Contra Costa Clean Water Program

Pollutants of Concern Report: Accomplishments in Water Year 2018 and Allocation of Effort for Water Year 2019

Submitted to the San Francisco Bay Regional Water Quality Control Board

In Compliance with NPDES Permit Provision C.8.h.iv
Municipal Regional Stormwater Permit (Order R2-2015-0049)

October 2018

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Municipal Regional Stormwater Permit 2.0 (Order R2-2015-0049)
and the Central Valley Regional Water Quality Control Board

Prepared for

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- Contra Costa County
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Acronyms and Abbreviations

BASMAA	Bay Area Stormwater Management Agencies Association
Bay	San Francisco Bay
Bay Area	San Francisco Bay Area
BMP	best management practice
CCCWP	Contra Costa Clean Water Program
CV	Central Valley
Delta	Sacramento-San Joaquin River Delta
EPA	United States Environmental Protection Agency
HDS	hydrodynamic separator
LID	low impact development
MPC	Monitoring and Pollutants of Concern
MRP	municipal regional stormwater permit
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
PCBs	polychlorinated biphenyl congeners
POC	pollutants of concern
ppb	parts per billion
PSD	particle size distribution
RAA	reasonable assurance analysis
RMP	Regional Monitoring Program for Water Quality in San Francisco Bay
RWQCB	Regional Water Quality Control Board
SSC	suspended sediment concentration
SSID	stressors/sources identification
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
TOC	total organic carbon
WTP	wastewater treatment plant
WY	water year

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1 BACKGROUND

This report summarizes pollutants of concern (POC) monitoring conducted by Contra Costa Clean Water Program (CCCWP) during water year 2018 (October 1, 2017 through September 30, 2018), and describes POC monitoring to be completed in the coming water year (October 1, 2018 through September 30, 2019). This report fulfills Provision C.8.h.iv of the Municipal Regional Stormwater Permit (MRP 2.0, Order R2-2015-0049) issued in 2015 by the San Francisco Bay Regional Water Quality Control Board (SFRWQCB, 2015). The following subsections describe monitoring goals (Section 1.1), CCCWP's dual jurisdiction between the San Francisco Bay and the Central Valley regional water quality control boards (Section 1.2), and concludes with lessons learned from the past several years of permit implementation (Section 1.3). Section 2 describes monitoring completed in water year 2018, and Section 3 describes monitoring to be completed in water year 2019. The report concludes with Section 4, a summary of monitoring performed by third parties reported elsewhere.

1.1 Monitoring Goals

CCCWP Permittees prioritize monitoring POCs with the goal of identifying reasonable and foreseeable means of achieving load reductions of pollutants required by total maximum daily loads (TMDLs). TMDLs are watershed plans to attain water quality goals developed and established by the San Francisco Bay Regional Water Quality Control Board (SFRWQCB). The two most prominent TMDLs in driving stormwater monitoring, source control, and treatment projects under MRP 2.0 are the mercury TMDL and the polychlorinated biphenyl congeners (PCBs) TMDL. In the interest of protecting the beneficial uses of the surface waters for people and wildlife dependent on San Francisco Bay (the Bay) for food, these regulatory plans are intended to reduce concentrations of mercury and PCBs in fish within the Bay.

Mercury and PCBs tend to bind to sediments. The principal means of transport from watersheds is via sediments washed into the Municipal Separate Storm Sewer System (MS4); therefore, an important focus of POC monitoring is identifying the most significant sources of contaminated sediments to the MS4. An additional focus is quantifying the effectiveness of control measures. The highest POC monitoring priorities for Permittees are answering these two basic TMDL implementation questions: where are the most significant POC sources, and what can be done to control them?

The SFBRWQCB framed those two priority management information needs, along with three others, in the MRP as follows:

1. ***Source Identification*** Identify which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff.

2.	***Contributions to Bay Impairment***	Identify which watershed source areas contribute most to the impairment of San Francisco Bay beneficial uses (due to source intensity and sensitivity of discharge location).
3.	***Management Action Effectiveness***	Provide support for planning future management actions or evaluating the effectiveness or impacts of existing management actions.
4.	***Loads and Status***	Provide information on POC loads, concentrations, and presence in local tributaries or urban stormwater discharges.
5.	***Trends***	Evaluate trends in POC loading to San Francisco Bay and POC concentrations in urban stormwater discharges or local tributaries over time.

Provision C.8.f of the MRP does not specify monitoring details; rather, it requires a total number of samples for different pollutant types to be monitored over the permit term, along with yearly minimum numbers of samples for each POC. The effort is to be applied to the five management information needs listed above.

The MRP requires all stormwater programs to collectively reduce PCBs from stormwater by 3 kg per year. This makes management information needs 1 (sources) and 3 (effectiveness) the highest priorities for Permittees to maintain compliance. Part of management information need 2 (watershed areas which contribute most to impairment) is also directly related to achieving load reductions. In order to prioritize management actions, Permittees need to know which specific watersheds or sub-catchments are the greatest density of source areas or average sediment pollutant concentrations.

Other aspects of the five management information needs are not as much directly related to complying with the PCB load reduction requirement of 3 kg by 2020. Knowing which areas of the Bay are most sensitive (second part of management information need 2) is interesting from a planning perspective, but nothing in the language of the MRP indicates extra credit would be given for reducing loads to sensitive areas. Likewise, long-term trends of POC concentrations in urban stormwater may be interesting to follow, but short-term actions are a higher priority to comply with the numeric requirements of this permit and to make progress toward improving long-term trends. For this reason, the sensitive areas aspect of management information need 2 and the trends analysis in management information need 5 is mostly addressed by funding pilot and special studies implemented by the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP).

Thinking more broadly about management questions helps address multiple questions with the same effort. For example, by identifying specific source areas through management information need 1, the concept emerged that old industrial areas contribute relatively greater amounts of PCBs per unit area. That information is responsive to management information need 2 (areas which contribute the most to impairment). Over time, source area information is aggregated into load estimates, which inform management information need 4 (loads and status). As progress is made on abating source areas and implementing green infrastructure projects, load reduction information is developed responsive to management information need 5 (trends). The loads and status aspect (management information need 4) involves watershed modeling using monitoring data to estimate current loads of POCs and potential long-term load reductions which may be achieved through source control and stormwater treatment. This addresses long-term planning to understand how implementation of stormwater treatment through green infrastructure[1] leads to attainment of POC load reduction goals.

CCCWP is developing a model to forecast attainment of load reduction goals for a reasonable assurance analysis (RAA) in fulfillment of Provisions C.11.d.i and C.12.d.i. An RAA establishes the relationship between areal extent of green infrastructure implementation and POC reductions, estimates the amount and characteristics of land area to be treated through green infrastructure in future years, and estimates the amount of POC reductions which will result from green infrastructure implementation by specific future years.

