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

555 County Center
Redwood City, CA 94063

P 650.599.1406
F 650.361.8227
flowstobay.org

Submitted via email and by upload to Water Board FTP site (c/o Zachary Rokeach) on October 15, 2019

October 15, 2019

Mr. Michael Montgomery, Executive Officer
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

SUBJECT: Submittal of *SMCWPPP Pollutants of Concern Monitoring Report, Water Year 2019 Accomplishments and Water Year 2020 Planned Allocation of Effort,* dated October 15, 2019

Dear Mr. Montgomery:

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), a program of the City/County Association of Governments of San Mateo County (C/CAG), is pleased to submit the attached report entitled *Pollutants of Concern Monitoring Report, Water Year 2019 Accomplishments and Water Year 2020 Planned Allocation of Effort,* dated October 15, 2019. This report was prepared on behalf of all San Mateo County municipal agencies in compliance with Municipal Regional Permit (MRP; Order No. R2-2015-0049) Provision C.8.h.iv. As such, this report describes the allocation of sampling effort for pollutants of concern (POC) monitoring for the forthcoming year and what was accomplished for POC monitoring during the preceding water year. The report includes Water Year (WY) 2019 POC monitoring locations, number and types of samples collected, purpose of sampling, and analytes measured. Data and interpretations will be submitted by March 31, 2020 with the Integrated Monitoring Report (to be submitted in lieu of the annual Urban Creeks Monitoring Report). Exact POC monitoring locations for WY 2020 are under development based on SMCWPPP's on-going efforts to identify likely PCBs and mercury source properties.

I certify under penalty of law that the attached report was prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my enquiry of the person or persons who manage the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please call me at (650) 599-1419.

Sincerely,

Matthew Fabry

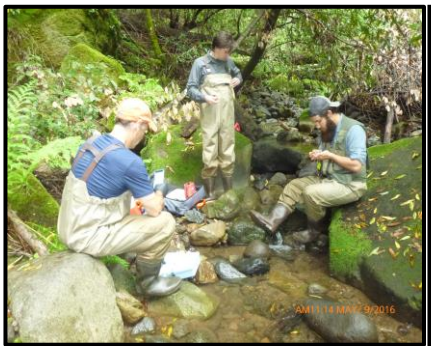
Matthew Fabry, P.E.
Program Manager

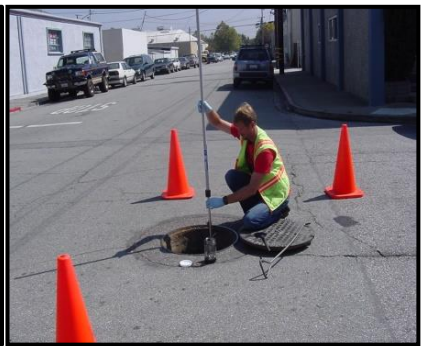
CC: Richard Looker and Janet O'Hara, SF Bay Regional Water Board

Attachment: *SMCWPPP Pollutants of Concern Monitoring Report, Water Year 2019 Accomplishments and Water Year 2020 Planned Allocation of Effort,* dated October 15, 2019

Pollutants of Concern Monitoring Report

Water Year 2019 Accomplishments and Water Year 2020 Planned Allocation of Effort





Submitted in Compliance with
NPDES Permit No. CAS612008 (Order No. R2-2015-0049),
Provision C.8.h.iv

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

A Program of the City/County Association of Governments

October 15, 2019

CREDITS

This report is submitted by the participating agencies in the

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

Prepared for:

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

Prepared by:

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

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LIST OF ABBREVIATIONS

AFR	Alternative Flame Retardant
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
BSM	Bioretention Soil Media
CEC	Contaminants of Emerging Concern
CEDEN	California Environmental Data Exchange Network
CW4CB	Clean Watersheds for a Clean Bay
ECWG	Emerging Contaminants Work Group of the RMP
HDS	Hydrodynamic Separator
IMR	Integrated Monitoring Report
MRP	Municipal Regional Permit
NNE	Nutrient Numeric Endpoints
NPDES	National Pollution Discharge Elimination System
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyls
PFAS	Perfluoroalkyl Sulfonates
PFOS	Perfluorooctane Sulfonates
POC	Pollutant of Concern
RAA	Reasonable Assurance Analysis
RMP	San Francisco Estuary Regional Monitoring Program
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SPoT	Statewide Stream Pollutant Trend Monitoring
SSC	Suspended Sediment Concentration
STLS	Small Tributary Loading Strategy
TOC	Total Organic Carbon
UCMR	Urban Creeks Monitoring Report
WMA	Watershed Management Area
WY	Water Year

1.0 INTRODUCTION

This Pollutants of Concern (POC) Monitoring Report was prepared by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) on behalf of San Mateo County Permittees subject to the National Pollutant Discharge Elimination System (NPDES) regional stormwater permit, referred to as the Municipal Regional Permit (MRP). The MRP was reissued by the San Francisco Regional Water Quality Control Board (Regional Water Board) on November 19, 2015 as Order R2-2015-0049 (Regional Water Board 2015). This report fulfills the requirements of Provision C.8.h.iv of the MRP for reporting:

- The allocation of sampling effort for POC monitoring planned for the forthcoming year (i.e., Water Year 2020[1]); and
- What was accomplished for POC monitoring during the preceding Water Year (i.e., Water Year 2019).

In accordance with Provision C.8.h.iv, this report includes monitoring locations, number and types of samples collected, purpose of sampling (Management Questions addressed), and analytes measured. Similar POC Monitoring Reports were submitted on October 15, 2015, 2016, 2017, and 2018.

Data and interpretations will be provided with the Integrated Monitoring Report (IMR) which will be submitted to the Regional Water Board by March 31, 2020, in lieu of an annual Urban Creeks Monitoring Report (UCMR). The IMR will include a comprehensive analysis of all data collected since the previous IMR (i.e., the IMR will analyze data from Water Years 2014 through 2019). Data generated from sampling of receiving waters (e.g., creeks) in Water Year (WY) 2019 will be submitted to the San Francisco Bay Area Regional Data Center by March 31, 2020 for upload to the California Environmental Data Exchange Network (CEDEN).

