CONTRA COSTA PCBS AND MERCURY TMDL CONTROL MEASURE PLAN AND REASONABLE ASSURANCE ANALYSIS

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

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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
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LIST OF ACRONYMS

BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practices
CCCWP	Contra Costa Clean Water Program
g	gram
GSI	Green Stormwater Infrastructure
GIS	Geographic Information System
HRU	Hydrologic Response Unit
mg	milligram
mg/kg	milligram per kilogram
MPC	Monitoring and Pollutants of Concern Committee
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
MTC	Metropolitan Transportation Commission
ng	nanogram
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PCBs	Polychlorinated Biphenyls
PG&E	Pacific Gas and Electric
POTW	Publicly Owned Treatment Works
RAA	Reasonable Assurance Analysis
ROW	Right-of-Way
RWSM	Regional Watershed Spreadsheet Model
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SSID	Stressor/Source Identification
SWMM	Stormwater Management Model
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WY	Water Year

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Executive Summary

This report presents the implementation plan for the Contra Costa County Clean Water Program (CCCWP or Program) Permittees within Region 2[1] to meet mercury and polychlorinated biphenyls (PCBs) load reductions required by Total Maximum Daily Loads (TMDLs). The plan is required by the San Francisco Bay Regional Water Quality Control Board (Water Board) through the Municipal Regional Stormwater NPDES Permit (MRP). MRP Provisions C.11.c.iii.(2), C.11.c.iii.(3), C.11.d.iii, C.12.c.iii.(2), C.12.c.iii.(3), and C.12.d.iii specifically require a report providing a mercury and PCBs control measures implementation plan and corresponding reasonable assurance analysis (RAA).

CCCWP Permittees recommend a programmatic approach for reducing PCBs and mercury loads from urban stormwater discharges, whereby compliance is assessed based on implementing and documenting a regionally agreed-on program of control measures, which include:

- Management of PCBs in building materials during demolition,
- Source property identification and abatement,
- Management of PCBs in electrical utility equipment,
- Management of PCBs in bridge structures during replacement,
- Green stormwater infrastructure (GSI),
- Full trash capture devices, and
- Enhanced operation and maintenance, such as enhanced inlet cleaning.

As part of the process to implement C.11.d and C.12.d, CCCWP Permittees have worked diligently with peer stormwater programs through the Bay Area Stormwater Management Agency Association (BASMAA) to define the actions and quantifiable benefits of PCBs and mercury control measures. Lessons learned from over 15 years of monitoring, analysis, and reporting informed a series of technical work group meetings beginning in March 2019, with the active

[1] Permittees within Region 2 include the Cities of Clayton, Pittsburg, Concord, Martinez, Pleasant Hill, Walnut Creek, San Ramon, Lafayette, Orinda, El Cerrito, Richmond, San Pablo, Pinole, Hercules, the Towns of Danville and Moraga, and portions of unincorporated Contra Costa County and the Flood Control District. This requirement does not apply to the Cities of Brentwood, Antioch, or Oakley as they are not subject to the San Francisco Bay PCBs TMDL. East County Permittees have separate requirements for demonstrating reasonable assurance that Central Valley TMDLs will be achieved.

participation of Regional Water Board staff in four of those meetings. These workgroup meetings have resulted in a programmatic approach agreed on regionally by all stormwater programs. The programmatic approach includes feasible implementation actions that will move the Permittees forward towards the TMDL load reduction goals. Commitment to the programmatic actions provide Permittees with planning certainty needed for compliance while addressing the public interest in measurable progress towards achieving water quality standards.

This TMDL Implementation Report presents an estimate of the load reductions resulting from PCBs and mercury control programs, along with an objective assessment of how inherent uncertainties affect forecast outcomes. It is important to emphasize that projected pace of control measure implementation and the resultant predicted load reductions are based on current and projected business practices, which are subject to change. Economic or socio-economic impacts and political shifts may affect future implementation scenarios, causing increases or decreases in the amount of private investment and public funds available for development and control measure implementation, and/or changes in the ability to provide services that are needed for implementation.

PCBs Control Measures

Control measures discussed in Section 2 of this report focus on PCBs. Accounting methodologies are presented for both PCBs and mercury control measures in the RAA Report (Appendix A) and the supporting BASMAA Source Control Loads Reduction Accounting for RAA Report (Appendix B).

Table ES-1 below summarizes the PCBs program of control measures and the estimated resulting load reductions over time that would result from the proposed control measures.

Table ES-1. Summary of PCBs Control Measures and Estimated Load Reductions

Control Measure	PCBs Load Reduction (kg/yr) by:			
	2020	2030	2040	2050
1. PCBs in Building Materials Management	0.37	0.37	0.37	0.37
2. Source Property Identification and Abatement	0.21	0.54	0.54	0.54
3. PCBs in Electrical Utilities Management	0.07	0.12	0.17	0.21
4. PCBs in Infrastructure	0.00	0.01	0.02	0.02
5. Green Stormwater Infrastructure	0.14	0.18	0.26	0.32
6. Full Trash Capture Treatment Control Measures	0.05	0.05	0.05	0.05
7. Enhanced Operations and Maintenance	0.004	0.004	0.004	0.004
Total Load Reduced	0.84	1.27	1.41	1.51
Load Reduction Goal	1.51	1.51	1.51	1.51
Remaining Load to be Reduced	0.67	0.24	0.10	0

The analysis shows that based on current assumptions the load reduction needed to achieve the PCBs goals assigned to Contra Costa County permittees would not be achieved until after 2040 (i.e., when shaded bottom row in Table ES-1 reaches zero). The RAA estimate of achieving the PCBs TMDL wasteload allocation by 2050 is based on many assumptions, and while the RAA demonstrates that Contra Costa will not achieve the PCBs load reduction goal before 2050, this goal may not be achieved until well after 2050.

However, Provision C.12.d states that this report should describe scenarios showing a path to compliance by 2030. The analysis provided in Appendix G shows that it is technically and economically infeasible to achieve the TMDL wasteload allocation by 2030.

The discussion by control measure below includes the elements of each control measure, ramifications for Permittees, and an assessment of the level of effort or change of assumptions that would result in compliance by 2030.

PCBs in Building Materials Management

Permittees will continue implementing adopted ordinances requiring inspection for and removal of PCBs-containing building materials prior to demolition, and reporting outcomes annually. Now that the ordinances have been adopted, Permittee effort applied to permitting building demolition projects and providing information for annual reports is not expected to increase. Program costs could be impacted if there are requirements for additional studies, such as effectiveness assessments or refined methods for estimating loads reduced. Past Program costs

for participation in TMDL studies have ranged from about $10,000 - $100,000 depending on the scope and complexity. Any such study costs would be factored into the overall Program monitoring plan, including regional collaborations, with the usual goal of containing or reducing overall program monitoring costs.

There is no way to accelerate the schedule of attaining TMDL goals by changes to this control measure. Studies would provide information that helps better understand whether the PCBs load reduction achieved is greater or less than 0.37 kg per year (for Contra Costa County) but would not likely lead to significant changes in the implementation of the program.

Source Property Identification and Abatement

Permittees (e.g., Cities of San Pablo, Richmond, and Pittsburg, unincorporated Contra Costa County) with Old Industrial areas will continue source property investigations and referrals. This would continue to impact time and attention for those Permittees. CCCWP has performed a detailed analysis of Old Industrial land areas and has developed a Conceptual Work Plan for Source Area Investigation, included as Appendix C. Based on the analysis, CCCWP will propose a schedule for screening potential PCBs source areas, with 25 percent of such land areas being screened by the end of MRP 3.0. To that end, Program resources would continue to be applied to the source area investigations at about the level of effort established in MRP 1.0 and MRP 2.0.

The rate of discovering new source properties theoretically could be accelerated by increased monitoring effort; however, there is no assurance that new source properties would be discovered. Diminishing returns are expected from this investigation effort going forward, because early efforts targeted high likelihood areas. Therefore, there is low likelihood that progress shown in Table ES-1 above could be accelerated by increased effort on this control measure.

PCBs in Electrical Utilities Management

This control measure will improve procedures to document removal and disposal of PCBs in oil-filled electrical equipment (OFEE) as part of ongoing maintenance practices for municipally owned electrical utilities in the MRP area. The Pittsburg Power Company is the only municipally owned electrical utility in Contra Costa County; the remainder of the county is served by the Pacific Gas and Electric Company (PG&E). The Pittsburg Power Company will document the

removal of PCBs-containing electrical equipment since 2005 and provide data to support calculations of the associated stormwater load reductions due to these efforts.[2]

The limiting factor on implementing this control measure, outside of municipally owned power companies, will likely continue to be the Water Board's ability to direct PG&E to provide the same data and documentation as the municipally owned electrical utilities.

PCBs in Infrastructure

Permittees will inventory bridges in their jurisdictions, including known information about past maintenance, expected maintenance needs, and useful life. The Permittees will then use the inventories to track bridge replacement or rehabilitation projects in their jurisdictions to ensure that contract standard specifications and special provisions addressing PCBs removal from bridge materials are included in any such work. This TMDL Implementation Plan includes the assumption that the responsibility for developing the contract standard specifications and special provisions will be assigned to Caltrans by the State Water Resources Control Board.

Permittees have no way of increasing the benefit from or accelerating the rate of implementing this control measure once it is implemented.

<u>Green Stormwater Infrastructure</u>

Permittees will implement their Green Stormwater Infrastructure plans. This will encumber municipal time and attention at current levels, or potentially increased levels, depending on the level of development and redevelopment activity. Permittees will continue tracking GSI implementation in an ArcGIS online (AGOL) database (or a suitable replacement system). The Program will continue to gather data annually to assess PCBs loads reduced. The rate of implementing this control measure is constrained by the rate of private development, private redevelopment, and municipal capital project development.

[2] BASMAA conducted a regional Stressor/Source Identification (SSID) project that developed and implemented a regional SSID workplan to further understand the magnitude and extent of PCBs released by electrical utility equipment spills, and to identify controls that could be implemented to reduce the water quality impacts of this source. As a result of this project, BASMAA sent a letter to the SFBRWQCB requesting that the Regional Water Board use its authority under Section 13267 of the California Water Code to compel private electrical utilities operating in the Bay Region to provide technical information that is needed to support further investigation of electrical utility equipment and properties as potential sources of PCBs to MS4s in the Bay Region.

Full Trash Capture Treatment Control Measures

Permittees will continue tracking full trash capture devices in AGOL. The Program would continue to gather AGOL data annually to assess PCBs loads reduced. The opportunities to accelerate this or expand the benefit are limited, as there are a finite number of full trash capture opportunities available to Permittees.

Enhanced Operations and Maintenance (O&M)

Enhanced O&M generally means increasing the frequency that sediment is removed from storm drain catch basin inserts, or increasing street sweeping frequencies. Permittees began enhanced O&M measures in 2017-18, resulting in the 0.004 g / year pf PCBs reduced shown in Table ES-1. Permittees will continue to perform enhanced O&M at current levels and will consider expanding enhanced O&M in Old Industrial areas and / or near source property areas.