Permittees are developing green infrastructure plans as required by Provision C.3.j. The plans will describe how Permittees will shift their impervious surfaces and storm drain infrastructure from gray, or traditional storm drain infrastructure where runoff flows directly into the storm drain and then into the receiving water, to green – a more resilient, sustainable system that slows runoff by dispersing it to vegetated areas, harvests and uses runoff, promotes infiltration and evapotranspiration, and uses bioretention and other green infrastructure practices to clean stormwater runoff. CCCWP is nearing completion of a stormwater resources plan by January 2019, which will provide information about planned and potential future projects within Permittees' jurisdictions to inform green infrastructure plans. The RAA will be performed on each Permittee's green infrastructure plan to quantify the expected volume and pollutant load reductions resulting from plan implementation.

In addition to sediment-associated TMDL pollutants, such as mercury and PCBs, Provision C.8.f also requires monitoring of copper, nutrients, and emerging contaminants (the alternative flame retardants perfluorooctane sulfonates and perfluoroalkyl sulfonates). Copper and nutrients are directly monitored by CCCWP as described in Sections 2 and 3 below. Emerging contaminants are assessed through a regional collaboration with the Bay Area Stormwater Management Agencies Association (BASMAA) and the RMP and, therefore, are not discussed at length in this report.

To summarize, of the five monitoring goals – source identification, contribution to impairment, effectiveness assessment, loads and status, and trends – the most urgent compliance-driven priorities for CCCWP Permittees are source identification and effectiveness assessment for mercury and PCBs.

[1] American Rivers defines "green infrastructure" as an approach to water management which protects, restores, or mimics the natural water cycle. Green infrastructure is effective, economical, and enhances community safety and quality of life. It means planting trees and restoring wetlands, rather than building a costly new water treatment plant. Practically, in terms of stormwater management in Contra Costa County, this means requiring all new development and redevelopment projects include stormwater treatment via approved low impact development (LID) designs. These include rain gardens, bioswales, infiltration galleries, etc.

Analysis and modeling to forecast long-term trends will commence during the coming year through the RAA. Assessments of long-term trends and contribution to impairment are regional projects performed in collaboration with BASMAA and the RMP.

1.2 Dual Regional Water Quality Control Board Jurisdictions

CCCWP is in a unique position among Bay Area stormwater programs, as the county is split between the jurisdiction of the San Francisco Bay and Central Valley Regional Water Quality Control Boards (SFRWQCB and CVRWQCB, respectively). In addition to meeting monitoring requirements in the MRP, CCCWP is also required to meet monitoring specifications established in the East Contra Costa County National Pollution Discharge Elimination System (NPDES) permit (CVRWQCB, 2010). Monitoring responsive to both permits was coordinated successfully to efficiently achieve required goals. Since the Central Valley Region has been moving toward a regional permit for municipal stormwater, CCCWP requested SFRWQCB and CVRWQCB to consolidate all areas of the county under the MRP administered by the SFBRWQCB. CCCWP will continue to be responsive to monitoring requirements established by TMDLs in the Central Valley Region which affect the East County Permittees. At present, the main focus of monitoring in response to the CVRWQCB information needs is to address the methylmercury TMDL through compliance with Provision C.11.l, which requires conducting a methylmercury control study. The results of the study will be submitted in October 2018. The summary of monitoring completed (Section 2) make note, where appropriate, of monitoring information addressing methylmercury in addition to requirements of the MRP.

1.3 Lessons Learned from MRP 1.0 (Order R2-2009-0074) and Water Years 2016-2018

At the advent of MRP 1.0 in 2009 (SFRWQCB, 2009), CCCWP and other BASMAA member agencies had some working knowledge of the distribution of PCBs and mercury loads across the urban landscape. Monitoring studies conducted in the 2000-2002 time frame showed concentrations of PCBs are highest in older industrial areas where PCBs were previously used and released. Mercury is somewhat more evenly distributed across urban land use types (through aerial deposition), with exceptions where known legacy mining sources (e.g., New Almaden) exist upstream. Still, mercury concentrations also tend to be higher in older industrial urban areas, where industrial uses and disposal of mercury occurred in the past. In some places, these early assessments turned up evidence that PCBs in sediments collected from catch basins, curbs and gutters may be elevated because of release from nearby contaminated properties. Follow-up assessments solidified the evidence of specific source properties in the City of Richmond (within Contra Costa County). Other programs had similar findings of specific source properties. Along with other information, the early studies performed by CCCWP and other BASMAA member agencies were used to develop the mercury and PCBs TMDLs for the Bay.

Source identification work conducted during MRP 1.0 confirmed two private properties in the City of Richmond with consistently high concentrations of PCBs in sediments collected from adjacent curbs, gutters and catch basins. One of the properties is a metal recycler who previously accepted and recycled used transformers; the other property was a forklift repair shop where hydraulic oil is prevalent[2]. Both properties were referred to the SFRWQCB for remediation and are discussed in the 2014 integrated monitoring report (CCCWP, 2014).

The metals recycler is an active business regulated under the Industrial General Permit (SWRCB, 2015). As a result of CCCWP's source property screening and referral process under MRP 1.0, the property owner is now prohibited from discharging stormwater into the municipal storm sewer system and has designed an on-site stormwater treatment system. Oversight by the City of Richmond and the SFRWQCB compelled the property owner to implement enhanced operations and maintenance control measures, such as containing stormwater on-site, installing rumble strips to remove dirt from truck tires prior to leaving the site, and conducting enhanced street sweeping with vacuum sweepers. As a follow-up investigation, CCCWP conducted stormwater monitoring in water year 2018 in the public right-of-way (see Section 2). The results help determine that this property is still tracking sediments contaminated with PCBs into the MS4 system. This property is being re-referred to the SFRWQCB for enforcement in the annual report for FY 2017-18. The lesson learned from this property is that follow-up sampling is useful to ensure source control measures are mitigating pollutants as expected, especially at active businesses. By mitigating releases from this property, the distribution of pollutants by way of runoff, trackout, and windborne dispersion onto surrounding streets is expected to be diminished over time.

The wide-ranging source identification activities described in Section 2 produced another new source property for referral to the SFBRWQCB in the City of Richmond. The property is adjacent to a 2015 sampling location containing sediment PCB levels above 1.0 mg/kg and is located in San Pablo. The 10-acre property is a dormant remediation site, between the railroad tracks on Chesley Avenue. With the assistance of the SFBRWQCB, Permittees and property owners will implement actions to abate sediment discharge from this parcel to adjacent streets, the MS4, and directly to Wildcat Creek via a bypass drainage, and PCB loads will be further reduced. By mitigating this parcel, in addition to the City of San Pablo's redevelopment/abatement of the 4.45-acre former BNSF railyard site to the north, the distribution of PCB loading in this target source area is expected to diminish over time. A data gap remaining in this area is whether the railroad parcels in the area contribute PCBs to the surrounding loads.

Other than some old clean-up properties draining directly to the Bay, there are very few additional large sites which may offer high opportunity for source control. Rather, when screening is complete, CCCWP Permittees would need to wait for high likelihood parcels to change ownership or offer other opportunity for redevelopment in order to gain modest load reductions. This kind of follow-up – to address the gap between cleanup levels directed by Department of Toxic Substances Control and PCB target levels driven by TMDLs – will be a continuous, adaptive process to gradually reduce the distribution of contaminated sediments around legacy cleanup sites and old industrial areas.