2.0 POC MONITORING REQUIREMENTS

Provision C.8.f of the MRP requires monitoring of several POCs including polychlorinated biphenyls (PCBs), mercury, copper, emerging contaminants[2], and nutrients. Provision C.8.f specifies yearly (i.e., Water Year) and total (i.e., Permit term) minimum numbers of samples for each POC. In addition, POC monitoring must address the five priority management information needs (i.e., Management Questions) identified in C.8.f:

1. **Source Identification** – identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff;
2. **Contributions to Bay Impairment** – identifying which watershed source areas contribute most to the impairment of San Francisco Bay beneficial uses (due to source intensity and sensitivity of discharge location);

[1]POC monitoring is conducted on a Water Year (WY) basis, with each WY beginning on October 1 and concluding on September 30 of the named year. For example, WY 2019 began October 1, 2018 and concludes September 30, 2019.

[2]Emerging contaminant monitoring requirements will be met through participation in the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) special studies. The special studies will account for relevant Contaminants of Emerging Concern (CECs) in stormwater and will address at least perfluorooctane sulfonates (PFOS), perfluoroalkyl sulfonates (PFAS), and alternative flame retardants being used to replace polybrominated diphenyl ethers (PBDEs). Bay Area Stormwater Management Agencies Association (BASMAA) representatives are working with the RMP to develop and implement the studies.

3. **Management Action Effectiveness** – providing support for planning future management actions or evaluating the effectiveness or impacts of existing management actions;
4. **Loads and Status** – providing information on POC loads, concentrations or presence in local tributaries or urban stormwater discharges; and
5. **Trends** – providing information on trends in POC loading to the Bay and POC concentrations in urban stormwater discharges or local tributaries over time.

The MRP specifies the minimum number of samples that must be collected and analyzed for each POC. For example, over the five year permit term, a minimum total of 80 PCBs samples must be collected and analyzed. On average, 16 PCBs samples should be collected per year to meet the total requirement of 80 samples; however, the Permit requires a minimum of at least 8 PCBs samples per year. This allows flexibility to collect more samples some years and less other years. The MRP also specifies the minimum number of samples for each POC that must address each Management Question. For example, by the end of year four[3] of the permit term, each of the five Management Questions must be addressed with at least 8 PCBs samples. It is possible that a single sample can address more than one Management Question. POC monitoring requirements are summarized in Table 1.

[3]Note that the minimum sampling requirements addressing information needs must be completed by the end of year four of the permit; whereas, the minimum number of total samples does not need to be met until the end of year five of the permit.

Table 1. MRP Provision C.8.f Pollutants of Concern monitoring requirements.

Pollutant of Concern	Media	Total Samples [d]	Yearly Minimum	Minimum Number of Samples That Must Be Collected for Each Information Need by the End of Year Four				
				Source Identification	Contributions to Bay Impairment	Management Action Effectiveness	Loads and Status	Trends
PCBs	Water or sediment	80	8	8	8	8	8	8
Total Mercury	Water or sediment	80	8	8	8	8	8	8
Total & Dissolved Copper	Water	20	2	--	--	--	4	4
Nutrients [a]	Water	20	2	--	--	--	20	--
Emerging Contaminants [b]	--	--	--	--	--	--	--	--
Ancillary Parameters [c]	--	--	--	--	--	--	--	--

a. Ammonium[4], nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, total phosphorus (analyzed concurrently in each nutrient sample).

b. Must include perfluorooctane sulfonates (PFOS, in sediment), perfluoroalkyl sulfonates (PFAS, in sediment), alternative flame retardants. The Permittee shall conduct or cause to be conducted a special study that addresses relevant management information needs for emerging contaminants. The special study must account for relevant Contaminants of Emerging Concern (CECs) in stormwater and would address at least PFOS, PFAS, and alternative flame retardants being used to replace PBDEs.

c. Total Organic Carbon (TOC) should be collected concurrently with PCBs data when normalization to TOC is deemed appropriate. Suspended sediment concentration (SSC) should be collected in water samples used to assess loads, loading trends, or Best Management Practice (BMP) effectiveness. Hardness data are used in conjunction with copper concentrations collected in fresh water.

d. Total samples that must be collected over the five-year Permit term.

[4] There are several challenges to collecting samples for "ammonium" analysis. Therefore, samples will be analyzed for total ammonia which is the sum of un-ionized ammonia (NH3) and ionized ammonia (ammonium, NH4+). Ammonium concentrations will be calculated by subtracting the calculated concentration of un-ionized ammonia from the measured concentration of total ammonia. Un-ionized ammonia concentrations will be calculated using a formula provided by the American Fisheries Society that includes field pH, field temperature, and specific conductance. This approach was approved by Regional Water Board staff in an email dated June 21, 2016.

The requirements in MRP Provision C.8.f (POC Monitoring) are met through a variety of water quality programs and studies:

- SMCWPPP collects POC samples as part of its own water quality monitoring program to directly meet C.8.f. requirements.
- Other MRP provisions require studies or have information needs that are consistent with Provision C.8.f. requirements. The associated POC monitoring is credited towards these other provisions and Provision C.8.f.:
    - MRP Provisions C.11/12.a require that Permittees develop and maintain a list of management areas (referred to as Watershed Management Areas, or WMAs) in which mercury and PCBs control measures will be implemented during the permit term, as well as the monitoring data and other information used to select the WMAs. Updated lists with identified control measures are provided with each of SMCWPPP's Annual Reports. Provision C.8.f supports C.11/12.a. requirements by requiring monitoring directed towards mercury and PCBs source identification.
    - MRP Provision C.12.e requires that Permittees sample caulk and other sealants used in storm drain or roadway infrastructure in the public right-of-way to investigate whether PCBs are present in such material and in what concentrations. SMCWPPP worked with other MRP Permittees through the Bay Area Stormwater Management Agencies Association (BASMAA) to complete a regional investigation that addressed this requirement. 54 samples of caulk and sealant materials from ten types of roadway and storm drain infrastructure were collected throughout the MRP area and combined into 20 composites that were tested for PCBs. SMCWPPP reported on the results of the investigation in its FY 2017/18 Annual Report.
- To learn more about the effectiveness of selected stormwater treatment controls and meet C.8.f. requirements, SMCWPPP worked with other MRP Permittees through BASMAA to conduct the following POC monitoring studies:
    - A BASMAA regional study evaluated the effectiveness of biochar-amended bioretention soil media (BSM) to remove PCBs and mercury from stormwater runoff collected in the MRP region. Twenty-six samples consisting of influent/effluent pairs from bench scale column tests of biochar-enhanced BSM were analyzed. Stormwater runoff was run through six columns with five different biochar-enhanced BSM mixes and one standard BSM as a control to evaluate which mix was most effective at removing PCBs and mercury. A report documenting the study was included with SMCWPPP's WY 2018 UCMR.
    - A BASMAA regional study evaluated the mercury and PCBs removal effectiveness of HDS units resulting from the cleanout of solids from HDS unit sumps. Samples of the solids captured and removed from eight HDS unit sumps during cleanouts were collected and analyzed for mercury and PCBs. Maintenance records and construction plans for the HDS units were reviewed to develop estimates of the average volume of solids removed per cleanout. This information was combined with the monitoring data to calculate the mass of POCs removed. HDS unit performance was evaluated by calculating the average annual percent removal of POCs during cleanout. A report documenting the study was included with SMCWPPP's WY 2018 UCMR.

- SMCWPPP also works collaboratively with our water quality monitoring partners to find mutually beneficial monitoring approaches. MRP Provision C.8.a.iii allows Permittees to use data collected by third-party organizations to fulfill monitoring requirements, provided the data are demonstrated to meet the required data quality objectives. For example, samples collected in San Mateo County through the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP), the Clean Watersheds for a Clean Bay (CW4CB) EPA grant-funded project, and the State's Stream Pollution Trends (SPoT) Monitoring Program are used by SMCWPPP to help address Provision C.8.f monitoring requirements.

3.0 POC MONITORING ACCOMPLISHMENTS (WY 2019) AND GOALS (WY 2020)

In compliance with MRP Provision C.8.f of the MRP, SMCWPPP conducted POC monitoring for PCBs, mercury, copper, and nutrients in WY 2019. The MRP-required yearly minimum number of samples was met or exceeded for all POCs. The total number of samples collected for each POC in WY 2019, the agency conducting the monitoring, and the Management Questions addressed are listed in Table 2 (PCBs), Table 3 (mercury,) Table 4 (copper,) and Table 5 (nutrients). These tables also include this information for WY 2016 through WY 2018 and show cumulative progress towards the Provision C.8.f minimum sample requirements. Tables 2 through 5 show that the MRP-required minimum number of samples addressing each Management Question by the end of year four of the Permit was met or exceeded for all POCs. Specific monitoring stations are listed in Table 6 and mapped in Figure 1. The sections below describe details of the monitoring accomplished in WY 2019 and the planned allocation of effort for WY 2020. A summary of the planned allocation of effort for WY 2020 is presented in Table 7.

Table 2. SMCWPPP/BASMAA and Third-Party POC Monitoring Accomplishments, PCBs, WYs 2016 - 2019.

Pollutant of Concern/ Organization	Number of PCBs Samples	Management Question Addressed[a]					Sample Type and Comments
		1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
WY 2019							
SMCWPPP	25	25	--	--	--	--	Urban sediment samples to identify source areas
RMP STLS	2	2	2	--	2	2	Stormwater runoff samples to characterize WMAs
SPoT	1	--	--	--	--	1	Creek bed sediment sample to assess trends (PCBs only, no mercury)
WY 2018							
SMCWPPP	13	13	13	--	13	13	Stormwater runoff samples to characterize WMAs
SMCWPPP	57	57	--	--	--	--	Urban sediment samples to identify source areas
BASMAA	5	5	--	--	--	--	Regional public infrastructure caulk/sealant samples (1/4 of project total)
BASMAA	8	--	--	8	--	--	Regional HDS unit & biochar effectiveness study (1/4 of project total)
RMP STLS	2	2	2	--	2	2	Stormwater runoff samples to characterize WMAs
SPoT	--	--	--	--	--	--	Creek bed sediment sample to assess trends
WY 2017							
SMCWPPP	17	17	17	--	17	17	Stormwater runoff samples to characterize WMAs
SMCWPPP	67	67	--	--	--	--	Urban sediment samples to identify source areas
RMP STLS	4	4	4	--	4	4	Stormwater runoff samples to characterize WMAs
SPoT	1	--	--	--	--	1	Creek bed sediment sample to assess trends (PCBs only, no mercury)
WY 2016							
SMCWPPP	8	8	8	--	8	8	Stormwater runoff samples to characterize WMAs
RMP STLS	7	7	7	--	7	7	Stormwater runoff samples to characterize WMAs
CW4CB	--	--	--	3	--	--	BMP effectiveness samples at Bransten Road bioretention facilities
Total / MRP Minimum[b]	217 / 80	207 / 8	53 / 8	11 / 8	53 / 8	55 / 8	

[a] Individual samples can address more than one Management Question simultaneously.

[b] The MRP overall minimum number of POC samples must be met by the end of the five-year permit term. The MRP minimum number of samples for each Management Question must be met by the end of year four of the permit.

Table 3. SMCWPPP/BASMAA and Third-Party POC Monitoring Accomplishments, Mercury, WYs 2016 - 2019.