Diversion to POTW

A pilot diversion project performed during MRP 1.0 showed limited benefit from diverting wet or dry weather urban runoff to sanitary sewers for treatment. Permittees do not anticipate stormwater diversion to sanitary sewers will be an implementation action in the foreseeable future.

Mercury Control Measures

The RAA confirmed the original TMDL findings that urban stormwater is closer to achieving mercury goals compared to PCB goals. As progress is made towards achieving PCB goals, mercury goals will also be achieved. GSI that reduces stormwater volumes and traps urban sediments will reduce mercury loads in addition to PCBs. Thus, the approach to achieving mercury TMDL wasteload allocations for urban stormwater will be via stormwater management actions that concurrently address PCBs.

Schedule for Implementation

The RAA results predict that the PCBs TMDL wasteload allocation will be achieved in Contra Costa County no sooner than the year 2050, although several of the control measures would continue to be implemented for other reasons after this date. For example, GSI provides multiple benefits, addresses other urban pollutants, and is a requirement for new development and redevelopment projects, so would continue to be implemented as long as that requirement is in place. In addition, the Management of PCBs in Building Materials, Management of PCBs in Electrical

Utilities, and Management of PCBs in Infrastructure programs will be implemented until these sources have been abated. As PCBs have been banned in the United States since 1979, it is likely that these programs will no longer be needed by 2050, 70 years later. The Source Property Identification and Abatement Program will be complete by 2040. Full trash capture device implementation is assumed to be complete no later than 2030. The source control measure Mercury Load Avoidance and Reduction, which began during MRP 1.0, is assumed to continue indefinitely.

Evaluation of Costs

The estimate of public agency costs for implementing the PCBs and mercury control measures ranges from $1,000,000,000 to $2,000,000,000 countywide. The estimated cost for implementing source control programs is negligible in comparison to the estimated costs for implementing GSI measures. An analysis of cost effectiveness demonstrates that source control measures are much more cost efficient than treatment control measures at reducing loads of PCBs in urban runoff.

Public project implementation will depend on funding availability. Funding for implementation of projects included in the Permittees' Green Infrastructure Plans would be obtained by the municipal agency, partnerships of agencies, or other stakeholder project sponsors working to implement the identified projects. Economic or socio-economic impacts and political shifts may affect future implementation scenarios, causing increases or decreases in the amount of private investment and public funds available for development and control measure implementation, and/or changes in the ability to provide services that are needed for implementation.

Uncertainty Analysis

There are two types of uncertainty in this analysis: modeling uncertainty and planning uncertainty. The RAA (Appendix A) discusses modeling uncertainty. The main causes of modeling uncertainty are: 1) the scientific soundness of the model, and 2) the reliability and applicability of the data used in the model. Modeling uncertainties were addressed through a peer review that is documented along with the RAA modeling approach in Appendix H. Modeling uncertainty is not as much of a limiting factor on the ability to forecast change as compared to planning uncertainties that result from input assumptions.

The estimate of achieving the PCBs TMDL wasteload allocation by 2050 is based on several assumptions that introduce planning uncertainties. The RAA result that Contra Costa will not achieve the PCBs load reduction goal before 2050 is reasonably certain (i.e., not likely to change

as a result of changed assumptions). But it is possible, due to planning uncertainties, that this goal may not be achieved until well after 2050. Examples of planning uncertainties that lead to uncertainty in the RAA results include:

- The assumption that the building demolition program achieves a PCBs load reduction benefit equivalent to 0.37 kg/yr (Table ES-1, top row) is an order of magnitude estimate – the true value could be double or half the assumed value.
- The willingness of PG&E to implement a control measures plan for OFEE is not assured.
- The RAA model does not include PCBs degradation, which could theoretically lead to achievement of the TMDL slightly sooner than predicted.
- The load reduction benefit of source property investigations is based on specific assumptions about the expected number of future source property referrals or abatements that may not play out as expected.
- Climate change, long-term meteorological patterns, and large seismic events could each significantly affect watershed transport of polluted sediments.
- Sea level rise could cause Bay Margin sites to become partly or fully submerged, moving those potential source areas from the domain of stormwater control measures to the domain of in-bay remediation.
- Large scale economic or socio-economic and political shifts, which may be either planned (e.g. , Federal Infrastructure Projects that create GSI funding opportunities) or unplanned, (e.g., the 2020 COVID-19 pandemic), can affect the rate of GSI implementation.

1. INTRODUCTION

1.1 Purpose

This *PCBs and Mercury TMDL Control Measure Plan and Reasonable Assurance Analysis* report was prepared by the Contra Costa Clean Water Program (CCCWP) as required by 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.c.iii.(2), C.11.c.iii.(3), C.11.d.iii, C.12.c.iii.(2), C.12.c.iii.(3), and C.12.d.iii for providing a mercury and PCBs control measures implementation plan and corresponding reasonable assurance analysis (RAA).

The following MRP reporting requirements are addressed within this report:

- An estimate of the amount and characteristics of land area that will be treated through green stormwater infrastructure (GSI) implementation by 2020, 2030, and 2040; the data used; and a full description of models and model inputs relied on to generate this estimate.
- A reasonable assurance analysis to demonstrate quantitatively that Contra Costa's population-based portion of PCBs reductions of at least 3 kg/yr and mercury reductions of at least 10 kg/yr will be realized by 2040 through implementation of GSI projects; all data used; a full description of models and model inputs relied on to make the demonstration; and documentation of peer review of the reasonable assurance analysis.
- A PCBs and mercury control measure implementation plan and corresponding RAA that demonstrates quantitatively that the plan will result in mercury load reductions sufficient to attain the mercury TMDL wasteload allocations by 2028 and PCBs load reductions sufficient to attain the PCBs TMDL wasteload allocations by 2030. The plan must:
    1. Identify all technically and economically feasible PCBs control measures and mercury control measures (including GSI projects) to be implemented;
    2. Include a schedule according to which these technically and economically feasible control measures will be fully implemented; and
    3. Provide an evaluation and quantification of the PCBs load reduction and mercury 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 is organized into the following sections:

1. Introduction and Background – Section 1 describes requirements for managing mercury and PCBs per the TMDLs and the MRP.
2. PCBs Control Measure Plan – Section 2 describes the technically and economically feasible PCBs control measures that are currently being implemented or will be implemented by the Permittees during this and future permit terms.
3. Mercury Control Measure Plan – Section 3 describes the technically and economically feasible mercury control measures that are currently being implemented or will be implemented by the Permittees during this and future permit terms.
4. Schedule of Implementation – the schedule of implementation for the PCBs and mercury control measures is provided in Section 4.
5. Costs, Efficiency, and Environmental Impacts – Section 5 provides an evaluation of costs, control measure efficiency, and significant environmental impacts resulting from the implementation of the PCBs and mercury control measures.
6. Conclusion – the final section summarizes the findings of the report.

The RAA provided in Appendix A presents estimates of the PCBs and mercury loads that will be reduced through implementation of the control measures described in the PCBs and Mercury Control Measure Plans presented in Section 2 and Section 3. This RAA summarizes the data used, describes the model and model inputs, and documents peer review.

1.2 Background

1.2.1 PCBs and Mercury 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 and placed 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 to reduce PCBs and mercury from entering stormwater runoff and the Bay. These control measures, or BMPs, are the tools that Permittees can use to assist in restoring water quality in the Bay.

PCBs TMDL

The PCBs TMDL was developed based on a fish tissue target of 10 nanograms (ng) of PCBs per gram (g) of fish tissue. This target is based on a cancer risk of one case per an exposed population of 100,000 for the 95th percentile San Francisco Bay Area sport and subsistence fisher consumer (32 g fish per day) (SFBRWQCB, 2008). A food web model was developed by San Francisco Estuary Institute (SFEI) to identify the sediment target concentration that would yield the fish tissue target; this sediment target was found to be 1 microgram (µg) of PCBs per kg of sediment. This is equivalent to reducing the total mass of PCBs in the active layer of the San Francisco Bay to 160 kg. The San Francisco Estuary Institute (Davis, 2003; SFEI, 2007a) developed a mass budget model that identified the total external load of PCBs to the Bay that would attain a long-term (i.e., equilibrated) PCBs mass in the bay of 160 kg within approximately 30 years. The mass budget model estimated that reduction of the external load to 10 kg of PCBs per year would achieve this goal, assuming a starting Bay-wide PCBs concentration in surface sediment of 4.65 micrograms per kilogram (µg/kg)[3] (SFEI, 2007a). Twenty percent of the estimated allowable external load was allocated to urban stormwater runoff.

The wasteload allocation (WLA) for PCBs for urban stormwater is 2 kg/yr by 2030. This load allocation was developed by applying the required sediment concentration (1 µg/kg) to the estimated annual sediment load discharged from local tributaries. The PCBs TMDL staff report (SFBRWQCB, 2008) estimated the annual sediment load originating from stormwater to be 2,000,000 metric tons (i.e., 2,000,000,000 kg/yr) based on a range of then available estimates

[3] Bay-wide PCBs concentration in surface sediment estimated based on Regional Monitoring Program 2004 – 2006 data (SFEI, 2007a).

and differing methods. This WLA was distributed among the counties on population in the year 2000. A summary of the allocations for each county is provided in Table 1-1.

Table 1-1: PCBs Wasteload Allocations by County

County	Population (year 2000)	Wasteload Allocations (kg/yr)
Alameda	1,440,000	0.5
Contra Costa	790,000	0.3
Marin	240,000	0.1
Napa	120,000	0.05
San Francisco	630,000	0.2
San Mateo	600,000	0.2
Santa Clara	1,600,000	0.5
Solano	290,000	0.1
Sonoma	110,000	0.05
Total		2

The PCBs TMDL Staff Report estimates a total stormwater load of 20 kg/yr based on studies conducted by SFEI (SFEI, 2006; 2007b). SFEI calculated this baseline load using three different methods to scale monitoring data (grab sample concentration data from Water Year (WY) 2005[4], United States Geologic Survey [USGS] continuous discharge, and suspended sediment data) from Coyote Creek and the Guadalupe River by area and land use. Subtracting the WLA for urban stormwater from this estimate resulted in a required load reduction of 18 kg/yr (i.e., a 90% reduction) by 2030. Note that the MRP area[5] portion of the 2 kg/yr allocation is 1.6 kg/yr.

PCBs TMDL compliance can be demonstrated through two different approaches:

1. Meet the WLA (i.e., monitoring and/or modeling-based compliance demonstration); and
2. Demonstrate the required load reductions can be achieved (i.e., modeling-based compliance demonstration).