[2] Transformer oil and hydraulic oil are known historic products containing PCBs.

One important lesson learned about monitoring low impact development (LID) facilities is that more effort needs to be directed toward quantifying exfiltration into the underlying soils (i.e., infiltration). Much of the LID monitoring in MRP 1.0 focused on comparing pollutant concentrations in stormwater flowing into a bioretention facility to concentrations in treated water flowing out of the facility underdrain. This influent-effluent monitoring focus overlooked the benefit of infiltration, which essentially provides 100 percent pollutant load reduction for flows not exceeding the facility's infiltration capacity. Monitoring during water year 2017 included water level logging using piezometers deployed across LID facilities at a number of locations throughout the County to better characterize the range of infiltration rates typically achieved. These data will help improve our ability to predict the load reduction benefits of existing and future LID facilities, pursuant to management information needs 3 and 5.

Information about actual and assumed infiltration rates was included in CCCWP's hydromodification technical report (CCCWP, 2017a). The technical report was provided to SFRWQCB staff for their consideration, with the goal of supporting reasonable sizing factors for facilities to attain hydromodification management criteria. An added benefit of the information is that modeling of green infrastructure can be based on measured instead of assumed infiltration rates. The CCCWP RAA modeling methodology for quantifying the pollutant loads reduced by green infrastructure projects incorporates these findings. New infiltration rate information for Contra Costa County soils will be developed in water year 2019 and provided to the RAA modeling team for use in CCCWP's RAA modeling.

CCCWP monitored the Marsh Creek watershed for mercury and methylmercury, with an interest in understanding whether stormwater discharges from the historic Mount Diablo mercury mine in the upper watershed reach the Sacramento-San Joaquin River Delta (Delta) and San Francisco Bay. This activity is responsive to management information needs 1, 2, 4 and 5. A lesson learned during MRP 1.0 was that high frequency monitoring biased results toward smaller storms, while upper watershed flow is trapped behind the Marsh Creek Reservoir. Marsh Creek monitoring was amended to focus on large storms. The first storms in many years large enough to convey upper watershed flow to lower Marsh Creek occurred in water year 2017 and were successfully sampled. This monitoring also supports information needed for the methylmercury control study required by the Delta Methylmercury TMDL.

2 MONITORING ACCOMPLISHED IN WATER YEAR 2018

During water year 2018, a variety of monitoring activities were performed with respect to goals established at the conclusion of the previous water year, as outlined in the POCs monitoring report for water year 2017 (CCCWP, 2017b). For each activity, the associated management information need is identified from among the following:

1. Source identification
2. Contributions to Bay impairment
3. Management action effectiveness
4. Loads and status
5. Trends

Monitoring activities in water year 2018 are summarized below and discussed in greater detail in the following subsections:

- Stormwater sampling for PCBs in the City of Richmond in two general locations (management information needs 1, 2, 4 and 5):
  - Adjacent to a private metals recycling facility
  - In MS4 discharge to Meeker Slough
- Best management practice (BMP) effectiveness (influent/effluent monitoring) of two biofiltration cells in the City of Richmond for mercury and methylmercury in stormwater (management information needs 1, 2, 3, 4 and 5); this monitoring also supports information needs for the methylmercury control study required by the CVRWQCB's Delta Methylmercury TMDL
- Stormwater sampling for copper and nutrients in lower Walnut Creek and lower Marsh Creek (management information needs 1, 2, 4 and 5)

Refer to Figures 1 through 3 for the location of each monitoring activity.

2.1 Stormwater Sampling and Analysis for PCBs

Permittees with old industrial areas reviewed maps and conducted desktop research and field surveys to see if there were any areas where screening was still needed. Subsequently, stormwater samples for water year 2018 were collected in the City of Richmond from the following locations, for the following reasons:

- Street runoff flowing to an MS4 drop inlet adjacent to a private metals recycling facility which was previously known to contribute PCBs to the local MS4, and is suspected of continuing to do so, primarily by means of vehicular trackout. Sampling and analysis were performed to test whether the property owner's enhanced operation and maintenance procedures mitigated the release of PCBs from the property to acceptable levels.

- Two locations of MS4 discharge in the west portion of Meeker Slough to test whether urban runoff from the City of Richmond contributes substantial concentrations of PCBs to the slough. Meeker Slough is known to have some of the highest concentrations of PCBs in sediment and water in the Bay. It is in the interest of the City of Richmond to build a body of evidence showing current-day discharges to Meeker Slough do not contribute to elevated levels of PCBs, as well as to identify if there may be source properties upstream which may be loading to the slough through the City's MS4.

Refer to Table 1 for test methods and reporting limits and Table 2 for position coordinates of the sampling points and a summary of analytical results.

Table 1. Stormwater Analytical Tests, Methods, Reporting Limits, and Holding Times

Sediment Analytical Test	Method	Target Reporting Limit	Holding Time
Total PCBs (RMP 40 congeners)[1]	EPA 1668C	0.1 µg/kg	1 year
Total Mercury	EPA 1631E	0.5 ng/L	28 days
Total Methylmercury	EPA 1630	0.1 ng/L	28 days
Suspended Sediment Concentration	ASTM D 3977-97	1.5 mg/L	7 days
Total Organic Carbon (TOC)	EPA 9060	0.50 mg/L	28 days

1 San Francisco Bay RMP 40 PCB congeners include PCB-8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, 105, 110, 118, 128, 132, 138, 141, 149, 151, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203.

2 Particle size distribution by the Wentworth scale; percent fines (slit and clay) are less than 62.5 microns.

Table 2. PCB Monitoring Results – Meeker Slough and Metal Recycling Facility (WY 2018)					
Site ID [1]	MKS-1	MKS-2	SIMS-DI	SIMS-DI	SIMS-DI
Date Sampled	03/20/2018		03/01/2018	03/20/2018	04/06/2018
Latitude (decimal deg.)	37.91486	37.91458	37.92516		
Longitude (decimal deg.)	-122.34386	-122.34186	-122.36613		
Total PCBs [2] (pg/L)	18100	12100	99800	96700	550000
Total Hg (ug/L)	0.038	0.027	0.97	0.63	2.1
SSC (mg/L)	59	105	231	182	298
TOC (mg/L)	3.4	4.7	10	4.7	5.7
PCBs/SSC Ratio (ppb) [3]	307	115	432	***531***	***1846***

1 Site ID key: MKS-1 = MS4 Discharge to Meeker Slough MKS-2 = MS4 Discharge to Meeker Slough SIMS-DI = Richmond Metal Recycling Facility
2 PCBs in stormwater matrix analyzed by method EPA 1668
3 Values in ***bold italics*** indicate a likely high source area for PCBs

2.2 BMP Effectiveness – Influent/Effluent Monitoring

BMP effectiveness monitoring for mercury, methylmercury and suspended sediment concentration (SSC) was conducted at two adjacent pilot biofiltration BMPs (LAU3 and LAU4) on Cutting Boulevard in the City of Richmond. These BMPs were selected for monitoring to continue an evaluation of how bioretention affects methylmercury. That effectiveness evaluation is part of a methylmercury control study required by the CVRWQCB (CCCWP, 2015). The motivation to continue monitoring was that one of the bioretention cells monitored appeared to increase mercury methylation within the media, but the effect seemed to diminish after the first three or four storms. The extended monitoring was intended to understand whether that decrease of mercury methylation in the problem cell was consistent over time, or whether it increased again. PCBs were not analyzed in these follow-up samples because sufficient effectiveness information was developed for PCBs at that location.

