Inc.	1215 Willow Pass Rd., Pittsburg; 096-091-003-2	6.0	FY 2015-16[1]	Referral
Rumrill Sports Complex (Former BNSF Railyard Site)	1509 Rumrill Blvd, San Pablo / 409-313-009; 409-313-009; 410-012-007; 410-012-008	4.45	FY 2015-16	Self-Abatement

1. This property was first referred in 2016 and was included in the 2016/2017 Annual Report. The referral included in this report has been revised.

2.2 Green Infrastructure / Treatment Control Measures

This control measure includes new development and redevelopment projects on private and public properties regulated by Provision C.3, as well as retrofit of existing infrastructure in public ROW areas and on public properties not subject to Provision C.3. See Section 3 of the Contra Costa Clean Water Program Fiscal Year 2017/18 Annual Report for further detail on C.3 implementation.

Permittees will account for implemented C.3. projects and may also account for public green infrastructure (GI) projects over this permit term to achieve the PCBs load reductions shown in MRP Table 12.2 and mercury load reductions shown in MRP Table 11.1. Permittees may also choose to report on potential GI projects that may be implemented over this permit term. As an example, these may include a project that has been planned or identified; however, funding sources for implementation have not been secured at the time of this report.

Permittees will be identifying existing C.3 projects as part of this control measure and, in compliance with the requirement of MRP Provision C.3.b.i.(2), will be tracking development projects that are subject to C.3. over this permit term.

In addition, the Permittees will be conducting an ongoing review of opportunities for incorporating GI into existing and planned capital improvement projects over this permit term (a.k.a., no missed opportunities) and developing a GI Plan for the inclusion of low impact development drainage design into storm drain infrastructure on public and private lands, including streets, roads, storm drains, parking lots, building roofs, and other storm drain infrastructure elements, in compliance with MRP Provision C.3.j.

2.3 Managing PCBs In Building Materials and Infrastructure

2.3.1 PCBs in Building Materials

During the first three years of the permit term, the Permittees will develop and implement (or cause to be developed and implemented) an effective protocol for managing materials with PCBs concentrations of 50 ppm or greater in applicable structures at the time such structures undergo demolition, so that PCBs do not enter the MS4. PCBs from these structures can enter storm drains during and/or after demolition through vehicle track-out, airborne releases, soil erosion, stormwater runoff, or improper waste disposal. Applicable structures include, at a minimum, commercial, public, institutional and industrial structures constructed or remodeled between the years 1950 and 1980 and with building materials with PCBs concentrations of 50 ppm or greater. Single-family residential and wood frame structures are exempt. A Permittee is exempt from this requirement if the only structures that existed pre-1980 within its jurisdiction were single-family residential and/or wood-frame structures[4].

The PCBs management framework will be implemented by the start of the fourth year of the permit term (i.e., July 1, 2019).

[4] Each Permittee seeking exemption from C.12.f requirements must submit in its 2017 Annual Report documentation, such as historic maps or other historic records, that clearly demonstrates that the only structures that existed pre-1980 within its jurisdiction were single-family residential and/or wood-frame structures. The City of Clayton has been approved for this exemption and documentation was included in its 2017 Annual Report.

Permittees are 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 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. This should be reported on in the 2020 Annual Reports at the regional level on behalf of all Permittees.
- In their 2016, 2017, and 2018 Annual Reports, Permittees are required to summarize the steps they have taken to begin implementing this requirement. In their 2020 Annual Reports and thereafter, Permittees are required to provide documentation of each of 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, demolition date, and brief description of PCBs control method(s) used.

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials. This Regional Project has 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. This Regional Project also includes training materials and a workshop for municipal staff and an outreach workshop for the industry on implementing the framework/protocols developed via the project. The tools and materials developed as part of the project build upon materials and outputs developed in 2010-

2011 by the San Francisco Estuary Partnership with State Water Board grant funding, called the "PCBs in Caulk Project", as well as subsequent and parallel activities by BASMAA. See Section 12 of the Contra Costa Clean Water Program Fiscal Year 2017/18 Annual Report for further details on compliance with this MRP provision. Specific activities undertaken by the Permittees are discussed in the Permittee-specific sections of this report.

2.3.2 PCBs in Infrastructure

PCBs may also be found in storm drain or roadway infrastructure in public rights-of-way such as caulk and sealants used in storm drains and between concrete curbs and street pavement. The Program and Permittees participated in a BASMAA Regional Project to characterize the levels of PCBs in caulks/sealants used in storm drains and roadway infrastructure to quantify the potential PCBs load reduction benefits that may result from public infrastructure improvements. A project report prepared by the BASMAA Regional Project is included in the Contra Costa Clean Water Program Fiscal Year 2017/18 Annual Report (See Attachment 12.3). The results of these investigations will inform further investigations of PCBs in infrastructure and the development of Permittees' GI Plans.

2.4 Enhanced Operation and Maintenance

Routine MS4 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 during this permit term.

Many of the Permittees have installed inlet-based full trash capture devices in response to the trash control requirements of MRP Provision C.10. These devices enhance the capture of sediments that may be contaminated with PCBs. In addition, these inlets are typically cleaned more frequently as a result of the installation of the full trash capture device. Therefore, the Permittees are conducting an enhanced O&M activity for each of these inlets. The load

reduction achieved by this enhanced O&M implementation effort[5] has been estimated in this annual report.

The following assumptions were used for calculating the reported loads reduced by enhanced O&M control measures:

- Inlet-Based Trash Devices Cleaning
    - Basket, connector pipe screen (CPS), and inlet filters that are listed in the AGOL system were included. The drainage area listed for each device was used for the load reduction calculation. Only operational devices installed since FY 2013-14 were included.
    - If cleanout was stated to occur three times per year, a 'quarterly' frequency was assumed for the purposes of the calculation, as three times per year is not a viable calculation option per the Interim Accounting Methodology. This assumption is assumed to be equivalent to quarterly cleanouts, as a mid-dry season cleanout occurrence is considered superfluous for the purposes of sediment removal.
    - The default trash device cleanout frequency enhancement is from annual to semi-annual, as this cleanout frequency is required by MRP Provision C.10, unless a more frequent frequency was reported by the Permittee (or no enhancement was reported).
- Street Sweeping Enhanced O&M

  One permittee, Concord, has enhanced their sweeping from None to Annually. However, an annual street sweeping frequency is not an enhancement option in the Interim Accounting Methodology. In order to consider this enhancement, the calculation used the least frequent sweeping option, Monthly, and scaled this load reduction linearly to Annual by dividing the estimated load reduced by 12.6

[5] The load reduction estimates account only for the change in inlet cleaning frequency, per the Interim Accounting Methodology, and do not estimate loads reduced due to the increase in sediment captured by the inlet-based full trash capture devices.

- Desilting

  Permittees have conducted some desilting; however, the data needed to estimate loads reduced are difficult to collect for these projects. Therefore, there is no desilting load reduction included in this annual report.

2.5 Diversion to POTW

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. A pilot diversion project was conducted at the North Richmond Pump Station, but there is no ongoing diversion.

2.6 Source Controls and Other Control Measures

2.6.1 Mercury Load Avoidance and Reduction

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. Manufacturers have significantly reduced the amount of mercury in fluorescent linear tube 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:

- Permittee-managed household hazardous waste (HHW) drop-off facilities and curbside or door-to-door pickup;

- Private business take-back and recycling programs (e.g., Home Depot); and,
- Private waste management services for small and large businesses.

The Program is conducting a Methylmercury Control Study in response to Provision C.11.i of the East County Permit[6], which states: "Permittees shall conduct methylmercury control studies to monitor and evaluate the effectiveness of existing BMPs on the control of methylmercury and shall develop and evaluate additional BMPs as needed to reduce mercury and methylmercury discharges to the Delta and meet methylmercury waste load allocations…". The *Methylmercury Control Studies Progress Report* was submitted to the Central Valley Water board on October 30, 2015 and can be found on the CCCWP website http://www.cccleanwater.org/surveys-studies-annual-report/. The Methylmercury Control Study Final Report will be submitted in October 2018.

The Program coordinates with Permittees and local household hazardous waste (HHW) collection facilities to implement mercury collection and recycling in accordance with MRP Provisions C.11.a.i and C.11.a.ii.

CCCWP Permittees collect HHW at three regional facilities in the County:

- Central Contra Costa Sanitary District (CCCSD);
- Delta Diablo Sanitation District (DDSD); and,
- West Contra Costa Integrated Waste Management District (WCCIWMA).

CCCSD serves the communities of Concord, Clayton, Martinez, Pleasant Hill, Orinda, Lafayette, Moraga, Walnut Creek, Danville, San Ramon and Unincorporated County. DDSD serves Pittsburg, Antioch, Oakley and Bay Point. WCCIWMA serves Richmond, Pinole, El Sobrante, El Cerrito and San Pablo.

The types of data collected at each facility are slightly different as is the level of differentiation between types of mercury containing devices and the level of specificity in reporting the data. These efforts are no longer required to be reported but will be tracked for mercury loads reduced through implementation of mercury avoidance and reduction control measures.

[6] East Contra Costa County Municipal NPDES Permit (NPDES Permit No. CAS083313, Order No. R5-2010-0102).

In addition, Table 2-2 below lists some mercury spill response efforts in Contra Costa County.

Table 2-2: Mercury Spills in Contra Costa County

SPILL DATE	CITY	LOCATION	INCIDENT TYPE	QUANTITY/ CONCENTRATION	DATE OF FINAL SPILL REPORT
3/13/2017	Antioch	2209 Manzanita Dr	Spill	5-gal(s) Mercury	3/13/2017
3/7/2017	Rossmoor	3324 Tice Creek Dr. Apt. 11	Spill	"a few" ml/g of Mercury spilled	3/10/2017
1/22/2017	Antioch	2206 Mandarin Way	Spill	Small Unk Mercury amount	1/26/2017
12/22/2016	Antioch	2324 Mandarin Way	Spill	1 oz Mercury	12/22/2016

2.6.2 Illegal Dumping Clean-Up

This source control measure entails clean-up of construction and demolition debris from illegal dumping areas that contain PCBs. This control measure will apply to construction and demolition illegal dumping only during this permit term but may be expanded to other types of illegally dumped trash if supported by monitoring data.

2.6.3 Stockpile, Spills, and Disposal of PCBs

This control measure includes the proper clean-up and disposal of stockpiles, spills, and/or improperly disposed quantities of PCBs. The measure would involve, for instance, a concentrated source of PCBs (e.g., a barrel) that is found leaking and cleaned-up or properly disposed and the clean-up of transformer spills by PG&E (see Table 2-3 below for a list of some of the PG&E transformer pole spills in Contra Costa County).

Table 2-3: PG&E Transformer Pole Spills in Contra Costa County

SPILL DATE	CITY	LOCATION	INCIDENT TYPE	QUANTITY/ CONCENTRATION	DATE OF FINAL SPILL REPORT FROM PGE AND SFBRWQCB
1/31/2018	Richmond	600 South 4th Street	Fire/Explosion		2/12/2018
1/9/2018	Concord	2395 Willow Pass Rd.	Spill	50 gal(s) Non-PCB Insulating Oil	1/9/2018
Not determined	Richmond	665 S 31st St.	Storm Drain/Creek	120-gal(s) Petroleum Mineral oil (non-PCB)	10/3/2017

SPILL DATE	CITY	LOCATION	INCIDENT TYPE	QUANTITY/ CONCENTRATION	DATE OF FINAL SPILL REPORT FROM PGE AND SFBRWQCB
6/26/2017	El Cerrito	984 King Ave	Spill	3-gal, unknown concentration PCBs	Not determined
6/26/2017	El Cerrito	984 King Ave	Spill	3-gal(s) Transformer oil 9.5 ppm	6/27/2017
6/23/2017	Richmond	4480 Bell Ave.	Spill	5-gal(s) Petroleum Mineral oil (Unknown PCB)	6/24/2017
6/5/2017	Richmond	4949 Cypress Ave	Spill	1 gal(s) Petroleum Mineral oil (non-PCB)	6/6/2017
6/3/2017	Pittsburg	493 Rich Spring Dr.	Spill	3 gal(s) Non-PCB Mineral Oil	6/6/2017
5/9/2017	Danville	134 Verde Mesa Drive	Spill	20 gal(s) Mineral Oil (Unknown PCB)	5/9/2017
4/9/2017	Pinole	2621 Appian Way	Spill	180 gal(s) Mineral Oil (non-PCB)	4/9/2017
4/6/2017	Richmond	1100 S 27th St.	Spill	1 gal, 25 PPM PCBs	Not determined
4/5/2017	Richmond	209 Parr Blvd	Spill	1 gal(s) Petroleum Mineral oil (25 ppm PCB)	4/6/2017
1/12/2017	Lafayette	3584 Mt. Diablo Blvd	Spill	10-gal(s) Transformer Oil (Unknown PCB)	1/14/2017
11/19/2016	Pleasant Hill	624 Contra Costa Blvd.	Spill	50 gal	Not determined
11/10/2016	Moraga	806 Crossbrook Dr	Spill	5-gal, 280 ppm PCBs	Not determined
10/21/2016	Alamo	Corner of Danville Blvd x Stone Valley Road	Spill	5 gal	Not determined
8/31/2016	Concord	1494 Washington Blvd	Spill	42,658 gal	Not determined
6/12/2016	Discovery Bay	2426 Pinehurst Ct.	Spill	1 gal, unknown PCBs	Not determined
4/5/2016	Orinda	Orinda	Spill	20-gal, undefined conc.	Not determined
3/6/2016	Concord	1354 Babel Ln, Concord	Spill	30-gal, 31 ppm (reported to OES as 1,000 ppm)	Not determined
2/7/2016	Richmond	5610 Bayview, Richmond	Spill	13 gal, <2 ppm	3/2/2016
5/4/2015	Richmond	5635 San Diego St, Richmond	Spill	60-gal, 45 ppm	11/16/2015
11/14/2014	Richmond	Port of Richmond	Spill	48,303 kg, 600,000 mg/kg	Early 2016

CCCWP and BASMAA representatives have been working with SFBRWQCB staff to ensure thorough documentation and clean-up completion of PG&E PCBs transformer spills as possible. The reporting is inconsistent through the OES reporting system and often cases are closed before the municipality or water board staff hear of the spill. This activity could have a significant effect on where PCBs in the public right-of-way are found, as many spills happen in residential areas. Residential areas are not typically high likelihood areas for PCBs sources, so no other control measures have been developed specifically for these areas. SFBRWQCB and BASMAA representatives will work on better defining agency roles and responsibilities in responding to spills, at least for their own agencies, and hope to get PG&E to cooperate to make a smoother and more transparent process as we try to reduce the loading of PCBs into the San Francisco Bay, San Joaquin/Sacramento Rivers Delta, and Suisun and San Pablo Bays.

CCCWP staff has been compiling information on PCBs transformer spills that have occurred since 2014 (there are additional data from earlier years). Table 2-2 presents a partial list of the spills that have happened throughout Contra Costa County from November 2014 – June 2018. All information on the spills and clean-ups are not currently available, as the process to get documentation of the completion of a clean-up is difficult. PG&E has many private contractors that are called out at odd hours in inclement weather to do the clean-up. Locating one representative who can confirm PG&E's process or progress on spills has proven impossible so far. Many spills are less than 49 gallons and less than 50 ppm, but still have significant levels of PCBs concentrations (e.g., 5 gallons of transformer oil with a PCBs concentration of 44 ppm).

BASMAA has begun the process of conducting a regional Stressor/Source Identification (SSID) project, in compliance with MRP Provision C.8.e, that will develop and implement a regional SSID work plan to further understand the magnitude and extent of PCBs released by electrical utility equipment spills, and to identify controls (if necessary) that could be put into place to reduce the water quality impacts of this source. Development of the work plan will occur during FY 2018/19. Implementation of the work plan will occur during FY 2019/20.

3 CITY OF ANTIOCH

3.1 List of Watersheds / Management Areas

The watersheds / management areas (W/MAs) within the City of Antioch are shown on Figure 3-1 and are listed in Table 3-1 below.

Table 3-1: City of Antioch PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
ANT-1: Old Urban	3,836.7	0.0	95.5	1.4	3.0	0.0
ANT-2: Old Industrial / High Likelihood	303.9	81.8	2.1	8.8	7.2	0.0
ANT-PGE: Categorical PG&E	157.7	0.0	0.0	2.3	97.7	0.0
ANT-Rail: Categorical Rail	92.9	93.4	1.3	0.0	5.3	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized below in Table 3-2 and are described in the section below.

Table 3-2: City of Antioch Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	0.0	0.0	0.0	0.0	0.0	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	54.6	0.0	96.5	0.0	3.5	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

3.2 Scope and Schedule of PCBs Control Measures

3.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Antioch have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

3.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

3.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

3.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Antioch are listed in Table 3-3 below.

Table 3-3: City of Antioch Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Semi-Annually	54.6

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

3.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

3.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

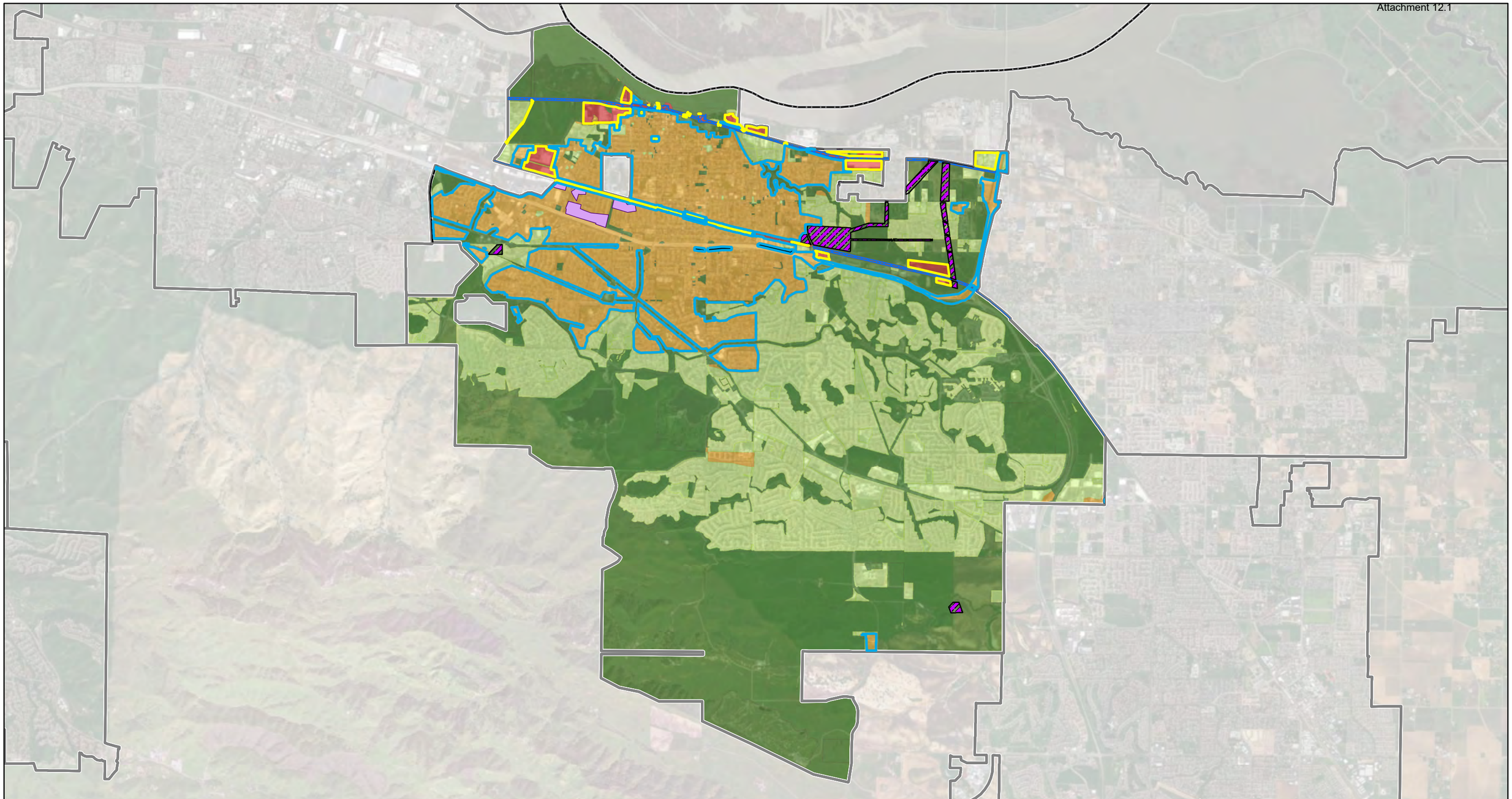
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the San Francisco Bay, San Joaquin/Sacramento Rivers Delta, and Suisun and San Pablo Bays.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Source Property Referral/Abatement

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- ANT-1, Old Urban
- ANT-2, Old Industrial / High Likelihood

N

0 4,400 8,800 Feet

Watershed/Management Areas and Control Measures
City of Antioch

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 3-1

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4 CITY OF BRENTWOOD

4.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) where control measures within the City of Brentwood are shown on Figure 4-1 and are listed in Table 4-1 below.

Table 4-1: City of Brentwood PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
BRW-1: Old Urban	851.3	0.0	100.0	0.0	0.0	0.0
BRW-2: Old Industrial	115.9	100.0	0.0	0.0	0.0	0.0
BRW-PGE: Categorical PG&E	14.3	0.0	0.0	0.0	100.0	0.0
BRW-RAIL: Categorical Railroad	16.6	76.9	0.0	2.90	20.2	0.00

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 4-2 and are described in the sections below.

Table 4-2: City of Brentwood Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	8.0	0.0	0.0	0.0	100.0	0.0
Trash Full Capture Devices[1]	234.4	1.5	10.6	79.1	8.9	0.0
Enhanced O&M Measures[2]	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

4.2 Scope and Schedule of PCBs Control Measures

4.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Brentwood have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

There are not any properties that have been identified as likely future redevelopment projects, with a possible connection to PCBs, at this time. Any property that is part of a redevelopment project will be subject to environmental investigation under CEQA, demolition standards, and redevelopment standards that include compliance with applicable provisions of section C.3.

4.2.2 Green Infrastructure / Treatment Measures

Old Urban W/MA: Any development, redevelopment, and infrastructure projects within this W/MA will be subject to redevelopment standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3. Much of the area is old residential and original downtown Brentwood, which is highly unlikely to experience significant redevelopment or demolition. The other significant land area of Old Urban is within the Brentwood Boulevard Specific plan and could be affected by Brentwood Boulevard Widening projects identified in the City's Capital Improvements Plan. Most of the Brentwood Boulevard Widening is unfunded.

Old Industrial W/MA: Any development, redevelopment, and infrastructure projects within this W/MA will be subject to redevelopment standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3. In addition, areas identified as old industrial will have the potential for source property investigation and referral.

4.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

For building demolition, future projects may be subject to PCBs control framework/protocols that are to be developed. The City of Brentwood contains two locations that have been identified as high-likelihood.

One is an Antioch Building Materials site at 6823 Brentwood Boulevard. It is in the Old Industrial W/MA and has been identified as High Likelihood. This location is within the Brentwood Boulevard Specific Plan area and any future project will be subject to all the environmental requirements of a development or redevelopment project.

The second location is a PG&E-owned parcel near the southwest edge of Brentwood, along the new Highway 4 corridor. The access drive is located at the intersection of John Muir Parkway with Fairview Ave. This location is within an Old Industrial W/MA but is extremely unlikely to be redeveloped.

The City of Brentwood is also participating in the BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

Brentwood's infrastructure, even within the old urban W/MA, is of mostly of modern construction, so at this time, it seems there is little reason to suspect that there are PCBs-containing materials in the infrastructure. More will be revealed with continuing efforts to study PCBs sources. The older original infrastructure is not of the type where PCBs containing materials would have been used since it is mostly asphalt pavements and concrete curb, gutter and sidewalks, where caulking was not used. The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

4.2.4 Enhanced Operation and Maintenance Control Measures

The City of Brentwood has no Enhanced Operation and Maintenance control measures to report.

4.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

4.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

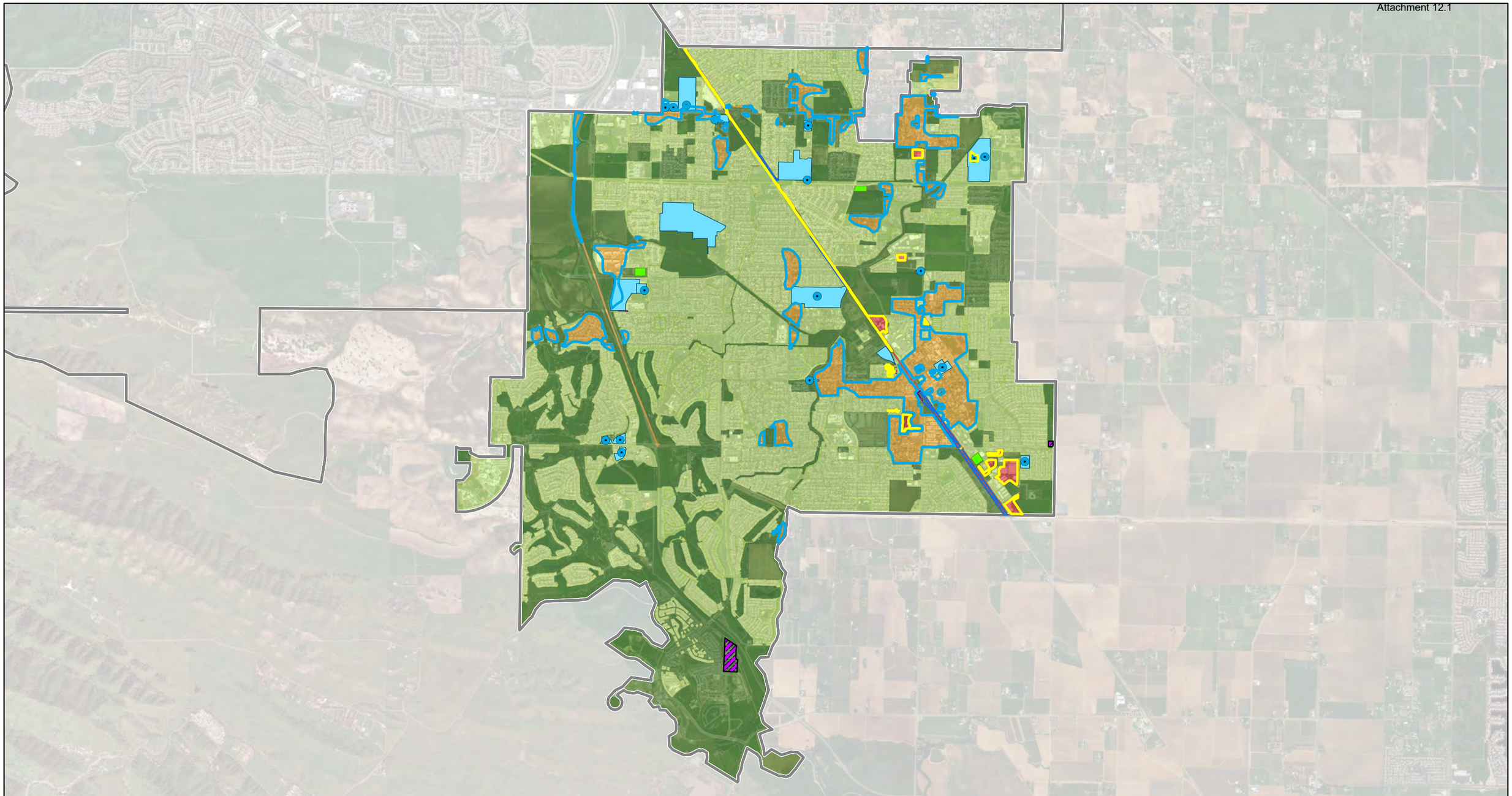
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the San Francisco Bay, San Joaquin/Sacramento Rivers Delta, and Suisun and San Pablo Bays.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- BRW-1, Old Urban
- BRW-2, Old Industrial

N

0 3,300 6,600 Feet

Watershed/Management Areas and Control Measures
City of Brentwood

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 4-1

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5 CITY OF CLAYTON

5.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) the City of Clayton are shown on Figure 5-1 and are listed in Table 5-1 below.

Table 5-1: City of Clayton PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
CLA-1: Old Urban	738.1	0.0	100.0	0.0	0.0	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 5-2 and are described in the sections below.

Table 5-2: City of Clayton Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	23.5	0.0	55.7	44.3	0.0	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

5.2 Scope and Schedule of PCBs Control Measures

5.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Clayton have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

No further investigation is warranted in the City of Clayton.

5.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within the W/MA will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

5.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The City of Clayton has been approved for exemption pursuant to C.12.f.i and C.12.f iii. Please refer to the City of Clayton FY 2017-18 Annual Report for confirmation.

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

5.2.4 Enhanced Operation and Maintenance Control Measures

The City of Clayton has no Enhanced Operation and Maintenance control measures to report.

5.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

5.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

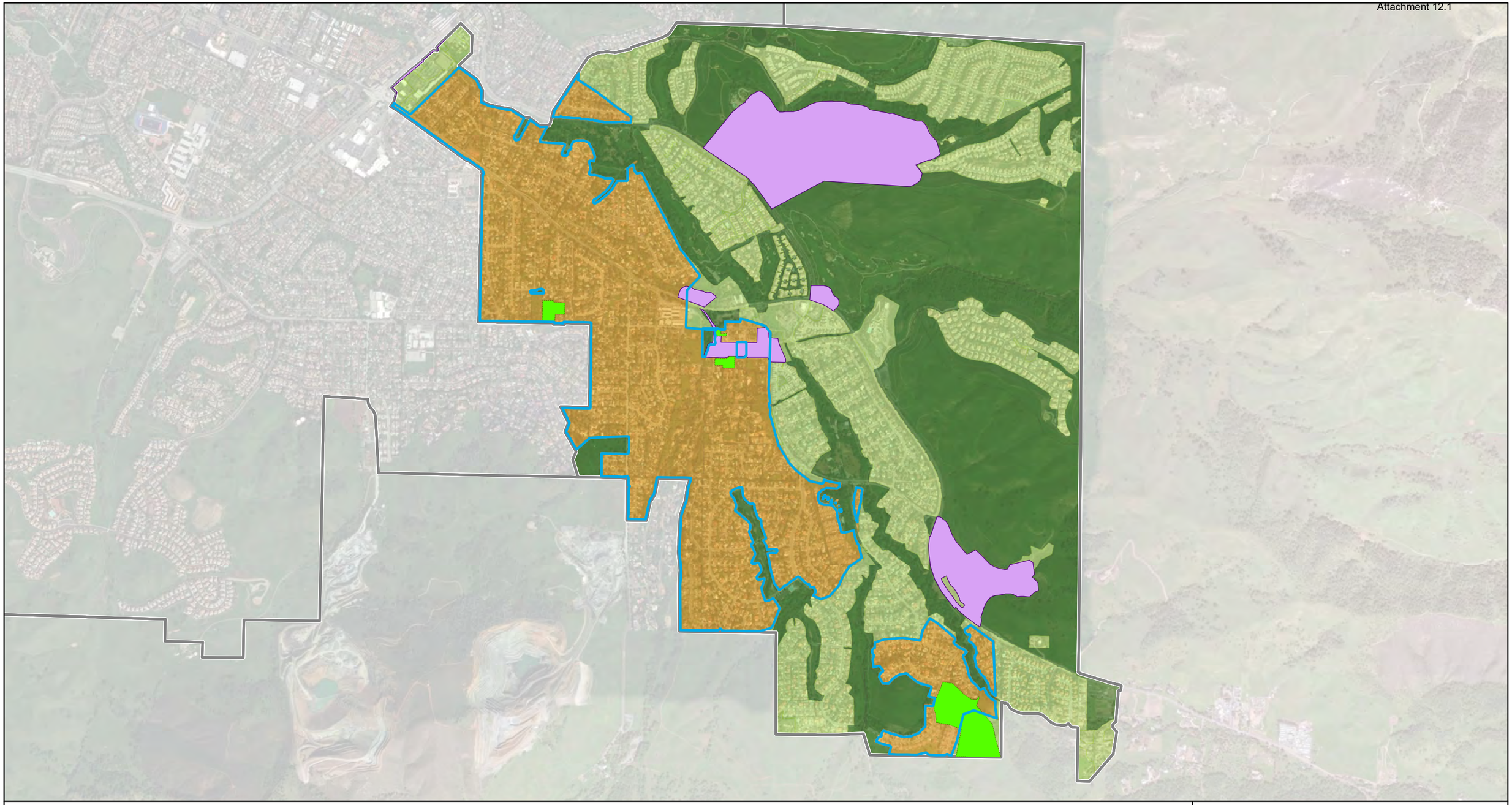
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the San Francisco Bay, San Joaquin/Sacramento Rivers Delta, and Suisun and San Pablo Bays.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

City Limits
County Boundary

Yield Classification
Old Industrial
Old Urban
New Urban
Open Space
Other

Control Measures
Stormwater Treatment Project

Enhanced O&M
Full Trash Capture Device Cleanout

Watershed/Management Areas
CLA-1, Old Urban

N

0 1,400 2,800 Feet

Watershed/Management Areas and Control Measures
City of Clayton

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 5-1

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6 CITY OF CONCORD

6.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Concord are shown on Figure 6-1 and are listed in Table 6-1 below.

Table 6-1: City of Concord PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
CON-1: Old Urban	13,047.7	0.1	76.8	6.6	16.2	0.3
CON-2: Old Industrial	1,073.1	19.2	20.5	47.8	12.4	0.0
CON-3: Military Base	5,344.7	0.0	1.0	0.0	5.1	93.9
CON-PGE: Categorical PG&E	21.9	0.9	92.4	0.3	6.4	0.0
CON-RAIL: Categorical Railroad	49.6	30.6	12.0	1.5	55.9	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 6-2 and are described in the sections below.

Table 6-2: City of Concord Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	48.8	5.7	69.1	1.8	23.4	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	21.9	0.0	100.0	0.0	0.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

6.2 Scope and Schedule of PCBs Control Measures

6.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Concord have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

6.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

The City of Concord has completed one (1) green infrastructure installation as part of a recent capital improvement project, with an additional installation planned as part of the second phase of the project. In addition, numerous private development projects, subject to the provisions of C.3, continue through various stages of construction, with several completed this year and multiple ongoing. Several major redevelopment plans are also in the early stages of review and approval by the City of Concord, which will incorporate C.3 design and treatment over the entire project site.

6.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

As part of the demolition for the planned Veranda shopping center project, the building materials and surrounding onsite soils for the existing Chevron offices on Diamond Boulevard were tested and materials identified as below the residential numeric detection limits for PCBs (<0.25 ppm), per EPA guidance, were designated for haul away and disposal at an approved site, thereby mitigating a measured volume of PCBs that otherwise had the potential to migrate into downstream receiving waters.

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1. The City of Concord is actively involved in the region-wide discussions and development of the program to reduce the migration of PCBs during building demolition through participation on the Regional Project Technical Advisory Committee.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

6.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Concord are listed in Table 6-3 below.

Table 6-3: City of Concord Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	Treatment Area (acres)	Location
Street Sweeping	FY2016-2017	None	Annually[1]	21.9	Various locations see list below

Notes:

1. Load reduction credit for annual sweeping frequency is calculated using 0.08 (or 1/12) times the monthly sweeping efficiency value.

The City of Concord Public Works department has implemented an enhanced street sweeping program. Numerous streets that historically had limited access for street sweeping due to parked cars are being posted “no parking” so that they can be swept clean. This enhanced maintenance activity is happening annually. The effort involves extensive public notifications, placing over 150 barricades, trimming trees, re-painting red-curbs, and towing vehicles that remain on the street. The list of locations is provided below.

- Carey Drive; from Monument Boulevard to Victory Lane
- Frisbi Court; from Lacey Lane to the end of the street
- Virginia Lane; from Monument Boulevard to Premier Place
- Oakmead Drive; from Monument Boulevard to Toyon Drive

- Laguna Street; from Amador Drive to Detroit Avenue
- Victory Lane; from Monument Boulevard to Linden Drive
- Robin Lane; from Virginia Lane to Meadow Lane
- Toyon Drive; from Oakmead Drive to Ellis Street
- Riley Court; from Meadow Lane to the end of the street
- Reganti Place; from Reganti Drive to the end of the street
- Lacey Lane; from Monument Boulevard to Tilson Drive
- Ellis Street; from Toyon Drive to Clayton Road
- Sierra Road; from Oak Grove Road to Fox Meadow Way
- Pine Street; from Clayton Road to the end of the Street
- Toyon Oakmead to Oakmead
- San Miguel Cowell to Via Montanas

6.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

6.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the San Francisco Bay, San Joaquin/Sacramento Rivers Delta, and Suisun and San Pablo Bays.

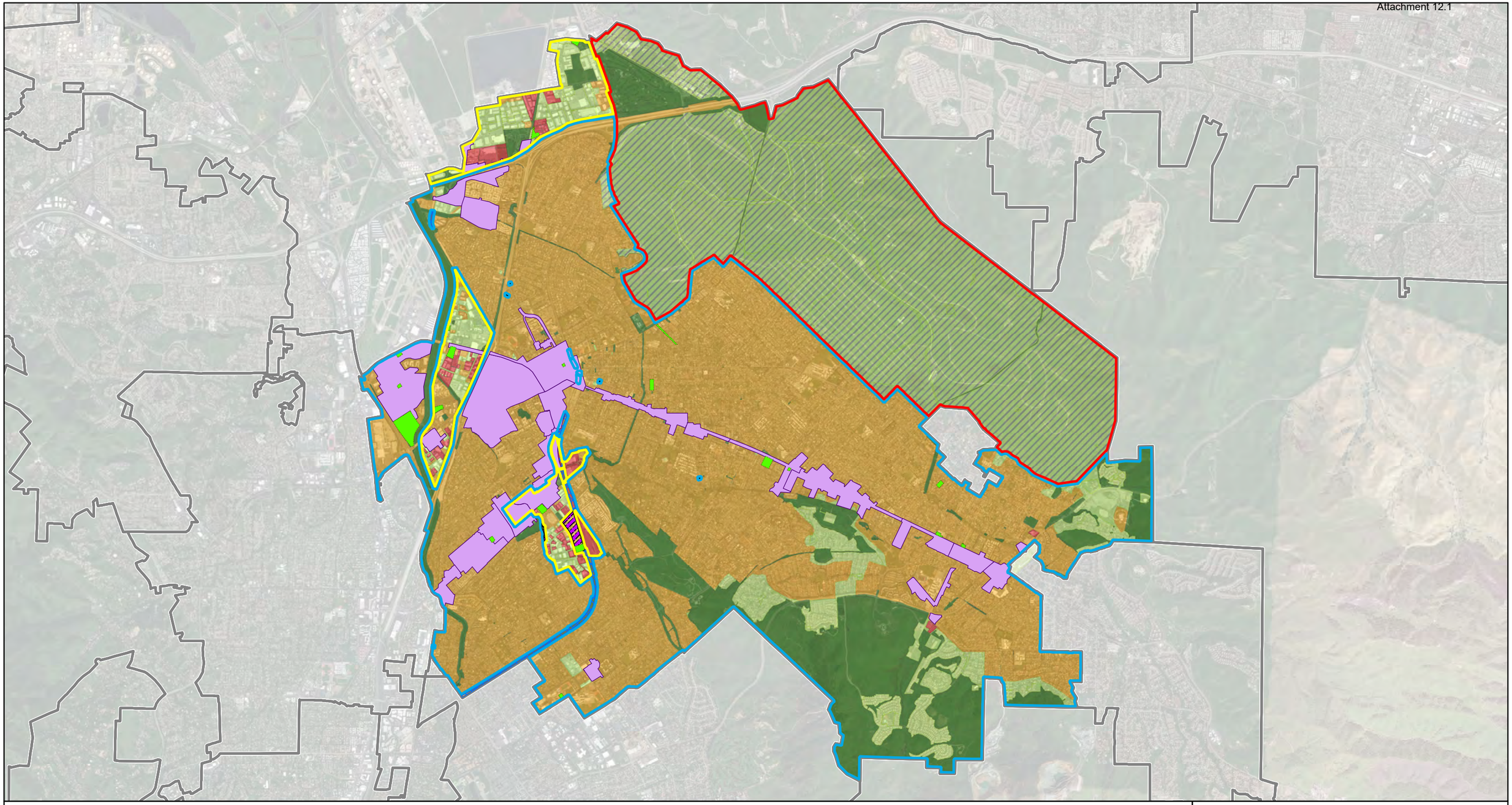
Illegal Dumping Cleanup

The Permittees does identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs are addressed as they are identified through industrial facility inspection and spill notification programs.

In February 2016, the City of Concord collected documentation from PG&E following a transformer spill and subsequent PCBs cleanup.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- CON-1, Old Urban
- CON-2, Old Industrial
- CON-3, Military Base

N

0 4,000 8,000 Feet

Watershed/Management Areas and Control Measures
City of Concord

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 6-1

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7 TOWN OF DANVILLE

7.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the Town of Danville are shown on Figure 7-1 and are listed in Table 7-1 below.

Table 7-1: Town of Danville PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
DAN-1: Danville Town Boundary	11,554.2	0.1	38.9	21.5	39.6	0.0
DAN-PGE: Categorical PG&E	14.4	0.0	75.1	24.9	0.0	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The majority of the Town is residential with a lot of preserved open space areas and hillsides. Old Urban commercial uses are concentrated in the old downtown area on Hartz Avenue and along San Ramon Valley Boulevard. A portion of the older residential areas are also identified as old urban.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 7-2 and are described in the sections below.

Table 7-2: Town of Danville Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	29.1	0.0	55.0	0.0	45.0	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	53.1	0.0	96.4	2.8	0.8	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

7.2 Scope and Schedule of PCBs Control Measures

7.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

Danville has no known or suspected source properties. No properties within the Town of Danville have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

No further investigation is warranted in the Town of Danville.

7.2.2 Green Infrastructure / Treatment Control Measures

Danville is primarily built out. A couple larger undeveloped parcels are planned for residential development but haven't been built yet. All redevelopment in Danville will be subject to C.3 regulations. The Town updates the Capital Improvement Plan (CIP) annually and recently incorporated a Green Infrastructure (GI) identification system into all project descriptions and added a GI list to the CIP. Green Infrastructure will be encouraged throughout town where feasible.

Table 7-3: Town of Danville Planned Projects (FY 2017/18 – FY 2019/20)

WMA ID	DATE OF COMPLETION/OTHER MILESTONE	TREATMENT AREA (AC.)	PROJECT ID	LOCATION
DAN-1 Town Boundary	2017/18	0.61	Rose St. P-lot	Rose St and E. Linda Mesa
DAN-1 Town Boundary	2019	4.4	Town Park and Ride	Sycamore and I-680
DAN-1 Town Boundary	2019	1	Town Offices parking lot	510 La Gonda Way

7.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1. . Town staff have been monitoring the progress of this project and how it will be incorporated into the building permit process. Once an ordinance template is finalized, Danville will begin adoption of the ordinance.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

7.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the Town of Danville are listed in Table 7-4 below.

Table 7-4: Town of Danville Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	Treatment Area (acres)	Location
Full Trash Capture Device Clean Out	FY2014-2015	Annually	3x/yr	53.1	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

7.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

7.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

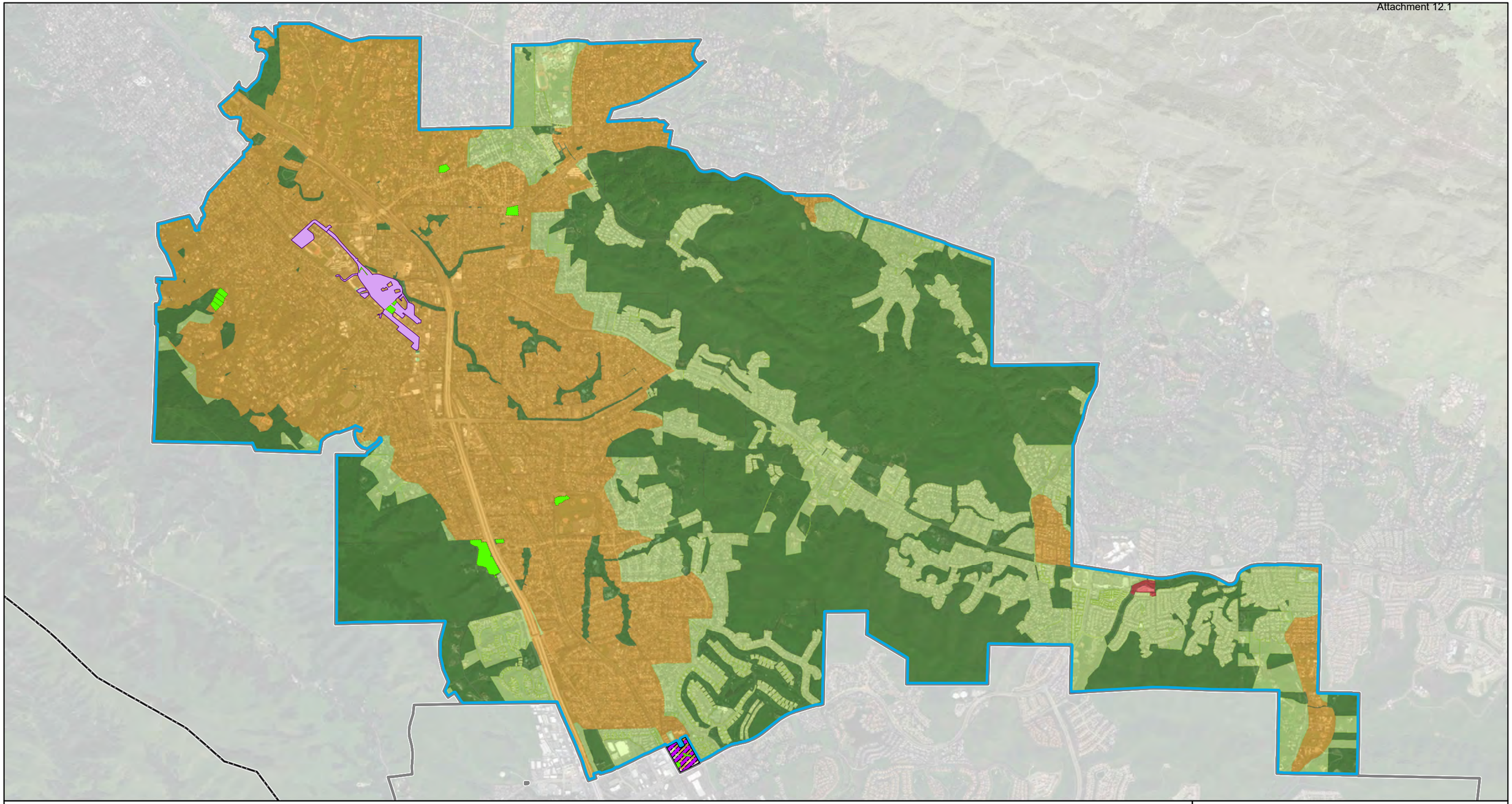
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the San Francisco Bay, San Joaquin/Sacramento Rivers Delta, and Suisun and San Pablo Bays.

Illegal Dumping Cleanup

The Town of Danville regularly identifies and cleans up illegal dumping throughout town, including construction and demolition debris.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through the Town's established industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- DAN-01, Danville WMA

N

0 2,600 5,200 Feet

Watershed/Management Areas and Control Measures
Town of Danville

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 7-1

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8 CITY OF EL CERRITO

8.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of El Cerrito are shown on Figure 8-1 and are listed in Table 8-1 below.

Table 8-1: City of El Cerrito PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
ELC-1: Old Urban	2,023.2	0.0	98.0	0.4	1.5	0.0
ELC-2: Old Industrial and High Likelihood	0.7	73.5	2.7	0.0	23.7	0.0
ELC- PGE: Categorical PG&E	29.9	26.4	38.8	0.1	34.7	0.0
ELC- RAIL: Categorical Railroad	9.4	0.0	100.0	0.0	0.0	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 8-2 and are described in the sections below.

Table 8-2: City of El Cerrito Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	2.0	0.0	70.0	0.0	30.0	0.0
Trash Full Capture Devices[1]	0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	218.8	0.2	95.7	2.8	1.2	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

8.2 Scope and Schedule of PCBs Control Measures

8.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of El Cerrito have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

8.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

The City of El Cerrito has already completed a number of public and private green infrastructure projects. These include: rain gardens at the El Cerrito Recycling + Environmental Resource Center, at the City Hall and Public Safety Building, on the Ohlone Greenway bicycling and pedestrian corridor, on San Pablo Avenue at Eureka Avenue and San Pablo Avenue at Madison Avenue, and at recently completed private development projects within the City consistent with C.3. Additional rain gardens are expected to be completed as part of the San Pablo Avenue Green Spine Project at Moeser Lane in FY18-19.

8.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The City of El Cerrito is currently incorporating a requirement for PCBs monitoring, reporting and safe disposal into the City building demolition permit process and will also be participating in the BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

8.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of El Cerrito are listed in Table 8-3 below.

Table 8-3: City of El Cerrito Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out	FY2014-2015	Annually	Quarterly	83.1	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out	FY2016-2017	Annually	Quarterly	135.7	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

8.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

8.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The City of El Cerrito has partnered with RecycleMore to offer Household Hazardous Waste (HHW) Collection at an additional site, located at the El Cerrito Recycling Center. This service provides residents in the City of El Cerrito with an even more convenient location for disposing of materials containing HHW, including products that contain mercury. El Cerrito, along with other permittees, is also actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay and Delta.

Illegal Dumping Cleanup

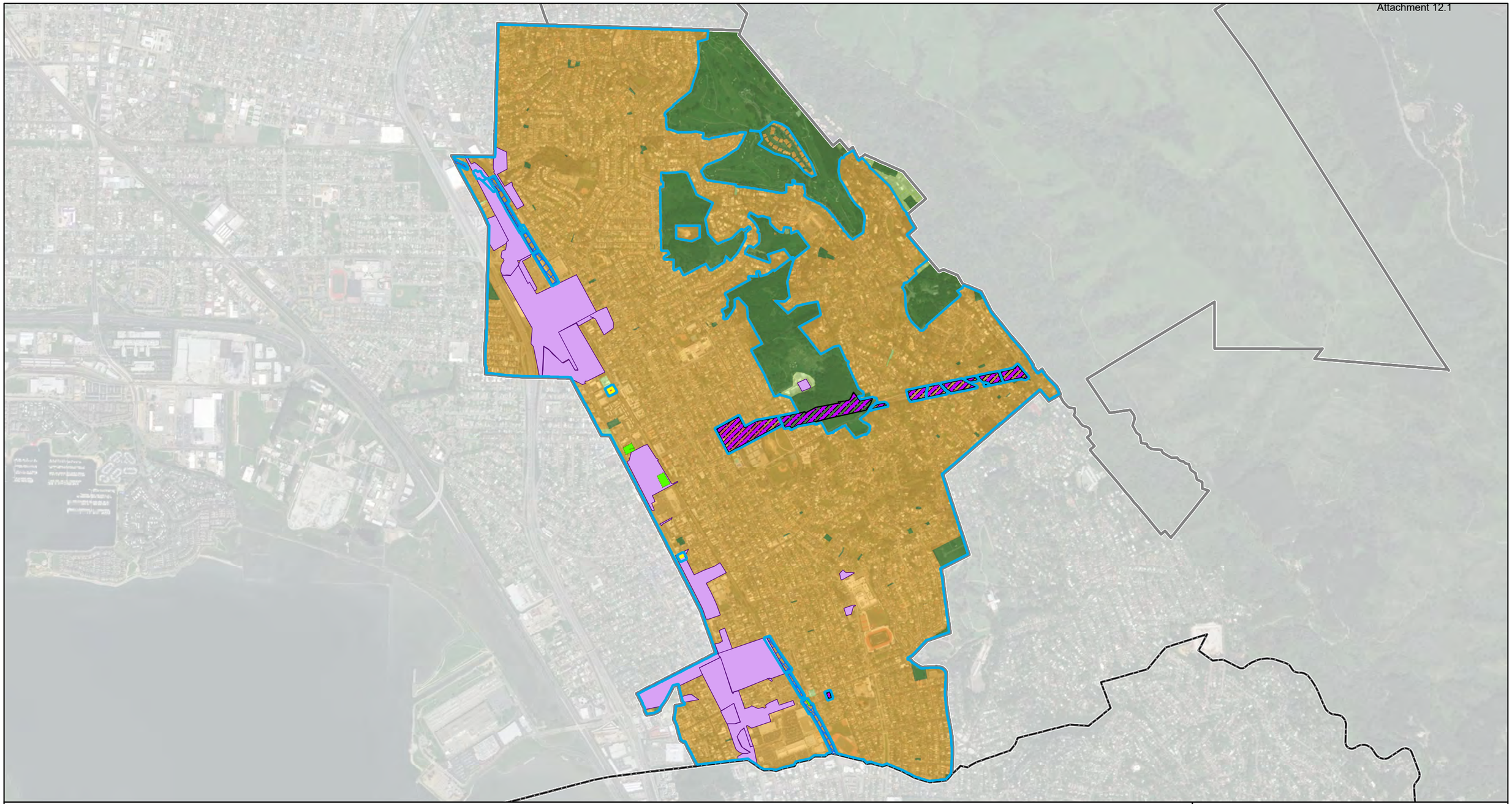
The City of El Cerrito Public Works department actively works to identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and

demolition debris occurs. Public Works Staff respond whenever an illegal dumping complaint is received, in addition to completing weekly inspections and cleanups throughout the community.

Stockpiles, Spills, and Disposal of PCBs

El Cerrito has done significant outreach to educate the public that only rain should enter creeks and storm drains. This has included featuring related articles in the City's "News & Views" newsletter, the City's "Greener El Cerrito" newsletter, and in the City's "Green Happenings" e-newsletter. City staff also provided outreach materials at events such as the City's 4th of July Festival and Earth Day in 2018. Through these outreach methods, the City has actively encouraged residents to report spills and illicit discharges and to properly dispose of Household Hazardous Waste. Stockpiles and spills of PCBs are addressed as they are identified through industrial facility inspection and spill notification programs.

The City of El Cerrito's Public Works staff responds to reports of spills and discharges as soon as possible by containing spills and vacuuming or diverting spills away from the MS4 to a permeable landscape. Staff normally investigates the complaint on the same business day. In cases where the complaint is received after business hours, staff is dispatched as an emergency through the El Cerrito Police Department, at which time the after-hours crew responds, contains or diverts and investigates.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- ELC-1, Old Urban
- ELC-2, Old Industrial / High Likelihood

N

0 1,600 3,200 Feet

Watershed/Management Areas and Control Measures
City of El Cerrito

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 8-1

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9 CITY OF HERCULES

9.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Hercules are shown on Figure 9-1 and are listed in Table 9-1 below.

Table 9-1: City of Hercules PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
HER-1: Old Urban	479.9	23.9	44.3	20.0	11.7	0.0
HER-2: Old Industrial/ High Likelihood	64.3	51.6	18.7	10.0	19.7	0.0
HER-PGE: Categorical PG&E	2.4	29.0	59.6	11.5	0.0	0.0
HER-RAIL: Categorical Railroad	26.1	88.5	0.5	0.0	10.9	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 9-2 and are described in the sections below.

Table 9-2: City of Hercules Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	0.0	0.0	0.0	0.0	0.0	0.0
Trash Full Capture Devices[1]	286.0	18.4	21.1	48.1	12.4	0.0
Enhanced O&M Measures[2]	22.7	0.0	0.0	96.9	3.1	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

9.2 Scope and Schedule of PCBs Control Measures

9.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Hercules have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

9.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

9.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

9.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Hercules are listed in Table 9-3 below.

Table 9-3: City of Hercules Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2017-2018	Annually	Quarterly	22.7	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

9.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

9.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

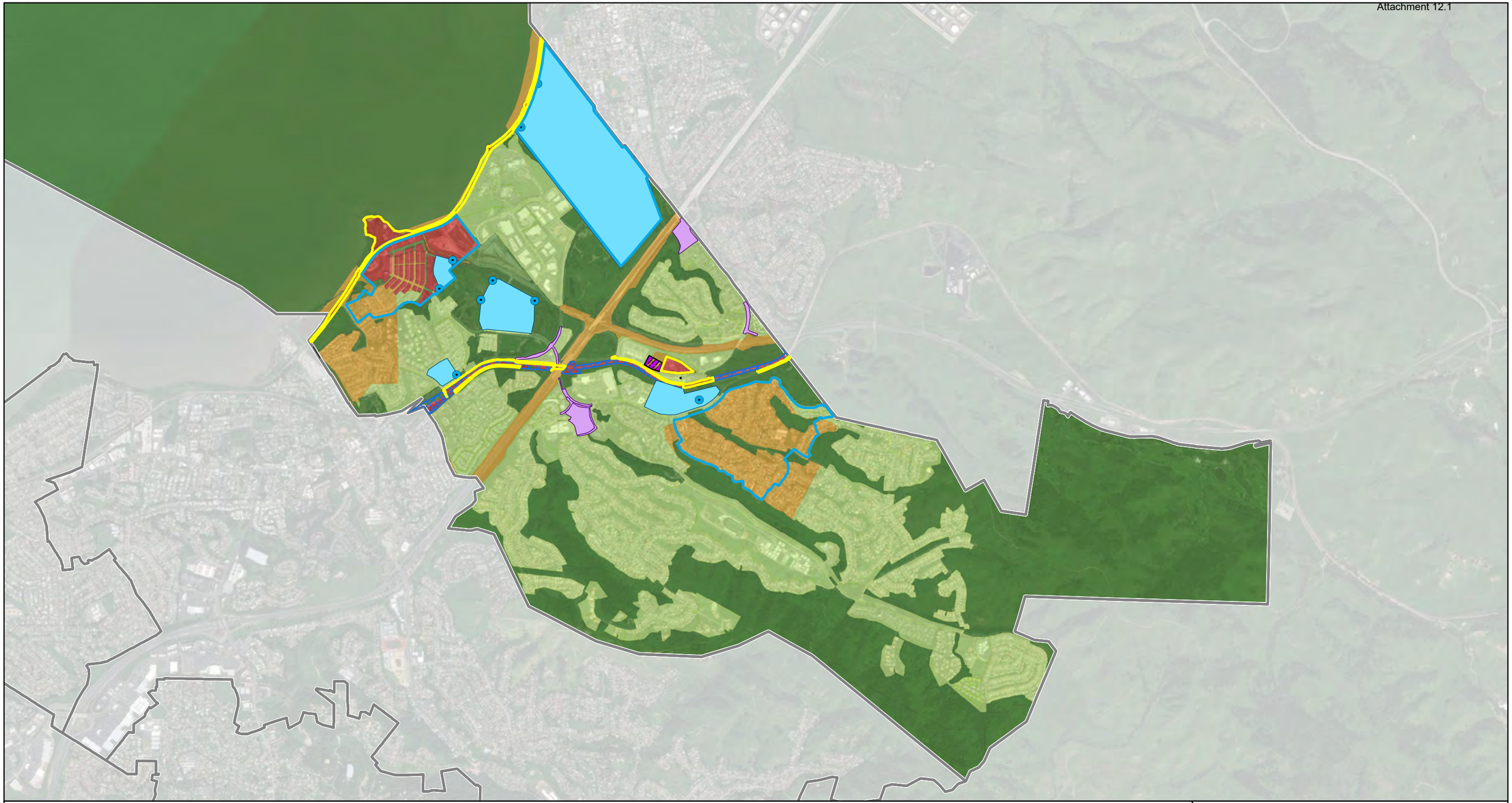
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees does identify and clean up illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs are addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- HER-1, Old Urban
- HER-2, Old Industrial / High Likelihood

N

0 2,100 4,200 Feet

Watershed/Management Areas and Control Measures
City of Hercules

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 9-1

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10 CITY OF LAFAYETTE

10.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Lafayette are shown on Figure 10-1 and are listed in Table 10-1 below.

Table 10-1: City of Lafayette PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
LAF-1: Old Urban	5,869.8	0.0	100.0	0.0	0.0	0.0

Notes:

2. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 10-2 and are described in the sections below.

Table 10-2: City of Lafayette Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	6.0	0.0	70.0	0.0	30.0	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	0	0.0	0	0.0	0.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

10.2 Scope and Schedule of PCBs Control Measures

10.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

The City of Lafayette has no known or suspected source properties. No properties within the City of Lafayette have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

No further investigations are warranted in the City of Lafayette.

10.2.2 Green Infrastructure / Treatment Control Measures

The City of Lafayette requires all new development, redevelopment, and infrastructure projects within the City to comply with the applicable sections of the MRP Provision C.3 and demolition standards at the time of application. When projects are determined to be unregulated, the City requires the project to implement LID design standards to the fullest extent practicable. Although limited opportunities are available to incorporate green infrastructure into the City's capital improvement program, the City will continue to look for opportunities to incorporate green infrastructure when possible.

The City developed a Downtown Creeks Preservation, Restoration, and Development Plan for the downtown area that includes possible future green infrastructure projects. The City was recently awarded a grant to install a rain garden at 3501 Golden Gate Way that was part of this plan. Construction of this project is anticipated to be completed by October 2019. For further information, go to: http://www.lovelafayette.org/home/showdocument?id=4132.

10.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

10.2.4 Enhanced Operation and Maintenance Control Measures

The City of Lafayette has been street sweeping since 1969. Though the program has changed throughout the years, the areas swept today include commercial and arterial streets once a week, residential streets once a month, and City owned parking lots once a month. This schedule amounts to approximately 6,400 acres swept a year and was established pre-MRP.

Established before fiscal year 2013/2014, the City of Lafayette has been cleaning drain inlets once a year in preparation of the wet season except for the inlet-based full trash capture units which are currently professionally cleaned three times per year. If any drain inlet is in need of maintenance between cleanings or was missed because of lack of access, the City's maintenance crew performs the cleaning. The City of Lafayette also employs Futures Explorered trash pickup patrols to clean up liter in the downtown where a majority of the pedestrian traffic is and hosts an annual creek cleanup day.

Since fiscal year 2013/2014, enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Lafayette are more on-land trash pickups as trash is seen and as needed, and installation of new double recycle/trash cans around the downtown. These activities have resulted in increased trash reduction above what is required by the permit.

10.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

10.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

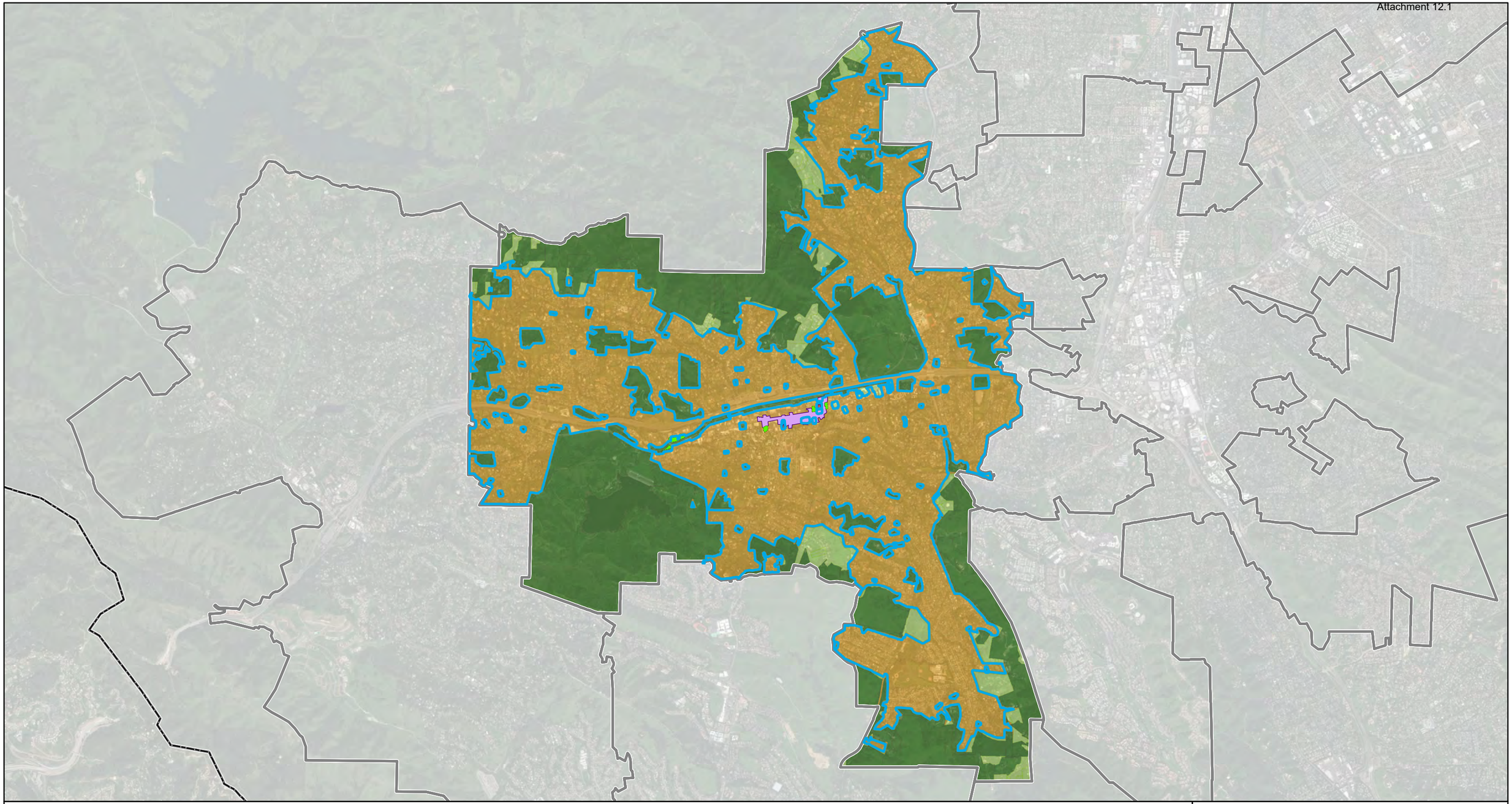
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay. As street lighting containing mercury or high-pressure sodium pressure lighting fixtures fail, the City of Lafayette is properly disposing of the old fixture and replacing it with LED lighting.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs. The City of Lafayette also picks up other illegally dumped items within the public right-of-way as they become known.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs. The City of Lafayette has experienced no specific PCBs incidents of dumping that require cleanup to date.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- LAF-1, Old Urban

N

0 3,600 7,200 Feet

Watershed/Management Areas and Control Measures
City of Lafayette

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 10-1

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11 CITY OF MARTINEZ

11.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Martinez are shown on Figure 11-1 and are listed in Table 11-1 below.

Table 11-1: City of Martinez PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
MTZ-1: Old Urban	2,776.0	0.0	100.0	0.0	0.0	0.0
MTZ-2: Refinery/Industrial	648.2	51.5	7.1	19.0	22.4	0.0
MTZ-3: Downtown/Commercial	177.7	31.1	42.1	24.8	2.1	0.0
MTZ-PGE: Categorical PG&E	16.8	7.8	27.0	0.0	65.3	0.0
MTZ-RAIL: Categorical Railroad	10.8	61.5	9.9	0.0	28.6	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 11-2 and are described in the sections below.

Table 11-2: City of Martinez Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	19.5	33.3	53.3	4.6	8.7	0.0
Trash Full Capture Devices[1]	4.1	39.0	53.7	7.3	0.0	0.0
Enhanced O&M Measures[2]	403.5	1.9	63.5	14.6	20.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

11.2 Scope and Schedule of PCBs Control Measures

11.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Martinez have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

The City of Martinez conducted visual windshield inspection of potential Old Industrial and High Likelihood parcels. Although no investigations are currently underway, future investigations have the potential to result in a property referral.

11.2.2 Green Infrastructure / Treatment Control Measures

As required By the Municipal Regional NPDES permit (MRP), all regulated development, redevelopment, capital improvement, and infrastructure projects within the W/MA will be subject to the development standards in effect at the time an application is made, and the applicable provisions of Section C.3 of the MRP, including the installation of low impact development (LID) drainage design facilities such as bioretention basins, bioswales, and CDS units. Non-regulated projects are encouraged to install one or more LID elements.

City staff completed the review of long–range capital improvement projects for opportunities to include green infrastructure facilities. Capital improvement projects identified as having the potential and feasibility to include green infrastructure components, and where sufficient funds are available to cover the incremental increase in cost, the City intends to incorporate green infrastructure facilities with these projects, subject to City Council approval. Table 11-3 includes some of near future projects:

Table 11-3: City of Martinez Planned Projects (FY 2017/18 – FY 2019/20)

WMA ID	DATE OF COMPLETION/OTHER MILESTONE	TREATMENT AREA (AC.)	PROJECT ID	LOCATION
MTZ-1	2019/20	0.98 AC	Pacheco Blvd. at Arnold Drive Traffic Signal and Street widening	Pacheco Blvd widening from Arnold Drive to Sunrise Drive

WMA ID	DATE OF COMPLETION/OTHER MILESTONE	TREATMENT AREA (AC.)	PROJECT ID	LOCATION
MTZ-3	2018/19	3.44 AC.	Alhambra Creek Restoration Project	Alhambra Creek from the Railroad Tracks to Ward Street. Approximately 3,100 cubic yards of silt will be removed from Alhambra Creek with this project.

11.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

11.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Martinez are listed in Table 11-4 below.

Table 11-4: City of Martinez Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Semi-Annually	0.8	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2016-2017	Annually	Semi-Annually	369.3	Inlet-based full trash capture devices
Street Sweeping	FY2017-2018	Monthly	2x Week	33.4	Downtown Core, intermodal parking lot, Alhambra Ave and Berrellesa Street (north of HWY 4)

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

11.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

11.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

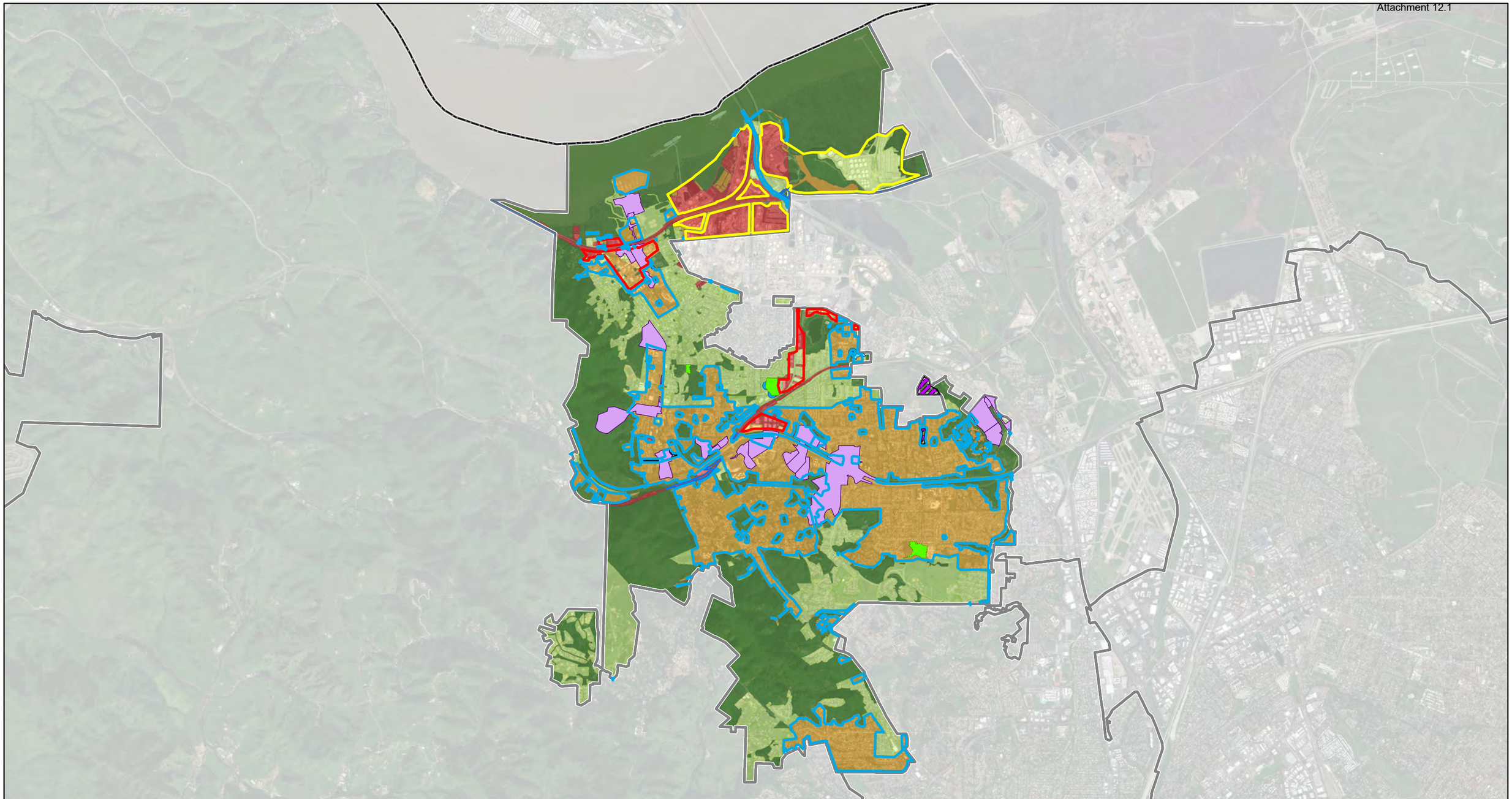
- In 2014, the City replaced 487 streetlights (throughout the City) from high-pressure sodium (HPS) lamps to LED. The replaced lights contain approximately 25 mg /each of mercury.
- In FY 2013-14 & FY 2014-15, the City replaced approximately 3,910 linear feet of florescent lights. The replaced lights contain approximately 2.5 mg mercury/linear foot.
- In FY 2013-14 & FY 2014-15, the City replaced approximately 97 compact lights. The replaced lights contain approximately 5 mg mercury/each.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- MTZ-1, Old Urban
- MTZ-2, Refinery/Industrial
- MTZ-3, Downtown/Commercial

N

0 3,750 7,500 Feet

Watershed/Management Areas and Control Measures
City of Martinez

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 11-1

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12 TOWN OF MORAGA

12.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the Town of Moraga are shown on Figure 12-1 and are listed in Table 12-1 below.

Table 12-1: Town of Moraga PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
MOR-1: Old Industrial	22.8	100.0	0.0	0.0	0.0	0.0
MOR-2: Old Urban	2,382.4	0.0	99.9	0.0	0.1	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 12-2 and are described in the sections below.