Pollutant of Concern/ Organization	Number of Mercury Samples	Management Question Addressed[a]					Sample Type and Comments
		1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
WY 2019							
SMCWPPP	25	25	--	--	--	--	Urban sediment samples to identify source areas
RMP STLS	2	2	2	--	2	2	Stormwater runoff samples to characterize WMAs
SPoT	--	--	--	--	--	--	Creek bed sediment sample to assess trends
WY 2018							
SMCWPPP	13	13	13	--	13	13	Stormwater runoff samples to characterize WMAs
SMCWPPP	57	57	--	--	--	--	Urban sediment samples to identify source areas
BASMAA	8	--	--	8	--	--	Regional HDS unit & biochar effectiveness study (1/4 of project total)
RMP STLS	2	2	2	--	2	2	Stormwater runoff samples to characterize WMAs
SPoT	1	--	--	--	--	1	Creek bed sediment sample to assess trends (mercury only, no PCBs)
WY 2017							
SMCWPPP	17	17	17	--	17	17	Stormwater runoff samples to characterize WMAs
SMCWPPP	67	67	--	--	--	--	Urban sediment samples to identify source areas
RMP STLS	4	4	4	--	4	4	Stormwater runoff samples to characterize WMAs
SPoT	--	--	--	--	--	--	Creek bed sediment sample to assess trends
WY 2016							
SMCWPPP	8	8	8	--	8	8	Stormwater runoff samples to characterize WMAs
RMP STLS	7	7	7	--	7	7	Stormwater runoff samples to characterize WMAs
CW4CB	--	--	--	3	--	--	BMP effectiveness samples at Bransten Road bioretention facilities
Total / MRP Minimum[b]	211 / 80	202 / 8	53 / 8	11 / 8	53 / 8	54 / 8	

[a] Individual samples can address more than one Management Question simultaneously.

[b] The MRP overall minimum number of POC samples must be met by the end of the five-year permit term. The MRP minimum number of samples for each Management Question must be met by the end of year four of the permit.

Table 4. SMCWPPP/BASMAA and Third-Party POC Monitoring Accomplishments, Copper, WYs 2016 - 2019.

Pollutant of Concern/ Organization	Number of Samples	Management Question Addressed[a]					Sample Type and Comments
		1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
WY 2019							
SMCWPPP	2	--	--	--	2	--	Dry season creek water samples from mixed-use watersheds
WY 2018							
SMCWPPP	4	--	--	--	4	4	Creek water samples collected during storm event and spring base flows
SPoT	1	--	--	--	--	1	Creek bed sediment samples to assess trends
WY 2017							
SMCWPPP	1	--	--	--	1	--	Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
SMCWPPP	5	--	--	--	5	2	Creek water samples collected during storm event and spring base flows[c]
SPoT	1	--	--	--	--	1	Creek bed sediment samples to assess trends
WY 2016							
SMCWPPP	3	--	--	--	3	--	Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
Total / MRP Minimum[b]	17 / 20	NA	NA	NA	15 / 4	8 / 4	

NA = Not Applicable. For this pollutant, the MRP does not require sampling to address the management question.

[a] Individual samples can address more than one Management Question simultaneously.

[b] The MRP overall minimum number of POC samples must be met by the end of the five-year permit term. The MRP minimum number of samples for each Management Question must be met by the end of year four of the permit.

[c] One of these five samples was a PCBs/Hg stormwater runoff sample that was also analyzed for copper.

Table 5. SMCWPPP/BASMAA and Third-Party POC Monitoring Accomplishments, Nutrients, WYs 2016 - 2019.

Pollutant of Concern/ Organization	Number of Samples	Management Question Addressed[a]					Sample Type and Comments
		1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
WY 2019							
SMCWPPP	9	--	--	--	9	--	Dry season creek samples at stations also sampled during spring base flows
WY 2018							
SMCWPPP	4	--	--	--	4	--	Creek water samples collected during storm event and spring base flows
WY 2017							
SMCWPPP	5	--	--	--	5	--	Creek water samples collected during storm event and spring base flows
WY 2016							
SMCWPPP	2	--	--	--	2	--	Creek water samples collected from bottom-of-the-watershed stations
Total / MRP Minimum[b]	20 / 20	NA	NA	NA	20 / 20	NA	

NA = Not Applicable. For this pollutant, the MRP does not require sampling to address the management question.

[a] Individual samples can address more than one Management Question simultaneously.

[b] The MRP overall minimum number of POC samples must be met by the end of the five-year permit term. The MRP minimum number of samples for each Management Question must be met by the end of year four of the permit.