The two biofiltration cells, LAU3 and LAU4, are very similar in construction, except LAU4 contains engineered soil amended with biochar. Both biofiltration cells are flooded with tidal water from the Bay when tidal elevations exceed approximately 5.0 feet mean lower low water. The cell where increased mercury methylation was observed, LAU3, has a lower invert elevation than LAU4, and is therefore inundated with tidal water more often and for longer periods compared to LAU4. It is suspected that either wet/dry cycling of the biofiltration cells, and/or the introduction of sulfate, both due to periodic tidal inflow may influence mercury methylation within the BMP.

Results from water year 2018 monitoring are summarized in Table 3. In a larger context, results of all methylmercury sampling from these biofiltration BMPs will be compiled, analyzed and reported in the methylmercury control study final report by CCCWP, scheduled for completion in October 2018.

Table 3. Mercury and Methylmercury Monitoring Results – Cutting Boulevard (WY 2018)

Site ID [1]	LAU3-I		LAU3-E		LAU4-I		LAU4-E	
Sample Date	03/01/2018	04/06/2018	03/01/2018	04/06/2018	03/01/2018	04/06/2018	03/01/2018	04/06/2018
Sample Time	08:40	07:45	08:45	07:50	08:20	07:55	08:25	08:00
Latitude (degrees)	37.92536		37.92536		37.92536		37.92536	
Longitude (degrees)	-122.36981		-122.36977		-122.36931		-122.36934	
Mercury (µg/L)	0.017	0.025	0.077	0.028	0.09	0.061	0.1	0.03
Methylmercury (ng/L)	0.13	0.12	0.38	1.3	0.21	0.24	0.4	0.22
SSC (mg/L)	9.9	71	13	2.8	65	25	172	54
MeHg/Hg Ratio (%)	0.8	0.5	0.5	4.6	0.2	0.4	0.4	0.7

1 Site ID key:
LAU3-I = Biofiltration Cell 3 Influent LAU3-E = Biofiltration Cell 3 Effluent LAU4-I = Biofiltration Cell 4 Influent LAU4-E = Biofiltration Cell 4 Effluent
MeHg Methylmercury

2.3 Copper and Nutrients Monitoring

Copper and nutrients samples were collected during one storm at Walnut Creek and Marsh Creek. The sampling sites were located in the lower reach of each creek but upstream of tidal influences, and represent discharge to the Bay/Delta from the two largest watersheds in the county. For Marsh Creek, the site was co-located with the fixed monitoring station for water years 2012-2014, which is approximately 0.2 miles upstream of the City of Brentwood's wastewater treatment plant (WTP) discharge. This site was selected because past data for copper and nutrients can be compared to current results to address trends (management information need 5). For Walnut Creek, the site was co-located with an MRP Provision C.8.d creek status probabilistic monitoring site, which is yet to be sampled. This site was selected because future monitoring efforts under the creek status monitoring program may provide an opportunity for trends assessment.

One grab sample was collected near peak flow from each creek during the storm of March 1, 2018. Samples were filtered in the field within 15 minutes of collection for dissolved copper, ammonia, nitrate, nitrite, and orthophosphate. Refer to Table 4 for test methods and reporting limits and Table 5 for position coordinates and a summary of analytical results.

Table 4. Watershed Characterization Analytical Tests, Methods and Reporting Limits – Copper and Nutrients

Analytical Test	Method	Target Reporting Limit
Suspended Sediment Concentration (SSC)	ASTM D 3977-97B	3 mg/L
Copper, total recoverable and dissolved	EPA 200.8	0.5 µg/L
Hardness	SM 2340C (titration)	5 mg/L
Ammonia as N	SM 4500-NH3 C v20	0.1 mg/L
Nitrate	EPA 300.0	0.05 mg/L
Nitrite	EPA 300.0	0.05 mg/L
Total Kjeldahl Nitrogen	SM 4500 NH3-C	0.1 mg/L
Dissolved Orthophosphate	SM 4500P-E	0.01 mg/L
Total Phosphorus	SM 4500P-E	0.01 mg/L

Table 5. Copper and Nutrients Monitoring Results – Lower Marsh Creek and Lower Walnut Creek (WY 2018)

Site ID [1]	LMC	WAL
Sample Date	03/01/2018	03/01/2018
Sample Time	1120 [a]	1000 [a]
Latitude (decimal degrees)	37.96264	37.97271
Longitude (decimal degrees)	-121.68794	-122.05305
Copper, Dissolved (µg/L)	3.2	3
Copper, Total (µg/L)	3.5	10
Hardness (mg/L)	180	120
Ammonia as N (mg/L)	<0.1	<0.1
Nitrate (mg/L)	0.73	0.28
Nitrite (mg/L)	0.025 J	0.005 J
Total Kjeldahl Nitrogen (mg/L)	1.1	1.5
Dissolved Orthophosphate (mg/L)	0.03	0.16
Phosphorus (mg/L)	0.069	0.37

1 Site ID key: LMC = Lower Marsh Creek WAL = Lower Walnut Creek
a Near peak of hydrocurve
< Analyte not detected at or above the detection limit; numeric value after the "<" symbol is the value of the detection limit
J Analyte detected below the reporting limit; result should be considered as an estimated value

2.4 Summary of Monitoring Completed in Water Year 2018

Water year 2018 monitoring is summarized in Table 6. The table lists the total number of tests completed for each pollutant class and analyte, the corresponding management information needs addressed, and the target number of tests outlined in the MRP. Table 6 also identifies monitoring completed by third parties used to help CCCWP meet the numeric monitoring targets identified in the MRP. Third-party monitoring completed in water year 2018 is discussed in Section 4.

The number of samples collected and analyzed in water year 2018 met or exceeded the minimum annual requirements of the MRP in all pollutant categories, with the exception of emerging contaminants which will be sampled and analyzed in one special study before the end of the five-year permit term.

The results of water year 2018 monitoring will be reported in the urban creeks monitoring report due on March 31, 2019, and will help inform water year 2019 sampling efforts.