Table 12-2: Town of Moraga Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	5.9	0.0	100.0	0.0	0.0	0.0
Trash Full Capture Devices[1]	0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	92.8	16.1	75.4	3.1	5.4	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

12.2 Scope and Schedule of PCBs Control Measures

12.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the Town of Moraga have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

No further investigations are warranted in the Town of Moraga.

12.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

The Town of Moraga has two (2) green infrastructure installations proposed in its capital improvement program, one is an off-site mitigation for a landslide repair and repaving project in the form of a bioswale. The second is incorporation of bioretention facilities to treat street runoff as part of construction of a roundabout at an existing intersection. In addition, a few private development projects, subject to the provisions of C.3, continue through various stages of construction. Both projects are in the initial planning phase and details are not available at this time.

12.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Town of Moraga is applying conditions of approval to demolition permits for buildings that have the potential to have PCBs and/or mercury-containing materials. The condition of approval requires that the applicant have the structure evaluated for PCBs and mercury containing materials prior to issuance of the demolition permit. If PCBs and/or mercury containing materials are found, the applicant shall have these items removed and properly disposed of a licensed contractor and written documentation thereof. The Town of Moraga is also participating in the BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

12.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the Town of Moraga are listed in Table 12-3 below.

Table 12-3: Town of Moraga Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Quarterly	32.6	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2016-2017	Annually	Quarterly	57.3	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2017-2018	Annually	Quarterly	2.8	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

12.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

12.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

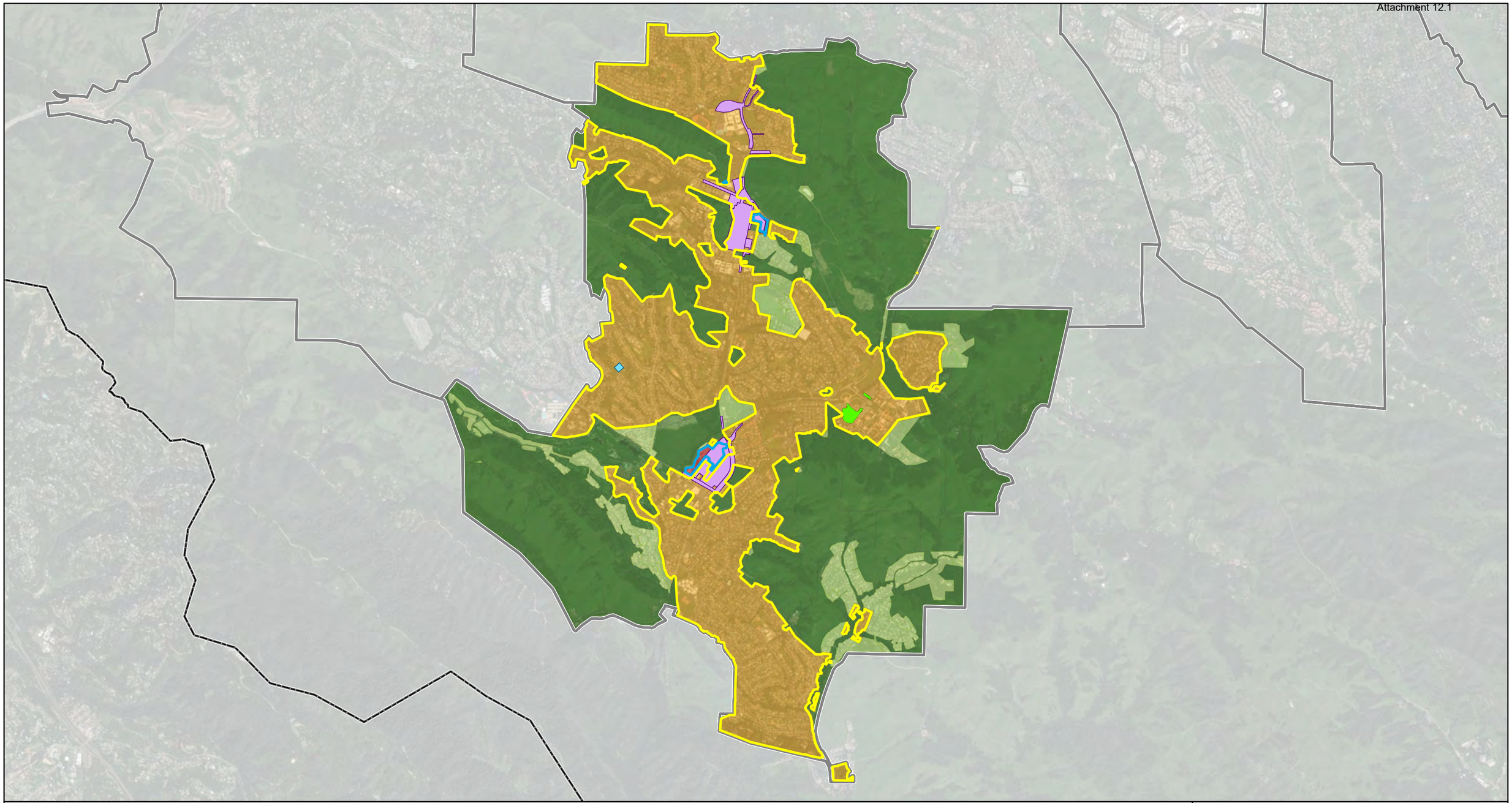
The Permittees are actively implementing mercury recycling programs in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees does identify and cleanup illegal dumping of construction and demolition debris as needed.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs are addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- MOR-1, Old Industrial
- MOR-2, Old Urban

N

0 2,700 5,400 Feet

Watershed/Management Areas and Control Measures
Town of Moraga

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 12-1

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13 CITY OF OAKLEY

13.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Oakley are shown on Figure 13-1 and are listed in Table 13-1 below.

Table 13-1: City of Oakley PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
OAK-1: Old Urban	881.3	0.0	85.2	1.4	13.4	0.0
OAK-2: Old Industrial/High Likelihood	279.9	93.6	0.8	1.5	4.1	0.0
OAK-PGE: Categorical PG&E	12.0	0.00	0.0	38.0	62.0	0.0
OAK-RAIL: Categorical Railroad	63.6	100.0	0.0	0.0	0.0	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 13-2 and are described in the sections below.

Table 13-2: City of Oakley Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	18.7	0.0	9.1	26.7	64.2	0.0
Trash Full Capture Devices[1]	49.0	0.2	0.0	96.7	3.1	0.0
Enhanced O&M Measures[2]	65.6	0.2	16.8	69.2	13.9	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

13.2 Scope and Schedule of PCBs Control Measures

13.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Oakley have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

The City of Oakley has not identified any source properties but will continue its inspection of commercial/industrial facilities required by Provision C.4 which may identify source properties in the future, albeit unlikely given the commercial rather than industrial nature of the facilities inspected.

13.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

13.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The City of Oakley is applying conditions of approval to demolition permits for buildings that have the potential to have PCBs- and/or mercury-containing materials. The condition of approval requires that the applicant have the structure evaluated for PCBs and mercury containing materials prior to issuance of the demolition permit. If PCBs and/or mercury containing materials are found, the applicant shall have these items removed and properly disposed of by a licensed contractor and provide written documentation thereof. The City of Oakley is also participating in the BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

13.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Oakley are listed in Table 13-3 below.

Table 13-3: City of Oakley Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Quarterly	33.6	FY2014-2015
Full Trash Capture Device Clean Out[1]	FY2016-2017	Annually	Quarterly	7.3	FY2016-2017
Full Trash Capture Device Clean Out[1]	FY2017-2018	Annually	Quarterly	24.7	FY2017-2018

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

13.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

13.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

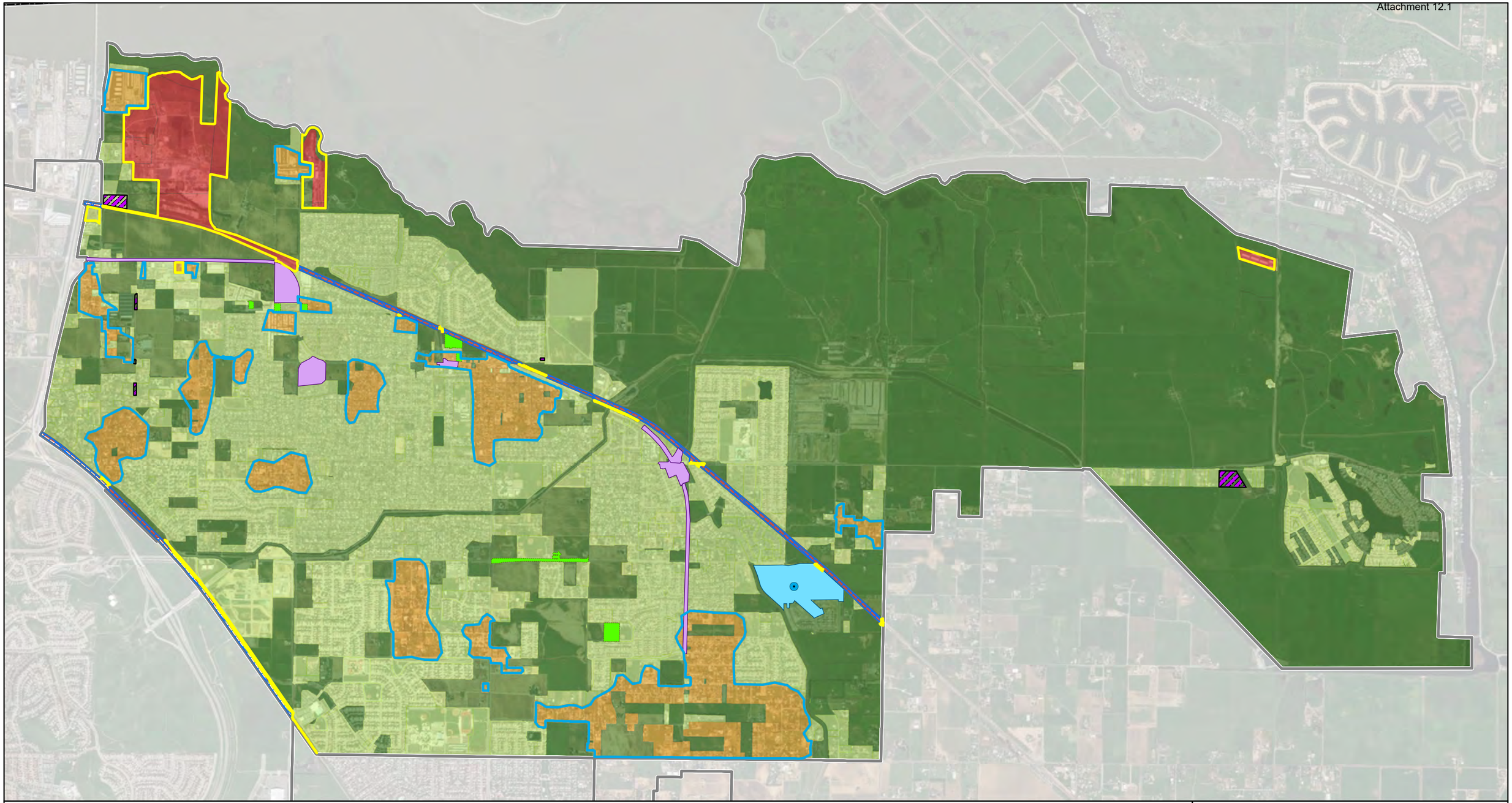
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- OAK-1, Old Urban
- OAK-2, Old Industrial / High Likelihood

N

0 2,250 4,500 Feet

Watershed/Management Areas and Control Measures
City of Oakley

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 13-1

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14 CITY OF ORINDA

14.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Orinda are shown on Figure 14-1 and are listed in Table 14-1 below.

Table 14-1: City of Orinda PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
ORI-1: Old Urban	5,274.1	0.0	93.9	0.0	6.0	0.0
ORI-2: Downtown	44.0	0.0	97.5	0.5	2.0	0.0
ORI-PGE: Categorical PG&E	154.0	22.7	0.1	4.0	73.2	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 14-2 and are described in the sections below.

Table 14-2: City of Orinda Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	16.7	0.0	100.0	0.0	0.0	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	33.4	0.0	99.7	0.0	0.3	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

14.2 Scope and Schedule of PCBs Control Measures

14.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Orinda have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

The City of Orinda is largely old urban. There are no suspected source properties contained in the City of Orinda's W/MAs. The only old industrial areas are owned and operated by PG&E and included in WMA 4. Therefore, no ongoing inspection or abatement is required.

14.2.2 Green Infrastructure / Treatment Control Measures

The City of Orinda requires developers to follow the Stormwater C.3 Guidebook developed by the Contra Costa Clean Water Program for all new development or redevelopment. The City may pursue a Downtown Specific Plan in the future, but there is no timeline for implementation at the time of this report.

14.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

14.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Orinda are listed in Table 14-3 below.

Table 14-3: City of Orinda Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Semi-Annually	6.8	Inlet-based full trash capture devices
Street Sweeping	FY2017-2018	Monthly	Biweekly	12.0	Camino Pablo: 2 lanes in each direction, 1 mile each way, 1 lane in each direction, 1.2 miles each way
Street Sweeping	FY2017-2018	Monthly	Biweekly	14.4	Moraga Way: 1 lane in each direction, 3.5 miles each way

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

14.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

14.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

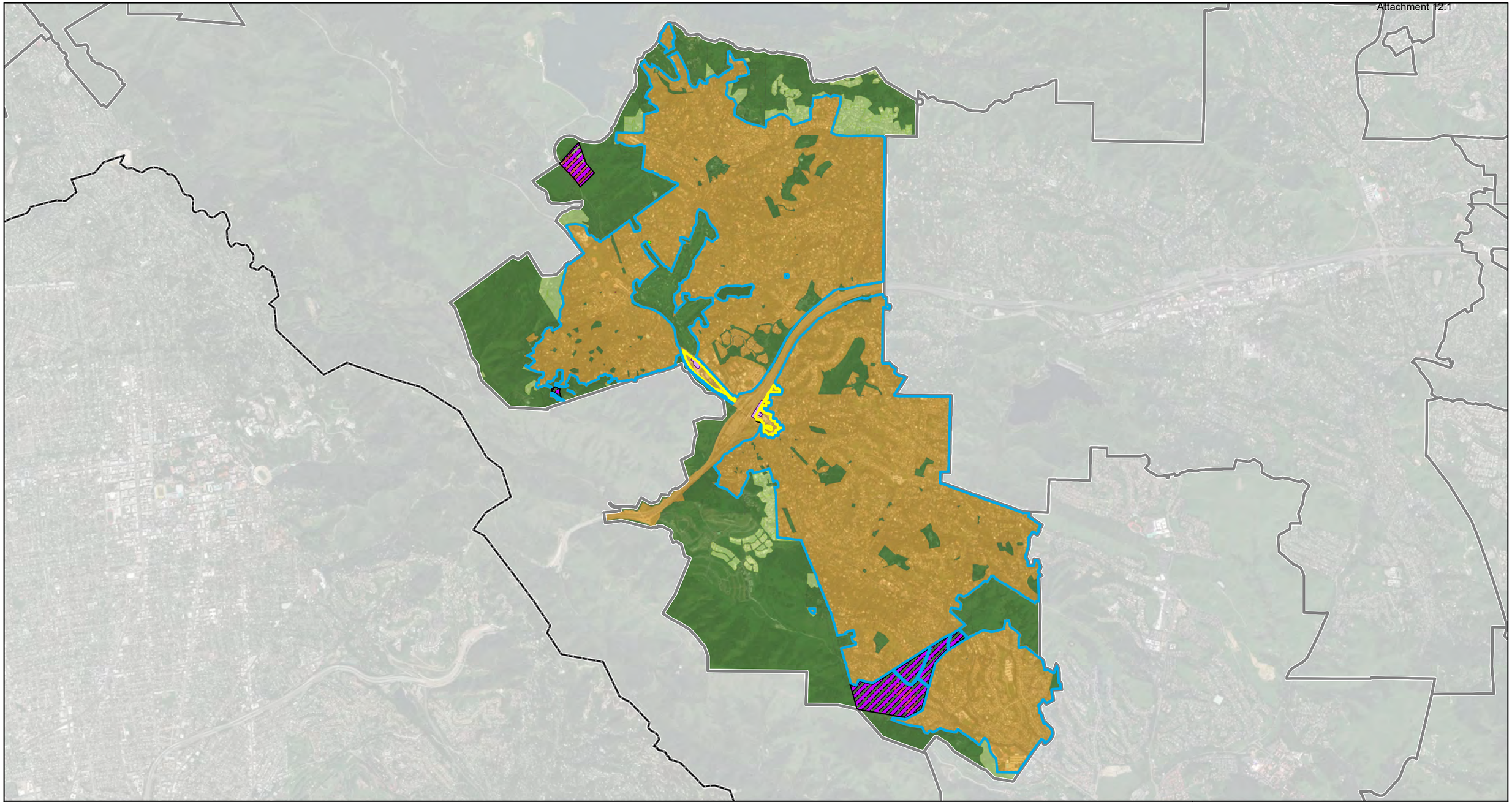
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- ORI-1, Old Urban
- ORI-2, Downtown

N

0 3,300 6,600 Feet

Watershed/Management Areas and Control Measures
City of Orinda

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 14-1

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15 CITY OF PINOLE

15.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Pinole are shown on Figure 15-1 and are listed in Table 15-1 below.

Table 15-1: City of Pinole PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
PIN-1: Old Industrial/ High Likelihood	95.0	64.8	7.0	21.5	6.6	0.0
PIN-2: Old Urban Commercial	367.7	0.0	91.1	0.9	7.9	0.0
PIN-3: Old Urban Residential	1,919.3	0.0	85.5	1.5	13.0	0.0
PIN-PGE: Categorical PG&E	4.6	0.0	0.0	0.	100.0	0.0
PIN-RAIL: Categorical Railroad	3.6	13.6	0.0	0.0	86.4	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 15-2 and are described in the sections below.

Table 15-2: City of Pinole Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	8.1	0.0	45.7	0.0	54.3	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

15.2 Scope and Schedule of PCBs Control Measures

15.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Pinole have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

15.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

15.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

A universal waste and suspect hazardous building materials inventory was conducted prior to demolition activities on a 3-story commercial building and associated outbuilding located at 1617 and 1627 Canyon Drive in Pinole in February 2017. This inventory identified 100 gallons of hydraulic fluid in the passenger elevator equipment above ground storage tank that was suspected of containing PCBs that was recommended for proper disposal.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

15.2.4 Enhanced Operation and Maintenance Control Measures

The City of Pinole has no Enhanced Operation and Maintenance control measures to report.

15.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

15.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

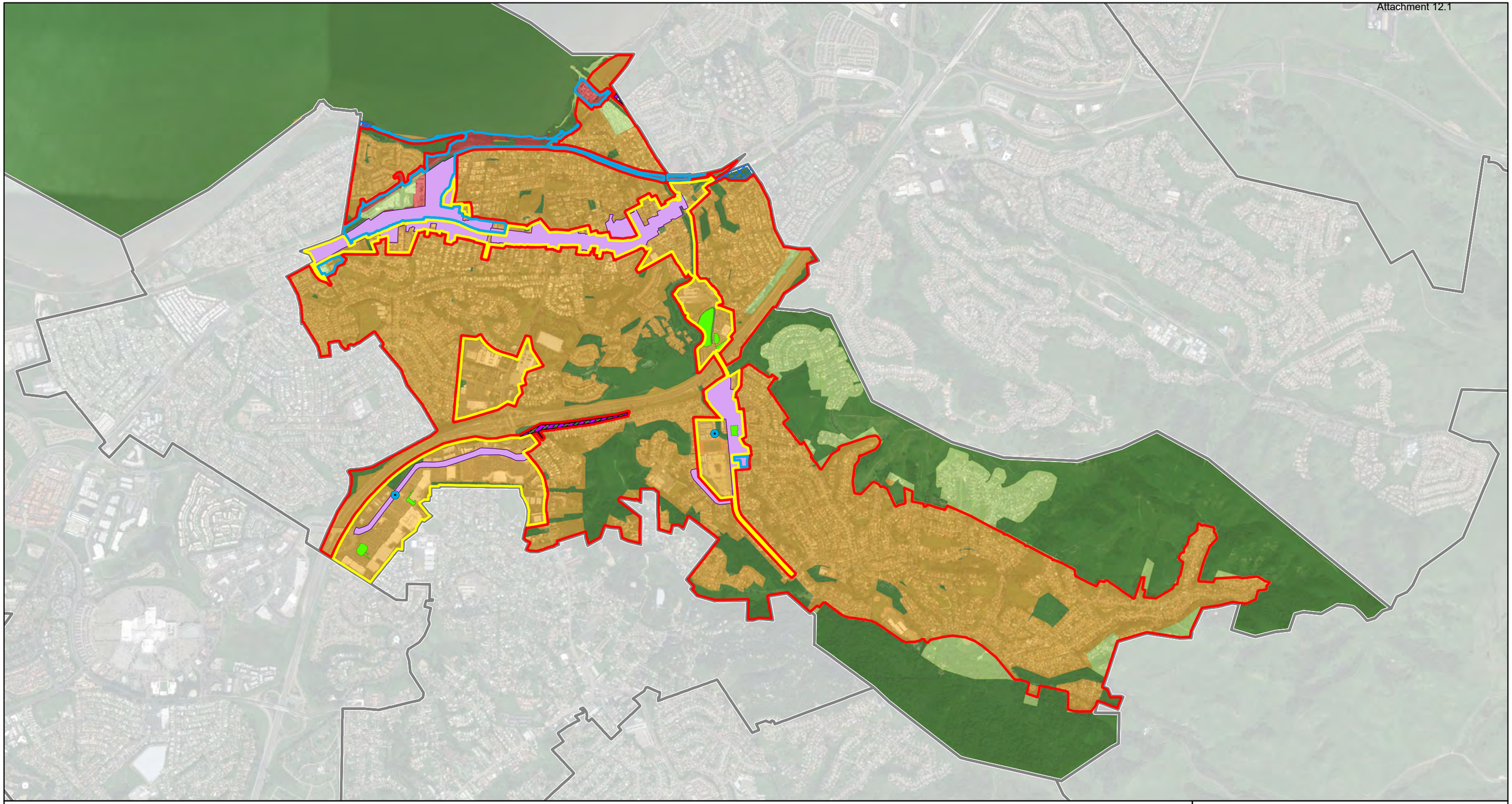
The Permittees are actively implementing mercury recycling programs in all W/MAs in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees does identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs are addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- PIN-1, Old Industrial / High Likelihood
- PIN-2, Old Urban Commercial
- PIN-3, Old Urban Residential

N

0 1,750 3,500 Feet

Watershed/Management Areas and Control Measures
City of Pinole

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 15-1

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16 CITY OF PITTSBURG

16.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Pittsburg are shown on Figure 16-1 and are listed in Table 16-1 below.

Table 16-1: City of Pittsburg PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
PIT-1: Old Urban	3,033.6	0.0	100.0	0.0	0.0	0.0
PIT-2: Southern Energy Delta/ Genon	859.0	28.4	0.0	0.0	71.6	0.0
PIT-3: USS Posco Industries	442.6	80.1	0.0	19.9	0.0	0.0
PIT-4: Dow Chemical Company	433.5	66.3	1.2	7.9	24.6	0.0
PIT-5: Old Industrial	78.6	56.0	16.4	10.3	17.3	0.0
PIT-6: Camp Stoneman	382.8	84.2	1.4	8.6	5.9	0.0
PIT-7: Waterfront Industrial	84.2	89.6	0.0	9.3	1.0	0.0
PIT-PGE: Categorical PG&E	348.3	12.5	3.1	0.7	83.7	0.0
PIT-RAIL: Categorical Railroad	106.2	93.0	0.0	3.1	3.9	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 16-2 and are described in the sections below.

Table 16-2: City of Pittsburg Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Source Property Identification and Abatement	6.0	100.0	0.0	0.0	0.0	0.0
Green Infrastructure and Treatment	2.0	0.0	85.0	0.0	15.0	0.0

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Trash Full Capture Devices[1]	1.1	0.0	100.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	115.0	0.5	6.3	52.7	40.5	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

16.2 Scope and Schedule of PCBs Control Measures

16.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

One property within the City of Pittsburg has been referred to the SFBRWQCB in FY 2015-16 as a result of implementation of the Source Property Identification and Abatement control measure to date. The Former Molino Enterprises, Inc. (Molino) is a former auto wrecking facility that was forced to close in 2008. In 1997, Contra Costa Health collected samples which yielded long-chain hydrocarbons at concentrations up to 140,000 mg/kg and total lead up to 1,200 mg/kg. In 1997, one soil sample collected from a stained area yielded total petroleum hydrocarbons at 130,000 mg/kg. On May 30, 1997, the District Attorney's office of Contra Costa County sent an Order to Show Cause preliminary injunction to the owner requiring them to retain the services of a licensed professional to investigate the extent of contamination beneath the site. Gallardo & Associates was retained to prepare a work plan and conduct a site investigation. Between 1997 and 1998, monitoring wells were installed and soil boring samples were taken and analyzed. Subsequent to regulatory action by the County, the owner installed a stormwater treatment system at the site in 2002. Sampling of stormwater continued from about 2002 thru 2008. On April 8, 2008, SFBRWQCB staff inspected and noted violations of the Industrial General Permit. In November 2015, a Remedial Investigation Work Plan was approved for the site. An initial round of sampling was conducted in December 2015. As a result of the history of inspections and monitoring activities, Molino was referred to the SFBRWQCB on January 15, 2016. Further on-site investigations by the owner's representative found PCBs scattered throughout the site. Plans are underway to develop a comprehensive site analysis to determine the extent of PCBs on the site. A Source Properties referral form for this property was provided in Attachment A of the *Mercury and PCBs Watershed/Management Areas, Control Measures, and Load Reduction – Update 2017* report. An updated source property

referral form is provided in Attachment A of this report, which describes enhanced operations and maintenance measures.

Table 16-3: Contaminated Sites Self-Abated or Referred to the SFBRWQCB (FY 2013/14 through FY 2017/18)

SITE NAME	LOCATION/APN	PROPERTY SIZE (ACRES)	YEAR	Referral/ Self-Abatement
Former Molino Enterprises. Inc.	1215 Willow Pass Rd., Pittsburg; 096-091-003-2	6.0	FY 2015-16	Referral

Ongoing Investigations

Ongoing investigations of other parcels may result in a property referral in the future.

16.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3. . The Clean Water Program developed a Stormwater Resource Plan in collaboration with Contra Costa Permittees. During this process, potential Capital Improvement Projects and right of way areas were identified for future Green Infrastructure development. As development progresses, the City will work closely with developers to encourage the inclusion of Green Infrastructure as part of required frontage improvements.

16.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The City of Pittsburg has been implementing a condition of approval for ministerial, discretionary, and capital improvement projects to conduct assessments for PCBs containing materials for masonry structures prior to demolition and remove them in accordance with EPA guidelines. The City of Pittsburg is also participating in the BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1. Staff has had internal discussions regarding the implementation strategy and process by which the PCBs in Demolition Permits will be addressed. The City is creating a "PCB Building Demo" Building Permit module for this

upcoming activity. The City received a Community-wide Brownfield Assessment Grant to conduct Phase I and Phase II Environmental Site Assessments on City-owned and private parcels. As part of this effort, five parcels will be sampled for contaminants including PCBs.

Managing PCBs in Infrastructure

The City also participated in the BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

16.2.4 Enhanced Operation and Maintenance Control Measures

The City of Pittsburg implemented enhanced the street sweeping schedule for more effective street sweeping and debris removal. Staff will explore the possibility of incorporating other enhancements in conjunction with maintenance of the MS4.

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Pittsburg are listed in Table 16-4 below.

Table 16-4: City of Pittsburg Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Semi-Annually	0.7	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2017-2018	Annually	Semi-Annually	114.3	Inlet-based full trash capture devices

Notes:

2. Full trash capture device clean out includes inlet-based CPS and Basket devices.

16.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

16.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The City participates in a regional Household Hazardous Wastes program with the Delta Household Hazardous Waste Facility. The City promotes the use of this facility for the

collection of mercury containing items for residents and small businesses through brochures and through contact with the general public at year-round publicly hosted events.

The Permittees are actively implementing mercury recycling programs in order to reduce mercury loading to the Bay.

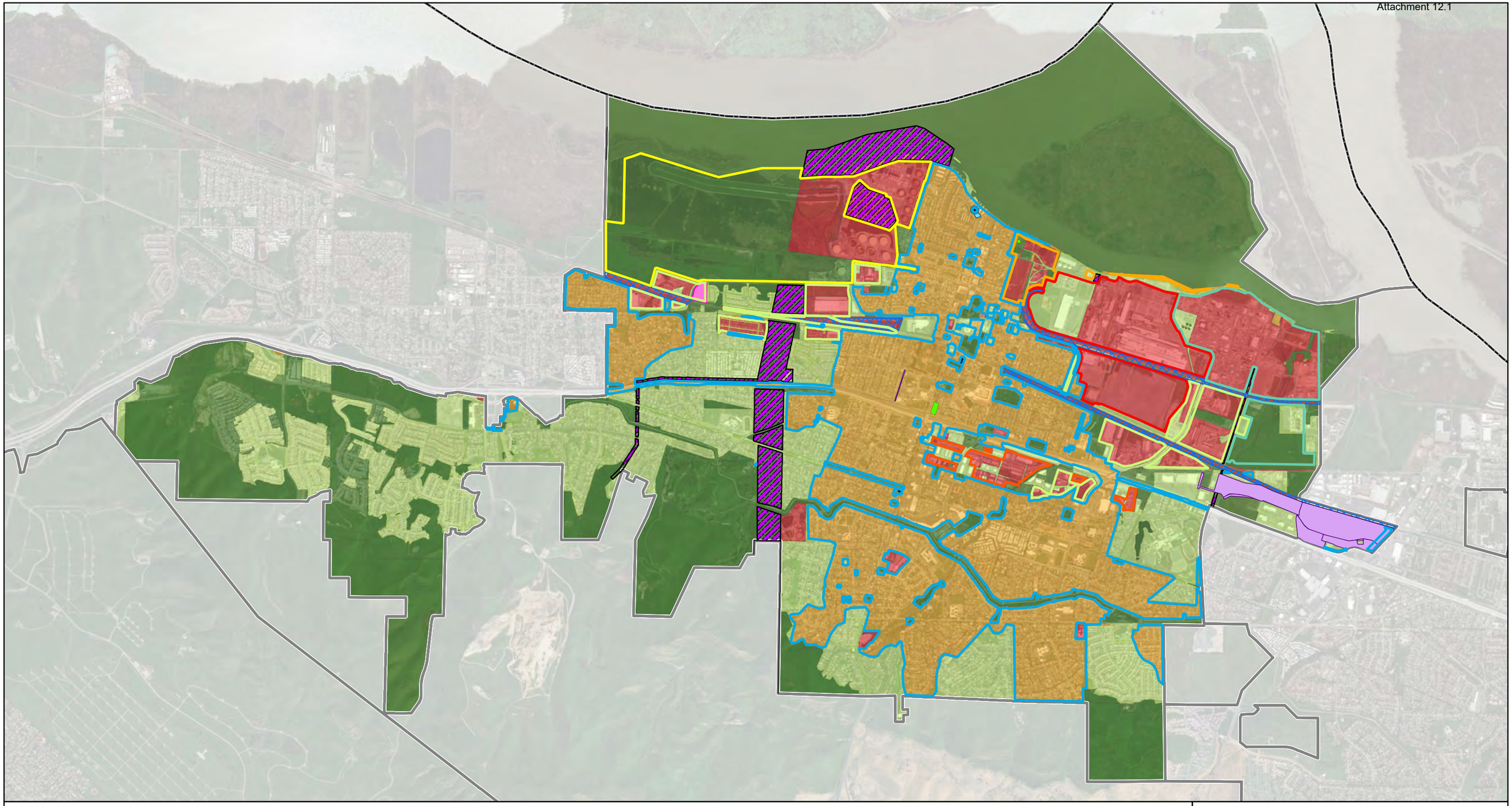
Illegal Dumping Cleanup

The City has hired an employee dedicated to addressing illegally dumped material within the public rights of way. PW staff are trained on the proper disposal protocols for hazardous substances.

The Permittees will identify and cleanup illegal dumping of construction and demolition debris as needed.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Source Property Referral/Abatement

Full Trash Capture

- HDS

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- PIT-1, Old Urban
- PIT-2, Southern Energy Delta/Genon
- PIT-3, USS Posco Industries
- PIT-4, Dow Chemical Company
- PIT-5, Waterfront Industrial
- PIT-6, Old Industrial
- PIT-7, Camp Stoneman

N

0 2,800 5,600 Feet

Watershed/Management Areas and Control Measures
City of Pittsburg

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 16-1

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17 CITY OF PLEASANT HILL

17.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Pleasant Hill are shown on Figure 17-1 and are listed in Table 17-1 below.

Table 17-1: City of Pleasant Hill PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
PLH-1: Old Urban	4,509.0	0.0	80.2	6.3	13.5	0.0
PLH-2: Old Industrial	20.2	100.0	0.0	0.0	0.0	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 17-2 and are described in the sections below.

Table 17-2: City of Pleasant Hill Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	0.5	0.0	100.0	0.0	0.0	0.0
Trash Full Capture Devices[1]	35.8	0.0	93.6	6.1	0.3	0.0
Enhanced O&M Measures[2]	263.4	0.0	94.3	2.6	3.1	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

17.2 Scope and Schedule of PCBs Control Measures

17.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of Pleasant Hill have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

The City of Pleasant Hill has not identified any source properties but will continue its inspection of commercial/industrial facilities required by Provision C.4 which may identify source properties in the future, albeit unlikely given the commercial rather than industrial nature of the facilities inspected. Ongoing investigations may result in a property referral in the future.

17.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

17.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

17.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Pleasant Hill are listed in Table 17-3 below.

Table 17-3: City of Pleasant Hill Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Quarterly	263.4	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

17.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

17.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

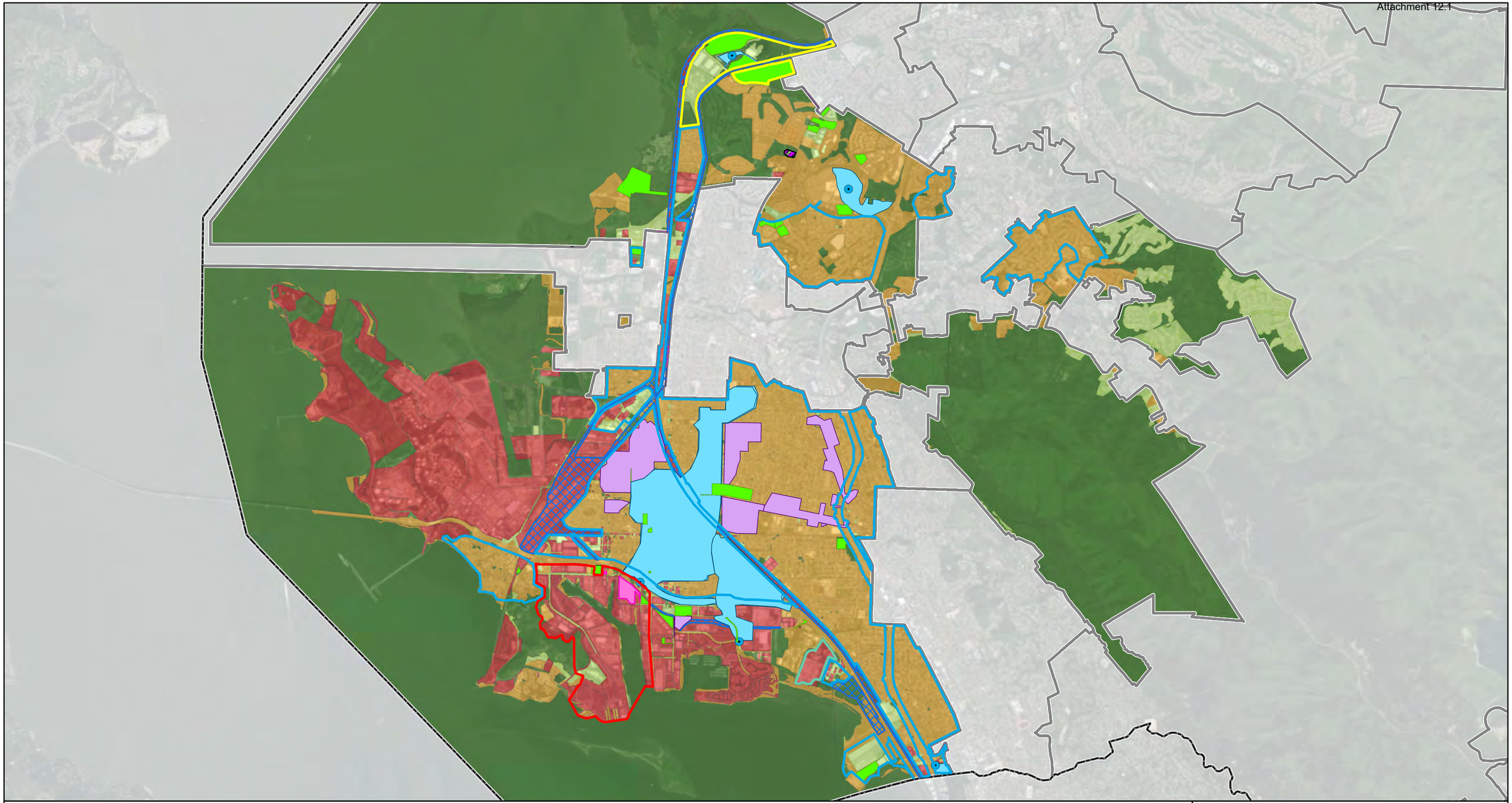
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees does identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs are addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Source Property Referral/Abatement

Full Trash Capture

- HDS
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- RIC-1, Old Urban
- RIC-2, Point Pinole
- RIC-3, Santa Fe Channel
- RIC-4, Zeneca Site

N

0 4,300 8,600 Feet

Watershed/Management Areas and Control Measures
City of Richmond

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 18-1

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18 CITY OF RICHMOND

18.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Richmond are shown on Figure 18-1 and are listed in Table 18-1 below.

Table 18-1: City of Richmond PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
RIC-1: Old Urban	5,563.0	6.3	85.1	4.9	3.7	0.0
RIC-2: Point Pinole	329.4	31.6	0.0	31.9	36.5	0.0
RIC-3: Santa Fe Channel	833.6	63.8	7.0	6.5	22.7	0.0
RIC-4: Zeneca Site	63.4	100.0	0.0	0.0	0.0	0.0
RIC-PGE: Categorical PG&E	6.6	42.7	0.0	15.5	41.9	0.0
RIC-Rail: Categorical Rail	467.6	80.9	5.7	1.1	12.3	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 18-2 and are described in the sections below.

Table 18-2: City of Richmond Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Source Property Identification and Abatement	30.5	100.0	0.0	0.0	0.0	0.0
Green Infrastructure and Treatment	297.1	46.3	23.6	7.8	22.2	0.0
Trash Full Capture Devices[1]	2017.3	8.4	86.1	2.8	2.8	0.0
Enhanced O&M Measures[2]	481.8	4.4	89.8	3.8	2.1	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

18.2 Scope and Schedule of PCBs Control Measures

18.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

Four properties within the City of Richmond have been referred to the SFBRWQCB or have been abated as a result of implementation of the Source Property Identification and Abatement control measure to date (Table 18-3).

Table 18-3: Contaminated Sites Self-Abated or Referred to the SFBRWQCB (FY 2013/14 through FY 2017/18)

SITE NAME	LOCATION/APN	PROPERTY SIZE (ACRES)	YEAR	Referral/ Self-Abatement
Sims Metal Management Richmond Facility	600 South 4th Street, Richmond / 560-240-040, 560-250-027, 560-250-025	19.3	FY 2017-18	Referral
World Corp	1014 Chesley Ave., Richmond	10.44	FY 2017-18	Referral
Port of Richmond	Point Potrero Marine Terminal, Richmond	0.72	FY 2017-18	Self-Abatement
San Diego St. Transformer Spill	R.O.W. San Diego St., Richmond	0.08	FY 2017-18	Self-Abatement

Property #1. Sims Metal Management Richmond Facility (Sims Richmond) is a scrap metal facility located in Richmond within the Parr Watershed. Sims Richmond is located adjacent to and on former United Heckathorn Co. property, a Superfund site that is under remediation for dichlorodiphenyltrichloroethane (DDT) and dieldrin contamination. As part of 2011-2013 CW4CB Task 3 efforts, Sims Richmond was identified for a site inspection because of previous observations that electrical transformers used to be stored on-site. An inspection of Sims Richmond was conducted on May 18, 2011 by City of Richmond staff. During the inspection, inspectors noted that activities on the large dirt lot of the Sims Richmond site had the potential to generate track-out; there was also visible standing water as a result of dust control. On October 3 and 4, 2012, samples were collected from four locations in the public ROW along S. 4th Street, Wright Avenue, and Hoffman Boulevard. The sediment samples had PCBs concentrations ranging from 0.932 to 1.450 mg/kg. Additionally, stormwater samples were collected from one location in the public ROW at the corner of Cutting Blvd and South 4th Street on March 1 and 20, 2018, and April 6, 2018. The water samples had PCBs concentrations

ranging from 0.423 to 1.846 ppm. As a result of these inspection and monitoring activities, Sims Richmond has been referred to the SFBRWQCB (see Attachment A).

SIMS Richmond implements the following BMPs to contain pollutants onsite:

1) Construction of a concrete berm, completed in 2013, in front of property to prevent stormwater that accumulates on the property from running off to the City street. This water is pumped to an onsite retention pond and/or Baker Tank for reuse as dust control on metal piles;
2) Continuous street sweeping occurs during business hours on S. 4th Street and Wright Avenue (City ROW);
3) Pervious surfaces were paved during FY 2017/2018;
4) Implementation of a mechanical device to brush off dust from truck tires; and
5) The stormwater outfall has been plugged since 2011 such that stormwater from the facility does not discharge to the City's stormwater collection system.

The facility is also inspected by the City, as required by Provision C.4 of the MRP, to ensure BMPs are implemented to control pollutants onsite. In FY 18/19, the City will install a trash capture device with the ability to trap sediments at the storm drain inlet and perform inlet cleaning throughout the year.

Property #2. World Oil Corp. Historical operations at this facility were likely to involve the handling of PCBs. These operations include roofing shingle manufacturing from the 1930 through 1984 and an Oil & Antifreeze Recycling business from 2000 to 2007. Records also show that waste oil and sludge generated at the facility were sampled and documented to contain PCBs. The site is now a vacant lot. The majority of structures on site were built between 1916 and 1954 (target age and characteristics of buildings containing PCBs in building materials). During decommissioning, concrete building foundations were crushed onsite and the aggregate spread over the property. Through the Contra Costa Clean Water Program, it was confirmed that the site is a PCBs source property from stormwater sampling of run-off from the facility during a rain event on 1/8/17. PCBs concentration was 0.647 mg/kg, which was above the action level of 0.5 mg/kg. As a result, the San Francisco Regional Water Resource Control Board issued the property owner a 13267 letter, dated September 7, 2017, requiring submittal of work plan to monitor and remediate PCBs on site. Since the confirmation of the presence of PCBs at World Oil Corp facility in 2017, the City has implemented the following enhanced O&M actions to prevent sediments containing PCBs from entering the City's storm drain system: 1) storm drain

inlet protection and cleaning, and 2) street sweeping on Chesley Ave. These enhanced O&M actions were not implemented prior to 2017. Meanwhile, SFRWQCB staff will direct the owner of the facility to ensure BMPs are implemented to prevent tracking PCBs offsite. Such BMPs will consist of berms on the north and western sides of the parcel. The City will expedite the grading permitting process when the application is submitted by World Oil. The City will also inspect the site to ensure proper BMPs are implemented during grading operation to prevent tracking of sediments off site. Currently, there is no vehicular traffic on/off site.

Property #3 Port of Richmond. On the morning of November 14, 2014, Port staff and a hazardous materials abatement contractor investigated a report of an oil leak within the graving basins located within the Point Potrero Marine Terminal. Staff and the contractor discovered oil slowly leaking from an abandoned transformer located on the concrete gangway within Basin Number 3. Toward the rear of the transformer, there was oil pooling against the rear wall of the graving basin. Based upon the identification plate on the transformer and the contractor's prior experience, the contractor concluded the oil likely contained PCBs. A few days later, it was discovered that the abandoned transformer within Basin Number 1 was also leaking, and it was also concluded by the same contractor the oil likely contained PCBs. As a hazardous material, PCBs are managed under the Toxic Substances Control Act (TSCA) found in the Code of Federal Regulations at 40 CFR 761. The Environmental Protection Agency (EPA) oversees the management, clean up and disposal of PCBs waste and PCBs-contaminated material. According to TSCA, when a PCBs spill occurs, the responsible party must begin cleanup within 24 hours. The Port of Richmond directed a certified hazardous materials contractor, Cal Inc. to begin cleanup in accordance with TSCA.

Laboratory result showed the oil from the transformers composed of 600,000 mg/kg of Aroclor 1260. On December 24, 2014 the Contractor had cleaned all visible oil and removed the transformers from the graving basins. In summer 2015, the Port contracted a second hazardous abatement contractor to sample, test, and remove concrete contaminated with PCBs from the graving basins. By early 2016, all concrete permeated with PCBs was removed. On June 7, 2018, the City received notice from the EPA stating the City has met the clean-up requirement and therefore no further actions is required. The approximate area contaminated with PCBs was 0.72 acre.

Property #4 PG&E Transformer spill on San Diego St. On May 3, 2015 at 11:20 PM, a PG&E distribution pole located at 5635 San Diego Street in Richmond, California toppled during a wind storm. The distribution pole contained three (3) overhead 37.5 kilo-volt-ampere (KVA) transformers (one manufactured by Allis Chalmers, one manufactured by Pole Star and one

without a nameplate), which were damaged as the pole struck the asphalt roadway at the site and began to leak. Based on manufacturer specifications, each transformer contained a maximum of 23 gallons of transformer fluid, giving a maximum spill volume of 69 gallons. Some unknown amount of transformer fluid drained into a nearby storm drain, and from there entered a nearby urban creek, Cerrito Creek (the Creek). PG&E staff arrived on site at approximately 12:20 AM on May 4, 2015 and placed absorbent material on the release and an absorbent boom around the impacted storm drain inlet. PG&E collected a sample of mixed oil directly from the top of the asphalt in the release area and the sample was delivered to Anresco Laboratories in San Francisco, California, to be analyzed for PCBs using USEPA Test Method 8082. The analytical results of the surface sample indicated that the oil contained 45.0 mg/kg of PCBs (Aroclor 1260). PG&E also collected bulk samples from residual transformer oil in the Allis Chalmers and unnamed transformers and a wipe sample from inside the shell of the Pole Star transformer, which contained no residual oil. These samples were analyzed for PCBs by Test America laboratories in Pleasanton, California. Aroclor 1260 was detected on the wipe sample from the Pole Star transformer, but the two oil samples from the other transformers were nondetect for PCBs.

Sandbags were placed across the bed and bank downstream of the affected reach creating a 4-5 ft. dam to hold back tidal flow during excavation. Standing water present in the channel was removed with a vacuum truck. Approximately 17,995 gallons of water were pumped out of the Creek and stored in onsite tanks. The stored water was sampled for waste characterization purposes and transported for disposal to Seaport Environmental in Redwood City, California. Excavation of potentially impacted sediment in the bed and banks of Cerrito Creek was carried out with a small tracked excavator, which accessed the canal from the Pacific East Mall parking lot along the south bank of the Creek. Sediment, vegetation and trash debris was removed from an approximately 120 ft. by 6 ft. area to an average depth of 1.5 ft., which generated approximately 40 cubic yards of potentially impacted solid waste. The excavated waste material was placed into four (4) roll-off containers stored on site and sampled for waste characterization purposes. Upon review of characterization laboratory samples, the waste was classified as nonhazardous and shipped to Kirby Canyon Landfill in San Jose, California for proper disposal.

PG&E removed and replaced asphalt and sidewalks from the west end of San Diego Street that had been affected by the oil release. On October 26, 2015, PSC removed approximately 1,800 square feet of asphalt and concrete from the area of San Diego Street and associated sidewalk. Confirmation soil samples were collected from four locations beneath the removed

asphalt/concrete and submitted to Anresco Laboratories for PCB Aroclor 1260 analysis. One result had a detectable PCBs concentration of concern (0.107 ppm). PG&E chose to perform additional excavation to remove soil associated with this sample. A thickness of 7-10 inches of soil was excavated from the targeted sample area and a second confirmation sample collected and results were non-detect. New concrete was poured to replace the removed sidewalk panels. New asphalt was placed in the removal area to restore the site to prior conditions. A total of 30.68 tons of asphalt/concrete waste and 12.6 tons of soil waste was removed and disposed of as non-RCRA hazardous waste at U.S. Ecology Landfill located in Beatty, Nevada. A total of 50 gallons of non-RCRA hazardous wash water was collected and disposed of at U.S. Ecology Landfill located in Beatty, Nevada.

Source Properties Referral/Abatement forms for these properties are provided in Appendix A.

Ongoing Investigations

The City of Richmond, through its C.4 business inspection program, continuously inspects and investigates industrial and commercial properties for potential sources of PCBs in the Santa Fe Channel, Zeneca, and North Richmond management areas. Moreover, City staff inspects PG&E maintenance yards, located in its jurisdiction, to warrant that all PCBs containing transformers and equipment are properly contained and disposed. Ongoing investigations may result in a property referral in the future.

Through the plan checking process, any properties that apply for grading permits for the purpose of site remediation under clean up orders by State regulatory agencies (i.e., State Water Resources Control Board and Department of Toxic Substance Control) are required to submit monitoring results for PCBs prior to permit issuance.

Currently, the City does not perform any source identification in residential Old Urban or New Urban management areas.

18.2.2 Green Infrastructure / Treatment Control Measures

Development and redevelopment projects in all management areas are subjected to the Contra Costa County C.3 requirements.

In the Point Pinole Business Park Management Area, a proposed and planned project is located on a 42.14-acre site at 2995 Atlas Road, at the corner of Atlas and Giant Road. The project involves construction of a 700,000 square foot logistics building and associated parking,

loading, and landscaping. The new building would include 40,000 square feet of office space and 687,820 square feet of warehouse space. This is a required project for C.3.

In the Old Urban Management Area, the City has planned projects to conform to its adopted General Plan and proposed Urban Greening Master Plan.

The Santa Fe Channel Management Area is an industrial area in Richmond historically and presently. This area is known to have been contaminated with high levels of PCBs, according to studies conducted over the years by the San Francisco Estuary Institute, BASMAA, and CCCWP. Bioretention facilities were constructed in the City right-of-way and in front of a PG&E substation, as a pilot project funded by an EPA grant (Clean Watersheds for a Clean Bay), to treat PCBs found in sediments. The City plans to continue to construct green infrastructure in the area, Cutting Blvd between S 1st St and S 4th St, when funding is available. Another completed project that incorporated bioretention was Honda Port of Entry.

In the New Urban Management Area, proposed redevelopment projects are subject to the C.3 requirements.

18.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

18.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Richmond are listed in Table 18-4 below.

Table 18-4: City of Richmond Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Semi-Annually	Quarterly	1.8	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2016-2017	Semi-Annually	Quarterly	480.0	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

18.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

18.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The Permittees are actively implementing mercury recycling programs in all W/MAs in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

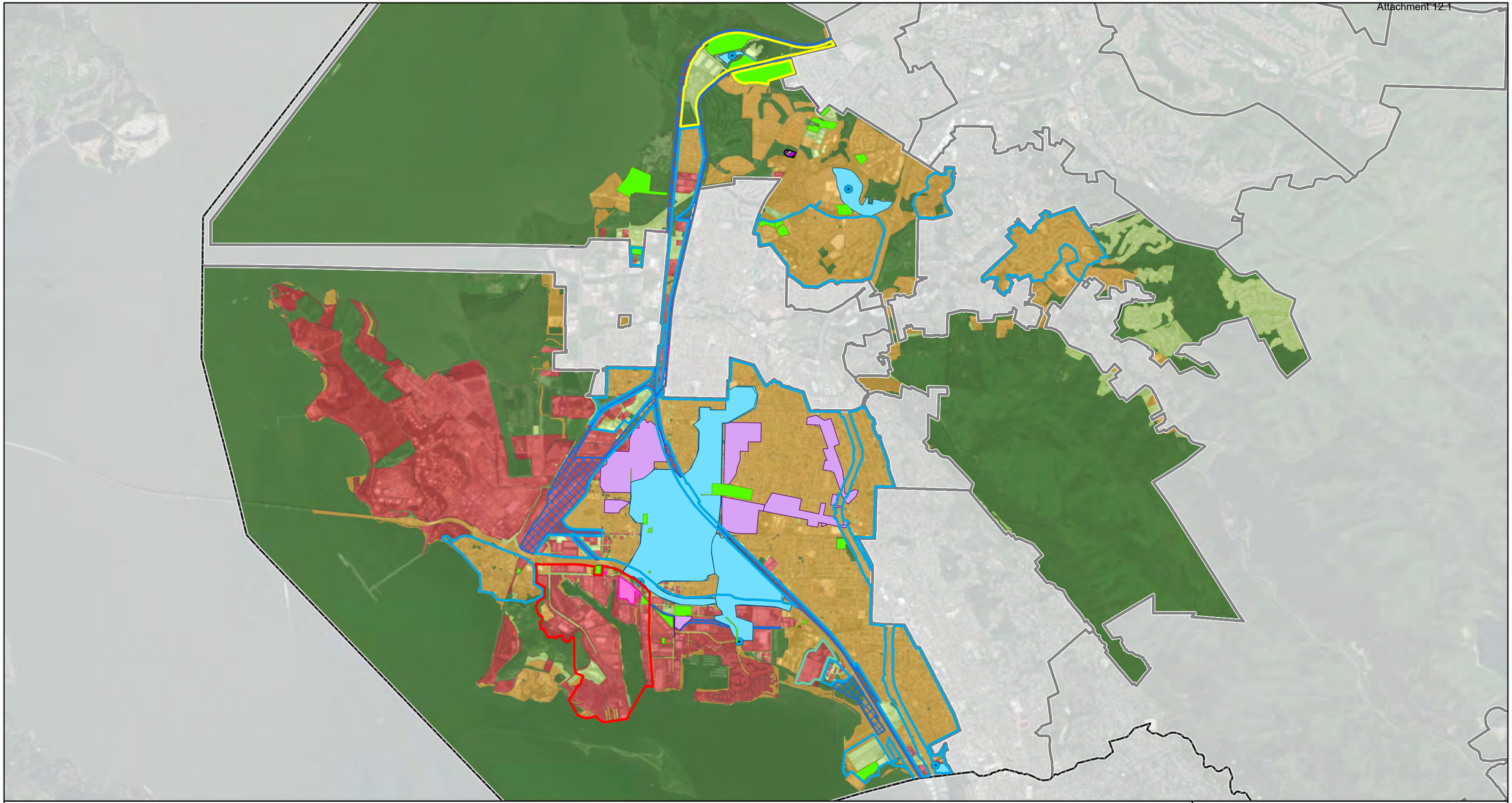
The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

The City of Richmond utilizes the 1-800-NO DUMPING hotline for reports of illegal dumping activities. When reports are received by the City abatement crew, illegally dumped materials are abated and sorted according to the type of wastes and disposed of accordingly.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.

The City of Richmond staff diligently investigates, enforces, and follows up on the removal, disposal, and remediation of spills from transformers belonging to PG&E as they are reported.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Source Property Referral/Abatement

Full Trash Capture

- HDS
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- RIC-1, Old Urban
- RIC-2, Point Pinole
- RIC-3, Santa Fe Channel
- RIC-4, Zeneca Site

N

0 4,300 8,600 Feet

Watershed/Management Areas and Control Measures
City of Richmond

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 18-1

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19 CITY OF SAN PABLO

19.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of San Pablo are shown on Figure 19-1 and are listed in Table 19-1 below.

Table 19-1: City of San Pablo PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
SPB-1: Rumrill Industrial Area	45.2	22.9	52.7	16.7	7.7	0.0
SPB-2: Giant Highway Industrial Area	22.7	73.9	9.5	16.5	0.0	0.0
SPB-3: Old Urban	1,599.1	0.8	88.4	0.6	10.2	0.0
SPB-RAIL	0.1	89.3	10.7	0.0	0.0	0.0
SPB-PG&E	0.2	0.0	0.0	0.0	100.0	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 19-2 and are described in the sections below. The City will be assessing Clean Watersheds for a Clean Bay results, development applications, sampling results, and other pilot projects to gain a clear understanding of the economic and environmental impacts of each project. The City will use this information to make informed decisions in the future about funding programs that provide additional PCBs and mercury reductions.

Table 19-2: City of San Pablo Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Source Property Identification and Abatement	4.5	100.0	0.0	0.0	0.0	0.0
Green Infrastructure and Treatment	12.8	0.0	80.5	0.0	19.5	0.0
Enhanced O&M Measures[1]	430.5	3.2	90.4	2.8	3.6	0.0

Notes:

1. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

19.2 Scope and Schedule of PCBs Control Measures

19.2.1 Source Property Identification and Abatement

Over the 2014-2015 and 2015-2016 reporting periods the City of San Pablo (in conjunction with the Contra Costa Clean Water Program) screened 132 parcels, revised the high-likelihood parcels to 11 and collected samples at six of the 11 sites. Of the six samples collected, there was one sample in the City of San Pablo that contained PCBs levels above 1.0 mg/kg.

Since the initial sampling, the City of San Pablo performed further research into the neighborhood surrounding the site with the elevated PCBs sample and learned that this area is adjacent to a previously referred (2009) PCBs contaminated site; however, this site is located in a different jurisdiction. In January 2017, the City of San Pablo in conjunction with CCCWP performed additional sampling to eliminate other properties surrounding the area and worked with the Contra Costa Clean Water Program and the City of Richmond to perform sediment sampling around the previously referred PCBs contaminated site at 1014 Chesley Avenue. One additional sampling event occurred in May 2017, which confirmed that the site was still leaking PCBs into the public right-of-way. Over the 2017-2018, reporting year the City of San Pablo transferred this site to the City of Richmond since the property is located in the City of Richmond's jurisdiction. The City of San Pablo will continue to work with the City of Richmond and SFBRWQCB regarding the status of this property, however information regarding this progress can be found in the City of Richmond section.

In addition, the City of San Pablo attended various meetings regarding a potential contaminated site at 1411 Rumrill Avenue in San Pablo. The City attended a meeting in February 2018 to discuss the potential for an abatement process and credit for this abatement. The City will perform further work on this over the 2018-2019 reporting period.

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of San Pablo have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

While no properties within the City of San Pablo have been referred to the Regional Water Board by the Contra Costa Clean Water Program, one PCBs-contaminated site has been self-abated through a voluntary clean-up. In November of 2015, the City of San Pablo completed a voluntary clean-up of the 4.45-acre old Burlington Northern Santa Fe (BNSF) railroad track brownfield site at 1509 Rumrill Blvd, San Pablo, CA 94804. This City worked with Department of

Toxic Substances Control (DTSC) to cap the site and developed it into a sports complex with bioretention facilities in the parking lot. A self-abatement report was provided in Attachment A of the *Mercury and PCBs Watershed/Management Areas, Control Measures, and Load Reduction – Update 2017* report.

Table 19-3: Contaminated Sites Self-Abated or Referred to the SFBRWQCB (FY 2013/14 through FY 2017/18)

SITE NAME	LOCATION/APN	PROPERTY SIZE (ACRES)	YEAR REFERRED	Referral/ Self-Abatement
Rumrill Sports Complex (Former BNSF Railyard Site)	1509 Rumrill Blvd, San Pablo / 409-313-009; 409-313-009; 410-012-007; 410-012-008	4.45	FY 2015-16	Self-Abatement

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

19.2.2 Green Infrastructure / Treatment Control Measures

Over the 2017-2018 reporting year, one project with bioretention facilities was completed in the City of San Pablo. Over the 2016-2017 reporting year, one project with bioretention facilities was completed. Over the 2015-2016 reporting year, five projects with bioretention facilities were completed. There are six redevelopment projects currently planned in the City of San Pablo over the next two reporting years.

19.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1. The City of San Pablo is assisting in this project by providing municipality representatives in the Technical Advisory Committee and the Steering Committee.

In addition, the City of San Pablo implemented a minor update to their Stormwater Ordinance (Section 8.40.100.C) in 2016 to expand the City's ability to request demolition projects to test for contaminates. Over the 2017-2018 reporting year, one demolition application was

submitted that was considered a high likelihood for PCBs in building materials, therefore the City required the site to test for PCBs in caulking material. The sampling confirmed that elevated levels of PCBs were present in building materials and the site has been required to remove these items in accordance with state and federal laws/guidelines.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

19.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of San Pablo are listed in Table 19-4 below.

Table 19-4: City of San Pablo Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Semi-Annually	304.7	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2016-2017	Annually	Semi-Annually	69.6	Inlet-based full trash capture devices
Full Trash Capture Device Clean Out[1]	FY2017-2018	Annually	Semi-Annually	56.1	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

The City of San Pablo desilted 400 linear feet of Wildcat Creek to remove sediment that is blocking storm drain pipes. This desilting project resulted in the removal of 800 cubic yards of sediment from the creek. As the data needed to determine the PCBs and mercury load reductions for this desilting are not available, no load reduction credit has been included in this report for this project.

19.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

19.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

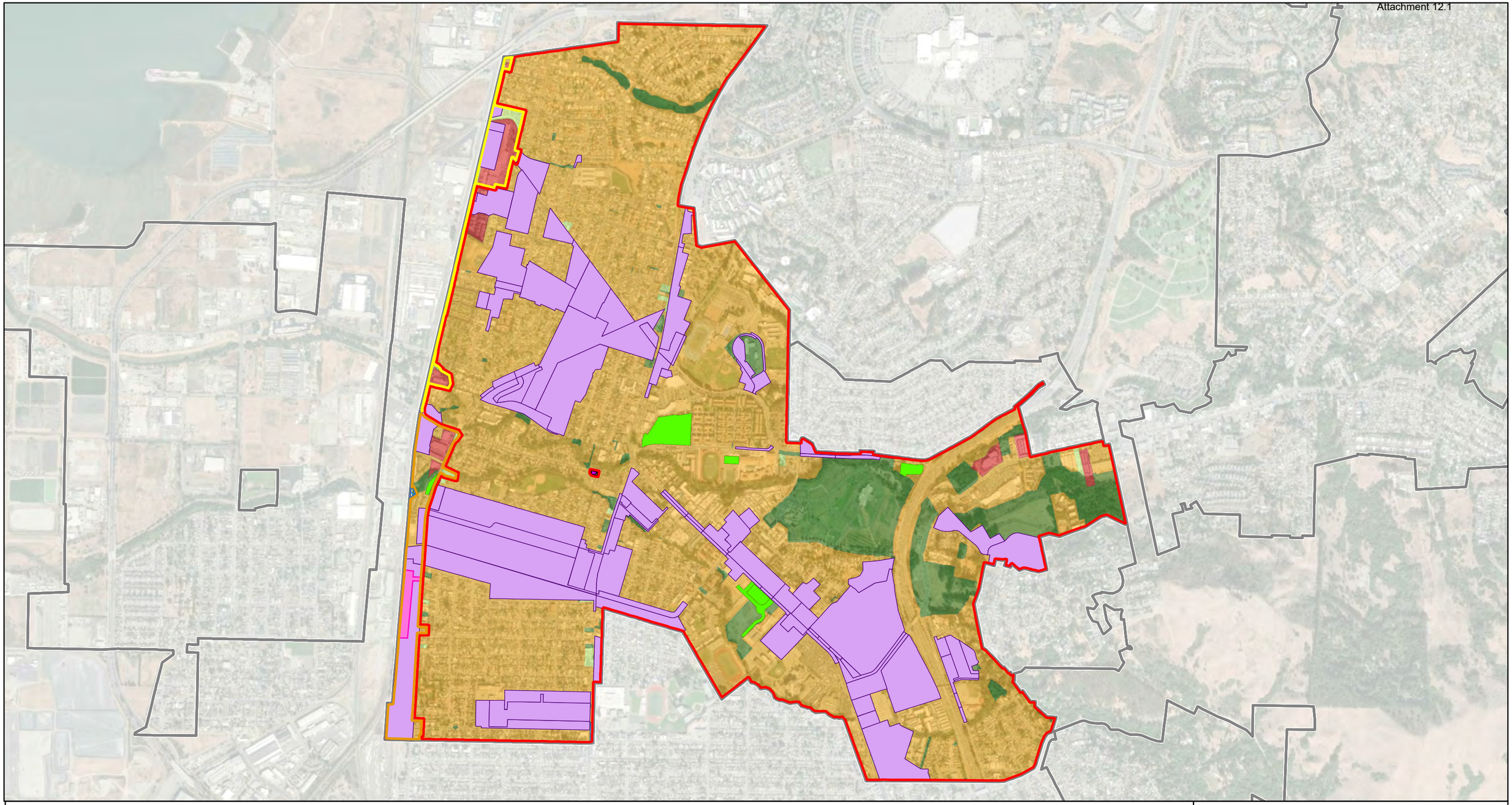
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Source Property Referral/Abatement
- HDS
- HDS Device Drainage Area
- Trash Capture Device Enhanced O&M

Watershed/Management Areas

- SPB-1, Rumrill Industrial Area
- SPB-2, Giant Highway Industrial Area
- SPB-3, Old Urban

N

0 1,300 2,600 Feet

Not all control measures are present in every jurisdiction. Street sweeping O&M applies to certain permittees but is not shown on the figure.

Watershed/Management Areas and Control Measures
City of San Pablo

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | September 2018

Figure 19-1

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20 CITY OF SAN RAMON

20.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of San Ramon are shown on Figure 20-1 and are listed in Table 20-1 below.

Table 20-1: City of San Ramon PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
SRM-1: Old Urban	916.9	0.0	93.9	4.7	1.5	0.0
SRM-PGE: Categorical PG&E	84.5	15.9	13.8	2.6	67.6	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The City of San Ramon has identified one WMA that covers old urban areas within the City. There are no areas within the City's jurisdiction that are categorized as old industrial land use (pre-1974) as defined in the initial Source Property Identification and Abatement study conducted by the Contra Costa Clean Water Program. There are a limited number of commercial buildings within WMA 1 that were constructed pre-1974. Those units are located within the City of San Ramon Northwest Specific Plan and are subject to redevelopment as the residential and commercial markets develop in the area. One PG&E storage facility that may have contained power transformers will be included in a county-wide categorical WMA.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 20-2 and are described in the sections below.

Table 20-2: City of San Ramon Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Green Infrastructure and Treatment	0.0	0.0	0.0	0.0	0.0	0.0
Trash Full Capture Devices[1]	27.0	0.0	0.0	100.0	0.0	0.0

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Enhanced O&M Measures[2]	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

20.2 Scope and Schedule of PCBs Control Measures

20.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

No properties within the City of San Ramon have been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Abatement control measure to date.

Ongoing Investigations

No further investigations are warranted in the City of San Ramon.

20.2.2 Green Infrastructure / Treatment Control Measures

As stated above, the portion of WMA 1 that includes commercial buildings falls under the San Ramon Northwest Specific Plan that will be subject to C.3 stormwater treatment requirements.

The planned project is currently in the proposal stage of development. The project includes demolition of a 1950's era sports bar and the construction of new apartment units that will require C.3 stormwater treatment.

20.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Building Department is scheduling an update to the City Building Code to include BASMAA recommended mitigation practices for PCB removal during building demolition. This is expected to happen in Spring 2019.

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

Managing PCBs in Infrastructure

The Program and Permittees participated in a BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

20.2.4 Enhanced Operation and Maintenance Control Measures

The City of San Ramon has no Enhanced Operation and Maintenance control measures to report.

20.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

20.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

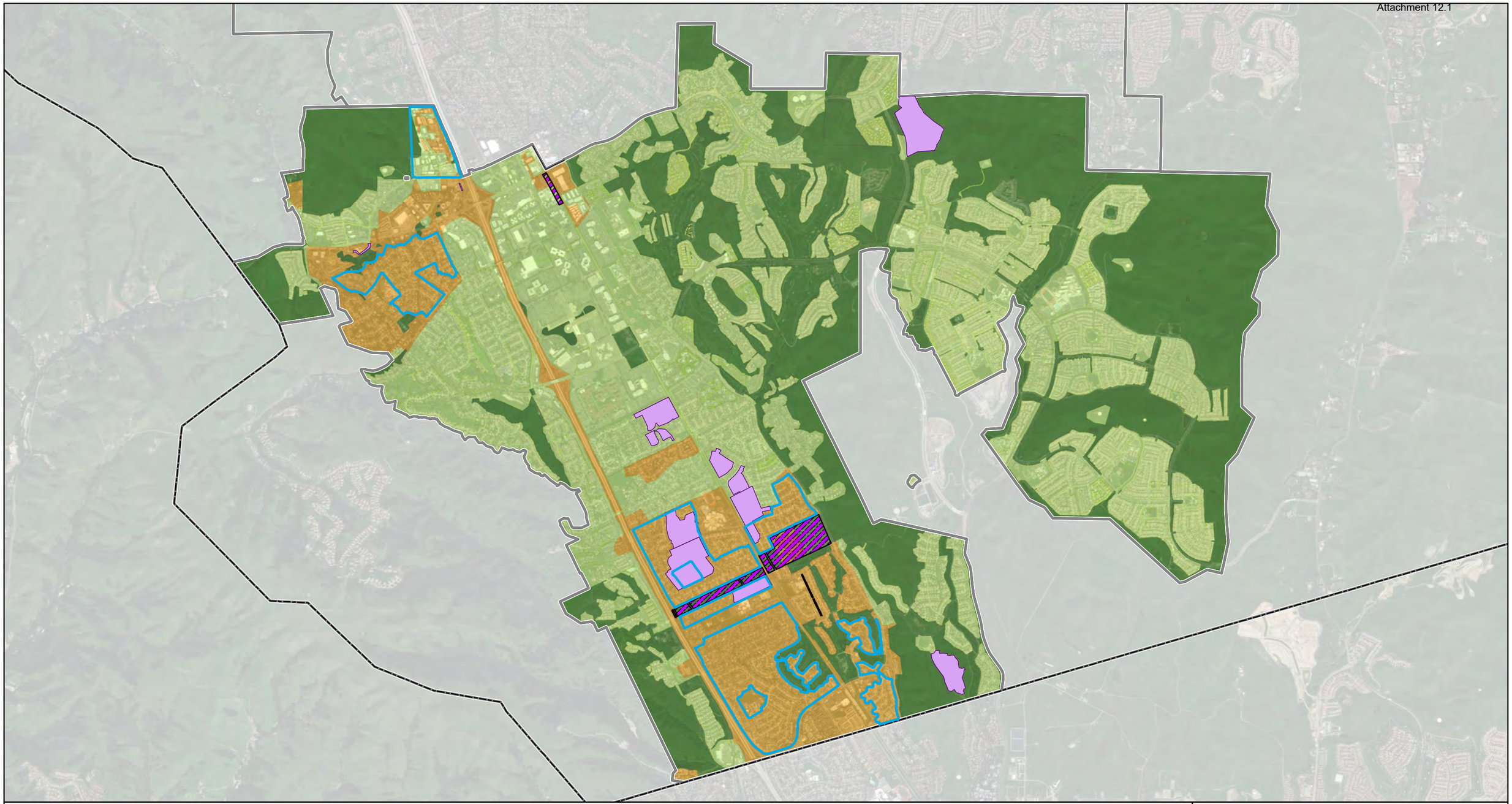
The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Illegal Dumping Cleanup

The City of San Ramon typically removes items from illegal dumping sites within 24 hours of notification or discovery by staff.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- SRM-1, Primary WMA

N

0 2,900 5,800 Feet

Watershed/Management Areas and Control Measures
City of San Ramon

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 20-1

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21 CITY OF WALNUT CREEK

21.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within the City of Walnut Creek are shown on Figure 21-1 and are listed in Table 21-1 below.

Table 21-1: City of Walnut Creek PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
WCR-1: Downtown Core	775.7	0.9	96.3	0.4	2.5	0.0
WCR-2: Shadelands	233.7	5.3	86.4	0.0	8.3	0.0

Notes:

1. Land use breakdown as of IMR land use year 2013.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 21-2 and are described in the sections below.

Table 21-2: City of Walnut Creek Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Source Property Identification and Abatement	<0.01	0.0	100	0.0	0.0	0.0
Green Infrastructure and Treatment	67.0	2.5	76.0	0.0	21.5	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	735.1	0.0	89.9	3.8	6.3	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out.

21.2 Scope and Schedule of PCBs Control Measures

21.2.1 Source Property Identification and Abatement

PCBs-Contaminated Properties Referred to the Regional Water Board

During renovation of the Larkey Pool swim center, 27 linear feet of PCBs-containing concrete slab expansion joint caulking, approximately 6 inches in width, were removed. The self-abatement form for this project is provided in Appendix A.

An additional few private and non-jurisdictional properties had been identified to have low potential for PCBs. During FY 2014-15 and FY 2015-16, staff screened sixty-one (61) properties. None was classified as high likelihood for PCBs source. Using institutional knowledge, records review, and windshield surveys, staff categorized them as low or moderate likelihood sources of PCBs. The City's routine business facility inspections confirmed the status designation of these properties. Properties that had been redeveloped or undergoing redevelopment are classified as low likelihood source.

Ongoing Investigations

Ongoing investigations may result in a property referral in the future.

21.2.2 Green Infrastructure / Treatment Control Measures

As required by the Municipal Regional NPDES Permit (MRP, provision C.3.j), the City of Walnut Creek requires the inclusion of low impact development (LID) drainage design into storm drain infrastructure on public and private lands (including streets, storm drains, parking lots, building roofs and others). When a project is not considered as a regulated project under provision C.3 (such as a single-family residence project), it is encouraged to install one or more LID elements.

In FY 2017-18 there were six newly-constructed C.3 projects bringing the total number of private and public projects with low impact development (LID) features to sixty (60). Because the City of Walnut Creek does not have old urban lands, the amount of PCBs load removed from C.3 projects within old urban lands is minimal.

Engineering staff conducted ongoing review of opportunities to incorporate green infrastructure into existing and planned capital improvement projects. One planned CIP project was to remodel the plaza in front of the Lesher Center for the Arts building. Although this

project did not meet the size threshold for C.3 compliance, the City voluntarily included pervious pavers to replace existing impervious concrete pavement. Managing PCBs in Building Materials and Infrastructure

21.2.3 Managing PCBs in Building Materials

The City of Walnut Creek is participating in the BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1.