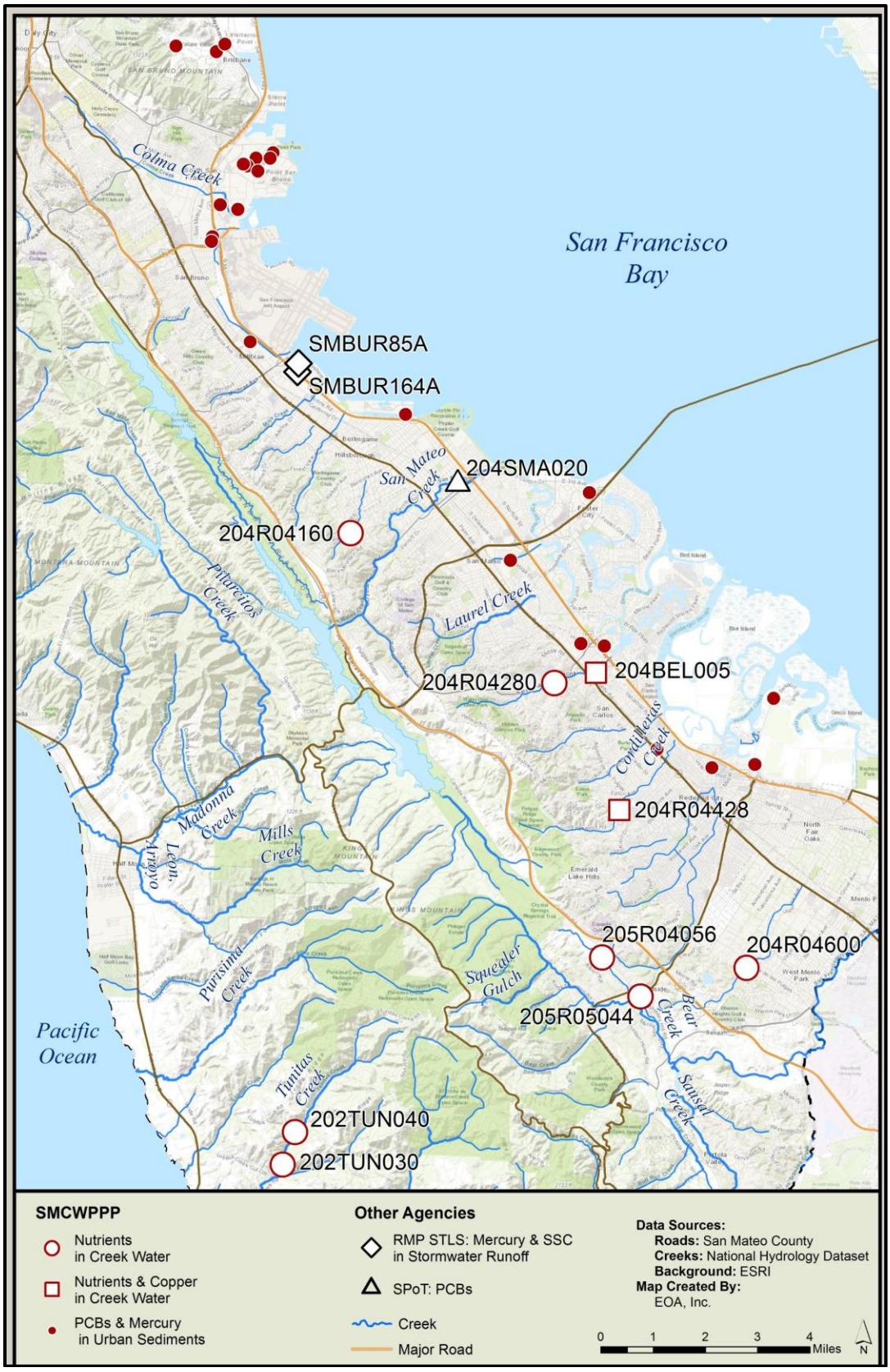

Figure 1. POC Monitoring Stations in San Mateo County, WY 2019.

Table 6. POC Monitoring Stations in San Mateo County, WY 2019.

Organization	Station Code	Sample Date	Latitude	Longitude	Matrix	PCBs	Mercury	Suspended Sediment	Total Copper	Dissolved Copper	Hardness as CaCO3	Nutrients [a]
SMCWPPP												
SMCWPPP	SM-RCY-05-D	5/13/2019	37.51154	-122.20694	sediment	x	x					
SMCWPPP	SM-RCY-04-E	5/13/2019	37.49309	-122.21312	sediment	x	x					
SMCWPPP	SM-RCY-03-B	5/13/2019	37.49198	-122.22804	sediment	x	x					
SMCWPPP	SM-BEL-01-A	5/13/2019	37.52513	-122.26635	sediment	x	x					
SMCWPPP	SM-BEL-60-J	5/13/2019	37.52570	-122.27456	sediment	x	x					
SMCWPPP	SM-FCY-01-A	5/13/2019	37.56762	-122.27260	sediment	x	x					
SMCWPPP	SM-BUR-06-B	5/13/2019	37.58840	-122.33720	sediment	x	x					
SMCWPPP	SM-MIL-01-A	5/13/2019	37.60764	-122.39189	sediment	x	x					
SMCWPPP	SM-SMO-08-C	5/13/2019	37.54847	-122.29967	sediment	x	x					
SMCWPPP	SM-SCS-07-A	5/13/2019	37.49684	-122.24727	sediment	x	x					
SMCWPPP	SM-SSF-01-R	5/14/2019	37.65865	-122.39123	sediment	x	x					
SMCWPPP	SM-SSF-01Q	5/14/2019	37.65647	-122.39420	sediment	x	x					
SMCWPPP	SM-SSF-01-L	5/14/2019	37.65693	-122.39556	sediment	x	x					
SMCWPPP	SM-SSF-01-P	5/14/2019	37.65504	-122.39049	sediment	x	x					
SMCWPPP	SM-SSF-01-N	5/14/2019	37.65977	-122.38571	sediment	x	x					
SMCWPPP	SM-SSF-01-M	5/14/2019	37.66021	-122.38527	sediment	x	x					
SMCWPPP	SM-SSF-01-O	5/14/2019	37.65872	-122.38623	sediment	x	x					
SMCWPPP	SM-SSF-03-J	5/14/2019	37.64438	-122.39728	sediment	x	x					
SMCWPPP	SM-SSF-04-H	5/14/2019	37.64551	-122.40344	sediment	x	x					
SMCWPPP	SM-SSF-05-J	5/14/2019	37.63666	-122.40587	sediment	x	x					
SMCWPPP	SM-SBO-05-D	5/14/2019	37.63538	-122.40616	sediment	x	x					
SMCWPPP	SM-BRI-02-J	5/14/2019	37.68805	-122.40571	sediment	x	x					
SMCWPPP	SM-BRI-02-L	5/14/2019	37.68801	-122.40581	sediment	x	x					
SMCWPPP	SM-BRI-02-N	5/14/2019	37.69008	-122.40282	sediment	x	x					
SMCWPPP	SM-BRI-02-M	5/14/2019	37.68930	-122.41998	sediment	x	x					
SMCWPPP	202TUN030	7/31/2019	37.37943	-122.37487	water							x
SMCWPPP	202TUN040	7/31/2019	37.38854	-122.37083	water							x
SMCWPPP	204BEL005	7/31/2019	37.51769	-122.26918	water				x	x	x	x
SMCWPPP	204R04160	7/31/2019	37.55514	-122.35563	water							x
SMCWPPP	204R04280	7/31/2019	37.51464	-122.28357	water							x
SMCWPPP	204R04428	7/31/2019	37.47974	-122.26007	water				x	x	x	x
SMCWPPP	204R04600	7/31/2019	37.43659	-122.21465	water							x
SMCWPPP	205R04056	7/31/2019	37.43873	-122.26508	water							x
SMCWPPP	205R05044	7/31/2019	37.42806	-122.25149	water							x
Third Party Organizations												
RMP STLS	SMBUR164A	11/28/2018	37.59960	-122.37526	water	x	x	x				
RMP STLS	SMBUR85A	11/28/2018	37.60195	-122.37499	water	x	x	x				
SPoT	204SMA020	7/2/2019	37.5703	-122.3186	sediment	x						