Table 6. Summary of Monitoring Completed in WY 2018 by Pollutant Class, Analyte, Management Information Need, and MRP Targets

Pollutant Class / Type of Monitoring	Analyte									Management Information Need					Agency or Organization Performing the Monitoring	Number of Samples Collected and Analyzed in WY 2018	Cumulative Number of Samples Collected and Analyzed In WYs 2016 through 2018	Annual Minimum Number of Samples Required by the MRP	Total Number of Samples Required By the MRP Over 5-Year Term
	PCBs	Mercury	Methylmercury	SSC	PSD	TOC	Copper [1]	Hardness	Nutrients [2]	Source ID	Bay Impairment	Management Action	Loads & Status	Trends					
PCBs - water	✓			✓		✓				X	X	X	X	X	CCCWP	5			
PCBs - water	✓			✓		✓				X	X		X	X	RMP	4	42	8	80
PCBs - water	✓			✓		✓						X			BASMAA	6[a]			
PCBs - sediment	✓				✓	✓				X					BASMAA	5[b]	42	8	80
PCBs - sediment	✓									X	X	X			BASMAA	2[c]			
Mercury - water		✓	✓	✓		✓				X	X	X	X	X	CCCWP	13			
Mercury - water		✓		✓		✓				X	X		X	X	RMP	4	88	8	80
Mercury - water	✓	✓		✓		✓						X			BASMAA	25[a]			
Mercury - sediment	✓	✓			✓	✓				X	X	X			BASMAA	8[c]	38	8	80
Copper - water							✓	✓		X	X		X	X	CCCWP	2	6	2	20
Nutrients – water									✓	X	X		X	X	CCCWP	2	6	2	20
Emerging Contaminants[3]															-	0	0	3	3

1 Total and dissolved fractions of copper
2 Nutrients include: ammonia, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate and total phosphorus
3 Emerging contaminants (alternative flame retardants) need only be tested during one special study over the 5-year term of the permit
a Laboratory column experiments of various soil media filtrate samples collected and analyzed under BASMAA regional project; 25 samples total of which CCCWP takes credit for 6 (25 percent of total)
b Caulk/sealant samples collected and analyzed under BASMAA regional project; 20 samples total of which CCCWP takes credit for 5 (25 percent of total)
c HDS sediment samples collected and analyzed under BASMAA regional project; 8 samples total of which CCCWP takes credit for 2 (25 percent of total)
SSC suspended sediment concentration
PSD particle size distribution
TOC total organic carbon