The City compiled a list of public facilities that were constructed between 1950 and 1980. All wood-frame structures were excluded from the list. If any of the buildings on the list is to be remodeled or demolished as part of the City's Capital Improvement Program, staff will test the materials for PCBs. Our Council approved the Critical Community Facility work plan in February 2018 and allocated funding to update Heather Farm Park and Civic Park master plans. Facilities within these two parks are applicable to be tested for PCBs prior to any remodeling or demolition in the future.

The Building Division continues to require testing of PCBs as part of the building demolition permit. Building Permit staff received training on the screening assessment protocol of PCBs in priority building materials. Each staff received a copy of BASMAA's PCBs screening assessment flowchart. In this permit year, none of the project tested had positive screening result of PCBs concentration above 50 mg/kg in one or more priority materials.

Managing PCBs in Infrastructure

The City of Walnut Creek also participated in the BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

21.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the City of Walnut Creek are listed in Table 21-3 below.

Table 21-3: City of Walnut Creek Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	Treatment Area (acres)	Location
Full Trash Capture Device Clean Out[1]	FY2014-2015	Annually	Semi-Annually	735.1	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Basket devices.

21.2.5 Diversion to POTW

No diversion to POTW control measures are proposed.

21.2.6 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The City of Walnut Creek participates in the regional recycling efforts of mercury-containing thermometer and devices through the Central Contra Costa Sanitary District (CCCSD) household hazardous waste program.

The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

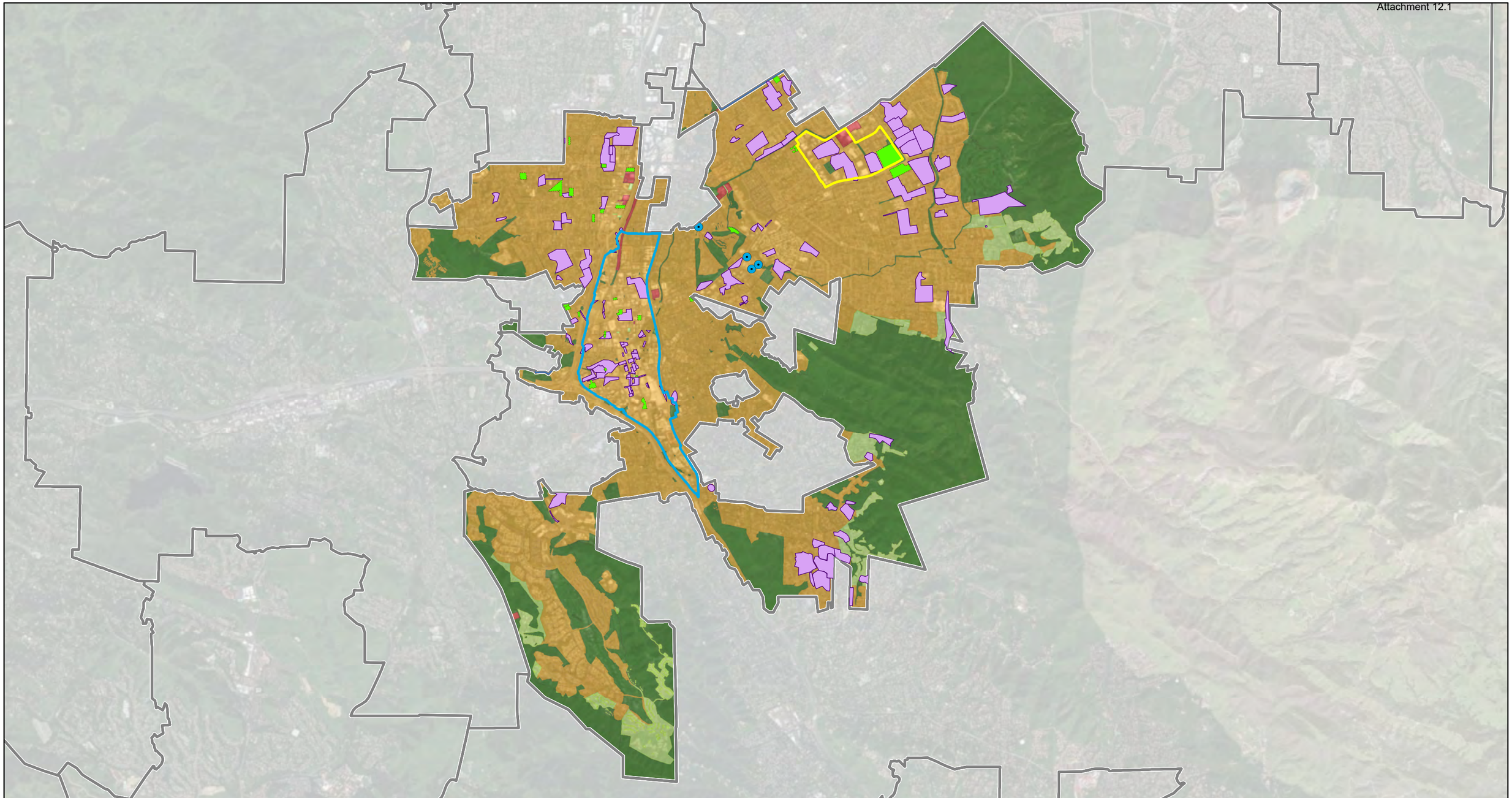
Illegal Dumping Cleanup

The City has not encountered any incidents involving illegal dumping of PCBs and/or mercury containing materials and related cleanups.

The Permittees will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project

Full Trash Capture

- HDS
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- WCR-1, Downtown Core
- WCR-2, Shadelands

N

0 4,100 8,200 Feet

Watershed/Management Areas and Control Measures
City of Walnut Creek

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 21-1

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22 UNINCORPORATED CONTRA COSTA COUNTY

22.1 List of Watersheds / Management Areas and Control Measures

The watersheds / management areas (W/MAs) within Unincorporated Contra Costa County are shown on Figure 22-1 and are listed in Table 22-1 below.

Table 22-1: Unincorporated Contra Costa County PCBs and Mercury Watershed Management Areas (W/MAs) and Associated Land Uses

W/MA Identifier	Total Area[1] (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
CCC-1: High Likelihood and Source Properties	5,931.2	51.7	9.1	2.8	22.8	13.6
CCC-2: Old Industrial Areas	1,055.0	99.9	0.0	0.0	0.1	0.0
CCC-3: North Richmond Pump Station (NRPS) Drainage Area	182.2	0.1	86.7	3.7	9.6	0.0
CCC-4: Infrastructure Improvement Areas (old industrial and old urban areas with very limited or no storm drain systems adjacent to industrial areas)	560.8	0.0	30.3	42.4	27.3	0.0
CCC-5: Enhanced Operations and Maintenance Areas (old industrial and old urban areas with curb, gutter, and storm drain systems)	1,856.4	0.0	90.9	2.7	6.3	0.0
CCC-6: Green Infrastructure (incorporated as infrastructure is redeveloped County-wide, not mapped)	1,775.3	3.7	2.2	0.7	93.4	0.0
CCC-PGE: Categorical PG&E	639.9	9.8	2.0	15.0	72.4	0.9
CCC-RAIL: Categorical Railroad	5,931.2	51.7	9.1	2.8	22.8	13.6

Notes:

1. Land use breakdown as of IMR land use year 2013.

These W/MAs are designated based on the types of control measures and actions that may be taken to reduce PCBs flowing or present in the stormwater drainage system. These areas represent priority areas within Contra Costa County. Contra Costa County is large and spread out. Many areas indicated as old industrial and old urban areas that may have PCBs are not included within these priority management areas at this point in time. Contra Costa County has evaluated close to 1,000 potential properties and has found PCBs in sediment sampling at one site, Fass Metals. The County is working on implementing enhanced O&M control measures for Fass Metals in order for the referral to be accepted by the SFBRWQCB. An additional site,

Radiant Avenue, was found to be self-abated by the property owner. The Radiant Avenue self-abatement was accepted by the SFBRWQCB for PCBs and mercury loads reduced.

The control measures that are currently being implemented or will be implemented during the term of the permit in each of these W/MAs are summarized in Table 22-2 and are described in the sections below.

Table 22-2: Unincorporated Contra Costa County Area Treated by Area-Based Control Measure Category (FY 2013/14 through FY 2017/18)

Control Measure Category	Total Area Treated (Acres)	% Old Industrial	% Old Urban	% New Urban	% Open Space	% Other
Source Property Identification and Abatement	19.5	100.0	0.0	0.0	0.0	0.0
Green Infrastructure and Treatment	79.7	0.0	39.1	0.9	60.0	0.0
Trash Full Capture Devices[1]	0.0	0.0	0.0	0.0	0.0	0.0
Enhanced O&M Measures[2]	633.8	1.7	79.9	3.6	14.7	0.0

Notes:

1. Includes only Hydrodynamic Separator (HDS) units.
2. Includes enhanced street sweeping, enhanced storm drain inlet cleaning, and full trash capture device clean out, other than HDS units.

22.2 Scope and Schedule of PCBs Control Measures

22.2.1 Source Property Identification and Abatement

One property within the Unincorporated Contra Costa County has been referred to the SFBRWQCB as a result of implementation of the Source Property Identification and Self-Abatement actions taken to date. This property, Fass Metals, is in Watershed/Management Area 1 (W/MA 1). Fass Metals is located in North Richmond and is a known PCBs site that was investigated and remediated with oversite of the Department of Toxic Substances Control (DTSC). Even though the site was remediated and capped, PCBs were found in a sediment sample and a stormwater sample collected on the public right of way just outside the site . The County is working to implement control measures to best prevent the PCBs-contaminated sediments from migrating off the site and into the MS4. A Source Properties referral will be re-referred to the SFBRWQCB when the enhanced O&M is implemented.

A second site on Radiant Avenue in North Richmond, in unincorporated county, was self-abated by the property owner. The property owner worked with consultants who completed environmental assessments of the property indicating that PCBs and other contaminants of concern were present, developed a soil removal plan, completed the plan and capped the site, other than an area that will be a mitigated wetland area, and received closure from the SFBRWQCB. The self-abatement form for the Radiant Avenue site has also been forwarded to the SFBRWQCB. A Source Properties Self Abatement Report for this property was provided in Attachment A of the *Mercury and PCBs Watershed/Management Areas, Control Measures, and Load Reduction – Update 2017* report.

Table 22-3: Contaminated Sites Self-Abated or Referred to the SFBRWQCB (FY 2013/14 through FY 2017/18)

SITE NAME	LOCATION/APN	PROPERTY SIZE (ACRES)	YEAR	Referral/ Self-Abatement
Radiant Avenue	Radiant Avenue, North Richmond; 408-082-030	19.5	FY 2016-17	Self-Abatement

Ongoing Investigations

Properties designated as High Likelihood or old industrial in Contra Costa County will be further investigated to see if they are properties likely to have PCBs. Contra Costa County will work with County C.4 industrial inspectors under the Commercial and Industrial Inspection Program to investigate the likelihood of PCBs on these High Likelihood Properties. These investigations will be coordinated with industrial facility inspections over the next few years. Ongoing investigations may result in a property referral in the future.

22.2.2 Green Infrastructure / Treatment Control Measures

Any development, redevelopment, and infrastructure projects within each of the W/MA's will be subject to the development standards in effect at the time an application would be made, such as demolition standards and applicable provisions of section C.3.

Green infrastructure will be incorporated into Contra Costa County redevelopment and new infrastructure projects county-wide over time when there are opportunities to do so.

22.2.3 Managing PCBs in Building Materials and Infrastructure

Managing PCBs in Building Materials

The Program and Permittees are actively participating in a BASMAA Regional Project to address PCBs in building materials as described in section 2.3.1. Contra Costa County's Building Inspector Management is actively involved in the region-wide discussions and development of the program to reduce the migration of PCBs during building demolition through participation on the Regional Project Technical Advisory Committee. The County will be implementing a PCBs in Building Materials Program this next fiscal year with assistance from the BASMAA Regional Project.

Managing PCBs in Infrastructure

The Program and Permittees participated in the BASMAA Regional Project to address PCBs in infrastructure as described in section 2.3.2.

22.2.4 Enhanced Operation and Maintenance Control Measures

Enhanced Operation and Maintenance (O&M) control measures that have been implemented by the Contra Costa County Watershed Program are listed in Table 22-4 below.

Table 22-4: Unincorporated Contra Costa County Enhanced O&M Control Measures (FY 2013/14 through FY 2017/18)

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Street Sweeping	FY2015-2016	Monthly	Biweekly	55.0	Crockett Commercial
Street Sweeping	FY2015-2016	Monthly	Biweekly	27.5	El Sobrante Commercial (excluding San Pablo Dam Road)
Street Sweeping	FY2015-2016	Monthly	Biweekly	13.4	El Sobrante Commercial (only including San Pablo Dam Road)
Street Sweeping	FY2015-2016	Monthly	Biweekly	19.5	Pacheco Commercial (
Street Sweeping	FY2015-2016	Monthly	Biweekly	32.7	Richmond Pkwy

Enhanced O&M Control Measure Type	Fiscal Year	Baseline Frequency	Enhanced Frequency	New Treatment Area (acres)	Location
Street Sweeping	FY2015-2016	Monthly	Biweekly	83.3	Rodeo Commercial
Street Sweeping	FY2015-2016	Monthly	Biweekly	17.8	San Pablo Ave Commercial
Full Trash Capture Device Clean Out[1]	FY2016-2017	Annually	Semi-Annually	384.6	Inlet-based full trash capture devices

Notes:

1. Full trash capture device clean out includes inlet-based CPS and Drop Inlet devices.

Several areas of the County have roadside ditches and other areas have curb and gutter or curb and gutter interspersed with roadside ditches. As development takes place over time, Contra Costa County will develop curb and gutter and storm drain systems in some areas of the County, particularly in residential areas adjacent or near to old industrial areas. Contra Costa County Public Works Maintenance operates and maintains storm drain infrastructure by cleaning and repairing it to reduce debris and sediment that flows the Bay.

Contra Costa County has street sweeping in most areas that have curb and gutter. In some of the old urban and old industrial areas that have curb and gutter and storm drain infrastructure, Contra Costa County has enhanced the street sweeping frequency from once to twice per month. These areas include approximately 249 acres of commercial and some residential areas in the unincorporated areas of Crockett, Pacheco, Richmond and Rodeo. These areas include old industrial, old urban, new urban and open space.

The County has installed full trash capture devices in some areas. Some units were initially installed in 2013 included a total of 139 connector piper screens and top hats. The County installed an additional 147 connector pipe screens in 2016-17 in the unincorporated communities of Bay Point, Richmond, and Rodeo. These systems are maintained to reduce not only debris but accumulated sediment from flowing to the Bay. They treat a total of 383.5 acres. Additional systems are planned to be installed in sections of North Richmond and Bay Point during 2018-19.

Diversion to POTW

Contra Costa County maintains the North Richmond pump station in North Richmond. A temporary diversion was planned under MRP 1.0. The diversion provided an opportunity to

coordinate more with West County Wastewater District, test how a diversion could work, and discuss potential future diversions. Contra Costa County is investigating the possibility of building more permanent diversion infrastructure and coordinating with West County Wastewater District to potentially find a way to divert more stormwater drainage discharges.

22.2.5 Source Controls and Other Control Measures

Mercury Load Avoidance and Reduction

The Permittees are actively implementing mercury recycling programs in all W/MA's in order to reduce mercury loading to the Bay.

Household hazardous waste facilities collect materials and devices containing mercury. There may be other opportunities over time to collect mercury or identify additional sources and take measures to reduce discharges to the MS4. Contra Costa County's Landscaping and Lighting District is coordinating with PG&E to replace Mercury (Hg) containing light fixtures with LED fixtures. Contra Costa County has converted many mercury and/or high-pressure sodium vapor street lights to Light Emitting Diode (LED) street lights. In addition, the County Public Works Department converted all the fluorescent bulbs in the main office building to LED this year with over 6,500 feet of fluorescent tubes replaced on one property.

Illegal Dumping Cleanup

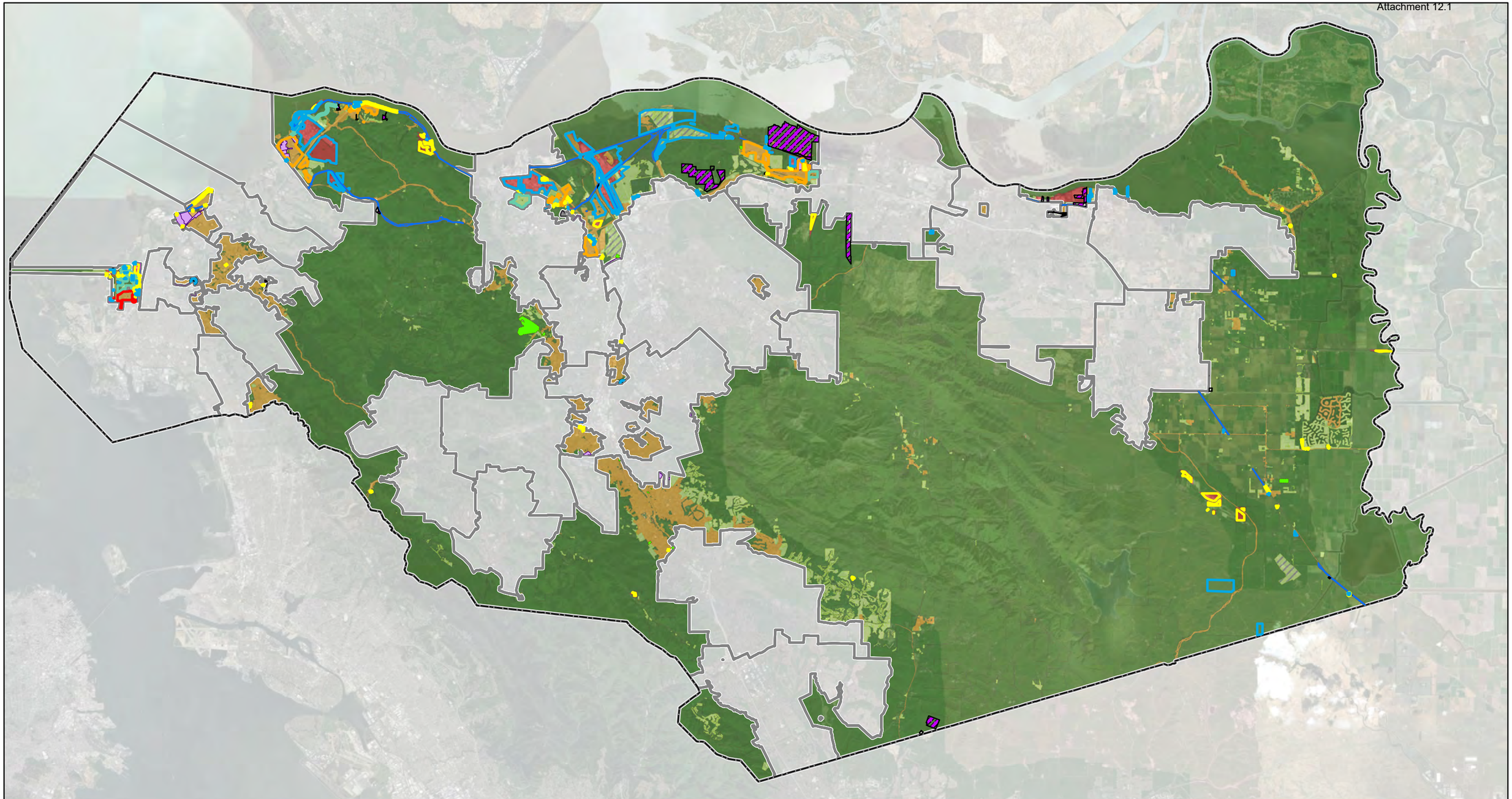
Illegal dumps are cleaned from Contra Costa County's road right-of-way regularly and disposed of properly by Contra Costa County's Public Works or where appropriate, Hazardous Materials. Illegal dumping consists of many types of material including: furniture, trash, construction material and debris, and potentially hazardous materials or wastes. Where possible, information is used to track down the owner of the material and properly dispose of the material or recover costs of disposing.

The County will identify and cleanup illegal dumping of construction and demolition debris where illegal dumping of construction and demolition debris occurs.

Stockpiles, Spills, and Disposal of PCBs

Stockpiles and spills of PCBs will be addressed as they are identified through industrial facility inspection and spill notification programs.

Spills of PCBs occur due to accidents, weather, worn out transformers, or other reasons. The County may also find or be notified about stockpiles of materials. The County has trained Hazardous Materials and Environmental Health Inspectors on the importance of the identification and correct disposal of PCBs related to stormwater and the Municipal Regional Stormwater Permit (MRP 2.0). The County Watershed Program coordinates with Haz Mat to complete stormwater inspections and has communicated the importance of relaying information relating to PCBs sources to the Watershed Program. The County has also been involved in a Code Enforcement Task Force and has communicated the importance of working with stormwater managers to identify and communicate the potential presence of PCBs when there are spills or stockpiled material. The County works with the Contra Costa County Hazardous Materials staff and the Clean Water Program to inform program staff of spill incidents within unincorporated County. Where these spills involve other agencies or organizations, Contra Costa County will work with the agencies or property owners as appropriate.



Legend

- City Limits
- County Boundary
- Categorical Railroad
- Categorical PGE

Yield Classification

- Old Industrial
- Old Urban
- New Urban
- Open Space
- Other

Control Measures

- Stormwater Treatment Project
- Source Property Referral/Abatement

Full Trash Capture

- HDS
- Project/Drainage Area

Enhanced O&M

- Full Trash Capture Device Cleanout

Watershed/Management Areas

- CCC-1, High Likelihood and Source Properties
- CCC-2, Old Industrial Areas
- CCC-3, North Richmond Pump Station (NRPS) Drainage Area
- CCC-4, Infrastructure Improvement Areas
- CCC-5, Enhanced Operations and Maintenance Areas

N

0 15,000 30,000 Feet

Watershed/Management Areas and Control Measures
Unincorporated Contra Costa County

Contra Costa Clean Water Program

Geosyntec consultants

Oakland | June 2018

Figure 22-1

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23 LOADS REDUCED

This section presents estimates of the loads reduced by the control measures that are reported in the preceding sections of this report (Sections 3 through 22) for each Permittee and county-wide for FY 2013/14 through FY 2017/18. The loads reduced reported in this section reflect previous fiscal years' reporting, although previously reported load reductions may have been revised.

23.1 Loads Reduced – PCBs

Table 23-1 and Table 23-2 report the estimated PCBs loads reduced for each Permittee and county-wide, respectively. The results presented in these tables (212.75 g/yr) demonstrate that the Contra Costa Permittees have collectively achieved the PCBs load reductions required by June 30, 2018 (90 g/yr).

Table 23-1: PCBs Loads Reduced by the Permittees (FY 2013/14 through FY 2017/18)

Permittee	PCBs Loads Reduced (g/yr)					
	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Cumulative Load Reduced
Antioch	0.00	0.03	0.00	0.00	0.00	0.03
Brentwood	0.11	0.25	0.00	0.01	0.00	0.37
Clayton	0.00	0.34	0.01	0.00	0.00	0.35
Concord	0.00	0.34	0.32	0.19	0.30	1.15
Danville	0.08	0.14	0.25	0.04	0.00	0.51
El Cerrito	0.00	0.13	0.00	0.20	0.03	0.36
Hercules	0.00	1.40	0.00	0.00	0.00	1.40
Lafayette	0.04	0.03	0.04	0.00	0.00	0.11
Martinez	0.00	0.02	0.05	0.96	0.07	1.10
Moraga	0.16	0.04	0.00	0.12	0.00	0.32
Oakley	0.00	0.07	0.00	0.03	0.01	0.11
Orinda	0.39	0.00	0.00	0.06	0.03	0.48
Pinole	0.02	0.04	0.00	0.04	0.00	0.10
Pittsburg	0.00	0.01	12.20	0.00	0.06	12.27
Pleasant Hill	0.00	0.58	0.00	0.01	0.00	0.59
Richmond	0.29	6.63	0.85	2.41	80.76	90.94
San Pablo	0.00	0.20	18.32	0.08	0.04	18.64
San Ramon	0.00	0.00	0.00	0.00	0.02	0.02
Walnut Creek	0.23	1.04	0.10	0.48	0.08	1.93

Permittee	PCBs Loads Reduced (g/yr)					
	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Cumulative Load Reduced
Unincorporated County	0.26	0.07	0.48	79.62	0.18	80.61
TOTAL - All Control Permittees	**1.6**	**11.4**	**32.6**	**84.3**	**82.9**	**211.4**

Table 23-2: PCBs Loads Reduced Within Contra Costa County (FY 2013/14 through FY 2017/18)

Control Measure Category	PCBs Loads Reduced (g/yr)						Required Load Reductions (g/yr)	
	FY13-14	FY14-15	FY15-16	FY16-17	FY17-18	Cumulative Load Reduced	2018	2020
Source Property Identification and Abatement[1]	0.00	0.00	30.28	79.27	63.62	173.17	--	--
Green Infrastructure and Treatment	1.46	7.70	2.05	3.78	4.75	19.74	--	23.00
Trash Full Capture Devices	0.11	2.42	0.03	0.00	13.05	15.61	--	--
Enhanced O&M	0.00	1.26	0.25	1.21	0.17	2.89	--	--
Manage PCBs in Building Materials	N/A	N/A	N/A	N/A	N/A	--	--	--
Manage PCBs in Infrastructure[4]	--	--	--	--	--	--	--	--
Diversion to POTW[4]	--	--	--	--	--	--	--	--

Control Measure Category	PCBs Loads Reduced (g/yr)						Required Load Reductions (g/yr)	
	FY13-14	FY14-15	FY15-16	FY16-17	FY17-18	Cumulative Load Reduced	2018	2020
Source Controls/ Other[4]	--	--	--	--	--	--	--	--
TOTAL - All Control Measures	**1.6**	**11.4**	**32.6**	**84.3**	**81.6**	**211.4**	**90.00**	**560.00**

Notes:

1. Load Reduced = (Source Property Area (ac)) x (4.065 – 0.0303 (g/ac/yr)). Acres associated with this control measure can be found in each Permittee section of this report.
2. For parcel-based projects, Load Reduced = (Project Area (ac)) x (Existing Yield – 0.0035 (g/ac/yr)). For green street or regional retrofit projects, Load Reduced = (Project Drainage Area (ac)) x (area-weighted PCBs yield (g/ac/yr)) x 0.70. Acres associated with this control measure can be found in each Permittee section of this report.
3. Load Reduced = (Project Drainage Area (ac)) x (area-weighted PCBs yield (g/ac/yr)) x 0.20. Acres associated with this control measure can be found in each Permittee section of this report.
4. See individual Permittee sections for how loads were estimated.
5. "--" indicates no required load reduction target or loads reduced.

23.2 Loads Reduced – Mercury

Table 23-3 and Table 23-4 report the estimated mercury loads reduced for each Permittee and county-wide, respectively. The MRP does not specify required load reductions for mercury in 2018.

Table 23-3: Mercury Loads Reduced by the Permittees (FY 2013/14 through FY 2017/18)

Permittee	Mercury Loads Reduced (g/yr)					
	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Cumulative Load Reduced
Antioch	0.00	0.23	0.00	0.00	0.00	0.23
Brentwood	1.36	1.98	0.00	0.00	0.00	3.34
Clayton	0.00	2.33	0.06	0.00	0.00	2.39
Concord	0.00	2.78	3.60	1.21	2.07	9.66
Danville	0.57	1.00	1.61	0.28	0.00	3.46
El Cerrito	0.00	0.93	0.02	1.43	0.17	2.55
Hercules	0.00	17.42	0.00	0.00	0.04	17.46
Lafayette	0.30	0.22	0.24	0.00	0.00	0.76
Martinez	0.00	0.10	0.57	11.25	0.05	11.97

Permittee	Mercury Loads Reduced (g/yr)					
	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Cumulative Load Reduced
Moraga	1.07	0.33	0.00	1.37	0.03	2.80
Oakley	0.00	0.61	0.00	0.21	0.06	0.88
Orinda	2.65	0.03	0.00	0.39	0.03	3.10
Pinole	0.12	0.29	0.00	0.27	0.00	0.68
Pittsburg	0.00	0.05	3.90	0.00	0.42	4.37
Pleasant Hill	0.00	4.15	0.00	0.10	0.00	4.25
Richmond	2.86	97.04	9.46	22.64	198.27	330.27
San Pablo	0.00	1.55	7.32	0.53	0.31	9.71
San Ramon	0.00	0.00	0.00	0.00	0.18	0.18
Walnut Creek	2.74	7.20	0.68	3.20	0.53	14.35
Unincorporated County	1.73	0.45	1.79	27.75	1.22	32.94
TOTAL - All Control Measures	**13.40**	**138.69**	**29.25**	**70.63**	**203.38**	**455.35**

Table 23-4: Mercury Loads Reduced Within Contra Costa County (FY 2013/14 through FY 2017/18)

Control Measure Category	Mercury Loads Reduced (g/yr)					
	FY13-14	FY14-15	FY15-16	FY16-17	FY17-18	Cumulative Load Reduced
Source Property Identification and Abatement[1]	0.00	0.00	9.69	25.35	20.35	55.39
Green Infrastructure and Treatment[2]	12.05	104.57	18.94	35.53	66.48	237.57
Trash Full Capture Devices[3]	1.36	24.99	0.43	0.00	115.93	142.71
Enhanced O&M Measures[4]	0.00	9.14	0.20	9.76	0.63	19.73
Manage PCBs in Building Materials	N/A	N/A	N/A	N/A	N/A	--
Manage PCBs in Infrastructure	--	--	--	--	--	--
Diversion to POTW	--	--	--	--	--	--
Source Controls/ Other[4]	--	--	--	--	--	--

Control Measure Category	Mercury Loads Reduced (g/yr)					
	FY13-14	FY14-15	FY15-16	FY16-17	FY17-18	Cumulative Load Reduced
TOTAL - All Permittees	**13.41**	**138.70**	**29.26**	**70.64**	**203.39**	**455.40**

Notes:

1. Load Reduced = (Source Property Area (ac)) x (4.065 – 0.0303 (g/ac/yr)). Acres associated with this control measure can be found in each Permittee section of this report.
2. For parcel-based projects, Load Reduced = (Project Area (ac)) x (Existing Yield – 0.0035 (g/ac/yr)). For green street or regional retrofit projects, Load Reduced = (Project Drainage Area (ac)) x (area-weighted PCBs yield (g/ac/yr)) x 0.70. Acres associated with this control measure can be found in each Permittee section of this report. The Mercury Load Performance Criteria via Green Infrastructure Implementation for Contra Costa County is 9 g/yr by June 30, 2020.
3. Load Reduced = (Project Drainage Area (ac)) x (area-weighted PCBs yield (g/ac/yr)) x 0.20. Acres associated with this control measure can be found in each Permittee section of this report.
4. See individual Permittee sections for how loads were estimated.
5. "--" indicates no required load reduction target.

23.3 Regional Loads Reduced

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 23-5). 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.

Table 23-5: PCBs and Mercury Load Reduction Performance Criteria 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 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). 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. These data will be updated in future annual reports as additional information is gathered.

23.3.1 Regional PCBs Loads Reduced

The cumulative PCBs loads reduced to date by all Permittees during the MRP compliance period (FY 13-14 through present) are presented in Table 23-6. A total of 691 g/yr of PCBs were reduced across the permit area by June 30, 2018. These data demonstrate the MRP performance criterion of 500 g/yr of PCBs loads reduced by 2018 has been achieved at the regional level.

Table 23-6: Total annual PCBs loads reduced by all Permittees during the MRP 2.0 term to date (FY 13-14 – FY 17-18)

Control Measure Category	PCB Load Reductions (g/yr) [1,2]
Source Property Identification and Abatement	424
Green Stormwater Infrastructure (i.e., Parcel-Based New/Redevelopment or Green Street/Regional Retrofit)	156
Large Full Trash Capture (i.e. HDS Units)	100
Enhanced O&M Measures	9.4
Stormwater Diversion to Sanitary Sewer	2.0
TOTAL - All Control Measures	**691**

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.

2 - Load Reductions have not yet been calculated for the following control measures: Manage PCBs in Building Materials; Manage PCBs in Infrastructure; Source Controls/Other. Not all enhanced O&M measures have been included in the load reductions reported here. These will be added as updates 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 23-1. In total, source property identification and referral or abatement has reduced PCBs loads by 424 g/yr, accounting for 61% of the total PCBs loads reduced to-date. Source property identification and abatement remains the most effective control measure currently available for reducing PCBs loads to the Bay (BASMAA, 2017). Green infrastructure has been the second largest contributor to load reductions, providing 156 g/yr of PCBs loads reduced and accounting for 23% of the total PCBs loads reduced to-date. These data demonstrate the MRP performance criterion of 120 g/yr of PCBs loads reduced through GI has already been met across the region. An additional 100 g/yr have been reduced by large, full trash capture devices (i.e., HDS Units). The remaining < 2% of the regional PCBs loads reduced during the permit to date have come from enhanced O&M practices and stormwater diversions. However, not all enhanced O&M practices have been accounted for to-date. Further, any load reductions achieved through other control measures (i.e., managing PCBs in infrastructure, Source Controls, Others) have not yet been reported. Additional information will be compiled and presented in future annual reports to update and correct (if needed) the PCBs load reductions that that are reported here.

The PCBs in building materials program will achieve 2,000 g/yr (66%) of the MRP 2020 PCBs load reduction performance criterion, assuming all Permittees implement the program by 2020. The remaining 1,000 g/yr must be achieved through all other control measures. Given the PCBs

load reductions of 692 g/yr achieved to-date, an additional 308 g/yr of PCBs must be reduced across the region by the end of the permit term. Assuming the 2020 PCBs performance criterion is met, an additional 11.4 kilograms per year (kg/yr) must be reduced to achieve the PCBs TMDL load reduction target of 14.4 kg/yr that has been allocated to Permittees. A small portion of this may have already been reduced during earlier permit terms (i.e., between July 1, 2002 and July 1, 2013). However, the bulk of the remaining 11.4 kg/yr will need to be reduced in future permit terms to achieve the PCBs TMDL load reduction target.

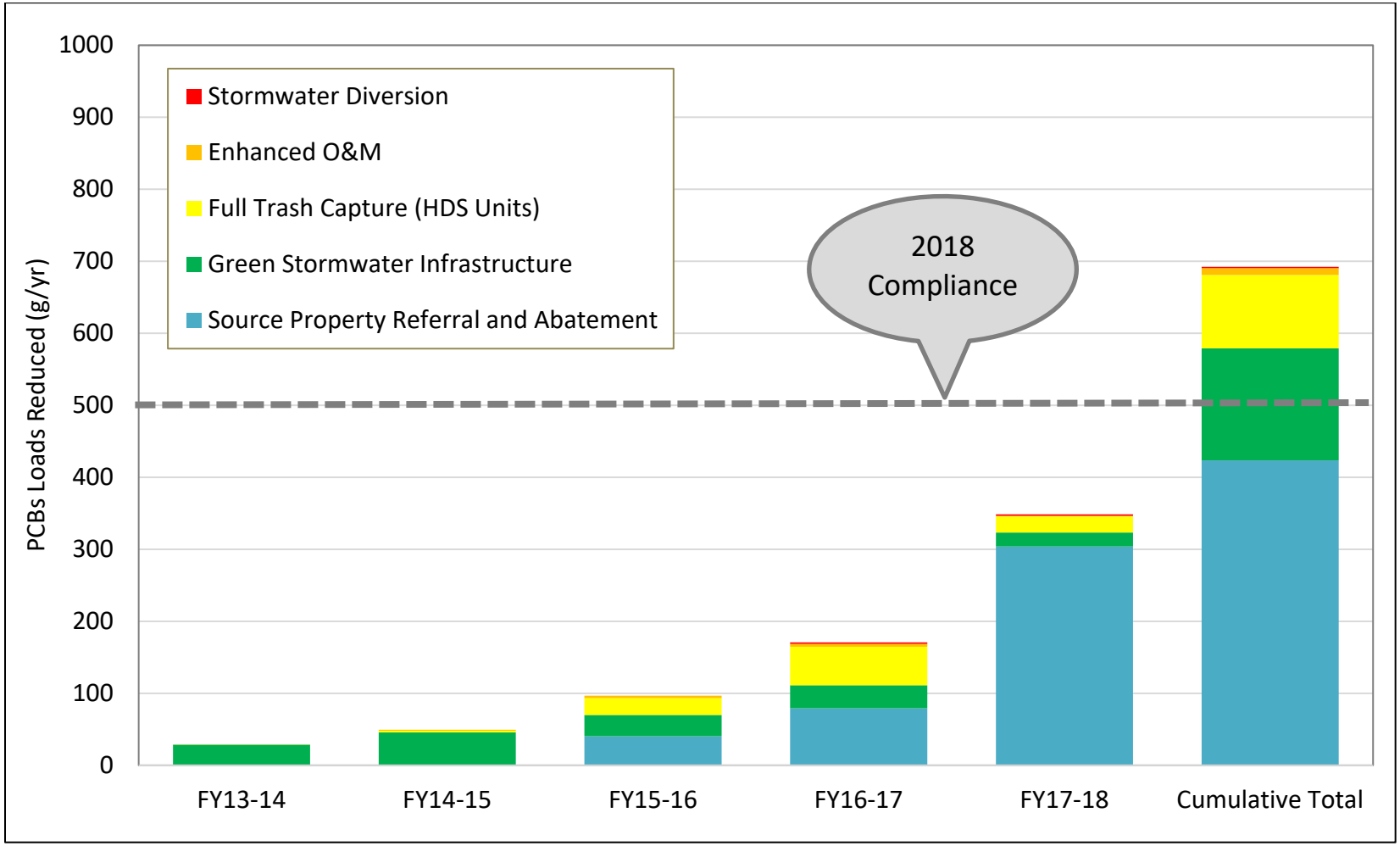

Figure 23-1. PCBs Load Reductions Achieved by MRP Permittees during the Permit Term to Date by Fiscal Year and the Cumulative Total

23.3.2 Regional Mercury Loads Reduced

The cumulative PCBs loads reduced to date by all Permittees during the MRP compliance period (FY 13-14 through present) are presented in Table 23-7. A total of 2,987 g/yr of mercury were reduced across the permit area.

Table 23-7: Total annual mercury loads reduced by all Permittees during the MRP 2.0 term to date (FY13-14 – FY17-18)

Control Measure Category	Mercury Load Reductions (g/yr) [1,2]
Source Property Identification and Abatement	123
Green Stormwater Infrastructure (i.e., Parcel-Based New/Re-Development or Green Street/Regional Retrofit)	1,874
Large Full Trash Capture (i.e. HDS Units)	907
Enhanced O&M Measures	78
Stormwater Diversion to Sanitary Sewer	4.7
TOTAL - All Control Measures	**2,987**

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.

2 - Load Reductions have not yet been calculated for the following control measures: Source Controls/Other. Not all enhanced O&M measures have been included in the load reductions reported here. These will be added as updates in future annual reports.

The mercury loads reduced by control measure category each fiscal year and the cumulative total for the region are presented in Figure 23-2. GI has been the largest contributor to mercury load reductions during the permit term. Total mercury loads have been reduced by 1,874 g/yr through GI, accounting for 63% of the total loads reduced to-date. These data demonstrate the MRP performance criterion of 48 g/yr of mercury loads reduced through GI by 2020 has already been met across the region. An additional 907 g/yr of mercury have been reduced by large, full trash capture devices (i.e., HDS Units), accounting for 30% of the total loads reduced to-date. Source property identification and referral or abatement has reduced mercury loads by 123 g/yr, accounting for only 4% of the total mercury loads reduced to date. The remaining < 3% of the regional mercury loads reduced during the permit to date have come from enhanced operation and maintenance practices and stormwater diversions. However, not all enhanced O&M practices or source controls have been accounted for to date. Additional information will be compiled and presented in future annual reports to update and correct (if needed) the mercury load reductions that that are reported here.

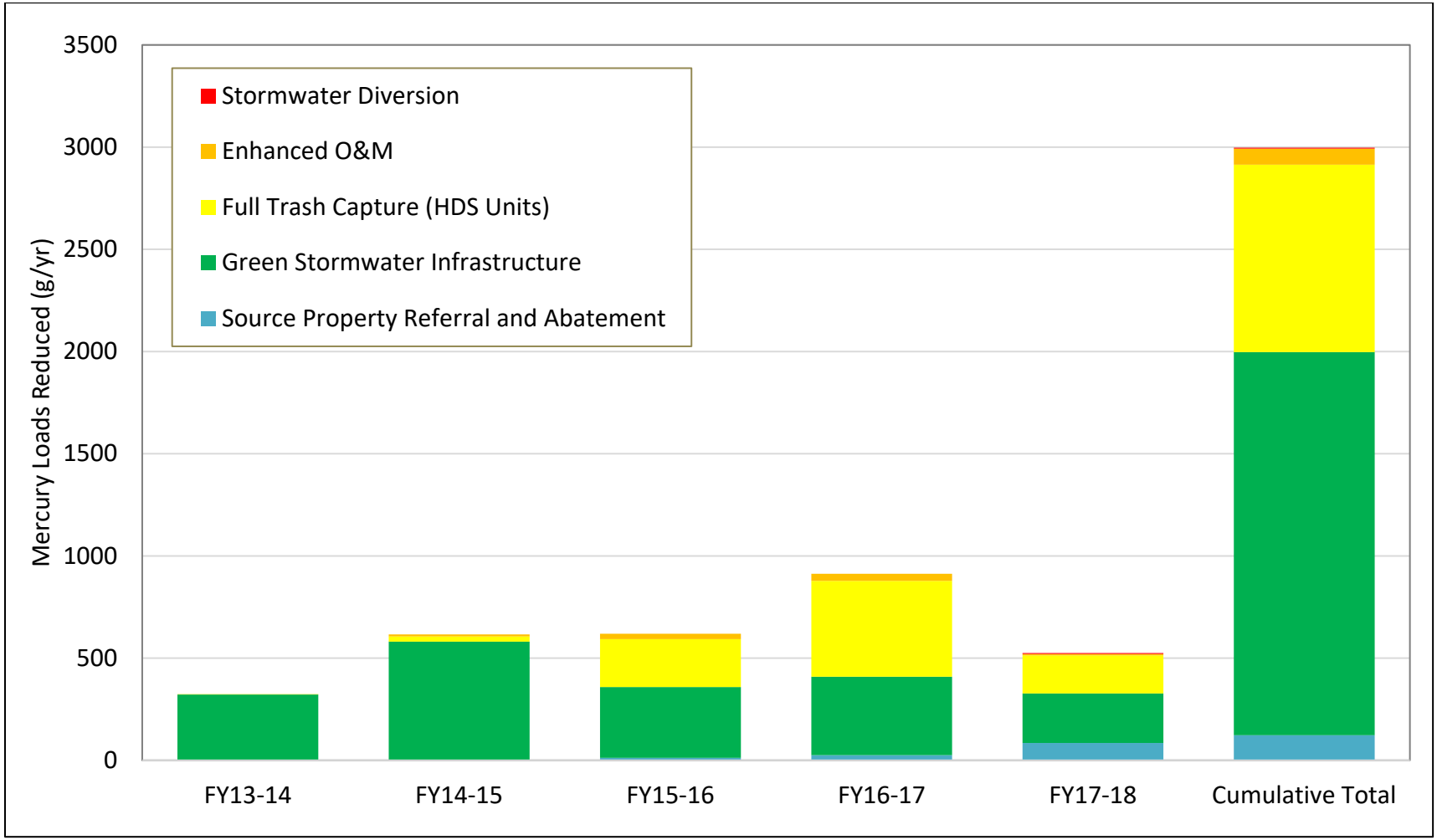

Figure 23-2. Mercury Load Reductions Achieved by MRP Permittees during the Permit Term to Date by Fiscal Year and the Cumulative Total

23.3.3 Regional Source Property List

Table 23-8 provides a current listing of all of the source properties that have been identified throughout the region and referred to the SFBRWQB or were self-abated during the permit term. In total, 21 source properties comprising 172 acres have been referred to the SFBRWQB for abatement or were self-abated during this permit term. This list will continue to be updated in future annual reports as additional source properties are referred or abated.

Table 23-8. List of PCBs Source Properties Identified to Date Across the MRP Region That Have Been Referred to the Regional Water Board or Self-Abated

County-wide Program	Site Name	Location	Type of Source Property	Referral Date	Abatement Date	Area (Acres)
ACCWP	Asbestos Abatement Mgmt Group of CA (AMG)	3438 Helen Street (APN 7-609-26-2)	Referral	FY 17-18		0.43
ACCWP	Custom Alloy Scrap Sales (Cass) Facilities	2601 Peralta Street, Oakland	Referral	FY 17-18		7.65
ACCWP	Former Giampolini Property	2847 Peralta Street and 2847 Peralta Street, Oakland	Self-Abatement		FY 17-18	1.93
ACCWP	Former South SPRR/Novartis Site	4560 Horton Street, Emeryville	Self-Abatement		FY 17-18	0.03
ACCWP	General Electric Company - Oakland	5441 East 14th Street, Oakland	Self-Abatement		FY 17-18	10.10
ACCWP	Lawrence Berkeley National Lab	One Cyclotron Road, Berkeley	Self-Abatement		FY 17-18	1.00
ACCWP	OAB Transformer Spill	10th and Maritime Street, Oakland	Self-Abatement		FY 17-18	0.02
ACCWP	Precision Cast Products	1549 32nd St. and 2868 Hannah St., Oakland	Referral	FY 17-18		0.79
ACCWP	Union Pacific Railroad – Oakland Coliseum	700 73rd Avenue (APN 041 390100703, APN 041 390100705, APN 041 390100706, APN 41-3901-7-5)	Referral	FY 17-18		0.4
CCCWP	Sims Metal Management Richmond Facility	600 South 4th Street, Richmond	Referral		FY 17-18	19.30
CCCWP	Former Molino Enterprises. Inc.	1215 Willow Pass Rd., Pittsburg	Referral	FY 15-16		6.00
CCCWP	World Corp	1014 Chesley, Richmond	Referral	FY 17-18		10.40
CCCWP	Rumrill Sports Complex (Former BNSF Railyard Site)	1509 Rumrill Blvd, San Pablo	Self-Abatement		FY 15-16	4.45
CCCWP	Radiant Avenue	Radiant Avenue, North Richmond	Self-Abatement		FY 16-17	19.50
CCCWP	Port of Richmond	Point Potrero Marine Terminal	Self-Abatement		FY 17-18	0.72
CCCWP	San Diego Street Transformer Spill	ROW, San Diego Street, Richmond	Self-Abatement		FY 17-18	0.08

County-wide Program	Site Name	Location	Type of Source Property	Referral Date	Abatement Date	Area (Acres)
CCCWP	Larkey Pool	2771 Buena Vista Ave., Walnut Creek	Self-Abatement	FY 17-18		<0.01
SCVURPPP	Union Pacific Railroad	Leo Avenue Cul-de-Sac Railroad Right-Of-Way, San Jose	Referral	FY 15-16		5.00
SCVURPPP	Westinghouse Electric Federal Superfund	401 East Hendy Avenue, Sunnyvale; APNs: 204-47-001, 204-47-002, 204-48-028, 204-46-008	Referral	FY 17-18		73.00
SMCWPPP	977 and 1007/1011 Bransten Road	977 and 1007/1011 Bransten Road, San Carlos	Referral	FY 17-18		3.00
SMCWPPP	Delta Star / Tiegel	270 Industrial Road/495 Bragato Road, San Carlos	Referral	FY 17-19		7.70
					TOTAL ACRES	**171.5**

24 REFERENCES

BASMAA, 2017. Interim Accounting Methodology for TMDL Loads Reduced, Version 1.1. Prepared by Geosyntec Consultants and EOA, Inc. for the Bay Area Stormwater Management Agencies Association (BASMAA). March 2017.

Contra Costa Clean Water Program, 2016. Mercury and PCBs Control Measures Implementation Status Report. Submitted in Compliance with Provision C.11.a.iii.(1) and C.12.a.iii.(1) Municipal Regional Stormwater Permit NPDES Permit No. CAS612008 Order No. R2-2015-0049. March 31, 2016.

Mangarella, P., Havens, K., Lewis, W., and McKee, L.J., 2010. Task 3.5.1: Desktop Evaluation of Controls for Polychlorinated Biphenyls and Mercury Load Reduction. A Technical Report of the Regional Watershed Program: SFEI Contribution 613. San Francisco Estuary Institute, Oakland, CA.

McKee, L., Mangarella, P., Williamson, B., Hayworth, J., and Austin, L., 2006. Review of Methods Used to Reduce Urban Stormwater Loads: Task 3.4. A Technical Report of the Regional Watershed Program: SFEI Contribution #429. San Francisco Estuary Institute, Oakland, CA.

Yee, D., McKee, L.J., 2010. Task 3.5: Concentrations of PCBs and Hg in Soils, Sediments, and Water in the Urbanized Bay Area: Implications for Best Management. A Technical Report of the Watershed Program. SFEI Contribution 608. San Francisco Estuary Institute, Oakland, CA 94621.

APPENDIX A

Source Property Referrals and Self-Abatement Reports

(Note: Only the Referral and Self-Abatement Report Forms are provided. Attachments to these forms have been previously submitted to the SFRWQCB.)

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

The purpose of this form is to provide the Department of Toxic Substances Control and the Regional Water Quality Control Board with sufficient information to require site owner/operators to conduct follow-up investigations and/or PCB cleanup actions. Please use additional pages, as necessary, to complete your responses.

Referring Agency: **City of Richmond**
Staff Contact Name: **Joanne Le**
Phone: **(510) 620-6450** Email Address: **joanne_le@ci.richmond.ca.us**
Date of Referral: **7/2/18**

1. Name of Site: **Sims Metal Inc.**

2. Address City County ZIP: **600 S 4th St, Richmond, CA 94804**

3. APN(s): **560-240-040, 560-250-027, 560-250-025**

4. Provide a Site Location Map and a Site Diagram showing significant features: **See Appendix 1: Memorandum_Sims Metals_20180530 for site map and further detail.**
   Parcel Area (acres) **19.3 acres**

5. Current Owner
   Name: **Sims Metal Inc.**

   Address, City, County & Zip Code: **600 S 4th Street, Richmond CA 94804**

   Phone: **(510) 412-5363, 510-412-5322**
   E-mail Address: **vispi.patel@simsmm.com**
   Website: **http://www.simsmm.com/Local-Solutions/North-America/California/Richmond**

6. Background: Current Business Operations
   Name: **Sims Metal Inc.**

   Type: **Scrap Metal Recycler**

   Period of Operation: **1985-Present**

7. Background: Previous Business Operations (if known)
   #1 Name: **Kaiser Shipyard**

   Type: **Metal Recycler, Ship Manufacturer**

   Period of Operation: **1940s**

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site.

Transformers, former Superfund site; Sims Metal Management Richmond Facility (Sims Metal, Richmond) is located adjacent to and on former United Heckathorn Co. property, a Superfund site that is under remediation for dichlorodiphenyltrichloroethane (DDT) and dieldrin contamination. During the

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

superfund investigation of the site, it was discovered that scrap metal previously recycled at the facility included used electrical transformers. That practice is believed to have ceased, and the property owner has implemented Best Management Practices (BMPs). For more information see No. 14 below.

9. Describe the known and suspected sources of PCBs at the site.

Transformers

Facility Description: Per the Sims Richmond website: "Sims Metal Management's scrap metal recycling yard in Richmond, CA purchases and processes ferrous & non-ferrous scrap metal. The recycling center specializes in recycling bus, railcars and aluminum trailer scrap. Services offered by the yard include industrial, obsolete & demo scrap services, demolition & dismantling and trucking & roll-off container services. The yard's processing capabilities include baling, car crushing, shearing, mobile baling, tin compacting, torch cutting and wet car processing. The yard is equipped with wet car detox station, baler, shears, torch cutters and mobile car crusher. Complementary services include container loading, overseas container loading, rail car loading, bulk/container ship loading and truck loading"

As a result of recent field observation, it was recommended by monitoring contractor monitoring at the site to confirm property is a source of PCBs.

10. Has sampling or other investigation been conducted in the vicinity of the 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).

WY 17/18 Sediment Sampling

See attached, Memorandum_Sims Metals_20180530 for site map and further detail.

Table 1: 2018 Stormwater Sampling Details at entrance of Sims Metals, Richmond

Site ID	Sampling Location	Sample Date	PCBs Particle Ratio[1, 2] (ppb)
Sims (37.92521, -122.36613)	Public ROW: Southwest corner of Cutting Boulevard and South 4th Street in curb and gutter	03/01/18	432
Sims (37.92521, -122.36613)	Public ROW: Southwest corner of Cutting Boulevard and South 4th Street in curb and gutter	03/20/18	***531***
Sims (37.92521, -122.36613)	Public ROW: Southwest corner of Cutting Boulevard and South 4th Street in curb and gutter	04/06/18	***1846***

[1] Sum of RMP 40 congeners; test performed by EPA Method 1668
[2] Calculated by dividing total PCBs by SSC; values in ***bold italics*** indicate exceedance of 500 ppb action level.

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

2011-2013 CW4CB Task 3 Sediment Sampling

On October 3 and 4, 2012, samples were collected from four locations in the public ROW on along S. 4th Street (Site ID LAU-01), Wright Avenue (PARR-06 and PARR-07), and Hoffman Boulevard (PARR-08). The sediment samples had PCB concentrations ranging from 0.932 to 1.450 mg/kg, above typical urban background (See attached Figure 2 for sampling locations).

Table 2: Historical Sampling Details around Sims Metals, Richmond

Site ID	Sampling Location Description	PCB Concentration (mg/kg) 2000-2010 Pre-CW4CB	PCB Concentration (mg/kg) 2012-2013 CW4CB Task 3
Site I	Public ROW: Along South 4th Street in the street curb and gutter.	2.789 (EOA, 2007)	Not sampled
Site J	Public ROW: Corner of South 8th Street and Wright Avenue in the street curb and gutter.	0.639 (EOA, 2007)	Not sampled
Site M	Public ROW: Along Hoffman Boulevard in the street curb and gutter.	1.843 (EOA, 2007)	Not sampled
Site N	Public ROW: Along Hoffman Boulevard in the street curb and gutter.	1.994 (EOA, 2007)	Not sampled
RMD26	Public ROW: Along Cutting Boulevard in the drop inlet/catch basin.	0.5673 (SFEI, 2010)	Not sampled
RMD27	Public ROW: Along Cutting Boulevard in the drop inlet/catch basin.	1.1869 (SFEI, 2010)	Not sampled
LAU-01	Public ROW: Along S 4th Street along the fence line before the facility entrance.	Not sampled	1.450
PARR-06	Public ROW: Along Wright Avenue in the curb and gutter.	Not sampled	0.119
PARR-07	Public ROW: Along Wright Avenue near the railroad tracks in the curb and gutter.	Not sampled	0.932
PARR-08	Public ROW: Along Hoffman Boulevard in the curb and gutter.	Not sampled	1.370

11. Is the site subject to the general industrial stormwater permit? [Yes] No
    If yes, describe the findings of recent and past stormwater inspections conducted on the site, especially in regards to potential PCB sources.

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PCB REFERRAL SITE INFORMATION

Industrial General Permit (IGP) WDID No. 2 07I005110. On February 25, 2010, PG Environmental, LLC, conducted a site inspection on behalf of Regional Water Board Staff. As a result of this inspection, the facility was issued a Notice of Violation for 1) failure to conduct sampling for all parameters specified in the Permit 2) failure to provide analytical results with the Annual Report as required by the IGP 3) failure to implement pH sampling and analyses methods that meet the requirement of the IGP and 4) failure to evaluate and if necessary improve BMPs following detection of high analyte concentrations in stormwater discharge. (See attached NOV from Water Board). Since the issuance of the NOV, the facility chose to hold stormwater onsite and not discharge to the City stormwater collection system. The facility store stormwater in Bakers tanks and rail cars and use as dust control onsite. In 2013, the facility constructed a berm on site to contain stormwater onsite and to prevent run-on of stormwater from S 4th street. Additional BMPs are listed under #15.

12. Is there currently a potential for exposure of the community or workers to hazardous substances, pollutants, or contaminants at the site? Yes No **Unknown**
    If yes, explain:

    Possibly. PCB-containing dust tracking offsite into MS4 transported by wind and storm water.

13. Are any Federal, State or Local regulatory agencies currently involved with the site?
    Yes No
    If yes, provide as much of the information below as known.

Agency Involvement Contact Name Phone

Agency	Involvement	Contact Name	Phone Number
SFRWQCB	Inspections	Michelle Rembaum-Fox	510-622-2387
City of Richmond	MRP C.4 Inspections	Joanne Le	510-620-6540
USEPA	Cleanup Oversite of United Heckathorn Co.	Rachelle Thompson, USEPA Site Manager	415-972-3962

EPA Number: CAD981436363 (see #8, 11 above)

USEPA Superfund Website – United Heckathorn Co. Site Information:
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902440

Heckathorn Co. Site – Cleanup Results to Date: "Since 1997, the removal of contaminated soils and sediments has greatly reduced the potential for exposure to pesticide contaminants from the United Heckathorn site. However, unacceptable levels of DDT and dieldrin remain in the waters and sediments of Lauritzen Channel. EPA is in the process of preparing a focused feasibility study to address the remaining contamination. In October 2012, EPA installed a flap gate on the storm water outfall in the Lauritzen Channel to prevent DDT and dieldrin-contaminated sediment from moving in and out of the system during high tide."

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

Per the USEPA United Heckathorn Co. Site – Investigations and Cleanup Activities: "EPA conducted several field investigations in 2012 and 2013 to prepare for the upcoming Focused Feasibility Study, including a bathymetric survey, sediment sampling, mussel sampling, water sampling, fish sampling, particle tracking, current monitoring, groundwater monitoring, and other activities. EPA is currently analyzing the results and developing cleanup options. EPA will then recommend its preferred alternative, which will be made available for public comment in a Proposed Plan prior to the final decision on the remedy."

14. Provide any other pertinent site information not covered above:

This site is covered by the IGP and has been previously implicated as a PCBs Source Property due to pollutant containing sediments tracking off property transported by vehicles, wind and water. The site has had control measures implemented that are not sufficiently controlling pollutants to stay on property, and is continuing to discharge pollutants to the MS4.

15. Describe enhanced control measures that will be implemented at the site.

During FY 17/18 the facility completed paving the entire site as opposed to pervious surfaces with high potential of tracking of sediments through truck traffic observed previously. In addition, the facility continues to implement enhanced street sweeping during business hours, and mechanical device to brush off dust from truck tires. In FY 18/19, the City is in the process of getting a trash capture device installed with the ability to trap sediments at the storm drain inlet which is shown in Figure 2 of the attached memorandum and perform inlet cleaning throughout the year based on visual inspections.

Attach Site Location Map, Site Diagram, and any pertinent sampling & analyses data

See attached Appendix 1: Memorandum_Sims Metals_20180530

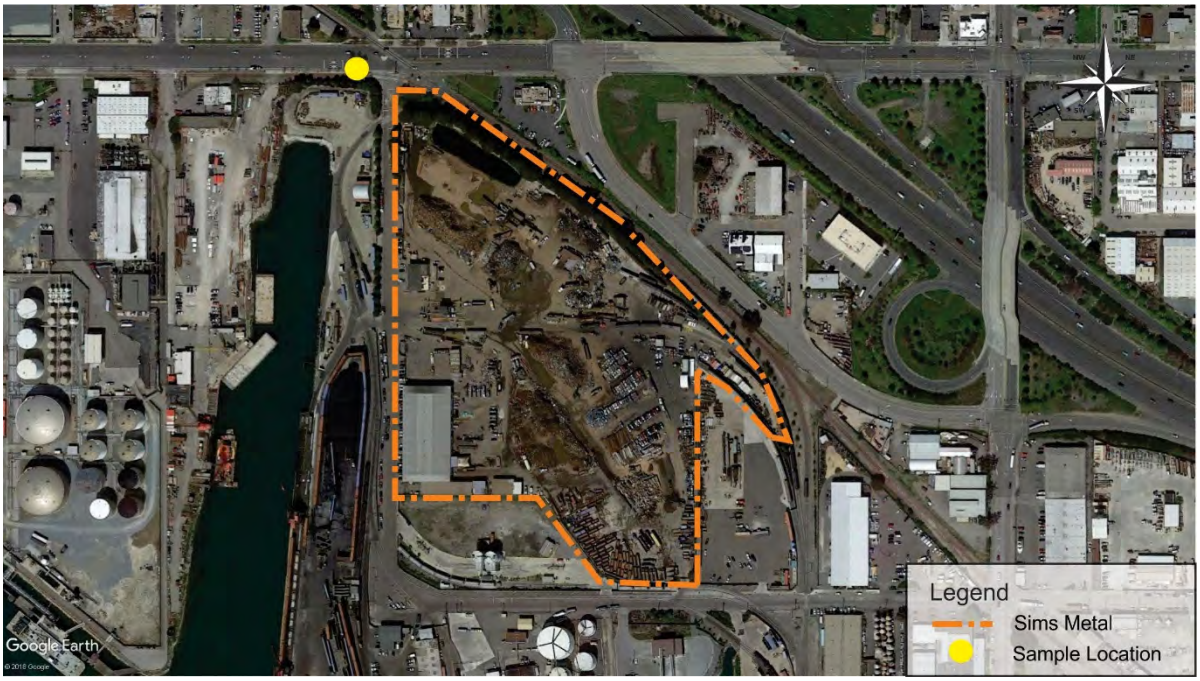
Technical Memorandum

Date	May 30, 2018
To	Lucile Paquette, Contra Costa Clean Water Program
From	Brad Haeger, ADH Environmental
Subject	Contra Costa Clean Water Program PCBs Results in Public Right-of-Way Adjacent to Sims Metal Management 2017-2018 Wet Season

Summary

This technical memorandum documents wet season 2017-2018 storm observations and sampling efforts which took place in the public right-of-way adjacent to Sims Metal Management, located at 600 South 4th Street in Richmond, California (Figure 1). The purpose of sampling and chemical analysis was to monitor POCs which were potentially tracked out of private property and entering the MS4.

Figure 1. Sims Metal Management and Sampling Location



In general, rainfall events predicted to produce at least 0.25 inches of rain and occurring after a period of dry weather were selected for sampling. Stormwater collection generally coincided with the first observed peak in runoff. A summary of the event statistics and results are presented in Table 1. Sampling was performed in the same location for all three events – on the southwest corner of Cutting Boulevard and South 4th Street, near the main entrance/exit for the Sims Metal Management yard (Figure 2). A crew of

three was always present – two to sample with clean hands/dirty hands protocol, and a third for traffic safety spotting. Teflon™ bailers were used to sample water from the curb/gutter and to transfer it to sample bottles (Figure 3). Field logs (Attachments 1, 2 and 3) and photographs were recorded during each site visit.

Table 1. Summary of Sample Dates, Analytical Results and Rainfall Statistics

Sample Date		Analytical Results					Rainfall Statistics[1]		
Site ID[2]	Storm Date	Total Hg (µg/l)	Total PCBs[3] (pg/L)	PCBs Particle Ratio[4] (ppb)	SSC (mg/L)	TOC (mg/L)	Antecedent Dry Prior	Accumulation Prior to Sample (inches)	Storm Total (inches)
Sims Metal	03/01/18	0.97	99800	432	231	10	64 hours	0.89	1.40
Sims Metal	03/20/18	0.63	96700	***531***	182	4.7	62 hours	0.15	1.64
Sims Metal	04/06/18	2.10	550000	***1846***	298	5.7	12 days	0.66	2.52

1 Precipitation data from Weather Underground Station KCARICHM46, approximately 1 mile west of sampling site.
2 Sample location coordinates: 37.92521˚, -122.36613˚
3 Sum of RMP 40 congeners; test performed by EPA Method 1668
4 Calculated by dividing total PCBs by SSC; values in ***bold italics*** indicate exceedance of 500 ppb action level.
Hg Mercury
PCB Polychlorinated biphenyls
SSC Suspended sediment concentration
TOC Total organic carbon

Figure 2. MS4 Sampling Location (03/01/18)

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

The purpose of this form is to provide the Department of Toxic Substances Control and the Regional Water Quality Control Board with sufficient information to require site owner/operators to conduct follow-up investigations and/or PCB cleanup actions. Please use additional pages, as necessary, to complete your responses.

Referring Agency: **City of Richmond**
Staff Contact Name: **Joanne Le**
Phone: **(510) 620-6540** Email Address: **joanne_le@ci.richmond.ca.us**
Date of Referral: **8/22/2017**

1. Name of Site: **World Oil**

2. Address City County ZIP: **1014 Chesley Ave, Richmond, CA 94804**

3. APN(s): **561-270-004**

4. Provide a Site Location Map and a Site Diagram showing significant features. **(See attached 13267 letter)** Parcel Area (acres): **10.44**

5. Current Owner
   Name: **World Oil Corp**

   Address, City, County & Zip Code: **7300 Chevron Way, Dixon, CA 95620**

   Phone: **(707) 693-6000** E-mail Address: **http://www.worldoilcorp.com**

6. Background: Current Business Operations **see Submittal of Technical Data and Workplan for PCB Characterization in Surface Soil, submitted to WB on 10/23/17**
   Name: **Industrial Vacant Land**

   Period of Operation: **Decommissioned 2007-2008, vacant since.**

7. Background: Previous Business Operations (if known)
   #1 Name: __unknown_____
   Type: **Oil and Antifreeze Recycling Business**
   Period of Operation: **2000-2007**

   #2 Name: **Pacific Coast Building Products then Pacific Supply (a subsidiary)**
   Type: **Asphalt roofing products manufacturing facility, then storage**
   Period of Operation: **1996-2000, 1984 -1996**

   #4 Name: **Certain Teed**
   Type: **Asphalt roofing products manufacturing facility**
   Period of Operation: **1930-1984**

   #5 Name: **General Roofing Manufacturing Company**
   Type: **Roofing fabrication facility**
   Period of Operation: **Circa 1916 (site structures built between 1916-1954)**

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site.
See reports Submittal of Technical Data and Workplan for PCB Characterization in Surface Soil (10/23/17) and PCB Characterization Report (7/13/18) submitted to Mark Johnson at the SFBRWQCB by APEX. The Contra Costa County Clean Water Program confirmed the site as a PCBs source property from stormwater sampling of run-off from the facility during a rain event on 1/8/17 (see 13267 letter).

9. Describe the known and suspected sources of PCBs at the site.
See reports in #8. Operations on the Site were likely to involve the handling of PCBs. These operations include roofing shingle manufacturing from the 1930 through 1984 and an Oil & Antifreeze Recycling business from 2000 to 2007. Records also show that waste oil and sludge generated at the facility were sampled and documented to contain PCBs. The site is now a vacant lot. The majority of Site structures were built between 1916 and 1954 (target age and characteristics of buildings containing PCBs in building materials). During decommissioning, concrete building foundations were crushed onsite and the aggregate spread over the Site.

10. Has sampling or other investigation been conducted in the vicinity of the 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).
See reports Submittal of Technical Data and Workplan for PCB Characterization in Surface Soil (10/23/17) and PCB Characterization Report (7/13/18) submitted to Mark Johnson at the SFBRWQCB by APEX. The Contra Costa County Clean Water Program confirmed the site as a PCBs source property from stormwater sampling of run-off from the facility during a rain event on 1/8/17 (see 13267 letter).

11. Is the site subject to the general industrial stormwater permit? Yes No
If yes, describe the findings of recent and past stormwater inspections conducted on the site, especially in regards to potential PCB sources.
The site is currently vacant.

12. Is there currently a potential for exposure of the community or workers to hazardous substances, pollutants, or contaminants at the site? Yes No Unknown
If yes, explain:

13. Are any Federal, State or Local regulatory agencies currently involved with the site?
Yes No
If yes, provide as much of the information below as known.

Agency Involvement Contact Name Phone

Agency	Involvement	Contact Name	Phone Number
SF Bay Regional Water Board	**Overseeing site clean-up**	**Mark Johnson**	**(510) 622-2493**

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

14. Provide any other pertinent site information not covered above:

See attached 13267 Letter from the Regional Water Board to the property owner.

15. Describe enhanced control measures that will be implemented at the site.
Storm drain inlet protection, cleaning and street sweeping on Chesley Ave, are currently implemented by the City of Richmond to remove sediment tracking from site. On 7/16/18, a phone meeting took place with WB, City of Richmond staff, CCCWP staff, and Mark Labrenz of APEX Companies, LLC., on behalf of World Oil, to discuss the World Oil PCB Characterization Report (Report). In his written response to the Report, Mark Johnson will include direction to World Oil to implement BMPs to ensure no wind or stormwater migration off site. He will work directly with World Oil and APEX to ensure those BMPs will consist of berms on north and western sides of the parcel. The City will process a grading permit to perform the grading as quickly as possible as soon as the application is submitted. There is no vehicular traffic on/off site.

Attach Site Location Map, Site Diagram, and any pertinent sampling & analyses data

See attached 13267 Letter from the Regional Water Board to the property owner for a site map.

World Corp-H&H map, Richmond CA

Photo and map of PCBs sample location associated with the Site

SOURCE PROPERTY SELF-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 completely 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: **City of Richmond**
Staff Contact Name: **Joanne Le, Environmental Compliance Manager**
Phone: **(510) 620-6540** Email Address: **joanne_le@ci.richmond.ca.us**
Date of Report: **7/2/2018**

1. Name of Site: **Point Potrero Marine Terminal**

2. Address City County ZIP: **1322 Canal Blvd, Richmond, CA 94804**

3. APN(s): **560-320-017**

4. Provide a Site Location Map and a Site Diagram showing significant features. Parcel Area (acres): **0.72 acre.**

5. Current Owner
   Name: **Port of Richmond**

   Address, City, County & Zip Code: **1322 Canal Blvd, Richmond, CA 94804**

   Phone: **(510) 215-4606** E-mail Address: **jim_matzorkis@ci.richmond.ca.us**

6. Describe Current (Post-Abatement) Site Operations/Land Use:
The site currently operates as a port.

7. Describe Previous Business Operations / Sources of PCBs or Mercury (if known):
Sources of PCBs are transformers containing oil with PCBs as well as paint with PCBs.

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site:

On the morning of November 14, 2014, Port staff and a hazardous materials abatement contractor investigated a report of an oil leak within the graving basins located within the Point Potrero Marine Terminal. Staff and the contractor discovered oil slowly leaking from an abandoned transformer located on the concrete gangway within Basin Number 3. Toward the rear of the transformer, there was oil pooling against the rear wall of the graving basin. Based upon the identification plate on the transformer and the contractor's prior experience, the contractor concluded the oil likely contained

PCBs. A few days later, it was discovered that the abandoned transformer within Basin Number 1 was also leaking, and it was also concluded by the same contractor the oil likely contained PCBs.

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).

A sample collected at site where oil leak occurred confirmed that the oil contained PCBs.

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
US EPA	**Case Manager**	**Cynthia Ruelas**	**(415) 972-3329**
US EPA	**Field Manager**	**George Randell**	**(415) 972-3439**

14. Describe the type and extent of abatement that has occurred:

As a hazardous material, PCBs are managed under the Toxic Substances Control Act (TSCA) found in the Code of Federal Regulations at 40 CFR 761. The Environmental Protection Agency (EPA) oversees the management, clean up and disposal of PCB waste and PCB-contaminated material. According to TSCA, when a PCB spill occurs, the responsible party must begin cleanup within 24 hours. The Port of Richmond directed a certified hazardous materials contractor, Cal Inc. to begin cleanup in accordance with TSCA. See attachment 2- Waste-Summary for volume of material removed and laboratory analysis.

15. Describe how the property abatement has effectively eliminated the transport of PCBs or mercury 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):

On December 24, 2014 the Contractor had cleaned all visible oil and removed the transformers from the graving basins. In summer 2015, the Port contracted a second hazardous abatement contractor to sample, test, and remove concrete contaminated with PCBs from the graving basins. By early 2016, all concrete permeated with PCBs was removed. The City of Richmond received notice from EPA in writing that the City has met the clean-up requirement and therefore no further actions is required. The approximate area contaminated with PCBs was 0.72 acre.