[4] Although the PCBs TMDL Staff Report states that PCBs loads estimates for the Guadalupe River were based on data collected between 2003 and 2005; SFEI, 2006 indicates that the baseline load estimate of 20 kg/yr was based on an extrapolation of monitoring data collected in WY 2005.

[5] Marin, Napa, San Francisco, and Sonoma are not within the MRP boundary.

Mercury TMDL

The mercury TMDL addresses two water quality objectives. The first, established to protect people who consume Bay fish, applies to fish large enough to be consumed by humans. The objective is 0.2 milligrams (mg) of mercury per kilogram (kg) of fish tissue (average wet weight concentration measured in the muscle tissue of fish large enough to be consumed by humans). The second objective, established to protect aquatic organisms and wildlife, applies to small fish (3-5 centimeters in length) commonly consumed by the California least tern, an endangered species. This objective is 0.03 mg mercury per kg fish (average wet weight concentration). To achieve the human health and wildlife fish tissue and bird egg monitoring targets and to attain water quality standards, the Bay-wide suspended sediment mercury concentration target is 0.2 mg mercury per kg dry sediment.

A roughly 50% decrease in sediment, fish tissue, and bird egg mercury concentrations is necessary for the Bay to meet water quality standards. Reductions in sediment mercury concentrations are assumed to result in a proportional reduction in the total amount of mercury in the system, which will result in the achievement of target fish tissue and bird egg concentrations (SFBRWQCB, 2004).

The urban stormwater runoff load to the San Francisco Bay is estimated to be equivalent to 116 kg/yr, as reported in the San Francisco Bay Regional Monitoring Program for Water Quality's Sources, Pathways, and Loadings Report (McKee et al., 2015), which is less than the Mercury TMDL Staff Report reported load of 160 kg/yr[6] (corresponding to "baseline year" of 2003). The WLA for urban stormwater is 82 kg/yr (SFBRWQCB, 2006). Based on the TMDL reported load of 160 kg/yr, this results in an estimated total required load reduction of 78 kg/yr, required to be achieved by 2028. A summary of the WLA and load reductions required for each urban stormwater entity subject to the TMDL is provided in Table 1-2 (SFBRWQCB, 2006).

[6] This loading assumes an annual sediment load of 410,000,000 kg/yr of sediment with a concentration of 0.38 mg/kg (ppm) (SFBRWQCB, 2006). Although the estimates were based on monitoring data collected in previous years, the TMDL states the baseline year as 2003.

Table 1-2: Mercury Wasteload Allocations by County

Entity	Wasteload Allocation (kg/yr)[1]
Santa Clara Valley Urban Runoff Pollution Prevention Program	23
Alameda Countywide Clean Water Program	20
Contra Costa Clean Water Program	11
San Mateo County Stormwater Pollution Prevention Program	8.4
Vallejo Sanitation and Flood Control District	1.6
Fairfield-Suisun Urban Runoff Management Program	1.6
American Canyon	0.14
Sonoma County area	1.6
Napa County area	1.6
Marin County area	3.3
Solano County area	0.81
San Francisco County area	8.8
Total	82

[1] Listed in Table 4-w of Appendix A in the Mercury TMDL Staff Report (SFBRWQCB, 2006).

Mercury TMDL compliance can be demonstrated through the following three approaches[7]:

1. Show mercury concentrations are below 0.2 milligrams mercury per kilogram of sediment (mg/kg) on a countywide level (i.e., monitoring-based compliance demonstration);
2. Meet the WLA in Table 1-2 (i.e., monitoring and/or modeling-based compliance demonstration);[8] and
3. Demonstrate the required load reductions can be achieved (i.e., modeling-based compliance demonstration).

[7] Detailed documentation requirements for demonstration of these approaches are summarized in the Mercury TMDL Staff Report (SFBRWQCB, 2006).

[8] Modeling-based compliance demonstration requires monitoring-based empirical inputs to conduct the analyses.

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.

The MRP was amended on February 13, 2019, to add the cities of Antioch, Brentwood, Oakley, and the eastern portions of unincorporated Contra Costa County and the Contra Costa County Flood Control & Water Conservation District (the East County Permittees), which are located within the jurisdiction of the Central Valley Water Board (Region 5) and were previously covered under a separate Joint Municipal NPDES Permit titled "East Contra Costa County Municipal NPDES Permit". The East County Permittees are not subject to the PCBs and mercury TMDLs, although they have been implementing PCBs and mercury control measures. The amended MRP specifically exempts the East County Permittees from MRP Provisions C.11 and C.12, but does incorporate requirements for the Sacramento-San Joaquin Delta Estuary Methylmercury TMDL. Therefore, this report does not report on planned PCBs and mercury control measure implementation or RAA results for the East County Permittees. For unincorporated Contra Costa County, this report summarizes the control measures implemented and the PCBs and mercury loads reduced within the SFBRWQCB Region 2 boundary.

MRP Provision C.3.j required each Permittee to develop a Green Infrastructure Plan for inclusion in the 2019 Annual Report. CCCWP developed, and each of the Permittees used, a mechanism to prioritize and map areas for potential and planned green infrastructure 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. The RAA required in Provisions C.11.c and C.12.c should do the following:

1. Quantify the relationship between the areal extent of green infrastructure 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 green infrastructure strategies likely to be implemented.
2. Estimate the amount and characteristics of land area that will be treated by green infrastructure by 2020, 2030, and 2040.
3. Estimate the amount of mercury and PCBs load reductions that will result from green infrastructure implementation by 2020, 2030, and 2040.

4. Quantitatively demonstrate that mercury load reductions of at least 10 kg/yr and PCBs load reductions of at least 3 kg/yr will be realized by 2040 through implementation of green infrastructure projects.
5. 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. The implementation plans must:

1. Identify all technically and economically feasible mercury or PCBs control measures (including green infrastructure 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.

1.2.3 Bay Area RAA Guidance

From a regulatory perspective, reasonable assurance is defined as the demonstration that the implementation of control measures will, in combination with operation of existing or proposed storm drain system infrastructure and management programs, result in sufficient pollutant reductions over time to meet total maximum daily load (TMDL) wasteload allocations, water quality-based effluent limits (WQBELs), or other water quality targets specified in a municipal separate storm sewer system (MS4) permit (USEPA, 2017). From the perspective of a stakeholder in the watershed who is focused on the improvement of water quality or restoration of a beneficial use of a waterbody, reasonable assurance is the demonstration and a commitment that specific management practices are identified with sufficient detail (and with a schedule for implementation) to establish that necessary improvements in the receiving water quality will occur. From the perspective of a MS4 Permittee, reasonable assurance is a detailed analysis of

TMDL WLAs, associated permit limitations, and the extent of stormwater management actions needed to achieve TMDL WLAs and address receiving water limitations. RAAs may also assist in evaluating the financial resources needed to meet pollutant reductions based on schedules identified in the permit, TMDL, or stormwater management plan, and in preparing associated capital improvement plans.

As defined in the *Bay Area RAA Guidance Document* (BASMAA, 2017), an RAA is a demonstration that the control measures proposed in Bay Area City and County Green Infrastructure 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 wasteload allocations for urban stormwater runoff over the defined period of time. Additionally, the RAA should provide a method for evaluating the type, size, number, location, and phasing of green infrastructure measures needed to comply with the green infrastructure load reduction goal (i.e., 10 kilograms per year [kg/yr] mercury load reductions and 3 kg/yr PCBs load reductions by 2040) stated in MRP Provisions C.11/C.12.c. As such, the green infrastructure planning and associated RAAs will require adaptive management. The RAA may also be used to justify extending the TMDL compliance schedules (SFBRWQCB, 2015). [9]

The MRP provides flexibility for Permittees to define what constitutes an acceptable RAA, however the RAAs developed in compliance with the MRP must be peer reviewed and must be approved by the SFBRWQCB. The RAA presented in this report is consistent with the guidance provided in the *Bay Area RAA Guidance Document* (BASMAA, 2017).

[9] See MRP Attachment A: Fact Sheet page Attachment A-122.

2. PCBS CONTROL MEASURE PLAN

This section describes the control measures that are currently being implemented or will be implemented by the Permittees during this and future permit terms to control PCBs in urban runoff.

2.1 Source Control Measures

Source control measures include the following programs:

- PCBs in building materials management,
- Source area investigation and abatement,
- PCBs in electrical utilities management, and
- PCBs in infrastructure management.

Each of these source control programs are described below.

2.1.1 Management of PCBs in Building Materials Program

The Permittees have developed and implemented, in cooperation with the Bay Area Stormwater Management Agencies Association (BASMAA), a protocol for managing materials with PCBs concentrations of 50 ppm or greater in applicable structures at the time such structures undergo demolition. 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 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.[10]

[10] Each Permittee seeking exemption from this program must have submitted documentation to the SFBRWQCB, 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.

The CCCWP and Permittees participated in a BASMAA Regional Project to address PCBs in building materials. This Regional Project developed an implementation framework, guidance materials, and tools for local agencies to ensure that PCBs-containing materials and wastes are properly managed during building demolition; these materials are provided in Appendix D. This Regional Project also provided training materials and a workshop for municipal staff and an outreach workshop for the industry on implementing the framework/protocols developed via the project. 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.

Permittees have implemented the following process for this control measure:

- Municipalities inform applicable demolition permit applicants that their projects are subject to the program for managing materials with PCBs, necessitating, at a minimum, an initial screening for priority PCBs–containing materials.
- For every applicable demolition project, applicants implement the BASMAA protocol for identifying building materials with PCBs concentrations of 50 ppm and then complete and submit a version of BASMAA's model "PCBs Screening Assessment Form" (Screening Form) or equivalent to the municipality.
- The municipality reviews the Screening Form to make sure it is filled out correctly and is complete and works with the applicant to correct any deficiencies.
- The municipality then issues the demolition permit or equivalent, according to its procedures.
- The municipality sends each completed Screening Form for applicable structures and any supporting documents to its countywide program. The countywide program compiles the forms and works with the other MRP countywide programs to manage and evaluate the data, and to assist Permittees with associated MRP reporting requirements.

Data collection started with implementation of the new program on July 1, 2019. When enough new data have been collected, the data will support:

- Development of a revised estimate of the reduction in PCBs loading to stormwater runoff resulting from implementation of the new program, and

- Evaluation of various aspects of the PCBs management program and the effectiveness of potential future refinements.

2.1.2 Source Property Identification and Abatement Program

CCCWP provides monitoring to support source property identification that at times (i.e., for one to three percent of land area investigated) leads to referrals and self-abatement of properties. These are typically sites in Old Industrial areas where PCBs were used, released, and/or disposed of and/or where sediment concentrations are significantly elevated above urban background levels and are being transported to the MS4. The source property identification and abatement control measure begins with performing investigations in High Likelihood/Interest areas to identify PCBs sources. A detailed description of the investigation process is provided in Appendix E. This program is an example of the CCCWP Permittees collectively funding investigations to help abate discharge of PCBs-contaminated sediments.