Figure 1. Location of WY 2018 Monitoring Activities – County Overview

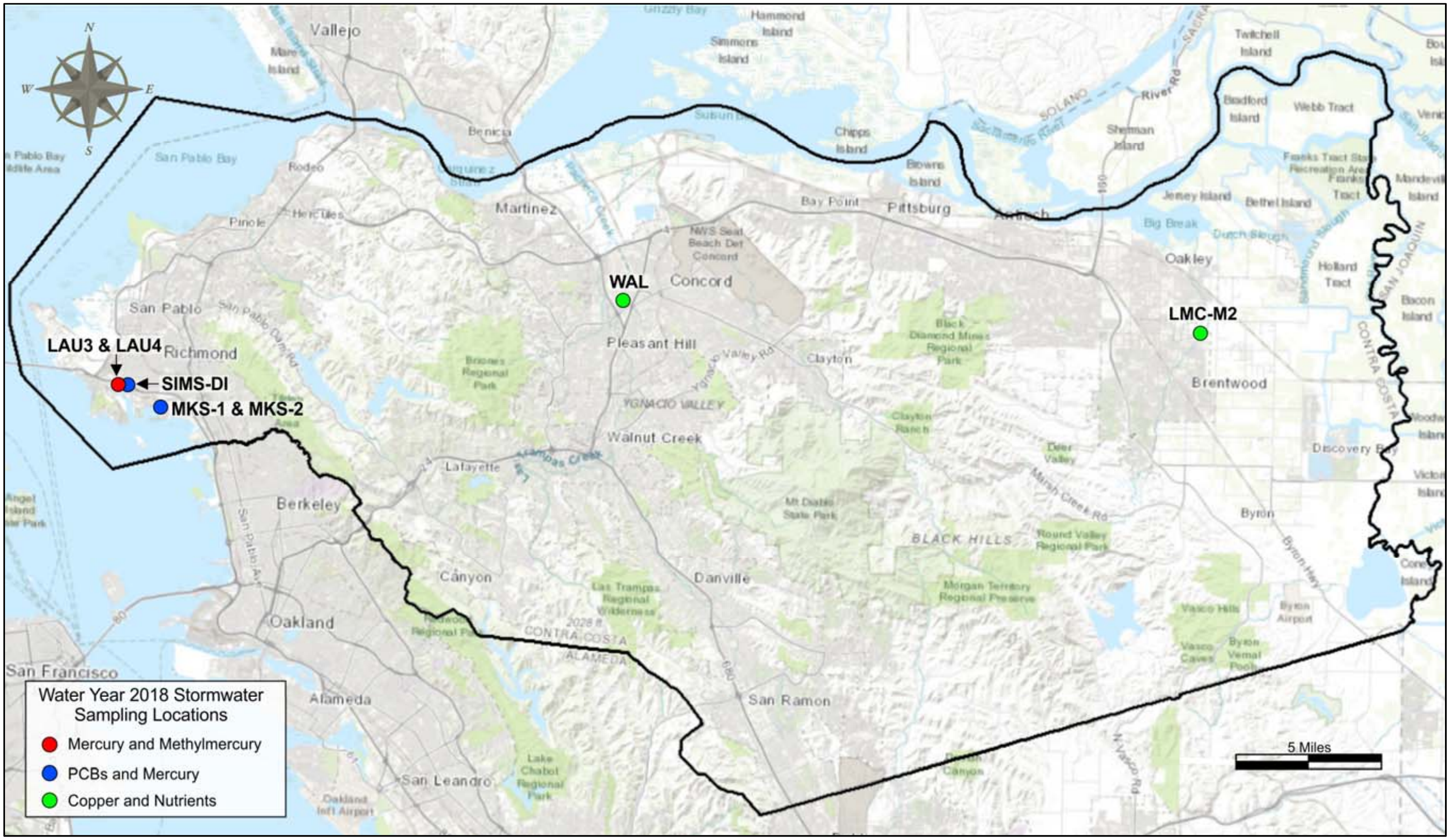


Figure 2. Location of WY 2018 Monitoring Activities – City of Richmond Detail

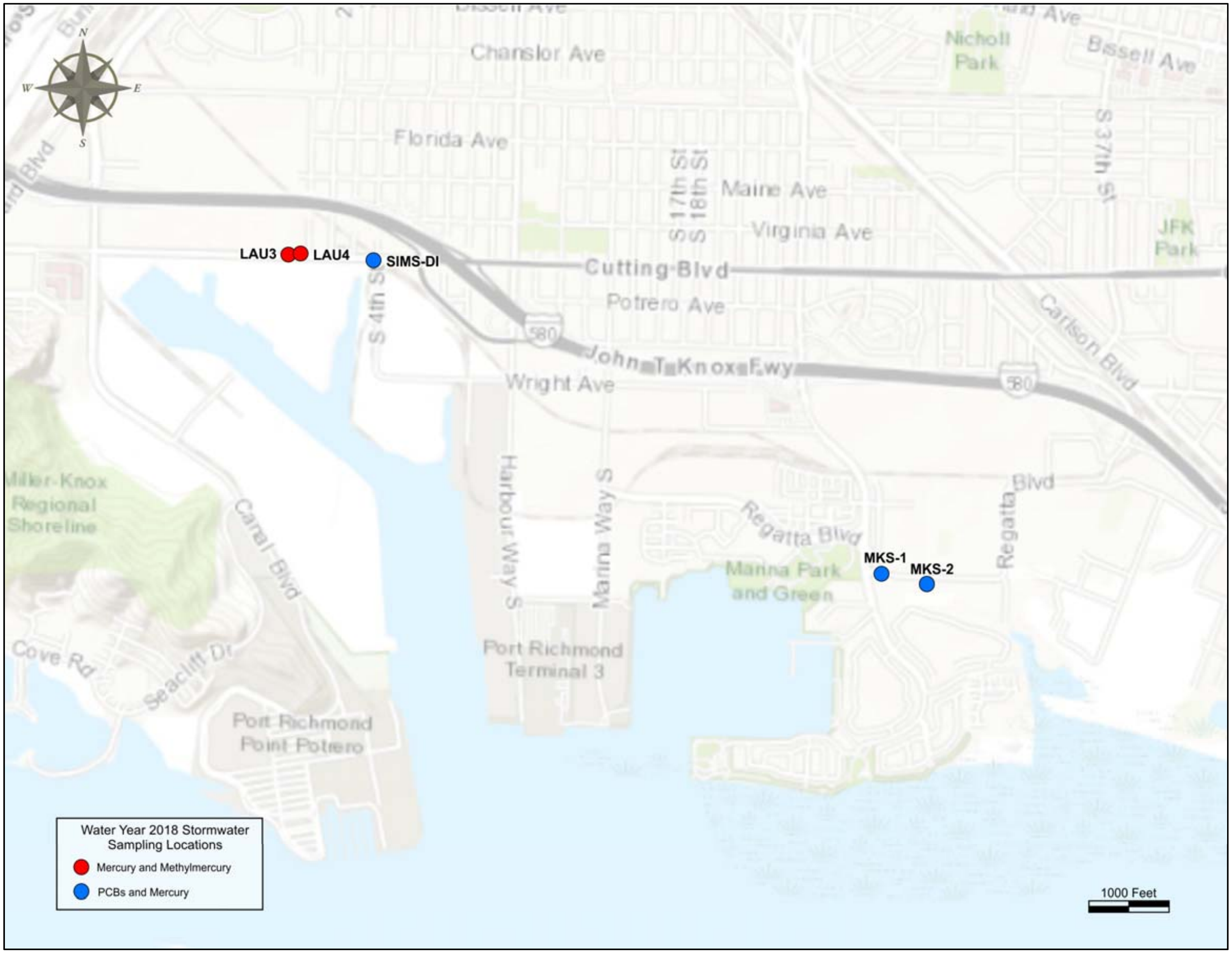
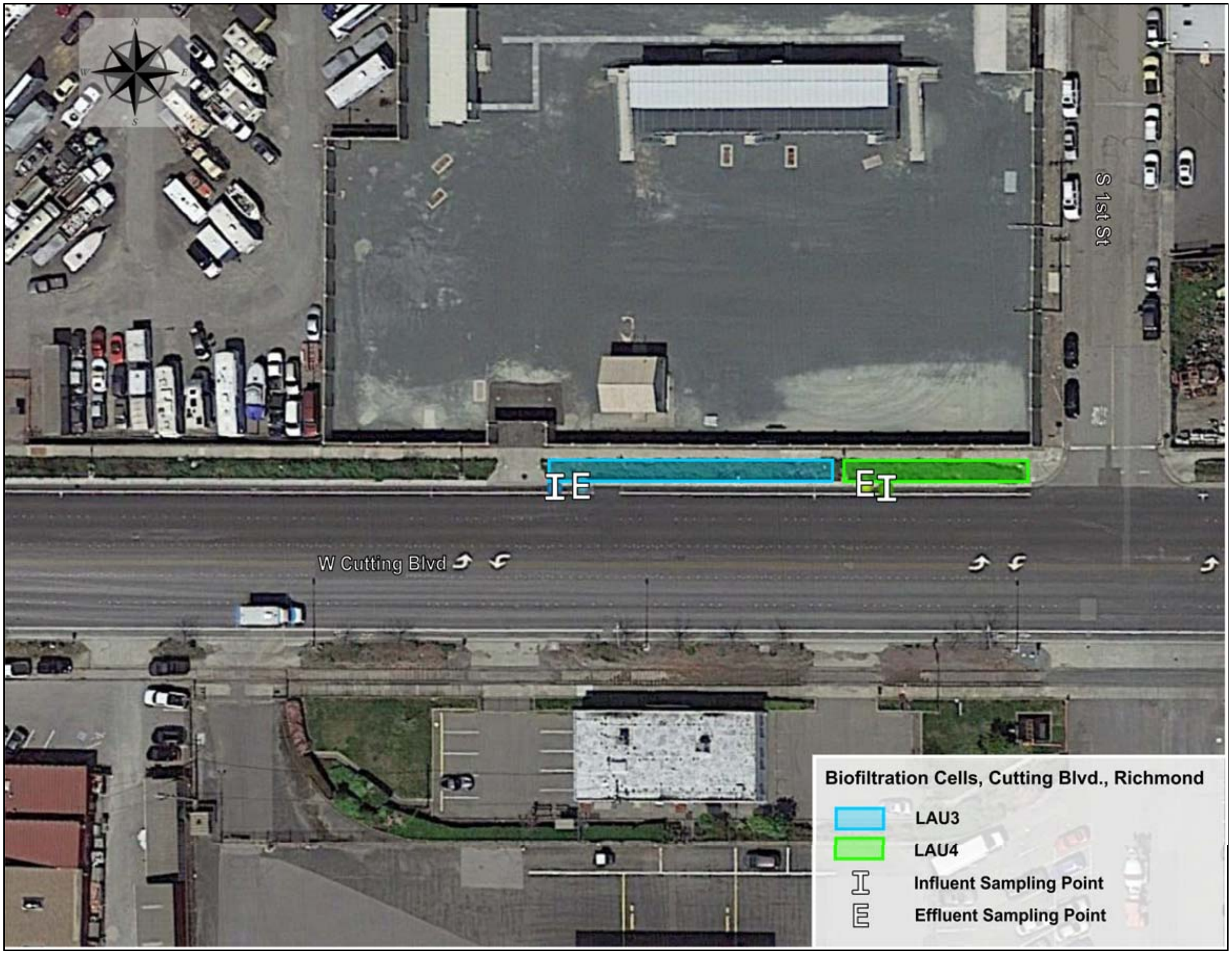


Figure 3. BMP Effectiveness Monitoring Locations LAU3 and LAU4 on Cutting Boulevard in the City of Richmond