16. Describe any available water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4:

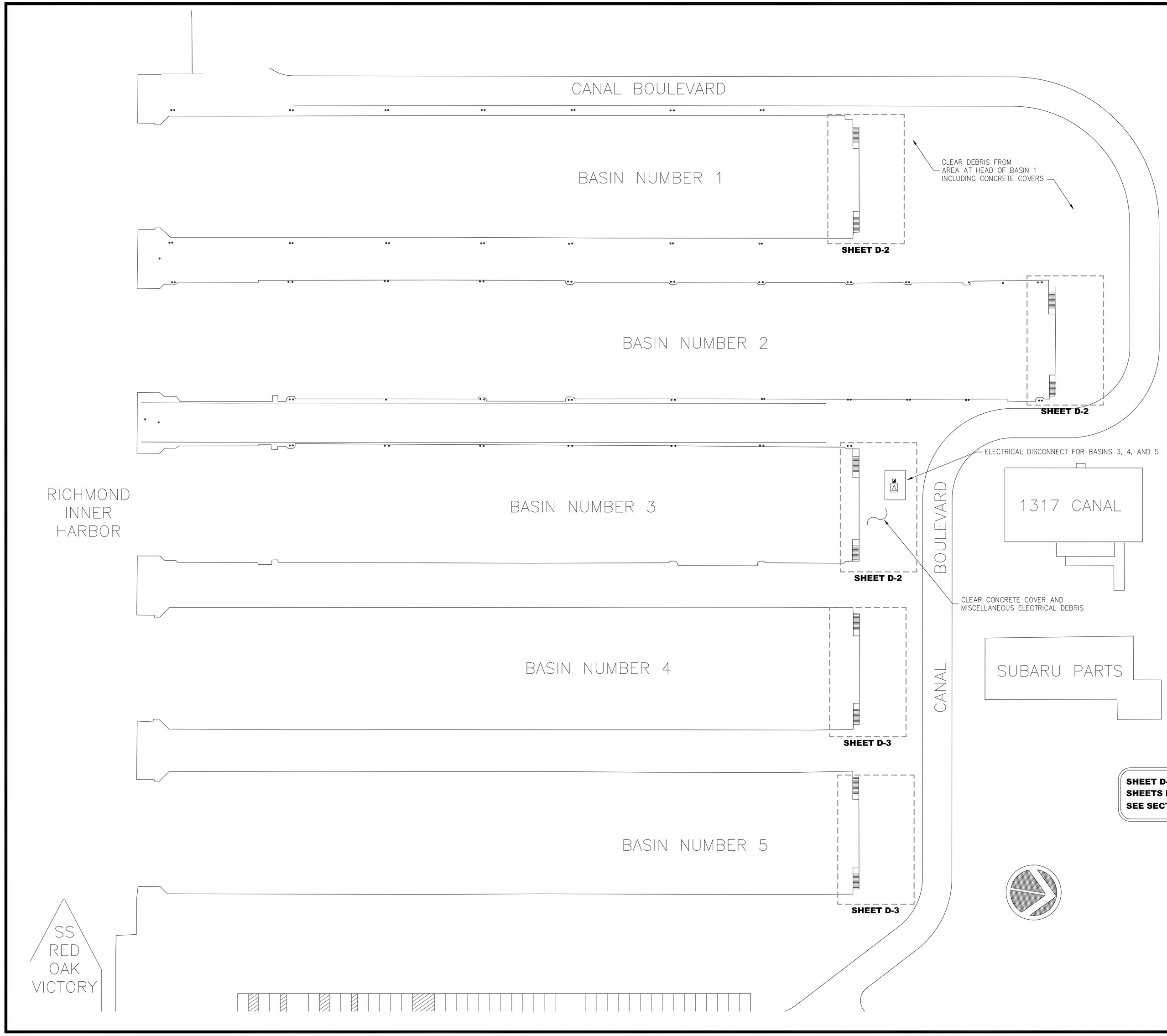
SOURCE PROPERTY SELF-ABATEMENT REPORT

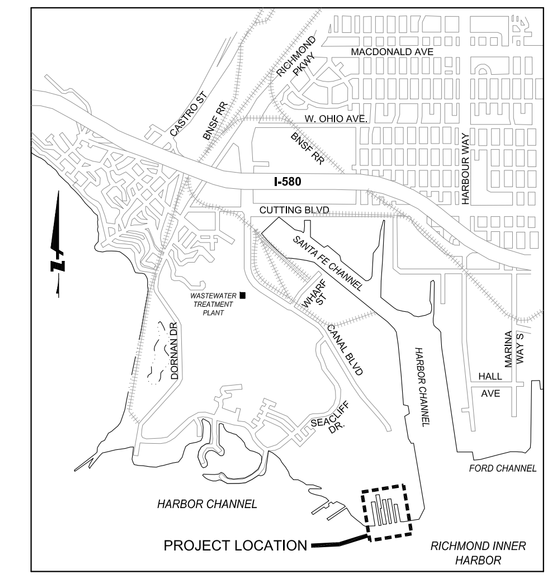
The Contra Costa Clean Water Program has performed sediment and water samples in the watershed where the property is located and none of the samples indicated PCBs levels above reporting levels.

Attachments:

1. **Site plan**
2. **Summary of waste removed from the site**
3. **Test results of transformer oil**

Attachment 12-1





VICINITY MAP
NTS

SHEET D-1 SHOWS SURFACE FEATURES
SHEETS D-2 AND D-3 SHOW BASIN GALLEY FEATURES
SEE SECTION A ON D-3 FOR ILLUSTRATION

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

Port of Richmond

REVISIONS

NO.	DESCRIPTION	BY	DATE	APPV'D
1				
2				
3				
4				
5				

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. STEVENS
C 058660
STATE OF CALIFORNIA
04/04/2015

BKF ENGINEERS / SURVEYORS / PLANNERS
322 HARBOUR WAY
SUITE 23
RICHMOND, CA
510.262.0336
WWW.BKF.COM

DRAWN: JY
CHECKED: RCS
DESIGNED: JY
APPROVED: RCS

POINT POTRERO MARINE TERMINAL CLEANUP AND DISPOSAL OF PCBs CITY OF RICHMOND, CALIFORNIA

DATE 03.30.15
SCALE 1"=40'
BKF PROJECT NO. 20115020-10
CLIENT PORT OF RICHMOND
DRAWING NO. D-1

BID SUBMITTAL

K:\MAIN\2011\20115020-Port-of-Richmond\13-Proj_Items\0_PCB\bid\EXHIBIT\SITE-pLAN-pcb.dwg 4-04-15 09:32:31 AM stev
PLOT SCALE: 1 = 1
VIEWPORT ROTATION: 'XX'

SOURCE PROPERTY SELF-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 completely 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: **City of Richmond**
Staff Contact Name: **Joanne Le, Environmental Compliance Manager**
Phone: **(510) 620-6540** Email Address: **joanne_le@ci.richmond.ca.us**
Date of Report: **6/152018**

1. Name of Site: **San Diego St**

2. Address City County ZIP: **San Diego St and Belmont Ave, Richmond, CA**

3. APN(s): **N/A, located in the City of Richmond right-of-way.**

4. Provide a Site Location Map and a Site Diagram showing significant features. Parcel Area (acres): Portion of Cerrito creek, and asphalt and sidewalks impacted by the spill equate to **0.06 acre.**

5. Current Owner
   Name: **City of Richmond**

   Address, City, County & Zip Code: **450 Civic Center Plaza**

   Phone: **(510) 620-6540** E-mail Address: **joanne_le@ci.richmond.ca.us**

6. Describe Current (Post-Abatement) Site Operations/Land Use:
The site is a public street located in the City of Richmond, CA, adjacent to an urban creek, Cerrito Creek.

7. Describe Previous Business Operations / Sources of PCBs or Mercury (if known):
Sources of PCBs are PG&E transformers containing oil with PCBs that spilled when the power distribution pole fell over.

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site:
On May 3, 2015 at 11:20 PM, a PG&E distribution pole located at 5635 San Diego Street in Richmond, California toppled during a wind storm. The distribution pole contained three (3) overhead 37.5 kilo-volt-ampere (KVA) transformers (one manufactured by Allis Chalmers, one manufactured by Pole Star and one without a nameplate), which were damaged as the pole struck

the asphalt roadway at the site and began to leak. Based on manufacturer specifications, each transformer contained a maximum of 23 gallons of transformer fluid, giving a maximum spill volume of 69 gallons. Some unknown amount of transformer fluid drained into a nearby storm drain, and from there entered a nearby urban creek, Cerrito Creek (the Creek). PG&E staff arrived on site at approximately 12:20 AM on May 4, 2015 and placed absorbent material on the release and an absorbent boom around the impacted storm drain inlet. PG&E collected a sample of mixed oil directly from the top of the asphalt in the release area and the sample was delivered to Anresco Laboratories in San Francisco, California, to be analyzed for polychlorinated biphenyls (PCBs) using United States Environmental Protection Agency (USEPA) Test Method 8082. The analytical results of the surface sample indicated that the oil contained 45.0 milligrams per kilogram (mg/kg) of PCBs (Aroclor 1260). PG&E also collected bulk samples from residual transformer oil in the Allis Chalmers and unnamed transformers and a wipe sample from inside the shell of the Pole Star transformer, which contained no residual oil. These samples were analyzed for PCBs by Test America laboratories in Pleasanton, California. Aroclor 1260 was detected on the wipe sample from the Pole Star transformer, but the two oil samples from the other transformers were nondetect for PCBs. (See attached report)

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).

Samples were collected at site where the oil leak occurred and confirmed oil contained PCBs. See #8.

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
SF Regional Water Board	**Spill response and follow-up**	**Janet O'Hara**	**(510) 622-5681**
SF Regional Water Board		**Katie Hart**	**(510) 622-2356**
Department of Fish and Wildlife		**Serge Glushkoff**	**(916) 651-8796**
City of Richmond		**Joanne Le**	**(510) 620-6540**

14. Describe the type and extent of abatement that has occurred:
    Sandbags were placed across the bed and bank downstream of the affected reach creating a 4-5 ft. dam to hold back tidal flow during excavation. Standing water present in the channel was removed with a vacuum truck. Approximately 17,995 gallons of water were pumped out of the Creek and stored in onsite tanks. The stored water was sampled for waste characterization purposes and transported for disposal to Seaport Environmental in Redwood City, California. Excavation of potentially impacted sediment in the bed and banks of Cerrito Creek was carried out with a small tracked excavator, which accessed the canal from the Pacific East Mall parking lot along the south bank of the Creek. Sediment, vegetation and trash debris was removed

from an approximately 120 ft. by 6 ft. area to an average depth of 1.5 ft., which generated approximately 40 cubic yards of potentially impacted solid waste. The excavated waste material was placed into four (4) roll-off containers stored on site and sampled for waste characterization purposes. Upon review of characterization laboratory samples, the waste was classified as nonhazardous and shipped to Kirby Canyon Landfill in San Jose, California for proper disposal.

PG&E removed and replace asphalt and sidewalks from the west end of San Diego Street that had been affected by the oil release. On October 26, 2015, PSC removed approximately 1,800 square feet of asphalt and concrete from the area of San Diego Street and associated sidewalk. Confirmation soil samples were collected from four locations beneath the removed asphalt/concrete and submitted to Anresco Laboratories for PCB Aroclor 1260 analysis. One result had a detectable PCB concentration of concern (0.107 ppm). PG&E chose to perform additional excavation to remove soil associated with this sample. A thickness of 7-10 inches of soil was excavated from the targeted sample area and a second confirmation sample collected and results were non-detect. New concrete was poured to replace the removed sidewalk panels. New asphalt was placed in the removal area to restore the site to prior conditions. A total of 30.68 tons of asphalt/concrete waste and 12.6 tons of soil waste was removed and disposed of as non-RCRA hazardous waste at U.S. Ecology Landfill located in Beatty, Nevada. A total of 50 gallons of non-RCRA hazardous wash water was collected and disposed of at U.S. Ecology Landfill located in Beatty, Nevada.

During remedial activities associated with the oil release, waste material was contained, classified and transported for proper disposal. Final quantities of disposed waste material from the remediation are as follows:

- **Initial excavation of the FCC - 41.37 tons of nonhazardous solid waste material and 17,995 gallons of nonhazardous wastewater.**
- **Release area remediation (asphalt/concrete replacement) – 30.68 tons of non-RCRA hazardous asphalt/concrete waste, 12.6 tons of non-RCRA hazardous soil waste, and 50 gallons of non-RCRA hazardous wastewater.**
- **Final excavation of the FCC – 30.23 tons of nonhazardous sediment-containing liquid waste and 10.24 tons of nonhazardous solid waste.**

15. Describe how the property abatement has effectively eliminated the transport of PCBs or mercury 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):
    Soils and concrete affected by the spill were excavated and disposed. See #14.

16. Describe any available water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4:
    See attached report.

SOURCE PROPERTY SELF-ABATEMENT REPORT

Attachments:

1. **San Diego Street Transformer Oil Release Cleanup and Closure Report**

Attachment 12.1

LEGEND:

RELEASE LOCATION

0 200 400

SCALE IN FEET

WEST END OF SAN DIEGO STREET,
RICHMOND, CALIFORNIA 94530, USA
CLEANUP AND CLOSURE REPORT

SAN DIEGO STREET TRANSFORMER OIL RELEASE SITE VICINITY MAP

ARCADIS

FIGURE
1

Path: Z:\GISPROJECTS_ENV\PG&E El Cerrito CA\MXD\Site Vacinity Map.mxd Date Saved: 2/12/2016 10:18:40 AM Author: M Miller

LEGEND:

- Base of Distribution Pole
- Oil Sample From Top of Asphalt
- Sediment Sample, Background
- Soil Sample, Background
- Soil Sample, Confirmation
- Storm Drain Inlets
- Storm Drain Outlet
- Transformer Impact
- Water Sample, Background
- Water Sample, Confirmation
- Wipe Sample, Confirmation
- Storm Drain Pipe
- Oil-Impacted Asphalt
- Sand Bag Dike

NOTES:

1. SOIL, SEDIMENT, AND WATER SAMPLES WERE GRAB SAMPLES.
2. CONFIRMATION SOIL SAMPLES WERE COLLECTED FOLLOWING EXCAVATION.
3. SAMPLES WERE COLLECTED BETWEEN MAY 4 AND 6, 2015.
4. 0+20L AND 0+70C WERE RESAMPLED ON MAY 6, 2015 FOLLOWING ADDITIONAL EXCAVATION IN THESE AREAS.
5. ALL LOCATIONS ARE APPROXIMATE.

0 30 60

SCALE IN FEET

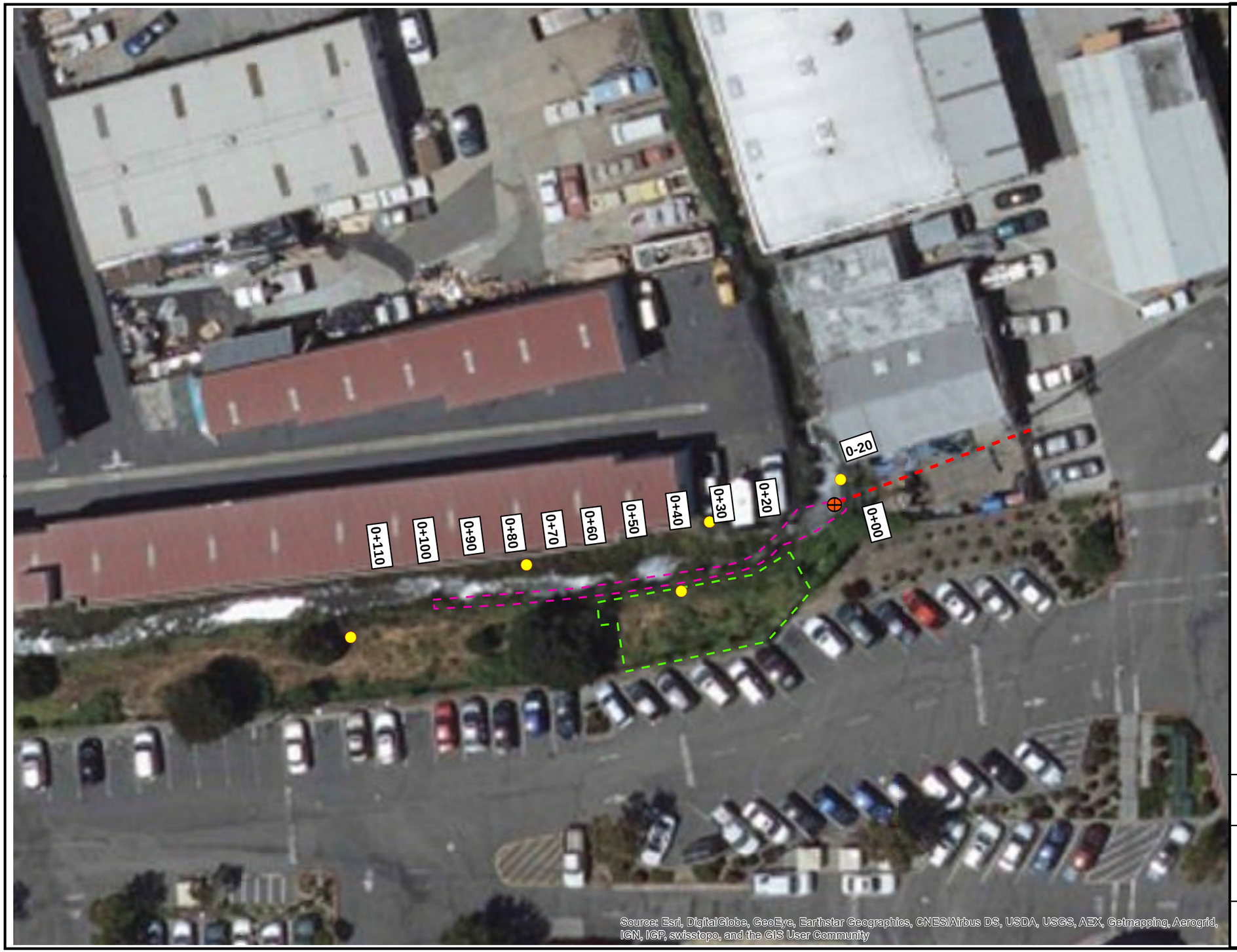
WEST END OF SAN DIEGO STREET,
RICHMOND, CALIFORNIA 94530, USA
CLEANUP AND CLOSURE REPORT

SAN DIEGO STREET TRANSFORMER OIL RELEASE SAMPLE LOCATIONS

ARCADIS

FIGURE 2

PATH: Z:\GISPROJECTS_ENV\PG&E El Cerrito CA\MXD\Sample Locations.mxd DATE: 2/12/2016 10:26:03 AM Author: M Miller



LEGEND:

- Storm Drain Outlet
- Photo Documentation Point
- Storm Drain Pipe
- Approximate Area of Final Excavation
- Approximate Coverage Area of Slope Stability Measures

NOTE:
1. ADDITIONAL 8 TO 12" INCHES OF SOIL EXCAVATED FROM THE AFFECTED REACH OF THE FLOOD CONTROL CHANNEL BY PSC BETWEEN DECEMBER 14 AND 17, 2015 PER SFBRWQCB ORDER.

0 30 60

SCALE IN FEET

WEST END OF SAN DIEGO STREET
RICHMOND, CALIFORNIA 94530, USA
CLEANUP AND CLOSURE REPORT

SAN DIEGO STREET TRANSFORMER OIL RELEASE REMEDIAL EXCAVATION PLAN VIEW

ARCADIS

FIGURE
3

PATH: Z:\GISPROJECTS_ENV\PG&E El Cerrito CAIMXD\Figure 3 Proposed Excavation Map.mxd DATE: 2/12/2016 11:33:26 AM Author: M Miller

LEGEND:

- Soil Sample, Confirmation
- Area of removed asphalt/concrete

NOTE:
1. SOIL SAMPLES COLLECTED FROM 3 TO 7" DEPTH AFTER CONCRETE/ASPHALT REMOVAL ON OCTOBER 26, 2015.
2. ADDITIONAL EXCAVATION AND SAMPLING PERFORMED AT LOCATION 1 ON OCTOBER 27, 2015 FOLLOWING DETECTION OF PCB AROCLOR 1260 ABOVE THE DESIGNATED CLEANUP LEVEL.
3. ALL SOIL SAMPLE LOCATIONS ARE APPROXIMATE.

0 30 60

SCALE IN FEET

WEST END OF SAN DIEGO STREET
RICHMOND, CALIFORNIA 94530, USA

CLEANUP AND CLOSURE REPORT

SAN DIEGO STREET TRANSFORMER OIL RELEASE CONCRETE AND ASPHALT REMOVAL PLAN VIEW

ARCADIS

FIGURE
4

PATH: Z:\GISPROJECTS_ENV\PG&E El Cerrito CA\MXD\Figure 4 Confirmation Soil Samples.mxd DATE: 2/12/2016 10:07:25 AM Author: M Miller

SOURCE PROPERTY SELF-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 completely 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:	**City of Walnut Creek**	
Staff Contact Name:	**Rinta Perkins**	
Phone:	**925-256-3511**	Email Address: **perkins@walnut-creek.org**
Date of Report:	**06/19/2018**	

1. Name of Site: **Larkey Pool Renovation project (WO# 9852)**

2. Address City County ZIP: **2771 Buena Vista Avenue, Walnut Creek, CA 94596**

3. APN(s): **171-110-021**

4. Provide a Site Location Map and a Site Diagram showing significant features.
   Area of contamination (square feet): **27.4 square feet**
   Refer to Attachment 1 for the Site Map and Attachment 2 for the Existing Condition map.

5. Current Owner

   Name: **City of Walnut Creek**

   Address, City, County & Zip Code: **1666 N. Main Street, Walnut Creek, CA 94596**

   Phone: **(925) 256-3511** E-mail Address: **perkins@walnut-creek.org**

6. Describe Current (Post-Abatement) Site Operations/Land Use:

   The recently-renovated Larkey Pool swim center has upgraded swimming lanes and a new splash pad for people of all ages and abilities. New concrete deck around the pool and pathways were installed to meet ADA standards. The facility was upgraded to meet the current health and safety, and seismic standards.

7. Describe Previous Business Operations / Sources of PCBs or Mercury (if known):

   Asbestos, lead paint and PCBs pre-renovation survey was conducted by an industrial hygienist prior to the demolition of the pool old decking and bath house renovation. The scope of the survey was limited to the building and surrounding deck area.

A total of six (6) PCB samples were collected during the survey. One sample (PCB-6), which was located under the rubberized deck caulking, measured 1800 parts per million (ppm), which is above the regulatory limit of 50 ppm. Given the typically porous nature of the surrounding concrete, PCBs would be considered capable of leaching into this material, therefore contributing to potentially hazardous waste. Refer to Attachment 3 for the Existing Deck Details showing the locations of surveyed materials. Refer to Attachment 4 for the Asbestos, Lead and PCB survey report.

In order to limit the amount of toxic waste associated with the deck demolition, the concrete surrounding the expansion joints had to be evaluated for the presence of PCBs. On November 10, 2015 a follow-up survey was conducted to determine the presence of PCB containing materials penetrating concrete decking slab. Concrete coring was completed on the main pool deck in various locations but did not indicate that PCB residue from the original felt expansion joints was infiltrating into the concrete decking. Therefore, the concrete decking would not be considered a hazardous material. Refer to Attachment 5 for the PCBs follow-up survey report.

Runoff from the subject property drains to an inlet, which is tied to the City's storm drain system at the corner of Buena Vista Avenue and 1st Avenue.

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site:

   During the survey, a total of fifteen (15) homogeneous suspect ACMs were identified in the buildings. Two of which tested positive for asbestos-content.

TABLE 1A – ASBESTOS CONTAINING MATERIAL(S)

HM No	Sample ID	Description	Building	Location	Asbestos Content	Estimated quantity[1]
6	6A, 6B, 6C	Caulking Exterior block to door and window frame	Pool house	Penetration frames	8% chrysotile	200 LF
11	11A, 11B, 11C	Roofing penetration mastic	Pool house	Roof	5% chrysotile	10 SQFT

9. Has sampling or other investigation been conducted in the vicinity of the property to identify it as a source property? **No**

   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). **Not applicable**

13. Were any Federal, State, or Local regulatory agencies involved with the site abatement? **No**
    If yes, provide as much of the information below as known: **Not applicable**

14. Describe the type and extent of abatement that has occurred:

    The project site was regraded and delineated into several drainage management areas, which drained to either a self-treating, self-retaining area or a bioretention. Refer to Attachment 6 for the Stormwater Management plan.

    PCBs-containing materials were carefully segregated from the rest of the construction debris before being disposed of by the contractor (Asbestos Management Group of California Inc.) at Recology Hay Road Landfill in Vacaville. See Attachment 7 for a copy of the Uniform Hazardous Waste Manifest.

15. Describe how the property abatement has effectively eliminated the transport of PCBs or mercury 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):

    Runoff from this site is now captured and treated by one of the on-site stormwater treatment facilities. The improvement had eliminated stormwater runoff via sheet flow to the nearby storm drain.

16. Describe any available water or sediment monitoring data that demonstrates the effective elimination of transport of PCBs offsite into the MS4.

    Neither water nor sediment monitoring has been conducted since the completion of this project.

Attachments:

1. **Site Location Map**
2. **Larkey Pool existing condition**
3. **Existing deck details**
4. **Asbestos, lead and PCBs survey report (dated August 31, 2015)**
5. **PCBs follow-up survey report (dated November 10, 2015)**
6. **Larkey Pool Stormwater Management Plan**
7. **Manifest**

City of Walnut Creek

Attachment 12.1 View Disclaimer

Larkey Park Swim Center

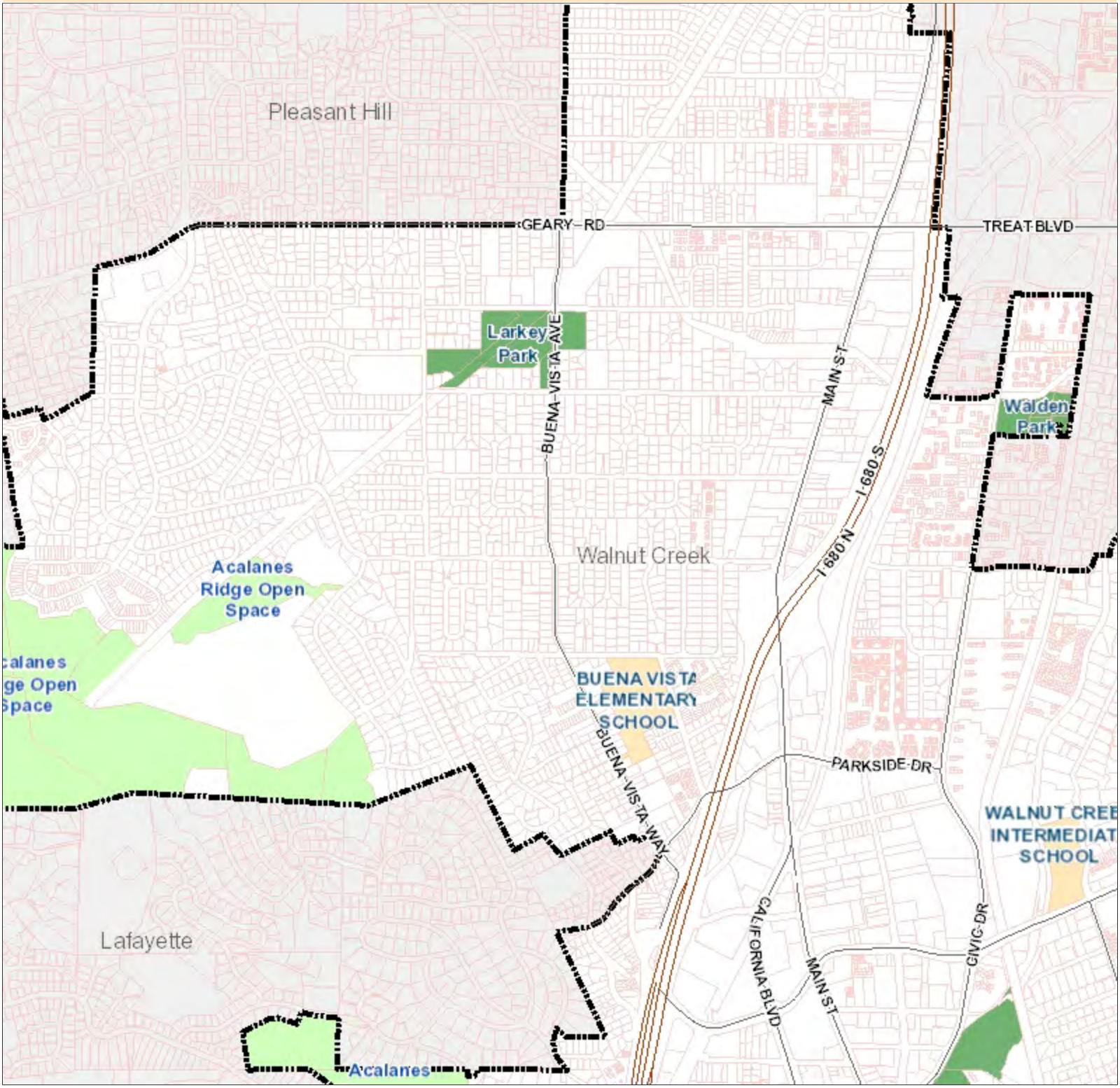
Site Map

Feet
1,333.33

Map Scale 1: 16,000.00

N

Parcel Info



CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

The purpose of this form is to provide the Department of Toxic Substances Control and the Regional Water Quality Control Board with sufficient information to require site owner/operators to conduct follow-up investigations and/or PCB cleanup actions. Please use additional pages, as necessary, to complete your responses.

Referring Agency: City of Pittsburg
Staff Contact Name: Jolan Longway
Phone: (925) 252-4803 Email Address: jlongway@ci.pittsburg.ca.us
Date of Referral: January 25, 2016

1. Name of Site: Former Molino Enterprises, Inc.

2. Address City County ZIP: 1215 Willow Pass Road, Pittsburg, Contra Costa County, 94565

3. APN(s): 096-091-003-2

4. Provide a Site Location Map and a Site Diagram showing significant features.

5. Current Owner
   Name: Pamela R Regatuso

   Address, City, County & Zip Code: P.O. Box 23763
   Pleasant Hill, CA 94523-0763

   Phone: E-mail Address:

6. Background: Current Business Operations
   Name: Molino Enterprises

   Type: Automotive recycling facility.

   Period of Operation: Unknown start – closed in 2008. Subject property was already in operation when it was annexed to the City in 1991

7. Background: Previous Business Operations (if known)
   #1 Name: Same as above, Molino Enterprises.

   Type:

   Period of Operation:

   #2 Name:

   Type:

   Period of Operation:

   #3 Name:

   Type:

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

Period of Operation:

8. Summarize any available information that may indicate hazardous substances, pollutants, or contaminants OTHER than PCBs have been associated with the site.

Contra Costa Health collected samples which yielded long-chain hydrocarbons, at concentrations up to 140,000 mg/kg and total lead up to 1,200 mg/kg. In 1997, one soil sample collected from a stained area yielded total petroleum hydrocarbons at 130,000 mg/kg.

On May 30, 1997 the District Attorney's office of Contra Costa County sent an Order to Show Cause preliminary injunction to the owner requiring them to retain the services of a licensed professional to investigate the extent of contamination beneath the site. Gallardo & Associates were retained to prepare a work plan and conduct site investigation. Between 1997 and 1998 monitoring wells were installed and soil boring samples were taken and analyzed. Samples were analyzed for total petroleum hydrocarbons as diesel, total petroleum hydrocarbons as motor oil, total petroleum hydrocarbons as gasoline, the fuel constituents benzene, toluene, ethyl benzene, and total xylenes, and the fuel oxygenate methyl tert-butyl ether. In addition select samples were also analyzed for volatile organic compounds. The results are summarized in Attachment B of the Remedial Work Plan. Subsequent to regulatory action by the County, the owner installed a storm water treatment system at the site in 2002. Sampling of the storm water continued from about 2002 thru 2008.

In November 2015 a Remedial Investigation Work Plan was approved for the site, with soil samples to be analyzed for: Total Petroleum Hydrocarbons as gasoline, diesel, and motor oil, oil and grease, volatile organic compounds, semi volatile organic compounds, CA 22 Metals, and pH. An initial round of sampling was conducted in December 2015, and the results are summarized in the attached December 29, 2015 submittal to the Water Board.

9. Describe the known and suspected sources of PCBs at the site.

Suspected sources of PCBs at the site are from former car crushing area and liquid waste containers, located north of the drainage ditch; spill s from day to day operations.

10. Has sampling or other investigation been conducted in the vicinity of the 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).

A water filtration system was installed to address oil, grease and sediment. The clean water is then discharged to a roadside ditch at the entrance. This roadside ditch is within the City's right of way on Willow Pass Road. Sampling of this area was part of the site SWPPP, based on visual observation only.

11. Is the site subject to the general industrial stormwater permit? Yes No
If yes, describe the findings of recent and past stormwater inspections conducted on the site, especially in regards to potential PCB sources.

No current industrial general permit, since the business was forced to close in 2008. Prior to that the business operated with an industrial discharge permit, for which the Water Board issued them a notice of

CONTRA COSTA CLEAN WATER PROGRAM

PCB REFERRAL SITE INFORMATION

violation. The site has been cleared of all vehicles, equipment, and other items associated with the business operations.

12. Is there currently a potential for exposure of the community or workers to hazardous substances, pollutants, or contaminants at the site? Yes No Unknown If yes, explain:

Soil investigative work continues. Most contaminants have been found within the first foot of soil.

13. Are any Federal, State or Local regulatory agencies currently involved with the site?
Yes No
If yes, provide as much of the information below as known.

Agency Involvement Contact Name Phone

Agency	Involvement	Contact Name	Phone Number; email
San Francisco Regional Water Quality Control Board	Oversee environmental investigation of the site	Alec Naugle	(510) 622-2510; Alec.Naugle@waterboards.ca.gov
San Francisco Regional Water Quality Control Board	Overseeing the referral of the site	Jan O'Hara	510.622.5681 Janet.O'Hara@waterboards.ca.gov

14. Provide any other pertinent site information not covered above:

The property is in the process of being sold. City staff has been in contact with the buyer's environmental consultant; next steps are unknown if buyer will pursue purchase of parcel and pursue further investigation.

15. Describe enhanced control measures that will be implemented at the site.

Phone call on 4.24.18 w/WB Supervisor Alec Naugle, as the lead contact for this case has confirmed the site owner/operator is remediating the ditch at south end of site. He is awaiting the final plan and will make sure Jan O'Hara is kept in the loop with his staff that is working on the case. City will conduct regular drive-by inspections to ensure no track-out during remedial activities.

Attach Site Location Map, Site Diagram, and any pertinent sampling & analyses data

See the previous referral packet for reference to Site Location Map, Site Diagram, and any pertinent sampling & analyses data.

Attachment 12.2

Quantitative Relationship Between Green Infrastructure Implementation and PCBs/Mercury Load Reductions

CONTRA COSTA
CLEAN WATER
PROGRAM

QUANTITATIVE RELATIONSHIP BETWEEN GREEN INFRASTRUCTURE IMPLEMENTATION AND PCBs/MERCURY LOAD REDUCTIONS

Submitted in Compliance with Provisions C.11.b.iii.(3), C.11.c.iii.(3), C.12.b.iii.(3), and C.12.c.iii.(1)

Municipal Regional Stormwater Permit
NPDES Permit No. CAS612008
Order No. R2-2015-0049

August 22, 2018

The Contra Costa Clean Water Program – A Municipal Stormwater Program consisting of Contra Costa County, its 19 Incorporated Cities/Towns, and the Contra Costa County Flood Control & Water Conservation District

This report is submitted by the agencies of the

CONTRA COSTA CLEAN WATER PROGRAM

Program Participants:

- Cities of: Antioch, Brentwood, Clayton, Concord, Danville (Town), El Cerrito, Hercules, Lafayette, Martinez, Moraga (Town), Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon and Walnut Creek
- Contra Costa County
- Contra Costa County Flood Control & Water Conservation District

Contra Costa Clean Water Program
255 Glacier Drive
Martinez, CA 94553-482

Tel (925) 313-2360
Fax (925) 313-2301

Website: www.cccleanwater.org

Report Prepared By:

Geosyntec Consultants

on behalf of the
Contra Costa Clean Water Program

LIST OF ACRONYMS

ASOS	Automated Surface Observation System
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practices
CCCWP	Contra Costa Clean Water Program
CIMIS	California Irrigation Management Information System
GI	Green Infrastructure
GIS	Geographic Information System
HRU	Hydrologic Response Unit
KTRL	Kendall-Theil Robust Line
MAD	Median Absolute Deviation
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
ng/kg	nanogram per kilogram
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated Biphenyls
RAA	Reasonable Assurance Analysis
RMSE	Root Mean Square Error
ROW	Right-of-Way
RWSM	Regional Watershed Spreadsheet Model
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SWMM	Stormwater Management Model
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
WY	Water Year

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1. INTRODUCTION

1.1 Purpose

This *Quantitative Relationship between Green Infrastructure Implementation and PCBs/Mercury Load Reductions* report was prepared by the Contra Costa Clean Water Program (CCCWP) per the Municipal Regional Permit (MRP) for urban stormwater issued by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB; Order No. R2-2015-0049). This report fulfills the requirements of MRP Provisions C.11.b.iii.(3), C.11.c.iii.(3), C.12.b.iii.(3), and C.12.c.iii.(1) for submitting the quantitative relationship between green infrastructure (GI) implementation and PCBs load reductions that will be used for the Reasonable Assurance Analysis (RAA) required by MRP Provisions C.11.c.ii.(2), C.11.d.ii, C.12.c.ii.(2), and C.12.d.ii.

This report was prepared in cooperation with the Alameda Countywide Clean Water Program. The RAA modeling described herein will be conducted for both countywide programs and will use data inputs from both Contra Costa County and Alameda County.

1.2 Background

1.1.1 PCBs and Mercury Total Maximum Daily Loads

Fish tissue monitoring in San Francisco Bay has revealed bioaccumulation of PCBs, mercury, and other pollutants. The levels found are thought to pose a health risk to people consuming fish caught in the Bay. As a result of these findings, California has issued an interim advisory on the consumption of fish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act "Section 303(d) list" due to PCBs and mercury. In response, the SFBRWQCB has developed Total Maximum Daily Load (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 and restore water quality.

Municipal separate storm sewer systems (MS4s) are one of the PCBs and mercury source/pathways identified in the TMDL plans. Local public agencies (i.e., Permittees) subject to requirements via National Pollutant Discharge Elimination System (NPDES) permits are required to implement control measures in an attempt to reduce PCBs and mercury from entering stormwater runoff and the Bay. These control measures, also referred to as Best Management Practices (BMPs), are the tools that Permittees can use to assist in restoring water quality in the Bay.

1.1.2 Municipal Regional Permit

NPDES permit requirements associated with Phase I municipal stormwater programs and Permittees in the Bay area are included in the MRP, which was issued to 76 cities, counties and flood control districts in 2009 and revised in 2015[1]. The MRP includes provisions to reduce loads of mercury and PCBs consistent with the TMDL implementation timeframe (Provisions C.11 and C.12, respectively) through implementation of GI projects (Provisions C.3.j, C.11.c, and C.12.c) and source controls (Provisions C.11.d and C.12.d).

The Permittees are reporting load reductions achieved before and during the current MRP term (2014 – 2020) using the approved Interim Accounting Methodology (BASMAA, 2017). MRP Provisions C.11.b.iii.(3) and C.12.b.iii.(3) requires the Permittees to report in the 2018 and subsequent Annual Reports any refinements to the Interim Accounting Methodology to be used in subsequent Permit terms. As part of this reporting requirement, Provision C.11.c.iii.(3) and C.12.c.iii.(1) requires the Permittees to report on the quantitative relationship between GI implementation and PCBs and mercury load reductions, including all data used and a full description of models and model inputs relied on to establish this relationship.

Green Infrastructure Planning and RAA

MRP Provision C.3.j requires the Permittees to develop a Green Infrastructure Plan for inclusion in the 2019 Annual Report. The Green Infrastructure Plan must be developed using a mechanism

[1] The cities of Antioch, Brentwood, and Oakley, and the eastern portions of unincorporated Contra Costa County and the Contra Costa County Flood Control & Water Conservation District (the East County Permittees) are located within the jurisdiction of the Central Valley Water Board and are covered under a separate Joint Municipal NPDES Permit titled "East Contra Costa County Municipal NPDES Permit" (East County Permit), which was last reissued in September 2010 (NPDES Permit No. CAS083313, Order No. R5-2010-0102). The East County Permit expired on September 1, 2015; however, it remains in force and effect until a new permit is reissued. In October 2016, the East County Permittees requested that the Central Valley Water Board designate the San Francisco Bay Water Board as the permitting authority for MS4 discharges in eastern Contra Costa County. In response to this request, the Central Valley Water Board provided a letter, dated January 6, 2017, that documents written agreement by both Water Boards to designate the San Francisco Bay Water Board to regulate MS4 discharges from the East County Permittees under MRP 2.0 and any successor orders. This East County Permittees are implementing PCBs and mercury control measures and this document reports those implementation efforts and the associated load reductions.

to prioritize and map areas for potential and planned GI projects, both public and private, on a drainage-area-specific basis, for implementation by 2020, 2030, and 2040.

MRP Provisions C.11.c and C.12.c require the Permittees to prepare an RAA for inclusion in the 2020 Annual Report that quantitatively demonstrates that specified mercury and PCBs load reductions will be achieved by 2040 through implementation of GI.

This RAA should do the following:

1. Quantify the relationship between the areal extent of GI implementation (e.g., acres treated) and mercury and 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 GI strategies likely to be implemented.
2. Estimate the amount and characteristics of land area that will be treated by GI by 2020, 2030, and 2040.
3. Estimate the amount of mercury and PCBs load reductions that will result from GI implementation by 2020, 2030, and 2040.
4. Ensure that the calculation methods, models, model inputs, and modeling assumptions used have been validated through a peer review process.

Additionally, MRP Provisions C.11.d. and C.12.d. require the Permittees to prepare plans and implementation schedules for mercury and PCBs control measures and an RAA demonstrating that sufficient control measures will be implemented to attain the mercury TMDL wasteload allocations by 2028 and the PCBs TMDL wasteload allocations by 2030. The implementation plans, which will also be included in the 2020 Annual Report, along with the GI-based RAA outlined above, must:

1. Identify all technically and economically feasible mercury or PCBs control measures (including GI projects, but also other control measures such as source property identification and abatement, managing PCBs in building materials during demolition, enhanced operations and maintenance, and other source controls) to be implemented;
2. Include a schedule according to which technically and economically feasible control measures will be fully implemented; and
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.

This report presents the quantitative relationship between GI implementation and PCBs and mercury load reductions, including the data used and a full description of models and model inputs relied on to establish this relationship. This relationship will be used to predict loads reduced through GI implementation for the RAAs described above and to report loads reduced through GI implementation in the subsequent Permit term.

2. DESCRIPTION OF RAA MODEL

This section provides an overview of the RAA modeling framework and describes the output of each component.

2.1 RAA Model Overview

The approach used to estimate the load reductions resulting from implementation of GI includes the model components listed below, which are described in further detail in the following sections:

- Baseline Pollutant Loading Model – the baseline pollutant loading model is a continuous simulation[2] hydrology model combined with pollutant loading inputs to obtain the average annual loading of mercury and PCBs across the county during the TMDL baseline period (i.e., 2003 – 2005).
    - Hydrology – this model component produces average annual runoff across each county for the period of record using a hydrologic response unit (HRU) approach. The HRU approach involves modeling various combinations of land surface features (i.e., imperviousness, underlying soil characteristics, slope, etc.) present within each county for a unit area drainage catchment. See Section 2.2.1.
    - Water Quality – the hydrology output is combined with average annual concentrations estimated by the Regional Monitoring Program's Regional Watershed Spreadsheet Model (RWSM; Wu et al, 2017) developed by the San Francisco Estuary Institute (SFEI) to produce average annual PCBs and mercury loading for the period of record. See Section 2.2.2.

[2] Continuous simulation models calculate outputs (e.g., runoff) "continuously", i.e., for many time steps over a long-term period of record (e.g., every 10 minutes for 10 years). Long-term "continuous" input data (e.g., hourly rainfall) is required. This is contrasted with design-event simulations which model a single rainfall event, e.g., a 24-hour storm with a 10-year recurrence frequency.

- GI Performance Models – the GI performance models are developed to represent load reductions resulting from implementation of GI. See Section 2.3.
- Future Condition (RAA Scenario) Models – the RAA scenario models are conducted to represent future land use changes and control measure implementation that could result in pollutant load reduction. Both GI and source controls are considered, depending on the time frame of interest. See Section 2.4 for a description of load reduction calculations.

2.2 Baseline Loading Model

2.2.1 Hydrologic Model

As introduced above, the proposed approach for modeling hydrology is to use a hydrologic response unit (HRU) approach. An HRU is a unique combination of land surface features (imperviousness, underlying soil characteristics, slope, etc.) which is expected to give a consistent runoff response to rainfall, no matter where that unique combination is found. The HRU approach involves modeling all possible combinations of land surface features present within each county for a unit area drainage catchment and then storing these results in a database. These HRU results can been be scaled geospatially across the entire county without developing a detailed hydrologic model. This method is consistent with the *Bay Area RAA Guidance Document* (BASMAA, 2017b).

The generic HRUs are modeled using USEPA's Stormwater Management Model (SWMM) to obtain an average annual runoff volume per acre for the identified baseline period of record (water year [WY] 2000 – 2009) for each HRU. Certain HRU inputs (imperviousness, soil parameters) are adjusted as needed to calibrate the HRUs on an average annual basis to identified flow gauges in the counties.

The average annual runoff volume per acre associated with a specific HRU can then be multiplied by the area represented by that HRU across each county (or a selected smaller planning area, such as a watershed or jurisdictional boundary). The resulting volumes associated with each represented HRU within the specified geospatial area can then be summed for the identified area to obtain the estimated total average annual runoff volume.

2.2.2 Water Quality Model

Identified HRUs across each county are combined with the RWSM land use classifications layer to determine pollutant loading rates. The RWSM provides average annual concentrations of PCBs

and mercury that wash off from various land use categories. On an average annual basis, this approach approximates the total load.

Average annual runoff volume associated with the geospatial HRUs is multiplied by the PCBs and mercury average annual concentration (based on the RWSM land use categories for the identified area) to obtain average annual pollutant load using the following equation:

$$Load_{Baseline} = \sum\left(\sum Unit\ Runoff_{HRU} \times Area_{LU,HRU}\right) \times Concentration_{LU} \times 0.00123 \qquad \text{Eqn. 1}$$

Where:

$Load_{Baseline}$	=	The total average annual baseline pollutant load for the identified area for calculation [grams/year]
Unit $Runoff_{HRU}$	=	The average annual runoff per acre for a given HRU within the identified area for calculation [ac-ft/acre/yr]
$Area_{LU,HRU}$	=	The total area of the HRU within the RWSM land use category within the identified area for calculation [acres]
$Concentration_{LU}$	=	The average annual pollutant concentration associated with the RWSM land use category [ng/L]
0.00123	=	Conversion factor [(L/ac-ft)*(g/ng)]

2.3 Green Infrastructure Performance Model

Volume reduction (via retention in the green infrastructure facility) and pollutant load reduction (via filtration through media and discharge through an underdrain) are modeled utilizing a combination of hydraulic modeling in SWMM and currently available empirical GI performance data.

2.3.1 Hydraulic GI Models

GI control measure hydraulic performance is modeled in SWMM with a 100% impervious tributary area for three GI facility types: (1) bioretention[3] with a raised underdrain, (2) bioretention with no underdrain, and (3) lined bioretention. The model is run with varying footprint sizes and varying underlying infiltration rates (i.e., the rate at which treated runoff infiltrates into native soils underlying the BMP facility). Average annual volume retained, volume treated, and volume bypassed by the GI measure are recorded for each GI model run.

Volume-based performance[4] corresponding to the generic 100% impervious tributary area can be applied to the effective area in GI drainage areas made up of identified HRUs. The effective area is also known as the "runoff generating area" and is calculated as the tributary area multiplied by the long-term or average annual runoff coefficient.

2.3.2 Green Infrastructure Pollutant Reduction Calculations

To calculate pollutant load reduction associated with GI implementation, the hydraulic model results are combined with water quality performance data. The annual estimate of pollutant load reduction from the modeled drainage area is equivalent to the difference between the influent load and the sum of the pollutant load that bypasses the GI measure and the effluent load (Eqn. 2). Equations corresponding to the pollutant reduction calculation are provided below and the water balance is illustrated in Figure 1. In summary, influent load is calculated as the pollutant load produced by the 100% impervious tributary area for each RWSM land use category using Eqn. 3. The pollutant load that bypasses the facility is calculated as the proportion of runoff that bypasses the facility per the hydraulic GI model output, multiplied by the influent concentration (Eqn. 4). The effluent load is calculated as the proportion of runoff that is captured by the facility per the hydraulic GI model output, combined with an effluent concentration (Eqn. 5 and Eqn. 6).

[3] The bioretention is assumed to include: 6-inch or 12-inch ponding depth, 1.5 ft of filter media with a 5 in/hr flow through rate, and 1 ft of gravel beneath the media.

[4] Volume-based performance refers to how much runoff volume the GI facility captures and retains or treats and discharges through the underdrain, typically represented as a percentage of the average annual runoff volume.

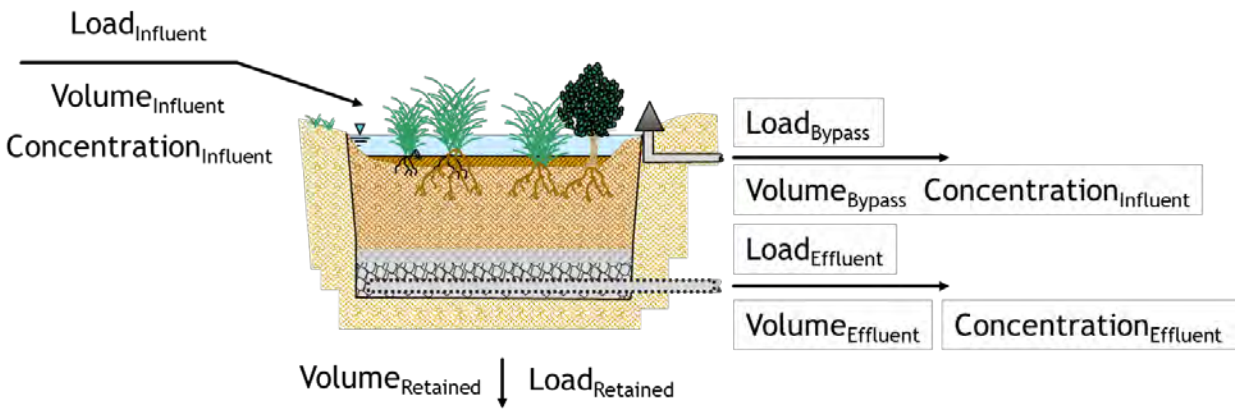

Figure 1: Illustration of GI Facility Pollutant Load Reduction Calculations

$$Load_{Reduced} = Load_{Influent} - Load_{Bypass} - Load_{Effluent} \quad \text{Eqn. 2}$$

$$Load_{Influent} = Volume_{Influent} \times Concentration_{Influent} \times C \quad \text{Eqn. 3}$$

$$Load_{Bypass} = Volume_{Bypass} \times Concentration_{Influent} \times C \quad \text{Eqn. 4}$$

$$Load_{Effluent} = (Volume_{Captured} - Volume_{Retained}) \times Concentration_{Effluent} \times C \quad \text{Eqn. 5}$$

$$Volume_{Captured} = Volume_{Influent} - Volume_{Bypass} \quad \text{Eqn. 6}$$

Where:

$Load_{Reduced}$	=	The total average annual pollutant load reduced by the GI facility [g/year]
$Load_{Influent}$	=	The total average annual pollutant load produced by the facility drainage area [g/year]
$Load_{Bypass}$	=	The pollutant load that bypasses the facility [g/year]
$Load_{Effluent}$	=	The pollutant load discharged from the facility after treatment [g/year]
$Volume_{Influent}$	=	The runoff produced by the drainage area to the GI facility [ac-ft/year]
$Volume_{Bypass}$	=	The proportion of influent runoff that bypasses the facility [ac-ft/year]

$Volume_{Captured}$	=	The proportion of influent runoff that is captured by the facility [ac-ft/year]
$Volume_{Retained}$	=	The proportion of captured runoff that is retained by the facility through infiltration and/or evapotranspiration [ac-ft/year]
$Concentration_{Influent}$	=	The pollutant concentration associated with the GI drainage area [ng/L]
$Concentration_{Effluent}$	=	The concentration discharged from the facility after treatment [ng/L]
C	=	Conversion factor constant = 0.00123 [(L/ac-ft)*(g/ng)]

2.4 RAA Scenario Loading Model

The loading corresponding with RAA future condition scenarios (2020, 2030, 2040) will be developed using the same volume and concentration combination approach used for the baseline condition. HRU outputs developed for the baseline model will scaled across the county corresponding to anticipated land use and development changes for each of the future conditions. Similarly, the RWSM land use classifications layer will be updated corresponding to each future condition scenario.

The outputs of the future hydrology scaling combined with the concentrations corresponding with future RWSM land use classification provides the land use-based loading estimated for each of the future conditions. To obtain the discharged load corresponding to each future GI scenario, load reductions associated with anticipated GI (developed as described above) will be subtracted from the land use-based load.

3. MODEL INPUTS AND DATA USED

This section describes the inputs to each component of the model and the data used.

3.1 Baseline Loading Model

3.1.1 Hydrologic Model

Generic HRU models are developed in SWMM to estimate average annual runoff volume per acre values that can be applied to all land surfaces within each county. The land surface feature inputs that will be varied to model the generic HRUs are described in the sections below and summarized in Table 3.

Climate Inputs

HRU climate inputs provide the total amount of precipitation that falls on the land surface and the amount of precipitation that is lost to the atmosphere via evapotranspiration before running off the land surface. Multiple gauges from across Alameda and Contra Costa counties that had continuous hourly precipitation data were chosen to represent distinct rainfall regions within both counties. For precipitation, these regions are based on 30-year annual rainfall regimes as identified by PRISM[5]. For evapotranspiration rates, the California Irrigation Management Information System (CIMIS) evapotranspiration zones were used within each county. The combination of the identified precipitation regions and evapotranspiration regions were combined to yield "climate zones" used for generic HRU models. Precipitation zones, evapotranspiration zones, and climate zones are shown in Exhibit 1 through Exhibit 3 (see Appendix A). Table 1 provides a summary of precipitation gauges used and average annual rainfall corresponding to the entire period of record and WY 2000 - 2009. Table 2 provides a summary of the CIMIS data used for the daily reference evapotranspiration rate for each evapotranspiration zone.

Table 1: HRU Precipitation Gauges WY2000-2009

Gauge ID	Gauge Name	Average Annual Precipitation (inches) WY 2000 - 2009	Gauge Source
KHWD	Hayward Air Terminal (ASOS)	16.3	ASOS[1]
KLVK	Livermore Municipal Airport (ASOS)	14.6	ASOS
KOAK	Oakland Airport (ASOS)	19.0	ASOS
DBF	Dublin Fire Station, San Ramon	17.3	CCCFCD[2]
FCD	Flood Control District, Martinez	16.2	CCCFCD
LSM	Los Medanos, Pittsburg	11.8	CCCFCD
SMC	Saint Mary's College, Moraga	28.9	CCCFCD

1. Automated Surface Observation System (ASOS) data were used for Alameda County gauge sites for the period of WY2000-2009 since NCDC gauge data was not available for the baseline period. ASOS sites sometimes co-occur with NCDC gauge sites (e.g., airports), but are maintained and delivered by separate government entities.
2. Contra Costa County gauge data is collected by the Flood Control District but was provided to Geosyntec by Dubin Engineering.

[5] Parameter-elevation Relationships on Independent Slopes Model (PRISM), developed and managed by the PRISM Climate Group, Oregon State University http://prism.oregonstate.edu/.

Table 2: CIMIS Reference Evapotranspiration

ET Zone	Monthly Evapotranspiration (in/day)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.03	0.05	0.08	0.11	0.13	0.15	0.15	0.13	0.11	0.08	0.04	0.02
2	0.04	0.06	0.1	0.13	0.15	0.17	0.16	0.15	0.13	0.09	0.06	0.04
3	0.06	0.08	0.12	0.16	0.17	0.19	0.18	0.17	0.14	0.11	0.08	0.06
6	0.06	0.08	0.11	0.16	0.18	0.21	0.21	0.2	0.16	0.12	0.08	0.06
8	0.04	0.06	0.11	0.16	0.2	0.23	0.24	0.21	0.17	0.11	0.06	0.03
14	0.05	0.08	0.12	0.17	0.22	0.26	0.28	0.25	0.19	0.13	0.07	0.05

1. CIMIS reference evapotranspiration, which is based on irrigated turf grass, was scaled by 0.6 to represent the local mix of vegetated cover including urban vegetation, native xeric adapted plants, and unirrigated vegetated open space areas.

Slope

Slope affects how quickly rainfall will run off a modeled land surface and therefore how much is able to be infiltrated into the subsurface. The available digital elevation model (DEM)[6] for the counties was analyzed to obtain percent slope values for each ~30m by ~30m square of land surface. These percent slope values were classified into three distinct slope zones as summarized in Table 3 and shown in Exhibit 4 (see Appendix A).

Underlying Soil Inputs

Physical characteristics of the soil underlying the land surface affect the amount of rainfall that may be infiltrated into the subsurface. Infiltration was simulated in SWMM using the Green-Ampt infiltration model option. The physical soil input parameters for the Green-Ampt infiltration model were varied based on hydrologic soil group (HSG) as identified by the National Resource Conservation Service (NRCS[7]) soil survey and were modified as described below for developed areas. Soil parameters used as model inputs include suction head, hydraulic conductivity, and initial moisture deficit. Developed areas that are assumed to have been compacted and therefore result in less infiltration to the subsurface are modeled using 75 percent of the HSG hydraulic conductivity value. Soil parameters are not reported here, as this input is adjusted as part of

[6] U.S. Geological Survey. National Elevation Dataset (NED) 1/3 arc-second. 2013

[7] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. link: https://websoilsurvey.sc.egov.usda.gov/

baseline model calibration. Details about soil inputs are provided in Table 3. A map of hydrologic soil group is provided as Exhibit 5 (see Appendix A).

Areas of development were identified based on the land use of the surface. Soils within urban and agricultural use areas were considered to have been compacted by the site preparation and activities.

Imperviousness

Imperviousness (i.e., the percentage of impervious area) affects area on the land surface where rainfall may be infiltrated and therefore the quantity of runoff produced. The runoff from a range of land use imperviousness values is modeled by area-weighting the results of a pervious surface runoff result (i.e., pervious HRU output) with a corresponding impervious surface runoff result (i.e., impervious HRU output) (see Table 3 and Exhibit 6 (see Appendix A)).

The baseline model HRU imperviousness is developed by geospatially combining the land uses identified by Association of Bay Area Governments (ABAG, 2005) with the National Land Cover Dataset (NLCD, 2006) data. Each feature of the ABAG dataset is assigned a single imperviousness value that is used to determine the average hydrologic response of that land surface. A lookup-table containing NLCD based imperviousness for each ABAG land use code was used as a starting value for HRU calibration. These initial values may be adjusted within an appropriate range as part of baseline model calibration.

3.1.2 Developing HRUs across each County

Each identified combination of land surface features is modeled for a generic unit-acre drainage area in SWMM for the baseline period of record (i.e., WY 2000 – 2009), utilizing a batch-processing method (which allows for inputs to be altered, model files run, and results extracted for many models automatically). The average annual runoff volume per acre is then extracted for each generic HRU modeled.

Table 3: Land Surface Feature Inputs for Generic HRU Hydrologic Models

Variables	Description	Number of Varying Features	Feature Representations	Source
Hourly Annual Precipitation	Rainfall Gauge and Rainfall Zone	7	Contra Costa County Gauges: DBF, FCD, LSM, SMC Alameda County ASOS Gauges: KHWD, KLVK, KOAK	PRISM[1], NCDC/ County-maintained rainfall gauges
Daily Evapotranspiration Rate	Evapotranspiration Zone	5	Zones 1, 2, 3, 6, 8, 14	CIMIS[2]
Slope Zone	Representation of Slope	3	<5%, 5-15%, 15%+	USGS[3]
Developed/ Undeveloped Areas	Representation of Compaction of Underlying Soils (Pervious Areas Only)	2	Undeveloped (Ksat * 1) Developed (Ksat * 0.75)	ABAG Land Use 2005[4]
Hydrologic Soil Group	Representation of Underlying Soil Type (pervious areas only)	6	HSG A, B, C, D[5], Rock, Water	NRCS[6]
Imperviousness	Representation of Imperviousness	2	0% and 100%	NLCD and ABAG 2005

1. PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, 30-year normal mean annual precipitation
2. California Irrigation Management Information System (CIMIS) Reference Evapotranspiration; digitized from http://www.cimis.water.ca.gov/App_Themes/images/etozonemap.jpg
3. U.S. Geological Survey. National Elevation Dataset (NED) 1/3 arc-second. 2013
4. ABAG land uses are proposed to be used for identifying developed and undeveloped condition and will have an imperviousness value assigned based on a geospatial analysis of the NLCD Imperviousness layer. The impervious value for each ABAG land use feature will then be carried into the HRU model calibration and adjusted accordingly.
5. "Urban" representation will be re-classified based on the dominant adjacent HSG.
6. U.S. Department of Agriculture, Natural Resources Conservation Service. Soil Survey Geographic (SSURGO) database. 2016

HRUs are determined geospatially based on the climate zone, slope zone, developed/undeveloped areas, and HSG, along with land use-based imperviousness. Exhibits 1 through 5 (see Appendix A) display the data used to develop climate zones, county slope zones, and the HSG distribution across each county. Imperviousness designations will occur based on

land use at the parcel level, by combining the geospatial ABAG land use layer[8] with the other hydrologic input regions. This results in a "patchwork" of HRUs across the counties[9].

The resulting patchwork of HRUs can be combined at the scale of choice to provide total runoff volumes for a specific area, such as a watershed or jurisdictional boundary. To estimate the total runoff for the identified area, the total acreage of each designated HRU present within a watershed or jurisdiction will be multiplied by the average annual runoff per acre associated with each HRU and then summed (i.e., area-weighting the average annual runoff volume per acre for all HRUs present).

3.1.3 HRU Input Calibration

Calibration of hydrologic models is required by the *Bay Area RAA Guidance Document*. Calibration of the generic HRU models will be conducted utilizing available stream flow records and based solely upon the annual discharge volume between WY 2000-2009. This annual calibration means that the HRU runoff estimates are representative of the approximate annual runoff volume but will not be used to estimate or compare discharge rates at smaller timesteps, such as the hourly or daily runoff hydrograph.

The list of candidate gauge sites within the counties was developed based on an assessment of the representativeness of the gauged watersheds and the mitigation of confounding factors that interfere with calibration such as missing data and upstream impoundments. For the purposes of calibration, the candidate gauge sites that were selected included stream depth rating curves and at least daily mean records for the historical period of interest. The USGS flow gauges considered for calibration are provided in Table 4 and shown in Exhibit 8 (see Appendix A).

[8] ABAG land use features will used to aggregate the imperviousness for the land surface. The relationship between AGAB feature and its imperviousness will be developed based upon other local sources (SMCWPPP, 2017) and analysis of national public data sets such as the National Land Cover Dataset (NLCD)

[9] This will be done once all the HRU input files are finalized, including the imperviousness layers.

Table 4: Flow Gauge Considered for RAA Model Calibration

Gauge ID	Gauge Name	Location	County	Data Frequency
11337600	Marsh Creek	Brentwood	Contra Costa	Daily
11182500	San Ramon Creek	San Ramon	Contra Costa	Daily
11181390	Wildcat Creek	Richmond / San Pablo	Contra Costa	Daily
11181040	Lan Lorenzo Creek	San Lorenzo	Alameda	Daily
11181008	Castro Valley Creek	Hayward	Alameda	Daily
11181000	San Lorenzo Creek	Hayward	Alameda	Daily
11180700	Alameda Creek Flood Channel	Union City	Alameda	Daily
11179000	Alameda Creek	Fremont	Alameda	Daily
11176900	Arroyo de la Laguna	Verona	Alameda	Daily
11173575	Alameda Creek Below Welch Creek	Sunol	Alameda	Daily
11173510	Alameda Creek Below Calaveras Creek	Sunol	Alameda	Daily

The effective area tributary to each flow gauge is used to calibrate the HRUs to the stream gauge records. Annual flow predicted by area-weighting HRU runoff output for the watersheds draining to the stream gauges was compared to annual flow in the stream records for the identified period of record.

Calibration of land surface runoff hydrology to stream gauge records requires that baseflow be computed and accounted for throughout the period of record. A variety of methods exist for separating baseflow from runoff, including the fixed-interval method and the local-minimum method (Sloto and Crouse, 1996). The most appropriate method for separating baseflow is determined on a gauge by gauge basis depending on the variability in the flow record, and the occurrence of confounding factors that affect baseflow such as dam releases and other dry weather inflows.

The average percent difference between the area-weighted HRU total average annual runoff volume for the watershed and the average annual flow (converted to volume) measured for the WY 2000 – 2009 period will be calculated. The acceptable ranges included in the RAA Guidance document are provided in Table 5 below.

Table 5: Allowable Difference between Simulated and Observed Annual Volumes

Model parameters	Average % difference between simulated annual results and observed data		
	Very Good	Good	Fair (lower bound, upper bound)
Hydrology/Flow	<10	10-15	15-25

If the average percent difference between simulated and measured annual storm flow volumes is greater than 25%, HRU model parameters are adjusted until the percent difference is within the acceptable range. The primary model parameters adjusted include underlying soil hydraulic conductivity and land use imperviousness, but other hydrologic model parameters, such as depression storage, may be adjusted as appropriate.

Once average percent differences in all identified watersheds are within the acceptable range, the HRU model parameters are finalized and the HRU results database will be regenerated. HRUs and resulting average annual baseline volume will be applied across each county to obtain the baseline volume discharged by each county.

3.1.4 Water Quality Model

RWSM values used to develop pollutant loading estimates across each county are:

Table 6: Regional Watershed Spreadsheet Model PCBs and Mercury Concentrations in Runoff

Land Use Category	Total PCBs (ng/L)	Total mercury (ng/L)
Ag, Open	0.2	80
New Urban	0.2	3
Old Residential	4	63
Old Commercial/ Transportation	40	63
Old Industrial and Source Areas	204	40

Water quality calculations are also used to perform baseline pollutant loading validation. The calculated pollutant load draining to Regional Monitoring Program stations will be validated by calculating the volume-weighted watershed pollutant concentration using the modeling results and comparing it to the observed concentrations in the Regional Monitoring Program data. The equation used to calculate concentration (in ng/L) at an end-of-watershed location is as follows:

$$Concentration_{Baseline} = \frac{\sum Runoff_{HRU} \times Area_{HRU} \times Concentration_{LU,HRU}}{\sum Runoff_{HRU} \times Area_{HRU}} \quad \text{Eqn. 7}$$

Pollutant concentration and loading data from the Regional Monitoring Program will be compared to the result of Equation 7 for several watersheds for validation purposes.

3.2 Green Infrastructure Performance Model

3.2.1 Long-Term Green Infrastructure Simulations

Long term performance was assessed for each BMP configuration using continuous historical rainfall records. In Contra Costa County historical data was available at the same gauges that were used for the HRU runoff modeling between WY2000-2009, but for Alameda County other gauge sites with longer histories were used for long term BMP performance modeling. The rainfall gauges used to model BMP performance are shown in Table 7.

Table 7: Long Term GI Performance Precipitation Gauges

Gauge ID	Gauge Name	Period of Record	Average Annual Precipitation (inches)	Gauge Source[1]
040693	Berkeley (NCDC)	1948-1990	19.8	NCDC
041060	Brentwood (NCDC)	1950-1985	14.9	NCDC
043863	Hayward (NCDC)	1948-1988	24.3	NCDC
046335	Oakland Airport (NCDC)	1948-1985	16.4	NCDC
047821	San Jose Airport (NCDC)	1948-2010	13.6	NCDC
DBF	Dublin Fire Station, San Ramon	1973-2016	15.0	CCCFCD
FCD	Flood Control District, Martinez	1971-2016	16.5	CCCFCD
LSM	Los Medanos, Pittsburg	1974-2016	10.6	CCCFCD
SMC	Saint Mary's College, Moraga	1972-2016	26.8	CCCFCD

1. NCDC data was used for Alameda County and San Jose gauge sites. Contra Costa County gauge data is collected by the Flood Control District and was provided to Geosyntec by Dubin Engineering.

3.2.2 Hydraulic Green Infrastructure Model

Hydraulic GI models were developed in SWMM to estimate hydraulic performance for a 100% impervious tributary area. Hydraulic model inputs that were varied to model the GI facility performance for the counties are described below and summarized in Table 8.

1. BMP Configuration – three GI facility types were assumed: (1) bioretention with a raised underdrain, (2) bioretention with no underdrain, and (3) lined bioretention with an underdrain.

2. BMP Footprint Size – the BMP footprint size was varied as a percent of impervious area to model different levels of hydraulic capture performance depending on facility sizing.
3. BMP Underlying Infiltration Rate – the infiltration rate of the soils underneath the bioretention facility was varied for the bioretention with a raised underdrain and bioretention with no underdrain configurations (I.e., the unlined facility types).

Table 8: Land Surface Feature Inputs for Generic GI Performance Hydraulic Models

Variables	Description	Number of Varying Features	Feature Representations
Hourly Precipitation	Rainfall Gauge	9	NCDC: 040693 (Berkeley) 046335 (Oakland Airport) 043863 (Hayward) 047821 (San Jose) 041060 (Brentwood) Contra Costa County: DBF, FCD, LSM, SMC
Daily Evapotranspiration Rate	Evapotranspiration Zone	4	CIMIS Zones: 1, 6, 8, 14
BMP Configurations	BMP profiles and underdrain	3	Lined Bioretention with underdrain Unlined Bioretention with elevated underdrain Infiltration Basin without underdrain
BMP Surface Ponding Depth	Depth (feet)	2	0.5, 1
BMP Footprint Sizes	% of Impervious Area	12	0.25, 0.5, 0.75, 1, 1.5, 2, 2.5, 3, 3.5, 4, 5, 6
BMP Infiltration Rates	Ksat of underlying soil (in/hr)	7 3	Unlined Bioretention: 0.024, 0.05, 0.1, 0.2, 0.24, 0.3, 0.4, 0.5 Infiltration Basin: 0.5, 1, 2

The BMP cross-sections that were modeled each include:

- 6-inches or 12-inches ponding depth (both were modeled),
- 1.5 ft of filter media with 25% porosity with a 5 in/hr flow through rate, and

- 1 ft of gravel beneath the media with 40% porosity.

Two of the modeled BMP configurations include underdrains. In the lined bioretention facility, the underdrain is located at the bottom of the gravel layer. In the unlined bioretention facility, the underdrain was modeled at the top of the gravel layer. BMP configurations are shown in Exhibits 9 through 11 (see Appendix A).

3.2.3 Green Infrastructure Pollutant Reduction Calculations

As described in Section 2.3.2, pollutant load reduction associated with GI is calculated by combining the hydraulic model results with water quality performance data. The annual estimate of pollutant load reduction from the modeled drainage area is equivalent to the difference between the influent load and the sum of the pollutant load that bypasses the GI measure and the effluent load. The effluent load is calculated as the proportion of runoff that is treated by the GI measure multiplied by an effluent concentration.

Water quality performance data from selected, representative studies were used to determine a method to predict effluent concentrations in stormwater following treatment through a biofiltration (bioretention or tree well filters) GI measure. The data used to develop the relationship came from three studies: a) 2011 monitoring study of the El Cerrito Rain Gardens (Gilbreath, Pearce, and McKee, 2012), b) Clean Watersheds for a Clean Bay (CW4CB)[10] (Geosyntec and EOA, 2017), and c) a study at Echo Lake in King County, WA (King County, 2017). A summary of the paired influent-effluent data associated with each study is provided in table:

Table 9: Data used to Develop Effluent Concentrations

Project Name	Project Sponsor	Facility ID	Influent-Effluent Data Pairs (n pairs)	
			PCBs	Mercury
El Cerrito Green Streets – CW4CB	El Cerrito	ELC-B1	3	3
El Cerrito Green Streets – SFEI	SFEI	ELC-B1	4	4
PG&E Substation 1st and Cutting Bioretention Cells – CW4CB	Richmond	LAU-3	8	8

[10] The CW4CB study included additional monitoring of the El Cerrito rain gardens.

Project Name	Project Sponsor	Facility ID	Influent-Effluent Data Pairs (n pairs)	
			PCBs	Mercury
Monitoring Stormwater Retrofits in the Echo Lake Drainage Basin Bioretention Planter Boxes – SAM Effectiveness Study	King County, Dept. of Natural Resources and Parks	BPB-1	4	0
		BPB-2	4	0
		BPB-3	4	0
		BPB-4	2	0
West Oakland Industrial Area Tree Wells – CW4CB	Oakland	ETT-TW2	4	4
		ETT-TW6	4	4
Monitoring Stormwater Retrofits in the Echo Lake Drainage Basin Tree Well – SAM Effectiveness Study	King County, Dept. of Natural Resources and Parks	FLT-1	4	0
		Total Data Pairs	41	23

These data were statistically evaluated to identify an appropriate method for predicting effluent concentrations of PCBs and total mercury. The data analysis first evaluated whether available influent and effluent concentration data were significantly different and, if so, whether a monotonic relationship existed (i.e., effluent generally increased when influent increased).

A Wilcoxon non-parametric hypothesis test was run on the PCBs and total mercury paired influent-effluent data to determine if influent and effluent concentrations were statistically different at a 5% significance level. This difference was found to be significant for PCBs, and significant for total mercury when corresponding influent suspended solids concentration was greater than 20 mg/L.

Spearman's rho and Kendall's tau, which are non-parametric rank correlation coefficients, were used to identify the direction and strength of correlation between influent and effluent concentrations. As shown in Table 10, both correlation coefficients suggest that effluent concentrations are positively correlated with influent concentrations for both PCBs and mercury.

Table 10: Influent/Effluent Correlation Coefficients.

Correlation Coefficient	Total PCBs	Total Mercury
Spearman's rho	0.725	0.547
Kendall's tau	0.527	0.396

The Kendall-Theil Robust Line (KTRL) method (Granato, 2006) was used to determine the best fit line between influent and effluent data. This non-parametric method uses the median of all possible pairwise slopes between points, which is more robust to outliers than a simple linear regression. Because stormwater data tend to be lognormal, the analysis was focused on linear and log-linear relationships. After the KTRL was generated, the lower portion of the curve was adjusted to assume that neither PCBs nor total mercury can be exported from biofilters under normal circumstances, i.e., that the maximum effluent concentration of PCBs or total mercury is equal to the influent concentration. The resulting KTRL for PCBs is shown Figure 2. The resulting KTRL for total mercury is shown in Figure 3. Each figure also includes a constant average effluent concentration line with data fit statistics: root mean square error (RMSE) and median absolute deviation (MAD). As indicated, the KTRL provide a better fit of the data. However, the resulting effluent concentrations are not much different between the two lines except when influent PCBs are low (<10 ng/L) and total mercury concentration are high (>50 ng/L). For total mercury, concentration reductions are only predicted to occur when influent concentrations are greater than about 30 ng/L. Due to observed export of total mercury for several events, particularly for the 1st and Cutting bioretention cell (LAU-3), the moderate concentration reductions assumed by the KTRL at higher influent concentrations is reasonably conservative.