[a] Ammonia (for ammonium), nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, and total phosphorus are analyzed concurrently in each nutrient sample.

3.1. PCBs and Mercury

During WY 2019, SMCWPPP collected 25 sediment samples to address Management Question #1 (Source Identification). In addition, two stormwater runoff samples were collected in San Mateo County through the RMPs Small Tributary Loading Strategy (STLS) at stations that were previously sampled in WY 2016. These two samples address Management Questions #1 (Source Identification) and #2 (Contributions to Bay Impairment). These two samples, along with all of the other previously collected bottom of catchment stormwater runoff composite samples for mercury and PCBs, address Management Question #5 (Trends).[5] Data may also be used by the RMP STLS to improve calibration of models used to estimate the overall POC loads from small tributaries to San Francisco Bay (i.e., Management Question #4 – Loads and Status). One additional sediment sample was collected in San Mateo County by the SPoT program and analyzed for PCBs to address Management Question #5 (Trends).

3.1.1. SMCWPPP Accomplishments and Goals

WY 2019 Accomplishments

As in previous years, the primary goal of PCBs and mercury monitoring conducted by SMCWPPP in WY 2019 was to attempt to identify PCBs source properties or areas. In WY 2019, SMCWPPP collected 25 sediment samples as part of the source property investigation program. The goal of this program is to attempt to identify source properties that can be referred to the Regional Water Board for abatement. These samples were collected in the right-of-way near parcels with characteristics associated with potential PCBs use or in WMAs with previously observed elevated PCBs concentrations. Sample collection methods were similar to the methods implemented previously (SMCWPPP 2015, 2016a, 2016b, 2017a, 2017b, 2018, 2019). Individual and composite sediment samples collected from manholes, storm drain inlets, driveways, and sidewalks were analyzed for the “RMP 40” PCB congeners (method EPA 8270C), total mercury (method EPA 7471A), and moisture/total solids[6] (method ASTM D2216).

WY 2020 Goals

As stated above, WY 2019 PCBs and mercury monitoring conducted by SMCWPPP primarily focused on addressing Management Questions #1 (Source Identification) and #2 (Contributions to Bay Impairment), while contributing to the regional dataset being used to address Management #3 (Loads and Status). A similar focus is planned for WY 2020 with the collection of eight sediment sample in priority WMAs, primarily in an attempt to identify specific source properties that may eventually be referred to the Regional Water Board for investigation and abatement. The specific coordinates for the WY 2020 samples are not yet known and will be influenced by several logistical field considerations such as the presence of accessible sediment that can be sampled within the storm drain system and right-of-way, and ongoing review of the WY 2015 - 2019 dataset.

[5]The bottom of catchment stormwater runoff composite samples were collected from stations that either have been sampled more than once (during separate Water Years) or are anticipated to be resampled in future Water Years (to the extent that sufficient budget is available at the time).

[6]Samples were analyzed for total solids to allow for calculation of dry weight concentrations.

3.1.2. Third-Party Accomplishments and Goals

RMP STLS

The RMP's STLS Team typically conducts annual monitoring for POCs on a region-wide basis. SMCWPPP is an active participant in the STLS and works with other Bay Area municipal stormwater programs to identify opportunities to direct RMP funds and monitoring activities towards supplementing monitoring required by the municipal stormwater permit. POC monitoring activities conducted by the STLS beginning in WY 2012 have focused on pollutant loading monitoring at six region-wide stations (WY 2012 – WY 2014) and wet weather characterization monitoring in catchments of interest (WY 2015 – present). In WY 2019, the STLS Team continued wet weather characterization sampling using a similar approach to the PCBs and mercury sampling that was implemented by SMCWPPP in WY 2016 – WY 2018. Composite samples consisting of six to eight aliquots collected during the rising limb and peak of the storm hydrograph (as determined through field observations) were analyzed for PCBs, mercury, and suspended sediments. In WY 2019, two catchments (i.e., two bottom of catchment stormwater runoff composite samples) in San Mateo County were sampled by the RMP's STLS. SMCWPPP worked with the RMP to select these sample stations. Both catchments were previously sampled in WY 2016 using the same methods and had unexpectedly low PCBs concentrations. The WY 2019 results will be compared to the prior results to provide information on variability during different years and types of storm events.

RMP STLS monitoring in WY 2020 will continue to focus on wet weather characterization. The number of stations in San Mateo County that will be targeted by the STLS Team will likely be limited to two or less and, similar to WY 2018 and WY 2019, will likely be at stations that were previously sampled but had unexpectedly low PCBs concentrations. Additional stations may be monitored using un-manned "remote" samplers that capture suspended sediment from the water column throughout the duration of their deployment which is typically during one storm event. The STLS Team has been pilot testing these devises since WY 2015 and recently concluded that they generate data adequate for evaluating whether a WMA should be prioritized for source property investigations.