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. Source properties may include sites that were previously remediated but still have soils concentrations of PCBs that are elevated above urban background levels or may be newly identified source properties. Source properties may also include industrial facilities with ongoing industrial activities that are covered under the General Permit for Stormwater Discharges Associated with Industrial Activities (Industrial General Permit) or another NPDES permit.

CCCWP identifies significantly elevated PCBs concentrations through surface soil/sediment sampling in the public ROW or through water sampling where visual inspections and/or other information suggest that a specific property is a potential source of significantly elevated PCBs concentrations. Where data confirm significantly elevated concentrations (e.g., a sediment PCBs concentration equal to or greater than 1.0 mg/kg or a sediment concentration greater than 0.5 mg/kg and other lines of evidence) are present in soil/sediment from a potential source property or in stormwater samples, the Permittees may take actions to cause the property to be abated or may refer that property to the SFBRWQCB to facilitate the issuance of orders for further investigation and remediation of the subject property.

For each referred source property, the applicable Permittee will implement or cause to be implemented one or a combination of interim enhanced O&M measures in the public street or

storm drain infrastructure adjacent to the source property during the source property abatement process, or will implement a stormwater treatment system downstream of the property to intercept historically deposited sediment. The intent is to prevent further contaminated sediment from being discharged from the storm drain system. These enhanced O&M measures and/or treatment systems are described in the source property referral form that is sent to the SFBRWQCB. If implementation of enhanced O&M is not feasible (e.g., for properties that discharge directly to the Bay), the source property may still be referred to the SFBRWQCB, although PCBs load reduction credit would be received after the property is abated or after 10 years, whichever occurs first.

The selected enhanced O&M control measure(s) or stormwater treatment must be implemented and maintained during the source property abatement process and should be sufficient to intercept historically deposited sediment in the public ROW and prevent additional contaminated sediment from being discharged from the MS4. The Permittee should discuss the referral and achieve resolution with the SFBRWQCB prior to submitting the source property referral.

When a referred industrial facility is considered to be abated by the Permittee and the SFBRWQCB, the enhanced O&M measures may be discontinued, and ongoing facility inspections would be conducted as appropriate as part of the Permittee's routine industrial inspection program.

The properties in Contra Costa that have been referred to the SFBRWQCB or self-abated through FY 2019/20 are listed in Table 2-1 below.

The Permittees, with the support of the CCCWP, have estimated the remaining old industrial area to be investigated within Contra Costa County (Table 2-2). Appendix C provides a conceptual work plan for completing these investigations. Parcels that drain directly to the Bay may also be investigated, as feasible, if determined to be a high-likelihood source property.

Table 2-1: CCCWP 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	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
Fass Metals	818 W. Gertrude Avenue, Richmond, CA 94801 / 408-160-011	0.2	FY 2017/18	Referral w/out Enhanced O&M
Zeneca/Former Stauffer Chemical Company	1415 South 47th St, Richmond, CA 94804 / 560-050-022	9.2	FY 2019/20	Referral w/out Enhanced O&M
UC Richmond Field Station	1301 South 46th Street, Richmond, CA 94804 / 560-060-008	14.0	FY 2019/20	Referral w/out Enhanced O&M

Table 2-2: Old Industrial Areas to be Investigated within Contra Costa County

Description		Total Area (acres)
Total urban area below dams, within Region 2, and draining to the Bay		254,365
A.	All Old Industrial land use areas (2002)[1]	21,459
B.	Old Industrial land use areas that have redeveloped since 2002 and/or are currently treated by green stormwater infrastructure	1,135
C.	Old Industrial land use areas that have been previously determined to be low likelihood, investigated[2], referred, or abated.	9,236
D.	Old Industrial land use areas that do not drain to the MS4, rather drain directly to the Bay	6,550
E.	Old Industrial land use areas that will be investigated (A – (B + C + D))	4,539

Notes:

1. Does not include Old Industrial land use areas within Eastern Contra Costa County (Region 5).
2. Includes areas associated with the Concord Naval Weapons Station, parcels identified as being primarily open space, and Old Industrial parcels associated with low (<0.5 mg/kg) sediment samples.

If investigation does not identify a specific source for an Old Industrial area with observed elevated concentrations, then the source area will be considered for the application of other types of control measures, such as treatment controls or enhanced O&M.

2.1.3 Management of PCBs in Electrical Utilities Program

The Management of PCBs in Electrical Utilities Program includes the development and implementation of improved procedures for documenting removal and disposal of PCBs-containing electrical equipment as part of ongoing equipment maintenance practices.

For this control measure program, municipally owned electrical utilities will document the removal of PCBs-containing electrical equipment since the start of the TMDL and in the future until all PCBs-containing OFEE have been removed from active service and will provide data to support calculations of the associated stormwater load reductions due to these efforts.[11] The

[11] BASMAA conducted a regional Stressor/Source Identification (SSID) project that developed and implemented a regional SSID workplan to further understand the magnitude and extent of PCBs released by electrical utility equipment spills, and to identify controls that could be implemented to reduce the water quality impacts of this source. As a result of this project, BASMAA sent a letter to the SFBRWQCB requesting that the Regional Water Board use its authority under Section 13267 of the California Water Code to compel private electrical utilities operating in the Bay Region to provide technical information that is needed to support further investigation of electrical utility equipment and properties as potential sources of PCBs to MS4s in the Bay Region.

Pittsburg Power Company is the only municipally owned electrical utility in Contra Costa County; the remainder of the county is served by the Pacific Gas and Electric Company (PG&E).

Electrical utility equipment and facilities in both the transmission and distribution systems are distributed across the MRP region. In the past, PCBs were routinely used in electrical utility equipment that contained dielectric fluid as an insulator. This is because prior to the 1979 PCBs ban, dielectric fluid was typically formulated with PCBs due to a number of desirable properties they have (e.g., high dielectric strength, thermal stability, chemical inertness, and non-flammability). Electrical equipment containing dielectric fluid is typically identified as Oil-Filled Electrical Equipment (OFEE). Any OFEE that contained PCBs in the past could still potentially contain PCBs today. The most common types of OFEE that may contain PCBs are transformers, capacitors, circuit breakers, reclosers, switches in vaults, substation insulators, voltage regulators, load tap changers, and synchronous condensers (PG&E, 2000).

There are hundreds of thousands of pieces of OFEE in public rights-of-way and at hundreds of electrical sub-station facilities across the MRP region. Some portion of these OFEE that are older and/or refurbished may contain (or contained in the past) dielectric fluids with PCBs at concentrations that are of concern if released to MS4s. Due to their large quantity, dispersed nature, and the difficulty in tracking and monitoring discharges, Permittees are limited in their ability to implement and/or enforce consistent and appropriate control measures to reduce releases of PCBs from this source category. This creates a potential missed opportunity to account for past and ongoing removal of PCBs-containing OFEE which has been and continues to reduce loads of PCBs from MS4s to the Bay.

2.1.4 Management of PCBs in Infrastructure Program

The BASMAA study *Evaluation of PCBs in Caulk and Sealants in Public Roadway and Storm Drain Infrastructure* (BASMAA, 2018) sampled caulk and sealant materials from public roadway and storm drain infrastructure around the Bay Area. The sampling program was designed to specifically target roadway and storm drain structures that were constructed during the most recent time period when PCBs were potentially used in caulk and sealant materials (i.e., prior to 1980, with a focus on the 1960's and 1970's). A total of 54 caulk and sealant samples were collected from ten different types of roadway and storm drain structures in the ROW, including concrete bridges/overpasses, sidewalks, curbs and gutters, roadway surfaces, above and below ground storm drain structures (i.e., flood control channels and storm drains accessed from manholes), and electrical utility boxes or poles attached to concrete sidewalks. The individual

samples were grouped by structure type and sample appearance (color and texture) and the groups were combined into 20 composites; 10 of these groups were collected from concrete bridges, overpasses, or roadways.

Total PCBs concentrations across the 20 composite samples ranged from non-detect to greater than 4,000 mg/kg. The majority of the composites had PCBs concentrations that were below 0.2 mg/kg. PCBs were not detected in ten of the composite samples, representing nearly 60% of the individual samples collected during this program. PCBs in twenty-five percent (5 of 20) of the composites were above 1 mg/kg. Of these, two composites had very high PCBs concentrations (greater than 1,000 ppm) that indicate PCBs were likely part of the original caulk or sealant formulations. Both of these composites were comprised of black, pliable joint filler materials that were collected from concrete bridges/overpasses.

This control measure has been developed as a result of the outcome of this study. For this control measure, Permittees will implement the following actions:

1. Maintain a list of applicable bridges that are scheduled for replacement or joint maintenance.
2. Implement or cause to be implemented the Caltrans specifications during applicable bridge projects that are under the direction of the Permittee.
3. Track and report on the use of the specifications for all applicable bridge projects within the Permittee's jurisdiction.

2.2 Treatment Control Measures

Treatment control measures include green stormwater infrastructure (GSI), full trash capture devices, enhanced operation and maintenance (O&M) practices, and diversion to publicly-owned treatment works (POTW). Each of these treatment control measures are described below.

2.2.1 Green Stormwater Infrastructure

Green stormwater infrastructure (GSI) refers to constructing and retrofitting storm drainage systems to mimic natural processes by slowing runoff by dispersing it to vegetated areas, harvesting and using runoff, promoting infiltration and evapotranspiration, and using bioretention to filter stormwater runoff. This control measure includes implementation of GSI in new development and redevelopment projects that are under the Permittees' planning and

building authority, as well as retrofit of existing infrastructure in public right-of-way (ROW) areas and on publicly owned parcels.

MRP Provision C.3 mandates implementation of a comprehensive program of stormwater control measures and actions designed to limit contributions of urban runoff pollutants to San Francisco Bay, including PCBs and mercury. GSI has been incorporated into new development and redevelopment projects in Contra Costa County since 2005. The first edition of the CCCWP *Stormwater C.3 Guidebook* was published in 2005. The current 7th Edition of the *Stormwater C.3 Guidebook* was published in 2017. Ancillary support documents, such as example projects, design details, and reporting templates, are continually being developed by the CCCWP to assist the Permittees in C.3 implementation. All of these documents are available on the CCCWP website[12].

Permittees track C.3 project implementation in an ArcGIS Online (AGOL) database. CCCWP developed the countywide GIS database to assist with maintaining, analyzing, interpreting, displaying, and reporting relevant municipal stormwater program data and information related to MRP Provision C.3, Provision C.10 (i.e., trash load reduction activities), and Provisions C.11/C.12 (i.e., mercury and PCBs TMDL implementation activities).

MRP Provision C.3.j required each Permittee located within Region 2[13] to develop a Green Infrastructure Plan for inclusion in the 2019 Annual Report. These Green Infrastructure Plans mapped and prioritized areas for potential and planned public and private GSI projects for implementation by 2020, 2030, and 2040. The RAA provided in Appendix A of this report estimates the PCBs and mercury load reductions that would be achieved through implementation of the Permittees' Green Infrastructure Plans.