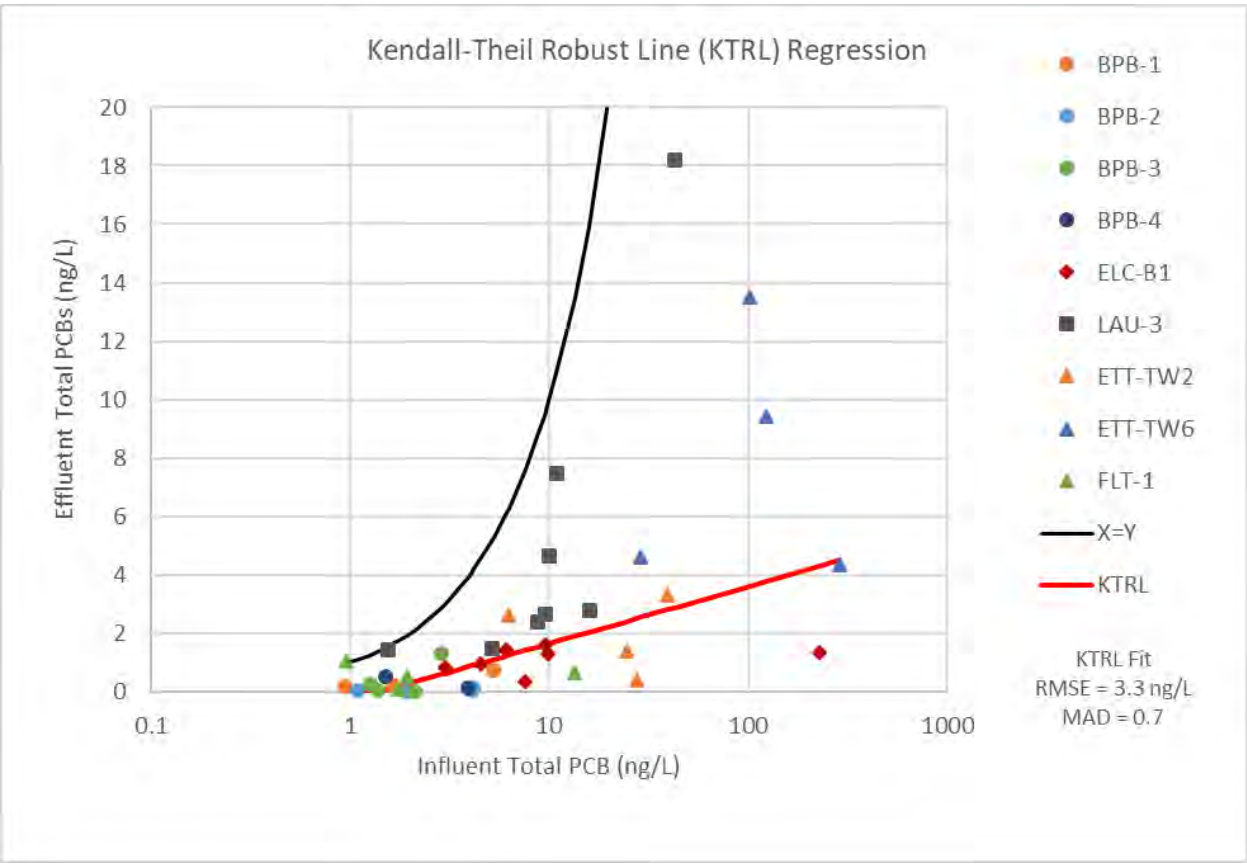

Figure 2: PCBs Influent vs Effluent Concentration Relationship Determined by KTRL Regression

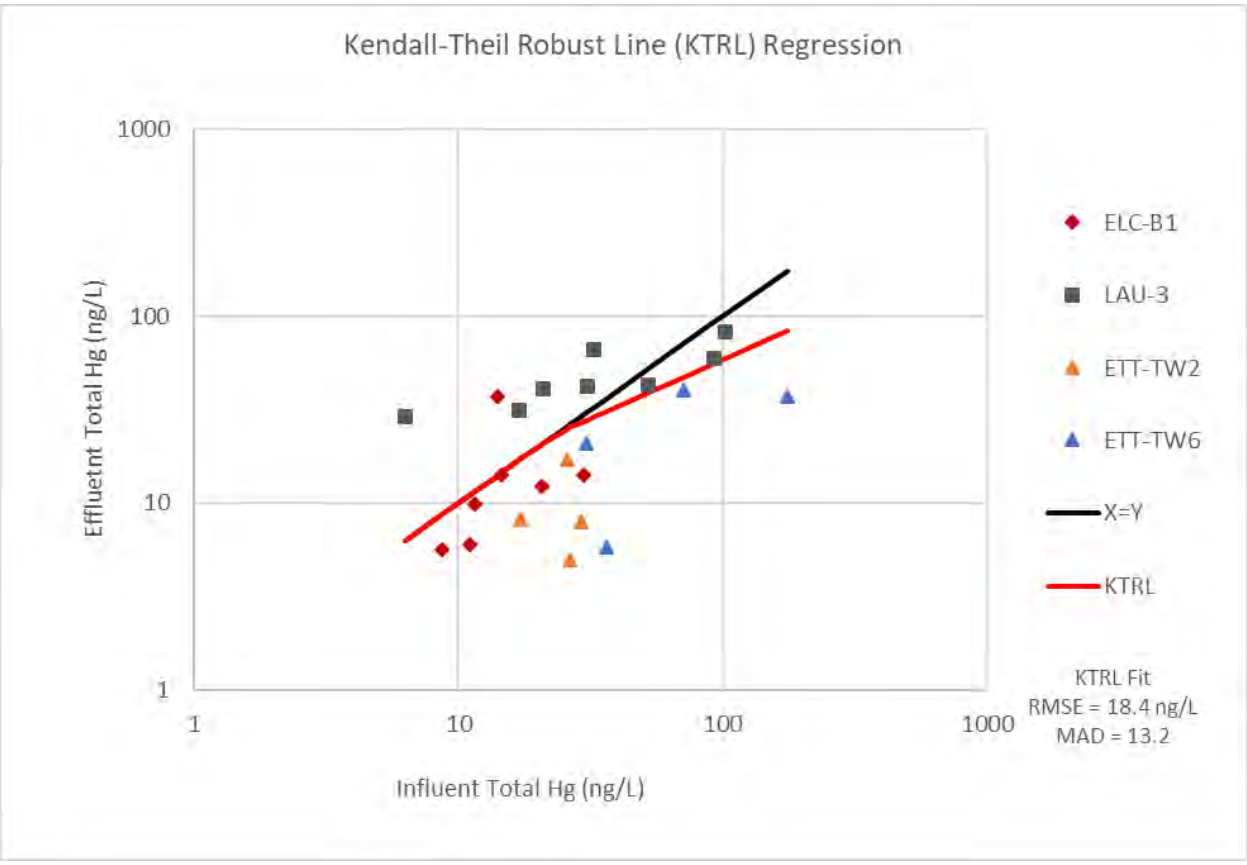

Figure 3: Mercury Influent vs Effluent Concentration Relationship Determined by KTRL Regression

3.3 RAA Scenario Loading Model

To model RAA future scenarios, future condition land use is needed. Future condition land use will be estimated using predictions of private parcel new development and redevelopment in combination with GI implementation on public parcels and rights-of-way.

Load reductions estimated for implementation of GI will be applied to future condition RAA scenario models based on estimated locations of GI and the tributary drainage areas to those GI. Effective area will be used to relate the HRUs, which can have a variety of imperviousness values, to the GI performance which will be based on a unit of effective area with 100% imperviousness. The GI performance curves can thus be applied to many different HRU types and/or combinations of HRUs that make up the tributary drainage areas for future GI measures.

4. QUANTITATIVE RELATIONSHIP BETWEEN GI IMPLEMENTATION AND PCBS LOADS REDUCED

The results of the hydraulic and pollutant reduction modeling of GI measures were used to develop a quantitative relationship between GI implementation and PCBs that can be applied to RAA future scenario models. An example quantitative relationship is provided for GI models run for the Berkeley gauge (040693). Utilizing output from hydraulic modeling, GI measure volumetric percent capture was calculated on an average annual basis. Volumetric model results for runs with GI measures sized to achieve 80%, 85%, 90%, and 95% capture were combined with water quality inputs to obtain pollutant load reduction for varying PCBs influent concentration.

The results of this analysis are shown in nomographs[11] provided in Figure 4, Figure 5, and Figure 6, which correspond to infiltrating bioretention (i.e., with no underdrain), bioretention with a raised underdrain, and lined bioretention, respectively. All facilities shown in the figures below have a 6-inch ponding depth. For bioretention with a raised underdrain, the facility configuration with an underlying infiltration rate of 0.24 in/hr only is shown (see Table 8 for all modeled infiltration rates). Facilities sized to achieve 80%, 85%, 90%, and 95% capture from the 100% impervious tributary catchment are shown in series, with pollutant load reduction in grams per effective acre[12] displayed as a function of influent concentration. Constant influent lines corresponding with RWSM land use-based influent concentrations are shown.

[11] A nomograph is a graphical relationship between two variables that can be used to quickly estimate one value from another.

[12] Effective area is calculated as the area multiplied by the runoff coefficient.

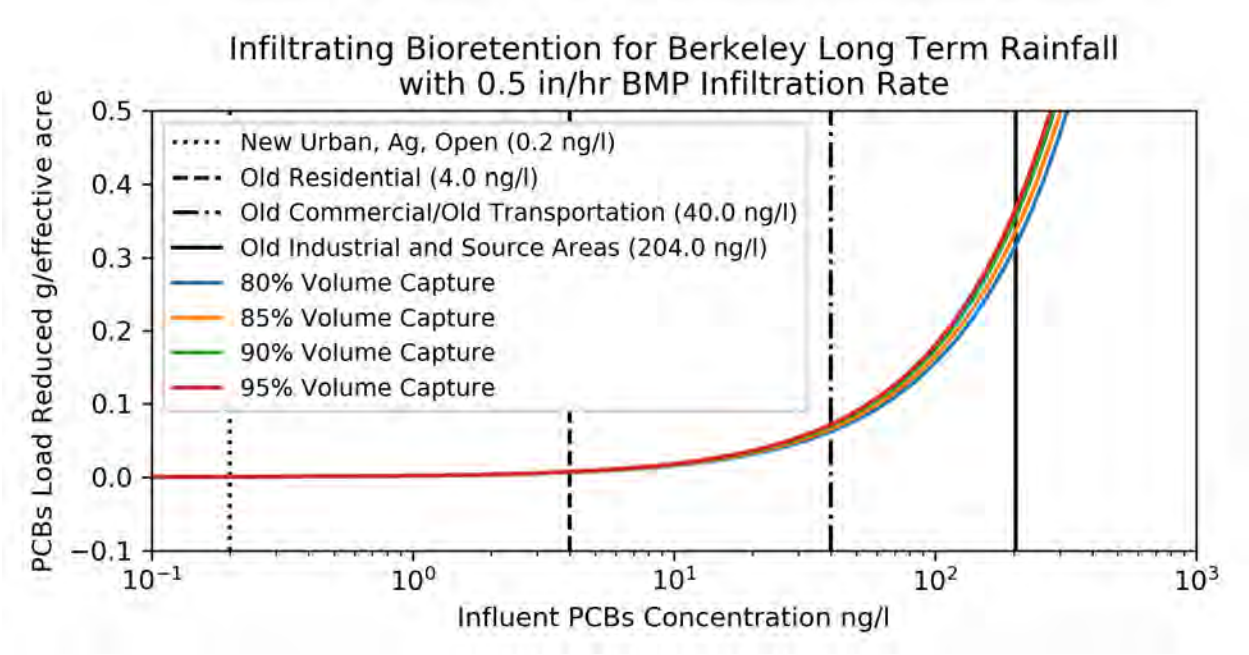

Figure 4: Modeled PCBs Load Removal Performance for Infiltrating Bioretention Basin

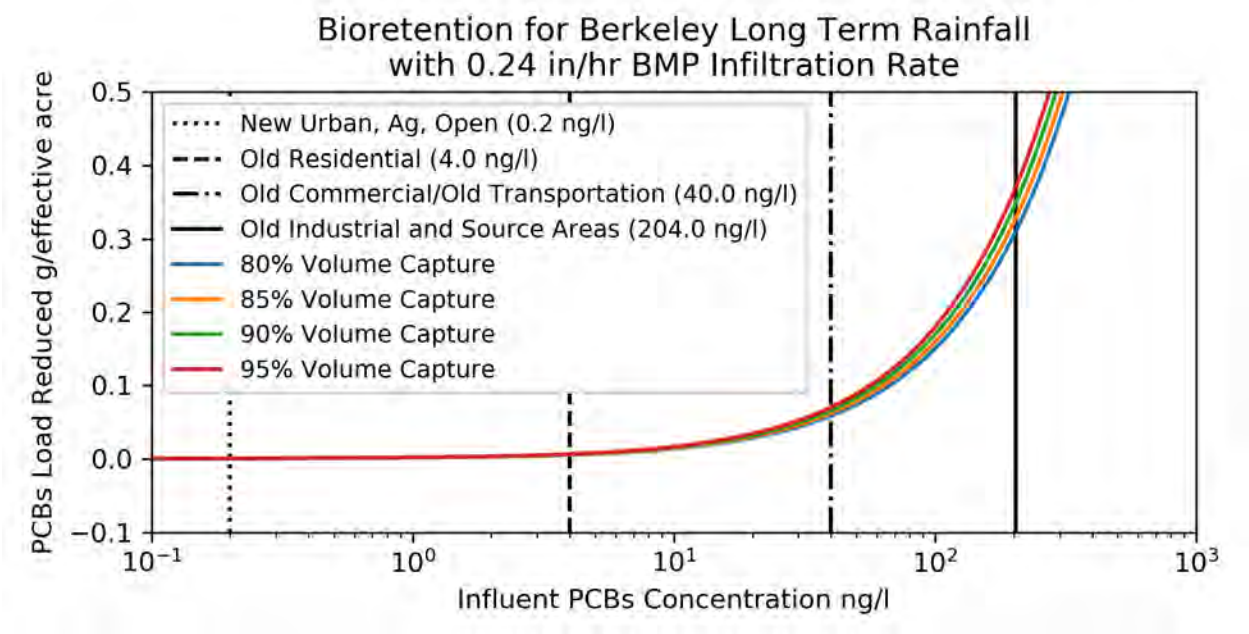

Figure 5: Modeled PCBs Load Removal Performance for Bioretention Basin with Elevated Underdrain

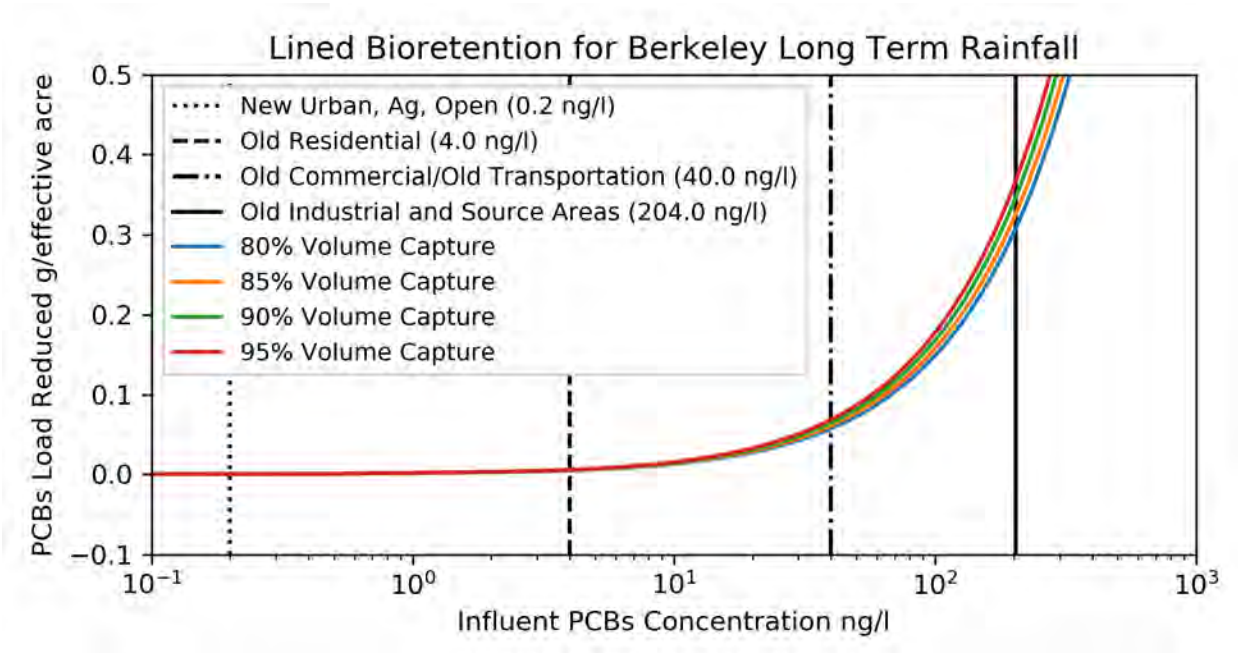

Figure 6: Modeled PCBs Load Removal Performance for Lined Bioretention Basin with Underdrain

The intersection points between the load reduction series and the constant influent lines represent the load reduced in grams per acre for each specific RWSM land use category. These intersection points are listed in Table 11.

Table 11: PCBs Load Reduction for RWSM Land Use Categories for Berkeley Gauge for Different BMP Percent Capture Values

Facility Configuration	Land Use Category	PCBs Load Reduced (g/effective ac)			
		80% Capture[1]	85% Capture[1]	90% Capture[1]	95% Capture[1]
Infiltrating Bioretention (0.5 underlying infiltration rate)	New Urban, Ag, Open	3.12E-04	3.30E-04	3.49E-04	3.61E-04
	Old Residential	0.00623	0.0066	0.00698	0.00722
	Old Commercial / Old Transportation	0.0623	0.066	0.0698	0.0722
	Old Industrial and Source Areas	0.318	0.337	0.356	0.368
Bioretention with Raised Underdrain (0.24 underlying infiltration rate)	New Urban, Ag, Open	3.08E-04	3.26E-04	3.47E-04	3.67E-04
	Old Residential	0.00518	0.0055	0.00589	0.00633
	Old Commercial / Old Transportation	0.0586	0.0621	0.0661	0.0703
	Old Industrial and Source Areas	0.311	0.329	0.350	0.371

Facility Configuration	Land Use Category	PCBs Load Reduced (g/effective ac)			
		80% Capture[1]	85% Capture[1]	90% Capture[1]	95% Capture[1]
Lined Bioretention	New Urban, Ag, Open	3.08E-04	3.26E-04	3.46E-04	3.67E-04
	Old Residential	0.00484	0.00513	0.00545	0.00577
	Old Commercial / Old Transportation	0.0574	0.0608	0.0647	0.0685
	Old Industrial and Source Areas	0.309	0.327	0.348	0.368

1. Average Annual Facility Volumetric Runoff Capture

5. QUANTITATIVE RELATIONSHIP BETWEEN GI IMPLEMENTATION AND MERCURY LOADS REDUCED

Mercury load reduction results for the Berkeley Gauge are shown in nomographs[13] in Figure 7, Figure 8, and Figure 9, which correspond to infiltrating bioretention (i.e., with no underdrain), bioretention with a raised underdrain, and lined bioretention, respectively. All facilities shown in the figures below have a 6-inch ponding depth. For bioretention with a raised underdrain, the facility configuration with an underlying infiltration rate of 0.24 in/hr only is shown (see Table 9 for all modeled infiltration rates). Facilities sized to achieve 80%, 85%, 90%, and 95% capture from the 100% impervious tributary catchment are shown in series, with pollutant load reduction in grams per acre displayed as a function of influent concentration. Constant influent lines corresponding with RWSM land use-based influent concentrations are shown.

[13] A nomograph is a graphical relationship between two variables that can be used to quickly estimate one value from another.

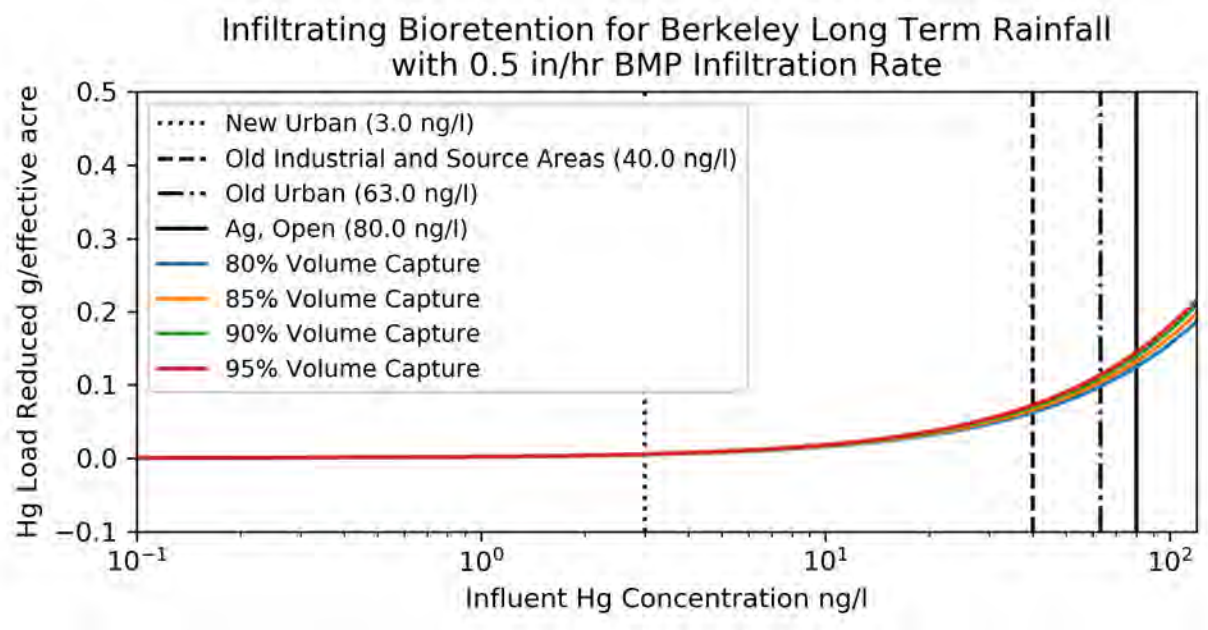

Figure 7: Modeled Mercury Load Removal Performance for Infiltrating Bioretention Basin

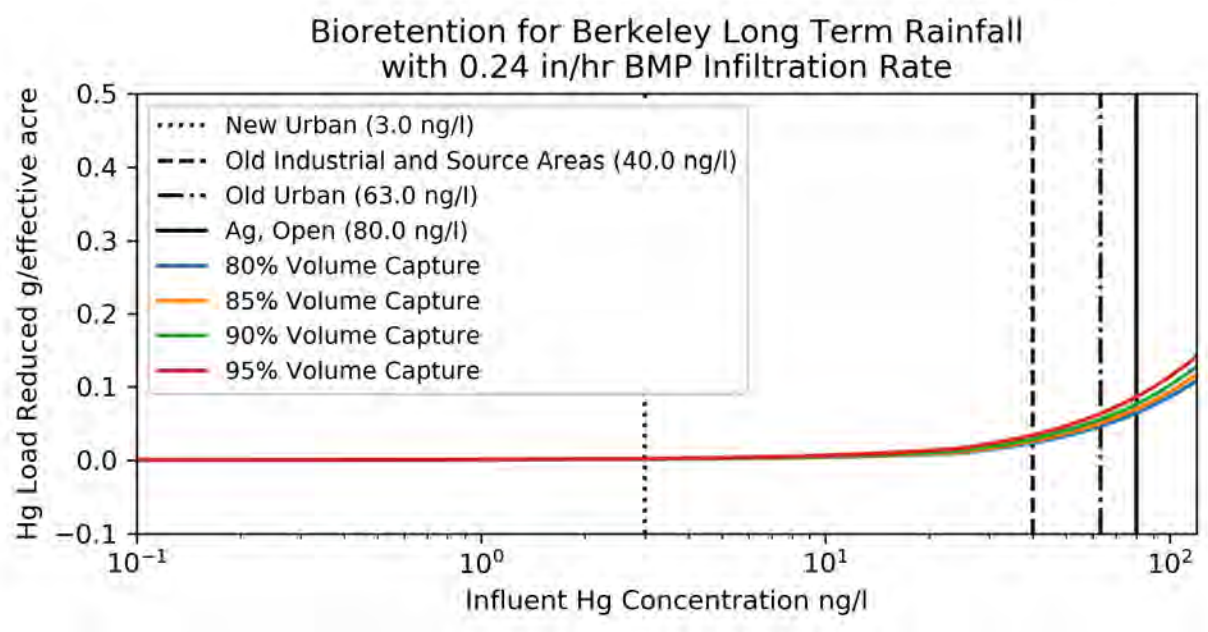

Figure 8: Modeled Mercury Load Removal Performance for Bioretention Basin with Elevated Underdrain

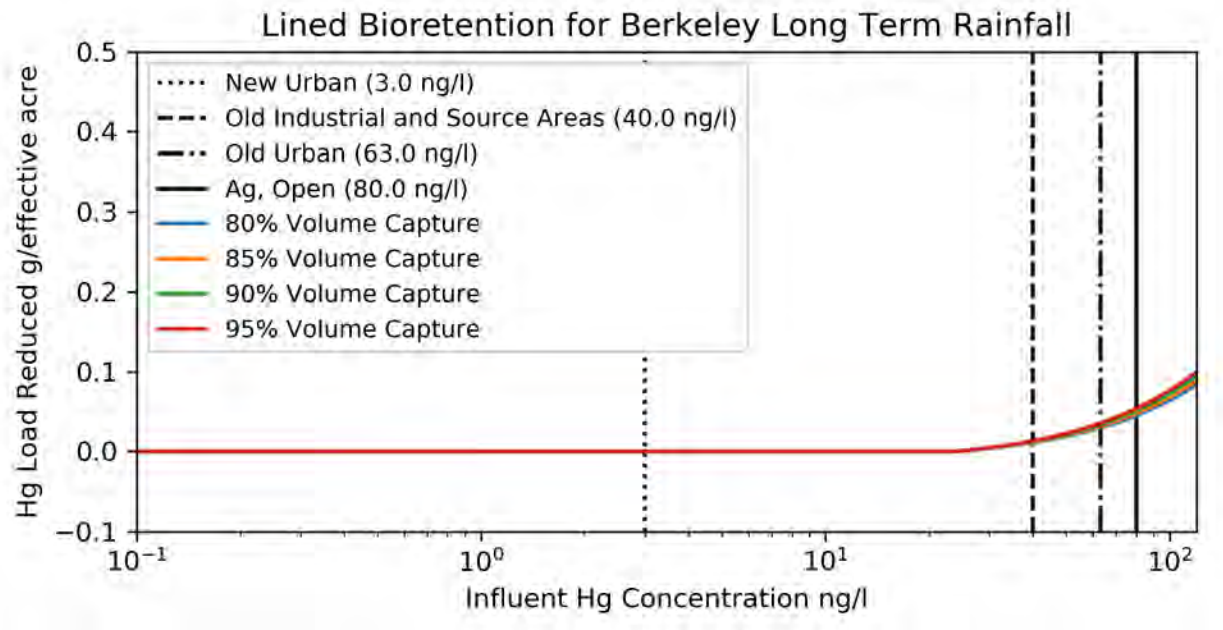

Figure 9: Modeled Mercury Load Removal Performance for Lined Bioretention Basin with Underdrain

The intersection points between the load reduction series and the constant influent lines represent the load reduced in grams per acre for each specific RWSM land use category. These intersection points are summarized in Table 12.

Table 12: Mercury Load Reduction for RWSM Land Use Categories for Berkeley Gauge for Different BMP Percent Capture Values

Facility Configuration	Land Use Category	Mercury Load Reduced (g/effective acre)			
		80% Capture[1]	85% Capture[1]	90% Capture[1]	95% Capture[1]
Infiltrating Bioretention (0.5 underlying infiltration rate)	New Urban	0.00467	0.00495	0.00524	0.00541
	Old Industrial and Source Areas	0.0623	0.066	0.0698	0.0722
	Old Urban	0.0981	0.104	0.110	0.114
	Ag, Open	0.125	0.132	0.140	0.144
Bioretention with Raised Underdrain (0.24 underlying infiltration rate)	New Urban	0.00113	0.0013	0.00153	0.00192
	Old Industrial and Source Areas	0.0234	0.0258	0.029	0.0341
	Old Urban	0.0462	0.0503	0.0556	0.0634
	Ag, Open	0.0643	0.0696	0.0765	0.0862

Facility Configuration	Land Use Category	Mercury Load Reduced (g/effective acre)			
		80% Capture[1]	85% Capture[1]	90% Capture[1]	95% Capture[1]
Lined Bioretention	New Urban	0	0	0	0
	Old Industrial and Source Areas	0.0108	0.0115	0.0123	0.0130
	Old Urban	0.0296	0.0314	0.0335	0.0353
	Ag, Open	0.0449	0.0476	0.0507	0.0536

[1] Average Annual Facility Volumetric Runoff Capture

6. REFERENCES

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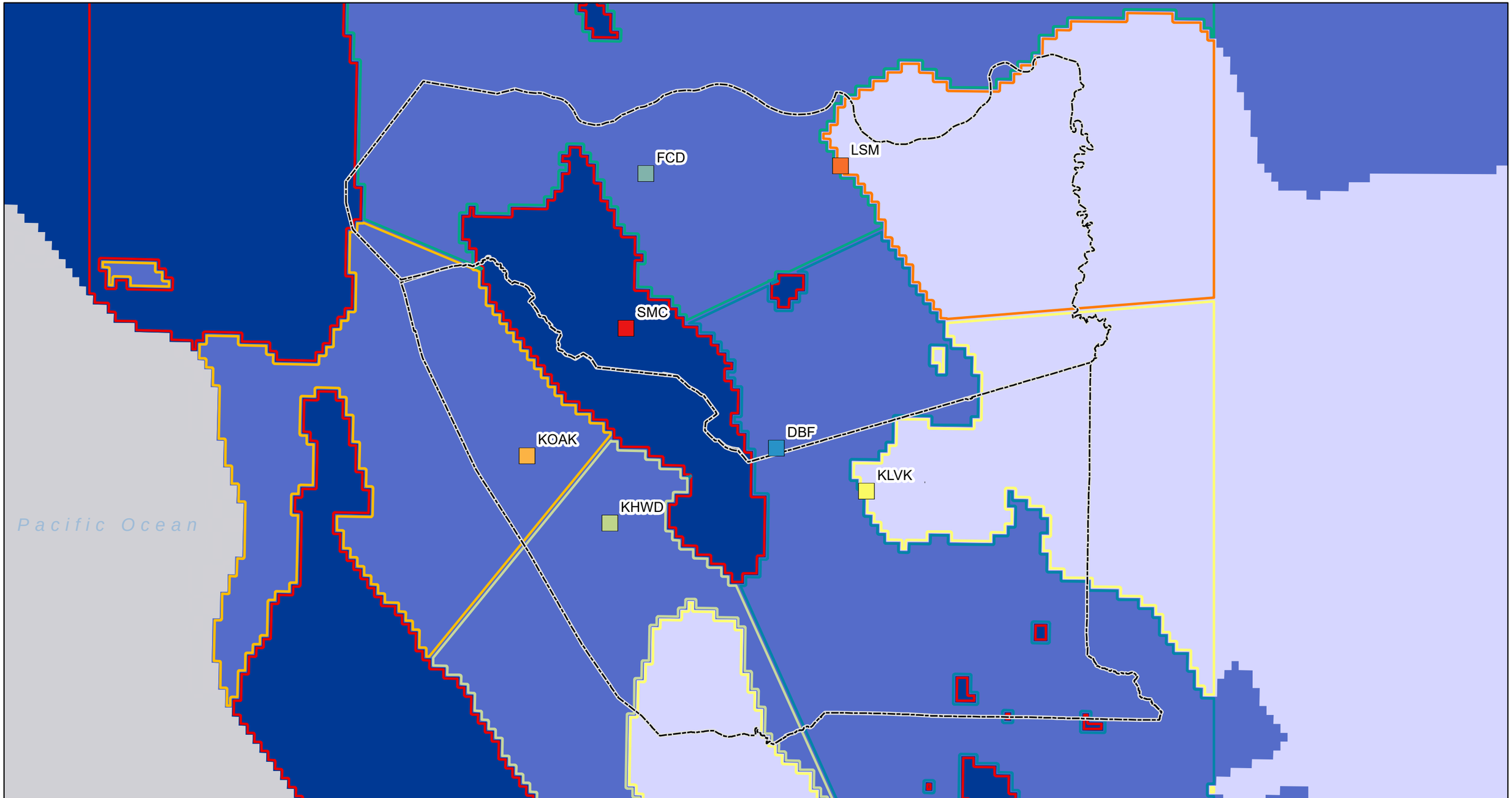
APPENDIX A

Modeling Inputs and Data Exhibits



Rain Gauge ID
- Rain Gauge ID
- County Boundary

Mean Annual Precipitation (in)
- < 16
- 16 - 25
- > 25

Rain Gauge Zones
- DBF
- FCD
- KHWD
- KLVK
- KOAK
- LSM
- SMC

N

0 6 12 Miles

Precipitation Zones for Baseline Runoff Period (WY 2000-2009)

Alameda County and Contra Costa County
California

Geosyntec consultants

Oakland | July 2018

Exhibit 1

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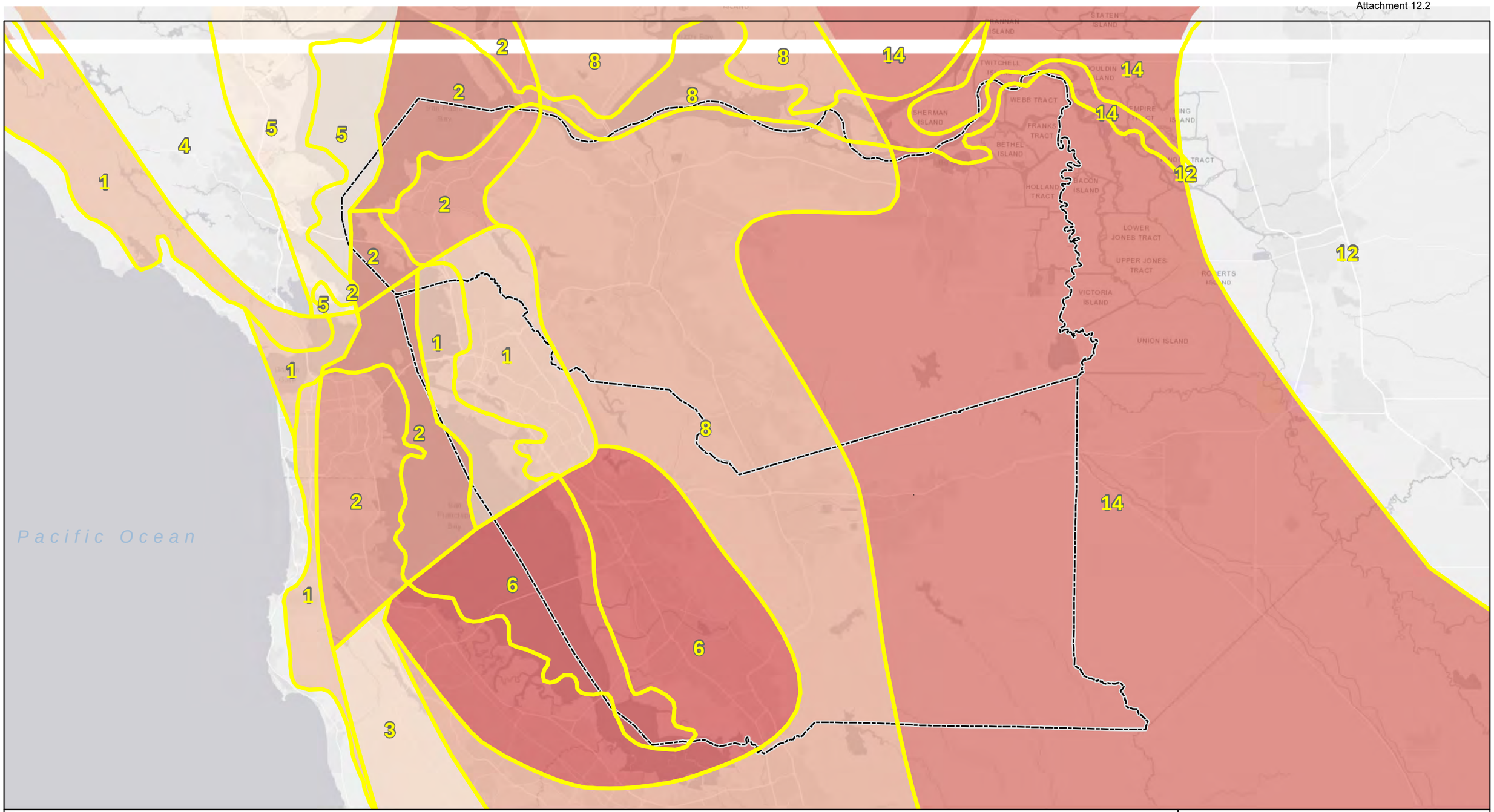


County Boundary

CIMIS ET Zone Boundary

CIMIS ET Zone

- 1
- 2
- 3
- 5
- 6
- 8
- 14

N

0 6 12 Miles

CIMIS Evapotranspiration Zones

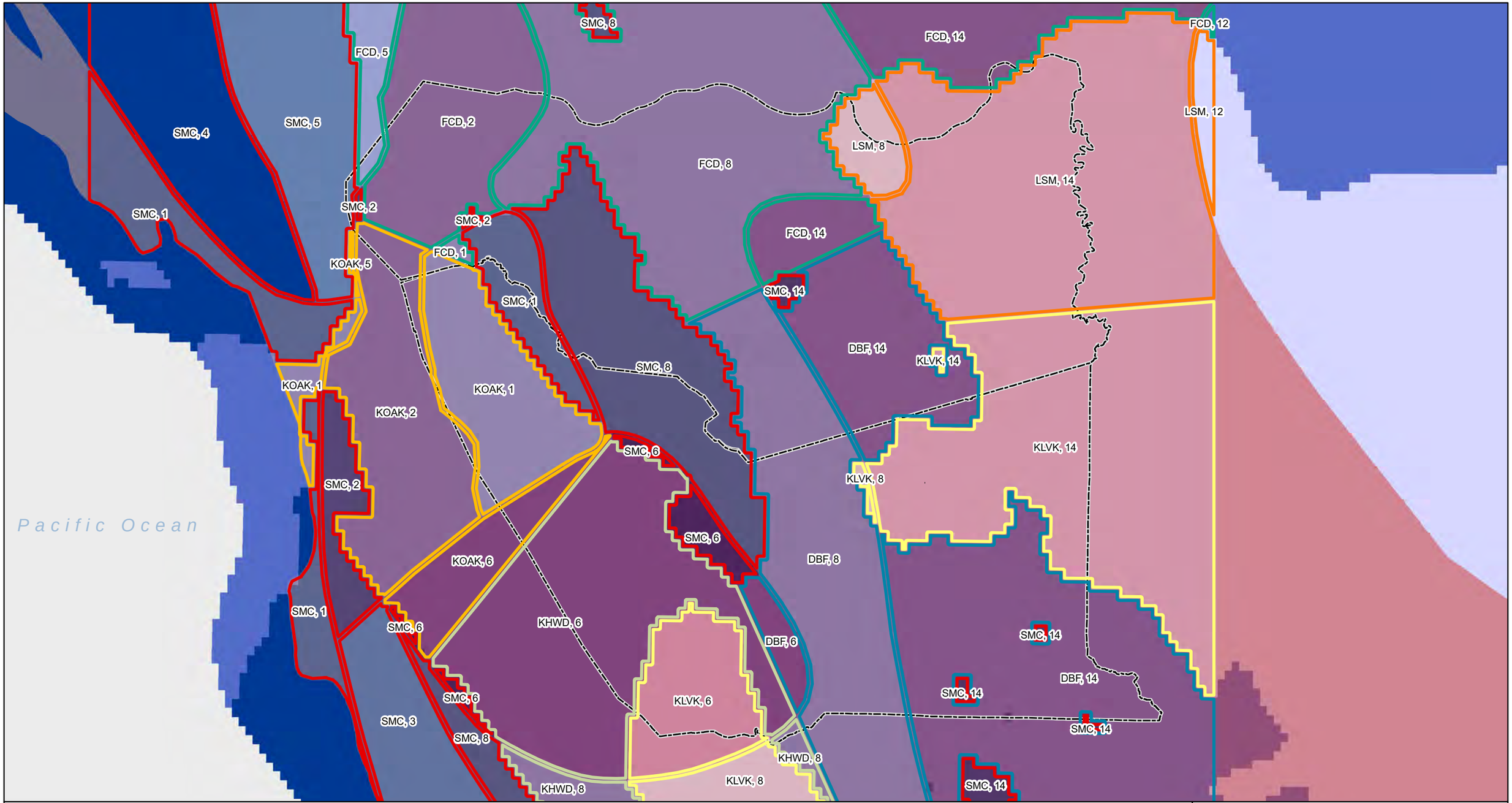
Alameda County and Contra Costa County
California

Geosyntec consultants

Oakland | July 2018

Exhibit 2

P:\GIS\Bay_Area_RAA\Project\GI_Load_Reduced_Report_Exhibits\Figure_3_ET_Zones.mxd 7/5/2018 6:00:18 PM



County Boundary

Mean Annual Precipitation (in)

- < 16
- 16 - 25
- > 25

CIMIS ET Zone

- 1
- 2
- 3
- 5
- 6
- 8
- 14

Climate Zones are created by overlapping precipitation zones and ET zones.The unique climate zones that occur in Contra Costa and Alameda County are labeled as "Gauge ID, ET Zone".

N

0 6 12 Miles

Climate Zones for Baseline Runoff Period (WY 2000-2009)

Alameda County and Contra Costa County California

Geosyntec consultants

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Exhibit 3

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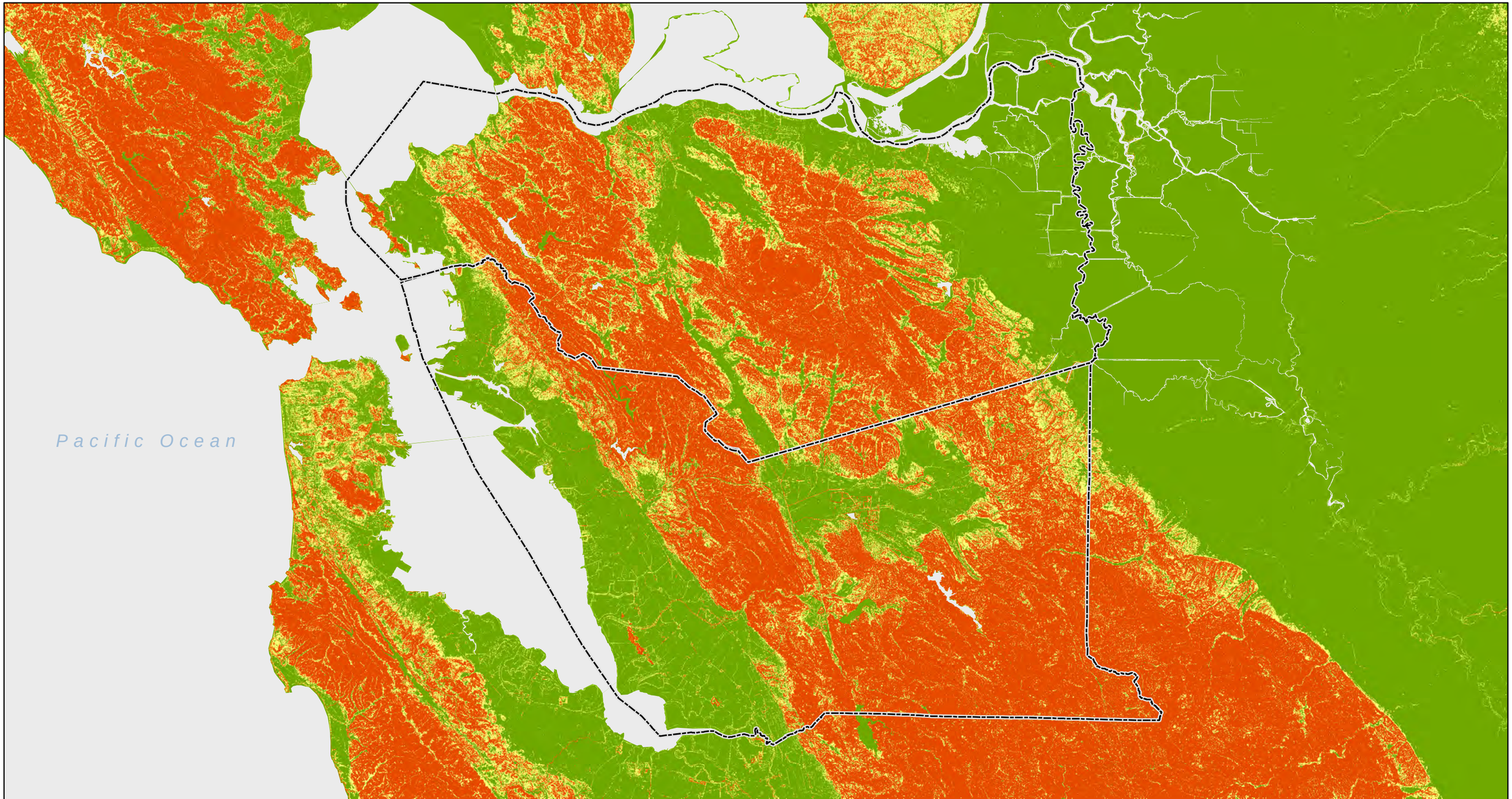

County Boundary

% Slope

- < 5
- 5-15
- > 15

N

0 6 12 Miles

Slope Zones

Alameda County and Contra Costa County
California

Geosyntec consultants

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Exhibit 4

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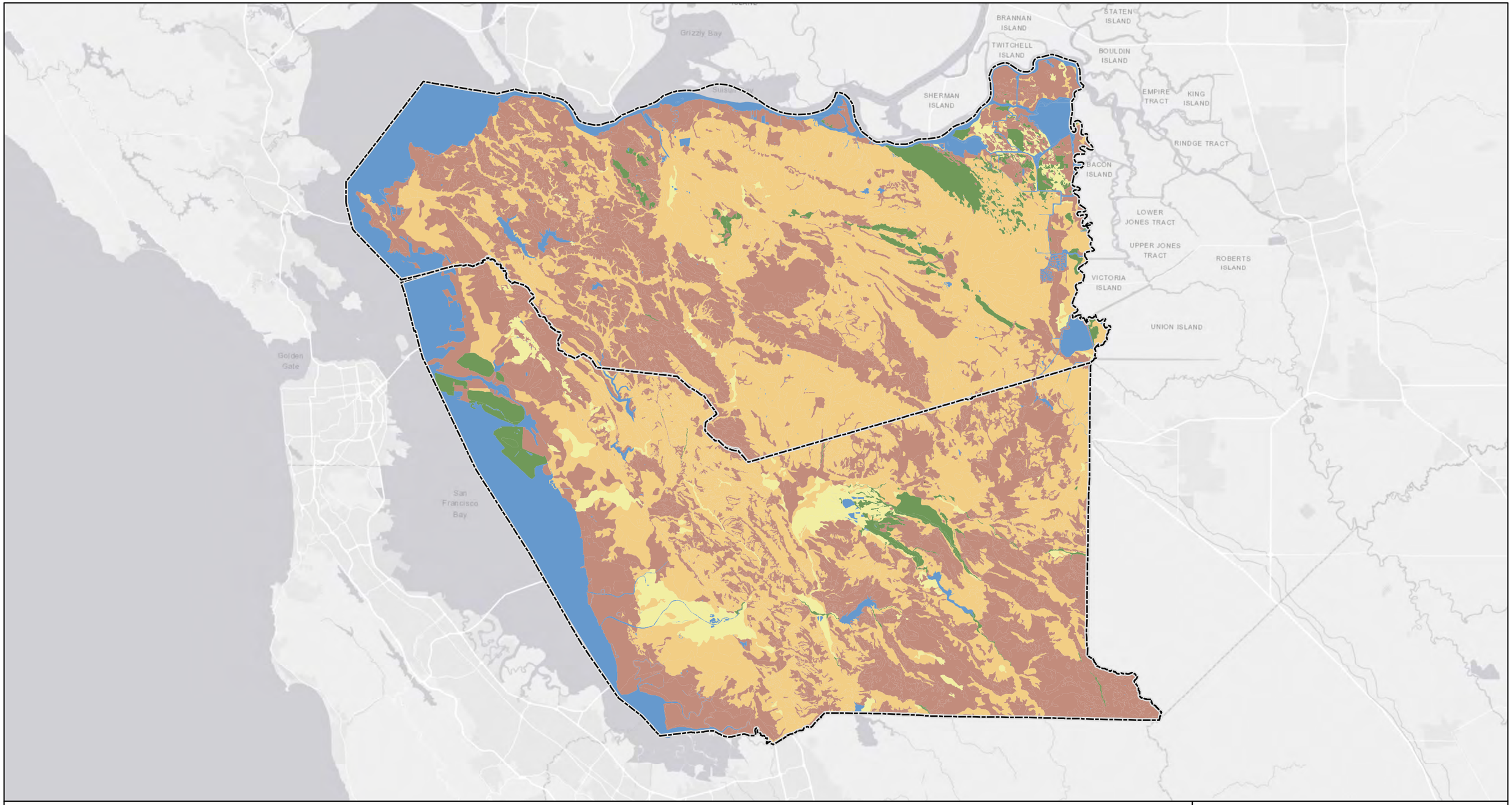

County Boundary

HSG

- A
- B
- C
- D
- W

Note: Area within the county with no HSG assignment was assigned the HSG of the most prominant adjacent soil group.

N

0 6 12 Miles

Hydrologic Soil Group

Alameda County and Contra Costa County
California

Geosyntec consultants

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Exhibit 5

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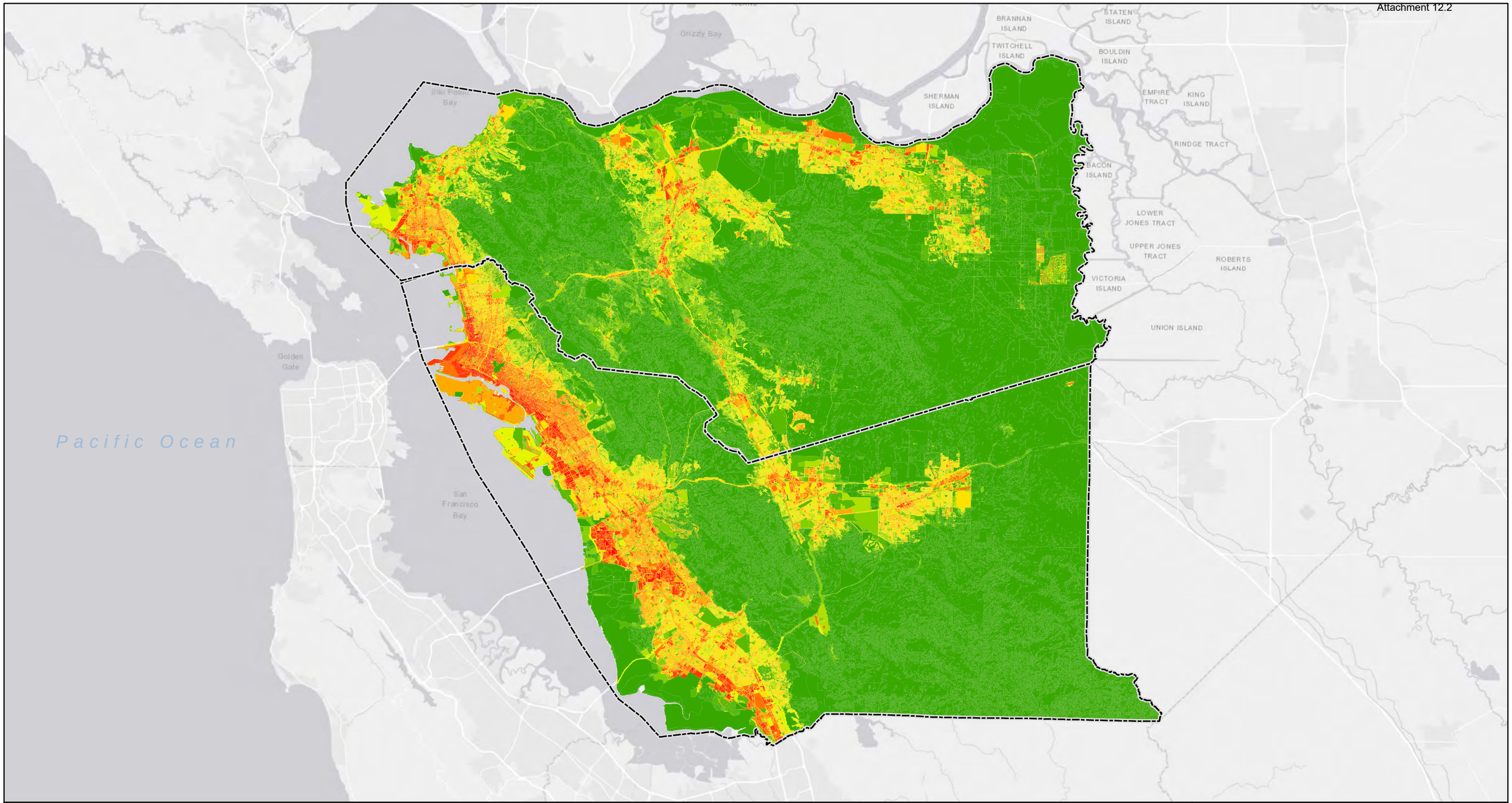

County Boundary

ABAG 2005 Imperviousness

- 0 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100

Note:
Imperviousness is assigned to ABAG 2005 landuse based on the NLCD 2006 Impervious Cover layer. These values may be adjusted during calibration for certain categories of ABAG landuse.

For purposes of calculating runoff from areas with compacted soil, developed areas and agricultural uses were assumed to be compacted to 0.75 times the underlying saturated soil conductivity (ksat). These areas generally have percent imperviousness > 20%.

N

0 6 12 Miles

Regional Imperviousness

Alameda County and Contra Costa County
California

Geosyntec consultants

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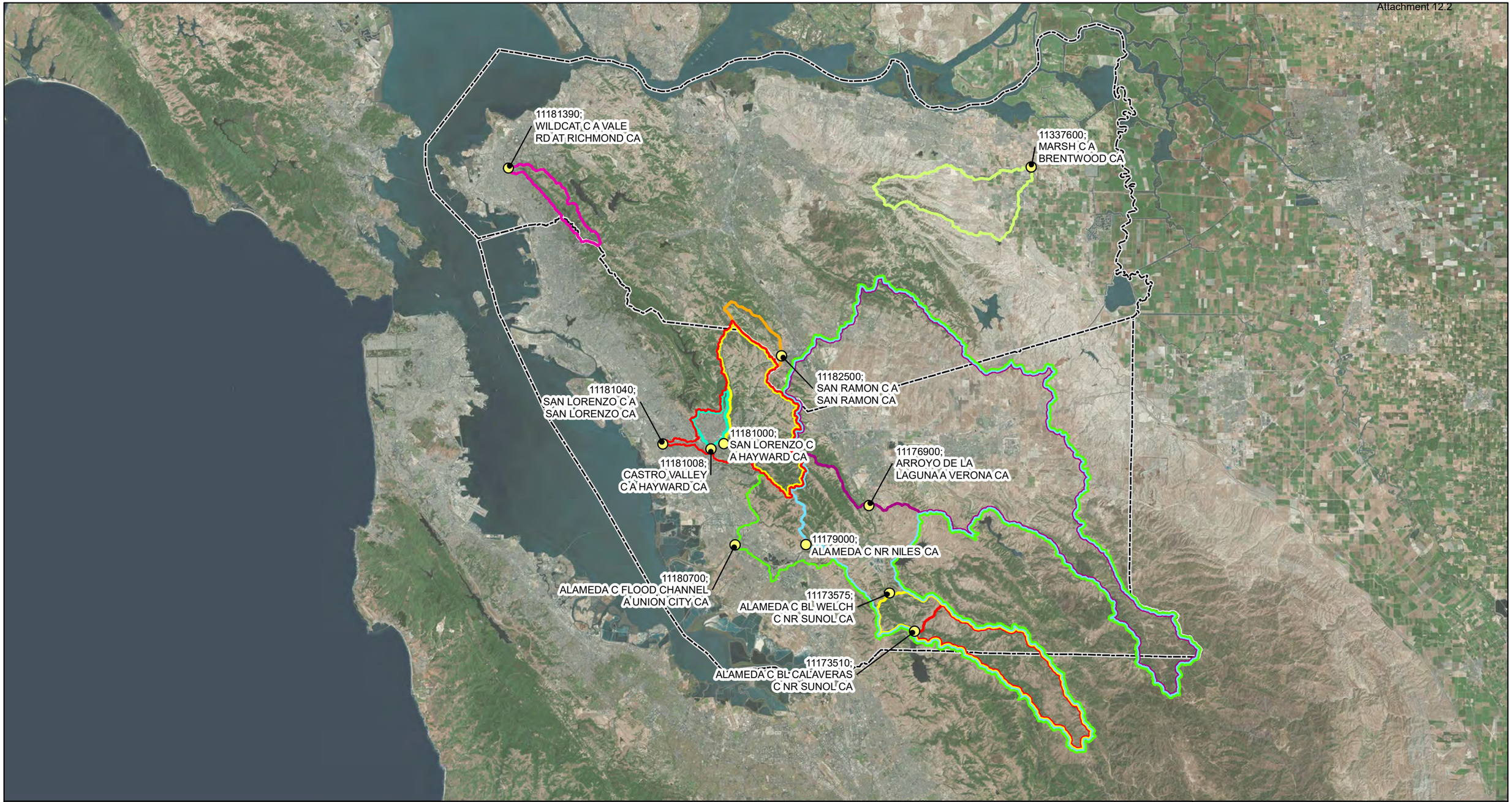
Exhibit 6

P:\GIS\Bay_Area_RAA\Project\GI_Load_Reduced_Report_Exhibits\Figure_7_Imperv_dev_undev.mxd 7/5/2018 6:00:46 PM



County Boundary
Gauge Location

Group 1	Group 2	Group 3	Group 4	Group 4
11181040	11180700	11182500	11337600	11181390
11181000	11179000			
11181008	11173575			
	11176900			
	11173510			

N

0 6 12 Miles

Candidate Calibration Watersheds

Alameda County and Contra Costa County
California

Geosyntec consultants

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Exhibit 7

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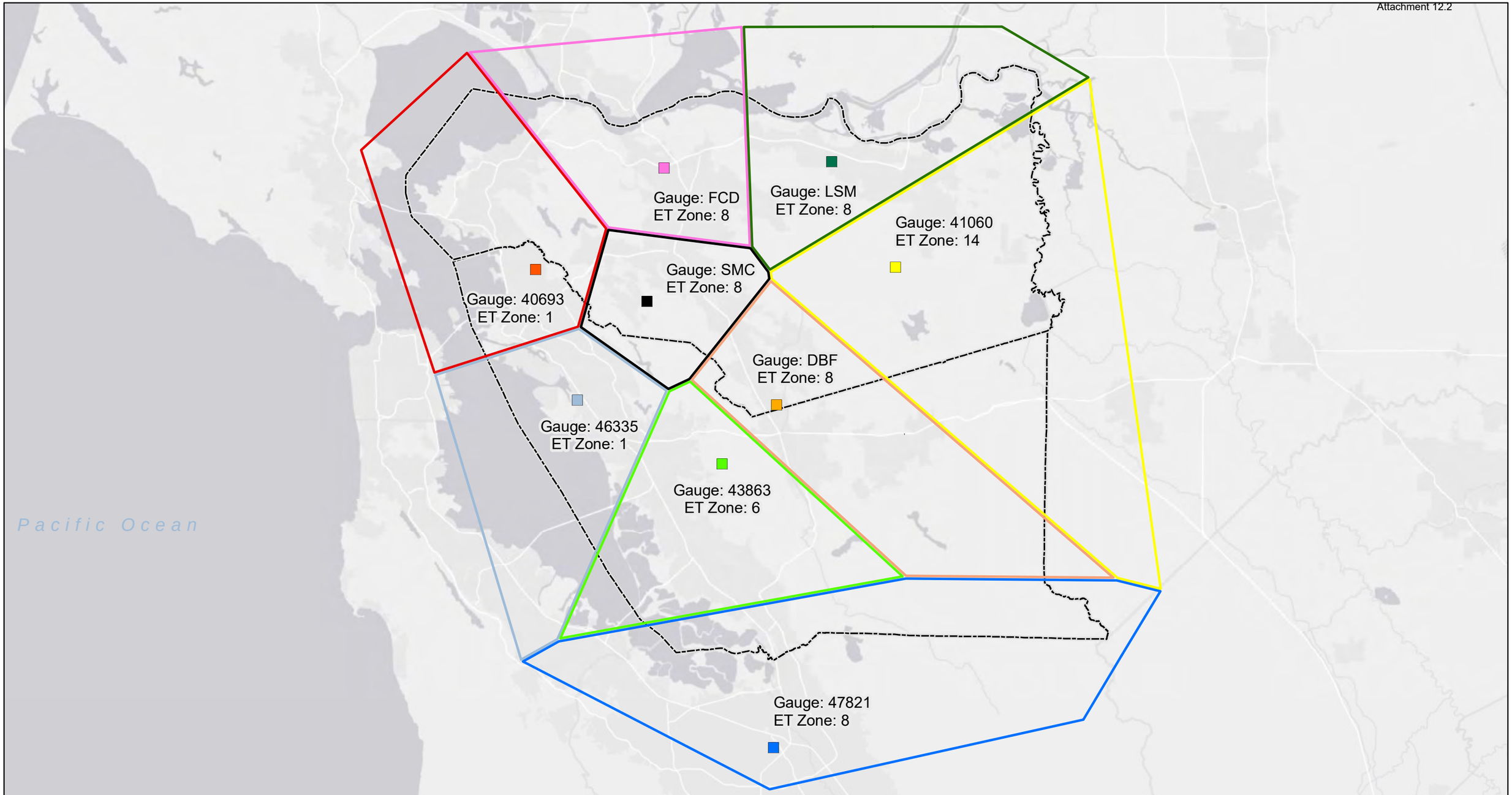


County Boundary

Long-Term Rainfall Gauge Location

- 40693
- 41060
- 43863
- 46335
- 47821
- DBF
- FCD
- LSM
- SMC

N

0 6 12 Miles

Long-Term Rainfall Gauge Zones

Alameda County and Contra Costa County
California

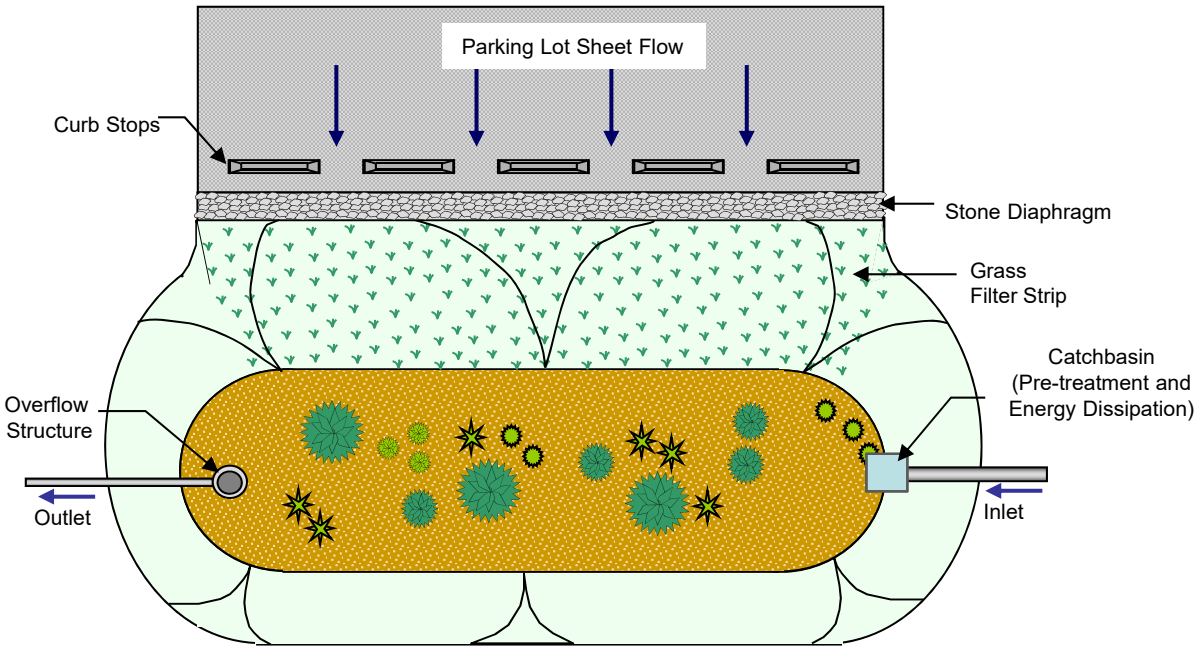
Geosyntec consultants

Oakland | July 2018

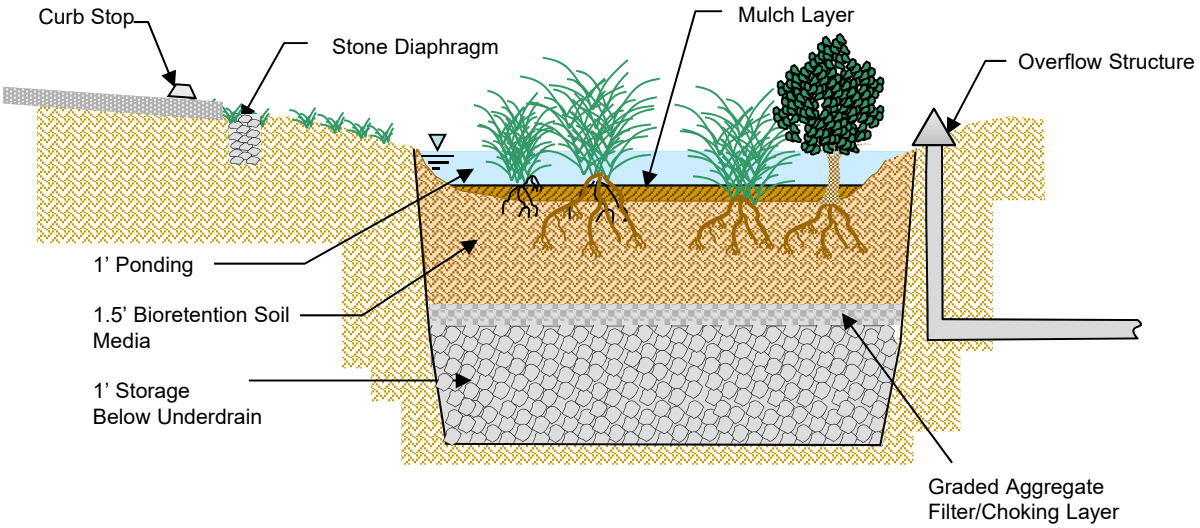
Exhibit 8

P:\GIS\Bay_Area_RAA\Project\GI_Load_Reduced_Report_Exhibits\Figure_8_GI_Long_Term_Rainfall_Precipitation_Zones.mxd 7/5/2018 6:01:01 PM

Plan View



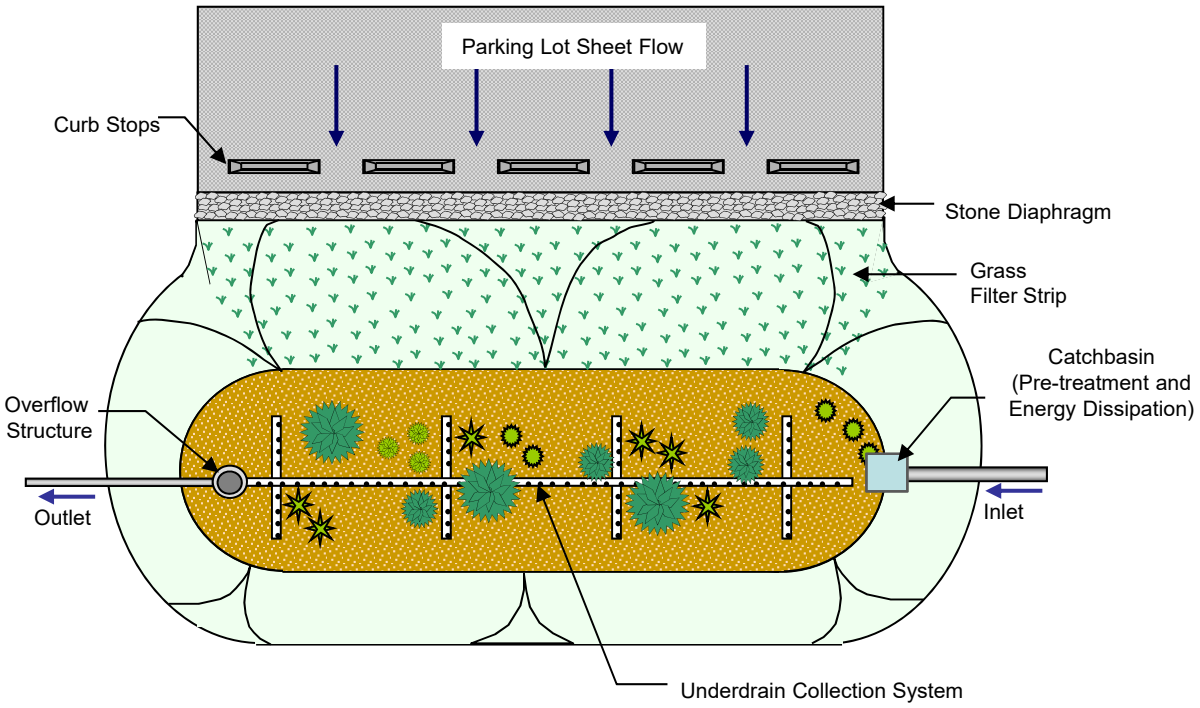
Profile



Note: Plan and Profile views are not to scale

Conceptual Illustration of an Infiltration Facility		
Geosyntec consultants		Exhibit 9
Oakland	July 2018	

Plan View



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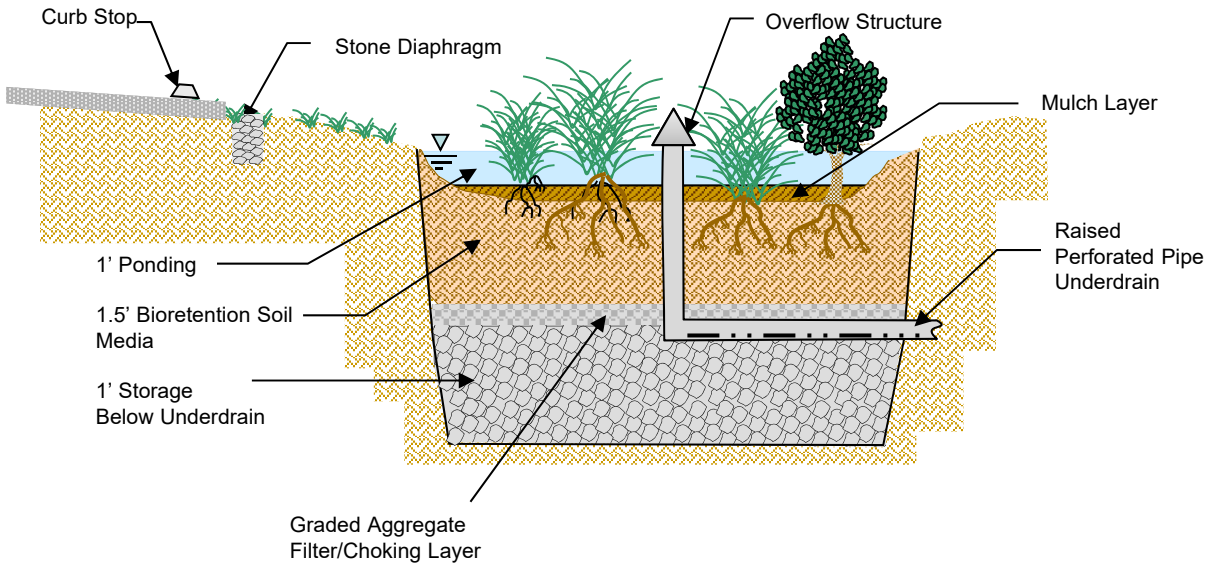


Note: Plan and Profile views are not to scale

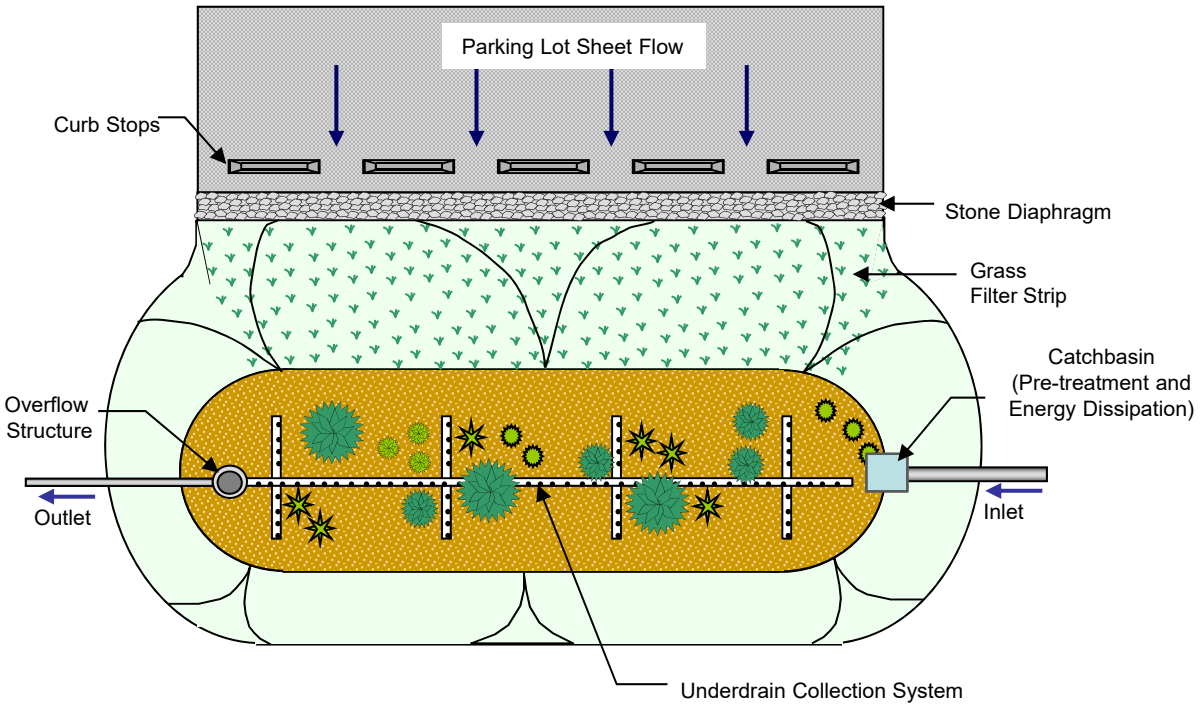
Conceptual Illustration of a Bioretention/Bioinfiltration Facility

Geosyntec consultants

Oakland | July 2018

Exhibit 10

Plan View



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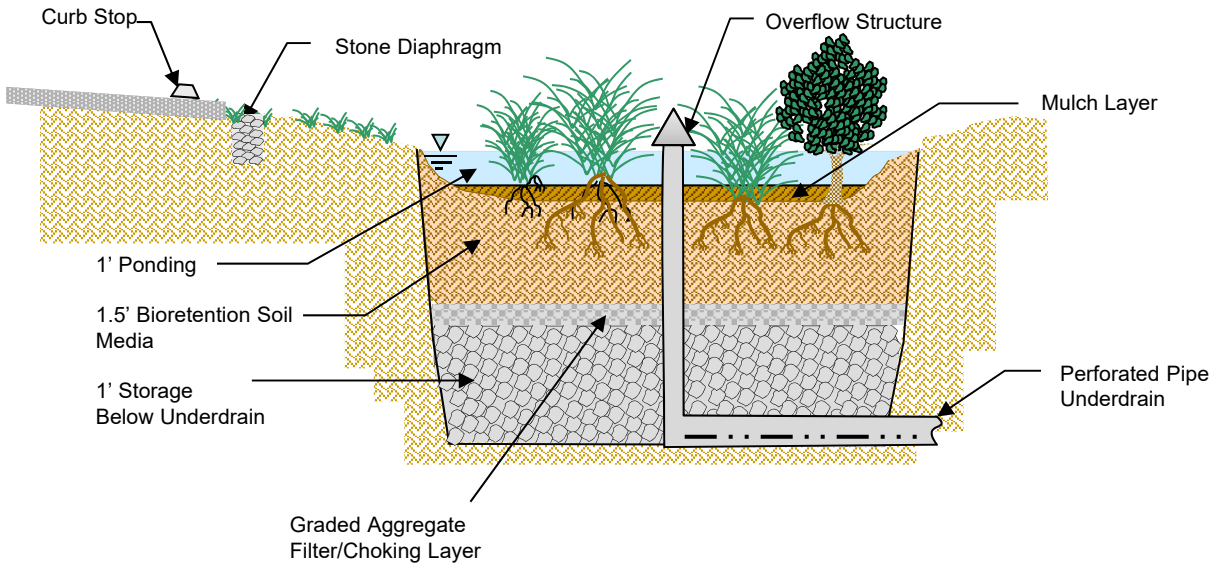


Note: Plan and Profile views are not to scale

Conceptual Illustration of a Biofiltration Facility

Geosyntec consultants

Oakland | July 2018

Exhibit 11

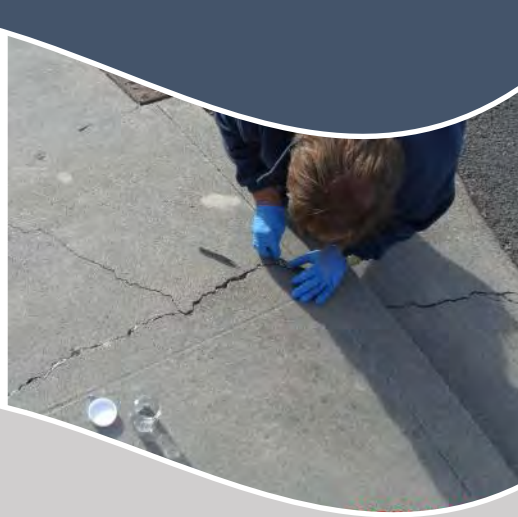
Attachment 12.3

Evaluation of PCBs in Caulk and Sealants in Public Roadway and Storm Drain Infrastructure – Project Report

Attachment 12.3

Evaluation of PCBs in Caulk and Sealants in Public Roadway and Storm Drain Infrastructure

Project Report



Prepared for:

Bay Area Stormwater Management Agencies Association

Prepared by:

EOA inc.