3 MONITORING PLAN FOR WATER YEAR 2019

Monitoring in water year 2019 is expected to include the following activities:

1. New and/or follow-up sediment screening for PCBs and mercury in streets, drop inlets and/or public rights-of-way adjacent to suspected source properties which may offer a high opportunity for PCBs/mercury controls; this activity may also target sediment potentially impacted by electrical transformer spills

2. Stormwater BMP effectiveness monitoring for PCBs, mercury and copper in one treatment control device located in the City of Pittsburg

3. Sediment sampling of retained material in hydrodynamic separator (HDS) sumps within the City of Richmond for PCBs and mercury

4. Watershed characterization monitoring for copper and nutrients during dry weather in Marsh Creek and Pinole Creek

5. Stormwater and sediment trap monitoring for PCBs and mercury countywide; performed by the RMP

6. BMP effectiveness-infiltration studies at locations monitored during water year 2016, as well as at a selection of newly constructed BMPs in the Cities of Pittsburg, Walnut Creek and/or Brentwood which incorporate infiltration to native soil as a component of the BMP device

The following subsections provide background information on monitoring goals and descriptions of planned activities, as well as overall numeric goals (number of samples to be collected) during water year 2019.

3.1 Sediment Screening

Continuation of street dirt and drop inlet sediment sampling for PCBs and mercury may take place at locations identified through ongoing desktop research and field surveys, and at locations identified by CCCWP Permittees. Sites which may be added to the sampling list include locations of interest due to historic or present-day land use, lack of adequate source control by nearby property owners, reoccurring accumulation of sediment, recent electrical transformer spills, etc.

Based on lessons learned during water years 2015-2018, it is apparent that high opportunity areas for PCBs and mercury controls do not always co-locate with known or suspected contaminated source properties. High concentrations of PCBs do not always occur where expected and, in some cases, are found in relatively high concentrations in areas of only moderate interest. For this reason, monitoring efforts were expanded to include larger geographical regions around locations of interest to investigate for the presence of PCBs in areas which might have otherwise been overlooked. Non-jurisdictional lands may be targeted in the coming water year to conduct due diligence in the search for PCB and mercury sources which thus far may have eluded discovery.

Up to five sediment screening samples may be collected in water year 2019.

3.2 Stormwater BMP Effectiveness Monitoring – Influent/Effluent Sampling for PCBs and Copper

A stormwater treatment-control BMP will be selected for monitoring within the City of Pittsburg. Ideally, the selected device will lend itself to automated, flow-weighted, whole-storm composite sampling of influent runoff and treated effluent. If the selected device is not well-suited for automated sampling, manual composite collection methods will be performed over a portion of the discharge period (e.g., during the rising limb of the hydrograph). Laboratory analysis will include total PCBs, total and dissolved copper, hardness, TOC and SSC. Three sampling events will be targeted for water year 2019. A comparison of influent to effluent POC concentrations should provide evidence of the effectiveness of the BMP device to control solids (SSC) and solids-associated pollutants (PCBs and total copper), and the ability of the device to affect soluble metals concentrations (dissolved copper). For a more robust influent versus effluent statistical comparison, monitoring may continue into water year 2020 to capture an additional three storm events.

3.3 Sediment Sampling of HDS Units in the City of Richmond

To help quantify loads of PCBs and mercury retained in HDS sumps, sampling will be conducted within the City of Richmond in areas known to have high concentrations of PCBs and/or mercury in urban runoff. Since HDS sumps are periodically cleaned out by city maintenance staff using vacuum trucks, determination of sediment volume in the sumps and PCB and mercury concentrations of the material should provide some measure of BMP treatment effectiveness. Up to five HDS units may be targeted for sampling.

3.4 Watershed Characterization for Copper and Nutrients

Sampling for copper and nutrients in water year 2019 is planned for Marsh Creek and Pinole Creek during dry weather in late spring and/or early summer. Pinole Creek will serve as an urban creek comparator to Marsh Creek, because Marsh Creek is suspected of comparatively high concentrations of nutrients in the late spring and early summer as the creek begins to dry up. Two locations on Marsh Creek will be sampled: Station M1 which is just downstream of the Brentwood WTP outfall, and Station M2 which is 0.2 miles upstream of the Brentwood WTP outfall and is immediately upstream of a fish ladder. Sampling for copper and nutrients in prior years took place at Station M2.

The determination of nutrient concentrations in Marsh Creek, and those in Pinole Creek for comparison, may help to inform conclusions of a stressors/sources identification (SSID) study that CCCWP is currently undertaking on Marsh Creek related to reoccurring fish kills. A key hypothesis of the SSID study is that overnight decomposition of aquatic vegetation suppresses dissolved oxygen to lethal levels (CCCWP, 2018). If nutrient concentrations are present in elevated levels, it might help explain the presence of overly abundant aquatic vegetation which was observed during late spring/early summer in portions of Marsh Creek.

Up to eight samples for nutrients and three samples for copper will be collected in water year 2019.

3.5 Stormwater and Sediment Trap Monitoring for PCBs and Mercury by the RMP

As a contributing member to the RMP through its affiliation with BASMAA, CCCWP participates in a Bay Area-wide characterization study of PCBs and mercury in stormwater runoff in areas of interest. For water year 2019, two stormwater samples and four sediment trap samples are targeted for collection within Contra Costa County at locations to be identified in a joint effort by the RMP and representatives of CCCWP.

3.6 LID Effectiveness – Infiltration Monitoring

Continued infiltration monitoring is planned for water year 2019 at BMPs monitored in water year 2017, as well as new sites as suitable locations become available. CCCWP is engaged in an ongoing dialogue with Permittees who are implementing new LID infiltration systems within their jurisdiction, with the goal of incorporating design features (e.g., monitoring wells) to facilitate field testing. The goals of continued infiltration monitoring are to gain a better understanding of stormwater treatment within BMPs over varied geography countywide, and to assess if infiltration rates vary over time.

3.7 Summary of Monitoring Planned for Water Year 2019

Based on the planned activities described in the sections above, sampling by CCCWP for water year 2019 is summarized in Table 7.