The results of the RAA analysis (see Appendix A) demonstrate that GSI projects that have the highest potential to reduce PCBs loads are concentrated within a small subset of the Contra Costa County Permittee area due to the pattern of pre-1980 industrial development within the region. These communities have lower median incomes, higher poverty rates, and score lower on public

[12] See: https://www.cccleanwater.org/development-infrastructure/

[13] East County Permittees were brought into coverage under the MRP by an amendment (Order R2-2019-0004) in January 2019. Provision C.16.5.a requires East County Permittees to submit Green Infrastructure Plans by December 31, 2020.

health indices, correlating with the presence of environmental stressors. The local governments have fewer resources and have difficulty maintaining aging infrastructure while meeting social needs. Conversely, most Contra Costa County Permittees have no or very few opportunities to contribute significantly toward achievement of countywide PCBs loading reductions via implementation of GSI in their communities. Further, if PCBs load reductions are not achieved on a regional or countywide scale, and load reductions are allocated at a local level (by population), these Permittees would not be able to achieve those load reduction allocations due to a lack of opportunity.

Further, the Permittees determined that prioritizing GSI projects based on PCBs load-reduction effectiveness could compromise public support for their Green Infrastructure programs overall. Many of the sites in Old Industrial areas have little pedestrian traffic; placement of an expensive urban amenity in these locations may be perceived as poor planning and poor use of scarce infrastructure funding.

Also, while GSI is an effective multi-decadal strategy for reducing PCB loading if implemented in the context of the multiple benefits that could be obtained from a long-term shift from "grey" to "green" infrastructure—as envisioned in MRP Provision C.3.j.—when considered solely as a pollutant control measure it is not nearly as cost-efficient as source controls. See Section 5.1.

Given these findings, and following discussions with SFBRWQCB staff, Contra Costa County Permittees prioritized their GI projects to achieve multiple benefits, including control of other stormwater pollutants, preserving and enhancing local stream hydrology, reducing localized flooding, helping communities adapt to climate change by increasing the resiliency of water supply, and public health benefits that derive from integrating landscaped areas into the urbanized environment.

Additional actions that the Permittees have taken or will take to promote the implementation of GSI include:

- Incorporate GSI requirements into planning documents such as General Plans, Specific Plans, Complete Streets Plans, Active Transportation Plans, Storm Drain Master Plans, Pavement Work Plans, Urban Forestry Plans, Flood Control or Flood Management Plans, and other plans that may affect the future alignment, configuration, or design of impervious surfaces within the Permittee's jurisdiction;

- Evaluate funding options for GSI projects;
- Adopt policies, ordinances, and/or other appropriate legal mechanisms to ensure implementation of their Green Infrastructure Plans;
- Conduct public outreach, train Permittee staff, and educate elected officials on the MRP GSI requirements and methods of implementation; and
- Maintain a list of public infrastructure improvement projects that have a potential for incorporating GSI.

Permittees will continue to implement GSI projects and will work with the SFBRWQCB staff on setting achievable GSI goals in future iterations of the MRP.

2.2.2 Full Trash Capture Treatment Control Measures

MRP Provision C.10 requires Permittees to implement trash prevention and control actions, including full trash capture systems, to reduce trash generation. Full trash capture systems capture sediment along with trash that may be contaminated with PCBs and mercury. Permittees have installed both large and inlet-based full trash capture devices in response Provision C.10. Large full trash capture devices, including hydrodynamic separators (HDS), gross solids removal devices (GSRDs), and baffle boxes, capture and treat urban runoff from large drainage areas, ranging from 10's to 100's of acres. Inlet-based devices in roadways enhance the capture of sediments that may be contaminated with PCBs and mercury from smaller, localized drainage areas. In addition, these inlets are typically cleaned more frequently as a result of the installation of the full trash capture device. Trash capture device implementation is described in each Permittee's Trash Load Reduction Plan. Permittees track installed trash capture devices in the AGOL database and to use the database to run scenarios to guide future locations for these devices. Permittees did not update the Trash Load Reduction Plan that was developed prior to adopting the visual assessment methodology.

2.2.3 Enhanced Operation and Maintenance

Routine MS4 O&M activities conducted by Permittees include street sweeping and drain inlet cleaning. In addition, storm drains, culverts, and channels are maintained as needed (i.e., desilted when needed to remove excessive quantities of accumulated sediment that may be causing localized flooding issues). Infrequent capital improvement projects may also remove accumulated sediment from the MS4, such as storm drain repairs or channel stabilization

projects. Each of these O&M activities removes PCBs and mercury that are present in the sediment that is removed. The RAA provided in Appendix A of this report estimates the PCBs and mercury load reductions that are achieved through implementation of increased levels of street sweeping and drain inlet cleaning since 2003.

Enhanced O&M control measures are implemented as part of the Source Property Identification and Abatement Program (see Section 2.2.1 below) for referred source properties. Additional Enhanced O&M or other corrective measures will be considered for Old Industrial source areas with observed elevated concentrations of PCBs if the source area investigation does not identify a specific source property and the source is suspected to be historically deposited sediment in the public ROW or the storm drain system.

PCBs and mercury load reductions achieved through implementation of enhanced O&M control measures, aside from enhanced O&M control measures associated with source property referrals, will be reported as part of the overall load reductions in future permit terms.

2.2.4 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 conducted at the North Richmond Pump Station (CCCWP, 2016) showed limited benefit from diverting wet or dry weather urban runoff to sanitary sewers for treatment, thus there is no ongoing diversion. Permittees do not anticipate stormwater diversion to sanitary sewer will be an implementation action in the foreseeable future.

3. MERCURY CONTROL MEASURE PLAN

The Mercury TMDL and subsequent MRP permit provisions implementing the TMDL include the assumption that urban stormwater is closer to achieving TMDL WLAs than PCBs. For this reason, the mercury control plan first names specific, well-defined measures to control the release of mercury from consumer products, and then notes that PCB control measures will also help achieve stormwater mercury WLAs. The RAA Report (Appendix A) explains how control measures translate to mercury loads reduced.

3.1 Source Control Measures

3.1.1 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 CCCWP coordinates with Permittees and local household hazardous waste 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 household hazardous waste 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, San Pablo, and unincorporated areas of Contra Costa County.

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.

3.2 Treatment Control Measures

Treatment control measures that address PCBs in stormwater will also reduce mercury. These treatment control measures, described in Section 2.2 above, include green stormwater infrastructure, full trash capture devices, and enhanced O&M.

Because of the widespread nature of mercury in the urban environment, further progress on reducing mercury loads will most likely occur in tandem with stormwater treatment control measures addressing PCBs (e.g., GSI implementation). The RAA provided in Appendix A of this report estimates the mercury load reductions that would be achieved through implementation of treatment control measures addressing PCBs.

4. SCHEDULE OF IMPLEMENTATION

4.1 Overall Schedule of Implementation

Table 4-1 below presents the schedule of implementation for each of the control measures described in the PCBs Control Measure Plan (Section 2) and the Mercury Control Measure Plan (Section 3). The schedule in Table 4-1 shows when implementation of each control measure began and will be complete with respect to TMDL implementation. The RAA results provided in Appendix A predict that the PCBs TMDL WLA will be achieved in Contra Costa County by the year 2050, thus this date is listed for most of the control measures, although several of the control measures would continue to be implemented for other reasons. For example, GSI as implemented provides multiple benefits, addresses other urban pollutants, and is a requirement for new development and redevelopment projects, so would continue to be implemented as long as that requirement is in place. In addition, the Management of PCBs in Building Materials, Management of PCBs in Electrical Utilities, and Management of PCBs in Infrastructure programs will be implemented until these sources have been abated. As PCBs have been banned in the United States since 1979, it is likely that these programs will no longer be needed by 2050, 70 years later. The Source Property Identification and Abatement Program will be complete by 2040, as described in the conceptual investigation workplan provided in Appendix C. Full trash capture device implementation is assumed to be complete no later than 2030. The source control measure Mercury Load Avoidance and Reduction, which began during MRP 1.0, is assumed to continue indefinitely.

Table 4-1: PCBs and Mercury Control Measure Plan Schedule of Implementation

Control Measure	Begin Implementation	Implementation Complete
Management of PCBs in Building Materials	2019	2050
Source Property Identification and Abatement	2015	2040
Management of PCBs in Electrical Utilities	2019	2050
Management of PCBs in Infrastructure	2021	2050
Green Stormwater Infrastructure	2003	Ongoing
Full Trash Capture Treatment Control	2005	2030
Enhanced Operations and Maintenance	2003	2050
Mercury Load Avoidance and Reduction	2005	Ongoing

4.2 Green Stormwater Infrastructure Schedule of Implementation

Table 4-2 below provides an estimate of the amount of public and private land area that will be treated through GSI implementation by 2020, 2030, and 2040 countywide. These areas are summarized from the Permittees' Green Infrastructure Plans, which were submitted to the SFBRWQCB in 2019. The data and models used to generate this estimate and schedules for GSI implementation for each Permittee are described in each Permittee's Green Infrastructure Plan and are summarized below. The RAA results for GSI implementation are based on these area predictions.

Table 4-2: Estimate of Area Treated through GSI Implementation by 2020, 2030, and 2040 within Contra Costa County

Year	Cumulative Area Treated by GSI (acres)
2020	7,100
2030	9,000
2040	11,900

4.2.1 Private Redevelopment Area Projection

The CCCWP Permittees track GSI implemented as part of private development projects subject to MRP Provision C.3.d through the CCCWP's AGOL tracking tool. The combined area treated by GSI implemented for private development from 2003 through 2018 represents a portion of the 2020 total area included in Table 4-2; the remainder was projected private development.

To forecast private development for 2019/2020, 2021 through 2030, and 2031 through 2040, the CCCWP used the UrbanSim model developed by the Urban Analytics Lab at the University of California under contract to the Bay Area Metropolitan Transportation Commission (MTC). MTC forecasts growth in households and jobs and uses the UrbanSim model to predict new development and redevelopment to satisfy future demand. Model inputs include parcel-specific zoning and real estate data; model outputs show increases in households or jobs attributable to specific parcels. The methods and results of the Bay Area UrbanSim model have been approved for use in transportation projections and the regional Plan Bay Area development process.

CCCWP used outputs from the Bay Area UrbanSim model to map parcels predicted to undergo development or redevelopment in each Contra Costa jurisdiction at each time increment specified in the MRP (2020, 2030, and 2040). The resulting maps were reviewed by local staff for

consistency with local knowledge and local planning and economic development initiatives, and the maps were revised as needed.

Although the UrbanSim methodology is robust, the pace of redevelopment and of resulting pollutant-load reductions depend on future economic conditions.