SFEI

KINNETIC LABORATORIES INCORPORATED

FINAL

August 16, 2018

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LIST OF ACRONYMS

ACCWP	Alameda Countywide Clean Water Program
BASMAA	Bay Area Stormwater Management Agencies Association
CCCWP	Contra Costa Clean Water Program
CEH	Center for Environmental Health
EPA	Environmental Protection Agency
FSURMP	Fairfield-Suisun Urban Runoff Management Program
GC/MS-SIM	Gas Chromatography/Mass Spectroscopy-Selective Ion Monitoring
KLI	Kinnetic Laboratories, Inc.
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MRL	Method Reporting Limits
MRP	Municipal Regional Stormwater NPDES Permit
MS	Matrix Spike
n/r	not reported
ND	Non-Detect
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated Biphenyl
PMT	Project Management Team
POC	Pollutants of Concern
ppb	parts per billion
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
ROW	Right-of-Way
SAP	Sampling and Analysis Plan
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFEI	San Francisco Estuary Institute
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
TMDL	Total Maximum Daily Loads
VSFCD	City of Vallejo and the Vallejo Sanitation and Flood Control District
XRF	X-ray Fluorescence

EXECUTIVE SUMMARY

The Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP; Order No. R2-2015-0049) implements the municipal stormwater portion of the polychlorinated biphenyls (PCBs) Total Maximum Daily Loads (TMDLs) for the San Francisco Bay. Provision C.12.e of the MRP requires Permittees collect at least 20 composite samples (throughout the permit area) to investigate PCBs concentrations in caulk and sealants from public roadway and storm drain infrastructure. To achieve compliance with this permit requirement, the Bay Area Stormwater Management Agencies Association (BASMAA[1]) implemented a regional sampling program on behalf of its member agencies. The goal of the ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program*** was to evaluate, at a limited screening level, whether and in what concentrations PCBs are present in caulks or sealants in public roadway and storm drain infrastructure in the portions of the Bay Area subject to the MRP. This sampling program also contributes to partial fulfillment of pollutants of concern (POC) monitoring required in Provision C.8.f of the MRP to address source identification, one of the five management information needs identified in the MRP. Source identification monitoring focuses on identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff.

The ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program*** was conducted between February 2017 and August 2018 in the portion of the San Francisco Bay Area subject to the MRP. The sampling program was implemented by a project team comprised of EOA Inc., Kinnetic Laboratories, Inc. (KLI), and the San Francisco Estuary Institute (SFEI). A BASMAA Project Management Team (PMT) consisting of representatives from BASMAA stormwater programs and municipalities provided oversight and guidance to the project team throughout the sampling program. Anonymous municipal partners also provided assistance during sampling.

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). Field reconnaissance was conducted in areas within participating municipalities that were developed during the time period of interest to identify structures with caulk or sealant applications. A total of 54 caulk and sealant samples were collected from ten different types of roadway and storm drain structures in the public right-of-way (ROW). Structures sampled included concrete bridges/overpasses, sidewalks, curbs and gutters, roadway surfaces, above and below ground storm drain structures (i.e., flood control channels and

[1] BASMAA is a 501(c)(3) non-profit organization that coordinates and facilitates regional activities of municipal stormwater programs in the San Francisco Bay Area. BASMAA programs support implementation of the MRP (Order No. R2-2015-0049). BASMAA is comprised of all 76 identified MRP municipalities and special districts, the Alameda Countywide Clean Water Program (ACCWP), Contra Costa Clean Water Program (CCCWP), the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), the Fairfield-Suisun Urban Runoff Management Program (FSURMP), the City of Vallejo and the Vallejo Sanitation and Flood Control District (VSFCD).

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). The groups were combined into 20 composites. Composites were analyzed for the RMP-40 PCBs congeners[2] using a modified EPA Method 8270C (Gas Chromatography/Mass Spectroscopy-Selective Ion Monitoring, GC/MS-SIM), with a detection limit of ≤ 0.5 ppb (0.0005 ppm).

Total PCBs concentrations across the 20 composite samples ranged from non-detect (ND) to > 4,000 ppm. The majority of the composites had PCBs concentrations that were below 0.2 ppm. 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 ppm. Of these, two composites had very high PCBs concentrations (> 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. These results demonstrate that PCBs-containing caulks and sealants were used in some capacity on Bay Area roadway and storm drain infrastructure in the past, but the full extent and magnitude of this usage is unknown. The conclusions from this sampling program are primarily limited by the small number of structures that were sampled (n=54), compared with the vast number of roadway and storm drain structures throughout the Bay Area that were originally constructed during the peak period of PCBs production and use (1950 – 1980).

Given the limitations of the project, much more information would be needed to estimate the total mass of PCBs in infrastructure caulk and sealant materials, to better understand the fate and transport of PCBs in these materials, and to calculate stormwater loading estimates. Nevertheless, this screening-level sampling program was the first step towards understanding if infrastructure caulk and sealants are a potential source of PCBs to urban stormwater. Although limited by the small sample number, the results of this sampling program indicate:: (1) the majority of roadway and storm drain structure types that were sampled in this project did not have PCBs-containing caulks or sealants at concentrations of concern, and (2) only black, pliable joint fillers found on concrete bridges/overpasses sampled had PCBs concentrations of potential concern to stormwater. If further investigation is conducted, focus on this type of application may be a reasonable place to continue such efforts.

[2] The 40 individual congeners routinely quantified by the Regional Monitoring Program (RMP) for Water Quality in the San Francisco Estuary include: PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203. These are referred to as the RMP-40 PCB congeners throughout this report.

1 INTRODUCTION

1.1 BACKGROUND

Until banned from production in 1979, polychlorinated biphenyls (PCBs) were commercially produced and used in a variety of products in the U.S., including caulk compounds and joint sealants. PCBs were added to these materials primarily to increase elasticity, but also to extend the lifespan of the materials and improve adherence to various structures (Kohler et al. 2005, Erickson and Kaley 2011). The use of PCBs in caulk and sealants is categorized as an open application that allows for potential release of PCBs into the environment during use, compared with closed applications (e.g., PCBs as dielectric fluid in transformers) that do not allow release to the environment during normal use (WHO 1993). Because of the open application of caulks and sealants in outdoor settings, exposed locations can come into direct contact with stormwater, and therefore has been identified as a potential direct source of PCBs in urban stormwater.

Globally, PCBs concentrations as high as 55% by mass have been measured in caulk or sealant materials that were used on the exteriors of public and private buildings constructed prior to 1979 (Herrick et al. 2004, Kohler et al. 2005, Robson et al. 2010). In the San Francisco Bay Area (Bay Area), PCBs have been measured in caulks used around the exterior of windows and door frames of tilt-slab style public and private buildings constructed prior to 1979 (Klosterhaus et al. 2014). PCBs-containing caulks and sealants have also been found on public roadway and storm drain infrastructure. In 2013, the City of Tacoma, Washington conducted a source-tracking program after elevated PCBs were detected in stormwater from a residential neighborhood that drains to the Thea Foss Waterway (City of Tacoma 2013, 2016). The City of Tacoma determined the source of PCBs was a black tar sealant in a storm drain catch basin. The sealant had been applied between asphalt and concrete surfaces in the catch basin during a 1975 road construction project. A sample of the sealant collected in 2013 had PCBs concentrations up to 260 parts per million (ppm). Although most of the sealant had worn away by 2013, residual PCBs likely contaminated the soil within the catch basin as the sealant material disintegrated over the years.

In the Bay Area, several open applications of PCBs-containing caulks have been identified in public infrastructure, including in the sealant that was used in the gaps between concrete slabs of the road deck on the old eastern span of the San Francisco-Oakland Bay Bridge (Caltrans 2013), and in caulk used in the joints of concrete drinking water storage reservoirs located in Alameda County (Sykes and Coate 1995). These examples represent the limited extent of local information that is currently available on PCBs in caulks and sealants used in storm drain and roadway infrastructure. There is no information available on PCBs concentrations in caulk or sealant applications on other local roadways, parking garages, bridges, dams, storm drain pipes, catch basins or inlets, or pavement joints (e.g., curb and gutter). Although the mass of PCBs contained in roadway and storm drain infrastructure caulks and sealants in the Bay Area is currently unknown (and we are not aware of any other published study that has completed an inventory in urban infrastructure in the U.S.), this potential PCBs source may warrant further investigation. .

1.2 Project Goal

The primary goal of this project was to evaluate, at a limited screening level, whether and in what concentrations PCBs are present in public roadway and storm drain infrastructure caulk and sealants in the portions of the Bay Area subject to the regulatory requirements of the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP; Order No. R2-2015-0049). The MRP implements the municipal stormwater portion of the PCBs Total Maximum Daily Loads (TMDLs) for the San Francisco Bay. This project fulfills Provision C.12.e of the MRP that requires Permittees collect at least 20 composite samples (throughout the permit area) to investigate PCBs concentrations in caulk and sealants from public roadway and storm drain infrastructure. This project also contributes to partial fulfillment of pollutants of concern (POC) monitoring required in Provision C.8.f of the MRP to address source identification, one of the five management information needs identified in the MRP. Source identification monitoring focuses on identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff.

To accomplish the project goal, the Bay Area Stormwater Management Agencies Association (BASMAA[3]) implemented a regional sampling program on behalf of its member agencies that included the following objectives:

- Collect caulk and sealant samples from up to 60 public roadway and storm drain infrastructure locations across the MRP area;
- Combine individual samples into 20 composites and analyze each for PCBs using laboratory methods that can detect a minimum PCBs concentration of 200 parts per billion (ppb, or µg/Kg); and
- Present the results of the sampling program in MRP Permittees' 2018 Annual Reports to the San Francisco Bay Regional Water Quality Control Board (Regional Water Board).

It is important to note that this regional sampling program was not designed to fully characterize the range of PCBs concentrations in Bay Area infrastructure caulk and sealants, but rather to provide a limited, screening level survey of concentrations of PCBs that may be found in roadway and storm drain infrastructure caulk and sealants. This limited screening level monitoring is a first step towards understanding if this is a potential source of PCBs to urban stormwater that may require further attention.

[3] BASMAA is a 501(c)(3) non-profit organization that coordinates and facilitates regional activities of municipal stormwater programs in the San Francisco Bay Area. BASMAA programs support implementation of the MRP (Order No. R2-2015-0049). BASMAA is comprised of all 76 identified MRP municipalities and special districts, the Alameda Countywide Clean Water Program (ACCWP), Contra Costa Clean Water Program (CCCWP), the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), the Fairfield-Suisun Urban Runoff Management Program (FSURMP), the City of Vallejo and the Vallejo Sanitation and Flood Control District (VSFCD).

This report presents the results of the ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program*** that was conducted during 2017 and 2018 in the portion of the San Francisco Bay Area subject to the MRP. The sampling program was implemented by a Project Team comprised of EOA Inc., Kinnetic Laboratories, Inc. (KLI), and the San Francisco Estuary Institute (SFEI). A BASMAA Project Management Team (PMT) consisting of representatives from BASMAA stormwater programs and municipalities provided oversight and guidance to the Project Team throughout the sampling program.

Section 2 of this report presents the overall approach and detailed methods that were used to implement the regional sampling program. Section 3 presents the results of the sampling program, including a summary of the types of locations where samples were collected and the measured PCBs concentrations. Section 4 summarizes the conclusions drawn from the results of the sampling program. Additional documents developed for this project, including the study design and the Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) are provided in Appendices A and B, respectively. Individual PCBs congener data are reported in Appendix C.

2 METHODS

This section presents the overall approach and methods that were used to implement the ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program***. Under the guidance and oversight of the PMT, the project team developed a study design (Appendix A) and a SAP/QAPP (Appendix B), which were followed throughout implementation of the sampling program.

2.1 Sampling Program Approach

The overall approach to the ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program*** was to work cooperatively with multiple Bay Area municipal agencies to identify public right-of-way (ROW) 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. Each sample was screened for chlorine content using portable X-ray Fluorescence (XRF) technology. This was done to evaluate whether this non-destructive, inexpensive, and portable screening technique could be applied to identify samples that contain high concentrations of PCBs. Following XRF screening, 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. All municipal participants in the project remained anonymous. All chemical analyses and reporting were also conducted blind to the specific locations where caulk or sealant samples were collected. Additional details about the methods used to conduct this sampling program are provided below.

2.2 Recruitment of Municipal Partners

The first step of this sampling program was to recruit Bay Area municipal agencies to participate in the project. Participation in the project entailed assisting the project team to identify potential sample locations and allowing the project team to collect samples in public ROW areas within their jurisdictions.

As part of the study design development, the project team prepared a memorandum to help recruit municipalities to participate in the sampling program (Appendix A). The memo described the planned monitoring program, outlined desirable attributes for municipal partners, and described the roles of the monitoring program partners. The primary criterion for sampling program partners was municipalities that had public infrastructure that was constructed or repaired prior to 1980, when PCBs were still in common use. To identify appropriate partners, the project team identified the following desirable attributes:

- Cities that were significantly urbanized prior to 1980. All newer urban areas were excluded from sampling because they were not expected to contain PCBs in caulk or sealants.
- Cities that conducted their own road and storm drain infrastructure maintenance. Information about maintenance and repairs to all potential sample site locations, as well as site-specific information on potential structures was needed to identify appropriate sampling sites.
- Cities that had available records of structure installation or repair and/or knowledgeable staff that provided such information as far back as the 1970's. Site selection relied heavily on the availability of information about the age of existing roadway and storm drain infrastructure within partner jurisdictions.
- Cities that had the available resources and willingness to assist the project team in identifying potential sampling sites within their jurisdictions.

Stormwater Program staff from each of the five Bay Area counties subject to the MRP conducted outreach to their municipalities to recruit participants for the sampling program.

2.3 Screening Criteria for Sample Site Selection

The initial population of sampling sites included the universe of publicly maintained roadways, sidewalks and storm drain structures containing caulk or sealants located within participating Bay Area municipalities. Based on literature review and best professional judgement, the project team developed additional screening criteria for sample site selection to assist project partners in identifying locations that were more likely to contain caulk or sealants with PCBs. These criteria also accounted for logistical and safety considerations during sample collection. The screening criteria that were used to identify potential sample sites included the following:

1. **Public Property in Participating Jurisdictions**: All sample sites were located in public ROWs within the jurisdiction of a participating municipality.
2. **Structure Types**: The structures sampled included concrete and asphalt roadways, bridges and overpasses, sidewalks, pavement joints (e.g., curbs and gutters), below ground storm drain structures accessed through manholes, catch basins or inlets, storm drain outfalls, above ground storm drain structures (i.e., flood control channels), and utility boxes or poles attached to concrete sidewalks.
3. **Open Applications of Caulk/Sealant**: All sampled structures had open applications of caulk or sealants that were exposed and readily available for sample collection. Examples included: sites

of roadway or storm drain infrastructure repairs, such as filled cracks that had formed on the surface after installation; joints between concrete curbs and street pavement; joints between concrete paving; sidewalks or bridge decks; and joints between sections of storm drain pipes or culverts.

4. **Structure Age**: Preferred sampling sites included structures (or portions of structures) that were constructed prior to 1980, with a preference given to more recent structures. Although PCBs were likely present in caulk and sealants used throughout the 1950's, 1960's and 1970's (and possibly earlier), these materials are expected to break-down and disintegrate over time due to normal wear. The older caulks/sealants are more likely to have worn away and/or to have been replaced. To increase the likelihood of finding PCBs, this project focused on identifying structures that were constructed (or repaired) between the late 1960's through the late 1970's. This period is the most recent decade during which PCBs were still used regularly in caulks and sealants.

5. **Structure Repair Status**: Sampling sites were selected from structures (or portions of structures) that had not undergone repair since the 1980's. Because PCBs were not used from about 1980 onward, any structures, or portions of structures that were repaired after 1980, including removal and replacement of caulk/sealant, and/or addition of caulk/sealant, were excluded from sampling.

6. **Road Materials**: Portland cement concrete structures are more durable than asphalt-based pavements, thus less likely to have been replaced or resurfaced since 1980. Therefore, sample site selection favored concrete structures because they were more likely to contain PCBs in caulk/sealants.

7. **Accessibility**: Field personnel only collected samples from sites that were deemed to be safe and accessible for sample collection. None of the sites that were sampled required confined space entry or other special equipment. Traffic controls were implemented in the few locations that required such measures for safety reasons.

8. **Ongoing Capital Projects:** In-progress storm drain infrastructure repair, roadway repaving or repair projects could have provided an opportunity to collect caulk or sealant samples from locations that would otherwise not be safely accessible. However, no such projects were identified during the regional sampling program.

Participating municipal agency staff were asked to review the screening criteria above to help the project team identify potential sampling locations. The initial focus was on locations within participating municipalities that were developed during the 1950's through 1970's. The project team then worked with the municipal staff to further identify locations within these areas that met additional site selection criteria. Available information was reviewed, including GIS map layers, satellite imagery, or records from tracking systems used by cities to document roadway/storm drain infrastructure construction and/or repair dates. Knowledgeable municipal staff were queried for information about open applications of caulk or sealants. Existing records were used to verify the criteria above for a given location. However, because records for the time period of interest were not always available or complete, anecdotal

information from knowledgeable agency staff was also considered. The project team also conducted field reconnaissance within the areas of interest to further identify potential sample locations.

2.4 Sample Collection

All sample collection was conducted following the detailed methods and procedures described in the project SAP/QAPP (Appendix B). The project field teams visited the areas that had been identified as potential sample locations. In a number of cases, specific sampling sites that met the selection criteria were identified during field reconnaissance. However, for much of the sampling effort, the field crews had to search the appropriate roadway and storm drain structures within areas of interest to identify exposed applications of caulk or sealant that could be collected in a safe way. The types of applications that were sampled included the following:

- Materials used to fill cracks in concrete or asphalt roadways or sidewalk surfaces;
- Tar-like sealant materials within storm drain structures or on roadway surfaces;
- Caulking used between concrete structures and asphalt pavement, such as gutters and catch basins; and
- Fillers between the joints of concrete blocks on bridges and overpasses, roadways, or storm drain channels.

A variety of techniques were used to collect samples, depending on the specific location and the condition of the caulk or sealant material. Stainless steel knives/spoons were used as sample collection tools for scraping material from structure surfaces and inside cracks. Other collection techniques included carefully chiseling hardened material from surfaces or from within cracks/joints using appropriate tools. Field notes and photographs were taken to ensure proper documentation of collection method(s) used at each site, the structure type, the type of caulk or sealant usage, and other relevant factors. The field sampling form is available in the SAP/QAPP provided in Appendix B. To ensure all municipal partners remained anonymous, information that could be used to identify specific locations where individual samples were collected was not recorded by the field crews. All photographs avoided inclusion of any identifying features of the area such as road signs, heritage trees or other landmarks.

2.5 XRF Screening Procedures

Following collection, all samples were sent to the Center for Environmental Health (CEH) for XRF analysis to measure chlorine content. Because PCBs are highly chlorinated, samples with high chlorine content are more likely to contain PCBs. Previous projects have used portable XRF technology to evaluate the chlorine content of caulk samples (Klosterhaus et al. 2014). This screening was done to provide an additional factor that could be used to determine how to group individual samples for compositing. Moderate chlorine concentrations may provide information on whether the presence of chlorine is driven primarily by PCBs or instead by other chlorine containing compounds. Chlorine content as measured by XRF screening was one of several factors that was considered in determining how to group samples for compositing purposes prior to PCBs analysis.

2.6 Composite Grouping

Following XRF screening, the project team reviewed all of the information gathered about each sample to determine how individual samples would be grouped for compositing. The project team determined that combining samples with similar characteristics (e.g., structure type and sample appearance) into composites could potentially provide information on how PCBs concentrations vary across different types of structures, usage, etc. Although limited by the small sample size (i.e., 20 samples), this type of information was considered potentially important for future efforts to identify infrastructure caulk or sealants that are more likely to contain PCBs. The primary factors that were used to group individual samples for compositing included:

- Structure type,
- Caulk or sealant appearance and texture,
- Age of the infrastructure, and
- Chlorine content.

Other factors were also considered, but based on the information collected about each sample, the above four factors provided sufficient differentiation among the individual samples to create 20 composite samples.

2.7 Laboratory Methods

To prepare the samples for compositing, the laboratory first had to reduce the material in each sample to a very fine powder. The techniques used varied according to the character of each sample, but generally involved first drying the material if needed (oven-dry or freeze-dry), then grinding to the desired particle size using a pulverizer and ring and puck mill. Composite samples were created by combining equal masses of ground particles from individual samples using representative sub-sampling techniques. All composites were created according to the composite groupings assigned by the project team. Composite samples were then extracted using EPA Method 3540C and analyzed for the RMP-40 PCB congeners[4] using a modified EPA Method 8270C (Gas Chromatography/Mass Spectroscopy-Selective Ion Monitoring, GC/MS-SIM). Samples with high concentrations relative to calibration standards were diluted and reanalyzed as needed. Method Reporting Limits (MRLs) for each of the RMP-40 PCB Congeners was ≤ 0.5 ppb (0.0005 ppm). Additional details on the laboratory methods that were used, the data quality objectives, and procedures that were implemented to ensure data quality during laboratory analysis are provided in the project SAP/QAPP Appendix B.

2.8 Data Analysis and Reporting

As the final step of this sampling program, the results of the sampling effort, compositing decisions, and PCBs concentrations measured were analyzed and reported. PCBs concentrations in this report are presented as the sum of the RMP-40 congeners; individual congener data is available in Appendix C. The composite sample results were divided into five categories based on PCBs concentration ranges of

[4] The 40 individual congeners routinely quantified by the Regional Monitoring Program (RMP) for Water Quality in the San Francisco Estuary include: PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203. These are referred to as the RMP-40 PCB congeners throughout this report.

interest. These categories were identified primarily based on the concentrations observed in caulk or sealants measured in other studies, and in public ROW surface soils and storm drain sediment from the Bay Area. The five PCBs concentration categories included the following:

1. **Very High (PCBs ≥1,000 ppm):** These concentrations (> 0.1% PCBs by weight) indicate PCBs were likely used in the original caulk or sealant formulation at concentrations high enough to impart the desired qualities of increased flexibility, durability, and adherence. PCB-containing caulks or sealants from building materials are typically greater than 10,000 ppm PCBs (i.e., 1 % PCBs).
2. **High (PCBs ≥ 50 ppm but < 1,000 ppm)**: These concentrations are above the federal hazardous waste threshold of 50 ppm but remain below the concentrations expected if PCBs were added to the original caulk or sealant formulations. More likely, this category includes materials that have been contaminated with PCBs. Removal of caulks or sealants with concentrations at or above 50 ppm requires hazardous waste handling and disposal procedures. However, no composites had PCBs concentrations in this category. Examples of materials in this category that were likely contaminated with PCBs include:
    a. Caulk/sealants that were in contact with older PCB-containing materials that remained in place when the newer caulks/sealants were applied over the existing material.
    b. Caulk/sealants that were in contact with surfaces that had residual PCBs left behind from PCB-containing materials used in the past. This could occur even if the original PCB-containing materials have largely disintegrated over time or were removed and replaced.
    c. Caulk/sealant materials that were in contact with unknown PCBs sources, which could include any past use or release of PCBs in the surrounding area.
3. **Moderate (PCBs ≥ 1 ppm but < 50 ppm):** As with the high PCBs category, materials with PCBs concentrations in this range more likely resulted from contamination, rather than addition of PCBs to the original formulation. BASMAA agencies currently use sediment PCBs concentrations above 1 ppm to identify watershed areas (both public ROW areas and private properties) that are potential sources of PCBs to stormwater. When PCB concentrations above 1 ppm are observed, further investigation and source abatement may be needed to protect stormwater quality. Caulks/sealants in this category have potentially been contaminated by the same sources that contribute to elevated soil/sediment concentrations in the surrounding area.
4. **Low (PCBs ≥ 0.2 ppm but < 1 ppm):** These PCBs concentrations are above the urban background concentration for PCBs that has been observed in Bay Area surface soils and storm drain sediment and may indicate proximity to a source. Caulks/sealants in this category likely result from contamination by other sources of PCBs, as described above.
5. **Very Low/Non-Detect (PCBs < 0.2 ppm):** This category includes all samples that had PCBs concentrations below < 0.2 ppm, including samples that did not detect any of the RMP-40 PCB congeners. Caulk or sealants in this category do not suggest proximity to a PCBs source. PCBs concentrations in Bay Area public ROW surface soils and storm drain sediment that are below 0.2 ppm suggest lack of proximity to a PCBs source (SCVURPPP 2018; SMCWPPP 2018).

Although compositing a mixture of higher and lower concentration samples can dilute the concentration detected in the composite sample, the number of samples included in each composite (8 at most)

suggests that none of the individual samples in a given composite has a concentration that is more than one PCBs concentration category higher than the composite.

The information gathered during sample collection for the individual samples included in each composite was further assessed. Features of the samples in each PCBs category were identified, including the types of structures sampled, the appearance of the caulk or sealant, etc. Although limited to a qualitative assessment due to the small sample number, this review was done to identify common factors (if any) about samples within each category that may suggest an association (or lack thereof) with elevated PCBs.

The XRF screening results were also compared with the measured PCBs concentrations to better understand the usefulness of XRF screening procedures in identifying PCBs-containing caulks or sealants. The infrastructure caulk/sealant concentrations observed during this project were then compared to PCBs concentrations measured in caulk or sealants in other studies, and to PCBs concentrations found in Bay Area public ROW surface soils and storm drain sediment.

3 RESULTS

This section presents the results of the ***BASMAA PCBs in Infrastructure Caulk and Sealant Sampling Program***. Although specific municipal partners remain anonymous in this report, at least ten different municipalities across the Bay Area participated in the project. Participants included one or more municipalities from each of the following countywide stormwater programs:

- 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

3.1 Sample Collection And Compositing Decisions

Field sampling was conducted between September 2017 and January 2018. Prior to conducting field reconnaissance and sampling, the project team identified areas within participating municipalities that had been developed prior to 1980, with a focus on the 1960's and 1970's. The field team conducted reconnaissance in these areas and identified structures with caulk or sealant applications that could be sampled. This effort was both challenging and time consuming because of the lack of information available on specific structures where caulk or sealant applications were located. During reconnaissance, field crews noted that caulks and sealants were generally absent or rare in the targeted structures (i.e., a considerable effort was required to locate sampleable materials that met the criteria).

The sampling program collected a total of 54 individual caulk or sealant samples from public roadway and storm drain infrastructure within the jurisdictions of partner municipalities. Additional information about the samples that were collected, including the types and ages of structures sampled, the appearance and texture of the materials collected, the XRF screening results, and the results of the compositing scheme are presented below.

3.1.1 Structures Sampled

Samples were collected from ten different types of roadway or storm drain structures that were originally constructed prior to 1980, as presented in Table 3.1. The ten structure types sampled comprise a large portion of the existing roadway and storm drain infrastructure in the Bay Area. The majority of samples (65%) were collected from concrete structures, including bridges, sidewalks, storm drain manholes, and flood control channels.

Although the information on specific construction dates for each structure sampled was not always available, all of the structures sampled were located in areas that were originally developed prior to 1980. General construction time-frames could be approximated for most of the structures based on the time period when the surrounding neighborhood was initially developed. In most cases (61%), the structures sampled were constructed during the 1960's and 1970's. Approximately 19% of the structures sampled were constructed prior to 1960. The original construction dates for the remaining 20% of the structures sampled were unknown, although all areas selected for sampling were in older urban neighborhoods (i.e., developed prior to 1980).

Table 3.1 Sample counts collected from roadway and storm drain structures by structure type and original construction date for the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program.

Structure Type	Original Construction Date of Structure			Total Sample Count
	Pre-1960	1960's - 1970's	Unknown (pre-1980)	
1. Asphalt Road Surface			1	**1**
2. Concrete Bridge/Overpass	5	6		**11**
3. Concrete Road Surface			5	**5**
4. Concrete sidewalk/curb/gutter	2	4	4	**10**
5. Below-ground Concrete Storm Drain Structure		1		**1**
6. Above-ground Concrete Storm Drain Structure (i.e., flood Control Channel)	1	7		**8**
7. Metal Electrical Utility Box attached to concrete sidewalk	2	6		**8**
8. Metal Outfall Pipe		4	1	**5**
9. Metal Pipes exposed at bridge crossing		3		**3**
10. Wood Electrical Utility Pole attached to concrete sidewalk		2		**2**
Total Sample Count	**10**	**33**	**11**	**54**

3.1.2 Appearance of Materials Sampled

The materials that were collected as part of this sampling program varied by color and texture as presented in Table 3.2. The caulk or sealant materials collected were black, white/gray, or brown in color. The textures of these materials ranged from pliable rubbery, foam, or fiber materials, to hard and brittle rock-like materials. The most common type of sample collected was a black material that had a very hard and brittle rock-like texture (43%).

Table 3.2 Caulk or sealant collected from roadway and storm drain infrastructure by sample color and texture for the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program.

Sample Color	Sample Texture				Total Counts
	Pliable/Rubbery	*Pliable/Foam*	*Hard/Brittle*	*Fibrous*	
Black	7	2	23		**32**
White/Gray	8		10		**18**
Brown				4	**4**
Total Counts	**15**	**2**	**33**	**4**	**54**

3.1.3 XRF Screening of Individual Samples

The XRF screening of individual samples for chlorine content only identified 4 samples (out of the 54 collected) that had positive detection of chlorine. The XRF screening results for these four samples are presented in Table 3.3. The chlorine content measured by XRF in these samples ranged from 18,000 ppm up to nearly 500,000 ppm. Because of the limited number of positive chlorine results, XRF analysis could not be used for the majority of the samples as a factor in determining how to group samples for

compositing. All composites that included individual samples with positive chlorine detection by XRF are identified and discussed in more detail in Section 3.2.

Table 3.3 XRF chlorine screening results for samples collected for the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program. Only samples with chlorine detected are included in this table.

Sample ID	Type of Structure	Structure Date	Caulk/Sealant Application	Sample Color and Texture	Chlorine Ion Concentration (ppm)
5	Wood Electrical Utility Pole attached to concrete sidewalk	1960-70's	Wood sealant	Black Hard/brittle	18,100 - 18,400
12	Concrete Bridge	<1960	Pre-fabricated joint filler	Black Pliable	159,500 - 189,100
48	Concrete Flood Control Channel	1960-70's	Pre-fabricated joint filler	White/Gray Hard/brittle	108,700 - 142,200
49	Concrete Flood Control Channel	1960-70's	Pre-fabricated joint filler	White/Gray Hard/brittle	95,900 - 489,800

3.1.4 Compositing Scheme

Based on the information recorded about the 54 individual samples that were collected, two major factors were identified that differentiated the majority of the samples, including: (1) the structure type the sample was collected from; and (2) the appearance of the sample, which was a combination of color and texture. The samples were grouped for compositing based primarily on these two factors, resulting in one to eight individual samples being included in each of the 20 composites. This compositing scheme resulted in grouping samples together that had similar caulk or sealant applications on specific structure types. Figure 3.1 presents the sample groupings included within each composite by structure type and sample appearance (color and texture). Each of the 20 composite samples was assigned a Composite ID which was a random letter designation from A to T. For three of the samples, the combination of structure type and sample appearance was unique enough to warrant analysis as an individual sample rather than a composite. Although XRF analysis results were limited, composites that contained individual samples with positive XRF results for chlorine were noted.

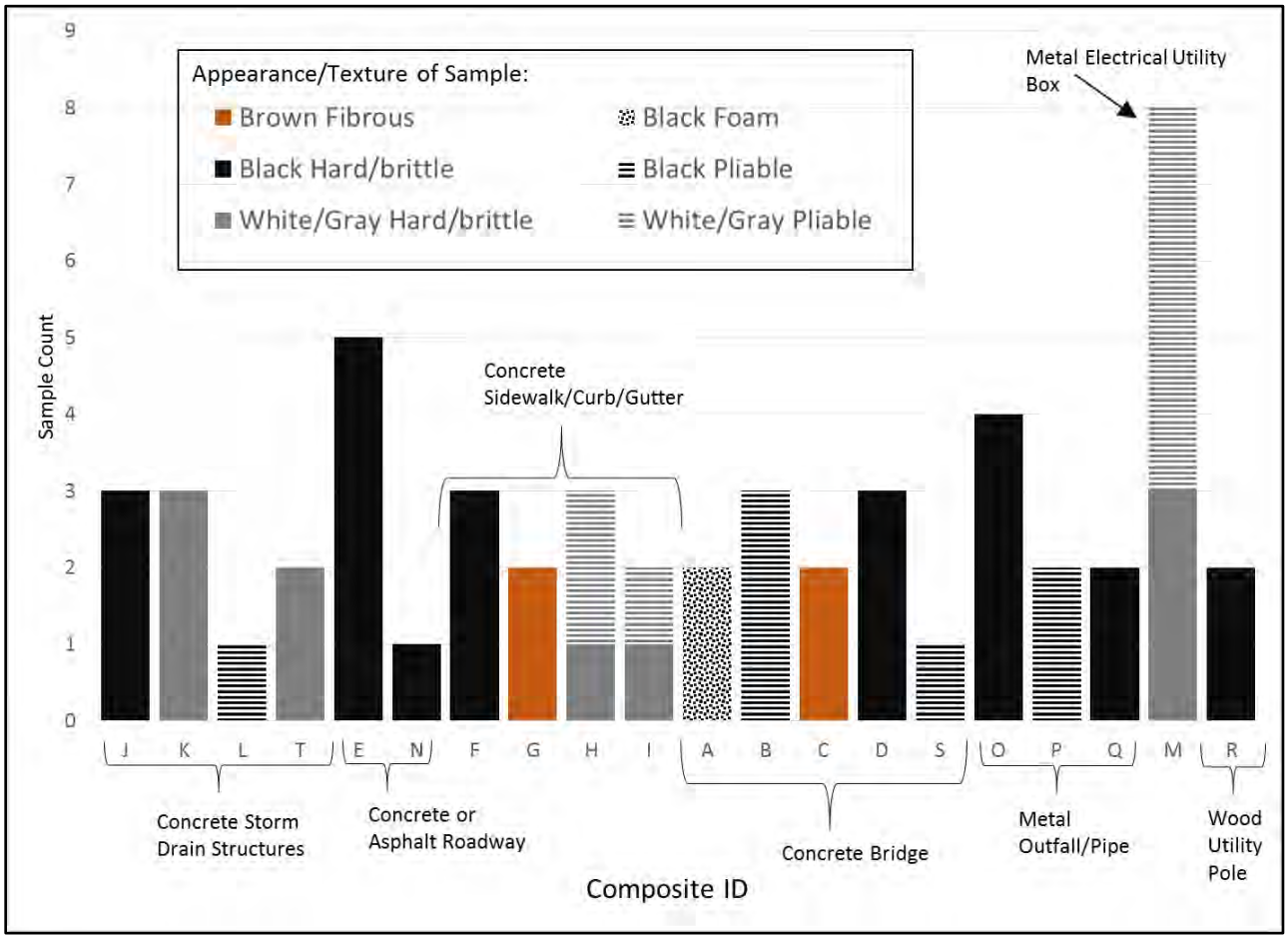

Figure 3.1 Structure types and sample appearance (color and texture) for the caulk and sealant samples included in each composite. Concrete Storm Drain Structures include samples collected from above ground flood control channels and below ground structures that were sampled via manhole access.

3.2 Laboratory Analysis

3.2.1 Quality Assurance and Quality Control

Data Quality Assurance (QA) and Quality Control (QC) was performed in accordance with the project's SAP/QAPP (Appendix B). The SAP/QAPP established Data Quality Objectives (DQOs) to ensure that data collected are sufficient and of adequate quality for their intended use. These DQOs include both quantitative and qualitative assessments of the acceptability of data. The qualitative goals include representativeness and comparability, and the quantitative goals include completeness, sensitivity (detection and quantization limits), precision, accuracy, and contamination. Measurement Quality Objectives (MQOs) are the acceptance thresholds or goals for the data.

The dataset included 20 composite field samples, with 1 blank, 1 laboratory control sample (LCS), and 2 matrix spikes (MSs), meeting the minimum number of QC samples required. All samples were analyzed within < 216 days, which is well within the recommended hold time of 1 year. Results were reported for the RMP 40 PCB congeners (with their coeluters). Two of the 40 congeners had poor recovery (>70% deviation from target values in LCS samples) and were rejected, so 95% of the field sample results were

reportable. In more than 50% of the samples, all PCBs congeners were non-detect (ND). Additionally, all congeners were ND in both MS samples, with consequent 0% recovery. Even adjusting for dilution factor, expected values of the target analytes were often < MDL reported. This suggests that MS samples were spiked at too low a level, and/or the method may have been insufficient to resolve interferences from the target analytes at the concentration ranges of interest. As the MS samples were the only ones analyzed in replicate, with all results ND, precision could not be calculated. The data, however, are usable for evaluating presence/absence or qualitative/order-of-magnitude comparison of concentration differences. However, due to highly uncertain measurement accuracy and no detectable replicate results to evaluate precision for any PCBs congeners, these data are not usable for finer differentiation. Additional details about the data quality review are presented below. The laboratory QA/QC data are available upon request.

Representativeness – The representativeness of data is the ability of the sampling locations and the sampling procedures to adequately represent the true condition of the sample sites. For this project, all samples are assumed to be representative as they were performed according to the protocols specified in the project SAP/QAPP (Appendix B). All field and laboratory personnel received and reviewed the SAP/QAPP and followed prescribed protocols, including laboratory methods, to ensure the collection of representative, uncontaminated samples.

Comparability – Comparability is the degree to which data can be compared directly to other relevant studies. Maximum concentrations were generally quite low in comparison to the maximums in the previous caulk study conducted in the region (Klosterhaus et. al 2014). However, the NDs/low spiking level/ 0% recovery in MSs mean that we do not have a good direct indicator of measurement accuracy in the caulk matrix.

Completeness – Completeness is the percentage of valid data collected and analyzed, compared to the total expected to be obtained under normal operating conditions. Overall completeness accounts for both sampling (in the field) and analysis (in the laboratory). In this project, the minimum number of field samples planned for collection was 40, which would be combined into 20 composite samples for PCBs analysis. The final dataset included 20 composites, comprised of 54 field samples, with 1 blank, 1 LCS, and 2 MSs, which achieves the number of samples planned for collection as part of the project (including QC samples). Data for two of the 40 PCBs congeners were rejected, so overall 95% of the field sample results were reportable.

Sensitivity – Different indicators of the sensitivity of an analytical method to measure a target parameter are often used including instrument detection limits (IDLs), method detection limits (MDLs), and reporting limits (RLs). For this Project, MDLs are the measurement of primary interest. The target MDL identified in MRP Provision C.12.e for PCBs analysis is 200 ppb (or µg/Kg). The PCBs analysis method that was used in this project (modified GC/MS-SIM) was selected to achieve this level of sensitivity. For this project, all samples that did not require dilution had MDLs well below the 200 ppb MDL target. For five samples that were analyzed at a secondary dilution, the MDL was elevated above this target. To evaluate the impact of the higher MDL on data interpretation (i.e., identifying the PCBs concentration category for each sample), ½ MDL was used for all congeners that were reported at ND in these samples, and a corrected total PCBs concentration was then calculated. In two of the five samples, the corrected PCBs concentration did not change the PCBs concentration category of the composite. For

the other three samples, the corrected PCBs concentration moved these composites from the low or very low category to the moderate PCBs category (< 50 ppm). The corrected concentrations did not result in any samples moving to the High or Very High PCBs categories.

Precision – Precision is used to measure the degree of agreement among individual measurements of the same property under prescribed similar conditions. Overall precision usually refers to the degree of agreement for the entire sampling, operational, and analysis system. For this project, precision was evaluated via matrix spikes and matrix spike duplicates (MS and MSD). The Project SAP/QAPP MQO for RPD is 25% for both laboratory and field duplicates. However, precision could not be evaluated, as no replicates of field samples were run, and all the MS results were ND.

Accuracy - Accuracy describes the degree of agreement between a measurement (or the average of measurements of the same quantity) and an acceptable reference or true value. For this project, accuracy of PCBs congener analysis was evaluated with MSs and laboratory control samples (LCS, spiked blanks). All congeners were ND in both MS samples. Thus, accuracy on MS samples could not be evaluated. LCS recoveries were within 70% relative to the target value for 38 of the 40 PCB congeners, which is an acceptable level of accuracy. However, LCS recoveries were >70% off (higher or lower) relative to the target value for two of the 40 PCBs congeners, and these results were rejected. The overall quantitativeness of the samples is therefore not robust.

Contamination - Blank samples help assure that analytes measured in samples originated from the target matrix in the sampled environment and are not contaminated artifacts of the analytical process. Per the Project SAP/QAPP, a method (laboratory) blank was run in the same batch as the samples and analyzed in a manner identical to the samples. The Project SAP/QAPP specifies that all blanks should not exceed the reporting limit. None of the target analytes were detected in the method blank.

3.2.2 PCBs Concentrations

Tables 3.4 – 3.6 present the PCBs concentrations measured in each composite during the ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program.*** The results are presented by PCBs category (Non-Detect/Very Low, Low, Moderate, High, and Very High). Additional information about the samples included in each composite is also presented, such as the structure type(s), sample appearance, and XRF screening results. Within each table, the composite results are presented in order of highest to lowest PCBs concentrations.

Total PCBs concentrations across the 20 composite samples ranged from non-detect (ND) to > 4,000 ppm (Tables 3.4-3.6). Twelve of the 20 composite samples (60%), had non-detect or very low PCBs concentrations that were well below the urban background for Bay Area public ROW surface soils and sediment (<0.2 ppm). In ten of the twelve composites with very low concentrations, all RMP-40 PCBs congeners were below detection limits. PCBs were detected above 0.2 ppm in the remaining eight composite samples, ranging from 0.43 ppm to 4,967 ppm. Composites A and B were in the Very High PCBs category (≥ 1,000 ppm). No composites were in the High PCBs category (≥50 ppm but <1,000 ppm). Composites Q, R and S were in the Moderate PCBs category (≥ 1 ppm but < 50 ppm). Composites C, D and K were in the Low PCBs category (≥ 0.2 ppm but < 1 ppm). Additional discussion about the types of samples in each PCBs concentration category is provided below.

3.2.2.1 No PCBs Detected

A total of 32 individual samples were included in the ten composite samples that had no PCBs detected (Table 3.4). The samples in these composites were collected from a variety of structure types, including asphalt and concrete roadway surfaces, concrete sidewalks, curbs and gutters, electrical utility boxes attached to concrete sidewalks, storm drain manholes, flood control channels, metal pipes and metal outfalls (Figure 3.2). The majority of these structures were constructed during the 1960's and 1970's. XRF screening did not detect any samples with chlorine in this category.

Table 3.4 Sample descriptions and PCBs concentrations for composites that had No PCBs Detected from the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program. None of the RMP-40 PCB congeners were detected in any of the composite samples in this table.

Composite ID	Total PCBs (mg/Kg)	Type of Structure(s) Sampled	Caulk or Sealant Application	Sample Appearance (Color/ Texture)	# of Samples in Composite	Sample ID's in Composite	Structure Construction Date
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 joints	Black Hard/brittle	3	2	<1960
						7	<1960
						46	<1980
G	ND	Concrete sidewalk /curb/gutter	Caulk between joints	Brown Fibrous	2	16	1960-70's
						17	1960-70's
H	ND	Concrete sidewalk /curb/gutter	Crack Sealant	White/Gray Hard/brittle or Pliable	3	1	<1980
						8	1960-70's
						18	1960-70's
J	ND	Concrete Storm Drain Structure: Flood Control Channel	Caulk between joints	Black Hard/brittle	3	50	1960-70's
						53	1960-70's
						54	1960-70's
L	ND	Concrete Storm Drain Structure: Inside Manhole opening	Sealant between concrete surfaces	Black Pliable	1	34	1960-70's
M	ND	Metal Electrical Utility Box attached to concrete sidewalk	Caulk around base	White/Gray Pliable or White Hard/Brittle	8	11	<1960
						14	1960-70's
						15	1960-70's
						19	1960-70's
						21	1960-70's
						22	1960-70's
						25	<1960
						45	1960-70's
N	ND	Asphalt Roadway Surface	Surface adhesive	Black Hard/brittle	1	4	<1980
O	ND	Metal Outfall	Interior and Exterior Pipe Sealant	Black Hard/brittle	4	33	1960-70's
						41	1960-70's
						42	1960-70's
						43	1960-70's
P	ND	Metal Pipes adjacent to bridge and Metal Outfall	Exterior Pipe wrap	Black Pliable	2	3	1960-70's
						40	<1980

Figure 3.2 Examples of structures that were sampled and caulk or sealant materials that were included in the composites that had No PCBs Detected. Not all structures or samples included in the No PCBs Detected category are pictured here.

3.2.2.2 Very Low PCBs

A total of four individual samples were included in the two composites in the Very Low PCBs category (< 0.2 ppm, Table 3.5). The samples in these composites were collected from concrete sidewalks and concrete flood control channels (Figure 3.3). Samples in Composite T were collected from structures that were constructed in the 1960's and 1970's. The majority of these structures were constructed during the 1960's and 1970's. XRF screening detected chlorine concentrations in both samples included in Composite T, ranging from 100,000 to 500,000 ppm. However, chemical analysis results found PCBs in this composite were less than 0.02 ppm. The two samples included in this composite were both pre-fabricated materials that could have contained chlorine that was not from PCBs.

Table 3.5 Sample descriptions and PCBs concentrations for all composites in the Very Low PCBs concentration category (i.e., < 0.2 ppm) from the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program. Results are presented in order from highest to lowest PCBs concentrations.

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 included in Composite	Structure(s) Construction Date
I	0.06	Concrete sidewalk/curb/gutter	Surface adhesive	White Hard/brittle or White Pliable	2	23	<1980
						24	<1980
*T	0.03	Concrete Storm Drain Structure: Flood Control Channel	Pre-fabricated joint filler	White/Gray Hard/brittle	2	48	1960-70's
						49	1960-70's

*XRF screening estimated the chlorine content of these sample was 100,000 – 500,000 ppm. XRF screening did not identify chlorine content in any other samples in this table.

Figure 3.3 Examples of structures that were sampled and caulk or sealant materials that were included in composites that had Very Low PCBs (< 0.2 ppm). Not all structures or samples included in the Very Low PCBs category are pictured here.

3.2.2.3 Low PCBs

Three composite samples (Composites C, D and K) had low PCBs concentrations ranging from 0.43 ppm to 0.78 ppm. All of the materials within each of these composites were used as joint fillers in the gaps between concrete structures, including bridges and flood control channels (Figure 3.4). Composite C was comprised of samples of brown fibrous materials from concrete bridges. Composite D was comprised of black, hard/brittle materials from concrete bridges. Composite K was comprised of samples of gray, hard materials from concrete flood control channels. The observed PCBs concentrations suggest proximity to a PCBs source. However, given the relatively low concentrations, the PCBs in these samples likely resulted from contamination by a source other than the sampled materials. For example, older PCB-containing caulks or sealants may have been used previously at these locations, and there may be residual PCBs from these past sources.

Figure 3.3 Examples of structures that were sampled and caulk or sealant materials that were included in the composites that had Low PCBs (≥ 0.2 ppm and < 1 ppm). Not all structures or samples included in the Low PCBs category are pictured here.

Table 3.6 Sample descriptions and PCBs concentrations for all composite samples in the Very High, Moderate and Low PCBs concentration categories (i.e., above 0.2 ppm) from the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program. None of the composites in this sampling program had PCBs concentrations in the High PCBs category. Results are presented in order from highest to lowest PCBs concentrations.

PCBs Category	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
VERY HIGH	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
MODERATE	Q	24	Metal Pipes adjacent to bridge	Exterior Pipe Sealant	Black Hard/brittle	2	28	1960-70's
							44	1960-70's
	*R	2.8	Wood Electrical Utility Pole attached to concrete sidewalk	Wood sealant	Black Hard/brittle	2	5	1960-70's
							6	1960-70's
	*S	2.5	Concrete Bridge	Pre-fabricated joint filler	Black Pliable	1	12	<1960
LOW	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
	K	0.43	Concrete Storm Drain Structure: Flood Control Channel	Caulk between joints	Gray Hard/brittle	3	47	1960-70's
							51	<1960
							52	1960-70's

*XRF screening chlorine content of these samples ranged from 18,000 ppm to 189,000 ppm. XRF screening did not identify chlorine content in any other samples in this table.

3.2.2.4 Moderate PCBs

Three composite samples (Composites Q, R and S) had Moderate PCBs concentrations, ranging from 2.5 ppm to 24 ppm (Table 3.6). Composite Q (24 ppm) was comprised of black, pliable sealant materials used on the exterior surfaces of exposed metal pipes (e.g., gas, water, or sewage pipelines) that ran adjacent to concrete bridges (Figure 3.5). Composite R was comprised of black sealant materials collected from wooden utility poles attached to concrete sidewalks. Composite S consisted of black filler materials used in expansion joints or between adjacent surfaces on concrete bridges. The concentrations found in these composites were all within the range of concentrations considered high for surface soil and storm drain sediments during investigations conducted to identify watershed-based PCBs sources, but much lower than the concentrations that would be expected if PCBs were a component of the caulk or sealant formulation. Given the elevated, but still relatively low concentrations, the sources of PCBs in these samples more likely result from contamination by residual PCBs remaining at these locations from past sources.

Figure 3.4 Examples of structures that were sampled and sealant materials that were included in the composites that had Moderate PCBs (≥ 1 ppm and < 50 ppm). Not all structures/samples in the Moderate PCBs category are pictured here.

3.2.2.5 Very High PCBs

Only two composite samples (Composites A and B), comprising 9% of the individual samples collected during this program had Very High PCBs concentrations (≥ 1,000 ppm). All of the samples within these composites were of black, pliable joint filler materials that were collected from concrete bridges (Figures 3.6 – 3.7). PCBs concentrations in this category indicate that PCBs were likely part of the original caulk or sealant formulations to impart desired characteristics such as elasticity. This finding is consistent with a previous sampling effort that found elevated PCBs in the black, pliable expansion joint filler that was used on the old eastern span of the San Francisco-Oakland Bay Bridge (Caltrans 2013).

Figure 3.5 Examples of structures that were sampled and caulk materials that were included in Composite A, which had Very High PCBs (≥ 1,000 ppm).

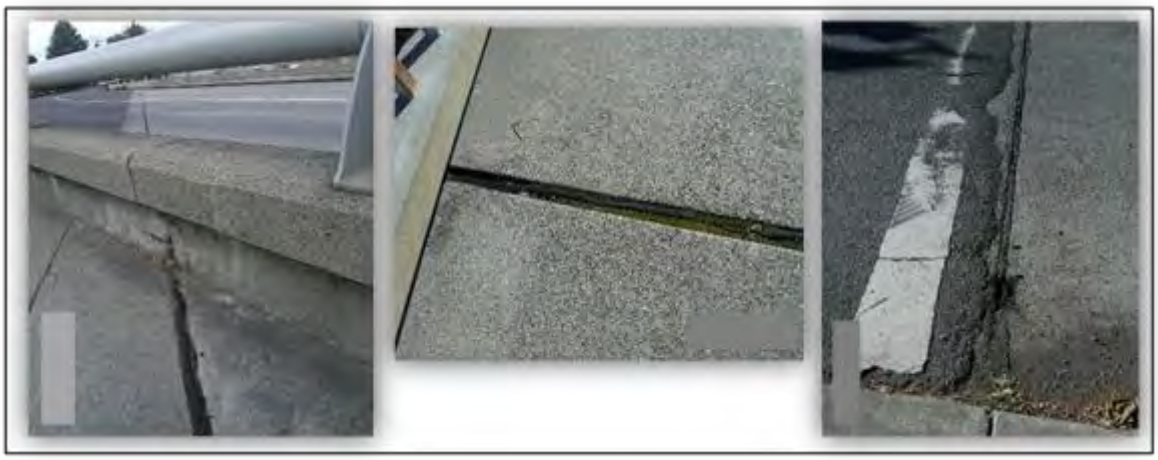

Figure 3.6 Examples of structures that were sampled and caulk materials that were included in Composite B, which had Very High PCBs (≥ 1,000 ppm).

3.2.3 Utility of XRF Screening

Composite R and S were the only samples that had PCBs above urban background and that also had chlorine detected by XRF analysis (Tables 3.3 and 3.6). However, given the 5 orders of magnitude difference between the chlorine concentration determined by XRF analysis and the PCBs concentrations determined by GC/MS analysis, even when chlorine is detected, the vast majority is often not from PCBs. More critically however, although all of the composites with no PCBs detected in this study also never had chlorine detected by XRF, some composites with very high PCBs (A & B), also had no detectable chlorine by XRF. Thus the results provided no evidence that XRF screening was useful for identifying samples with PCBs, nor for conclusively identifying samples that would not have PCBs.

3.2.4 Comparison with Other Studies

Table 3.7 presents a comparison of the PCBs concentrations measured in caulk and sealants collected during this sampling program with concentrations measured in caulk and sealants from previous studies in the Bay area, across the United States, and globally. Previous studies found very high, high and moderate concentrations of PCBs in caulk and sealant materials used on the exteriors of buildings, between concrete structures, in storm drain infrastructure, and in a drinking water reservoir (Sykes and Coates 1995, Herrick et al. 2004, Kohler et al. 2005, Robson et al. 2010, Tacoma 2013, 2016, Klosterhaus et al. 2014). PCBs concentrations detected in these studies ranged from the low parts per million up to 55% PCBs by mass. All of the PCBs concentrations detected in the current study are within the range of concentrations found in these other studies.

For additional context, Table 3.7 also includes the range of PCBs concentrations that have been measured to-date in public ROW surface soils and storm drain sediments in the Bay Area. In public ROW surface soils and sediments, PCBs above 1 ppm are considered high, and indicate proximity to a source. However, the highest concentrations that have been observed to date in public ROW surface soils and storm drain sediment in the Bay Area are below 200 ppm, or < 0.02% PCBs. By comparison, the highest concentrations found in caulks and sealants in this study were at least one order-of-magnitude greater than the highest storm drain sediment concentrations. Further, the highest concentrations of PCBs in caulks and sealants from this study were also one order-of-magnitude greater than the PCBs concentrations found in storm drain sealant in Tacoma, Washington (Tacoma 2013, 2016), and three orders-of-magnitude greater than the previous finding of PCBs in joint filler materials from the old eastern span of the San Francisco-Oakland Bay Bridge (Caltrans 2013).

About one-third of the samples of caulk or sealant materials collected during previous studies from building exteriors had PCBs concentrations above 50 ppm, which is the U.S. federal regulatory threshold for hazardous waste. In this BASMAA study, approximately one-tenth of the samples were above 50 ppm. The highest PCBs detected however, were much lower (one or two orders of magnitude lower) than the highest PCBs concentrations found in building caulks and sealants during previous studies. Compositing may have resulted in the dilution of higher concentration samples in the current study, however, at most this would result in dilution by one-half or one-third (given the number of samples included in each composite). Therefore, even accounting for potential dilution by one or more low concentration samples in each composite, the concentrations found in this study remain much lower than those observed in previous studies of PCBs in caulks or sealants from building exteriors.

Table 3.7 Comparison of PCBs concentrations measured in caulk and sealant materials collected from buildings and public roadway or storm drain infrastructure in the BASMAA Regional Infrastructure Caulk and Sealant Sampling Program, and other studies in the Bay Area, the United States and globally.

Study Location		Study Authors	Number of Samples	PCBs Concentrations	Materials Sampled
San Francisco Bay Area		*Numerous*[a]	*> 1,200*	*ND – 193 ppm*	*Public ROW surface soils or storm drain infrastructure sediment*
		BASMAA 2018	**20**[b]	**<4,967 ppm (up to 0.5%)**	**Caulk and sealants from public roadway/storm drain infrastructure**
		Klosterhaus et al. 2014	29	1 - 220,000 ppm (up to 22%)	Exterior building caulk
		Caltrans 2013	n/r[c]	0.7 - 3.7 ppm (0.0004%)	Black rubber sealant between expansion joints on old eastern span of San Francisco-Oakland Bay Bridge
		Sykes and Coate 1995	n/r	~200,000 ppm (20%)	Caulk lining a drinking water reservoir
Other Locations	**Tacoma, WA**	Tacoma 2013, 2016	n/r	260 ppm (0.026%)	Black tar sealant from a storm drain catch basin
	Boston, MA	Herrick et al. 2004	24	0.56-32,000 ppm (up to 3.2%)	Exterior building caulks
	Toronto, Canada	Robson et al. 2012	95	570-82,000 ppm (up to 8.2%)	Exterior building caulks
	Switzerland	Kohler et al. 2005	1,348	20-550,000 ppm (up to 55%)	Building joint sealants

[a]Gunther et al. 2001; KLI and EOA Inc. 2002; EOA Inc. 2002, 2004, 2007a, 2007b; City of San Jose and EOA Inc. 2003; SMSTOPPP 2002, 2003; Kleinfelder 2005, 2006; Salop et al. 2002a, 2002b; Yee and McKee 2010; SCVURPPP 2018; SMCWPPP 2018.
[b]The Samples were composites containing samples from 1 to 8 sites each.
[c]Not Reported (n/r)

4 CONCLUSIONS AND RECOMMENDATIONS

The ***BASMAA Regional Infrastructure Caulk and Sealant Sampling Program*** found PCBs at concentrations < 0.2 ppm for the majority of caulk and sealant samples collected from a variety of Bay Area public roadway and storm drain infrastructure. Forty percent (8 of 20) of the composite samples analyzed during this sampling program were above 0.2 ppm. Of these, only two composite samples had very high PCBs concentrations (> 1,000 ppm). Concentrations in this category indicate that PCBs were likely part of the original caulk or sealant formulations to impart desired characteristics such as elasticity. These results demonstrate that PCBs-containing caulks and sealants were used in some capacity on Bay Area roadway and storm drain infrastructure in the past, but the full extent and magnitude of this usage is unknown. All of the individual samples included within the two composite samples with very high PCBs consisted of black, pliable caulking materials that were used as joint fillers on concrete bridges or overpasses constructed prior to 1980. This finding, combined with previous findings in Tacoma and the Bay Area of PCBs in black filler materials, suggests that future characterization efforts might provide somewhat greater focus on these types of materials and applications.

No samples contained PCBs in the high category (50 - 1,000 ppm) and three composite samples only contained moderate (1 - 50 ppm) PCBs concentrations. For comparison purposes, soil/sediment samples collected in the public ROW that have concentrations within the moderate category (> 1 ppm), are typically investigated further and may indicate proximity to a PCBs “source property” that can be referred to the Regional Water Board for further evaluation. That said, the fate and transport processes of caulk/sealants in roadways and storm drain infrastructure likely differ greatly from sediment collected in public ROWs. Furthermore, the moderate concentrations observed during this study are well below the concentrations that would be expected if PCBs were a significant component of the original caulk/sealant material. The PCBs observed in samples with the moderate or low (>0.2 – 50 ppm) categories may be due to contamination from other sources, which could include residual PCBs associated with source materials that are no longer present. For example, the past use of PCBs-containing caulks or sealants that have since been removed or simply disintegrated over time may have left behind residual PCBs that contaminated surrounding surfaces.

Of the ten structure types that were sampled during this study, only concrete bridges/overpasses had PCBs at levels approaching the very high concentrations expected for PCBs-containing caulks and sealants. Thus, these results provide no indication that caulk and sealants present in the other nine types of structures that were sampled during this program would be expected to contain PCBs at levels above those observed in sediments/soils within the public ROW or on private properties in the Bay Area. There may be other types of materials that were not observed or collected during this sampling program that contain higher concentrations of PCBs.

The conclusions from this sampling program are limited by the small number of structures that were sampled (n=54), compared with the vast number of roadway and storm drain structures throughout the Bay Area that were originally constructed during the peak period of PCBs production and use (1950 – 1980). Many questions remain about infrastructure caulks and sealants as potential sources of PCBs to

stormwater. The data from this sampling program are not adequate to address these questions, including:

- Do PCBs migrate from infrastructure caulks and sealants into urban stormwater? If so, what are the processes involved?
- What are the PCBs concentrations of concern in infrastructure caulks and sealants?
- What is the mass of infrastructure caulk and sealants in the Bay Area that has PCBs concentrations of concern?
- How much PCBs mass is transported from infrastructure caulks and sealants to stormwater annually?

Given the limitations of the project, more information would be needed to estimate the mass of PCBs in infrastructure caulk and sealant materials, to better understand the fate and transport of PCBs in these materials, and to calculate stormwater loading estimates. Nevertheless, this screening-level sampling program was the first step towards understanding if infrastructure caulk and sealants are a potential source of PCBs to urban stormwater. Although limited by the small number of samples, the results of this sampling program indicate: (1) the majority of roadway and storm drain structure types that were sampled in this project did not have PCBs-containing caulks or sealants at concentrations of concern, and (2) only black, pliable joint fillers found on concrete bridges/overpasses sampled had PCBs concentrations of potential concern to stormwater. If further investigation is conducted, focusing on this type of application may be a reasonable place to continue such efforts.

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APPENDIX A: FINAL STUDY DESIGN

Evaluation of PCBs in Caulk and Sealants in Public Roadway and Storm Drain Infrastructure

Final Study Design

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1 INTRODUCTION

1.1 BACKGROUND

Until banned from production in 1979, polychlorinated biphenyls (PCBs) were commercially produced and used in a variety of products in the U.S., including caulk compounds and joint sealants. In addition to uses in public and private buildings of tilt-slab style constructed prior to 1979 (Klosterhaus et al. 2014), PCBs-containing caulks and sealants may also be found between the expansion joints in public infrastructure such as roadways, parking garages, bridges, dams, storm drain pipes, and pavement joints (e.g., curb and gutter). PCB use in caulk or sealant is categorized as an open-ended application that allows potential release of PCBs to the environment during use, compared with closed applications (e.g., PCBs as dielectric fluid in transformers) that do not allow release to the environment during normal use (WHO, 1993). Because open application of caulks and sealants in such public roadway and storm drain infrastructure can come into direct contact with stormwater as it flows over and through these systems, this can be a direct source of PCBs in urban stormwater.

In 2013, the City of Tacoma conducted a source-tracing program after elevated PCBs were detected in stormwater from a residential neighborhood that drains to the Thea Foss Waterway (City of Tacoma 2013, 2016). The city determined that the source of PCBs was a black tar crack sealant in a storm drain catch basin in the neighborhood that was applied during a 1975 road construction project. A sample of the sealant collected between the asphalt and concrete catch basin had PCB concentrations up to 260 ppm. Although most of the sealant had worn away by 2013, the soil underneath the sealant was likely contaminated with PCBs as the sealant material disintegrated over the years.

In the Bay Area, several open applications of PCB-containing caulks have been identified previously, including caulks used around windows and door frames of buildings (Klosterhaus et al., 2014), in the sealant that was used in the gaps between concrete slabs of the road deck on the Old East Span of the San Francisco Oakland Bay Bridge, and in caulk used in the joints of concrete drinking water storage reservoirs located in Alameda County (Sykes and Coate, 1995). These examples represent the limited extent of local information that is currently available on PCBs in storm drain and roadway infrastructure, and demonstrate that additional monitoring data are needed to evaluate the importance of this potential source of PCBs to urban stormwater runoff. Although the reservoir of PCBs contained in roadway and storm drain infrastructure caulks and sealants in the Bay Area is currently unknown (and we are not aware of any other published study that has completed an inventory in urban infrastructure in the US), this source is potentially large enough to warrant further investigation.

1.2 REGULATORY REQUIREMENTS

Provision C.12 of the Municipal Regional Stormwater NPDES Permit (MRP; Order No. R2-2015-0049) implements the PCB Total Maximum Daily Loads (TMDLs) for the San Francisco Bay Area. Provision C.12.e of the MRP specifically requires that Permittees collect at least 20 composite samples (throughout the permit area) to investigate PCB concentrations in caulk and sealants from public roadway and storm drain infrastructure, and report the results in the 2018 Annual Report. Laboratory

analysis methods must be able to detect a minimum PCBs concentration of 200 parts per billion (ppb, or µg/Kg). To achieve compliance with Provision C.12.e, MRP Permittees have agreed to collectively conduct this sampling via the Bay Area Stormwater Management Agencies Association (BASMAA). This effort will also contribute to partial fulfillment of pollutants of concern (POC) monitoring required in Provision C.8.f of the MRP to address source identification, one of the five management information needs identified in the MRP. Source identification monitoring focuses on identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff.

1.3 Project Goal

The overall goal of this project is to evaluate, at a limited screening level, whether and in what concentrations PCBs are present in public roadway and storm drain infrastructure caulk and sealants in the Bay Area. To accomplish this goal, this study design presents a regional sampling plan to collect and analyze PCBs in 20 composite samples of caulk and sealants from public roadway and storm drain infrastructure. Implementation of this sampling plan will result in Permittee compliance with MRP Provision C.12.e, and partial fulfillment of the Provision C.8.f monitoring requirements aimed at finding PCBs sources. The results of this project will be reported in each countywide stormwater program's 2018 Annual Report, and will be used to guide next steps.

2 Study Design

2.1 Approach

The overall approach is to collect, analyze and report on PCB concentrations measured in Bay Area roadway and storm drain infrastructure caulk and sealants. The project team, in coordination with participating municipalities, will collect up to 50 samples of caulk and other sealants from storm drain structures and between concrete curbs and street pavement in public right-of-ways. These samples will be composited and a total of 20 composite samples will be analyzed for PCB concentrations. The results will be reported in the 2018 Annual Report.

Participation of Bay Area municipal partners is a critical factor for success of this project. To ensure willingness to participate, municipal partners will remain anonymous in all project reporting. Further, a blind sampling approach will be applied such that no information will be retained or reported that identifies the specific locations where PCB concentrations were measured. Only generic information that does not identify sample locations will be retained, including the type of structure or material collected, type of usage, age of structure, etc. These factors may be used to guide selection of samples for compositing and PCBs analysis. Moreover, this information may provide clues about where PCBs are more likely to be found in infrastructure caulk or sealants in the Bay Area. Additional information about each sampling site that may be useful for future efforts to estimate the PCBs inventory in these materials may also be documented, including crack dimensions, the length and/or width of the caulk bead sampled, spacing of expansion joints in a particular type of application, etc.,.

Over-sampling across multiple municipalities may also be conducted, as resources allow, such that only a subset of those samples, selected blind to their location, will be sent to the lab for PCBs analysis. This approach was deemed appropriate because the goal of this project is not to identify specific locations with elevated PCBs, but rather, to better understand if roadway/storm drain infrastructure caulk or sealants are potential sources of PCBs to urban stormwater runoff in the Bay Area. The regional sampling plan presented below is divided into two phases, including:

1. Identification of Structures for Sampling and Sample Collection
2. Selection of Samples for Compositing, PCBs Analysis and Reporting

Detailed descriptions of all sampling and analysis methods that will be used, the data quality objectives, and the procedures that will be implemented to ensure data quality during this project will be provided in the Quality Assurance Project Plan and Sampling and Analysis Plan (QAPP/SAP, *in preparation*). If PCBs are found to be present in infrastructure in the Bay Area, a protocol may be developed in the future to identify and manage PCBs-containing materials during infrastructure improvement projects to reduce potential discharges to the MS4. If PCBs are found, some municipalities may wish to perform immediate abatement rather than waiting for the next infrastructure improvement project at that location.

2.2 Phase 1: Identification of Structures for Sampling and Sample Collection

Phase 1 includes recruitment of Bay Area municipal partners, identification of structures within partner municipalities' jurisdictions for sampling, and sample collection. Each of the steps required to implement Phase 1 are described below.

2.2.1 Recruitment of Municipal Partners

The first step in implementing Phase I of this monitoring program is to recruit participation from Bay Area municipalities. Stormwater Program staff from each of the five Bay Area counties subject to the MRP will conduct outreach to municipalities in their countywide program and request participation in the project. The project team has prepared a memo that can be used to inform potential municipal partners about the project and request for participation. The role of the municipal partners will be to assist the project team in identifying appropriate structures for sampling, and to assist the monitoring contractor during sample collection, as needed. This assistance will entail working with the project team to identify appropriate sites by providing municipal staff that have working knowledge of roadways and storm drain infrastructure in the city, including the general condition and location of appropriate structures, maintenance and repair issues, and access to records or knowledge of the information needed to apply the screening criteria for sample site selection (defined below).

The municipal staff will be asked to review the screening criteria with the project team, provide information on the location of structures that may meet these criteria, and (as needed) accompany project team members during field visits to potential sample locations to verify structure conditions and identify specific locations where caulk/sealant are available for sample collection. Municipal staff may also be requested to provide logistical support to the monitoring contractor during sample collection, if needed, which may involve providing permits, traffic controls or other safety measures that may be required.

Interested municipal staff will be asked to look for opportunities (described in more detail in Sections 2.1.2 and 2.2) to collect caulk or sealant samples independent of the project monitoring contractor. All necessary information for municipal staff to perform such sample collection will be provided in the project QAPP/SAP (*in preparation*).

Desirable attributes of municipal partners include one or more of the following characteristics:

- Cities that were significantly urbanized prior to 1980. All newer urban areas will be excluded from sampling, as these are not expected to contain PCBs in caulk or sealants.
- Cities that conduct their own road and storm drain infrastructure maintenance. Information about maintenance and repairs to all potential sample site locations, as well as site-specific information on potential structures will be needed to identify appropriate sampling sites.
- Cities that have available records of structure installation or rehabilitation and/or knowledgeable staff that can provide such information as far back as the 1970's. Site selection will rely heavily on the knowledge of roadway and storm drain infrastructure provided by municipal staff.
- Cities that have the available resources and willingness to assist the project team in identifying sampling sites, and during sample collection. The project team will ask participating municipal staff to review the screening criteria for sample site selection (provided below) and identify potential locations that meet the criteria. Municipal staff will also be asked to participate in field reconnaissance during site selection and logistical support during sample collection, as described below.
- Larger cities are more likely to have the desirable attributes described above. However, cities of any size that have these attributes are also desirable municipal partners.

2.2.2 Sample Site Selection Criteria

The sample population for this project is the universe of publicly maintained roadways, sidewalks and storm drain structures containing caulk or sealants located within participating Bay Area municipalities. Based on literature review and best professional judgement, the screening criteria for sample site selection provided below were developed to target structures for sampling that are more likely to contain PCBs in caulk or sealants, while also balancing logistical and safety considerations for sample collection. After the municipal partners have been identified, these criteria may be modified or refined based on input from knowledgeable municipal staff and to address any municipal-specific issues. Any modifications to the initial screening criteria presented below will be documented in the final project report. Initial screening criteria for sample site selection include the following:

1. **Public Property**: All sample sites must be located within the public right-of-way
2. **Structure Types**: The following concrete or asphalt structures may be selected: roadways, parking lots, bridges, sidewalks, pavement joints (e.g, curbs and gutters), storm drain catch basins or inlets, and storm drain pipes or culverts.
3. **Structure Age**: Sampling will focus on structures (or portions of structures) installed or rehabilitated during the 1970's. Although PCBs were likely present in caulk and sealants used prior to the 1970's, these materials are expected to break-down and disintegrate over time due to normal wear. So, the older caulks/sealants are more likely to have worn away and/or to have

been replaced. To reduce this possibility, this project will focus on sampling efforts on the 1970's as the most recent decade during which PCBs were used in caulk and sealants.