In future years, RMP STLS monitoring is expected to shift towards Management Question #5 (Trends). The STLS Trends Strategy Team, initiated in WY 2015, is currently developing a regional monitoring and modeling program to assess trends in POC loading to San Francisco Bay from small tributaries. The STLS Trends Strategy will initially focus on PCBs and mercury, but will not be limited to those POCs. The preliminary monitoring design concept included additional monitoring at one or two of the region-wide loadings stations to gain a better understanding of the variability in PCBs concentrations/loadings in the existing dataset. However, uncertainties about the utility of developing a trends monitoring program that targets just one or two watersheds coupled with unknowns about how to extrapolate findings to the region has prompted the Trends Strategy Team to delay monitoring and focus instead on identifying practical modeling approaches. STLS Trends monitoring is not anticipated to commence before WY 2021.

SPoT Monitoring Program

The SPoT Monitoring Program conducts annual dry season monitoring (subject to funding constraints) of sediments collected from a statewide network of large rivers. The goal of the SPoT Program is to investigate long-term trends in water quality (Management Question #5 – Trends). Sites are targeted in bottom-of-the-watershed locations with slow water flow and appropriate micromorphology to allow deposition and accumulation of sediments, including a station near the mouth of San Mateo Creek. In most years, sediments are analyzed for PCBs, mercury, metals (including copper) toxicity, pesticides, and

organic pollutants (Phillips et al. 2014). In WY 2019, SPoT monitoring in San Mateo Creek did not include mercury or copper but samples were analyzed for PCBs, pesticides, organic pollutants, and toxicity. It is likely that SPoT monitoring in WY 2020 program will include mercury, copper, pesticides, and toxicity, but not PCBs (K. Siegler personal communication, August 2019). The most recent technical report prepared by SPoT program staff was published in 2016 and describes seven-year trends from the initiation of the program in 2008 through 2014 (Phillips et al. 2016). An update to the report is anticipated in the near future.

3.2. Copper

In WY 2019, SMCWPPP collected grab water samples at two creek stations during the dry season. Both samples were analyzed for copper and nutrients. The goal of this approach was to address Management Question #4 (Loads and Status) by characterizing copper concentrations in mixed-use watersheds. Additional monitoring at these stations in WY 2019 included bioassessment surveys conducted during spring baseflows.

In WY 2020, SMCWPPP is planning to collect at least three copper samples to meet the five-year Permit term minimum of 20 cumulative samples. The approach to this copper monitoring is currently under development.

3.3. Nutrients

Nutrient monitoring addresses Management Question #4 (Loads and Status). Nutrients were included in the POC monitoring requirements to support Regional Water Board efforts to develop nutrient numeric endpoints (NNE) for the San Francisco Bay Estuary. The “Nutrient Management Strategy for San Francisco Bay” is part of a statewide initiative to address nutrient over-enrichment in State waters (Regional Water Board 2012). The suite of nutrients required in the MRP (i.e., ammonium, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, and total phosphorus) is similar to the list of analytes measured by the RMP and BASMAA partners at the six regional loading stations (including a San Mateo County station at the Pulgas Creek Pump Station in the City of San Carlos) monitored in WY 2012 and WY 2013. The prior data were used by the Nutrient Strategy Technical Team to develop and calibrate nutrient loading models.

In WY 2019, POC monitoring for nutrients in San Mateo County was conducted on July 31, 2019 at nine creek stations. These stations were also sampled for nutrients as part of the bioassessment survey protocol that was conducted in May 2019. The stations were selected using a probabilistic monitoring design established for creek status monitoring. Comparison of nutrient concentrations for the two WY 2019 time periods will be provided in the POC interpretive report to be submitted with the IMR by March 31, 2020.

A minimum of two nutrient samples will be collected in WY 2020, likely late in the dry season from locations where bioassessment surveys will be conducted as part of creek status monitoring in spring 2020. At this time, the specific watersheds that will be sampled have not yet been determined.

3.4. Emerging Contaminants

Emerging contaminant monitoring is being addressed through SMCWPPP’s participation in the RMP. The RMP has investigated Contaminants of Emerging Concern (CECs) since 2001 and established the RMP Emerging Contaminants Work Group (ECWG) in 2006. The purpose of the ECWG is to identify CECs that

might impact beneficial uses in the Bay and to develop cost-effective strategies to identify, monitor, and minimize impacts. The RMP published a CEC Strategy "living" document in 2013 and completed a full revision in 2017 (Sutton et al. 2013, Sutton and Sedlak 2015, Sutton et al. 2017) and made minor updates in 2018 (Lin et al. 2018). The CEC Strategy document guides RMP special studies on CECs using a tiered risk and management action framework.

Provision C.8.f of the MRP identifies three emerging contaminants that must be addressed through POC monitoring: Perflourooctane Sulfonate Substances (PFOS), Perfluoroalkyl and Polyfluoroalkyl Sulfonate Substances (PFAS), and Alternative Flame Retardants (AFRs). PFAS is a broad class of chemicals used in industrial applications and consumer goods primarily for their ability to repel oil and water. PFOS are a subgroup within the PFAS umbrella and are identified in the CEC Strategy as "moderate" concern due to Bay occurrence data suggesting a high probability of a low-level effect on Bay wildlife. Other PFAS and AFRs are identified as "possible" concern due to uncertainties in measured or predicted Bay concentrations or in toxicity thresholds. RMP staff recently published reports summarizing PFOS and PFAS monitoring results (Houtz et al. 2016, Sedlak et al. 2017, Sedlak et al. 2018).[7]

AFRs came into use following state bans and nationwide phase-outs of polybrominated diphenyl ether (PBDE) flame retardants in the early 2000's. They include many categories of compounds, including organophosphate esters. In 2018 the RMP STLS and ECWG worked together to conduct a special study to inform ECWG's planning activities related to AFRs. The special study compiled and reviewed available data and previously developed conceptual models for PBDE to support a stormwater-related AFR conceptual model being developed by the ECWG. Organophosphate esters were prioritized for further investigation due to their increasing use, persistent character, and ubiquitous detections at concentrations exceeding PBDE concentrations in the Bay. Limited stormwater data from two watersheds in Richmond and Sunnyvale suggest that urban runoff may be an important source of these compounds. Additional monitoring and modeling was recommended. Results of the AFR special study were published in 2018 (Lin and Sutton 2018).