4.2.2 Public GSI Project Area Projection

Publicly owned parcels and ROWs that could potentially be retrofit to include multi-benefit stormwater capture facilities were identified as part of the Contra Costa Watersheds Stormwater Resource Plan (SWRP) (CCCWP, 2019). These potential project locations were used as the basis for identifying potential public retrofit locations within each Permittee's jurisdiction based on local knowledge and priorities. Each Permittee selected projects, largely from the SWRP list, to be incorporated into their Green Infrastructure Plan. Projects in the Permittees' Green Infrastructure Plans were compiled countywide to develop the projection herein.

Generally, local knowledge and priorities include judgments of potential neighborhood support for a project, potential integration with transportation projects that can be externally funded, [14] and potential integration with storm drainage infrastructure projects, including drainage improvement projects funded by local special assessments and/or state and Federal grants. In addition, some identified public ROW retrofit projects could potentially be implemented as street frontage improvements and funded through development agreements.

For nearly all public projects identified in the Permittees' Green Infrastructure Plans, implementation is dependent on funding or other support that is not within the Permittees' control. It can be expected that the pace of implementation in any given jurisdiction will vary considerably from year to year (with more variability among smaller jurisdictions, because they have fewer projects). Progress will best be assessed as a multi-year average over the region or countywide. The regional or countywide pace of implementation will be affected by economic conditions and by the general availability of state and Federal infrastructure grants.

[14] See the "Roadmap of Funding for Sustainable Streets" prepared by BASMAA for the Urban Greening Bay Area Initiative (2018)

5. EVALUATION OF COSTS, CONTROL MEASURE EFFICIENCY, AND SIGNIFICANT ENVIRONMENTAL IMPACTS

5.1 Cost Analysis

5.1.1 Green Stormwater Infrastructure Cost Methodology

GSI project cost data were gathered from several sources within the Bay Area and Southern California to develop relationships between project size or project area (tributary drainage area) and total capital cost (construction and design). Likewise, O&M cost data were gathered from these sources, as well as through literature review. A technical memorandum summarizing this cost analysis is provided in Appendix F. The results of this analysis for project capital costs, in 2018 dollars, are presented in Table 5-1 below. Actual GSI project implementation costs will vary and may be greater than those listed in Table 5-1.

Table 5-1: Statistical Summary of Unit Capital Cost for Green Street, Parcel-Based, and Regional GSI Project Types

Project Category	No. of Projects (n)	Unit Capital Cost ($/ac treated) in 2018 Dollars[1]					
		Minimum	25th-percentile	Median	75th-percentile	Maximum	Mean
Green Street	19	$25,000	$70,000	$137,000	$267,000	$1,290,000	$213,000
Distributed Green Infrastructure	21	$16,000	$90,000	$121,000	$176,000	$416,000	$153,000
Regional Stormwater Control	11	$15,000	$25,000	$61,000	$127,000	$427,000	$101,000

[1] Units have been rounded to the nearest $1,000.

Annual O&M costs are intended to account for activities necessary to maintain the effectiveness of a project that recur on a regular basis, such as routine maintenance on an annual basis or repairs following a large storm event. For this cost analysis, annual O&M costs do not include replacement (of portions) or rehabilitation of GSI facilities, which occurs approximately every 20 to 30 years. For planning purposes, annual O&M costs are often assumed to be a percentage of the capital (design and construction) costs. Annual O&M costs range from approximately 1% to 6% of the capital costs, with an average of 4% of capital cost for the data sources reviewed.

The estimated capital cost, which includes both the design cost and the construction cost, for the estimated public GSI project area listed in Table 4-2 is provided in Table 5-2 below. This cost was estimated by applying the Green Street unit cost to right-of-way area and the Distributed Green

Infrastructure unit cost to the parcel area within the total estimated public GSI project area for each year. The low, medium, and high cost estimates were calculated using the 25th percentile, median, and 75th percentile unit costs. The annual O&M cost was calculated by multiplying the capital cost by an estimated fixed O&M cost factor of 4%. The total project cost includes the capital costs and the annual O&M costs over the design life of the project. For the purposes of this analysis, a 20-year design life and a 3% inflation rate were used to calculate the total present value of the annualized O&M costs.

Table 5-2: Cost to Treat the Estimated Public GSI Project Area by 2020, 2030, and 2040 within Contra Costa County

Year	Total Capital Cost ($1,000)			Annual O&M Cost ($1,000)			Total Project Cost ($1,000)		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2020	$446,000	$602,000	$881,000	$17,840	$24,080	$35,240	$719,000	$971,000	$1,421,000
2030	$487,000	$667,000	$992,000	$19,480	$26,680	$39,680	$786,000	$1,076,000	$1,600,000
2040	$567,000	$782,000	$1,168,000	$22,680	$31,280	$46,720	$915,000	$1,261,000	$1,884,000

Public project implementation will depend on funding availability. Funding for implementation of projects included in the Permittees' Green Infrastructure Plans would be obtained by the municipal agency, partnerships of agencies, or other stakeholder project sponsors working to implement the identified projects. Economic or socio-economic impacts and political shifts may affect future implementation scenarios, causing increases or decreases in the amount of private investment and public funds available for development and control measure implementation, and/or changes in the ability to provide services that are needed for implementation.

The Cities of San Pablo, Walnut Creek, and Richmond and Contra Costa County have partnered for an EPA San Francisco Bay Water Quality Improvement Fund grant to develop and pilot a Regional Alternative Compliance System in Contra Costa County. The objective of the project is to develop a Regional Alternative Compliance System that will efficiently and cost-effectively improve surface water quality, achieve multiple benefits, and reduce compliance pressures on jurisdictions and entities subject to MRP requirements. It is intended that the system will help facilitate implementation of GSI across Contra Costa County with the potential for substantial cost savings, while meeting MRP and TMDL water quality goals. A draft Regional Alternative Compliance System is expected in August 2021. The draft system will then be pilot tested from September 2021 – January 2022; lessons learned will be documented and used to propose a system by June 2022. Alternative Compliance Systems developed in other regions have taken decades to fully mature from the start of implementation.

5.1.2 Source Control Measure Cost Analysis

A regionally consistent approach to estimating source control program implementation costs developed through collaboration with the other Bay Area stormwater programs is summarized in Table 5-3 below.

Table 5-3: Planning Level Cost Estimate Values for Source Control Measures

Control Measure Category	Control Measure	Unit of Implementation	Estimated Unit Costs[1]			
			Initial[2]		Ongoing[3]	
			Cost	Unit	Cost	Unit
Source Area Identification and Referral	Identify and Refer Source Properties	Acres of old industrial land use area investigated	$382	$/acre	NA	NA
Full Trash Capture (FTC)	FTC Implementation - Large Devices	Acres treated	$4,500	$/acre	$6,000	$ per year
	FTC Implementation - Small Devices	Acres treated	$1,000	$/acre	$400	$ per year
Enhanced Municipal Operation and Maintenance (O&M)	Enhanced Street Sweeping - mechanical broom	Acres addressed	$48 / curb-mile swept (lifecycle cost)			
	Enhanced Street Sweeping - Regenerative Air or Vacuum Assisted	Acres addressed	$80 / curb-mile swept (lifecycle cost)			
	Street Flushing	Linear mile of street flushed	$193,139	$ / linear mile of street flushed	NA	NA
	Enhanced Inlet Cleanout	Number of inlets cleaned out	NA	NA	$100	$ per cleanout
	Enhanced Pump Station Cleanout	Additional annual cleanouts	$82,200	$/cleanout	NA	NA
	Storm Drain Piping Cleanout	Annual cleanouts	$146,062	$/cleanout	NA	NA
Managing PCBs-containing Materials during Building Demolition		Annual cost	NA	NA	$400	$ per application
PCBs in Infrastructure Management Program		Annual cost	Minor municipal cost - just tracking and reporting. Some ongoing Program costs but also small.			
Management of PCBs in Electrical Utility Equipment		Annual cost	Minor municipal cost - just tracking and reporting. Some ongoing Program costs but also small.			

1. The unit costs are rough planning level estimates that do not consider net present worth cost adjustments or other complexities.
2. Initial costs generally include planning, design, capital, and other initial one-time costs.
3. Ongoing costs include operation & maintenance and other ongoing costs.

These planning level costs have been applied to an estimated level of implementation for each of the planned source control measures in Table 5-4 below.

Table 5-4: Planning Level Cost Estimate for Source Control Implementation – CCCWP

Control Measure	Cumulative Unit Area Treated (acres) or Units Implemented			Estimated Implementation Cost		
	2020	2030	2040	2020	2030	2040
Management of PCBs in Building Materials	3 buildings	30 buildings	60 buildings	$1,200	$12,000	$24,000
Source Property Identification and Abatement	84 acres	97 acres	109 acres	$32,088	$36,863	$41,638
Full Trash Capture Treatment Control – Large Devices	4,815 acres	4,815 acres	4,815 acres	$1,354,500	$8,320,500	$16,060,500
Full Trash Capture Treatment Control – Inlet-Based Devices	7,020 acres	10,367 acres	10,367 acres	$4,684,400	$23,173,952	$42,939,891

As can be seen in Table 5-3 and Table 5-4, the estimated planning level cost for implementing source control programs is negligible in comparison to the estimated costs for implementing GSI measures.

5.2 Control Measure Efficiency

In general, as discussed above, source control measures are much more cost efficient to implement than structural treatment control measures.

There are several factors that are considered when selecting control measures to address PCBs and mercury for a specific area. Cost effectiveness (i.e., the cost per mass of pollutant reduced), while an important factor, is not sufficient when considering which type of control measure to implement at the management area or site scale. Different types of control measures may be more appropriate in some situations than others. Additionally, the potential load reduction available for each type of control measure varies; some control measures may be effective but not have much opportunity for implementation (such as source property identification and abatement), while others may be less effective but have much more opportunity (such as full trash capture devices).

Factors that help identify optimal implementation for a given location are listed below; site- or catchment-specific characteristics may increase or decrease the importance of any of these factors at a given location:

- *Costs*: includes all life cycle (i.e., including maintenance) costs associated with planning and implementing a given control measure.
- *Load Reduction Potential*: includes the load reduction potential at the site, catchment, or municipal scale.
- *Opportunity*: includes the current and future opportunities and feasibility to implement a given control measure successfully.
- *Safety*: includes consideration of the potential to cause a safety hazard and the need for any additional measures to avoid creating a safety hazard. Safety hazards may include slip, trip, or fall hazards; drowning hazards; visual impairments (i.e., overgrowth into a roadway); vector concerns; chemical hazards; or flooding concerns.
- *Implementation Challenges*: includes consideration of potential implementation challenges due to local ordinances or regulations, resistance from the local community, major utility conflicts, or ability to obtain adequate funding.