Table 7. CCCWP Monitoring Planned for WY 2019 by Pollutant Class and MRP Targets

Pollutant Class / Type of Monitoring	Management Information Need					Number of Samples Planned for WY 2019 by CCCWP (and through the RMP)	Cumulative Number of Samples Collected and Analyzed in WYs 2016 through 2018	Annual Minimum Number of Samples Required by the MRP	Total Number of Samples Required By the MRP Over 5-Year Term
	Source ID	Bay Impairment	Management Action	Loads & Status	Trends				
PCBs - water	X	X	X	X	X	6[a] + 2[b]	42	8	80
PCBs - sediment	X	X	X		X	5[c] + 5[d] + 4[b]	42	8	80
Mercury - water	X	X		X	X	2[b]	88	8	80
Mercury - sediment	X	X	X			5[c] + 5[d] + 4[b]	38	8	80
Copper[1] - water	X	X		X	X	6[a] + 3[e]	6	2	20
Nutrients[2] – water	X	X		X	X	8[e]	6	2	20
Emerging Contaminants[3]						0	0	-	-
BMP Infiltration			X			6	6[f]	0	0

1 Total and dissolved copper
2 Ammonium, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate and total phosphorus
3 Emerging contaminants (alternative flame retardants) need only be tested during one special study over the 5-year term of the permit
a Stormwater BMP influent/effluent monitoring
b Stormwater samples (2) and sediment samples (4) targeted for collection by the RMP in Contra Costa County
c Sediment screening from streets, drop inlets and/or public rights-of-way
d HDS sump sediment samples
e Characterization monitoring in Marsh Creek and Pinole Creek
f Infiltration rates monitoring was performed at 6 bioretention/infiltration BMPs in water year 2017

4 SUMMARY OF WATER YEAR 2018 POLLUTANT MONITORING REPORTED ELSEWHERE

This section describes monitoring activities conducted by others which were funded in part by CCCWP. In addition to directly managing monitoring programs, CCCWP participates in the RMP by direct financial contributions and participation in RMP subcommittees responsible for planning and directing monitoring projects. The RMP Sources, Pathways and Loadings Workgroup, and the associated Small Tributaries Loading Strategy subgroup, are the main points of contact between CCCWP and the RMP. CCCWP also collaborates on projects with BASMAA and supports Permittees in implementing projects at the local level.

4.1 MRP Provision C.8.f. – Pollutants of Concern Monitoring: RMP Ongoing Reconnaissance Sampling for PCBs and Mercury

MRP Provision C.8.f. requires Permittees to assess inputs of POCs to the Bay from local tributaries and urban runoff, provide information to support implementation of TMDLs and other pollutant control strategies, assess progress toward achieving waste load allocations for TMDLs, and help resolve uncertainties associated with loading estimates and impairments associated with these pollutants. In particular, monitoring required by this provision must be directed toward addressing the five priority POC management information needs. In support of these information needs, the RMP continued to perform reconnaissance monitoring for PCBs and mercury in water year 2018.

In water year 2018, the RMP performed reconnaissance monitoring to identify drainages with potentially elevated concentrations of PCBs and/or mercury. The intention of reconnaissance monitoring by the RMP is to guide upstream source investigations. With input from CCCWP, locations were selected to provide coverage in areas where data gaps existed. Of 10 locations monitored by the RMP in the Bay Area in water year 2018, four locations were located in Contra Costa County (SFEI, 2018):

- Kirker Creek at Pittsburg Antioch Highway
- Little Bull Valley near the discharge to Carquinez Strait
- MS4 discharge to Meeker Slough at Regatta Boulevard
- Upper West Meeker Slough

Of these four locations, only Upper West Meeker Slough had elevated PCB particle ratios (458 ng/g). The remaining three locations had PCB particle ratios ranging from 13 ng/g at Little Bull Valley to 154 ng/g at Kirker Creek; this range of values is typical of most urban settings. Mercury particle ratios were elevated for Kirker Creek (0.816 µg/g) and slightly elevated for Upper West Meeker Slough (0.530 µg/g).

In summary, work performed by the RMP in water year 2018 provided four stormwater samples each for mercury and PCBs which were directly responsive to management information needs 1 (sources), 2 (contributions to Bay impairment), and 4 (loads and status), and indirectly supportive of progress on management information needs 3 (effectiveness) and 5 (trends).

4.2 MRP Provision C.8.f. – Pollutant of Concern Monitoring for BMP Effectiveness: BASMAA Regional Project

MRP Permittees agreed to collectively conduct POC monitoring for management action effectiveness via a BASMAA regional project. The overall goal of monitoring was to evaluate the effectiveness of selected stormwater treatment controls to provide information needed to support RAA development. BASMAA agreed to focus this monitoring effort on two treatment options with the potential to reduce PCBs and mercury discharges: HDS units and enhanced bioretention filters. HDS monitoring focused on collecting sediment removed from HDS unit sumps during maintenance to evaluate the PCBs and mercury load reduction effectiveness. Enhanced bioretention filter monitoring focused on testing various soil media amendments to identify those which improve PCBs and mercury load removal.

In February 2017, BASMAA selected a consultant team to develop a study design for the BMP effectiveness investigation and implement sampling for this investigation under the direction of a project management team consisting of members of the BASMAA Monitoring and Pollutants of Concern Committee. Together, this project team 1) collected and analyzed eight sediment samples from HDS units located in various land-use areas such as old industrial, old urban and/or new urban; and 2) collected and analyzed 25 aqueous extractant samples from five different biofiltration soil media laboratory exposures. Overall, this project addressed information priority need 3 (management action effectiveness) by providing support for planning future management actions, or evaluating the effectiveness or impacts of existing management actions. The final project report will be submitted with the Urban Creeks Monitoring Report in March 2019.

4.3 MRP Provision C.12.e. – Evaluate PCBs Presence in Caulk/Sealants Used in Storm Drain or Public Roadway Infrastructure

MRP Provision C.12.e. requires Permittees to collect samples of caulk and other sealants used in storm drains and between concrete curbs and street pavement, and to investigate whether PCBs are present in such material and in what concentrations. PCBs are most likely present in material applied during the 1970s, so the focus of this investigation is on structures installed during this era. Permittees are required to collect at least 20 composite samples throughout the permit area of caulk and sealants used in storm drains or roadway infrastructure in public rights-of way, and analyze this material for PCBs using methods which can detect a minimum PCB concentration of 200 ppb.

To achieve compliance with Provision C.12.e, MRP Permittees agreed to collectively conduct this sampling via a BASMAA regional project. This effort also contributes to partial fulfillment of POC monitoring required in Provision C.8.f of the MRP to address source identification, one of the five management information needs identified in the MRP. Source identification monitoring focuses on identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff.

In February 2017, BASMAA selected a consultant team to develop a study design for the caulk investigation and implement sampling for this investigation under the direction of a project management team consisting of members of the BASMAA Monitoring and Pollutants of Concern Committee. Together, the project team completed collection and analysis of 20 composite samples and completed a project report (BASMAA, 2018). The Final PCBs in Infrastructure Caulk-Project Report (August 2018), is included as Appendix 12.3, in the CCCWP FY 2017-18 Program Annual Report.

The investigation found that PCBs in caulk and sealant samples were lower than typical concentrations present in urban street sediment (< 0.2 ppm) for the majority of samples collected from a variety of Bay Area public roadway and storm drain infrastructure. Only 40 percent of the composite samples analyzed during the sampling program were above urban background (> 0.2 ppm). Of these, only two composite samples had very high PCBs concentrations (> 1,000 ppm). These results demonstrate that PCB-containing caulks and sealants were used in some capacity on Bay Area roadway and storm drain infrastructure in the past, but the full extent and magnitude of the usage is unknown. All of the individual samples included within the two composite samples with very high PCBs consisted of black, pliable caulking materials which were used as joint fillers on concrete bridges constructed prior to 1980. This finding suggests future characterization efforts should likely focus on these types of materials and applications.

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