In 2018, the RMP's ECWG also developed a special study proposal to analyze stormwater samples collected from urban watersheds for a large suite of CECs. The list of CECs to be analyzed is based on recent work conducted in Puget Sound streams and is intended to target urban runoff constituents rather than those found in wastewater (e.g., pharmaceuticals). In addition to vehicle tire chemicals and imidacloprid (a neonicotinoid insecticide), the list includes the CECs specifically identified in Provision C.8.f of the MRP (PFOSs, PFASs, and AFRs). Pilot sampling is expected to begin in 2019 in close coordination with the STLS with reporting anticipated in 2020.

These RMP special studies satisfy the POC monitoring requirement for CECs within provision C.8.f.

[7] The Emerging Contaminants Workgroup is also conducting monitoring on a number of other emerging contaminants that are not identified in the MRP. These include microplastics, ethoxylated surfactants, and fipronil.

Table 7. Summary of Planned Allocation of POC Monitoring Effort in San Mateo County, WY 2020.

Pollutant of Concern/ Organization	Planned Number of Samples (WY 2020)	Yearly Minimum	Management Question Addressed [a]					Sample Type and Comments
			1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
PCBs & Mercury								
SMCWPPP	8	8	X	--	--	--	--	Urban sediment samples to identify source areas
RMP STLS	2		X	X	--	X	--	Stormwater runoff samples to characterize WMAs
SPoT	1		--	--	--	--	X	Creek bed sediment samples to assess trends
Copper								
SMCWPPP	3	2	--	--	--	X	--	TBD
Nutrients								
SMCWPPP	2	2	--	--	--	X	--	Creek water samples collected late in the dry season at locations sampled earlier in WY 2020 during spring bioassessments

[a] Individual samples can address more than one Management Question simultaneously.

4.0 REFERENCES

Houtz, E.F., Sutton, R., Park, J-S., and Sedlak, M. (2016). Poly- and perfluoroalkyl substances in wastewater: Significance of unknown precursors, manufacturing shifts, and likely AFFF impacts. Water Research v. 95, pp. 142-149.

Lin, D., Sutton, R., Shimabuku, I., Sedlak, M., Wu, J., and Holleman, R. (2018). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations 2018 Update. SFEI Contribution No. 873. San Francisco Estuary Institute, Richmond, CA.

Phillips BM, Anderson B.S., Siegler K, Voorhees J, Tadesse D, Webber L, Breuer, R. (2016). Spatial and Temporal Trends in Chemical Contamination Relative to Land Use in California Watersheds: Stream Pollution Trends (SPoT) Monitoring Program. Fourth Report - Seven-Year Trends 2008-2014. California State Water Resources Control Board, Sacramento, CA. SWAMP-MR-2016-0008.

Phillips, B.M., Anderson, B.S., Siegler, K., Voorhees, J., Tadesse, D., Webber, L., Breuer, R. (2014). Trends in Chemical Contamination, Toxicity and Land Use in California Watersheds: Stream Pollution Trends (SPoT) Monitoring Program. Third Report – Five-Year Trends 2008-2012. California State Water Resources Control Board, Sacramento, CA.

San Francisco Regional Water Quality Control Board (Regional Water Board) (2012). San Francisco Bay Nutrient Management Strategy.

San Francisco Regional Water Quality Control Board (Regional Water Board) (2015). San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. Order R2-2015-0049, NPDES Permit No. CAS612008. November 19, 2016. 152 pp plus Attachments A-G.

SMCWPPP (2015). PCBs and Mercury Source Area Identification, Water Year 2015 POC Monitoring Report. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. September 2015.

SMCWPPP (2016a). Progress Report: Identification of Watershed Management Areas for PCBs and Mercury. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. April 1, 2016.

SMCWPPP (2016b). Identifying Management Areas and Controls for Mercury and PCBs in San Mateo County Stormwater Runoff. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. September 30, 2016.

SMCWPPP (2017a). Urban Creeks Monitoring Report, Water Quality Monitoring, Water Year 2016 (October 2015 – September 2016). Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. March 31, 2017.

SMCWPPP (2017b). Control Measure Plan for PCBs and Mercury in San Mateo County Stormwater Runoff. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. September 30, 2017.

SMCWPPP (2018). Urban Creeks Monitoring Report, Water Quality Monitoring, Water Year 2017 (October 2016 – September 2017). Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. March 31, 2018.

SMCWPPP (2019). Urban Creeks Monitoring Report, Water Quality Monitoring, Water Year 2018 (October 2017 – September 2018). Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. March 31, 2019.

Sedlak, M.D., Benskin, J.P., Wong, A., Grace, R., and Greig, D.J. (2017). Per and polyfluoroalkyl substances (PFASs) in San Francisco Bay wildlife: Temporal trends, exposure pathways, and notable presence of precursor compounds. Chemosphere v. 185, pp. 1217-1226.

Sedlak, M.D., Sutton, R., Wong, A., Lin, D. (2018). Per and polyfluoroalkyl substances (PFASs) in San Francisco Bay: Synthesis and Strategy. San Francisco Estuary Institute, Richmond, CA. Contribution # 867. 130 pages.

Sutton, R. and Sedlak, M. (2015). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. 2015 Update. San Francisco Estuary Institute, Richmond, CA. Contribution # 761.

Sutton, R., Sedlak, M., Sun, J., and Lin, D. (2017). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. 2017 Revision. San Francisco Estuary Institute, Richmond, CA. Contribution # 851.

Sutton, R., Sedlak, M., and Yee, D. (2013). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. San Francisco Estuary Institute, Richmond, CA. Contribution # 700.

Sutton, R. and Lin, D. (2018). Alternative Flame Retardants in San Francisco Bay: Synthesis and Strategy. San Francisco Estuary Institute, Richmond, CA. Contribution # 885. September 2018.