5.2.1 Clean Watersheds for a Clean Bay

The Clean Watersheds for a Clean Bay (CW4CB) project was a collaboration among the BASMAA member agencies funded by a San Francisco Bay Water Quality Improvement Fund grant from the United States Environmental Protection Agency and matching funds from Bay Area countywide stormwater management programs and member agencies. The CW4CB project was designed to evaluate the effectiveness of stormwater controls for PCBs and mercury in response to the PCBs and mercury TMDLs. The CW4CB project pilot-tested methods to control discharges of PCBs and mercury in urban stormwater runoff and developed and implemented a regional risk reduction program that focused on targeted education on the health risks of consuming certain species of Bay fish that contain relatively high levels of mercury and PCBs. The results of the CW4CB project are available on the CW4CB website (http://basmaa.org/Clean-Watersheds-for-a-Clean-Bay-Project).

A significant finding from the project was that source control measures, such as source area identification and abatement, are much more cost effective for controlling PCBs and mercury than treatment control measures.

Table 5-5 lists the estimated cost per unit pollutant load reduced by the source property identification and referral and the bioretention treatment control retrofit pilot projects. The

source property identification and referral cost per unit load reductions represent the cost of pollutant loads reduced per acre of watershed investigated. Costs are in 2016 dollars.

Table 5-5: Estimated Cost Effectiveness for the CW4CB Source Property Identification and Abatement and Treatment Control Retrofit Pilot Projects

Pilot Project Type	Average Cost per PCBs Unit Load Reduced[1] ($/(mg/year))	Estimated Cost per Mercury Unit Load Reduced[1] ($/(mg/year))
Source Area Identification and Abatementl[2]	$16	$53
Treatment Control Retrofit – Bioretention[3]	$22,000	$372,500

1. Assigns the pilot project total design and construction costs to each pollutant independently. Treatment control retrofit project costs are not annualized. Costs are in 2016 dollars.
2. Average for all five pilot watersheds of cost of loads reduced per acre of watershed area investigated ($/acre) divided by the unit load reduced ((mg/yr)/acre).
3. Average of cost per acre treated ($/acre) divided by unit load reductions ((mg/yr)/acre) for the El Cerrito Green Streets, Bransten Road, and PGE 1st and Cutting projects.

5.2.2 PCBs and Mercury Control Measure Plan Cost Effectiveness

A comparison of the estimated cost for GSI implementation in Section 5.1.1 to the source control measure analysis in Section 5.2.2 demonstrates that the programmatic source control measures (i.e., Management of PCBs in Building Materials, Source Property Identification and Abatement, Management of PCBs in Electrical Utilities, and Management of PCBs in Infrastructure) are much more cost efficient than treatment control measures (GSI and full trash capture devices) at reducing loads of PCBs in urban runoff.

5.3 Significant Environmental Impacts

The California Environmental Quality Act (CEQA) establishes requirements and procedures for state and local agency review of the environmental effects of projects proposed within their jurisdictions. It further requires that agencies, when feasible, avoid or reduce the significant environmental impacts of their decisions. The applicable statutes are contained in California Public Resources Code, Sections 21000 - 21189, and Title 14 CCR, Division 6, Chapter 3, Sections 15000 – 15387.

CEQA applies to all California public agencies that carry out or approve projects. CEQA compliance is only required if a lead agency is considering approval of a proposed "project." The distinction between the normal and the specific CEQA meaning of "project" is very important, as it can

determine whether an action is subject to CEQA compliance or not. Section 15378 of the State CEQA Guidelines provides the following definition of a project:

1. "Project" means the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and that is any of the following:

    a. An activity directly undertaken by a public agency including but not limited to public works construction and related activities clearing or grading of land, improvement to existing public structures, enactment and amendment of zoning ordinances, and the adoption and amendment of local General Plans or elements thereof pursuant to Government Code Sections 65100-65700.

    b. An activity undertaken by a person which is supported in whole or in part through public agency contacts, grants subsidies, or other forms of assistance from one or more public agencies.

    c. An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

CEQA requires the preparation of an Initial Study to determine if a project may result in significant effects on the environment. If there is substantial evidence in the record that supports a fair argument that significant effects may occur, an Environmental Impact Report will be prepared. A Negative Declaration or Mitigated Negative Declaration must be prepared if there is no substantial evidence that the project may have a significant effect on the environment, or if revisions to the project would avoid or mitigate the effects that would result in no significant effects.

The CEQA Guidelines stipulate that a public agency shall prepare or have prepared a proposed Negative Declaration or Mitigated Negative Declaration for a project subject to CEQA when:

- The initial study shows that there is no substantial evidence, in light of the whole record before the agency, that the project may have a significant effect on the environment, or

- The initial study identifies potentially significant effects, but:

    - Revisions in the project plans or proposals made by, or agreed to by the applicant before a proposed mitigated negative declaration and initial study are released

for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur; and

- There is no substantial evidence, in light of the whole record before the agency, that the project as revised may have a significant effect on the environment.

CEQA requires that reasonable alternatives to implement a proposed project should be considered during the planning process and potential environmental effects should be included in the evaluation of the project. CEQA also requires state and local agencies to disclose and consider the environmental impacts of their actions. It further requires that agencies, when feasible, avoid or reduce the significant environmental impacts of the implementation of their action.

This TMDL Control Measure Plan is statutorily exempted under Public Resources Code (California Administrative Code Sec. 15262 et seq.) because it involves feasibility or planning studies for possible future actions that the Permittees have not approved or adopted. Any future projects that are to be constructed as recommended by this Plan will either be determined to be exempt from CEQA or an initial study to determine potential environmental impacts will be prepared. In general, this TMDL Control Measure Plan has been determined to have no potential to generate significant adverse impacts to the environment, but instead will lessen adverse water quality impacts through reducing loads of PCBs and mercury into the Bay.

6. REASONABLE ASSURANCE ANALYSIS SUMMARY

This section provides a summary of the results of the reasonable assurance analysis. Further detail on the RAA modeling is provided in Appendix A.

6.1 RAA Results

6.1.1 Loads Reduced – PCBs

The total estimated annual PCBs loads reduced through implementation of the control measures outlined in the PCBs Control Measure Plan by 2020, 2030, 2040, and 2050 is provided in Table 6-1 below.

Table 6-1: Summary of PCBs Load Reductions Achieved through Control Measure Implementation

Control Measure	PCBs Load Reduction (kg/yr) by:			
	2020	**2030**	**2040**	**2050**
PCBs in Building Materials Management	0.37	0.37	0.37	0.37
Source Property Identification and Abatement	0.21	0.54	0.54	0.54
PCBs in Electrical Utilities Management	0.07	0.12	0.17	0.21
PCBs in Infrastructure	0.00	0.01	0.02	0.02
Green Stormwater Infrastructure	0.14	0.18	0.26	0.32
Full Trash Capture Treatment Control Measures	0.05	0.05	0.05	0.05
Enhanced Operations and Maintenance	0.004	0.004	0.004	0.004
Total Load Reduced	0.84	1.27	1.41	1.51
Load Reduction Goal	**1.51**	**1.51**	**1.51**	**1.51**
Remaining Load to be Reduced	0.67	0.24	0.10	0

TMDL Wasteload Allocation

As can be seen in Table 6-1, the required load reduction to achieve the TMDL (1.51 kg/yr) is not met by the TMDL compliance date of 2030 but is achieved by 2050. The RAA estimate of achieving the PCBs TMDL wasteload allocation by 2050 is based on many assumptions, and while the RAA demonstrates that Contra Costa will not achieve the PCBs load reduction goal before 2050, this goal may not be achieved until well after 2050.

An analysis of scenarios to achieve the TMDL wasteload allocation by 2030 is provided in Appendix G. The results of these analyses show that it is technically and economically infeasible to achieve the TMDL wasteload allocation by 2030.

MRP GSI Load Reduction Goal

The PCBs load reduction required to be achieved through GSI by 2040 per MRP Provision C.3.j (i.e., 3 kg/yr MRP area-wide or 0.5 kg/yr for Contra Costa County), after adjusting to reflect the RAA model results, is 0.31 kg/yr (see Appendix A for further detail). As shown in Table 6-1, this load reduction goal is not achieved by 2040, but is met by 2050.

Public project implementation will depend on funding availability. Funding for implementation of projects included in the Permittees' Green Infrastructure Plans would be obtained by the municipal agency, partnerships of agencies, or other stakeholder project sponsors working to implement the identified projects. Economic or socio-economic impacts and political shifts may affect future implementation scenarios, causing increases or decreases in the amount of private investment and public funds available for development and control measure implementation, and/or changes in the ability to provide services that are needed for implementation.

6.1.2 Loads Reduced – Mercury

Mercury loads reduced are estimated by applying the loads accounting methodology for mercury to the treatment control measures of GSI, full trash capture, and enhanced O&M (Table 6-2, and see Appendices A and H for further detail on the RAA modeling for mercury). Table 6-2 shows that the current implementation level provide about 0.29 kg/yr mercury reduction, anticipated to increase to about 0.47 kg/yr by 2050.

Table 6-2: Summary of Mercury Load Reductions Achieved through Control Measure Implementation

Control Measure	Hg Load Reduction (kg/yr) by:			
	2020	2030	2040	2050
Green Stormwater Infrastructure	0.17	0.22	**0.28**	0.33
Full Trash Capture Treatment Control Measures	0.10	0.12	0.12	0.12
Enhanced Operations and Maintenance	0.02	0.02	0.02	0.02
Total	**0.29**	**0.36**	**0.42**	**0.47**
Load Reduction Goal via GI in MRP 2	--	--	**0.48**	--
Remaining Load to be Reduced via GI	--	--	**0.20**	--

TMDL Wasteload Allocation

In contrast to PCBS, the mercury load reduction goal can't be calculated because the RAA seems to indicate that the WLA for mercury in Contra Costa County stormwater has already been achieved. This results from recalculating the baseline load compared to the original mercury TMDL. The mercury WLA for Contra Costa County is 11 kg/yr, while the new recalculated mercury baseline load for the entire county below dams is only 6.25 kg/yr.

The finding that the TMDL allocation has been "achieved" by recalculating the baseline does not lead CCCWP to conclude that mercury control measures are unnecessary. The main factor that drives the change on recalculation is eliminating areas above dams and areas subject to other permits. CCCWP assumes that the recalculated current load would need to be compared to a TMDL allocation developed based on similar assumptions. This recalculation of baseline for mercury is a nuance with no substantive effect on implementation, because of the assumption that achieving PCB WLAs by GSI, full trash capture, and enhanced O&M will lead to achieving mercury WLAs.

MRP GSI Load Reduction Goal

The mercury load reduction required to be achieved through GSI by 2040 per MRP Provision C.3.j is 10 kg/yr MRP area-wide (19% or 1.9 kg/yr for Contra Costa County). This represents 8% of the estimated TMDL baseline load of 127.7 kg/yr for the MRP area. Applying this percentage to the

adjusted baseline from the RAA model[15], an adjusted GSI goal would be 0.48 kg/yr for Contra Costa County (i.e., 6.02 kg/yr x 0.08 = 0.48 kg/yr). The adjusted load reduction goal focuses attention on what can be controlled by Permittees to reduce mercury loads to the Bay.

The predicted mercury load reduction by 2040 through GSI (0.28 kg/yr) would not achieve the adjusted load reduction goal for GSI established in MRP Provision C.11.c.i (Table 6-2). RAA results analyzing the potential for GSI to reduce mercury loads to achieve this goal (Table 6-3) show that a significant portion of the Old Industrial, Old Commercial, Old Transportation, and/or Old Urban Residential land use area would need to be treated to reduce mercury loads by about 0.2 kg per year in Contra Costa County. Assuming the mercury load reduction rate that is predicted by the RAA model would occur every decade through implementation of GSI on public and private land, this MRP load reduction goal would be achieved by 2077.

Table 6-3: Application of GSI to All Land Use Area in Contra Costa County within Region 2 below Dams

Land Use Category	Maximum Potential Mercury Load Reduction through GSI Implementation (kg/yr)
Old Industrial	0.40
Old Commercial	0.14
Old Transportation	0.22
Old Urban Residential	2.07
New Urban	0.02

There appears to be a mismatch between the mercury load reduction by GSI required in Provision C.11.c.i and the actual mercury reductions that are achievable. Provision C.11.c requires 0.006 kg/yr (6 g/yr) of mercury reduced by GI in the year 2020. Going from 0.006 kg/yr in 2020 to 1.9 kg/yr in 2040, nearly a 300-fold increase in GI implementation in 20 years, is not believable, reasonable, nor achievable. This can be rectified in MRP 3 by leaving out numeric targets for mercury (or PCBs) loads reduced by GSI, and instead setting acres treated goals for GSI implementation through Provision C.3.

[15] The adjusted baseline removes loads for areas above dams and other NPDES permittees (NPDES major and minor dischargers and Phase II municipal permittees). For further detail, see Appendix A.

6.2 Uncertainty Analysis

There are two types of uncertainty in this analysis: modeling uncertainty and planning uncertainty. The RAA (Appendix A) discusses modeling uncertainty, whereas planning uncertainties are summarized in this section. The estimate of achieving the PCBs TMDL wasteload allocation by 2050 is based on several assumptions that introduce planning uncertainties. The RAA result that Contra Costa will not achieve the PCBs load reduction goal before 2050 is reasonably certain (i.e., not likely to change as a result of changed assumptions). But it is possible, due to planning uncertainties, that this goal may not be achieved until well after 2050. A discussion of planning uncertainties that lead to uncertainty in the RAA results is provided below.

The RAA assumes that the building demolition program achieves a PCBs load reduction benefit equivalent to 0.37 kg/yr (Table 6-1, top row). An effectiveness assessment of the building demolition program may show a lower PCBs load reduction benefit as a result of either lower PCBs mass per building or lower numbers of applicable buildings being demolished than assumed. If so, the time to achieve the wasteload allocation would extend beyond 2050 unless other control measures could be scaled up.

The RAA model does not include PCBs degradation, which does occur (albeit very slowly). Little information is known about PCBs degradation in upland areas, thus insufficient information is available to develop a methodology to account for source reduction by degradation in the watershed. On its own, not accounting for degradation in the watershed exemplifies a planning uncertainty that could lead to achievement of TMDL WLAs somewhat sooner than 2050. Components of uncertainty that cannot be addressed through the RAA methods summarized in Appendix A include pollutant degradation and changes in larger-scale processes that are difficult to predict.

The load reduction benefit of source property investigations is based on specific assumptions about the expected number of future source property referrals or abatements. Discovering and referring more properties, leading to more source property abatements than assumed, would increase the benefit over the loads reduced presented in Table 6-1. Conversely, identifying fewer properties (or less area) than assumed would lead to lower load reduction benefits. This uncertainty will be resolved as the source property investigation program is implemented over the next two to three permit cycles.

The behavior of parties other than CCCWP Permittees cannot be committed by CCCWP. This introduces substantive planning uncertainties. For example, implementation of a control program for PCBs in electrical equipment can be committed by City of Pittsburg as a Permittee owner of a power company. The commitment of larger utilities, e.g., PG&E, to implement a control program is unknown to CCCWP. Similarly, CCCWP can commit to referring potential PCB source properties to the Water Board as they are identified, but has no control over the prioritization, level of effort or schedule for enforcement by the Water Board.

Changes in large-scale processes can be difficult to predict and can introduce substantial planning uncertainties. Climate change, long-term meteorological patterns, and large seismic events could each significantly affect watershed transport of polluted sediments. These can also include economic or socio-economic and political shifts, which may be either planned (e.g. , Federal Infrastructure Projects that create GSI funding opportunities) or unplanned, (e.g., the 2020 COVID-19 pandemic).

Major changes in large-scale processes can impact the actuality of some of the assumptions in the pollutant loading model as well as the future implementation scenarios. These may include changes to total area contributing to loading, for example as a result of sea level rise; changes to annual loading due to increases or decreases in average annual stormwater runoff volume, as a result of precipitation or flooding changes caused by long-term meteorological patterns and/or climate change; or changes to loading and/or redevelopment rates as a result of a seismic event. Economic or socio-economic impacts and political shifts can also affect future implementation scenarios, causing increases or decreases in the amount of private investment and public funds for development and control measure implementation, and/or changes in the ability to provide services that are needed for implementation. The examples provided represent just a small fraction of the range of possibilities; many of these large-scale phenomena are very challenging to predict. As such, they are even more difficult to model and, in many cases, represent scenarios that may not happen and/or the timeframe for when they happen cannot be estimated.

In general, these large-scale processes primarily drive uncertainty in the actual versus assumed rate of GSI implementation. However, sea level rise also introduces a substantial source property uncertainty. At some point, the Bay Margin sites become partly or fully submerged, moving the source area from the domain of stormwater control measures to the domain of in-bay remediation.

7. CONCLUSIONS

This report answers the question from MRP Provisions C.11.d and C.12.d: "what implementation actions would result in compliance with the mercury TMDL by the year 2028 and the PCBs TMDL by the year 2030?" Achieving TMDL-required PCBs load reductions for urban stormwater in Contra Costa County by those deadlines would require capital and labor resources beyond the means of the Permittees. The foreseeable time frame for achieving PCBs load reductions is no sooner than the year 2050, and possibly much later than 2050. Present day mercury loads from urban stormwater are closer to load reduction goals compared to PCBs; therefore, control measures to achieve PCBs load reductions will result in achieving the required mercury load reductions over time.

Optimistic goals in the Permittees' Green Infrastructure plans lead to the conclusion that PCBs load reduction goals might be achieved by 2050; however, those GI Plan goals are aspirational planning goals and are stated to be as such in the plans. As the GI Plans become the basis for requiring GSI implementation through the MRP, the practicality of implementing GSI projects according to schedules assumed in the Permittees' GI Plans (and this RAA) must be revisited. More realistic assumptions about GSI implementation will lead to predicted attainment of PCBs allocations well after 2050.

Dividing load reduction control measures into categories of "scalable" and "fixed" benefits helps evaluate alternatives for compliance. Control measures with fixed benefits cannot practically be increased in scope to achieve load reductions sooner or in greater measure. After the last building containing PCBs in caulk has been demolished, there will be no further opportunities to intervene and prevent PCBs in construction debris from entering the MS4. Scalable control measures (e.g., GSI or enhanced O&M) increase load reduction in proportion to implementation – more acres treated leads to more loads reduced.

Scaling up the number of GSI projects is practically and economically infeasible. Redevelopment in old industrial areas creates the most likely path to achieving PCBs load reduction goals; however, the schedule for redevelopment is cyclic and cannot be foreseen, leading to planning uncertainty about when PCBs load reduction goals will be achieved. Municipalities lack the funding and opportunity areas to implement GSI in the public right-of-way at a rate that would close the gap on TMDL attainment. The $1 billion to $2 billion in total costs associated with full implementation of the public projects in the Permittees' GSI plans would not be procured for the

single purpose of achieving PCBs TMDL goals, but rather as an outcome of community development for multiple benefits.

Scaling up enhanced operations and maintenance (O&M) in old industrial areas is also impractical. Appendix G shows that closing the gap on TMDL attainment through enhanced O&M in Contra Costa County old industrial areas would practically mean inspecting and maintaining about 18,500 additional drainage inlets per year with no trash capture device, or about 5,000 additional inlets per year equipped with trash capture devices. This translates to implementation scenarios of $1.85 million per year in new labor costs with no full trash capture, or $5 million in new capital costs with a new ongoing labor cost of $1 million per year if full trash capture inlet devices are used. The impacts of enhanced O&M requirements would be focused in economically disadvantaged communities that contain the majority of old industrial area.

Alternative compliance programs could allow opportunities to channel capital resources from development into stormwater improvements where they derive greater benefits, such as old industrial areas. Alternative compliance programs typically take many years to develop and fully implement. A recent Permittee-led grant funded project exploring alternative compliance is in the nascent stages, but it would be premature to rely on alternative compliance for achieving TMDL load reduction goals.

This RAA report introduces the “adjusted baseline” concept to reconcile logical inconsistencies in the PCBs and mercury TMDLs. The load reduction requirements assigned to the category of “urban stormwater” include mercury and PCBs loads from sources that are beyond the control of Contra Costa Permittees, such as individually permitted industrial properties and Phase 2 permittees. The San Francisco Bay TMDLs do not apply to East County jurisdictions. Control measures applied upstream of reservoirs do not affect PCBs or mercury loads to the Bay, because reservoirs act as sediment traps, thus these areas were not included in the TMDL. To address these inconsistencies, baseline loads were adjusted to develop TMDL load reduction goals applicable to the Contra Costa Permittees’ MRP jurisdictions where control measures are expected to reduce pollutant loads to the Bay. The adjusted TMDL goals preserve the intent of urban stormwater load allocations proposed in the original TMDLs (i.e., about 90% PCBs load reductions and about 50% mercury load reductions from the recalculated baseline).

The baseline adjustment focuses effort on areas where Permittees can implement control measures. Caltrans facilities are included in Permittee MRP areas for computing adjusted baseline; Caltrans facilities are interwoven within Permittee jurisdictions. Including Caltrans loads

with the MRP jurisdiction loads creates opportunities for cooperative implementation of control measures where Caltrans and municipal jurisdictions overlap.

In summary, this TMDL Implementation Report presents a programmatic approach to implement known and effective PCBs and mercury control measures. The programmatic approach will lead to achieving TMDL goals for PCBs loads discharged by urban stormwater no sooner than 2050, and possibly not until 2080 or after, depending on the rate of GSI implementation achieved. This quantitative analysis showing the linkage between schedule and feasibility supports an implementation time frame of 2050 - 2080 or later for achieving the PCBs and mercury TMDLs' wasteload allocations assigned to Contra Costa County.

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