4. **Structure Rehabilitation Age**: Sampling will focus on structures (or portions of structures) that have not undergone rehabilitation since the 1980's. Because PCBs were not used from at least 1980 onward, any structures, or portions of structures that were rehabilitated, including removal and replacement of caulk/sealant, and/or addition of caulk/sealant from 1980 onwards are excluded from sampling.
5. **Road Materials**: Portland cement concrete roads are more durable than asphalt-based pavement; thus, existing concrete roads are more likely to contain caulk/sealants applied during the 1970's because they are less likely to have been replaced or resurfaced since 1980.
6. **Open Application of Caulk/Sealant**: Sampling will focus on open applications of caulk or sealants that are exposed and available for sample collection. Examples include: sites of roadway or storm drain infrastructure repairs, such as filled cracks that formed on the surface after installation, joints between concrete curbs and street pavement, joints between concrete paving, sidewalks or bridge decks, and joints between sections of storm drain pipes or culverts.
7. **Accessibility**: All sample sites must be safely accessible to the monitoring team for sample collection. Sites that do not require confined space-entry or other special equipment are preferred.
8. **Ongoing Capital Projects:** Storm drain infrastructure rehabilitation or roadway repaving or repairs that are happening during the study period (July 2017 through December 2017) may provide an opportunity for municipal staff to collect samples of caulk or sealants (independent of the project monitoring contractor) that would otherwise not be accessible.
9. **Other Opportunities**: During field reconnaissance or sampling, additional unplanned/opportunistic sites may be identified that are good candidates for sampling, including locations observed to have older crack sealants that may be present from past repairs, locations where cracks between asphalt and concrete gutters may contain older caulks/sealants, etc. Municipal staff may have knowledge of such locations where old crack sealant may be present, or may identify such locations during their normal operation and maintenance activities throughout the course of the project.

The project team will work with municipal staff to identify potential sampling sites that meet the above criteria within the jurisdiction of each partner municipality. To identify sites, the first step will entail review of available information such as GIS map layers, satellite imagery, or records from tracking systems used by cities to document roadway/storm drain infrastructure construction and/or repairs to identify areas of interest within each partner municipality. Knowledgeable municipal staff will be queried for information about open applications of caulk or sealants based on their familiarity with municipal structures in the areas of interest. To the extent possible, the criteria above will be verified for a given location with existing records that document these factors. However, because records for the time period of interest may not be available or may be difficult to track, anecdotal information from knowledgeable municipal staff will also be considered during site selection.

2.2.3 Field Reconnaissance and Initial Sample Collection

The next step is to conduct field reconnaissance in the areas of interest to identify specific structures that meet all of the above criteria, and if feasible, to begin initial sample collection. Project team

members and appropriate municipal staff will work together, as needed, to conduct these visits. During field reconnaissance, the project team and/or municipal staff will identify specific structures that are sample site candidates within the areas of interest, document and confirm conditions at each site, identify specific areas of caulk or sealant that are available for collection, and collect caulk or sealant samples if feasible. If necessary, the logistics of collecting samples at a later date at sites that may require additional planning and/or equipment prior to sample collection (e.g., confined space entry sites) will be evaluated. Field notes and photo documentation will be used to record information gathered during the field reconnaissance and initial sample collection. Field sheets and instructions will be detailed in the project QAPP/SAP.

During these field visits, or at any time during the project sampling phase (July 2017 – December 2017), municipal staff will be asked to look for opportunities to collect caulk or sealant samples independent of the project monitoring contractor. For example, capital improvement projects that occur during the project sampling period may provide access to locations that would not otherwise be feasible for sample collection. Municipal staff may also observe caulk or sealant in roadway and storm drain infrastructure during the course of their regular operations and maintenance activities. All of the necessary information on how to collect caulk/sealant samples, the field notes and other documentation that should be recorded during sample collection, and all proper sample handling and storage procedures will be provided to municipal staff in the project QAPP/SAP. The project monitoring contractor will also be available to provide additional training on sample collection to any interested municipal staff during the initial field reconnaissance.

2.2.4 Follow-Up Sampling

The project team will review all of the information gathered during field reconnaissance and initial sample collection and identify any additional locations that are good candidates for follow-up sample collection. Follow-up sample site selection will be biased towards sites that are considered more likely to contain PCBs in caulk or sealants. Other factors considered will include the information on the types of samples already collected, the number of additional appropriate sites that have been identified, the type of structures identified, the types of caulk/sealant usages at the sites, logistical factors associated with sampling each structure, and available resources.

2.2.5 Field Sampling Methods

In-situ caulk or sealant samples will be collected from selected locations in public storm drain infrastructure or roadways following the methods and procedures detailed in the project QAPP/SAP. Materials that will be sampled include:

- caulk used to fill cracks in concrete or asphalt roadways or sidewalk surfaces,
- tar-like sealant material observed within storm drain structures or roadway surfaces,
- materials used to seal concrete structures such as gutters and catch basins to asphalt pavement,
- joint sealants between concrete blocks, etc.

Depending on the location and the condition of the caulk or sealant material available, samples may be collected using a variety of techniques ranging from stainless steel knives/spoons used to scrape material from structure surfaces or collect material from inside cracks, or by carefully chiseling hardened

material from surfaces or from within cracks/joints using appropriate tools. Field notes and photographs will be taken to document the sample collection method(s) used at each site, as well as to document the structure type, the type of caulk or sealant usage, and other relevant factors (but being careful to avoid any identifying features of the area such as road signs, heritage trees or other landmarks). Samples of caulk/sealant will be selected for compositing based on factors such as: structure type, structure age, particular caulk/sealant usage, multiple samples from a single structure, and percent chlorine based on XRF screening results (described below). Composite samples collected from multiple locations would allow PCBs analysis of caulk/sealant from across a wider geographic extent within the available analysis budget. All samples will be collected as one-time events.

2.3 Phase 2: Selection of Samples for Compositing, PCBs Analysis and Reporting

During Phase 2, the project team will review the information gathered on all samples that were collected, perform screening procedures in order to group samples for compositing purposes, select a sub-set of samples that will be sent to the laboratory for PCBs analysis, and report the results. Each of these steps are described in more detail below.

2.3.1 Selection of Samples for Compositing and PCBs Analysis

Once all the samples have been collected, the project team will decide which samples will be sent to the laboratory, and how those samples will be grouped for compositing prior to PCBs analysis. Selection of the sub-set of samples for PCBs analysis will not be random, but will remain blind to specific site location. Samples will be grouped for compositing based on a number of potential factors such as geographic area, structure type (e.g., catch basin, roadway, etc.), or material usage (e.g., sealant used to fill cracks on roadways, etc.). Multiple samples from a single structure may also be composited. Decisions on how samples will be composited will be made after the samples have been collected based on the types of sites that are sampled and other information gathered about each site. X-ray Fluorescence (XRF) technology will also be used to screen samples for chlorine content and guide selection and compositing decisions, as described below (Section 2.3.1.1). Composite samples will potentially allow the monitoring program to cover a greater geographic area with a limited number of samples that will be analyzed for PCBs, and may also provide some data on how concentrations vary across the different categories of structures, usage, etc. Although limited by the small sample size (i.e., 20 samples), this type of information may be important for future efforts to identify infrastructure caulk or sealants associated with PCBs.

2.3.2 XRF Screening Procedures

Because PCBs are highly chlorinated, samples with high chlorine content are more likely to contain PCBs. Previous projects have used portable XRF technology to evaluate the chlorine content of caulk samples (Klosterhaus et. al., 2014). Each sample collected in this project will be screened for chlorine content using portable XRF technology. Based on the range of chlorine content observed, the samples will be divided into high, moderate, and low chlorine content. Samples from the high and moderate chlorine content categories will be prioritized for PCBs analysis, as these have a higher probability of containing PCBs. Moderate chlorine concentrations may provide information on whether the presence of chlorine is driven primarily by PCBs or instead by other chlorine containing compounds. However, chlorine content as determined by XRF screening, will only be one of several factors that will be considered in

determining how to select samples for PCBs analysis and how to group those samples for compositing purposes. The XRF screening results will be compared with the PCBs analysis results to better understand the usefulness of this procedure in identifying PCB-containing caulks or sealants.

2.3.3 Laboratory Methods

Prior to PCBs analysis, the laboratory will composite samples per the direction of the project team. All composited samples will be analyzed for the RMP 40 PCBs following modified EPA Method 8270C (GCMS-SIM), which provides congener specific PCB concentrations at an acceptably low detection limit for the purposes of this project (MRL = 0.5 µg/Kg). All laboratory QA/QC procedures will follow the methods detailed in the project QAPP/SAP (*in preparation*).

2.3.4 Reporting

The range of total PCB concentrations measured in roadway and storm drain infrastructure caulk and sealant will be reported. If possible, PCBs concentrations will also be reported by appropriate sub-categories, such as structure type, age of installation/repair, caulk or sealant usage, percent chlorine, or other factors. The infrastructure caulk/sealant concentrations observed during this project may also be compared to PCB concentrations in other media, such as soil/sediment or caulk from building materials in the Bay Area. The project team will prepare a final project report of the sampling data that may also include recommendations for additional information needed to support future development of stormwater loading estimates and to develop appropriate control measures for this source. The final project report will be available for submittal to the Regional Water Board with the 2018 MRP Annual Reports due in September 2018.

2.4 Study Assumptions and Limitations

This regional sampling plan was not designed to characterize the full range of PCB concentrations in Bay Area caulk and sealants, but rather, to provide a limited, screening level survey of concentrations of PCBs that may be found in Bay Area roadway and storm drain infrastructure caulk in order to understand if this is a potential source to urban stormwater that requires further attention. Resources limit the project to collecting up to 50 samples, and only analyzing 20 composite samples for PCBs. The primary risk with such a small sample size is that the monitoring may not identify sites that have high concentrations of PCBs in caulk or sealants, even if such sites exist in the Bay Area. The study design attempts to minimize this limitation through targeted sample site selection, which focuses on locations that have a higher likelihood of containing PCBs in caulk and sealants. The assumption of this targeted sampling approach is that PCBs will not be found in high concentrations at sites that do not meet the site selection criteria identified in Section 2.2.2. XRF screening techniques may also increase the likelihood of selecting samples for lab analysis that have a higher likelihood of containing PCBs. Inclusion of composite samples can also extend the geographic coverage of the limited number of samples that will be analyzed for PCBs. However, given the small sample size and lack of definitive information on where PCB-containing caulks were used in Bay Area infrastructure, it is still possible that high concentrations will not be observed even if there are locations in the Bay Area that have high enough PCB concentrations in infrastructure caulk or sealants to warrant implementation of controls for this source of PCBs to urban stormwater.

3 SCHEDULE

- Draft and Final study design. (Draft Due May 2017; Final Due June 2017)
- Draft and Final Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). (Draft Due June 2017; Final Due August 2017)
- Draft and Final Cost Estimates (Draft Due June 2017; Final Due August 2017)
- Project team discussions with municipal partners to facilitate information exchange and begin sample site selection (July/August, 2017)
- Field reconnaissance and Initial Sample Collection (August/September 2017)
- Additional Sample Collection (September 2017 – November 2017)
- XRF Screening (October - December 2017)
- Laboratory Analysis (December 2017 – February 2018)
- Data QA/QC Review (March 2018)
- Data Analysis and Reporting (April-May 2018)
- Final Summary Report (Draft due June 2018, Final Due September 2018)

4 REFERENCES

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Sykes, R.G., and Coate, A., R. PCBs in sealants in water distribution reservoirs. Journal of the American Water Works Association, April 1995, pp. 96-100

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APPENDIX B: SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

BASMAA
Regional Monitoring Coalition

Pollutants of Concern Monitoring for Source Identification and Management Action Effectiveness, 2017-2018

Sampling and Analysis Plan and Quality Assurance Project Plan

Prepared for:

The Bay Area Stormwater Management Agencies Association (BASMAA)

Prepared by:

EOA inc.
1410 Jackson Street
Oakland, CA
94612

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SACRAMENTO STATE
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Sacramento, CA
95819

SFEI
4911 Central Avenue
Richmond, CA
94804

KINNETIC LABORATORIES INCORPORATED
307 Washington Street
Santa Cruz, CA
95060

Version 2
September 29, 2017

Title and Approval Sheet

Program Title	Pollutants of Concern (POC) Monitoring for Source Identification and Management Action Effectiveness
Lead Organization	Bay Area Stormwater Management Agencies Association (BASMAA) P.O. Box 2385, Menlo Park, CA 94026, 510-622-2326 info@basmaa.org
Primary Contact	Geoff Brosseau
Effective Date	September 29, 2017
Revision Number	Version 2

Approval Signatures:

A signature from the BASMAA Executive Director approving the BASMAA POC Monitoring for Source Identification and Management Action Effectiveness is considered approval on behalf of all Program Managers.

Geoff Brosseau	Date

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List of Acronyms

ACCWP	Alameda Countywide Clean Water Program
ALS	ALS Environmental Laboratory
BASMAA	Bay Area Stormwater Management Agencies Association
BSM	Bioretention Soil Media
CCCWP	Contra Costa Clean Water Program
CCV	continuing calibration verification
CEDEN	California Environmental Data Exchange Network
CEH	Center for Environmental Health
COC	Chain of Custody
Consultant-PM	Consultant Team Project Manager
CRM	Certified Reference Material
CSE	Confined Space Entry
ECD	Electron capture detection
EDD	Electronic Data Deliverable
EOA	Eisenberg, Olivieri & Associates, Inc.
EPA	Environmental Protection Agency (U.S.)
FD	Field duplicate
Field PM	Field Contractor Project Manager
FSURMP	Fairfield-Suisun Urban Runoff Management Program
GC-MS	Gas Chromatography-Mass Spectroscopy
IDL	Instrument Detection Limits
ICV	initial calibration verification
KLI	Kinnetic Laboratories Inc.
LCS	Laboratory Control Samples
Lab-PM	Laboratory Project Manager
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MDL	Method Detection Limit
MQO	Measurement Quality Objective
MRL	Method Reporting Limit
MRP	Municipal Regional Permit
NPDES	National Pollutant Discharge Elimination System
OWP-CSUS	Office of Water Programs at California State University Sacramento
PCB	Polychlorinated Biphenyl
PM	Project Manager
PMT	Project Management Team
POC	Pollutants of Concern
QA	Quality Assurance
QA Officer	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
ROW	Right-of-way
RPD	Relative Percent Difference
RMC	Regional Monitoring Coalition
RMP	Regional Monitoring Program for Water Quality in the San Francisco Estuary
SFRWQCB	San Francisco Regional Water Quality Control Board (Regional Water Board)
SAP	Sampling and Analysis Plan
SCCVURPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SCVWD	Santa Clara Valley Water Department
SFEI	San Francisco Estuary Institute

SMCWPPP	San Mateo County Water Pollution Prevention Program
SOP	Standard Operating Procedure
SWAMP	California Surface Water Ambient Monitoring Program
TOC	Total Organic Carbon
TMDL	Total Maximum Daily Load
VSFCD	Vallejo Sanitation and Flood Control District

1. Problem Definition/Background

The Bay Area Stormwater Management Agencies Association (BASMAA) member agencies will implement a regional monitoring program for Pollutants of Concern (POC) Monitoring for Source Identification and Management Action Effectiveness (Monitoring Program). The Monitoring Program is intended to fulfill components of the Municipal Regional Stormwater NPDES Permit (MRP; Order No. R2-2015-0049), which implements the polychlorinated biphenyls (PCBs) and Mercury Total Maximum Daily Loads (TMDLs) for the San Francisco Bay Area. Monitoring for Source Identification and Management Action Effectiveness are two of five monitoring priorities for POCs identified in the MRP. Source identification monitoring is conducted to identify the sources or watershed source areas that provide the greatest opportunities for reductions of POCs in urban stormwater runoff. Management action effectiveness monitoring is conducted to provide support for planning future management actions or to evaluate the effectiveness or impacts of existing management actions.

BASMAA developed two study designs to implement each component of the Monitoring Program. The ***Evaluation of PCBs Presence in Public Roadway and Storm Drain Infrastructure Caulk and Sealants Study Design*** (BASMAA 2017a) addresses the source identification monitoring requirements of Provision C.8.f, as well as requirements of Provision C.12.e to investigate PCBs in infrastructure caulk and sealants. The ***POC Monitoring for Management Action Effectiveness Study Design*** (BASMAA 2017b) addresses the management action effectiveness monitoring requirements of Provision C.8.f. The results of the Monitoring Program will contribute to ongoing efforts by MRP Permittees to identify PCB sources and improve the PCBs and mercury treatment effectiveness of stormwater control measures in the Phase I permittee area of the Bay Area. This Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) was developed to guide implementation of both components of the Monitoring Program.

1.1. Problem Statement

Fish tissue monitoring in San Francisco Bay (Bay) has revealed bioaccumulation of PCBs and mercury. The measured fish tissue concentrations are thought to pose a health risk to people consuming fish caught in the Bay. As a result of these findings, California has issued an interim advisory on the consumption of fish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act "Section 303(d) list" due to PCBs and mercury. In response, the California Regional Water Quality Control Board, San Francisco Bay Region (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 and restore water quality.

Since the TMDLs were adopted, Permittees have conducted a number of projects to provide information that supports implementation of management actions designed to achieve the wasteload allocations described in the Mercury and PCBs TMDL, as required by Provisions of the MRP. The Clean Watersheds for a Clean Bay project (CW4CB) was a collaboration among BASMAA member agencies that pilot tested various stormwater control measures and provided estimates of the PCBs and mercury load reduction effectiveness of these controls (BASMAA, 2017c). However, the results of the CW4CB project identified a number of remaining data gaps on the load reduction effectiveness of the control measures

that were tested. In addition, MRP Provisions C.8.f. and C.12.e require Permittees to conduct further source identification and management action effectiveness monitoring during the current permit term.

1.2. Outcomes

The Monitoring Program will allow Permittees to satisfy MRP monitoring requirements for source identification and management action effectiveness, while also addressing some of the data gaps identified by the CW4CB project (BASMAA, 2017c). Specifically, the Monitoring Program is intended to provide the following outcomes:

1. Satisfy MRP Provision C.8.f. requirements for POC monitoring for source identification; and Satisfy MRP Provision C.12.e.ii requirements to evaluate PCBs presence in caulks/sealants used in storm drain or roadway infrastructure in public ROWs;
    a. Report the range of PCB concentrations observed in 20 composite samples of caulk/sealant collected from structures installed or rehabilitated during the 1970's;
2. Satisfy MRP Provision C.8.f. requirements for POC monitoring for management action effectiveness;
    a. Quantify the annual mass of mercury and PCBs captured in HDS Unit sumps during maintenance; and
    b. Identify bioretention soil media (BSM) mixtures for future field testing that provide the most effective mercury and PCBs treatment in laboratory column tests.

The information generated from the Monitoring Program will be used by MRP Permittees and the Regional Water Board to better understand potential PCB sources and better estimate the load reduction effectiveness of current and future stormwater control measures.

2. Distribution List and Contact Information

The distribution list for this BASMAA SAP/QAPP is provided in Table 2-1.

Table 2-1. BASMAA SAP/QAPP Distribution List.

Project Group	Title	Name and Affiliation	Telephone No.
BASMAA Project Management Team	BASMAA Project Manager, Stormwater Program Specialist	Reid Bogert, SMCWPPP	650-599-1433
	Program Manager	Jim Scanlin, ACCWP	510-670-6548
	Watershed Management Planning Specialist	Lucile Paquette, CCCWP	925-313-2373
	Program Manager	Rachel Kraai, CCCWP	925-313-2042
	Technical Consultant to ACCWP and CCCWP	Lisa Austin, Geosyntec Inc. CCCWP	510-285-2757
	Supervising Environmental Services Specialist	James Downing, City of San Jose	408-535-3500
	Senior Environmental Engineer	Kevin Cullen, FSURMP	707-428-9129
	Pollution Control Supervisor	Doug Scott, VSFCD	707-644-8949 x269
Consultant Team	Project Manager	Bonnie de Berry, EOA Inc.	510-832-2852 x123
	Assistant Project Manager SAP/QAPP Author and Report Preparer	Lisa Sabin, EOA Inc.	510-832-2852 x108
	Technical Advisor	Chris Sommers, EOA Inc.	510-832-2852 x109
	Study Design Lead and Report Preparer	Brian Currier, OWP-CSUS	916-278-8109
	Study Design Lead and Report Preparer	Dipen Patel, OWP-CSUS	
	Technical Advisor	Lester McKee, SFEI	415-847-5095
	Quality Assurance Officer	Don Yee, SFEI	510-746-7369
	Data Manager	Amy Franz, SFEI	510-746-7394
	Field Contractor Project Manager	Jonathan Toal, KLI	831-457-3950
Project Laboratories	Laboratory Project Manager	Howard Borse, ALS	360-430-7733
	XRF Laboratory Project Manager	Matt Nevins, CEH	510-655-3900 x318

3. Program Organization

3.1. Involved Parties and Roles

BASMAA is a 501(c)(3) non-profit organization that coordinates and facilitates regional activities of municipal stormwater programs in the San Francisco Bay Area. BASMAA programs support implementation of the MRP (Order No. R2-2015-0049), which implements the PCBs and Mercury TMDLs for the San Francisco Bay Area. BASMAA is comprised of all 76 identified MRP municipalities and special districts, the Alameda Countywide Clean Water Program (ACCWP), Contra Costa Clean

Water Program (CCCWP), the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), the Fairfield-Suisun Urban Runoff Management Program (FSURMP), the City of Vallejo and the Vallejo Sanitation and Flood Control District (VSFCD) (Table 3-1).

MRP Permittees have agreed to collectively implement this Monitoring Program via BASMAA. The Program will be facilitated through the BASMAA Monitoring and Pollutants of Concern Committee (MPC). BASMAA selected a consultant team to develop and implement the Monitoring Program with oversight and guidance from a BASMAA Project Management Team (PMT), consisting of representatives from BASMAA stormwater programs and municipalities (Table 3-1).

Table 3-1. San Francisco Bay Area Stormwater Programs and Associated MRP Permittees Participating in the BASMAA Monitoring Program.

Stormwater Programs	MRP Permittees
Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)	Cities of Campbell, Cupertino, Los Altos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, Sunnyvale, Los Altos Hills, and Los Gatos; Santa Clara Valley Water District; and, Santa Clara County
Alameda Countywide Clean Water Program (ACCWP)	Cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City; Alameda County; Alameda County Flood Control and Water Conservation District; and, Zone 7 Water District
Contra Costa Clean Water Program (CCCWP)	Cities of, Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, , Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, Walnut Creek, Danville, and Moraga; Contra Costa County; and, Contra Costa County Flood Control and Water Conservation District
San Mateo County Wide Water Pollution Prevention Program (SMCWPPP)	Cities of Belmont, Brisbane, Burlingame, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Bruno, San Carlos, San Mateo, South San Francisco, Atherton, Colma, Hillsborough, Portola Valley, and Woodside; San Mateo County Flood Control District; and, San Mateo County
Fairfield-Suisun Urban Runoff Management Program (FSURMP)	Cities of Fairfield and Suisun City
Vallejo Permittees (VSFCD)	City of Vallejo and Vallejo Sanitation and Flood Control District

3.2. BASMAA Project Manager (BASMAA-PM)

The BASMAA Project Manager (BASMAA-PM) will be responsible for directing the activities of the below-described PMT, and will provide oversight and managerial level activities, including reporting status updates to the PMT and BASMAA, and acting as the liaison between the PMT and the Consultant Team. The BASMAA PM will oversee preparation, review, and approval of project deliverables, including the required reports to the Regional Water Board.

3.3. BASMAA Project Management Team (PMT)

The BASMAA PMT will assist the BASMAA-PM and the below described Consultant Team with the design and implementation of all project activities. PMT members will assist the BASMAA-PM and Consultant Team to complete project activities within scope, on-time, and within budget by having specific responsibility for planning and oversight of project activities within the jurisdiction of the BASMAA agency that they represent. In addition, the PMT will coordinate with the municipal project partners and key regional agencies, including the Regional Water Board. The PMT is also responsible for reviewing and approving project deliverables (e.g., draft and final project reports).

3.4. Consultant Team Project Manager (Consultant-PM)

The Consultant Team Project Manager (Consultant-PM) will be responsible for ensuring all work performed during the Monitoring Program is consistent with project goals, and provide oversight of all day-to-day operations associated with implementing all components of the Monitoring Program, including scheduling, budgeting, reporting, and oversight of subcontractors. The Consultant-PM will ensure that data generated and reported through implementation of the Monitoring Program meet measurement quality objectives (MQOs) described in this SAP/QAPP. The Consultant -PM will work with the Quality Assurance Officer as required to resolve any uncertainties or discrepancies. The Consultant -PM will also be responsible for overseeing development of draft and final reports for the Monitoring Program, as described in this SAP/QAPP.

3.5. Quality Assurance Officer (QA Officer)

The role of the Quality Assurance Officer (QA Officer) is to provide independent oversight and review of the quality of the data being generated. In this role, the QA Officer has the responsibility to require data that is of insufficient quality to be flagged, or not used, or for work to be redone as necessary so that the data meets specified quality measurements. The QA Officer will oversee the technical conduct of the field related components of the Monitoring Program, including ensuring field program compliance with the SAP/QAPP for tasks overseen at the programmatic level.

3.6. Data Manager (DM)

The Data Manager will be responsible for receipt and review of all project related documentation and reporting associated with both field efforts and laboratory analysis. The Data Manager will also be responsible for storage and safekeeping of these records for the duration of the project.

3.7. Field Contractor Project Manager (Field-PM)

The Field Contractor Project Manager (Field-PM) will be responsible for conduct and oversight of all field monitoring- and reporting-related activities, including completion of field datasheets, chain of custodies, and collection of field measurements and field samples, consistent with the monitoring methods and procedures in the SAP/QAPP. The Field-PM will also be responsible for ensuring that personnel conducting monitoring are qualified to perform their responsibilities and have received appropriate training. The Field-PM will be responsible for initial receipt and review of all project related documentation and reporting associated with both field efforts and laboratory analysis.

The Field-PM will also be responsible for receiving all samples collected opportunistically by participating municipalities, including all caulk/sealant samples, initial review of sample IDs to ensure there are no duplicate sample IDs, and shipping the samples under COC to the appropriate laboratory (CEH for the caulk/sealant samples; ALS for all other samples). Participating municipalities should ship all samples they collect to the Field PM at the following address:

Jon Toal
Kinnetic Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060
Reference: BASMAA POC Monitoring Project
(831)457-3950

3.8. Laboratory Project Manager (Lab-PM)

The Laboratory Project Manager (Lab-PM) and chemists at each analytical laboratory will be responsible for ensuring that the laboratory's quality assurance program and standard operating procedures (SOPs) are consistent with this SAP/QAPP, and that laboratory analyses meet all applicable requirements or explain any deviations. Each Lab-PM will also be responsible for coordinating with the Field-PM and other staff (e.g., Consultant -PM, Data Manager, QA Officer) and facilitating communication between the Field-PM, the Consultant -PM, and analytical laboratory personnel, as required for the project.

The Center for Environmental Health (CEH) will provide chlorine content screening of all caulk/sealant samples collected using X-Ray Fluorescence (XRF) technology to assist in selection of samples for further laboratory analysis of PCBs. This XRF-screening will also provide additional information on the utility of XRF in prioritizing samples for chemical PCBs analyses.

All other laboratory analyses will be provided by ALS Environmental.

3.1. Report Preparer

The Report Preparer (RP) will be responsible for developing draft and final reports for each of the following components of the Monitoring Program: (1) Source identification; and (2) Management action effectiveness. All draft reports will be submitted to the PMT for review and input prior to submission for approval by the BASMAA Board of Directors (BOD).

4. Monitoring Program Description

4.1. Work Statement and Program Overview

The Monitoring Program consists of the following three major tasks, each of which has a field sampling component:

- **Task 1. Evaluate presence and possible concentrations of PCBs in roadway and storm drain infrastructure caulk and sealants**. This task involves analysis of 20 composite samples of caulk/sealant collected from public roadway and storm drain infrastructure throughout the permit

area to investigate PCB concentrations. The goal of this task is to evaluate, at a limited screening level, whether and in what concentrations PCBs are present in public roadway and storm drain infrastructure caulk and sealants in the portions of the Bay Area under the jurisdiction of the Phase I Permittees identified in Table 3-1 (Bay Area).

- **Task 2. Evaluate Annual mass of PCBs and mercury captured in Hydrodynamic Separator (HDS) Unit sumps during maintenance.** This task involves collecting sediment samples from the sumps of public HDS unit during maintenance cleanouts to evaluate the mass of PCBs and mercury captured by these devices. The goal of this task is to provide data to better characterize the concentrations of POCs in HDS Unit sump sediment and improve estimates of the mass captured and removed from these units during current maintenance practices for appropriate TMDL load reduction crediting purposes.

- **Task 3. Bench-scale testing of the mercury and PCBs removal effectiveness of selected BSM mixtures enhanced with biochar.** This task involves collecting stormwater from the Bay Area that will then be used to conduct laboratory column tests designed to evaluate the mercury and PCBs treatment effectiveness of various biochar-amended BSM mixtures. Real stormwater will be used for the column tests to account for the effect of influent water quality on load removal. The goal of this task is to identify BSM mixtures amended with biochar that meet operational infiltration requirements and are effective for PCBs and mercury removal for future field testing.

All monitoring results and interpretations will be documented in BASMAA reports for submission to the Regional Water Board according to the schedule in the MRP.

4.2. Sampling Detail

The Monitoring Program includes three separate sampling tasks that involve collection and analysis of the following types of samples: caulk/sealants (Task 1); sediment from HDS units (Task 2); and stormwater collected and used for column tests in the lab (Task 3). Additional details specific to the sampling design for each task are provided below.

4.2.1. Task 1 - Caulk/Sealant samples

The PMT will recruit municipal partners from within each stormwater program to participate in this task. All caulk/sealant samples will be collected from locations within public roadway or storm drain infrastructure in the participating municipalities. Exact sample sites will be identified based on available information for each municipal partner, including: age of public infrastructure; records of infrastructure repair or rehabilitation (aiming for the late 1960s through the 1970s); and current municipal staff knowledge about locations that meet the site selection criteria identified in the study design (BASMAA, 2017a). Field crews led by the Field-PM and/or municipal staff will conduct field reconnaissance to further identify specific sampling locations and if feasible, will collect caulk/sealant samples during these initial field visits. Follow-up sampling events will be conducted for any sites that require additional planning or equipment for sample collection (e.g., confined space entry, parking controls, etc.). Sample locations will include any of the following public infrastructure where caulk/sealant are present: roadway or sidewalk surfaces, between expansion joints for roadways, parking garages, bridges, dams, or storm drain pipes, and/or in pavement joints (e.g., curb and gutter). Sampling will only occur during periods of dry weather when urban runoff flows through any structures that will be sampled are minimal, and do not

present any safety hazards or other logistical issues during sample collection. Sample collection methods are described further in Section 9.

As opportunities arise, municipal staff will also collect samples following the methods and procedures described in this SAP/QAPP during ongoing capital projects that provide access to public infrastructure locations with caulk/sealant that meet the sample site criteria. All samples collected by participating municipal staff will be delivered to the Field PM under COC. The Field-PM will be responsible for storing all caulk/sealant samples and shipping the samples under COC to CEH for XRF screening analysis.

All caulk/sealant samples collected will be screened for chlorine content using XRF technology described in Section 9. Samples will be grouped for compositing purposes as described in the study design (BASMAA, 2017a). Up to three samples will be included per composite and a total of 20 composite caulk/sealant samples will be analyzed for the RMP 40 PCB congeners[1]. All compositing and PCBs analysis will be conducted blind to the location where each sample was collected. Laboratory analysis methods must be able to detect a minimum PCBs concentration of 200 parts per billion (ppb, or µg/Kg). Laboratory analytical methods are described further in Section 12. The range of PCB concentrations found in caulk based on this documented sampling design will be reported to the Regional Water Board within the Permittees' 2018 Annual Reports.

4.2.2. Task 2 - Sediment samples from HDS Units

The PMT will recruit municipal partners that maintain public HDS units to participate in this task. All sediment samples will be collected from the sump of selected HDS units during scheduled cleaning and maintenance. Selection of the HDS units for sampling will be opportunistic, based on the units that are scheduled for maintenance by participating municipalities during the project period. Field crews led by the Field-PM and municipal maintenance staff will coordinate sampling with scheduled maintenance events. As needed, municipal staff will dewater the HDS unit sumps prior to sample collection, and provide assistance to field crews with access to the sump sediment as needed (e.g., confined space entry, parking controls, etc.). All sump sediment samples will be collected following the methods and procedures described in this SAP/QAPP. Sampling will only occur during periods of dry weather when urban runoff flows into the HDS unit sumps are minimal, and do not present any safety hazards or other logistical issues during sample collection. Sample collection methods are described further in Section 9.

All sediment samples collected will be analyzed for the RMP 40 PCB congeners, total mercury, total organic carbon (TOC), particle size distribution (PSD), and bulk density. Laboratory analytical methods are described further in Section 12. The range of PCB and mercury concentrations observed in HDS Unit sump sediments and the annual pollutant masses removed during cleanouts will be reported to the Regional Water Board in March 2019.

4.2.3. Task 3 - Storm Water and Column Test Samples

This task will collect stormwater from Bay Area locations that will then be used as the influent for column tests of biochar-amended BSM. Bay Area stormwater samples will be collected from locations

[1] The 40 individual congeners routinely quantified by the Regional Monitoring Program (RMP) for Water Quality in the San Francisco Estuary include: PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203

within public roadway or storm drain infrastructure in participating municipalities. Field personnel lead by the Field PM will collect stormwater samples during three qualifying storm events and ensure all samples are delivered to the lab of OWP at CSUS within 24-hours of collection. Stormwater will be collected from one watershed that has a range of PCB concentrations and is considered representative of Bay Area watersheds (e.g. the West Oakland Ettie Street Pump Station watershed). Storms from the representative watershed should be targeted randomly without bias, thereby accounting for the effects of storm intensity and ensuring variability in contaminant concentration, proportion of dissolved contaminants, particle size, particle size distribution, and particle density. To achieve this, minimal mobilization criteria should be used to ensure predicted storm intensity and runoff volume are likely to yield the desired volume. Sample collection methods are described further in Section 9.

The stormwater collected will be used as the influent for column tests of various BSM mixtures amended with biochar. These tests will be implemented in three phases. First, hydraulic screening tests will be performed to ensure all amended BSM mixtures meet the MRP infiltration rate requirements of 12 in/h initial maximum infiltration or minimum 5 in/h long-term infiltration rate. Second, column tests will be performed using Bay Area stormwater to evaluate pollutant removal. Third, additional column tests will be performed using lower concentration (e.g., diluted) Bay Area stormwater to evaluate relative pollutant removal performance at lower concentrations. Further details about the column testing are provided in Section 9.3.

All influent and effluent water samples collected will be analyzed for the RMP 40 PCB congeners, total mercury, suspended sediment concentrations (SSC), TOC, and turbidity. Laboratory analytical methods are described further in Section 12. The range of PCB and mercury concentrations observed in influent and effluent water samples and the associated pollutant mass removal efficiencies for each BSM mixture tested will be reported to the Regional Water Board in March 2019.

4.3. Schedule

Caulk/sealant sampling (Task 1) will be conducted between July 2017 and December 2017. HDS Unit sampling (Task 2) will be conducted between July 2017 and May 2018. Stormwater sample collection and BSM column tests (Task 3) will occur between October 2017 – April 2018.

4.4. Geographical Setting

Field operations will be conducted across multiple Phase I cities in the San Francisco Bay region within the counties of San Mateo, Santa Clara, Alameda, and Contra Costa, and the City of Vallejo.

4.5. Constraints

Caulk/sealant sampling and HDS unit sampling will only be conducted during dry weather, when urban runoff flows through the sampled structures are minimal and do not present safety hazards or other logistical concerns. Caulk/sealant sampling will be limited to the caulk/sealant available and accessible at sites that meet the project site criteria (described in the Study Design, BASMAA 2017a). HDS unit sampling will be limited by the number of public HDS units that are available for maintenance during the project period. Extreme wet weather may pose a safety hazard to sampling personnel and may therefore impact wet season sampling.

5. Measurement Quality Objectives (MQO)

The quantitative measurements that estimate the true value or concentration of a physical or chemical property always involve some level of uncertainty. The uncertainty associated with a measurement generally results from one or more of several areas: (1) natural variability of a sample; (2) sample handling conditions and operations; (3) spatial and temporal variation; and (4) variations in collection or analytical procedures. Stringent Quality Assurance (QA) and Quality Control (QC) procedures are essential for obtaining unbiased, precise, and representative measurements and for maintaining the integrity of the sample during collection, handling, and analysis, as well and for measuring elements of variability that cannot be controlled. Stringent procedures also must be applied to data management to assure that accuracy of the data is maintained.

MQOs are established to ensure that data collected are sufficient and of adequate quality for the intended use. MQOs include both quantitative and qualitative assessment of the acceptability of data. The qualitative goals include representativeness and comparability, and the quantitative goals include completeness, sensitivity (detection and quantization limits), precision, accuracy, and contamination.

MQOs associated with representativeness, comparability, completeness, sensitivity, precision, accuracy, and contamination are presented below in narrative form.

5.1. Representativeness and Comparability

The representativeness of data is the ability of the sampling locations and the sampling procedures to adequately represent the true condition of the sample sites. The comparability of data is the degree to which the data can be compared directly between all samples collected under this SAP/QAPP. Field personnel, including municipal personnel that collect samples, will strictly adhere to the field sampling protocols identified in this SAP/QAPP to ensure the collection of representative, uncontaminated, comparable samples. The most important aspects of quality control associated with chemistry sample collection are as follows:

- Field personnel will be thoroughly trained in the proper use of sample collection equipment and will be able to distinguish acceptable versus unacceptable samples in accordance with pre-established criteria.
- Field personnel are trained to recognize and avoid potential sources of sample contamination (e.g., dirty hands, insufficient field cleaning).
- Samplers and utensils that come in direct contact with the sample will be made of non-contaminating materials, and will be thoroughly cleaned between sampling stations.
- Sample containers will be pre-cleaned and of the recommended type.
- All sampling sites will be selected according to the criteria identified in the project study design (BASMAA, 2017a)

Further, the methods for collecting and analyzing PCBs in infrastructure caulk and sealants will be comparable to other studies of PCBs in building material and infrastructure caulk (e.g., Klosterhaus et al., 2014). This SAP/QAPP was also developed to be comparable with the California Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Program Plan (QAPrP, SWAMP 2013). All sediment

and water quality data collected during the Monitoring Program will be performed in a manner so that data are SWAMP comparable [2].

5.2. Completeness

Completeness is defined as the percentage of valid data collected and analyzed compared to the total expected to being obtained under normal operating conditions. Overall completeness accounts for both sampling (in the field) and analysis (in the laboratory). Valid samples include those for analytes in which the concentration is determined to be below detection limits.

Under ideal circumstances, the objective is to collect 100 percent of all field samples desired, with successful laboratory analyses on 100% of measurements (including QC samples). However, circumstances surrounding sample collections and subsequent laboratory analysis are influenced by numerous factors, including availability of infrastructure meeting the required sampling criteria (applies to both infrastructure caulk sampling and HDS Unit sampling), flow conditions, weather, shipping damage or delays, sampling crew or lab analyst error, and QC samples failing MQOs. An overall completeness of greater than 90% is considered acceptable for the Monitoring Program.

5.3. Sensitivity

Different indicators of the sensitivity of an analytical method to measure a target parameter are often used including instrument detection limits (IDLs), method detection limits (MDLs), and method reporting limits (MRLs). For the Monitoring Program, MRL is the measurement of primary interest, consistent with SWAMP Quality Assurance Project Plan (SWAMP 2013). Target MRLs for all analytes by analytical method provided in Section 13.

5.4. Precision

Precision is used to measure the degree of mutual agreement among individual measurements of the same property under prescribed similar conditions. Overall precision usually refers to the degree of agreement for the entire sampling, operational, and analysis system. It is derived from reanalysis of individual samples (laboratory replicates) or multiple collocated samples (field replicates) analyzed on equivalent instruments and expressed as the relative percent difference (RPD) or relative standard deviation (RSD). Analytical precision can be determined from duplicate analyses of field samples, laboratory matrix spikes/matrix spike duplicates (MS/MSD), laboratory control samples (LCS) and/or reference material samples. Analytical precision is expressed as the RPD for duplicate measurements:

$$RPD = ABS([X1 - X2] / [(X1 + X2) / 2])$$

Where: X1 = the first sample result
X2 = the duplicate sample result.

[2] SWAMP data templates and documentation are available online at http://waterboards.ca.gov/water_issues/programs/swamp/data_management_resources/templates_docs.shtml

Precision will be assessed during the Monitoring Program by calculating the RPD of laboratory replicate samples and/or MS/MSD samples, which will be run at a frequency of 1 per analytical batch for each analyte. Target RPDs for the Monitoring Program are identified in Section 13.

5.5. Accuracy

Accuracy describes the degree of agreement between a measurement (or the average of measurements of the same quantity) and its true environmental value, or an acceptable reference value. The "true" values of the POCs in the Monitoring Program are unknown and therefore "absolute" accuracy (and representativeness) cannot be assessed. However, the analytical accuracy can be assessed through the use of laboratory MS samples, and/or LCS. For MS samples, recovery is calculated from the original sample result, the expected value (EV = native + spike concentration), and the measured value with the spike (MV):

$$\% \text{ Recovery} = (MV-N) \times 100\% / (EV-N)$$

Where: MV = the measured value
EV = the true expected (reference) value
N = the native, unspiked result

For LCS, recovery is calculated from the concentration of the analyte recovered and the true value of the amount spiked:

$$\% \text{ Recovery} = (X/TV) \times 100\%$$

Where: X = concentration of the analyte recovered
TV = concentration of the true value of the amount spiked

Surrogate standards are also spiked into samples for some analytical methods (i.e., PCBs) and used to evaluate method and instrument performance. Although recoveries on surrogates are to be reported, control limits for surrogates are method and laboratory specific, and no project specific recovery targets for surrogates are specified, so long as overall recovery targets for accuracy (with matrix spikes) are achieved. Where surrogate recoveries are applicable, data will not be reported as surrogate-corrected values.

Analytical accuracy will be assessed during the Monitoring Program based on recovery of the compound of interest in matrix spike and matrix spike duplicates compared with the laboratory's expected value, at a frequency of 1 per analytical batch for each analyte. Recovery targets for the Monitoring Program are identified in Section 13.

5.6. Contamination

Collected samples may inadvertently be contaminated with target analytes at many points in the sampling and analytical process, from the materials shipped for field sampling, to the air supply in the analytical laboratory. When appropriate, blank samples evaluated at multiple points in the process chain help assure that compound of interest measured in samples actually originated from the target matrix in the sampled environment and are not artifacts of the collection or analytical process.

Method blanks (also called laboratory reagent blanks, extraction blanks, procedural blanks, or preparation blanks) are used by laboratory personnel to assess laboratory contamination during all stages of sample preparation and analysis. The method blank is processed through the entire analytical procedure in a manner identical to the samples. A method blank concentration should be less than the RL or should not exceed a concentration of 10% of the lowest reported sample concentration. A method blank concentration greater than 10% of the lowest reported sample concentration will require corrective action to identify and eliminate the source(s) of contamination before proceeding with sample analysis. If eliminating the blank contamination is not possible, all impacted analytes in the analytical batch shall be flagged. In addition, a detailed description of the likely contamination source(s) and the steps taken to eliminate/minimize the contaminants shall be included in narrative of the data report. If supporting data is presented demonstrating sufficient precision in blank measurement that the 99% confidence interval around the average blank value is less than the MDL or 10% of the lowest measured sample concentration, then the average blank value may be subtracted.

A field blank is collected to assess potential sample contamination levels that occur during field sampling activities. Field blanks are taken to the field, transferred to the appropriate container, preserved (if required by the method), and treated the same as the corresponding sample type during the course of a sampling event. The inclusion of field blanks is dependent on the requirements specified in the relevant MQO tables or in the sampling method.

6. Special Training Needs / Certification

All fieldwork will be performed by contractor staff that has appropriate levels of experience and expertise to conduct the work, and/or by municipal staff that have received the appropriate instruction on sample collection, as determined by the Field PM and/or the PMT. The Field-PM will ensure that all members of the field crew (including participating municipal staff) have received appropriate instructions based on methods described in this document (Section 9) for collecting and transporting samples. As appropriate, sampling personnel may be required to undergo or have undergone OSHA training / certification for confined space entry in order to undertake particular aspects of sampling within areas deemed as such.

Analytical laboratories are to be certified for the analyses conducted at each laboratory by ELAP, NELAP, or an equivalent accreditation program as approved by the PMT. All laboratory personal will follow methods described in Section 13 for analyzing samples.

7. Program Documentation and Reporting

The Consultant Team in consultation with the PMT will prepare draft and final reports of all monitoring data, including statistical analysis and interpretation of the data, as appropriate, which will be submitted to the BASMAA BOD for approval. Following approval by the BASMAA BOD, Final project reports will be available for submission with each stormwater program's Annual Report in 2018 (Task 1) or in the March 31, 2019 report to the Regional Water Board (Tasks 2 and 3). Procedures for overall management of project documents and records and report preparation are summarized below.

7.1. Field Documentation

All field data gathered for the project are to be recorded in field datasheets, and scanned or transcribed to electronic documents as needed to permit easy access by the PMT, the consultant team, and other appropriate parties.

7.1.1. Sampling Plans, COCs, and Sampling Reports

The Field-PM will be responsible for development and submission of field sampling reports to the Data Manager and Consultant-PM. Field crews will collect records for sample collection, and will be responsible for maintaining these records in an accessible manner. Samples sent to analytical laboratories will include standard Chain of Custody (COC) procedures and forms; field crews will maintain a copy of originating COCs at their individual headquarters. Analytical laboratories will collect records for sample receipt and storage, analyses, and reporting. All records, except lab records, generated by the Monitoring Program will be stored at the office of the Data Manager for the duration of the project, and provided to BASMAA at the end of the project.

7.1.2. Data Sheets

All field data gathered by the Monitoring Program will be recorded on standardized field data entry forms. The field data sheets that will be used for each sampling task are provided in Appendix A.

7.1.3. Photographic Documentation

Photographic documentation is an important part of sampling procedures. An associated photo log will be maintained documenting sites and subjects associated with photos. If an option, the date function on the camera shall be turned on. Field Personnel will be instructed to take care to avoid any land marks when taking photographs, such as street signs, names of buildings, road mile markers, etc. that could be used later to identify a specific location. A copy of all photographs should be provided at the conclusion of sampling efforts and maintained for project duration.

7.2. Laboratory Documentation

The Monitoring Program requires specific actions to be taken by contract laboratories, including requirements for data deliverables, quality control, and on-site archival of project-specific information. Each of these aspects is described below.

7.2.1. Data Reporting Format

Each laboratory will deliver data in electronic formats to the Field-PM, who will transfer the records to the Data Manager, who is responsible for storage and safekeeping of these records for the duration of the project. In addition, each laboratory will deliver narrative information to the QA Officer for use in data QA and for long-term storage.

The analytical laboratory will report the analytical data to the Field-PM via an analytical report consisting of, at a minimum:

1. Letter of transmittal
2. Chain of custody information
3. Analytical results for field and quality control samples (Electronic Data Deliverable, EDD)
4. Case narrative

5. Copies of all raw data.

The Field-PM will review the data deliverables provided by the laboratory for completeness and errors. The QA Officer will review the data deliverables provided by the laboratory for review of QA/QC. In addition to the laboratory's standard reporting format, all results meeting MQOs and results having satisfactory explanations for deviations from objectives shall be reported in tabular format on electronic media. SWAMP-formatted electronic data deliverable (EDD) templates are to be agreed upon by the Data Manager, QA Officer, and the Lab-PM prior to onset of any sampling activities related to that laboratory.

Documentation for analytical data is kept on file at the laboratories, or may be submitted with analytical results. These may be reviewed during external audits of the Monitoring Program, as needed. These records include the analyst's comments on the condition of the sample and progress of the analysis, raw data, and QC checks. Paper or electronic copies of all analytical data, field data forms and field notebooks, raw and condensed data for analysis performed on-site, and field instrument calibration notebooks are kept as part of the Monitoring Program archives for a minimum period of eight years.

7.2.2. Other Laboratory QA/QC Documentation

All laboratories will have the latest version of this Monitoring Program SAP/QAPP in electronic format. In addition, the following documents and information from the laboratories will be current, and they will be available to all laboratory personnel participating in the processing of samples:

1. Laboratory QA plan: Clearly defines policies and protocols specific to a particular laboratory, including personnel responsibilities, laboratory acceptance criteria, and corrective actions to be applied to the affected analytical batches, qualification of data, and procedures for determining the acceptability of results.

2. Laboratory Standard Operation Procedures (SOPs): Contain instructions for performing routine laboratory procedures, describing exactly how a method is implemented in the laboratory for a particular analytical procedure. Where published standard methods allow alternatives at various steps in the process, those approaches chosen by the laboratory in their implementation (either in general or in specific analytical batches) are to be noted in the data report, and any deviations from the standard method are to be noted and described.

3. Instrument performance information: Contains information on instrument baseline noise, calibration standard response, analytical precision and bias data, detection limits, scheduled maintenance, etc.

4. Control charts: Control charts are developed and maintained throughout the Program for all appropriate analyses and measurements for purposes of determining sources of an analytical problem or in monitoring an unstable process subject to drift. Control charts serve as internal evaluations of laboratory procedures and methodology and are helpful in identifying and correcting systematic error sources. Control limits for the laboratory quality control samples are ±3 standard deviations from the certified or theoretical concentration for any given analyte.

Records of all quality control data, maintained in a bound notebook at each workstation, are signed and dated by the analyst. Quality control data include documentation of standard calibrations, instrument

maintenance and tests. Control charts of the data are generated by the analysts monthly or for analyses done infrequently, with each analysis batch. The laboratory quality assurance specialist will review all QA/QC records with each data submission, and will provide QA/QC reports to the Field-PM with each batch of submitted field sample data.

7.3. Program Management Documentation

The BASMAA-PM and Consultant-PM are responsible for managing key parts of the Monitoring Program's information management systems. These efforts are described below.

7.3.1. SAP/QAPP

All original SAP/QAPPs will be held by the Consultant-PM. This SAP/QAPP and its revisions will be distributed to all parties involved with the Monitoring Program. Copies will also be sent to the each participating analytical laboratory's contact for internal distribution, preferably via electronic distribution from a secure location.

Associated with each update to the SAP/QAPP, the Consultant-PM will notify the BASMAA-PM and the PMT of the updated SAP/QAPP, with a cover memo compiling changes made. After appropriate distributions are made to affected parties, these approved updates will be filed and maintained by the SAP/QAPP Preparers for the Monitoring Program. Upon revision, the replaced SAP/QAPPs will be discarded/deleted.

7.3.2. Program Information Archival

The Data Manager and Consultant-PM will oversee the actions of all personnel with records retention responsibilities, and will arbitrate any issues relative to records retention and any decisions to discard records. Each analytical laboratory will archive all analytical records generated for this Program. The Consultant-PM will be responsible for archiving all management-level records.

Persons responsible for maintaining records for this Program are shown in Table 7-1.

Table 7-1. Document and Record Retention, Archival, and Disposition

Type	Retention (years)	Archival	Disposition
Field Datasheets	8	Data Manager	Maintain indefinitely
Chain of Custody Forms	8	Data Manager	Maintain indefinitely
Raw Analytical Data	8	Laboratory	Recycling
Lab QC Records	8	Laboratory	Recycling
Electronic data deliverables	8	Data Manager	Maintain indefinitely
Reports	8	Consultant-PM	Maintain indefinitely

As discussed previously, the analytical laboratory will archive all analytical records generated for this Program. The Consultant-PM will be responsible for archiving all other records associated with implementation of the Monitoring Program.

All field operation records will be entered into electronic formats and maintained in a dedicated directory managed by the BASMAA-PM.

7.4. Reporting

The Consultant team will prepare draft and final reports for each component of the Monitoring Program. The PMT will provide review and input on draft reports and submit to the BASMAA BOD for approval. Once approved by the BASMAA BOD, the Monitoring Program reports will be available to each individual stormwater program for submission to the Regional Water Board according to the schedule outlined in the MRP and summarized in Table 7.2.

Table 7-2. Monitoring Program Final Reporting Due Dates.

Monitoring Program Component	Task	MRP Reporting Due Date
Source Identification	Task 1 - Evaluation of PCB concentrations in roadway and storm drain infrastructure caulk and sealants	September 30, 2018
Management Action Effectiveness	Task 2 - Evaluation of the annual mass of PCBs and mercury captured in HDS Unit sump sediment	March 31, 2019
	Task 3 - Bench-scale testing of the mercury and PCBs removal effectiveness of selected BSM mixtures.	

8. Sampling Process Design

All information generated through conduct of the Monitoring Program will be used to inform TMDL implementation efforts for mercury and PCBs in the San Francisco Bay region. The Monitoring Program will implement the following tasks: (1) evaluate the presence and concentrations of PCB in caulk and sealants from public roadway and stormdrain infrastructure; (2) evaluate mass of PCBs and mercury removed during HDS Unit maintenance; and (3) evaluate the mercury and PCBs treatment effectiveness of various BSM mixtures in laboratory column tests using stormwater collected from Bay Area locations. Sample locations and the timing of sample collection will be selected using the directed sampling design principle. This is a deterministic approach in which points are selected deliberately based on knowledge of their attributes of interest as related to the environmental site being monitored. This principle is also known as "judgmental," "authoritative," "targeted," or "knowledge-based." Individual monitoring aspects are summarized further under Field Methods (Section 9) and in the task-specific study designs (BASMAA 2017a,b).

8.1. Caulk/Sealant Sampling

Caulk/sealant sampling will support the Monitoring Program's Task 1 to evaluate PCBs in roadway and stormdrain infrastructure caulk/sealant, as described previously (see Section 4). Further detail on caulk/sealant sampling methods and procedures are provided under Field Methods (Section 9).

8.2. Sediment Quality Sampling

Sediment sampling will support the Monitoring Program's Task 2 to evaluate the mass of mercury and PCBs removed during HDS unit maintenance, as described previously (see Section 4). Further detail on

sediment sampling methods and procedures are provided under Field Methods (Section 9).

8.3. Water Quality Sampling

Water sampling will support the Monitoring Program's Task 3 to evaluate the mercury and PCBs treatment effectiveness of various BSM mixtures, as described previously (see Section 4). Further detail on water sampling methods and procedures are provided under Field Methods (Section 9).

8.4. Sampling Uncertainty

There are multiple sources of potential sampling uncertainty associated with the Monitoring Program, including: (1) measurement error; (2) natural (inherent) variability; (3) undersampling (or poor representativeness); and (4) sampling bias (statistical meaning). Measures incorporated to address these areas of uncertainty are discussed below:

(1) Measurement error combines all sources of error related to the entire sampling and analysis process (i.e., to the measurement system). All aspects of dealing with uncertainty due to measurement error have been described elsewhere within this document.

(2) Natural (inherent) variability occurs in any environment monitored, and is often much wider than the measurement error. Prior work conducted by others in the field of stormwater management have demonstrated the high degree of variability in environmental media, which will be taken into consideration when interpreting results of the various lines of inquiry.

(3) Under- or unrepresentative sampling happens at the level of an individual sample or field measurement where an individual sample collected is a poor representative for overall conditions encountered given typical sources of variation. To address this situation, the Monitoring Program will be implementing a number of QA-related measures described elsewhere within this document, including methods refined through implementation of prior, related investigations.

(4) Sampling bias relates to the sampling design employed and whether the appropriate statistical design is employed to allow for appropriate understanding of environmental conditions. To a large degree, the sampling design required by the Monitoring Program is judgmental, which will therefore incorporate an unknown degree of sampling bias into the Project. There are small measures that have been built into the sampling design to combat this effect (e.g., homogenization of sediments for chemistry analyses), but overall this bias is a desired outcome designed to meet the goals of this Monitoring Program, and will be taken into consideration when interpreting results of the various investigations.

Further detail on measures implemented to reduce uncertainty through mobilization, sampling, sample handling, analysis, and reporting phases are provided throughout this document.

9. Sampling Methods

The Monitoring Program involves the collection of three types of samples: Caulk/sealants; sediment from HDS unit sumps; and water quality samples. Field collection will be conducted by field contractors or municipal staff using a variety of sampling protocols, depending on the media and parameter monitored. These methods are presented below. In addition, the Monitoring Program will utilize several field

sampling SOPs previously developed by the BASMAA Regional Monitoring Coalition identified in Table 9-3 (RMC, BASMAA, 2016).

9.1. Caulk/Sealant Sampling (Task 1)

Procedures for collecting caulk and sealant samples are not well established. Minimal details on caulk or sealant sample collection methodologies are available in peer-reviewed publications. The caulk/sealant sampling procedures described here were adapted from a previous study examining PCBs in building materials conducted in the Bay Area (Klosterhaus et al., 2014). The methods described by Klosterhaus et al. (2014) were developed through consultation with many of the previous authors of caulk literature references therein, in addition to field experience gained during the Bay Area study. It is anticipated that lessons will also be learned during the current study.

9.1.1. Sample Site Selection

Once a structure has been identified as meeting the selection criteria and permission is granted to perform the testing or collection of sealant samples, an on-site survey of the structure will be used to identify sealant types and locations on the structure to be sampled. It is expected that sealants from a number of different locations on each structure may sampled; however, inconspicuous locations on the structure will be targeted.

9.1.2. Initial Equipment Cleaning

The sampling equipment that is pre-cleaned includes:

- Glass sample jars
- Utility knife, extra blades
- Stainless-steel forceps

Prior to sampling, all equipment will be thoroughly cleaned. Glass sample containers will be factory pre-cleaned (Quality Certified™, ESS Vial, Oakland, CA) and delivered to field team at least one week prior to the start of sample collection. Sample containers will be pre-labeled and kept in their original boxes, which will be transported in coolers. Utility knife blades, forceps, stainless steel spoons, and chisels will be pre-cleaned with Alconox, Liquinox, or similar detergent, and then rinsed with deionized water and methanol. The cleaned equipment will then be wrapped in methanol-rinsed aluminum foil and stored in clean Ziploc bags until used in the field.

9.1.3. Field Cleaning Protocol

Between each use the tool used (utility knife blade, spoon or chisel) and forceps will be rinsed with methanol and then deionized water, and inspected to ensure all visible sign of the previous sample have been removed. The clean tools, extra blades, and forceps will be kept in methanol-rinsed aluminum foil and stored in clean Ziploc bags when not in use.

9.1.4. Blind Sampling Procedures

The intention of this sampling is to better determine whether sealants in road and storm drain infrastructure contain PCBs at concentrations of concern, and to understand the relative importance of PCBs in this infrastructure among the other known sources of PCBs that can affect San Francisco Bay. At this phase of the project, we are not seeking to identify specific facilities requiring mitigation (if PCBs are

identified, this could be a future phase). Therefore, in this initial round of sampling, we are not identifying sample locations, but instead implementing a blind sampling protocol, as follows:

- All samples will be collected without retaining any information that would identify structure locations. The information provided to the contractor on sampling locations will not be retained. Structure location information will not be recorded on any data sheets or in any data spreadsheets or other electronic computer files created for the Project. Physical sealant samples collected will be identified only by a sample identification (ID) designation (Section 4). Physical sealant sample labels will contain only the sample ID (see Section 4 and example label in Appendix A). Samples will be identified only by their sample ID on the COC forms.
- As an added precaution and if resources allow, oversampling will occur such that more samples will be collected than will be sent to the laboratory for compositing and analysis. In this case, the Project team would select a subset of samples for PCB analysis based on factors such as application type and/or chlorine content, but blind to the specific location where each sample was collected.
- Up to three individual sealant samples will be composited by the laboratory prior to analysis for PCBs, following instructions from the Consultant PM. This further ensures a blind sampling approach because samples collected at different locations will be analyzed together.

9.1.5. Caulk/Sealant Collection Procedures

At each sample location, the Field-PM, and/or municipal staff, will make a final selection of the most accessible sampling points at the time of sampling. From each point sampled, a one inch strip (aiming for about 10 g of material) of caulk or sealant will be removed from the structure using one of the following solvent-rinsed tools: a utility knife with a stainless-steel blade, stainless steel spoon to scrape off the material, or a stainless steel chisel. The Field-PM or municipal staff at the site will select the appropriate tool based on the conditions of the caulk/sealant at each sample point. Field personnel will wear nitrile gloves during sample collection to reduce potential sample contamination. The sample will then be placed in a labeled, factory-cleaned glass jar. For each caulk sample collected, field personnel will fill out a field data sheet at the time of sample collection, which includes the following information:

- Date and time of sample collection,
- sample identification designation,
- qualitative descriptions of relevant structure or caulk/sealant features, including use profile, color and consistency of material collected, surface coating (paint, oily film, masonry residues etc.)
- crack dimensions, the length and/or width of the caulk bead sampled, spacing of expansion joints in a particular type of application, and
- a description of any unusual occurrences associated with the sampling event (especially those that could affect sample or data quality).

Appendix A contains an example field data sheet. All samples will be kept in a chilled cooler in the field (i.e., at 4 ºC ± 2 ºC), and kept refrigerated pending delivery under COC to the Field PM at KLI. Further, the field data sheets will remain with the samples when they are shipped to KLI, and will then be maintained by the Field PM at KLI.

As needed, the procedure for replacement of the caulk/sealant will be coordinated with the appropriate municipal staff to help ensure that the sampling does not result in damage to the structure.

9.1.6. Sample ID Designation

Every sample must have a unique sample ID to ensure analytical results from each sample can be differentiated from every other sample. This information should follow the sample through the COC, analytical, and interpretation and reporting processes. For the infrastructure caulk/sealant samples, the sample ID must not contain information that can be used to identify where the sample was collected. The following 2-step process will be followed to assign sample IDs to the caulk/sealant samples.

1. Upon collection, the sample will be labeled according to the following naming convention:

   MMDDYYYY-TTTT-##

   Where:

MM	2 digit month of collection
DD	2 digit date of collection
YYYY	4 digit year of collection
TTTT	4 digit time of collection (military time)
##	Sequential 2-digit sample number (i.e., 01, 02, 03…etc.)

   For example, a sample collected on September 20, 2017 at 9 AM could be assigned the following sample ID: 09202017-0900-01.

2. This second step was added to avoid issues that could arise due to duplicate sample IDs, while maintaining the blind sampling approach. While the sample naming system identified above is unlikely to produce duplicate sample IDs, there is a chance that different groups may collect samples simultaneously. This second step will be implemented by the Field PM at KLI upon receipt of caulk/sealant samples from participating municipalities. The Field PM at KLI will review the sample IDs on the COC forms for all samples and compare the sample IDs to all caulk samples for this project already in storage at KLI. If any two samples have the same sample IDs, the Field PM will add a one-digit number to the end of one of the sample IDs, selected at random. This extra number will be added to the sample container label, the field data sheet, and the COC form for that sample.

9.2. HDS Unit Sampling Procedures (Task 2)

9.2.1. Sample Site Selection

Sample site selection will be opportunistic, based on the public HDS units that participating municipalities schedule for cleaning during the project. The project team will coordinate with participating municipalities to schedule sampling during HDS unit cleanouts.

9.2.2. Field Equipment and Cleaning

A list of potential sampling equipment for soil/sediment is presented in Table 5. The equipment list should be reviewed and tailored by field contractors to meet the needs of each individual sampling site. Appropriate sampling equipment is prepared in the laboratory a minimum of four days prior to sampling. Prior to sampling, all equipment will be thoroughly cleaned. Equipment is soaked (fully immersed) for three days in a solution of Alconox, Liquinox, or similar phosphate-free detergent and deionized water. Equipment is then rinsed three times with deionized water. Equipment is next rinsed with a dilute solution

(1-2%) of hydrochloric acid, followed by a rinse with reagent grade methanol, followed by another set of three rinses with deionized water. All equipment is then allowed to dry in a clean place. The cleaned equipment is then wrapped in aluminum foil or stored in clean Ziploc bags until used in the field.

Table 9-1 Field Equipment for HDS Unit Sampling.

Description of Equipment	Material (if applicable)
Sample scoops	Stainless steel or Kynar coated
Sample trowels	Stainless steel or Kynar coated
Compositing bucket	Stainless steel or Kynar coated
Ekman Dredge (as needed)	Stainless steel
Sample containers (with labels)	As coordinated with lab(s)
Methanol, Reagent grade (Teflon squeeze bottle with refill)	
Hydrochloric acid, 1-2%, Reagent grade (Teflon squeeze bottle)	
Liquinox detergent (diluted in DI within Teflon squeeze bottle)	
Deionized / reverse osmosis water	
Plastic scrub brushes	
Container for storage of sampling derived waste, dry	
Container for storage of sampling derived waste, wet	
Wet ice	
Coolers, as required	
Aluminum foil (heavy duty recommended)	
Protective packaging materials	Bubble / foam bags
Splash proof eye protection	
PPE for sampling personnel, including traffic mgmt as required	
Gloves for dry ice handling	Cotton, leather, etc.
Gloves for sample collection, reagent handling	Nitrile
Field datasheets	
COC forms	
Custody tape (as required)	
Shipping materials (as required)	
GPS	

9.2.3. Soil / Sediment Sample Collection

Field sampling personnel will collect sediment samples from HDS unit sumps using methods that minimize contamination, losses, and changes to the chemical form of the analytes of interest. The samples will be collected in the field into pre-cleaned sample containers of a material appropriate to the analysis to be conducted. Pre-cleaned sampling equipment is used for each site, whenever possible and/or when necessary. Appropriate sampling technique and measuring equipment may vary depending on the location, sample type, sampling objective, and weather. Additional safety measures may be necessary in some cases; for example, if traffic control or confined space entry is required to conduct the sampling.

Ideally and where a sufficient volume of soil/sediment allows, samples are collected into a composite container, where they are thoroughly homogenized, and then aliquoted into separate jars for chemical analysis. Sediment samples for metals and organics are submitted to the analytical laboratories in separate jars, which have been pre-cleaned according to laboratory protocol. It is anticipated that soil / solid media will be collected for laboratory analysis using one of two techniques: (1) Remote grab of submerged sediments within HDS unit sumps using Ekman dredge or similar; or (2) direct grab sampling of

sediments after dewatering HDS unit sumps using individual scoops, push core sampling, or similar. Each of these techniques is described briefly below.

- Soil and Sediment Samples, Submerged. Wet soil and sediment samples may be collected from within HDS unit sumps. Sample crews must exercise judgment on whether submerged samples can be collected in a manner that does not substantially change the character of the soil/sediment collected for analysis (e.g., loss of fine materials). It is anticipated that presence of trash within the sumps may interfere with sample collection by preventing complete grab closure and loss of significant portion of the sample. Field crews will have the responsibility to determine the best method for collection of samples within each HDS Unit sump. If sampling personnel determine that sample integrity cannot be maintained throughout collection process, it is preferable to cancel sampling operations rather than collect samples with questionable integrity. This decision making process is more fully described in Section 11, Field Variances.

- Soil and Sediment Samples, Dry. Soils / sediments may be collected from within the HDS unit sump after dewatering. Field crews will have the responsibility to identify areas of sediment accumulation within areas targeted for sampling and analysis, and determine the best method for collection of samples with minimal disturbance to the sampling media.

After collection, all soil/sediment samples for PCBs and mercury analyses will be homogenized and transferred from the sample-dedicated homogenization pail into factory-supplied wide-mouth glass jars using a clean trowel or scoop. The samples will be transferred to coolers containing double-bagged wet ice and chilled to 6°C immediately upon collection.

For each sample collected, field personnel will fill out a field data sheet at the time of sample collection. Appendix A contains an example field data sheet. All samples will be kept in a chilled cooler in the field, and kept refrigerated pending delivery under COC to the field-PM. The Field PM will be responsible for sending the samples in a single batch to CEH for XRF analysis under COC. Following XRF analysis, CEH will deliver the samples under COC to the Consultant-PM. The Consultant-PM will be responsible for working with the project team to group samples for compositing, and sending those samples to the analytical laboratory under COC.

9.2.4. Sample ID Designation

Every sample must have a unique sample ID so that the analytical results from each sample can be differentiated from every other sample. This information should follow the sample through the COC, analytical, and interpretation and reporting processes. Each sediment/soil sample collected from HDS units will be labeled according to the following naming convention:

MMM-UUU-##

where:

MMM	Municipal Abbreviation (i.e., SJC=San Jose; OAK=Oakland; SUN=Sunnyvale).
UUU	HDS Unit Catchment ID; this is the number provided by the municipality for a specific HDS unit.
##	Sequential Sample Number (i.e., 01, 02, 03…etc.)

9.3. Water Quality Sampling and Column Testing Procedures (Task 3)

For this task, monitoring will be conducted during three storm events. The stormwater collected during these events will then be used as the influent for the laboratory column tests of amended BSM mixtures. Four influent samples (i.e., one sample of Bay Area stormwater from each of the three monitored storm events plus one diluted stormwater sample) and 20 effluent samples from the column tests that includes 3 tests for each of the six columns, plus one test with the diluted stormwater in two columns (one test column and one control column) will be collected and analyzed for pollutant concentrations.

9.3.1. Sample Site Selection

Two stormwater collection sites have been selected based on influent PCB concentrations measured during CW4CB (BASMAA, 2017c). Both sites are near tree wells located on Ettie Street in West Oakland. The first site is the influent to tree well #6 (station code = TW6). During CW4CB, influent stormwater concentrations at this location were average to high, ranging from 30 ng/L to 286 ng/L. Stormwater collected from this site will be used as the influent for one of the main column tests and some water will be reserved for the dilution series column tests. The amount of dilution will be determined after results are received from the lab from the first run. The second site is the influent to tree well #2 (station code=TW2). During CW4CB, influent stormwater concentrations at this location were low to average, ranging from 6 ng/L to 39 ng/L. Stormwater collected from this site will be used for the remaining two main column tests..

9.3.2. Field Equipment and Cleaning

Field sampling equipment includes:

1. Borosilicate glass carboys
2. Glass sample jars
3. Peristaltic pump tubing

Prior to sampling, all equipment will be thoroughly cleaned. Glass sample containers and peristaltic pump tubing will be factory pre-cleaned. Prior to first use and after each use, glass carboys (field carboys and effluent collection carboys) will be washed using phosphate-free laboratory detergent and scrubbed with a plastic brush. After washing the carboy will be rinsed with methylene chloride, then de-ionized water, then 2N nitric acid, then again with de-ionized water. Glass carboys will be cleaned after each sample run before they are returned to the Field PM for reuse in the field.

9.3.3. Water Sampling Procedures

During each storm event, stormwater will be collected in six, five-gallon glass carboys. To fill the carboys, the Field PM will create a backwater condition in the gutter before the drain inlet at each site and use a peristaltic pump to pump the water into glass carboys. Field personnel will wear nitrile gloves during sample collection to prevent contamination. Carboys will be stored and transported in coolers with either wet ice or blue ice, and will be delivered to OWP within 24 hours of collection.

9.3.4. Hydraulic Testing

Based on the literature review and availability, the best five biochars will be mixed with the standard BSM to create biochar amended BSMs. Initially, each biochar will be mixed with standard BSM at a rate of 25% biochar by volume (the same as that at the CW4CB Richmond PG&E Substation 1st and Cutting

site). Hydraulic conductivity can be determined using the method stated in the BASMAA soil specification, method ASTM D2434.

1. Follow the directions for permeability testing in ASTM D2434 for the BSM.
2. Sieve enough of the sample biochar to collect at least 15 in^3 on a no. 200 sieve.
3. Mix the sieved biochar with standard BSM at a 1 to 4 ratio.
4. Thoroughly mix the soil.
5. Follow the directions for permeability testing in ASTM D2434.
6. If the soil mix is more than 1 in/hr different from the BSM, repeat steps 1-4 but on step 3, adjust the ratio as estimated to achieve the same permeability as the BSM.
7. Repeat steps 2-6 for each biochar.

9.3.5. Column Testing Procedures

Column Setup: Up to five biochar amended BSMs and one standard BSM will be tested (based on performance and availability of biochars). Six glass columns with a diameter of eight inches and a height of three feet will be mounted to the wall with sufficient height between the bottom of the columns and the floor to allow for effluent sample collection. Each column will be capped at the bottom and fitted with a spigot to facilitate sampling. Soil depth for all columns will be 18" after compaction, which is a standard depth used in bay area bioretention installations (see Figure 9-1 below). To retain soil the bottom of the soil layer will be contained by a layer of filter fabric on top of structural backing. Behind each column, a yardstick will be mounted to the wall so that the depth of water in the column can be monitored.

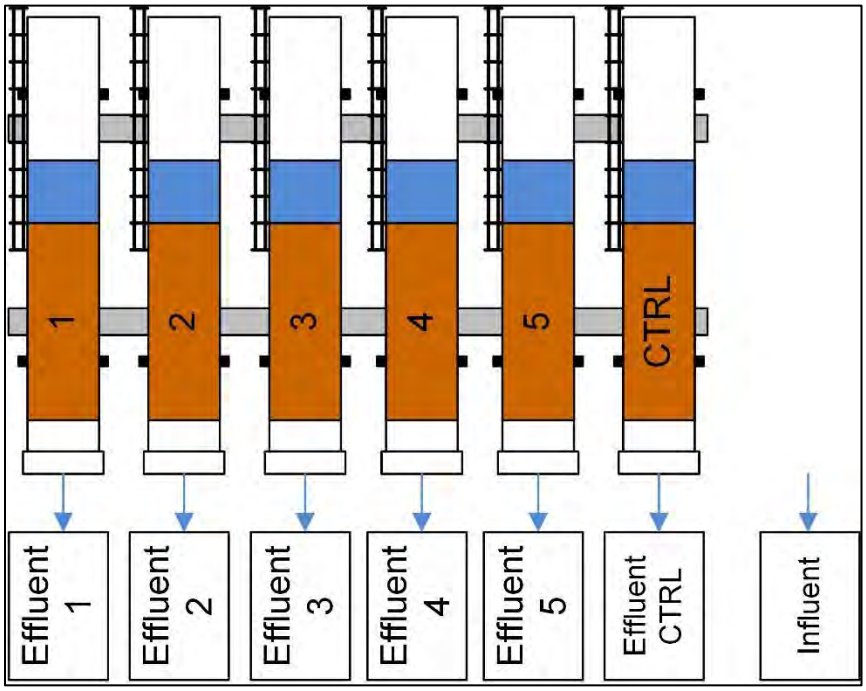

Figure 9-1. Column Test Setup

Dilution Run Column Setup: One of the existing biochar-amended BSM column and the standard BSM will be tested using diluted stormwater.

Testing procedure pre run setup: Before a sampling run begins a clean glass carboy will be placed under each soil column and labeled to match, this carboy will be sized to collect the full effluent volume

of the sample run. A glass beaker will also be assigned and labeled for each column of sufficient volume to accurately measure a single influent dose equivalent to 1 inch of depth in the column. An additional beaker will be prepared and labeled influent.

Media conditioning: Within 24 to 72 hours prior to the first column test run, pre-wet each column with a stormwater matrix collected from the CSUS campus by filling each column from the invert until water ponds above the media. Drain the water after 3 hours.

Sampling run: When the six glass carboys are delivered:

1. Inspect each carboy and fill out the Sample Receiving worksheet.
2. The runs will begin within 72 hours of delivery.
3. Select one carboy at random and fully mix it using a portable lab mixer for five minutes.
4. Turn off and remove the mixer, allow the sample to rest for one minute to allow the largest particles to settle to the bottom.
5. Fill each of the six dosing beakers and the one influent sample jar.
6. Pour each aliquot beaker into its respective column; record the time and height of water in each column.
7. Repeat steps 3-6 for each of the remaining carboys until a total of 18 inches of water is applied to each column. Before pouring an aliquot record the height of water in each column and the time. Pour each successive aliquot from the carboy when all columns have less than three inches of water above the soil surface. The water level should never be above 6 inches in any column at any time (6 inches is a standard ponding depth used in the bay area). Pour all aliquots from a single carboy into the columns at the same time.
8. Collect turbidity samples from the effluent of each column at the beginning, middle, and end of the sampling run. Fill the cuvettes for turbidity measurement directly from the effluent stream of each column and dispose of them after testing.
9. Collect mercury samples from the effluent of each column at the middle of the sample run using pre-labeled sample containers provided by the lab for that purpose.
10. Fill a pre-labeled sample jar from each columns effluent. The jar will be obtained from the laboratory performing the PCB analysis.
11. Pack each jar in ice and complete the lab COCs.
12. Ship the samples to the lab for analysis.

9.3.6. Sample ID Designations

Every sample must have a unique sample identification to ensure analytical results from each sample can be differentiated from every other sample. This information should follow the sample through the COC, analytical, and interpretation and reporting processes. Each influent and effluent water quality sample will be labeled according to the following naming convention:

SSS-TT-MMDDYYYY-##

Where:

SSS	Station code (see Table 9-2 for station codes)
TT	Sample Type (IN=influent; EF=Effluent)
MM	2 digit month of collection
DD	2 digit date of collection
YYYY	4 digit year of collection
##	Sequential 2-digit sample number (i.e., 01, 02, 03…etc.)

For example, a sample collected at the West Oakland Tree Well #2 site on October 20, 2017 and used for the influent sample for run #3 could be assigned the following sample ID: TW2-IN-09202017-03.

Table 9-2 Station Codes for Stormwater Influent Samples and Column Tests.

Station Code	Station Description
TW2	Stormwater sample collected from the West Oakland Tree Well #2
TW6	Stormwater sample collected from the West Oakland Tree Well #6
CO1	Effluent sample collected from column number 1
CO2	Effluent sample collected from column number 2
CO3	Effluent sample collected from column number 3
CO4	Effluent sample collected from column number 4
CO5	Effluent sample collected from column number 5
CO6	Effluent sample collected from column number 6

9.4. Collection of Samples for Archiving

Archive samples will not be collected for this Monitoring Program. The sample size collected will be enough to support additional analyses if QA/QC issues arise. Once quality assurance is certified by the QA Officer, the laboratory will be instructed to dispose of any leftover sample materials.

9.5. Waste Disposal

Proper disposal of all waste is an important component of field activities. At no time will any waste be disposed of improperly. The proper methods of waste disposal are outlined below:

9.5.1. Routine Garbage

Regular garbage (paper towels, paper cups, etc.) is collected by sampling personnel in garbage bags or similar. It can then be disposed of properly at appropriate intervals.

9.5.2. Detergent Washes

Any detergents used or detergent wash water should be collected in the field in a water-tight container and disposed of appropriately.

9.5.3. Chemicals

Methanol, if used, should be disposed of by following all appropriate regulations. It should always be collected when sampling and never be disposed in the field.

9.1. Responsibility and Corrective Actions

If monitoring equipment fails, sampling personnel will report the problem in the comments section of their field notes and will not record data values for the variables in question. Actions will be taken to replace or repair broken equipment prior to the next field use.

9.2. Standard Operating Procedures

SOPs associated with sampling and sample handling expected to be used as part of implementation of The Monitoring Program are identified in Table 9-3. Additional details on sample container information, required preservation, holding times, and sample volumes for all Monitoring Program analytes are listed

in Table 10-1 of Section 10.

Table 9-3. List of BASMAA RMC SOPs Utilized by the Monitoring Program.

RMC SOP #	RMC SOP	Source
FS-2	Water Quality Sampling for Chemical Analysis, Pathogen Indicators, and Toxicity	BASMAA 2016
FS-3	Field Measurements, Manual	BASMAA 2016
FS-4	Field Measurements, Continuous General Water Quality	BASMAA 2016
FS-5	Temperature, Automated, Digital Logger	BASMAA 2016
FS-6	Collection of Bedded Sediment Samples for Chemical Analysis and Toxicity	BASMAA 2016
FS-7	Field Equipment Cleaning Procedures	BASMAA 2016
FS-8	Field Equipment Decontamination Procedures	BASMAA 2016
FS-9	Sample Container, Handling, and Chain of Custody Procedures	BASMAA 2016
FS-10	Completion and Processing of Field Datasheets	BASMAA 2016
FS-11	Site and Sample Naming Convention	BASMAA 2016

In addition, contractor-specific plans and procedures may be required for specific aspects of the Monitoring Program implementation (e.g., health and safety plans, dry ice shipping procedures).

10. Sample Handling and Custody

Sample handling and chain of custody procedures are described in detail in RMC SOP FS-9 (Table 9-3) (BASMAA 2016). The Field-PM or designated municipal staff on site during sample collection will be responsible for overall collection and custody of samples during field sampling. Field crews will keep a field log, which will consist of sampling forms for each sampling event. Sample collection methods described in this document and the study designs (BASMAA 2017a, b) will be followed for each sampling task. Field data sheets will be filled out for each sample collected during the project. Example field data sheets are provided in Appendix A, and described further in Section 9.

The field crews will have custody of samples during field sampling, and COC forms will accompany all samples from field collection until delivery to the analyzing laboratory. COC procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. Each laboratory will follow sample custody procedures as outlined in its QA plans.

Information on sampling containers, preservation techniques, packaging and shipping, and hold times is described below and summarized in Table 10.1.

10.1. Sampling Containers

Collection of all sample types require the use of clean containers. Factory pre-cleaned sample containers of the appropriate type will be provided by the contracted laboratory and delivered to field team at least one week prior to the start of sample collection. Individual laboratories will be responsible for the integrity of containers provided. The number and type of sample containers required for all analytes by media type for each sampling task are provided in Table 10.1.

10.2. Sample Preservation

Field Crews will collect samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest. The samples will be collected in the field into pre-cleaned sample containers of a material appropriate to the analysis to be conducted. Pre-cleaned sampling equipment is used for each site, whenever possible and/or when necessary. Appropriate sampling technique and measurement equipment may vary depending on the location, sample type, sampling objective, and weather.

In general, all samples will be packed in sufficient wet ice or frozen ice packs during shipment, so that they will be kept between 2 and 4º C (Table 10.1). When used, wet ice will be double bagged in Zip-top bags to prevent contamination via melt water. Where appropriate, samples may be frozen to prevent degradation. If samples are to be shipped frozen on dry ice, then appropriate handling procedures will be followed, including ensuring use of appropriate packaging materials and appropriate training for shipping personnel.

10.3. Packaging and Shipping

All samples will be handled, prepared, transported, and stored in a manner so as to minimize bulk loss, analyte loss, contamination, or biological degradation. Sample containers will be clearly labeled with an indelible marker. All caps and lids will be checked for tightness prior to shipping. Ice chests will be sealed with packing tape before shipping. Samples will be placed in the ice chest with enough ice or frozen ice packs to maintain between 2 and 4º C. Additional packing material will be added as needed. COC forms will be placed in a zip-top bag and placed inside of the ice chest.

10.4. Commercial Vehicle Transport

If transport of samples to the contracted laboratories is to be by commercial carriers, pickup will be pre-arranged with the carrier and all required shipping forms will be completed prior to sample pickup by the commercial carrier.

10.5. Sample Hold Times

Sample hold times for each analyte by media type are presented in Table 10-1.

Table 10-1 Sample Handling for the Monitoring Program Analytes by media type.

Analyte	Sample Media	Sample Container	Minimum Sample / Container Size[a]	Preservative	Hold Time (at 6º C)
PCBs (40-RMP Congeners)	Caulk or sealant	Pre-cleaned 250-mL glass sample container (e.g., Quality Certified™, ESS Vial, Oakland, CA)	10 g	Cool to 6° C within 24 hours, then freeze to ≤-20° C	1 year at -20º C; Samples must be analyzed within 14 days of collection or thawing.
	Sediment	Pre-cleaned 250-mL I-Chem 200 Series amber glass jar with Teflon lid liner	500 mL (two jars)	Cool to 6° C within 24 hours, then freeze to ≤-20° C	1 year at -20º C; Samples must be analyzed within 14 days of collection or thawing.
	Water	1000-mL I-Chem 200-Series amber glass bottle, with Teflon lid-liner	1000 mL/per individual analyses	Cool to 6º C in the dark.	1 year until extraction, 1 year after extraction
Total Mercury	Sediment	Pre-cleaned 250-mL I-Chem 200 Series amber glass jar with Teflon lid liner	100 g	Cool to 6º C and in the dark	1 year at -20º C; Samples must be analyzed within 14 days of collection or thawing.
	Water	250-mL glass or acid-cleaned Teflon bottle	250 mL	Cool to 6º C in the dark and acidify to 0.5% with pre-tested HCl within 48 hours	6 months at room temperature following acidification
Bulk Density	Sediment	250-mL clear glass jar; pre-cleaned	250 mL	Cool to 6º C	7 days
Grain Size and TOC	Sediment	250-mL clear glass jar; pre-cleaned	250 mL	Cool to 6º C, in the dark up to 28 days[2]	28 days at ≤6 ◦C; 1 year at ≤-20 ◦C
SSC	Water	125-mL amber glass jar or Polyethylene Bottles	125 mL	Cool to 6º C and store in the dark	7 days
Turbidity	Water				
Total Solids	Water	1 L HDPE	1 L	Cool to ≤6 ◦C	7 days
TOC	Water	40-mL glass vial	40 mL	Cool to 6º C and store in the dark. If analysis is to occur more than two hours after sampling, acidify (pH < 2) with HCl or H_2SO_4.	28 days
Particle Size Distribution	Water	1 L HDPE	2 L	Cool to 6º C and store in the dark	7 days

[a]QC samples or other analytes require additional sample bottles.

11. Field Health and Safety Procedures

All field crews will be expected to abide by their employer's (i.e., the field contractor's) health and safety programs. Additionally, prior to the fieldwork, field contractors are required to develop site-specific Health and Safety plans that include the locations of the nearest emergency medical services.

Implementation of the Monitoring Program activities may require confined space entry (CSE) to accomplish sampling goals. Sampling personnel conducting any confined space entry activities will be expected to be certified for CSE and to abide by relevant regulations.

12. Laboratory Analytical Methods

12.1. Caulk/Sealant Samples (Task 1)

12.1.1. XRF Chlorine analysis

XRF technology will be used in a laboratory setting to rank samples for chlorine content before sending the samples to the project laboratory for chemical analysis. Procedures for testing caulk or sealants using X-Ray fluorescence (XRF) and collecting caulk and sealant samples are not well described, and minimal detail on caulk or sealant sample collection is available in peer-reviewed publications. Sealant sampling procedures were adapted from the previous study examining PCBs in building materials (Klosterhaus et al., 2014).

An XRF analyzer will be used at the Center for Environmental Health (CEH) as a screening tool to estimate the concentration of chlorine (Cl) in collected caulk and sealant samples from various structures. Settings for the analyzer will be 'standardized' using procedures developed/ recommended by CEH each time the instrument is turned on and prior to any measurement. European plastic pellet reference materials (EC680 and EC681) will be used as 'check' standards upon first use to verify analyzer performance. A 30 second measurement in 'soil' mode will be used. CEH personnel will inspect the caulk/sealant surfaces and use a stainless steel blade to scrape off any paint, concrete chips, or other visible surface residue. The caulk/sealant surface to be sampled will then be wiped with a laboratory tissue to remove any remaining debris that may potentially interfere with the XRF analysis. At least two XRF readings will be collected from each sample switching the orientation or position of the sample between readings. If Cl is detected, a minimum of four additional readings will be collected on the same material to determine analytical variability. Each individual Cl reading and its detection limit will be recorded on the data sheet. After XRF analysis, all samples will be returned to their original sample container. Results of the XRF analysis will be provided to the project team as a table of ranked Cl screening results for possible selection for chemical (PCBs) analysis.

12.1.2. Selection of Samples for PCB analysis and Compositing

Once samples have been ranked for their chlorine content, primarily samples with the highest Cl will preferentially be selected for chemical analysis. About 75% of samples to be analyzed should be selected from samples with the top quartile Cl content. The remaining 25% should be selected from samples with medium (25 to 75th percentile) Cl, as the previous study using XRF screening showed inconsistent correlation between total Cl and PCB. Although samples with very low Cl seldom had much PCBs, samples with medium Cl on occasion had higher PCBs than samples with high Cl, and within the high Cl group, Cl content was not a good predictor of their ranks of PCB concentration.

In addition to Cl content, other factors about each sample that were recorded on the field data sheets at the time of sample collection, including the color or consistency of the sample, the type and/or age of the structure that was sampled, or the type of caulk or sealant application will be considered in selecting the samples that will be sent to the laboratory for PCBs analysis, as well as how the samples will be grouped for compositing purposes. Those factors are described in more detail in the study design (BASMAA, 2017a).

The Consultant PM will work with the project team to identify up to three samples for inclusion in each composite. A common composite ID will then be assigned to each sample that will be composited together (i.e., all samples the lab should composite together will be identified by the common composite ID). The composite ID will consist of a single letter designation and will be identical for all samples (up to 3 total) that will be composited together. The Consultant PM will add the composite ID to each sample container label, to each sample ID on all COC forms, and to each field data sheet for all samples prior to sending the samples to the laboratory for PCBs analysis.

12.1.3. Sample Preparation

The project laboratory will composite the samples prior to extraction and PCBs analysis according to the groupings identified by the common composite ID. Sample preparation will include removal of any paint, concrete chips, or other surface debris, followed by homogenization of the caulk/sealant material and compositing up to three samples per composite. Each sample will have a composite ID that will be used to identify which samples should be composited together. Samples with the same composite ID will be combined into a single composite sample. For example, all samples with composite ID = “A” will be composited together; all samples with composite ID = “B” will be composited together, etc. Sample preparation and compositing will follow the procedures outlined in the laboratory SOPs (Appendix B). After compositing, each composite sample will be assigned a new sample ID using the following naming convention:

X-MMDDYYYY

Where:

X	the single letter Composite ID that is common to all samples included in a given composite.
MM	2 digit month of composite preparation
DD	2 digit date of composite preparation
YYYY	4 digit year of composite preparation

For example, if three samples with the composite ID= “A” are combined into a single composite sample on December 12, 2017, the new (composite) sample ID would be the following: A-12122017.

12.1.4. PCBs Analysis

All composite caulk/sealant samples will be extracted by Method 3540C, and analyzed for the RMP-40 PCB congeners[3] using a modified EPA Method 8270C (GC/MS-SIM), in order to obtain positive

[3] The 40 individual congeners routinely quantified by the Regional Monitoring Program (RMP) for Water Quality in the San Francisco Estuary include: PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203

identification and quantitation of PCBs. PCB content of these material covers an extremely wide range, so the subsampling of material should include sufficient material for quantification assuming that the concentration is likely to be around the median of previous results. There may be samples with much higher concentrations, which can be reanalyzed on dilution as needed. Method Reporting Limits (MRLs) for each of the RMP-40 PCB Congeners are 0.5 µg/Kg.

12.2. Sediment Samples Collected from HDS Units (Task 2)

All sediment samples collected from HDS units under Task 2 will be analyzed for TOC, grain size, bulk density, total mercury, and PCBs (RMP 40 Congeners1) by the methods identified in Table 12-1. All sediment samples (with the exception of grain size) will be sieved by the laboratory at 2 mm prior to analysis.

Table 12-1. Laboratory Analytical Methods for Analytes in Sediment

Analyte	Sampling Method	Recommended Analytical Method	Reporting Units
Total Organic Carbon (TOC)	Grab	EPA 415.1, 440.0, 9060, or ASTM D4129M	%
Grain Size	Grab	ASTM D422M/PSEP	%
Bulk Density	Grab	ASTM E1109-86	g/cm3
Mercury	Grab	EPA 7471A, 7473, or 1631	µg/kg
PCBs (RMP 40 Congeners)	Grab	EPA 1668	µg/kg

12.3. Water Samples – Stormwater and Column Tests (Task 3)

All water samples submitted to the laboratory will be analyzed for SSC, TOC, total mercury and PCBs (RMP-40 congeners) according to the methods identified in Table 12-2.

Table 12-2. Laboratory Analytical Methods for Analytes in Water

Analyte	Sampling Method	Recommended Analytical Method	Reporting Units
Suspended Sediment Concentration (SSC)	Grab	ASTM D3977-97 (Method C)	mg/L
Total Organic Carbon (TOC)	Grab	EPA 415.1 or SM 5310B	%
Mercury (Total)	Grab	EPA 1631	µg/L
PCBs (RMP 40 Congeners)	Grab	EPA 1668	ng/L

12.4. Method Failures

The QA Officer will be responsible for overseeing the laboratory implementing any corrective actions that may be needed in the event that methods fail to produce acceptable data. If a method fails to provide acceptable data for any reason, including analyte or matrix interferences, instrument failures, etc., then the involved samples will be analyzed again if possible. The laboratory in question's SOP for handling these types of problems will be followed. When a method fails to provide acceptable data, then the laboratory's

SOP for documenting method failures will be used to document the problem and what was done to rectify it.

Corrective actions for chemical data are taken when an analysis is deemed suspect for some reason. These reasons include exceeding accuracy or precision ranges and/or problems with sorting and identification. The corrective action will vary on a case-by-case basis, but at a minimum involves the following:

- A check of procedures.
- A review of documents and calculations to identify possible errors.
- Correction of errors based on discussions among analysts.
- A complete re-identification of the sample.

The field and laboratory coordinators shall have systems in place to document problems and make corrective actions. All corrective actions will be documented to the FTL and the QA Officer.

12.5. Sample Disposal

After analysis of the Monitoring Program samples has been completed by the laboratory and results have been accepted by QA Officer and the Field-PM, they will be disposed by laboratory staff in compliance with all federal, state, and local regulations. The laboratory has standard procedures for disposing of its waste, including left over sample materials

12.6. Laboratory Sample Processing

Field samples sent to the laboratories will be processed within their recommended hold time using methods agreed upon method between the Lab-PM and Field-PM. Each sample may be assigned unique laboratory sample ID numbers for tracking processing and analyses of samples within the laboratory. This laboratory sample ID (if differing from the field team sample ID) must be included in the data submission, within a lookup table linking the field sample ID to that assigned by the lab.

Samples arriving at the laboratory are to be stored under conditions appropriate for the planned analytical procedure(s), unless they are processed for analysis immediately upon receipt. Samples to be analyzed should only be removed from storage when laboratory staff are ready to proceed.

13. Quality Control

Each step in the field collection and analytical process is a potential source of contamination and must be consistently monitored to ensure that the final measurement is not adversely affected by any processing steps. Various aspects of the quality control procedures required by the Monitoring Program are summarized below.

13.1. Field Quality Control

Field QC results must meet the MQOs and frequency requirements specified in Tables 13-1 – 13-4 below.

13.1.1. Field Blanks

A field blank is collected to assess potential sample contamination levels that occur during field sampling activities. Field blanks are taken to the field, transferred to the appropriate container, preserved (if required by the method), and treated the same as the corresponding sample type during the course of a sampling event. The inclusion of field blanks is dependent on the requirements specified in the relevant MQO tables or in the sampling method or SOP.

Collection of caulk or sealant field blank samples has been deemed unnecessary due to the difficulty in collection and interpretation of representative blank samples and the use of precautions that minimize contamination of the samples. Additionally, PCBs have been reported to be present in percent concentrations when used in sealants; therefore any low level contamination (at ppb or even ppm level) due to sampling equipment and procedures is not expected to affect data quality because it would be many orders of magnitude lower than the concentrations deemed to be a positive PCB signal.

For stormwater samples, field blanks will be generated using lab supplied containers and clean matrices. Sampling containers will be opened as though actual samples were to be collected, and clean lab-supplied matrix (if any) will be transferred to sample containers for analysis.

13.1.2. Field Duplicates

Field samples collected in duplicate provide precision information as it pertains to the sampling process. The duplicate sample must be collected in the same manner and as close in time as possible to the original sample. This effort is to attempt to examine field homogeneity as well as sample handling, within the limits and constraints of the situation. These data are evaluated in the data analysis/assessment process for small-scale spatial variability.

Field duplicates will not be collected for caulk/sealant samples (Task 1), as assessment of within-structure variability of PCB concentrations in sealants is not a primary objective of the Project. Due to budget limitations, PCBs analysis of only one caulk/sealant sample per application will be targeted to maximize the number of Bay Area structures and structure types that may be analyzed in the Project. The selected laboratory will conduct a number of quality assurance analyses (see Section 13), including a limited number of sample duplicates, to evaluate laboratory and method performance as well as variability of PCB content within a sample.

For all sediment and water samples, 5% of field duplicates and/or column influent/effluent duplicates will be collected along with primary samples in order to evaluate small scale spatial or temporal variability in sample collection without specifically targeting any apparent or likely bias (e.g. different sides of a seemingly symmetrical unit, or offset locations in making a composite, or immediately following collection of a primary water sample would be acceptable, whereas collecting one composite near an inlet and another near the outlet, or intentionally collecting times with vastly different flow rates, would not be desirable).

13.1.3. Field Corrective Action

The Field PM is responsible for responding to failures in their sampling and field measurement systems. If monitoring equipment fails, personnel are to record the problem according to their documentation protocols. Failing equipment must be replaced or repaired prior to subsequent sampling events. It is the combined responsibility of all members of the field organization to determine if the performance

requirements of the specific sampling method have been met, and to collect additional samples if necessary. Associated data is to be flagged accordingly. Specific field corrective actions are detailed in Table 13-8.

13.2. Laboratory Quality Control

Laboratories providing analytical support to the Monitoring Program will have the appropriate facilities to store, prepare, and process samples in an ultra-clean environment, and will have appropriate instrumentation and staff to perform analyses and provide data of the required quality within the time period dictated by the Monitoring Program. The laboratories are expected to satisfy the following:

1. Demonstrate capability through pertinent certification and satisfactory performance in inter-laboratory comparison exercises.
2. Provide qualification statements regarding their facility and personnel.
3. Maintain a program of scheduled maintenance of analytical balances, laboratory equipment and instrumentation.
4. Conduct routine checking of analytical balances using a set of standard reference weights (American Society of Testing and Materials Class 3, NIST Class S-1, or equivalents). Analytical balances are serviced at six-month intervals or when test weight values are not within the manufacturer's instrument specifications, whichever occurs first.
5. Conduct routine checking and recording the composition of fresh calibration standards against the previous lot. Acceptable comparisons are within 2% of the precious value.
6. Record all analytical data in bound (where possible) logbooks, with all entries in ink, or electronically.
7. Monitor and document the temperatures of cold storage areas and freezer units on a continuous basis.
8. Verify the efficiency of fume/exhaust hoods.
9. Have a source of reagent water meeting specifications described in Section 8.0 available in sufficient quantity to support analytical operations.
10. Label all containers used in the laboratory with date prepared, contents, initials of the individual who prepared the contents, and other information as appropriate.
11. Date and safely store all chemicals upon receipt. Proper disposal of chemicals when the expiration date has passed.
12. Have QAPP, SOPs, analytical methods manuals, and safety plans readily available to staff.
13. Have raw analytical data readily accessible so that they are available upon request.

In addition, laboratories involved in the Monitoring Program are required to demonstrate capability continuously through the following protocols:

1. Strict adherence to routine QA/QC procedures.
2. Regular participation in annual certification programs.
3. Satisfactory performance at least annually in the analysis of blind Performance Evaluation Samples and/or participation in inter-laboratory comparison exercises.

Laboratory QC samples must satisfy MQOs and frequency requirements. MQOs and frequency requirements are listed in Tables 13-1 – 13-3. Frequency requirements are provided on an analytical batch

level. The Monitoring Program defines an analytical batch as 20 or fewer samples and associated quality control that are processed by the same instrument within a 24-hour period (unless otherwise specified by method). Target Method Reporting Limits are provided in Tables 13.4 – 13.8. Details regarding sample preparation are method- or laboratory SOP-specific, and may consist of extraction, digestion, or other techniques.

13.2.1. Calibration and Working Standards

All calibration standards must be traceable to a certified standard obtained from a recognized organization. If traceable standards are not available, procedures must be implemented to standardize the utilized calibration solutions (*e.g.*, comparison to a CRM – see below). Standardization of calibration solutions must be thoroughly documented, and is only acceptable when pre-certified standard solutions are not available. Working standards are dilutions of stock standards prepared for daily use in the laboratory. Working standards are used to calibrate instruments or prepare matrix spikes, and may be prepared at several different dilutions from a common stock standard. Working standards are diluted with solutions that ensure the stability of the target analyte. Preparation of the working standard must be thoroughly documented such that each working standard is traceable back to its original stock standard. Finally, the concentration of all working standards must be verified by analysis prior to use in the laboratory.

13.2.2. Instrument Calibration

Prior to sample analysis, utilized instruments must be calibrated following the procedures outlined in the relevant analytical method or laboratory SOP. Each method or SOP must specify acceptance criteria that demonstrate instrument stability and an acceptable calibration. If instrument calibration does not meet the specified acceptance criteria, the analytical process is not in control and must be halted. The instrument must be successfully recalibrated before samples may be analyzed.

Calibration curves will be established for each analyte covering the range of expected sample concentrations. Only data that result from quantification within the demonstrated working calibration range may be reported unflagged by the laboratory. Quantification based upon extrapolation is not acceptable; sample extracts above the calibration range should be diluted and rerun if possible. Data reported below the calibration range must be flagged as estimated values that are Detected not Quantified.

13.2.3. Initial Calibration Verification

The initial calibration verification (ICV) is a mid-level standard analyzed immediately following the calibration curve. The source of the standards used to calibrate the instrument and the source of the standard used to perform the ICV must be independent of one another. This is usually achieved by the purchase of standards from separate vendors. Since the standards are obtained from independent sources and both are traceable, analyses of the ICV functions as a check on the accuracy of the standards used to calibrate the instrument. The ICV is not a requirement of all SOPs or methods, particularly if other checks on analytical accuracy are present in the sample batch.

13.2.4. Continuing Calibration Verification

Continuing calibration verification (CCV) standards are mid-level standards analyzed at specified intervals during the course of the analytical run. CCVs are used to monitor sensitivity changes in the instrument during analysis. In order to properly assess these sensitivity changes, the standards used to perform CCVs must be from the same set of working standards used to calibrate the instrument. Use of a

second source standard is not necessary for CCV standards, since other QC samples are designed to assess the accuracy of the calibration standards. Analysis of CCVs using the calibration standards limits this QC sample to assessing only instrument sensitivity changes. The acceptance criteria and required frequency for CCVs are detailed in Tables 13-1 through 13-3. If a CCV falls outside the acceptance limits, the analytical system is not in control, and immediate corrective action must be taken.

Data obtained while the instrument is out of control is not reportable, and all samples analyzed during this period must be reanalyzed. If reanalysis is not an option, the original data must be flagged with the appropriate qualifier and reported. A narrative must be submitted listing the results that were generated while the instrument was out of control, in addition to corrective actions that were applied.

13.2.5. Laboratory Blanks

Laboratory blanks (also called extraction blanks, procedural blanks, or method blanks) are used to assess the background level of a target analyte resulting from sample preparation and analysis. Laboratory blanks are carried through precisely the same procedures as the field samples. For both organic and inorganic analyses, a minimum of at least one laboratory blank must be prepared and analyzed in every analytical batch or per 20 samples, whichever is more frequent. Some methods may require more than one laboratory blank with each analytical run. Acceptance criteria for laboratory blanks are detailed in Tables 13-1 through 13-3. Blanks that are too high require corrective action to bring the concentrations down to acceptable levels. This may involve changing reagents, cleaning equipment, or even modifying the utilized methods or SOPs. Although acceptable laboratory blanks are important for obtaining results for low-level samples, improvements in analytical sensitivity have pushed detection limits down to the point where some amount of analyte will be detected in even the cleanest laboratory blanks. The magnitude of the blanks must be evaluated against the concentrations of the samples being analyzed and against project objectives.

13.2.6. Reference Materials and Demonstration of Laboratory Accuracy

Evaluation of the accuracy of laboratory procedures is achieved through the preparation and analysis of reference materials with each analytical batch. Ideally, the reference materials selected are similar in matrix and concentration range to the samples being prepared and analyzed. The acceptance criteria for reference materials are listed in Tables 13-1 – 13-3. The accuracy of an analytical method can be assessed using CRMs only when certified values are provided for the target analytes. When possible, reference materials that have certified values for the target analytes should be used. This is not always possible, and often times certified reference values are not available for all target analytes. Many reference materials have both certified and non-certified (or reference) values listed on the certificate of analysis. Certified reference values are clearly distinguished from the non-certified reference values on the certificate of analysis.

13.2.7. Reference Materials vs. Certified Reference Materials

The distinction between a reference material and a certified reference material does not involve how the two are prepared, rather with the way that the reference values were established. Certified values are determined through replicate analyses using two independent measurement techniques for verification. The certifying agency may also provide “non-certified or “reference” values for other target analytes. Such values are determined using a single measurement technique that may introduce bias. When available, it is preferable to use reference materials that have certified values for all target analytes. This is not always an option, and therefore it is acceptable to use materials that have reference values for these

analytes. Note: Standard Reference Materials (SRMs) are essentially the same as CRMs. The term "Standard Reference Material" has been trademarked by the National Institute of Standards and Technology (NIST), and is therefore used only for reference materials distributed by NIST.

13.2.8. Laboratory Control Samples

While reference materials are not available for all analytes, a way of assessing the accuracy of an analytical method is still required. LCSs provide an alternate method of assessing accuracy. An LCS is a specimen of known composition prepared using contaminant-free reagent water or an inert solid spiked with the target analyte at the midpoint of the calibration curve or at the level of concern. The LCS must be analyzed using the same preparation, reagents, and analytical methods employed for regular samples. If an LCS needs to be substituted for a reference material, the acceptance criteria are the same as those for the analysis of reference materials..

13.2.9. Prioritizing Certified Reference Materials, Reference Materials, and Laboratory Control Samples

Certified reference materials, reference materials, and laboratory control samples all provide a method to assess the accuracy at the mid-range of the analytical process. However, this does not mean that they can be used interchangeably in all situations. When available, analysis of one certified reference material per analytical batch should be conducted. Certified values are not always available for all target analytes. If no certified reference material exists, reference values may be used. If no reference material exists for the target analyte, an LCS must be prepared and analyzed with the sample batch as a means of assessing accuracy. The hierarchy is as follows: analysis of a CRM is favored over the analysis of a reference material, and analysis of a reference material is preferable to the analysis of an LCS. Substitution of an LCS is not acceptable if a certified reference material or reference material is available, contact the Project Manager and QAO for approval before relying exclusively on an LCS as a measure of accuracy.

13.2.10. Matrix Spikes

A MS is prepared by adding a known concentration of the target analyte to a field sample, which is then subjected to the entire analytical procedure. The MS is analyzed in order to assess the magnitude of matrix interference and bias present. Because these spikes are often analyzed in pairs, the second spike is called the MSD. The MSD provides information regarding the precision of measurement and consistency of the matrix effects. Both the MS and MSD are split from the same original field sample. In order to properly assess the degree of matrix interference and potential bias, the spiking level should be approximately 2-5x the ambient concentration of the spiked sample. To establish spiking levels prior to sample analysis, if possible, laboratories should review any relevant historical data. In many instances, the laboratory will be spiking samples blind and will not meet a spiking level of 2-5x the ambient concentration. In addition to the recoveries, the relative percent difference (RPD) between the MS and MSD is calculated to evaluate how matrix affects precision. The MQO for the RPD between the MS and MSD is the same regardless of the method of calculation. These are detailed in Tables 13-1 – 13-3. Recovery data for matrix spikes provides a basis for determining the prevalence of matrix effects in the samples collected and analyzed. If the percent recovery for any analyte in the MS or MSD is outside of the limits specified in Tables 13-1 – 13-3, the chromatograms (in the case of trace organic analyses) and raw data quantitation reports should be reviewed. Data should be scrutinized for evidence of sensitivity shifts (indicated by the results of the CCVs) or other potential problems with the analytical process. If associated QC samples (reference materials or LCSs) are in control, matrix effects may be the source of

the problem. If the standard used to spike the samples is different from the standard used to calibrate the instrument, it must be checked for accuracy prior to attributing poor recoveries to matrix effects.

13.2.11. Laboratory Duplicates

In order to evaluate the precision of an analytical process, a field sample is selected and prepared in duplicate. Specific requirements pertaining to the analysis of laboratory duplicates vary depending on the type of analysis. The acceptance criteria for laboratory duplicates are specified in Tables 13-1 – 13-3.

13.2.12. Laboratory Duplicates vs. Matrix Spike Duplicates

Although the laboratory duplicate and matrix spike duplicate both provide information regarding precision, they are unique measurements. Laboratory duplicates provide information regarding the precision of laboratory procedures at actual ambient concentrations. The matrix spike duplicate provides information regarding how the matrix of the sample affects both the precision and bias associated with the results. It also determines whether or not the matrix affects the results in a reproducible manner. MS/MSDs are often spiked at levels well above ambient concentrations, so thus are not representative of typical sample precision. Because the two concepts cannot be used interchangeably, it is unacceptable to analyze only an MS/MSD when a laboratory duplicate is required.

13.2.13. Replicate Analyses

The Monitoring Program will adopt the same terminology as SWAMP in defining replicate samples, wherein replicate analyses are distinguished from duplicate analyses based simply on the number of involved analyses. Duplicate analyses refer to two sample preparations, while replicate analyses refer to three or more. Analysis of replicate samples is not explicitly required.

13.2.14. Surrogates

Surrogate compounds accompany organic measurements in order to estimate target analyte losses or matrix effects during sample extraction and analysis. The selected surrogate compounds behave similarly to the target analytes, and therefore any loss of the surrogate compound during preparation and analysis is presumed to coincide with a similar loss of the target analyte. Surrogate compounds must be added to field and QC samples prior to extraction, or according to the utilized method or SOP. Surrogate recovery data are to be carefully monitored. If possible, isotopically labeled analogs of the analytes are to be used as surrogates.

13.2.15. Internal Standards

To optimize gas chromatography mass spectrometry (GC-MS) analysis, internal standards (also referred to as “injection internal standards”) may be added to field and QC sample extracts prior to injection. Use of internal standards is particularly important for analysis of complex extracts subject to retention time shifts relative to the analysis of standards. The internal standards can also be used to detect and correct for problems in the GC injection port or other parts of the instrument. The analyst must monitor internal standard retention times and recoveries to determine if instrument maintenance or repair or changes in analytical procedures are indicated. Corrective action is initiated based on the judgment of the analyst. Instrument problems that affect the data or result in reanalysis must be documented properly in logbooks and internal data reports, and used by the laboratory personnel to take appropriate corrective action. Performance criteria for internal standards are established by the method or laboratory SOP.

13.2.16. Dual-Column Confirmation

Due to the high probability of false positives from single-column analyses, dual column confirmation should be applied to all gas chromatography and liquid chromatography methods that do not provide definitive identifications. It should not be restricted to instruments with electron capture detection (ECD).

13.2.17. Dilution of Samples

Final reported results must be corrected for dilution carried out during the process of analysis. In order to evaluate the QC analyses associated with an analytical batch, corresponding batch QC samples must be analyzed at the same dilution factor. For example, the results used to calculate the results of matrix spikes must be derived from results for the native sample, matrix spike, and matrix spike duplicate analyzed at the same dilution. Results derived from samples analyzed at different dilution factors must not be used to calculate QC results.

13.2.18. Laboratory Corrective Action

Failures in laboratory measurement systems include, but are not limited to: instrument malfunction, calibration failure, sample container breakage, contamination, and QC sample failure. If the failure can be corrected, the analyst must document it and its associated corrective actions in the laboratory record and complete the analysis. If the failure is not resolved, it is conveyed to the respective supervisor who should determine if the analytical failure compromised associated results. The nature and disposition of the problem must be documented in the data report that is sent to the Consultant-PM. Suggested ccorrective actions are detailed in Table 13-9.

Table 13-1. Measurement Quality Objectives - PCBs.

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Tuning[2]	Per analytical method	Per analytical method
Calibration	Initial method setup or when the calibration verification fails	• Correlation coefficient (r^2 >0.990) for linear and non-linear curves • If RSD<15%, average RF may be used to quantitate; otherwise use equation of the curve • First- or second-order curves only (not forced through the origin) • Refer to SW-846 methods for SPCC and CCC criteria[2] • Minimum of 5 points per curve (one of them at or below the RL)
Calibration Verification	Per 12 hours	• Expected response or expected concentration ±20% • RF for SPCCs=initial calibration[4]
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analytes
Reference Material	Per 20 samples or per analytical batch	70-130% recovery if certified; otherwise, 50-150% recovery
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	50-150% or based on historical laboratory control limits (average±3SD)
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	50-150% or based on historical laboratory control limits (average±3SD); RPD<25%
Surrogate	Included in all samples and all QC samples	Based on historical laboratory control limits (50-150% or better)
Internal Standard	Included in all samples and all QC samples (as available)	Per laboratory procedure
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count (sediment and water samples only)	RPD<25% (n/a if concentration of either sample<RL)
Field Blank	Not required for the Monitoring Program	<RL for target analytes

Table 13-2. Measurement Quality Objectives – Inorganic Analytes.

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Continuing Calibration Verification	Per 10 analytical runs	80-120% recovery
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery ; RPD<25%
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if concentration of either sample<RL)
Internal Standard	Accompanying every analytical run when method appropriate	60-125% recovery
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count	RPD<25% (n/a if concentration of either sample<RL), unless otherwise specified by method
Field Blank, Equipment Field, Eqpt Blanks	Not required for the Monitoring Program	Blanks<RL for target analyte

Table 13-3. Measurement Quality Objectives – Conventional Analytes.

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Laboratory Blank	Total organic carbon only: one per 20 samples or per analytical batch, whichever is more frequent (n/a for other parameters)	80-120% recovery
Reference Material	One per analytical batch	RPD<25% (n/a if native concentration of either sample<RL)
Laboratory Duplicate	(TOC only) one per 20 samples or per analytical batch, whichever is more frequent (n/a for other parameters)	80-120% recovery
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count	RPD<25% (n/a if concentration of either sample<RL)
Field Blank, Travel Blank, Field Blanks	Not required for the Monitoring Program analytes	NA

Consistent with SWAMP QAPP and as applicable, percent moisture should be reported with each batch of sediment samples. Sediment data must be reported on a dry weight basis.

Table 13-4. Target MRLs for Sediment Quality Parameters.

Analyte	MRL
Sediment Total Organic Carbon	0.01% OC
Bulk Density	n/a
%Moisture	n/a
%Lipids	n/a
Mercury	30 µg/kg

Table 13-5. Target MRLs for PCBs in Water, Sediment and Caulk

Congener	Water MRL (µg/L)	Sediment MRL (µg/kg)	Caulk/Sealant MRL (µg/kg)
PCB 8	0.002	0.2	0.5
PCB 18	0.002	0.2	0.5
PCB 28	0.002	0.2	0.5
PCB 31	0.002	0.2	0.5
PCB 33	0.002	0.2	0.5
PCB 44	0.002	0.2	0.5
PCB 49	0.002	0.2	0.5
PCB 52	0.002	0.2	0.5
PCB 56	0.002	0.2	0.5
PCB 60	0.002	0.2	0.5
PCB 66	0.002	0.2	0.5
PCB 70	0.002	0.2	0.5
PCB 74	0.002	0.2	0.5
PCB 87	0.002	0.2	0.5
PCB 95	0.002	0.2	0.5
PCB 97	0.002	0.2	0.5
PCB 99	0.002	0.2	0.5
PCB 101	0.002	0.2	0.5
PCB 105	0.002	0.2	0.5
PCB 110	0.002	0.2	0.5
PCB 118	0.002	0.2	0.5
PCB 128	0.002	0.2	0.5
PCB 132	0.002	0.2	0.5
PCB 138	0.002	0.2	0.5
PCB 141	0.002	0.2	0.5
PCB 149	0.002	0.2	0.5
PCB 151	0.002	0.2	0.5
PCB 153	0.002	0.2	0.5
PCB 156	0.002	0.2	0.5
PCB 158	0.002	0.2	0.5
PCB 170	0.002	0.2	0.5
PCB 174	0.002	0.2	0.5
PCB 177	0.002	0.2	0.5
PCB 180	0.002	0.2	0.5
PCB 183	0.002	0.2	0.5
PCB 187	0.002	0.2	0.5
PCB 194	0.002	0.2	0.5
PCB 195	0.002	0.2	0.5
PCB 201	0.002	0.2	0.5
PCB 203	0.002	0.2	0.5

Table 13-6. Size Distribution Categories for Grain Size in Sediment

Wentworth Size Category	Size	MRL
Clay	<0.0039 mm	1%
Silt	0.0039 mm to <0.0625 mm	1%
Sand, very fine	0.0625 mm to <0.125 mm	1%
Sand, fine	0.125 mm to <0.250 mm	1%
Sand, medium	0.250 mm to <0.5 mm	1%
Sand, coarse	0.5 mm to < 1.0 mm	1%
Sand, very coarse	1.0 mm to < 2 mm	1%
Gravel	2 mm and larger	1%

Table 13-7. Target MRLs for TOC, SSC, and Mercury in Water

Analyte	MRL
Total Organic Carbon	0.6 mg/L
Suspended Sediment Concentration	0.5 mg/L
Mercury	0.0002 µg/L

Table 13-8. Corrective Action – Laboratory and Field Quality Control

Laboratory Quality Control	Recommended Corrective Action
Calibration	Recalibrate the instrument. Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Calibration Verification	Reanalyze the calibration verification to confirm the result. If the problem continues, halt analysis and investigate the source of the instrument drift. The analyst should determine if the instrument must be recalibrated before the analysis can continue. All of the samples not bracketed by acceptable calibration verification must be reanalyzed.
Laboratory Blank	Reanalyze the blank to confirm the result. Investigate the source of contamination. If the source of the contamination is isolated to the sample preparation, the entire batch of samples, along with the new laboratory blanks and associated QC samples, should be prepared and/or re-extracted and analyzed. If the source of contamination is isolated to the analysis procedures, reanalyze the entire batch of samples. If reanalysis is not possible, the associated sample results must be flagged to indicate the potential presence of the contamination.
Reference Material	Reanalyze the reference material to confirm the result. Compare this to the matrix spike/matrix spike duplicate recovery data. If adverse trends are noted, reprocess all of the samples associated with the batch.
Matrix Spike	The spiking level should be near the midrange of the calibration curve or at a level that does not require sample dilution. Reanalyze the matrix spike to confirm the result. Review the recovery obtained for the matrix spike duplicate. Review the results of the other QC samples (such as reference materials) to determine if other analytical problems are a potential source of the poor spike recovery.
Matrix Spike Duplicate	The spiking level should be near the midrange of the calibration curve or at a level that does not require sample dilution. Reanalyze the matrix spike duplicate to confirm the result. Review the recovery obtained for the matrix spike. Review the results of the other QC samples (such as reference materials) to determine if other analytical problems are a potential source of the poor spike recovery.
Internal Standard	Check the response of the internal standards. If the instrument continues to generate poor results, terminate the analytical run and investigate the cause of the instrument drift.
Surrogate	Analyze as appropriate for the utilized method. Troubleshoot as needed. If no instrument problem is found, samples should be re-extracted and reanalyzed if possible.
Field Quality Control	**Recommended Corrective Action**
Field Duplicate	Visually inspect the samples to determine if a high RPD between results could be attributed to sample heterogeneity. For duplicate results due to matrix heterogeneity, or where ambient concentrations are below the reporting limit, qualify the results and document the heterogeneity. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.
Field Blank	Investigate the source of contamination. Potential sources of contamination include sampling equipment, protocols, and handling. The laboratory should report evidence of field contamination as soon as possible so corrective actions can be implemented. Samples collected in the presence of field contamination should be flagged.

14. Inspection/Acceptance for Supplies and Consumables

Each sampling event conducted for the Monitoring Program will require use of appropriate consumables to reduce likelihood of sample contamination. The Field-PM will be responsible for ensuring that all supplies are appropriate prior to their use. Inspection requirements for sampling consumables and supplies are summarized in Table 14-1.

Table 14-1. Inspection / Acceptance Testing Requirements for Consumables and Supplies

Project-related Supplies	Inspection / Testing Specifications	Acceptance Criteria	Frequency	Responsible Person Sampling Containers
Sampling supplies	Visual	Appropriateness; no evident contamination or damage; within expiration date	Each purchase	Field Crew Leader

15. Non Direct Measurements, Existing Data

No data from external sources are planned to be used with this project.

16. Data Management

As previously discussed, the Monitoring Program data management will conform to protocols dictated by the study designs (BASMAA 2017a, b). A summary of specific data management aspects is provided below.

16.1. Field Data Management

All field data will be reviewed for legibility and errors as soon as possible after the conclusion of sampling. All field data that is entered electronically will be hand-checked at a rate of 10% of entries as a check on data entry. Any corrective actions required will be documented in correspondence to the QA Officer.

16.2. Laboratory Data Management

Record keeping of laboratory analytical data for the proposed project will employ standard record-keeping and tracking practices. All laboratory analytical data will be entered into electronic files by the instrumentation being used or, if data is manually recorded, then it will be entered by the analyst in charge of the analyses, per laboratory standard procedures.

Following the completion of internal laboratory quality control checks, analytical results will be forwarded electronically to the Field-PM. The analytical laboratories will provide data in electronic format, encompassing both a narrative and electronic data deliverable (EDD).

17. Assessments and Response Actions

17.1. Readiness Reviews

The Field-PM will review all field equipment, instruments, containers, and paperwork to ensure that everything is ready prior to each sampling event. All sampling personnel will be given a brief review of the goals and objectives of the sampling event and the sampling procedures and equipment that will be used to achieve them. It is important that all field equipment be clean and ready to use when it is needed. Therefore, prior to using all sampling and/or field measurement equipment, each piece of equipment will be checked to make sure that it is in proper working order. Equipment maintenance records will be checked to ensure that all field instruments have been properly maintained and that they are ready for use. Adequate supplies of all preservatives, bottles, labels, waterproof pens, etc. will be checked before each field event to make sure that there are sufficient supplies to successfully support each sampling event, and, as applicable, are within their expiration dates. It is important to make sure that all field activities and measurements are properly recorded in the field. Therefore, prior to starting each field event, necessary paperwork such as logbooks, chain of custody record forms, etc. will be checked to ensure that sufficient amounts are available during the field event. In the event that a problem is discovered during a readiness review it will be noted in the field log book and corrected before the field crew is deployed. The actions taken to correct the problem will also be documented with the problem in the field log book. This information will be communicated by the Field-PM prior to conducting relevant sampling. The Field-PM will track corrective actions taken.

17.2. Post Sampling Event Reviews

The Field-PM will be responsible for post sampling event reviews. Any problems that are noted will be documented along with recommendations for correcting the problem. Post sampling event reviews will be conducted following each sampling event in order to ensure that all information is complete and any deviations from planned methodologies are documented. Post sampling event reviews will include field sampling activities and field measurement documentation in order to help ensure that all information is complete. The reports for each post sampling event will be used to identify areas that may be improved prior to the next sampling event.

17.3. Laboratory Data Reviews

The Field-PM will be responsible for reviewing the laboratory's data for completeness and accuracy. The data will also be checked to make sure that the appropriate methods were used and that all required QC data was provided with the sample analytical results. Any laboratory data that is discovered to be incorrect or missing will immediately be reported to the both the laboratory and Consultant-PM. The laboratory's QA manual details the procedures that will be followed by laboratory personnel to correct any invalid or missing data. The Consultant-PM has the authority to request re-testing if a review of any of the laboratory data is found to be invalid or if it would compromise the quality of the data and resulting conclusions from the proposed project.

18. Instrument/Equipment Testing, Inspection and Maintenance

18.1. Field Equipment

Field measurement equipment will be checked for operation in accordance with manufacturer's specifications. All equipment will be inspected for damage when first employed and again when returned from use. Maintenance logs will be kept and each applicable piece of equipment will have its own log that documents the dates and description of any problems, the action(s) taken to correct problem(s), maintenance procedures, system checks, follow-up maintenance dates, and the person responsible for maintaining the equipment.

18.2. Laboratory Equipment

All laboratories providing analytical support for chemical or biological analyses will have the appropriate facilities to store, prepare, and process samples. Moreover, appropriate instrumentation and staff to provide data of the required quality within the schedule required by the program are also required. Laboratory operations must include the following procedures:

- A program of scheduled maintenance of analytical balances, microscopes, laboratory equipment, and instrumentation.
- Routine checking of analytical balances using a set of standard reference weights (American Society of Testing and Materials (ASTM) Class 3, NIST Class S-1, or equivalents).
- Checking and recording the composition of fresh calibration standards against the previous lot, wherever possible. Acceptable comparisons are < 2% of the previous value.
- Recording all analytical data in bound (where possible) logbooks, with all entries in ink, or electronic format.
- Monitoring and documenting the temperatures of cold storage areas and freezer units once per week.
- Verifying the efficiency of fume hoods.
- Having a source of reagent water meeting ASTM Type I specifications (ASTM, 1984) available in sufficient quantity to support analytical operations. The conductivity of the reagent water will not exceed 18 megaohms at 25°C. Alternately, the resistivity of the reagent water will exceed 10 mmhos/cm.
- Labeling all containers used in the laboratory with date prepared, contents, initials of the individual who prepared the contents, and other information, as appropriate.
- Dating and safely storing all chemicals upon receipt. Proper disposal of chemicals when the expiration date has passed.
- Having QAPP, SOPs, analytical methods manuals, and safety plans readily available to staff.
- Having raw analytical data, such as chromatograms, accessible so that they are available upon request.

Laboratories will maintain appropriate equipment per the requirements of individual laboratory SOPs and will be able to provide information documenting their ability to conduct the analyses with the required level of data quality. Such information might include results from interlaboratory comparison studies, control charts and summary data of internal QA/QC checks, and results from certified reference material analyses.

19. Instrument/Equipment Calibration and Frequency

19.1. Field Measurements

Any equipment used should be visually inspected during mobilization to identify problems that would result in loss of data. As appropriate, equipment-specific SOPs should be consulted for equipment calibration.

19.2. Laboratory Analyses

19.2.1. In-house Analysis – XRF Screening

A portable XRF analyzer will be used as a screening tool to estimate the chlorine concentration in each caulk sample. Since caulk often contains in excess of 1% PCBs and detection limits of portable XRF may be in the ppm range, the portable XRF may be able to detect chlorine within caulk containing PCBs down to about 0.1%. The analysis will be performed on the field samples using a test stand. The analyzer will be calibrated for chlorine using plastic pellet European reference materials (EC680 and EC681) upon first use, and standardized each time the instrument is turned on and prior to any caulk Cl analysis. The standardization procedure will entail a calibration analysis of the materials provided/recommended with the XRF analyzer. Analyses will be conducted in duplicate on each sample and notes kept. The mean will be used for comparison to GC–MS results.

19.2.2. Contract Laboratory Analyses

The procedures for and frequency of calibration will vary depending on the chemical parameters being determined. Equipment is maintained and checked according to the standard procedures specified in each laboratory's instrument operation instruction manual.

Upon initiation of an analytical run, after each major equipment disruption, and whenever on-going calibration checks do not meet recommended DQOs (see Section 13), analytical systems will be calibrated with a full range of analytical standards. Immediately after this procedure, the initial calibration must be verified through the analysis of a standard obtained from a different source than the standards used to calibrate the instrumentation and prepared in an independent manner and ideally having certified concentrations of target analytes of a CRM or certified solution. Frequently, calibration standards are included as part of an analytical run, interspersed with actual samples.

Calibration curves will be established for each analyte and batch analysis from a calibration blank and a minimum of three analytical standards of increasing concentration, covering the range of expected sample concentrations. Only those data resulting from quantification within the demonstrated working calibration range may be reported by the laboratory.

The calibration standards will be prepared from reference materials available from the EPA repository, or from available commercial sources. The source, lot number, identification, and purity of each reference material will be recorded. Neat compounds will be prepared weight/volume using a calibrated analytical balance and Class A volumetric flasks. Reference solutions will be diluted using Class A volumetric glassware. Individual stock standards for each analyte will be prepared. Combination working standards will be prepared by volumetric dilution of the stock standards. The calibration standards will be stored at -20º C. Newly prepared standards will be compared with existing standards prior to their use. All solvents

used will be commercially available, distilled in glass, and judged suitable for analysis of selected chemicals. Stock standards and intermediate standards are prepared on an annual basis and working standards are prepared every three months.

Sampling and analytical logbooks will be kept to record inspections, calibrations, standard identification numbers, the results of calibrations, and corrective action taken. Equipment logs will document instrument usage, maintenance, repair and performance checks. Daily calibration data will be stored with the raw sample data

20. Data Review, Verification, and Validation

Defining data review, verification, and validation procedures helps to ensure that Monitoring Plan data will be reviewed in an objective and consistent manner. Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly. The Field-PM will be responsible for initial data review for field forms and field measurements; QA Officer will be responsible for doing so for data reported by analytical laboratories. This includes checking that all technical criteria have been met, documenting any problems that are observed and, if possible, ensuring that deficiencies noted in the data are corrected.

In-house examination of the data produced from the proposed Monitoring Program will be conducted to check for typical types of errors. This includes checking to make sure that the data have been recorded, transmitted, and processed correctly. The kinds of checks that will be made will include checking for data entry errors, transcription errors, transformation errors, calculation errors, and errors of data omission.

Data generated by Program activities will be reviewed against MQOs that were developed and documented in Section 13. This will ensure that the data will be of acceptable quality and that it will be SWAMP-comparable with respect to minimum expected MQOs.

QA/QC requirements were developed and documented in Sections 13.1 and 13.2, and the data will be checked against this information. Checks will include evaluation of field and laboratory duplicate results, field and laboratory blank data, matrix spike recovery data, and laboratory control sample data pertinent to each method and analytical data set. This will ensure that the data will be SWAMP-comparable with respect to quality assurance and quality control procedures.

Field data consists of all information obtained during sample collection and field measurements, including that documented in field log books and/or recording equipment, photographs, and chain of custody forms. Checks of field data will be made to ensure that it is complete, consistent, and meets the data management requirements that were developed and documented in Section 13.1.

Lab data consists of all information obtained during sample analysis. Initial review of laboratory data will be performed by the laboratory QA/QC Officer in accordance with the lab's internal data review procedures. However, upon receipt of laboratory data, the Lab-PM will perform independent checks to ensure that it is complete, consistent, and meets the data management requirements that were developed and documented in Section 13.2. This review will include evaluation of field and laboratory QC data and also making sure that the data are reported in compliance with procedures developed and documented in Section 7.

Data verification is the process of evaluating the completeness, correctness, and conformance / compliance of a specific data set against the method, procedural, or contractual specifications. The Lab-PM and Data Manager will conduct data verification, as described in Section 13 on Quality Control, in order to ensure that it is SWAMP-comparable with respect to completeness, correctness, and conformance with minimum requirements.

Data will be separated into three categories for use with making decisions based upon it. These categories are: (1) data that meets all acceptance requirements, (2) data that has been determined to be unacceptable for use, and (3) data that may be conditionally used and that is flagged as per US EPA specifications.

21. Verification and Validation Methods

Defining the methods for data verification and validation helps to ensure that Program data are evaluated objectively and consistently. For the proposed Program many of these methods have been described in Section 20. Additional information is provided below.

All data records for the Monitoring Program will be checked visually and will be recorded as checked by the checker's initials as well as with the dates on which the records were checked. Consultant Team staff will perform an independent re-check of at least 10% of these records as the validation methodology.

All of the laboratory's data will be checked as part of the verification methodology process. Each contract laboratory's Project Analyst will conduct reviews of all laboratory data for verification of their accuracy.

Any data that is discovered to be incorrect or missing during the verification or validation process will immediately be reported to the Consultant-PM. If errors involve laboratory data then this information will also be reported to the laboratory's QA Officer. Each laboratory's QA manual details the procedures that will be followed by laboratory personnel to correct any invalid or missing data. The laboratory’s QA Officer will be responsible for reporting and correcting any errors that are found in the data during the verification and validation process.

If there are any data quality problems identified, the QA Officer will try to identify whether the problem is a result of project design issues, sampling issues, analytical methodology issues, or QA/QC issues (from laboratory or non-laboratory sources). If the source of the problems can be traced to one or more of these basic activities then the person or people in charge of the areas where the issues lie will be contacted and efforts will be made to immediately resolve the problem. If the issues are too broad or severe to be easily corrected then the appropriate people involved will be assembled to discuss and try to resolve the issue(s) as a group. The QA Officer has the final authority to resolve any issues that may be identified during the verification and validation process.

22. Reconciliation with User Requirements

The purpose of the Monitoring Program is to comply with Provisions of the MRP and provide data that can be used to identify sources of PCBs to urban runoff, and to evaluate management action effectiveness in removing POCs from urban runoff in the Bay Area. The objectives of the Monitoring Program are to provide the following outcomes:

1. Satisfy MRP Provision C.8.f. requirements for POC monitoring for source identification;

2. Satisfy MRP Provision C.12.e.ii requirements to evaluate PCBs presence in caulks/sealants used in storm drain or roadway infrastructure in public ROWs;
3. Report the range of PCB concentrations observed in 20 composite samples of caulk/sealant collected from structures installed or rehabilitated during the 1970's;
4. Satisfy MRP Provision C.8.f. requirements for POC monitoring for management action effectiveness;
5. Quantify the annual mass of mercury and PCBs captured in HDS Unit sumps during maintenance; and
6. Identify BSM mixtures for future field testing that provide the most effective mercury and PCBs treatment in laboratory column tests.

Information from field data reports (including field activities, post sampling events, and corrective actions), laboratory data reviews (including errors involving data entry, transcriptions, omissions, and calculations and laboratory audit reports), reviews of data versus MQOs, reviews against QA/QC requirements, data verification reports, data validation reports, independent data checking reports, and error handling reports will be used to determine whether or not the Monitoring Program's objectives have been met. Descriptions of the data will be made with no extrapolation to more general cases.

Data from all monitoring measurements will be summarized in tables. Additional data may also be represented graphically when it is deemed helpful for interpretation purposes.

The above evaluations will provide a comprehensive assessment of how well the Program meets its objectives. The final project reports will reconcile results with project MQOs.

23. References

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BASMAA. 2016. *BASMAA Regional Monitoring Coalition Creek Status and Toxicity and Pesticide Monitoring Standard Operating Procedures*. Prepared for Bay Area Stormwater Management Agencies Association. Version 3, March 2016.

BASMAA 2017a. The Evaluation of PCBs Presence in Public Roadway and Storm Drain Infrastructure Caulk and Sealants Study Design. Prepared by EOA Inc. and the San Francisco Estuary Institute (SFEI). June 2017.

BASMAA 2017b. POC Monitoring for Management Action Effectiveness Study Design. Prepared by the Office of Water Programs, Sacramento State, CA, EOA Inc., and the San Francisco Estuary Institute (SFEI). July 2017.

BASMAA, 2017c. Clean Watershed for a Clean Bay (CW4CB) Final Report. Prepared for Bay Area Stormwater Management Agencies Association. Prepared by Geosyntec and EOA, Inc., May 2017.

Klosterhaus, S. McKee, L.J. Yee, D., Kass, J.M., and Wong, A. 2014. Polychlorinated Biphenyls in the Exterior Caulk of San Francisco Bay Area Buildings, California, USA. Environment International 66, 38-43.

Surface Water Ambient Monitoring Program Quality Assurance Team, 2013. *SWAMP Quality Assurance Project Plan.* Prepared for the California State Water Quality Control Board. 2013.

24. Appendix A: Field Documentation

Caulk/Sealant Sampling Field Data Sheet	**Composite ID:**	Contractor:	Pg of Pgs
Sample ID:	Date (mm/dd/yyyy):	Personnel:	Failure Reason
Photos (Y / N)	ArrivalTime: / DepartureTime:		
Photo Log Identifier	**Land-Use at the Sample Location:**	Commercial (pre-1980; post 1980)	Open Space
	Industrial (pre-1980; post-1980)	Residential (pre 1980; post 1980)	Other:

Description of Structure: (Do not include any information on the location of the structure)						**Diagram of Structure (if needed) to identify where caulk/sealants were located in/on structure**
Structure Type:	Storm Drain Catch Basin	Roadway Surface	Sidewalk	Curb/Gutter	Bridge	
	Other:					
Structure Material:	Concrete	Asphalt	Other:			
Condition of Structure:	Good	Fair	Poor	Other:		
Year of Strucutre Construction						
Year of Repair						

Description of Caulk or Sealant Sample Collected:							
Application or Usage	Caulk	caulk between adjoing surfaces of same material (e.g., concrete-concrete); Describe:					
		caulk between adjoining surfaces of different types of material (e.g., concrete-asphalt); Describe:					
		Other:					
	Sealant	Crack Repair (describe):					
		Other:					
Color							
Texture	Hard/brittle	Soft/pliable	Other:				
Condition	Good (intact/whole)	Poor (crumbling/disintegrating)	Other:				
Location	Surface	Between Joints	Submerged	Exposed	At street level	Below street level	Other:
Amount of Caulk/Sealant observed on structure	Crack dimensions:				Spacing of expansion joints		
	Length&width of caulk bead sampled:				Other:		

Samples Taken	
COLLECTION DEVICE:	Equiptment type used:
SITE/SAMPLING DESCRIPTION AND COMMENTS:	

HDS Unit Sampling Field Data Sheet (Sediment Chemistry)			Contractor:	Pg of Pgs
City:	Date (mm/dd/yyyy):	/ /	*Contractor:	
HDS Catchment ID:	ArrivalTime:	DepartureTime:	*SampleTime (1st sample):	Failure Reason
	Personnel:			

Photos (Y / N)	*GPS/DGPS	**Lat (dd.ddddd)**	**Long (ddd.ddddd)**	Address, Location, and Sketches (if needed)
Photo Log Identifier	**Target (if known):**			
	***Actual:**			
	GPS Device:			

Estimate of Volume of Sediment in the HDS unit sump prior to cleanout:	
Estimate of Volume of Sediment REMOVED from the HDS unit sump during the cleanout:	

Env. Conditions		WIND DIRECTION (from):	N W E S	
SITE ODOR:	None,Sulfides,Sewage,Petroleum,Smoke,Other_____			
SKY CODE:	Clear, Partly Cloudy, Overcast, Fog, Smoky, Hazy			
PRECIP:	None, Fog, Drizzle, Rain			
PRECIP (last 24 hrs):	Unknown, <1", >1", None			
SOILODOR:	None, Sulfides, Sewage, Petroleum, Mixed, Other_____			
SOILCOLOR:	Colorless, Green, Yellow, Brown			
SOILCOMPOSITION:	Silt/Clay, Sand, Gravel, Cobble, Mixed, Debris			
SOILPOSITION	Submerged, Exposed			

Samples Taken (3 digit ID nos. of containers filled) — **Field Dup at Site? YES / NO:** (create separate datasheet for FDs, with unique IDs (i.e., blind samples)

COLLECTION DEVICE: Equiptment type used: Scoop (SS / PC / PE), Core (SS / PC / PE), Grab (Van Veen / Eckman / Petite Ponar), Broom (nylon, natural fiber)

Sample ID (City-Catchment ID-Sample	DepthCollec (cm)	Composite / Grab (C / G)	Grain Size	PCBs	Hg	Bulk Density	TOC	OTHER		

SITE/SAMPLING DESCRIPTION AND COMMENTS:

Stormwater Field Data Sheet (Water Chemistry)				Entered in d-base (initial/date)			Pg of Pgs
*Station Code:	*Date (mm/dd/yyyy):	/ /			*PurposeFailure:		*Agency:
Personnel:	ArrivalTime:	DepartureTime:					*Protocol:

		*GPS/DGPS	Lat (dd.ddddd)	Long (ddd.ddddd)	
GPS Device:		Target:		-	OCCUPATION METHOD: Walk-in Bridge R/V _____ Other
Datum: NAD83	Accuracy (ft / m):	*Actual:		-	Sampling Location (e.g., gutter at SW corner of 10th Street)

Habitat Observations (CollectionMethod = Habitat_generic)					
SITE ODOR:	None,Sulfides,Sewage,Petroleum,Smoke,Other____	WADEABILITY: Y / N / Unk	BEAUFORT SCALE (see attachment)		
SKY CODE:	Clear, Partly Cloudy, Overcast, Fog, Smoky, Hazy	WIND DIRECTION (from):	N W E S	**PHOTOS** (RB & LB assigned when facing downstream; RENAME to StationCode_yyyy_mm_dd_uniquecode):	1: (RB / LB / BB / US / DS / ##)
OTHER PRESENCE:	Vascular,Nonvascular,OilySheen,Foam,Trash,Other_				
DOMINANT SUBSTRATE:	Bedrock, Concrete, Cobble, Boulder, Gravel, Sand, Mud, Unk, Other_____				
WATERCLARITY:	Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)	PRECIPITATION:	None, Fog, Drizzle, Rain, Snow		2: (RB / LB / BB / US / DS / ##)
WATERODOR:	None, Sulfides, Sewage, Petroleum, Mixed, Other___	PRECIPITATION (last 24 hrs):	Unknown, <1", >1", None		
WATERCOLOR:	Colorless, Green, Yellow, Brown				3: (RB / LB / BB / US / DS / ##)
OVERLAND RUNOFF (Last 24 hrs):	none, light, moderate / heavy, unknown				
OBSERVED FLOW:	NA, Dry Waterbody Bed, No Obs Flow, Isolated Pool, Trickle (<0.1cfs), 0.1-1cfs, 1-5cfs, 5-20cfs, 20-50cfs, 50-200cfs, >200cfs				

Field Samples (Record Time Sample Collected)

Carboy ID #	Start Sample Time	End Sample Time	Sample Type (Grab=G; Integrated = I)	Collection Depth (m)	Field Dup (Yes/No)	Indiv bottle (by hand, by pole, by bucket); Teflon tubing; Kemmer; Pole & Beaker; Other

COMMENTS:

Stormwater Influent Samples – Office of Water Programs

Sample Receiving							
Date (mm/dd/yy):		Time (24 hr) :			Team Member's Initial:		
Carboy	Temperature	pH	Observations				
1							
2							
3							
4							
5							
6							
7							

Stormwater Column Tests – Office of Water Programs

Sampling Run			
Date (mm/dd/yy):	Time (24 hr) :	Team Member's Initials:	Column ID:

During Test - Timed Measurements

Time	Water Depth	Media Condition	Other Observations

Grab Sample - Beginning of Run

Time	Water Depth	Turbidity (NTU)	Temp	pH	Other Observations

Grab Sample - Middle of Run

Time	Water Depth	Turbidity (NTU)	Temp	pH	Other Observations

Grab Sample - End of Run

Time	Water Depth	Turbidity (NTU)	Temp	pH	Other Observations

Grab Sample - Mercury

Time	Water Depth	Turbidity (NTU)	Temp	pH	Other Observations

25. Appendix B: Laboratory Standard Operating Procedures (SOPs)

APPENDIX C: PCBS CONGENERS CONCENTRATION DATA

PCBs Congener Concentrations Composites A-J (µg/kg dry weight). ND = non-detect (<0.05 µg/kg).

	Composite ID									
Congener	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
PCB 008	88000	44000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 018	300000	310000	ND	ND	ND	ND	ND	ND	6	ND
PCB 020+033	260000	320000	ND	80	ND	ND	ND	ND	6.6	ND
PCB 028	250000	400000	ND	ND	ND	ND	ND	ND	9	ND
PCB 031	240000	390000	26	ND	ND	ND	ND	ND	7.9	ND
PCB 043+049	370000	200000	ND	180	ND	ND	ND	ND	ND	ND
PCB 044	520000	310000	ND	ND	ND	ND	ND	ND	7	ND
PCB 052+069	420000	260000	18	50	ND	ND	ND	ND	ND	ND
PCB 056	250000	240000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 060	280000	160000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 061+074	320000	200000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 066	400000	380000	ND	ND	ND	ND	ND	ND	10	ND
PCB 070	410000	430000	17	ND	ND	ND	ND	ND	9	ND
PCB 086+097+117+125	52000	36000	61	ND	ND	ND	ND	ND	ND	ND
PCB 087+111+115	64000	41000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 089+090+101	120000	ND	32	81	ND	ND	ND	ND	ND	ND
PCB 093+095+098+102	66000	40000	27	ND	ND	ND	ND	ND	ND	ND
PCB 099	47000	27000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 105+127	72000	54000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 106+118	76000	57000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 110	100000	76000	47	ND	ND	ND	ND	ND	ND	ND
PCB 128	8300	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 132	5200	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 138	35000	28000	31	ND	ND	ND	ND	ND	ND	ND
PCB 139+149	28000	20000	19	ND	ND	ND	ND	ND	ND	ND
PCB 141	10000	11000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 151	8200	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 153	36000	28000	19	ND	ND	ND	ND	ND	ND	ND
PCB 156	7100	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 158+160	5700	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 170	18000	18000	480	310	ND	ND	ND	ND	ND	ND
PCB 174	14000	14000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 177	7700	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 180	34000	33000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 182+187	15000	12000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 183	7200	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 194	9500	11000	ND	ND	ND	ND	ND	ND	ND	ND
PCB 195	3400	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 196+203	9200	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 201	800	350	ND	ND	ND	ND	ND	ND	ND	ND

PCBs Congener Concentrations Composites K - T. (µg/kg dry weight). ND = non-detect (<0.05 µg/kg).

Congener	Composite ID									
	K	L	M	N	O	P	Q	R	S	T
PCB 008	ND	ND	ND	ND	ND	ND	250	ND	ND	ND
PCB 018	ND	ND	ND	ND	ND	ND	2400	ND	29	ND
PCB 020+033	ND	ND	ND	ND	ND	ND	2000	ND	43	ND
PCB 028	65	ND	ND	ND	ND	ND	2700	ND	100	ND
PCB 031	55	ND	ND	ND	ND	ND	2500	ND	67	ND
PCB 043+049	ND	ND	ND	ND	ND	ND	1100	ND	86	ND
PCB 044	ND	ND	ND	ND	ND	ND	1700	ND	130	ND
PCB 052+069	ND	ND	ND	ND	ND	ND	1400	2800	110	2.6
PCB 056	ND	ND	ND	ND	ND	ND	1100	ND	100	ND
PCB 060	ND	ND	ND	ND	ND	ND	700	ND	61	ND
PCB 061+074	ND	ND	ND	ND	ND	ND	980	ND	84	ND
PCB 066	ND	ND	ND	ND	ND	ND	2000	ND	190	ND
PCB 070	ND	ND	ND	ND	ND	ND	2100	ND	240	2.8
PCB 086+097+117+125	ND	ND	ND	ND	ND	ND	200	ND	59	ND
PCB 087+111+115	ND	ND	ND	ND	ND	ND	180	ND	79	ND
PCB 089+090+101	46	ND	ND	ND	ND	ND	400	ND	170	4.1
PCB 093+095+098+102	ND	ND	ND	ND	ND	ND	140	ND	71	ND
PCB 099	ND	ND	ND	ND	ND	ND	110	ND	52	ND
PCB 105+127	ND	ND	ND	ND	ND	ND	190	ND	72	ND
PCB 106+118	ND	ND	ND	ND	ND	ND	200	ND	110	ND
PCB 110	ND	ND	ND	ND	ND	ND	230	ND	160	3.8
PCB 128	ND	ND	ND	ND	ND	ND	24	ND	28	ND
PCB 132	ND	ND	ND	ND	ND	ND	71	ND	16	ND
PCB 138	40	ND	ND	ND	ND	ND	130	ND	110	3.8
PCB 139+149	29	ND	ND	ND	ND	ND	84	ND	72	3.2
PCB 141	ND	ND	ND	ND	ND	ND	30	ND	22	ND
PCB 151	ND	ND	ND	ND	ND	ND	23	ND	14	ND
PCB 153	ND	ND	ND	ND	ND	ND	28	ND	88	3.8
PCB 156	ND	ND	ND	ND	ND	ND	ND	ND	16	ND
PCB 158+160	ND	ND	ND	ND	ND	ND	ND	ND	18	ND
PCB 170	130	ND	ND	ND	ND	ND	760	ND	19	ND
PCB 174	ND	ND	ND	ND	ND	ND	46	ND	10	ND
PCB 177	ND	ND	ND	ND	ND	ND	35	ND	6.5	ND
PCB 180	41	ND	ND	ND	ND	ND	110	ND	20	3.9
PCB 182+187	26	ND	ND	ND	ND	ND	ND	ND	11	ND
PCB 183	ND	ND	ND	ND	ND	ND	21	ND	8.2	ND
PCB 194	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 195	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 196+203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 201	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND