# Urban Creeks Monitoring Report

## *Water Quality Monitoring*

***Water Year 2017 (October 2016 – September 2017)***

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

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

***A Program of the City/County Association of Governments***

**March 31, 2018**

# CREDITS

**This report is submitted by the participating agencies in the**

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# Preface

In early 2010, several members of the Bay Area Stormwater Agencies Association (BASMAA) joined together to form the Regional Monitoring Coalition (RMC), to coordinate and oversee water quality monitoring required by the San Francisco Bay Area regional municipal stormwater permit, which is a National Pollutant Discharge Elimination System (NPDES) permit (in this document the permit is referred to as the Municipal Regional Permit, or MRP)[1]. The RMC includes the following participants:

- Alameda Countywide Clean Water Program (ACCWP)
- Contra Costa Clean Water Program (CCCWP)
- San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)
- Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)
- Fairfield-Suisun Urban Runoff Management Program (FSURMP)
- City of Vallejo and Vallejo Flood and Wastewater District (Vallejo)

This Urban Creeks Monitoring Report complies with MRP provision C.8.h.iii for reporting of all data in Water Year 2017 (October 1, 2016 through September 30, 2017). Data were collected pursuant to provision C.8 of the MRP. Data presented in this report were produced under the direction of the RMC and the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) using probabilistic and targeted monitoring designs as described herein.

Consistent with the BASMAA RMC Multi-Year Work Plan (Work Plan; BASMAA 2011) and the Creek Status and Long-Term Trends Monitoring Plan (BASMAA 2012), monitoring data were collected in accordance with the BASMAA RMC Quality Assurance Project Plan (QAPP; BASMAA, 2016a) and the BASMAA RMC Standard Operating Procedures (SOPs; BASMAA, 2016b). Where applicable, monitoring data were derived using methods comparable with methods specified by the California Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Program Plan (QAPrP)[2]. Data presented in this report were also submitted in electronic SWAMP-comparable formats by SMCWPPP to the Regional Water Board on behalf of SMCWPPP Permittees and pursuant to Provision C.8.h.ii of the MRP.

[1] The San Francisco Bay Regional Water Quality Control Board (SFRWQCB or Regional Water Board) issued the MRP to 76 cities, counties, and flood control districts (i.e., Permittees) in the Bay Area on October 14, 2009 (SFRWQCB 2009). On November 19, 2015, the Regional Water Board updated and reissued the MRP (SFRWQCB 2015). The BASMAA programs supporting MRP Regional Projects include all MRP Permittees as well as the cities of Antioch, Brentwood, and Oakley, which are not named as Permittees under the MRP but have voluntarily elected to participate in MRP-related regional activities.

[2] The current SWAMP QAPrP is available at:
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf

# List of Acronyms

| | |
|---|---|
| ACCWP | Alameda County Clean Water Program |
| AFDM | Ash Free Dry Mass |
| BASMAA | Bay Area Stormwater Management Agency Association |
| BMI | Benthic Macroinvertebrate |
| BMP | Best Management Practice |
| C/CAG | San Mateo City/County Association of Governments |
| CCCWP | Contra Costa Clean Water Program |
| CEC | Chemicals of Emerging Concern |
| CEDEN | California Environmental Data Exchange Network |
| CSCI | California Stream Condition Index |
| CW4CB | Clean Watersheds for a Clean Bay |
| DO | Dissolved Oxygen |
| ECWG | Emerging Contaminant Workgroup |
| EPA | Environmental Protection Agency |
| FIB | Fecal Indicator Bacteria |
| FSURMP | Fairfield Suisun Urban Runoff Management Program |
| GIS | Geographic Information system |
| IBI | Benthic Macroinvertebrate Index of Biological Integrity |
| IPM | Integrated Pest Management |
| LID | Low Impact Development |
| MPC | Monitoring and Pollutants of Concern Committee |
| MRP | Municipal Regional Permit |
| MS4 | Municipal Separate Storm Water Sewer System |
| MWAT | Maximum Weekly Average Temperature |
| NPDES | National Pollution Discharge Elimination System |
| PAHs | Polycyclic Aromatic Hydrocarbons |
| PBDEs | Polybrominated Diphenyl Ethers |
| PCBs | Polychlorinated Biphenyls |
| PEC | Probable Effect Concentration |
| PFAS | Perfluoroalkyl Sulfonates |
| PFOS | Perfluorooctane Sulfonates |
| PHAB | Physical Habitat |

| | |
|---|---|
| POC | Pollutant of Concern |
| QAPP | Quality Assurance Project Plan |
| QAPrP | Quality Assurance Program Plan |
| QAO | Quality Assurance Officer |
| RCD | San Mateo County Resource Conservation District |
| RMC | Regional Monitoring Coalition |
| RMP | Regional Monitoring Program |
| RWSM | Regional Watershed Spreadsheet Model |
| S&T | Status and Trends |
| SCVURPPP | Santa Clara Valley Urban Runoff Pollution Prevention Program |
| SFEI | San Francisco Estuary Institute |
| SFRWQCB | San Francisco Regional Water Quality Control Board |
| SMCWPPP | San Mateo Countywide Water Pollution Prevention Program |
| SOP | Standard Operating Procedures |
| SPLWG | Sources, Pathways, and Loadings Work Group |
| SPoT | Statewide Stream Pollutant Trend Monitoring |
| SRP | San Mateo Countywide Stormwater Resource Plan |
| SSC | Suspended sediment concentration |
| SSID | Stressor/Source Identification |
| STLS | Small Tributaries Loading Strategy |
| SWAMP | Surface Water Ambient Monitoring Program |
| TEC | Threshold Effect Concentration |
| TKN | Total Kjeldahl Nitrogen |
| TMDL | Total Maximum Daily Load |
| TRC | Technical Review Committee |
| TRE | Toxicity Reduction Evaluation |
| TU | Toxic Unit (equivalent) |
| UCD | University of California, Davis |
| UCMR | Urban Creeks Monitoring Report |
| USEPA | US Environmental Protection Agency |
| USGS | US Geological Survey |
| WLA | Waste Load Allocation |
| WMA | Watershed Management Areas |
| WQO | Water Quality Objective |

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## Table E.1. Water Year 2017 Creek Status Monitoring Stations

In compliance with Provision C.8.h.iii.(1), this table of all Creek Status Monitoring stations sampled in Water Year 2017 is provided immediately following the Table of Contents. See Section 3.0 for additional information on Creek Status Monitoring.

| Map ID * | Station ID | Bayside or Coastside | Watershed | Creek Name | Land Use | Latitude | Longitude | Probabilistic | Targeted | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Bioassessment, Nutrients, General WQ | Chlorine | Toxicity, Sediment Chemistry | Temp | Cont. WQ** | Pathogen Indicators |
| 550 | 202R00550 | Coastside | Pescadero Creek | Jones Gulch | NU | 37.278796 | -122.26832 | X | X | | | | |
| 552 | 202R00552 | Coastside | San Gregorio Cr | Lawrence Creek | NU | 37.388456 | -122.31340 | X | X | | | | |
| 2472 | 204R02472 | Bayside | Redwood Creek | Redwood Creek | U | 37.465155 | -122.23462 | X | X | | | | |
| 2611 | 204R02611 | Bayside | Atherton Creek | Atherton Creek | U | 37.450833 | -122.20592 | X | X | | | | |
| 3240 | 204R03240 | Bayside | Atherton Creek | Atherton Creek | U | 37.427321 | -122.22682 | X | X | | | | |
| 3252 | 204R03252 | Bayside | San Mateo Creek | San Mateo Creek | U | 37.563132 | -122.32754 | X | X | | | | |
| 3272 | 204R03272 | Bayside | San Mateo Creek | San Mateo Creek | U | 37.533846 | -122.35018 | X | X | | | | |
| 3316 | 204R03316 | Bayside | Redwood Creek | Ojo de Aqua | U | 37.48119 | -122.23427 | X | X | | | | |
| 3336 | 204R03336 | Bayside | Belmont Creek | Belmont Creek | U | 37.516284 | -122.27867 | X | X | | | | |
| 3496 | 204R03496 | Bayside | Redwood Creek | Redwood Creek | U | 37.447749 | -122.23470 | X | X | | | | |
| 005 | 202SPE005 | Coastside | San Pedro Creek | San Pedro Creek | U | 37.59441 | -122.50520 | | | X | | | |
| 17 | 202DEN017 | Coastside | Denniston Creek | NA (MS4) | U | 37.50499 | -122.48641 | | | | | | X |
| 5 | 202DEN005 | Coastside | Denniston Creek | Denniston Creek | U | 37.50465 | -122.48697 | | | | | | X |
| 20 | 202DEN020 | Coastside | Denniston Creek | Denniston Creek | U | 37.50638 | -122.48714 | | | | | | X |
| 1 | 202CAP001 | Coastside | Capistrano Drainage | NA (MS4) | U | 37.50377 | -122.48568 | | | | | | X |
| 25 | 202CAP025 | Coastside | Capistrano Drainage | NA (MS4) | U | 37.50391 | -122.48574 | | | | | | X |
| 19 | 202SPE019 | Coastside | San Pedro Creek | San Pedro Creek | U | 37.58853 | -122.49943 | | | | X | | |
| 40 | 202SPE040 | Coastside | San Pedro Creek | San Pedro Creek | U | 37.58200 | -122.48708 | | | | X | X | |
| 50 | 202SPE050 | Coastside | San Pedro Creek | San Pedro Creek | U | 37.58198 | -122.47819 | | | | X | | |
| 70 | 202SPE070 | Coastside | San Pedro Creek | San Pedro Creek | NU | 37.57974 | -122.47371 | | | | X | X | |
| 85 | 202SPE085 | Coastside | San Pedro Creek | San Pedro Creek | NU | 37.57826 | -122.47156 | | | | X | | |

U = urban, NU = non-urban, NA = not applicable, MS4 = municipal separate storm sewer system

* Map ID applies to Figure 3.1.

**General water quality monitoring (temperature, dissolved oxygen, pH and specific conductivity) conducted continuously during two 2-week periods (spring and late summer).

# Executive Summary

This Urban Creeks Monitoring Report was prepared by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) in compliance the National Pollutant Discharge Elimination System stormwater permit for Bay Area municipalities referred to as the Municipal Regional Permit (MRP; Order No. R2-2015-0049). This report, including all appendices and attachments, fulfills the requirements of Provision C.8.h.iii of the MRP for reporting of all data collected in Water Year 2017 (WY 2017; October 1, 2016 through September 30, 2017) pursuant to Provision C.8 of the MRP. Data presented in this report were also submitted in electronic SWAMP-comparable formats by SMCWPPP to the Regional Water Board on behalf of SMCWPPP Permittees and pursuant to Provision C.8.h.ii of the MRP.

Water quality monitoring required by Provision C.8 of the MRP is intended to assess the condition of water quality in Bay Area receiving waters (creeks and the Bay); identify and prioritize stormwater associated impacts, stressors, sources, and loads; identify appropriate management actions; and detect trends in water quality over time and the effects of stormwater control measure implementation.

The organization of this Executive Summary follows the sub-provisions of Provision C.8 (Water Quality Monitoring) of the MRP. Each section very briefly describes what was done and summarizes key results. More details are provided in the body of the report and in its corresponding appendices.

### Compliance Options (C.8.a)

Provision C.8.a (Compliance Options) of the MRP allows Permittees to address monitoring requirements through a “regional collaborative effort,” their countywide stormwater program, and/or individually. On behalf of San Mateo County Permittees, SMCWPPP conducts creek water quality monitoring and monitoring projects in San Mateo County in collaboration with the Bay Area Stormwater Management Agency Association (BASMAA) Regional Monitoring Coalition (RMC), and actively participates in the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), which focuses on assessing Bay water quality and associated impacts.

### Monitoring Protocols and Data Quality (C.8.b)

Creek status and pesticides & toxicity monitoring data were collected in accordance with the BASMAA RMC Quality Assurance Project Plan (QAPP) and the BASMAA RMC Standard Operating Procedures (SOP). Where applicable, and in compliance with Provision C.8.b, methods described in the QAPP and SOP are comparable with methods specified by the California Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Program Plan (QAPrP).

### San Francisco Estuary Receiving Water Monitoring (C.8.c)

In accordance with Provision C.8.c of the MRP, Permittees are required to provide financial contributions towards implementing an Estuary receiving water monitoring program on an annual basis that, at a minimum, is equivalent to the RMP. SMCWPPP complies with this provision by making financial contributions to the RMP. Additionally, SMCWPPP representatives actively participate in RMP committees, workgroups, and strategy teams, such as the Small

Tributaries Loading Strategy (STLS) to help oversee RMP activities and look out for MRP Permittee interests.

**Creek Status Monitoring (C.8.d)**

The RMC's creek status monitoring strategy includes both a regional ambient/probabilistic monitoring design and a local "targeted" monitoring design. The probabilistic monitoring design was developed to remove bias from site selection such that ecosystem conditions can be objectively assessed on local (i.e., San Mateo County) and regional (i.e., RMC) scales. The targeted monitoring design focuses on sites selected based on the presence of significant fish and wildlife resources as well as historical and/or recent indications of water quality concerns. Monitoring results are compared to "triggers" listed in Provision C.8.d of the MRP. Some triggers are equivalent to regulatory Water Quality Objectives (WQOs); others are thresholds above (or below) which potential impacts to aquatic life or other beneficial uses may occur. Sites were triggers are exceeded (or not met) are considered for future stressor/source identification (SSID) projects.

During WY 2017, the SMCWPPP conducted biological assessments at ten probabilistic sites. Bioassessments include the collection of benthic macro-invertebrate and algae samples, physical habitat measurements, water chemistry (i.e., nutrient analyses) and general water quality. The California Stream Condition Index (CSCI), a statewide tool that translates benthic macroinvertebrate data into an overall measure of stream health, was used to assess biological condition at all probabilistic sites. Of the ten sites monitored in WY 2017, eight sites (80%) scored below the trigger CSCI score of 0.795 and were rated as altered or degraded. Low CSCI scores are related impacts to physical habitat typical for urbanized areas, such as creek channel modifications (e.g., lining with concrete) and contributing watersheds with a high percentages of impervious surface.

Targeted monitoring parameters consist of water temperature, general water quality, and pathogen indicators. In WY 2017, continuous temperature data were collected at five targeted stations and continuous general water quality data (pH, dissolved oxygen, specific conductance, and temperature) were collected at two targeted stations in San Pedro Creek. San Pedro Creek, located in the City of Pacifica, was targeted for temperature and general water quality monitoring because it contains the northern-most population of naturally producing steelhead trout (*Oncorhynchus mykiss*) in San Mateo County. Water quality appears to be fully supporting juvenile steelhead rearing and spawning life stages. There were no exceedances of the MRP trigger thresholds for temperature or any of the general water quality parameters.

In WY 2017, pathogen indicator samples (i.e., enterococci, *E. coli*) were collected at two stations on Denniston Creek near Pillar Point Harbor, one storm drain discharging to Denniston Creek, one outfall pipe discharging directly to the beach Pillar Point Harbor, and one storm drain upstream of the outfall pipe. Triggers for enterococci were exceeded at four of the five sites and triggers for *E. coli* were exceeded at three of the five sites. Pillar Point Harbor is the site of an SSID project that will examine the extent and sources of pathogen indicators in the area. In addition, local municipalities are actively implementing bacteria control measures (e.g., outreach regarding pet wastes and programs to reduce discharges from sanitary sewer systems). Impacts to urban streams identified through creek status monitoring are likely the result of long-term changes in stream hydrology, channel geomorphology, in-stream habitat complexity, and other modifications associated with the urban development, along with pollutant discharges typically found in urban watersheds. SMCWPPP Permittees are actively implementing many stormwater management programs to address these and other stressors and associated

sources of water quality conditions observed in local creeks, with the goal of protecting these natural resources. Through the continued implementation of MRP-associated and other watershed stewardship programs, SMCWPPP anticipates that stream conditions and water quality in local creeks will continue to improve over time.

**Stressor/Source Identification (SSID) Projects (C.8.e)**

Provision C.8.e of the MRP requires that Permittees evaluate creek status (Provision C.8.d) and pesticides and toxicity (Provision C.8.g) monitoring data with respect to triggers defined in the MRP and maintain a list of all results exceeding trigger thresholds. Sites where triggers are exceeded may indicate potential impacts to aquatic life or other beneficial uses and are therefore considered as candidates for future SSID projects. The MRP requires SMCWPPP and its RMC partners to collectively initiate a region-wide minimum of eight SSID projects. In WY 2017, SMCWPPP initiated the Pillar Point Watershed Pathogen Indicator SSID Project. The project work plan describes the steps that will be taken to investigate urban sources of fecal indicator bacteria in the Pillar Point Watershed. SMCWPPP will implement the work plan in WY 2018 with assistance from and in close coordination with the San Mateo County Resource Conservation District (RCD).

**Pollutants of Concern Monitoring (C.8.f)**

Pollutants of Concern (POC) monitoring is required by Provision C.8.f of the MRP. POC monitoring is intended to assess inputs of POCs to the Bay from local tributaries and urban runoff, provide information to support implementation of Total Maximum Daily Load (TMDL) water quality restoration plans and other pollutant control strategies, assess progress toward achieving wasteload allocations (WLAs) for TMDLs, and help resolve uncertainties associated with loading estimates for POCs. In WY 2017, SMCWPPP met or exceeded the MRP's minimum yearly requirements for all POC monitoring parameters.

The MRP requires that Permittees provide a list of management areas in which new PCBs and mercury control measures will be implemented during the permit term. These management areas are designated "Watershed Management Areas" (WMAs), and are defined as all San Mateo County catchments containing high interest parcels (i.e., properties with land uses associated with PCBs such as old industrial, electrical and recycling) and/or existing or planned PCBs and mercury controls. During WY 2017, SMCWPPP collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs and 67 sediment samples (of which 6 were duplicates) within WMAs. As part of continuing to develop strategies for reducing PCBs and mercury loads in stormwater runoff, SMCWPPP evaluated these data, along with additional WY 2017 stormwater runoff sample data collected through the STLS, and data from previous water years collected by SMCWPPP and through the STLS. Objectives included attempting to identify source properties within WMAs, identifying which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls, and prioritizing WMAs for future investigations. Each WMA was provisionally designated as higher, medium, or lower priority. In addition, SMCWPPP is working with the City of San Carlos to develop referrals for three source properties, and evaluating next steps at several other potential source properties.

One of the 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs was also analyzed for total and dissolved copper. An additional four creek water samples were collected for copper analysis from upstream and downstream locations in two creeks (Atherton and Redwood Creeks) during a large January 2017 storm event. One of the downstream stations was also sampled for copper during spring baseflow conditions. Copper concentrations

were higher at bottom-of-the-watershed stations in both creeks compared to stations higher in the watersheds), suggesting an influence by stormwater runoff. The upstream and downstream stations in Atherton and Redwood Creeks were concurrently sampled for nutrients during the large January 2017 storm event. Three of these stations were also sampled for nutrients during spring baseflow conditions. In Atherton Creek, nitrate, total nitrogen, dissolved orthophosphate and phosphorus concentrations were higher at the downstream station compared to the upstream station. However, TKN and ammonia concentrations were lower at the downstream station, suggesting an organic source of nitrogen in the upper watershed. Nutrient concentrations in both creeks were higher during the January storm sampling event compared to the spring baseflow event, suggesting that nutrient loads to San Francisco Bay from these creeks is higher during storm events.

With one exception, none of the WY 2017 POC monitoring water samples exceeded applicable WQOs. The exception was the stormwater runoff sample analyzed for copper. However, WQOs generally are applied to receiving waters, not stormwater runoff, and it is likely that mixing in the receiving water downstream of the outfall would have diluted the copper. In addition, higher hardness in the creek compared to the stormwater runoff would have reduced the bioavailability of the copper in the receiving water.

**Pesticides and Toxicity Monitoring (C.8.g)**

In WY 2017, SMCWPPP conducted dry weather pesticides and toxicity monitoring at one station (San Pedro Creek) in compliance with Provision C.8.g of the MRP. Statistically significant toxicity to *C. dubia* and *P. promelas* was observed in water samples collected during the dry season. However, the magnitude of the toxic effects in the samples compared to laboratory controls was relatively low and did not exceed MRP trigger criteria of 50 Percent Effect. The cause of the observed toxicity is unknown.

Pesticide concentrations in the sediment sample were all relatively low, with most below the method detection limits (MDLs). Toxic Unit (TU) equivalents were also relatively low (did not exceed 0.04). Threshold Effect Concentration (TEC) and Probable Effect Concentration (PEC) quotients were calculated for all metals and total poly aromatic hydrocarbons (PAHs) measured in sediment samples. Some TEC and PEC trigger exceedances were observed for chromium and nickel but are likely related to natural occurrences of these metals associated with the area's serpentine geology.

# 1.0 Introduction

This Urban Creeks Monitoring Report (UCMR), was prepared by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), on behalf of its 22 member agencies (20 cities/towns, the County of San Mateo, and the San Mateo County Flood Control District) subject to the National Pollutant Discharge Elimination System (NPDES) stormwater permit for Bay Area municipalities referred to as the Municipal Regional Permit (MRP).

The MRP was first adopted by the San Francisco Regional Water Quality Control Board (SFRWQCB or Regional Water Board) on October 14, 2009 as Order R2-2009-0074 (SFRWQCB 2009). On November 19, 2015, the SFRWQCB updated and reissued the MRP as Order R2-2015-0049 (SFRWQCB 2015). This report fulfills the requirements of Provision C.8.h.iii of the MRP for comprehensively interpreting and reporting all monitoring data collected during the foregoing October 1 – September 30 period (i.e., Water Year 2017). Data were collected pursuant to water quality monitoring requirements in provision C.8 of the MRP. Monitoring data presented in this report were submitted electronically to the Regional Water Board by SMCWPPP and, if collected from a receiving water, may be obtained via the San Francisco Bay Area Regional Data Center of the California Environmental Data Exchange Network (CEDEN).[3]

Major sections in this report are organized according to the following topics and MRP provisions. Some topics are summarized briefly in this report but described more fully in the appendices.

1.0 Introduction

2.0 San Francisco Estuary Receiving Water Monitoring (MRP Provision C.8.c)

3.0 Creek Status Monitoring (MRP Provision C.8.d) and Pesticides and Toxicity Monitoring (MRP Provision C.8.g) (**Appendix A**)

4.0 Stressor/Source Identification (SSID) Projects (MRP Provision C.8.e) (**Appendix B and C**)

5.0 Pollutants of Concern (POC) Monitoring (MRP Provision C.8.f) (**Appendices D and E**)

6.0 Recommendations and Next Steps

Figure 1.1 maps locations of monitoring stations associated with Provision C.8 compliance in Water Year 2017 (WY 2017), including Creek Status Monitoring, Pesticides and Toxicity Monitoring, and POC Monitoring conducted by SMCWPPP and the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP). This figure illustrates the geographic extent of monitoring conducted in San Mateo County in WY 2017.

[3] http://www.ceden.org/

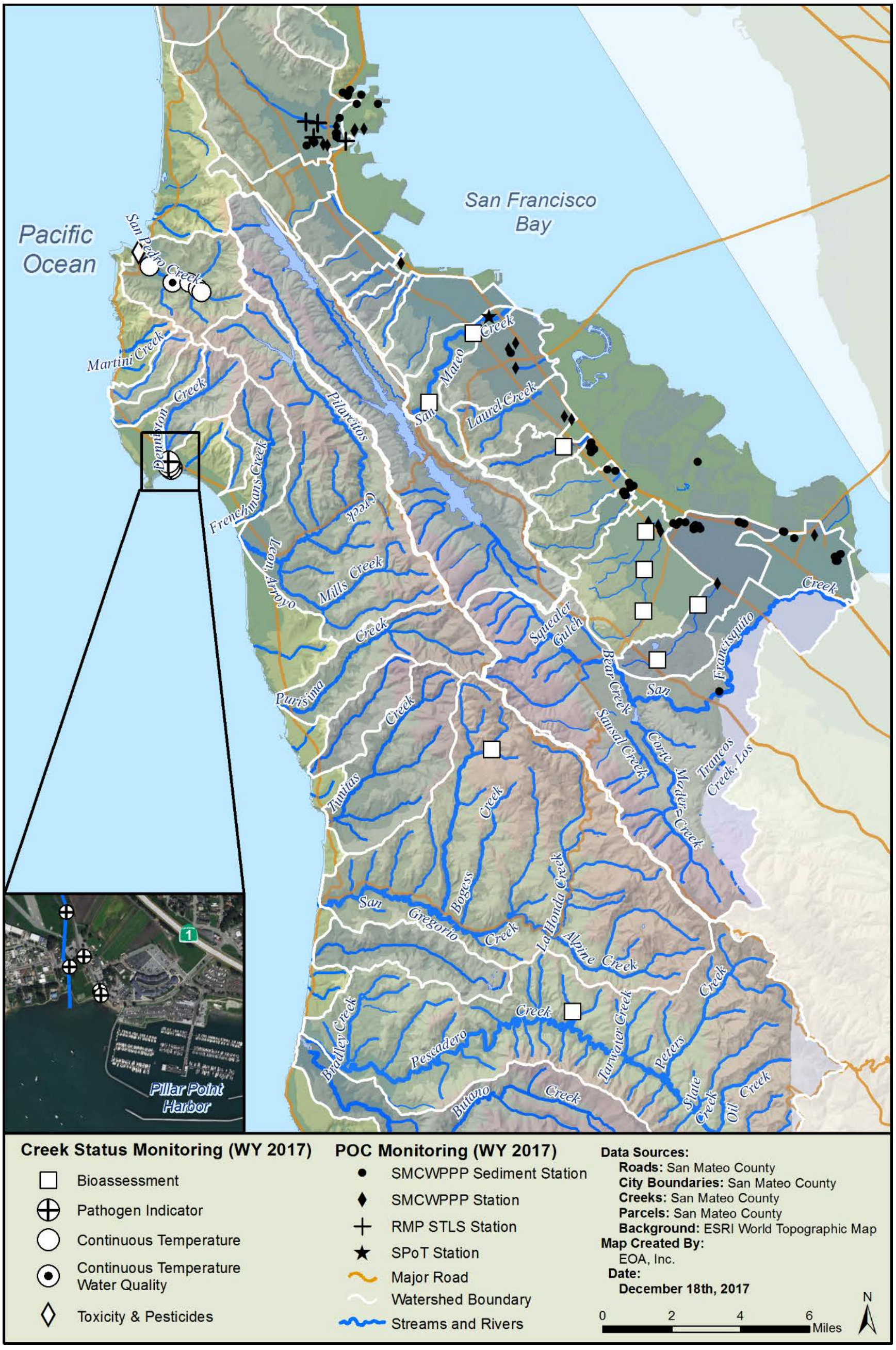


Figure. 1.1. San Mateo County MRP Provision C.8 monitoring locations: Creek Status Monitoring, Pesticides and Toxicity Monitoring, and POC Monitoring, WY 2017.

## 1.1 RMC Overview

Provision C.8.a (Compliance Options) of the MRP allows Permittees to address monitoring requirements through a "regional collaborative effort," their countywide stormwater program, and/or individually. In June 2010, Permittees notified the Regional Water Board in writing of their agreement to participate in a regional monitoring collaborative to address requirements in Provision C.8. The regional monitoring collaborative is referred to as the Bay Area Stormwater Management Agency Association (BASMAA) Regional Monitoring Coalition (RMC). In a November 2, 2010 letter to the Permittees, the Regional Water Board's Assistant Executive Officer (Dr. Thomas Mumley) acknowledged that all Permittees have opted to conduct monitoring required by the MRP through a regional monitoring collaborative, the BASMAA RMC. Participants in the RMC are listed in Table 1.1.

In February 2011, the RMC developed a Multi-Year Work Plan (RMC Work Plan; BASMAA 2011) to provide a framework for implementing regional monitoring and assessment activities required under Provision C.8 of the 2009 MRP. The RMC Work Plan summarizes RMC projects planned for implementation between Fiscal Years 2009-10 and 2014-15 (BASMAA 2011). Projects were collectively developed by RMC representatives to the BASMAA Monitoring and Pollutants of Concern Committee (MPC), and were conceptually agreed to by the BASMAA Board of Directors (BASMAA BOD). Although there are no plans to update the Multi-Year Work Plan, several additional regional projects were identified to be conducted in compliance with the 2015 MRP. Current regional projects relevant to Provision C.8 compliance include projects to maintain and update the regional database, coordinate the RMC Workgroup meetings, and conduct POC monitoring.

Regionally implemented activities in the RMC Work Plan are conducted under the auspices of BASMAA, a 501(c)(3) non-profit organization that represents the municipal stormwater programs in the San Francisco Bay Area. Scopes, budgets, and contracting or in-kind project implementation mechanisms for BASMAA regional projects follow BASMAA's Operational Policies and Procedures and are approved by the BASMAA BOD. MRP Permittees, often through their stormwater program representatives on the BOD and its subcommittees, collaboratively authorize and participate in BASMAA regional projects or tasks. Regional project costs are usually shared by either all BASMAA members or among those Phase I municipal stormwater programs that are subject to the MRP.

Table 1.1 Regional Monitoring Coalition (RMC) participants.

| Stormwater Programs | RMC Participants |
|---|---|
| Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) | Cities of Campbell, Cupertino, Los Altos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, Sunnyvale, Los Altos Hills, and Los Gatos; Santa Clara Valley Water District; and, Santa Clara County |
| Alameda Countywide Clean Water Program (ACCWP) | Cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City; Alameda County; Alameda County Flood Control and Water Conservation District; and, Zone 7 |
| Contra Costa Clean Water Program (CCCWP) | Cities of Antioch, Brentwood, Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, Walnut Creek, Danville, and Moraga; Contra Costa County; and, Contra Costa County Flood Control and Water Conservation District |
| San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) | Cities of Belmont, Brisbane, Burlingame, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Bruno, San Carlos, San Mateo, South San Francisco, Atherton, Colma, Hillsborough, Portola Valley, and Woodside; San Mateo County Flood Control District; and, San Mateo County |
| Fairfield-Suisun Urban Runoff Management Program (FSURMP) | Cities of Fairfield and Suisun City |
| Vallejo Permittees | City of Vallejo and Vallejo Flood and Wastewater District |

## 1.2 Coordination with Third-party Monitoring Programs

SMCWPPP strives to work collaboratively with its water quality monitoring partners to find mutually beneficial monitoring approaches. Provision C.8.a.iii of the MRP 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.

In WY 2017, SMCWPPP continued to coordinate with water quality monitoring programs conducted by third parties that supplement Bay Area stormwater monitoring conducted via the MRP. These programs include the RMP's Small Tributaries Loading Strategy (STLS), and the Stream Pollutant Trends (SPoT) monitoring conducted by the State of California's Surface Water Ambient Monitoring Program (SWAMP). Water quality data from these programs are reported in this document and were utilized to comply with or supplement MRP Provision C.8 monitoring, consistent with Provision C.8.a.iii.[4,5] These data are described in Section 5.0 (POC Monitoring) of this report.

[4] Data reported by these programs are summarized in this report, however, the data were not included in the SMCWPPP electronic data submittal.

[5] In most years, the SPoT Program collects sediment samples from one station in San Mateo Creek and analyzes for one or more of the constituents required by Provision C.8.f of the MRP. In WY 2017, the SPoT station sample was analyzed for one of those constituents (PCBs).

# 2.0 San Francisco Estuary Receiving Water Monitoring (C.8.c)

In accordance with Provision C.8.c of the MRP, Permittees are required to provide financial contributions towards implementing an Estuary receiving water monitoring program on an annual basis that at a minimum is equivalent to the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP). Since the adoption of the 2009 MRP, SMCWPPP has complied with this provision by making financial contributions to the RMP. Additionally, SMCWPPP representatives actively participate in RMP committees, workgroups, and strategy teams as described in the following sections, which also provide a brief description of the RMP and associated monitoring activities conducted during WY 2017.

Now in its 25th year, the RMP is a long-term discharger-funded monitoring program that shares direction and participation by regulatory agencies and the regulated community with the goal of assessing water quality in the San Francisco Bay. The regulated community includes municipal separate storm water sewer systems (MS4s), publicly owned treatment works (POTWs), dredger, and industrial dischargers. The San Francisco Estuary Institute (SFEI) is the implementing entity for the RMP and the fiduciary agent for RMP stakeholder funds. SFEI helps identify stakeholder information needs, develops workplans that address these needs, and implements the workplans. SFEI's work is overseen by a Board and various committees that include representatives from the dischargers and regulators.

The RMP is intended to answer the following core management questions:

1. Are chemical concentrations in the Estuary potentially at levels of concern and are associated impacts likely?
2. What are the concentrations and masses of contaminants in the Estuary and its segments?
3. What are the sources, pathways, loadings, and processes leading to contaminant related impacts in the Estuary?
4. Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased?
5. What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?

The RMP budget is generally broken into two major program elements: Status and Trends and Pilot/Special Studies. The following sections provide a brief overview of these programs. The *RMP 2017 Detailed Workplan and Budget*[6] provides more details and establishes deliverables for each component of the RMP budget. The RMP publishes annual summary reports. In odd years, the *Pulse of the Estuary Report* focuses on Bay water quality and summarizes information from all sources. In even years, the *RMP Update Report* has a narrower and specific focus on a selected topic. The *2017 Pulse of the Estuary*[7] celebrates the 25th

[6] http://www.sfei.org/documents/2017-rmp-detailed-workplan-and-budget
[7] http://www.sfei.org/documents/pulse-bay-25th-anniversary-rmp

anniversary of the RMP with a look back at the history of the program, along with articles on emerging contaminants, nutrients, and the Bay margins.

## 2.1 RMP Status and Trends Monitoring Program

The Status and Trends Monitoring Program (S&T Program) is the long-term contaminant-monitoring component of the RMP. The S&T Program was initiated as a pilot study in 1989, implemented thereafter, and was redesigned in 2007 based on a more rigorous statistical design that enables the detection of trends. The RMP Technical Review Committee (TRC), in which the BASMAA RMC participates, continues to assess the efficacy and value of the various elements of the S&T Program and to recommend modifications to S&T Program activities based on ongoing findings. The current S&T sampling schedule, established in 2014, is summarized in Table 2.1 with 2017 accomplishments and 2018 goals.

Table 2.1. RMP Status and Trends Monitoring Schedule.

| Program Element | Schedule | 2017 Sampling | 2018 Sampling |
|---|---|---|---|
| Water | Every two years | Yes | No |
| Bird Eggs | Every three years | No | Yes |
| Sediment | Every four years | Yes (Bay margins only) | Yes |
| Sport Fish | Every five years | No | No |
| Bivalves | Every two years | No | Yes |
| Support to the USGS for suspended sediment and nutrient monitoring | Every year | Yes | Yes |

Additional information on the S&T Program and associated monitoring data are available for download via the RMP website at http://www.sfei.org/content/status-trends-monitoring.

## 2.2 RMP Pilot and Special Studies

The RMP also conducts Pilot and Special Studies[8] on an annual basis. Studies are typically designed to investigate and develop new monitoring measures related to anthropogenic contamination or contaminant effects on biota in the Estuary. Special Studies address specific scientific issues that RMP committees, workgroups, and strategy teams identify as priority for further study. These studies are developed through an open selection process at the workgroup level and selected for funding through the TRC and the RMP Steering Committee.

In 2017, Pilot and Special Studies focused on the following topics:

- Nutrients Management Strategy
    - Continuous monitoring of nutrients, phytoplankton biomass, and dissolved oxygen at moored sensors

[8] Results and summaries of the most pertinent Pilot and Special Studies can be found on the RMP website (http://www.sfei.org/rmp/rmp_pilot_specstudies).

    - Continuous monitoring of dissolved oxygen in shallow margin habitats
    - Ship-based nutrient sampling
    - Data analysis and quantitative mechanistic interpretations to identify factors contributing to observed conditions
- Small Tributary Loadings Strategy (see below and Section 5.0 for more details)
- Chemicals of emerging concern (CEC) monitoring (imidacloprid, perfluorochemicals, phosphate flame retardants, bisphenol compounds, triclosan) and update of CEC Strategy
- Development of conceptual PCB models for prioritized Bay margin units
- Dioxin data synthesis report
- Selenium in fish tissue monitoring
- Evaluation of toxicity testing protocols for marine sediments
- Development of Sediment Monitoring Strategy

In WY 2017, the RMP continued to devote a considerable amount of resources towards overseeing and implementing Special Studies associated with the RMP's Small Tributary Loading Strategy (STLS). Pilot and Special Studies associated with the STLS are intended to fill data gaps associated with loadings of Pollutants of Concern (POC) from relatively small local tributaries to San Francisco Bay. Additional information on STLS-related studies is included in Section 5.0 (POC Monitoring) of this report.

## 2.3 Participation in Committees, Workgroups and Strategy Teams

In WY 2017, BASMAA and/or SMCWPPP representatives actively participated in the following RMP Committees and workgroups:

- Steering Committee (SC)
- Technical Review Committee (TRC)
- Sources, Pathways and Loadings Workgroup (SPLWG)
- Emerging Contaminant Workgroup (ECWG)
- Nutrient Technical Workgroup
- Strategy Teams (e.g., PCBs, Dioxins, Selenium, Small Tributaries)

Committee, workgroup, and strategy team representation was provided by Permittee, countywide stormwater program (including SMCWPPP) staff, and/or individuals designated by RMC participants and the BASMAA BOD. Representation typically includes participating in meetings, reviewing technical reports and work products, co-authoring or reviewing RMP articles and publications, and providing general program direction to RMP staff. Representatives of the RMC also provided timely summaries and updates to, and received input from stormwater program and Permittee representatives during BASMAA Monitoring and Pollutants of Concern Committee (MPC) and/or BASMAA BOD meetings to ensure Permittees' interests were represented.

# 3.0 Creek Status Monitoring (C.8.d) and Pesticides and Toxicity Monitoring (C.8.g)

This section summarizes the results of creek status monitoring and pesticides and toxicity monitoring required by Provisions C.8.d and C.8.g of the MRP, respectively. Creek Status and Pesticides and Toxicity monitoring stations are listed in Table E-1 and mapped in Figure 3.1. Detailed methods and results are provided in **Appendix A**. Consistent with Provision C.8.h.ii of the MRP, creek status and pesticides and toxicity monitoring data were submitted to the Regional Water Board by SMCWPPP in electronic SWAMP-comparable formats. These data were also provided to the Regional Data Center (i.e., SFEI) for upload to CEDEN.

**Creek Status Monitoring (C.8.d)**

Provision C.8.d of the MRP requires Permittees to conduct creek status monitoring that is intended to answer the following management questions:

1. *Are water quality objectives, both numeric and narrative, being met in local receiving waters, including creeks, rivers and tributaries?*
2. *Are conditions in local receiving waters supportive of or likely supportive of beneficial uses?*

Creek status monitoring parameters, methods, occurrences, durations and minimum number of sampling sites for each Bay Area countywide stormwater program are described in Provision C.8.d of the MRP. The RMC's regional monitoring strategy for complying with creek status monitoring requirements is described in the RMC Creek Status and Long-Term Trends Monitoring Plan (BASMAA 2012). The strategy includes a regional ambient/probabilistic monitoring component and a component based on local "targeted" monitoring. The combination of these monitoring designs allows each individual RMC participating countywide stormwater program to assess the status of beneficial uses in local creeks within its jurisdictional area, while also contributing data to answer management questions at the regional scale (e.g., differences between aquatic life condition in urban and non-urban creeks). Implementation began in WY 2012.

The probabilistic monitoring design was developed to remove bias from site selection such that ecosystem conditions can be objectively assessed on local (i.e., San Mateo County) and regional (i.e., RMC) scales. Probabilistic parameters consist of bioassessments, nutrients, and conventional analytes conducted according to methods described in the SWAMP SOP (Ode et al. 2016). Free chlorine and total chlorine residual were also measured at probabilistic sites. Ten probabilistic sites were sampled by SMCWPPP in WY 2017 (Table E-1).

The targeted monitoring design focuses on sites selected based on the presence of significant fish and wildlife resources as well as historical and/or recent indications of water quality concerns. Targeted monitoring parameters consist of water temperature, general water quality, and pathogen indicators using methods, sampling frequencies, and number of stations required in Provision C.8.d of the MRP. Hourly water temperature measurements were recorded during the dry season at five sites using HOBO® temperature data loggers in the San Pedro Creek watershed. General water quality monitoring (temperature, dissolved oxygen, pH and specific conductivity) was conducted using YSI® continuous water quality equipment (sondes) for two 2-week periods (spring and late summer) at two sites in the same watershed. Water samples for analysis of pathogen indicators (*E. coli* and enterococcus) were collected at five sites located in the Pillar Point Harbor watershed.

## Pesticides and Toxicity Monitoring (C.8.g)

Provision C.8.g of the MRP requires Permittees to conduct wet weather and dry weather pesticides and toxicity monitoring. Test methods, sampling frequencies, and number of stations required are described in the MRP. In WY 2017, SMCWPPP conducted dry weather pesticides and toxicity monitoring at one bottom-of-the-watershed station. Consistent with Provision C.8.g.iii, wet weather pesticides and toxicity monitoring will be conducted on a regional basis in WY 2018.

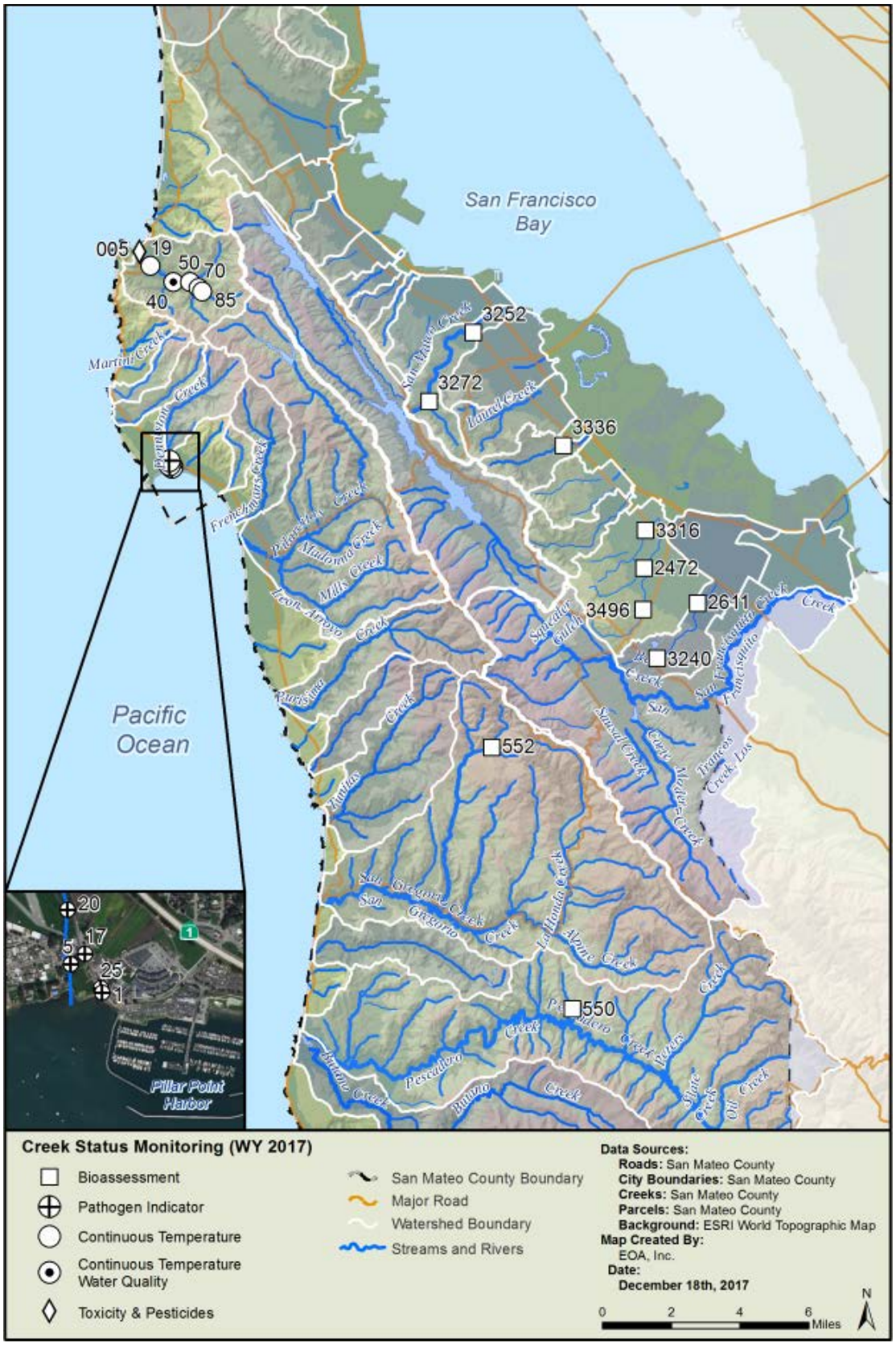


Figure 3.1. SMCWPPP Creek Status and Pesticides and Toxicity monitoring stations, WY 2017.

## 3.1 Approach to Management Questions

The first MRP creek status management question (*Are water quality objectives, both numeric and narrative, being met in local receiving waters, including creeks, rivers and tributaries?*) is addressed primarily through the evaluation of probabilistic and targeted monitoring data with respect to the triggers defined in the MRP. The MRP also defines triggers for pesticides and toxicity monitoring data. A summary of trigger exceedances observed for each site is presented below in Table 3.1. Sites where triggers are exceeded may indicate potential impacts to aquatic life or other beneficial uses and are considered for future stressor/source identification (SSID) projects (see Section 4.0 for a discussion of SSID projects).

The second MRP creek status management question (*Are conditions in local receiving waters supportive of or likely supportive of beneficial uses?*) is addressed primarily by assessing indicators of aquatic biological health using benthic macroinvertebrate (BMI) and algae data collected at probabilistic sites. Although a total of 60 probabilistic sites in San Mateo County have been sampled since WY 2012, the analysis presented in **Appendix A** is limited to the ten sites monitored in WY 2017.

The BASMAA RMC is currently conducting a *regional* analysis of biological condition using a five-year dataset (WY 2012 – WY 2016). The BASMAA regional study will conduct the following analyses:

- Assess the biological condition of streams in the region and each county using indices of biological integrity (IBIs) based on benthic macroinvertebrate and algae data collected by each countywide program and SWAMP.
- Evaluate IBIs in distinct groupings such as imperviousness categories and type of stream.
- Assess stressors associated with poor stream condition using multivariate modeling analyses.
- Summarize regional data for each year in the five-year dataset.
- Introduce the analyses that will be needed to make recommended changes to the probabilistic monitoring design.

Results of the BASMAA regional study will be available by late 2018. Analytical tools that are found to be useful in evaluating stressor association with biological condition may be implemented in future annual monitoring reports.

## 3.2 Monitoring Results and Conclusions

### 3.2.1 Bioassessment Monitoring Results/Conclusions

Bioassessment monitoring in WY 2017 was conducted in compliance with Provision C.8.d.i of the MRP. Ten sites were sampled for benthic macro-invertebrates, benthic algae, physical habitat observations, and nutrients using methods consistent with the BASMAA RMC QAPP (BASMAA 2016a) and SOPs (BASMAA 2016b). Stations were randomly selected using a probabilistic monitoring design. Eight of the sites (80%) were classified as urban and two (20%) were classified as non-urban.

The following conclusions are based on the WY 2017 data. An assessment of biological condition is provided and potential stressors are compared to applicable water quality objectives

(WQOs) and triggers identified in the MRP. Sites with monitoring results that exceed WQOs and triggers are considered as candidates for further investigation as SSID projects, consistent with provision C.8.e of the MRP. See **Appendix A** for detailed explanations of the findings.

**Biological Conditions Assessment**

The California Stream Condition Index (CSCI) is a statewide tool that translates benthic macroinvertebrate data into an overall measure of stream health. The CSCI is currently the most robust method of assessing aquatic biological health. There are also three benthic algae indices of biological integrity available (D18, H20, S2); however, the applicability of the algae IBIs in San Mateo County streams is uncertain due to several factors including:

- There is an overall dearth of soft algae taxa found in San Mateo County streams. This may not reflect stream health, but it significantly lowers the scores of two of the algae IBIs (H20 and S2).
- The algae IBIs were developed for Southern California streams and may not provide adequate interpretations of Northern California algae communities.
- Statewide Algae Stream Condition Indices are currently being developed and are anticipated to be available in 2018.

Of the ten sites monitored in WY 2017, two sites (20%) were rated in good condition (CSCI scores ≥ 0.795), two sites (20%) rated as likely altered condition (CSCI score 0.635 – 0.795), and six sites (60%) rated as very likely altered condition (≤ 0.635). The two sites in good condition were classified as non-urban and located in protected open space or County Park land. Three of the lowest CSCI scores occurred at sites located in concrete channels.

Relationships between potential stressors (physical habitat and water chemistry) and biological condition were explored on a limited basis using the WY 2017 dataset.

- Physical Habitat Assessment (PHAB) scores, a qualitative tool that assesses the overall habitat condition of the sampling reach during the assessment, were compared to biological condition indictor scores. PHAB consists of three attributes that are assessed for the entire bioassessment reach. These include channel alteration, epifaunal substrate and sediment deposition. Total PHAB scores were moderately correlated with CSCI scores ($r^2$=0.51, p value = 0.02) suggesting that physical habitat (e.g., substrate quality, channel alteration) has an influence on the BMI community. Individual physical habitat metrics associated with substrate size and composition were also correlated with CSCI scores.
- Landscape variables were calculated for each of the watershed areas draining into the bioassessment sites. CSCI scores were inversely correlated with impervious area and road density.

**Stressor Assessment**

Sites with CSCI scores and/or stressor levels exceeding applicable WQOs and triggers identified in the MRP will be considered as candidates for SSID projects.

- The eight sites with CSCI scores below 0.795 will be considered as candidates for SSID projects.
- **General water quality** (pH, temperature, dissolved oxygen, specific conductance). Measurements exceeded water quality objectives for pH at sites 204R02472 (Redwood

Creek), 204R02611 (Atherton Creek), and 204R03316 (Ojo de Agua). These sites will be considered as candidates for SSID projects.

- **Nutrients and conventional analytes** (ammonia, unionized ammonia, chloride, AFDM, chlorophyll a, nitrate, nitrite, TKN, ortho-phosphate, phosphorus, silica). There were no water quality objective exceedances for water chemistry parameters.

### 3.2.2 Targeted Monitoring Results/Conclusions

Targeted monitoring in WY 2017 was conducted in compliance with Provisions C.8.d.iii – v of the MRP. Hourly temperature measurements were recorded at five sites in the San Pedro Creek watershed from April through September. Continuous (15-minute) general water quality measurements (pH, DO, specific conductance, temperature) were recorded at two sites in the San Pedro Creek watershed during two 2-week periods in May/June (Event 1) and August/September (Event 2). Pathogen indicator grab samples were collected at five sites in the Pillar Point Harbor watershed during a sampling event in August. Targeted monitoring stations were deliberatively selected using the Directed Monitoring Design Principle.

Conclusions and recommendations from targeted monitoring in WY 2017 are listed below. The sections below are organized on the basis of three management questions. See **Appendix A** for detailed explanations of the findings.

1. *What is the spatial and temporal variability in water quality conditions during the spring and summer season?*
2. *Do general water quality measurements indicate potential impacts to aquatic life?*
3. *What are the pathogen indicator concentrations at creek sites where there is potential for water contact recreation to occur?*

**Spatial and Temporal Variability of Water Quality Conditions**

- **Spatial**. There was minimal spatial variability in water temperature across the five stations in the San Pedro Creek watershed. Temperature increased slightly at each downstream site but remained 4 to 7 °C below the instantaneous trigger threshold. Likewise, pH and specific conductivity increased slightly in the downstream direction and dissolved oxygen decreased slightly in the downstream direction.
- **Temporal**. Water temperature increased gradually at all five stations between April and early-September, in response to one of the hottest summers on record. In mid-September, water temperatures dropped relatively quickly in response to a much cooler air mass. Differences in general water quality measurements (pH, specific conductivity, dissolved oxygen) between the two two-week monitoring periods (May/June and August/September) were less pronounced.

**Potential Impacts to Aquatic Life**

- Potential impacts to aquatic life were assessed through analysis of continuous temperature data collected at five targeted stations and continuous general water quality data (pH, dissolved oxygen, specific conductance, and temperature) collected at two targeted stations in San Pedro Creek. San Pedro Creek, located in the City of Pacifica, was targeted for temperature and general water quality monitoring because it contains

the northern-most population of naturally producing steelhead trout (*Oncorhynchus mykiss*) in San Mateo County.

- The two lowermost temperature stations in San Pedro Creek exceeded the maximum weekly average temperature (MWAT) of 17°C once; however, this is not considered an exceedance of the trigger which requires two consecutive weeks of exceedance. None of the stations exceeded the maximum instantaneous trigger threshold of 24°C.
- None of the general water quality parameters (temperature, pH, dissolved oxygen, and specific conductance) exceeded any of the MRP trigger thresholds.

**Potential Impacts to Water Contact Recreation**

- In WY 2017, pathogen indicator samples were collected at two stations on Denniston Creek near Pillar Point Harbor and one storm drain discharging to Denniston Creek, one outfall pipe discharging directly to the beach Pillar Point Harbor, and one storm drain upstream of the outfall pipe. Pillar Point Harbor is the site of an SSID project that will examine the extent and sources of pathogen indicators in the area. Pathogen indicator triggers for enterococci were exceeded at four of the five sites. Triggers for *E. coli* were exceeded at three of the five sites.

- It is important to recognize that pathogen indicator thresholds are based on human recreation at beaches receiving bacteriological contamination from human wastewater and may not be applicable to conditions found in urban creeks or beaches that receive bacteria from natural and/or animal sources rather than wastewater discharges. As a result, the comparison of pathogen indicator results to body contact recreation water quality objectives may not be appropriate and should be interpreted cautiously. Furthermore, the WQOs for pathogens used in this report cannot be applied to waters sampled directly from the MS4, as dilution occurs when water from the MS4 discharges to a receiving water body. It should also be noted that the WQOs for pathogens used in this report are subject to change in the near future due to adoption by the State Board of new statistical threshold values based on USEPA criteria.

- Municipalities near Half Moon Bay are aware of the bacteria exceedances found in Pillar Point Harbor. Results of the coming SSID study will be used to further inform these municipalities about the nature and extent of the bacteria presence and any potential steps they can take to resolve the issue.

### 3.2.3 Chlorine Monitoring Results/Conclusions

Free chlorine and total chlorine residual was measured concurrently with bioassessments at the ten probabilistic sites in compliance with Provision C.8.c.ii. While chlorine residual is generally not a concern in San Mateo County creeks, WY 2017 and prior monitoring results suggest there are occasional free chlorine and total chlorine residual exceedances in the County. In WY 2017, exceedances of the MRP trigger for chlorine (0.1 mg/L) were observed at one station on Redwood Creek. Redwood City illicit discharge staff was notified and conducted an immediate follow-up investigation. The Redwood City staff reported that the source of the chlorine was unknown. They tracked the elevated chlorine measurements upstream to the jurisdictional boundary between Redwood City and the Town of Woodside and subsequently reported this information to Woodside. Chlorine exceedances are typically the result of one-time potable water discharges, and it is generally very difficult to determine the source of elevated chlorine from

such episodic discharges. SMCWPPP will continue to monitor chlorine in compliance with the MRP and will follow-up with illicit discharge staff as needed.

### 3.2.4 Pesticides and Toxicity Monitoring Results/Conclusions

In WY 2017, SMCWPPP conducted dry weather pesticides and toxicity monitoring at one station (San Pedro Creek) in compliance with Provision C.8.g of the MRP.

Statistically significant toxicity to *C. dubia* and *P. promelas* was observed in water samples collected during the dry season. However, the magnitude of the toxic effects in the samples compared to laboratory controls were not great and did not exceed MRP trigger criteria of 50 Percent Effect. The cause of the observed toxicity is unknown. Pesticide concentrations in the sediment sample were all very low, most below the MDL. TU equivalents did not exceed 0.04.

Threshold Effect Concentration (TEC) and Probable Effect Concentration (PEC) quotients were calculated for all metals and total PAHs (calculated as the sum of 24 individual PAHs) measured in sediment samples according to methods described in MacDonald et al. (2000). Two TEC and one PEC quotients exceeded 1.0. In compliance with the MRP, San Pedro Creek will therefore be placed on the list of candidate SSID projects. Decisions about which SSID projects to pursue should be informed by the fact that the TEC and PEC quotient exceedances may be related to naturally occurring chromium and nickel originating from the area's serpentine geology.

SMCWPPP will continue to sample one station per year for dry weather pesticides and toxicity throughout the permit term. In WY 2018, SMCWPPP will work with the BASMAA RMC partners to implement a regional approach to wet weather pesticides and toxicity monitoring.

## 3.3 Trigger Assessment

The MRP requires analysis of the monitoring data to identify candidate sites for SSID projects. Trigger thresholds against which to compare the data are provided for most monitoring parameters in the MRP and are described in the foregoing sections of this report. Stream condition was determined based on CSCI scores that were calculated using BMI data. Water and sediment chemistry and toxicity data were evaluated using numeric trigger thresholds specified in the MRP. Nutrient data were evaluated using applicable water quality standards from the Basin Plan (SFRWQCB 2017). In compliance with Provision C.8.e.i of the MRP, all monitoring results exceeding trigger thresholds are added to a list of candidate SSID projects maintained throughout the permit term. Follow-up SSID projects will be selected from this list. Table 3.1 lists candidate SSID projects based on WY 2017 Creek Status and Pesticides/Toxicity monitoring data.

Additional analysis of the data is provided in the foregoing sections of this report and should be considered prior to selecting and defining SSID projects. The analyses include review of physical habitat and water chemistry data to identify potential stressors that may be contributing to degraded or diminished biological conditions. Analyses in this report also include historical and spatial perspectives that help provide context and greater understanding of the trigger exceedances.

Table 3.1. Summary of SMCWPPP MRP trigger threshold exceedance analysis, WY 2017. "No" indicates samples were collected but did not exceed the MRP trigger; "Yes" indicates an exceedance of the MRP trigger.

| Station Number | Creek Name | Bioassessment [1] | Nutrients [2] | Chlorine [3] | Water Toxicity [4] | Sediment Toxicity [4] | Sediment Chemistry [5] | Continuous Temperature [6] | Dissolved Oxygen [7] | pH [8] | Specific Conductance [9] | Pathogen Indicators [10] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 202R00550 | Jones Gulch | No | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 202R00552 | Lawrence Creek | No | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 204R02472 | Redwood Creek | Yes | No | Yes | -- | -- | -- | -- | -- | Yes | -- | -- |
| 204R02611 | Atherton Creek | Yes | No | No | -- | -- | -- | -- | -- | Yes | -- | -- |
| 204R03240 | Atherton Creek | Yes | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 204R03252 | San Mateo Creek | Yes | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 204R03272 | San Mateo Creek | Yes | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 204R03316 | Arroyo Ojo de Agua | Yes | No | No | -- | -- | -- | -- | -- | Yes | -- | -- |
| 204R03336 | Belmont Creek | Yes | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 204R03496 | Redwood Creek | Yes | No | No | -- | -- | -- | -- | -- | -- | -- | -- |
| 202SPE005 | San Pedro Creek | -- | -- | -- | No | No | Yes | -- | -- | -- | -- | -- |
| 202DEN017 | NA (MS4) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| 202DEN005 | Denniston Creek | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | No |
| 202DEN020 | Denniston Creek | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | Yes |
| 202CAP001 | NA (MS4) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| 202CAP025 | NA (MS4) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| 202SPE019 | San Pedro Creek | -- | -- | -- | -- | -- | -- | No | -- | -- | -- | -- |
| 202SPE040 | San Pedro Creek | -- | -- | -- | -- | -- | -- | No | No | No | No | -- |
| 202SPE050 | San Pedro Creek | -- | -- | -- | -- | -- | -- | No | -- | -- | -- | -- |
| 202SPE070 | San Pedro Creek | -- | -- | -- | -- | -- | -- | No | No | No | No | -- |
| 202SPE085 | San Pedro Creek | -- | -- | -- | -- | -- | -- | No | -- | -- | -- | -- |

1. CSCI score ≤ 0.795.
2. Unionized ammonia (as N) ≥ 0.025 mg/L, nitrate (as N) ≥ 10 mg/L, chloride > 250 mg/L.
3. Free chlorine or total chlorine residual ≥ 0.1 mg/L.
4. Test of Significant Toxicity = Fail and Percent Effect ≥ 50 %.
5. TEC or PEC quotient ≥ 1.0 for any constituent.
6. Two or more MWAT ≥ 17.0°C or 20% of results ≥ 24°C.
7. DO < 7.0 mg/L in COLD streams or DO < 5.0 mg/L in WARM streams.
8. pH < 6.5 or pH > 8.5.
9. Specific conductance > 2000 uS.
10. Enterococcus ≥ 130 cfu/100ml or *E. coli* ≥ 410 cfu/100ml.

## 3.4 Management Implications

The Program's Creek Status and Pesticides and Toxicity Monitoring programs (consistent with MRP provisions C.8.c and C.8.g, respectively) focus on assessing the water quality condition of urban creeks in San Mateo County and identifying stressors and sources of impacts observed. Although the sample size from WY 2017 (overall n=10; urban n=8) is not sufficient to develop statistically representative conclusions regarding the overall condition of all creeks, it builds on data collected in WY 2012 through WY 2016 which are currently being analyzed by a BASMAA RMC regional project. The BASMAA regional project will assess stream conditions and stressors for the five-year dataset (WY 2012 – WY 2016) on regional and countywide basis. It will review and develop statistical tools that can be utilized in the future to analyze the growing dataset. It will also recommend options for modifying the RMC creek status monitoring program during the next reissue of the MRP, perhaps with a focus on trends monitoring.

Like previous years, WY 2017 data suggest that most urban streams have likely or very likely altered populations of aquatic life indicators (e.g., aquatic macroinvertebrates). These conditions are likely the result of long-term changes in stream hydrology, channel geomorphology, in-stream habitat complexity, and other modifications to the watershed and riparian areas associated with the urban development that has occurred over the past 50 plus years.

SMCWPPP Permittees are actively implementing many stormwater management programs to address these and other stressors and associated sources of water quality conditions observed in local creeks, with the goal of protecting these natural resources. For example:

- In compliance with MRP Provision C.3, new and redevelopment projects in the Bay Area are now designed to more effectively reduce water quality and hydromodification impacts associated with urban development. Low impact development (LID) methods, such as rainwater harvesting and use, infiltration and biotreatment are required as part of development and redevelopment projects. In addition, planning for and implementing Green Infrastructure projects in the public right-of-way is increasingly being incorporated into the municipal master planning process. All of these measures are expected to reduce the impacts of urbanization on stream health.
- In compliance with MRP Provision C.9, Permittees are implementing pesticide toxicity control programs that focus on source control and pollution prevention measures. The control measures include the implementation of integrated pest management (IPM) policies/ordinances, public education and outreach programs, pesticide disposal programs, the adoption of formal State pesticide registration procedures, and sustainable landscaping requirements for new and redevelopment projects. These efforts should reduce pyrethroids and other pesticides in urban stormwater runoff and reduce the magnitude and extent of toxicity in local creeks.
- Trash loadings to local creeks have been reduced through implementation of new control measures in compliance with MRP Provision C.10 and other efforts by Permittees to reduce the impacts of illegal dumping directly into waterways. These actions include the installation and maintenance of trash capture systems, the adoption of ordinances to reduce the impacts of litter prone items, enhanced institutional controls such as street sweeping, and the on-going removal and control of direct dumping. The MRP establishes a mandatory trash load reduction schedule, minimum areas to be treated by full trash capture systems, and requires development of receiving water monitoring programs for trash.

- In compliance with MRP Provisions C.2 (Municipal Operations), C.4 (Industrial and Commercial Site Controls), C.5 (Illicit Discharge Detection and Elimination), and C.6 (Construction Site Controls), Permittees continue to implement Best Management Practices that are designed to prevent non-stormwater discharges during dry weather and reduce the exposure of stormwater and sediments to contaminants during rainfall events.
- In compliance with MRP Provision C.13, copper in stormwater runoff is reduced through implementation of controls such as architectural and site design requirements, prohibition of discharges from water features treated with copper, and industrial facility inspections.
- Mercury and polychlorinated biphenyls (PCBs) in stormwater runoff are being reduced through implementation of the respective TMDL water quality restoration plans. In compliance with MRP Provisions C.11 (mercury) and C.12 (PCBs), the Program will continue to identify sources of these pollutants and will implement control actions designed to achieve load reduction goals. Monitoring activities conducted in WY 2017 that specifically target mercury and PCBs are described in Section 5.0 of this report.

In addition to the Program and Co-permittee controls implemented in compliance with the MRP, numerous other efforts and programs designed to improve the biological, physical and chemical condition of local creeks are underway. For example, C/CAG recently developed the San Mateo Countywide Stormwater Resource Plan (SRP) to satisfy state requirements and guidelines to ensure C/CAG and SMCWPPP member agencies are eligible to compete for future voter-approved bond funds for stormwater or dry weather capture projects. The SRP identifies and prioritizes opportunities to better utilize stormwater as a resource in San Mateo County through a detailed analysis of watershed processes, surface and groundwater resources, input from stakeholders and the public, and analysis of multiple benefits that can be achieved through strategically planned stormwater management projects. These projects aim to capture and manage stormwater more sustainably, reduce flooding and pollution associated with runoff, improve biological functioning of plants, soils, and other natural infrastructure, and provide many community benefits, including cleaner air and water and enhanced aesthetic value of local streets and neighborhoods.

Through the continued implementation of MRP-associated and other watershed stewardship programs, SMCWPPP anticipates that stream conditions and water quality in local creeks will continue to improve over time. In the near term, toxicity observed in creeks should decrease as pesticide regulations better incorporate water quality concerns during the pesticide registration process. In the longer term, control measures to “green” the “grey” infrastructure and disconnect impervious areas constructed over the course of the past 50 plus years will take decades to fully implement. Consequently, it may take several decades to observe the outcomes of these important, large-scale improvements to local creeks in San Mateo County watersheds. Long-term creek status monitoring programs designed to detect these changes over time should therefore help SMCWPPP and San Mateo County municipalities to better understand the condition and health of the local waterways.

# 4.0 Stressor/Source Identification Projects (C.8.e)

Provision C.8.e of the MRP requires that Permittees evaluate creek status (provision C.8.d) and pesticides and toxicity (provision C.8.g) monitoring data with respect to triggers defined in the MRP and maintain a list of all results exceeding trigger thresholds. Table 3.1 lists the results of the trigger evaluation for WY 2017 data. Sites where triggers are exceeded may indicate potential impacts to aquatic life or other beneficial uses, and are therefore considered as candidates for future SSID projects. SSID projects are selected from the list of trigger exceedances based on criteria such as magnitude of threshold exceedance, parameter, and likelihood that stormwater management action(s) could address the exceedance. The MRP requires that Permittees initiate a minimum number of SSID projects during the permit term. SMCWPPP and its RMC partners must collectively initiate a region-wide minimum of eight new SSID Projects during the permit term, with a minimum of one for toxicity. Four of the SSID projects must be initiated with a work plan by the third year of the permit term (i.e., 2018). All SSID project reports must be presented in a unified, regional-level report. In 2017, SMCWPPP, SCVURPPP, ACCWP, and CCCWP each developed an SSID project work plan in compliance with the 2015 MRP. These new SSID projects are summarized in the regional SSID report (**Appendix B**). All SSID projects initiated in compliance with the 2009 MRP are now complete including the two projects initiated by SMCWPPP.

SSID projects must identify and isolate potential sources and/or stressors associated with observed water quality impacts. They are intended to be oriented to taking action(s) to alleviate stressors and reduce sources of pollutants. The 2015 MRP describes the stepwise process for conducting SSID projects initiated under the current permit:

- Step 1: Develop a work plan for each SSID project that defines the problem to the extent known, describes the SSID project objectives, considers the problem within a watershed context, lists candidate causes of the problem, and establishes a schedule for investigating the cause(s) of the trigger exceedance. The MRP recommends study approaches for specific triggers. For example, toxicity studies should follow guidance for Toxicity Reduction Evaluations (TRE) or Toxicity Identification Evaluations (TIE), physical habitat and conventional parameter (e.g., dissolved oxygen, temperature) studies should generally follow Step 5 (Identify Probable Causes) of the Causal Analysis/Diagnosis Decision Information System (CADDIS), and pathogen indicator studies should generally follow the *California Microbial Source Identification Manual* (Griffith et al. 2013).
- Step 2: Conduct SSID investigation according to the schedule in the SSID work plan and report on the status of SSID investigations annually in the UCMR.
- Step 3: Conduct follow-up actions based on SSID investigation findings. These may include development of an implementation schedule for new or improved best management practices (BMPs). If a Permittee determines that municipal separate storm sewer system (MS4) discharges are not contributing to an exceedance of a water quality standard, the Permittee may end the SSID project upon written concurrence of the Executive Officer. If the SSID investigation is inconclusive, the Permittee may request that the Executive Officer consider the SSID project complete.

In 2017, SMCWPPP initiated the Pillar Point Watershed Pathogen Indicator SSID Project. This project is summarized below and the work plan is included as **Appendix C**. SMCWPPP will continue to collaborate with RMC partners on additional SSID projects.

## 4.1 Pillar Point Watershed Pathogen Indicator SSID Project

The Pillar Point Watershed Pathogen Indicator SSID Project was triggered by fecal indicator bacteria (FIB) densities exceeding Water Quality Objectives that have been measured in receiving waters and tributaries to Pillar Point Harbor. The Work Plan (**Appendix C**) describes the steps that will be taken to investigate urban sources of fecal indicator bacteria in the Pillar Point Watershed. SMCWPPP will implement the work plan in WY 2018 with assistance from and in close coordination with the San Mateo County Resource Conservation District (RCD). Consistent with Provision C.8.e.iii.(1)(g), the study generally follows the *California Microbial Source Identification Manual* (Griffith et al. 2013).

The objective of the SSID study is to build on a Proposition 50 Clean Beaches Initiative Grand-funded study that was conducted by the RCD and University of California, Davis (UCD) in 2008 and 2001-12. The RCD/UCD study indicated that high FIB measured at Pillar Point beaches was likely due to influences from storm drains and creeks rather than from sources at the beaches and within the harbor itself. The Pillar Point SSID study is designed to identify whether urban areas drained by the MS4 in the urban community of El Granada are an important source of bacteria to Pillar Point Harbor and whether the sources of bacteria are controllable (especially human and dog). These are key steps towards the longer-term goal of reducing FIB densities in Pillar Point Harbor and, more specifically, reducing the risk of illness for recreators at the local beaches. The study includes a desktop analysis consisting of historical data review and mapping and a water sampling program that targets multiple sites in study area watersheds. The field investigation spans the wet and dry seasons of WY 2018 and includes both FIB analysis and microbial source tracking techniques.

It is anticipated that the SSID Project Report will be included with the WY 2018 UCMR.

# 5.0 Pollutants of Concern Monitoring (C.8.f)

Pollutants of Concern (POC) monitoring is required by Provision C.8.f of the MRP. POC monitoring is intended to assess inputs of POCs to the Bay from local tributaries and urban runoff, provide information to support implementation of Total Maximum Daily Load (TMDL) water quality restoration plans and other pollutant control strategies, assess progress toward achieving wasteload allocations (WLAs) for TMDLs, and help resolve uncertainties associated with loading estimates for POCs. The MRP identifies five priority POC management information needs that need to be addressed though POC monitoring:

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);

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, and presence in local tributaries or urban stormwater discharges; and

5. **Trends** – evaluating trends in POC loading to the Bay and POC concentrations in urban stormwater discharges or local tributaries over time.

MRP Provision C.8.f requires monitoring of the following POCs: polychlorinated biphenyls (PCBs), mercury, copper, emerging contaminants, and nutrients.[9] The MRP defines yearly and total (i.e., over the MRP permit term) minimum number of samples for each POC and specifies the minimum number of samples for each POC that must address each information need.

To help meet these requirements, and to develop mutually beneficial monitoring approaches, SMCWPPP continued to work collaboratively with other organizations and projects that conduct water quality monitoring in the Bay Area. Provision C.8.a.iii of the MRP 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. Samples collected in San Mateo County through the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP), Clean Watersheds for a Clean Bay (CW4CB, a recently completed project that was funded by a grant from USEPA), and the State's Stream Pollution Trends (SPoT) Monitoring Program supplemented SMCWPPP's efforts towards achieving Provision C.8.f monitoring requirements.

In particular, SMCWPPP continued to be an active participant in the RMP's Small Tributary Loading Strategy (STLS). The STLS typically conducts annual monitoring for POCs on a region-wide basis, including collecting composite samples of stormwater runoff and analyzing for PCBs and mercury. As in past years, during WY 2017 SMCWPPP helped the STLS select its PCBs and mercury monitoring stations that are located in San Mateo County and evaluated the data from those stations along with PCBs and mercury data collected directly by SMCWPPP.

[9] Emerging contaminant monitoring requirements will be met through participation in RMP special studies and will address at least PFOS, PFAS, and alternative flame retardants being used to replace PBDEs.

## 5.1 SMCWPPP POC Monitoring

In WY 2017, SMCWPPP complied with Provision C.8.f of the MRP by conducting POC monitoring for PCBs, mercury, copper, and nutrients. Specific activities included:

- Collection of stormwater runoff samples from the bottom of selected urban catchments for PCBs and mercury analysis (n=17) and copper analysis (n=1);
- Collection of grab sediment samples in selected urban catchments for PCBs and mercury analysis (n=67, including 6 duplicate samples);
- Collection of wet and dry weather creek water samples for nutrients and copper analysis (n=5);
- Participation in SWAMP's Stream Pollutant Trends monitoring program; and
- Continued participation in the RMP's STLS.

Progress toward POC monitoring requirements accomplished in WY 2017 and the planned allocation of effort for WY 2018 are described in a report dated October 10, 2017 (SMCWPPP 2017) which was submitted to the Regional Water Board in compliance with MRP Provision C.8.h.iv. The yearly minimum number of samples specified in MRP Provision C.8.f was exceeded for all POCs. A report with further details about WY 2017 POC monitoring conducted by SMCWPPP is included as **Appendix D**. A report documenting the WY 2015 - 2017 POC monitoring conducted by the STLS is included as **Appendix E**.

General methods employed for POC monitoring were similar to previous years (SMCWPPP 2016). A comprehensive QA/QC program was implemented by SMCWPPP covering all aspects of POC monitoring with similar protocols to previous years. SMCWPPP (2016) provides further details. Overall, the results of the QA/QC review suggested that most of the POC monitoring data generated during WY 2017 were of sufficient quality. Although some data were flagged in the project database, none was rejected according to Data Quality Objectives (DQOs). However, most of the concentrations of mercury in stormwater runoff samples reported in WY 2017 were lower than prior years by about an order of magnitude. There was no reason to expect these lower mercury concentrations, since the population monitored was similar to prior years (e.g., based upon geography, storm size, land use). Therefore, all mercury in stormwater data were rejected by the SMCWPPP Quality Assurance Officer. Additional details about the QA/QC review are provided in **Appendix D.**

### 5.1.1 PCBs and Mercury

MRP Provisions C.11.a.iii and C.12.a.iii require that Permittees provide a list of management areas in which new PCBs and mercury control measures will be implemented during the permit term. These management areas are designated "Watershed Management Areas" (WMAs) in this report, and are defined as all catchments containing high interest parcels (i.e., properties with land uses associated with PCBs such as old industrial, electrical and recycling) and/or existing or planned PCBs and mercury controls.

WMAs are the framework used by SMCWPPP to plan its current PCBs and mercury monitoring program in San Mateo County. During WY 2017, SMCWPPP collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs and 67 sediment samples (of which 6

were duplicates) within WMAs. As part of continuing to develop strategies for reducing PCBs and mercury loads in stormwater runoff, SMCWPPP evaluated these data, along with additional WY 2017 stormwater runoff sample data collected through the STLS, and data from previous water years collected by SMCWPPP and through the STLS. Objectives included attempting to identify source properties within WMAs, identifying which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls, and prioritizing WMAs for future investigations.

**Stormwater Runoff Monitoring**

During WY 2017, SMCWPPP collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs that contain high interest parcels. An additional four stormwater runoff samples were collected in San Mateo County through the RMP's STLS, also from WMAs with high interest parcels. These combined 21 samples address Management Questions #1 (Source Identification) and #2 (Contributions to Bay Impairment). Data will also be used by the RMP STLS to improve calibration of the Regional Watershed Spreadsheet Model (RWSM) which is a land use based planning tool for estimation of overall POC loads from small tributaries to San Francisco Bay at a regional scale (i.e., Management Question #4 – Loads and Status).

WMAs were identified and prioritized for stormwater runoff sampling by evaluating several types of data, including: land use data, PCBs and mercury concentrations from prior sediment and stormwater runoff sampling efforts, municipal storm drain data showing pipelines and access points (e.g., manholes, outfalls, pump stations), and logistical/safety considerations. 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 the 40 PCBs congeners designated by the RMP as those most likely to be found in the Bay[10] (method EPA 1668C, total PCBs were calculated as the sum of these 40 congeners), total mercury (method EPA 1631E), and suspended sediment concentration (SSC; method ASTM D3977-97). Detailed results are presented in **Appendix D**. One of these samples was also analyzed for total and dissolved copper (method EPA 200.8) and hardness (method SM 2340C). See Section 5.1.2 for a discussion of the copper results.

**Sediment Sampling**

During WY 2017, SMCWPPP collected 67 grab sediment samples (of which 6 were duplicates) as part of the program to attempt to identify source properties within WMAs, potentially for referral to the Regional Water Board for further investigation and potential abatement. These samples were collected in the public right-of-way (ROW), including locations adjacent to high interest parcels with land uses associated with PCBs such as old industrial, electrical and recycling and/or other characteristics potentially associated with pollutant discharge (e.g., poor housekeeping, unpaved areas). Individual and composite sediment samples were collected from manholes, storm drain inlets, driveways, streets, and sidewalks.

Each sample was analyzed for total mercury and for the 40 PCBs congeners designated by the RMP as those most likely to be found in the Bay (see the previous section). Total PCBs were calculated as the sum of the 40 congeners. The laboratory sieved all samples to 2 mm prior to analysis. Detailed results are presented in **Appendix D**.

[10] PCBs congeners 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, 203.

**Watershed Management Area Prioritization**

SMCWPPP evaluated the WY 2017 and all other PCBs stormwater runoff and sediment monitoring data collected to-date to help prioritize WMAs for further investigation and control measure implementation. WMAs with one or more sediment and/or stormwater runoff samples with PCBs concentrations (particle ratio concentrations for stormwater runoff) greater than 0.5 mg/kg (or 500 ng/g) were provisionally designated as higher priority. WMAs with samples in the 0.2 – 0.5 mg/kg (200 – 500 ng/g) range were designated medium priority. WMAs with stormwater runoff sample PCBs particle ratio concentrations less than 0.2 mg/kg (200 ng/g) were designated lower priority. Sediment sample results were not used to designate a WMA lower priority due to the high potential for false negatives. Figure 5.1 is a map illustrating the current status of WMAs in San Mateo County, based on this provisional prioritization scheme and sediment and stormwater runoff monitoring results to-date.[11] Only WMAs with high interest parcels were included in Figure 5.1.

[11] Where sediment and stormwater runoff particle ratio concentration analysis results conflict, the higher result was conservatively applied.

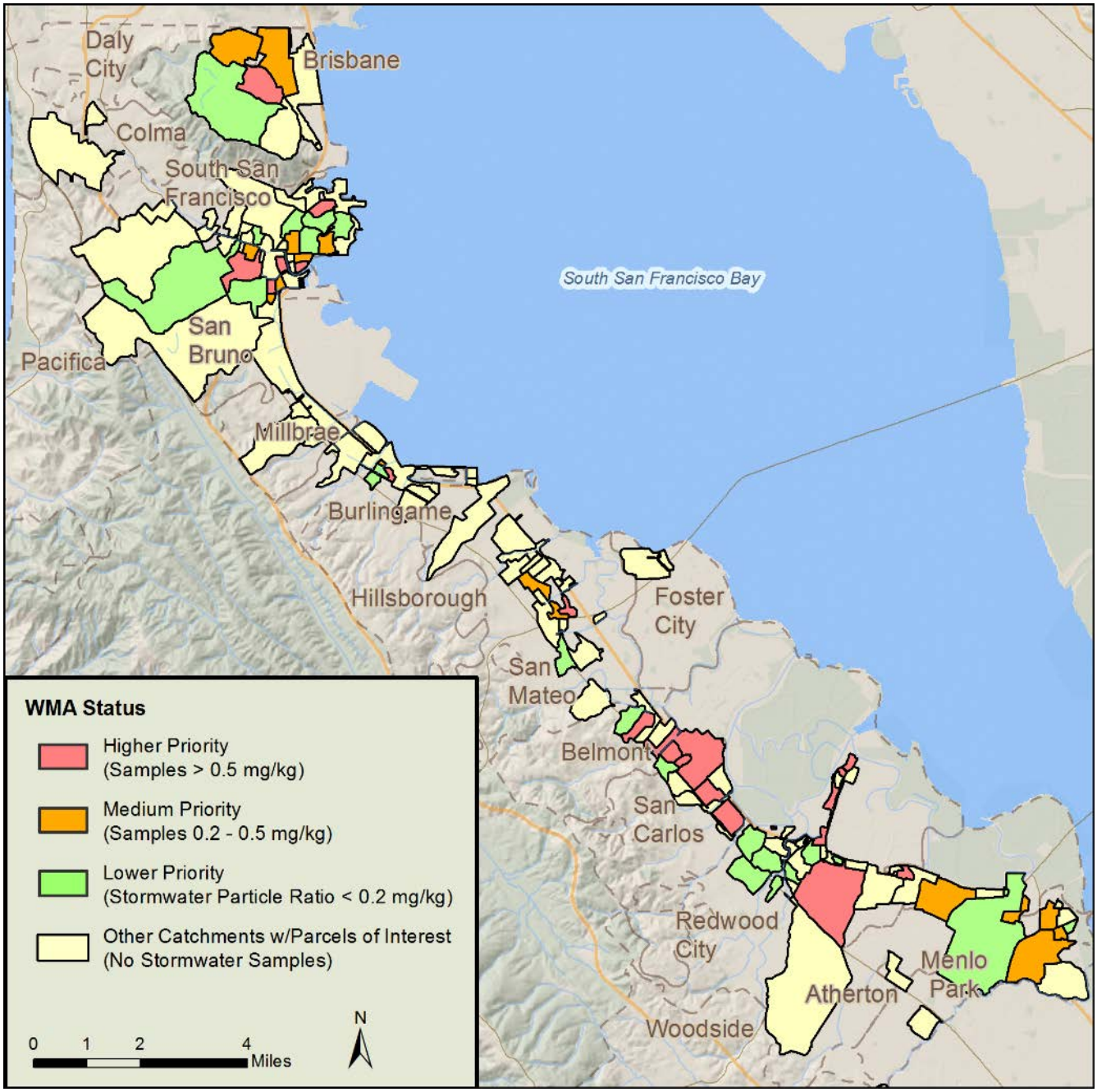


Figure 5.1. San Mateo County PCBs WMA **status based on sediment and stormwater runoff data collected through WY 2017**.

### 5.1.2 Copper

In WY 2017, SMCWPPP collected a total of four water samples for copper analysis (i.e., total and dissolved copper, and hardness) during a large storm event in January 2017, two from upstream and two from downstream stations in two creeks (Atherton Creek and Redwood Creek). The goal was to address loads and status (Management Question #4, see Section 5.0). A field crew also visited the downstream stations during spring baseflow conditions to assess seasonal trends (Management Question #5, see Section 5.0). At that time an additional water sample was collected from the Redwood Creek downstream station, but the Atherton Creek downstream station was dry. In addition, one of the stormwater runoff samples collected from industrial catchments for PCBs and mercury analysis was also analyzed for copper. Thus a total of six samples were analyzed for copper in WY 2017.

Based on the laboratory results, the following findings are noted:

- Copper concentrations were higher at bottom-of-the-watershed stations in both Atherton and Redwood Creeks compared to stations higher in the watersheds, suggesting an influence by stormwater runoff.

- Copper concentrations at the bottom-of-the-watershed station in Redwood Creek were similar between spring baseflow conditions compared to during January storm flows. However, the higher water hardness during spring baseflows compared to storm flows reduces the bioavailability of the copper. The downstream Atherton Creek station was dry during the spring and could not be sampled.

- Copper concentrations reported for the stormwater runoff sample collected from an outfall (sample SM-SSF-316A) were comparable to concentrations measured in the creeks. However, the hardness of the outfall water sample was an order of magnitude lower than the creek water samples.

- With the exception of the stormwater outfall sample, all dissolved copper concentrations were below hardness-dependent acute and chronic WQOs. WQOs do not apply to the stormwater runoff and it is likely that mixing in the receiving water downstream of the outfall would dilute the copper. In addition, higher hardness in the creek compared to the stormwater runoff would reduce the bioavailability of the copper.

### 5.1.3 Nutrients

In WY 2017, SMCWPPP collected samples (concurrent with the above copper sampling) from four creek stations (upstream and downstream locations in Atherton Creek and Redwood Creek) for nutrients analysis (i.e., ammonium[12], nitrate, nitrite, total Kjeldahl nitrogen (TKN), dissolved orthophosphate, and total phosphorus). The goal was to address loads and status (Management Question #4). All four stations were sampled during a large storm event in January 2017 and three of the four stations were also sampled during spring baseflow conductions to assess seasonal trends (Management Question #5). The downstream station in Atherton Creek was dry during the spring sampling event and could not be sampled.

Based on the laboratory results, the following findings are noted:

[12] Ammonium was calculated as the difference between ammonia and un-ionized ammonia. Un-ionized ammonia was calculated using the formula provided by the American Fisheries Society Online Resources (http://fishculture.fisheries.org/resources/fish-hatchery-management-calculators/).

- Nutrient concentrations in Atherton Creek were generally slightly higher than nutrient concentrations in Redwood Creek.
- In Redwood Creek, concentrations of all nutrients measured were higher at the downstream station compared to the upstream station during both storm flows and spring baseflows.
- In Atherton Creek, nitrate, total nitrogen, dissolved orthophosphate and phosphorus concentrations were higher at the downstream station compared to the upstream station. However, TKN and ammonia concentrations were lower at the downstream station. This suggests an organic source of nitrogen in the upper watershed.
- Nutrient concentrations in both creeks were higher during the January storm sampling event compared to the spring baseflow event. This finding is consistent with the draft conceptual model developed by the "San Francisco Bay Nutrient Management Strategy" which suggests that nutrient loads to San Francisco Bay from creeks are highest during the wet season, although considerably less than loads from publicly owned wastewater treatment works (POTWs) (Senn and Novick 2014).
- No applicable WQOs were exceeded.

### 5.1.4 SMCWPPP WY 2017 POC Monitoring - Conclusions

In WY 2017, the SMCWPPP collected and analyzed POC samples in compliance with Provision C.8.f of the MRP. Yearly minimum requirements were met for all monitoring parameters. In addition, SMCWPPP continued helping the RMP's STLS to select its WY 2017 PCBs and mercury monitoring stations that are located in San Mateo County. The data from those stations was evaluated along with PCBs and mercury data collected directly by SMCWPPP. Conclusions from WY 2017 POC monitoring included the following:

- SMCWPPP's PCBs and mercury monitoring focuses on San Mateo County WMAs containing high interest parcels with land uses potentially associated with PCBs such as old industrial, electrical and recycling. During WY 2017 SMCWPPP collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs and 67 grab sediment samples (of which 6 were duplicates) within the WMAs. SMCWPPP evaluated the PCBs stormwater runoff and sediment monitoring data to help prioritize WMAs for further investigation and identify which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls.
- Based on the sediment and stormwater runoff monitoring data collected to-date in San Mateo County by SMCWPPP and other parties (e.g., the RMP's STLS), WMAs were provisionally designated as higher, medium, or lower priority. Figure 4 is a map illustrating the current status of WMAs in San Mateo County, based on this provisional prioritization scheme.
- The WY 2017 grab sediment samples and other data collected to-date informed identification of source properties within WMAs, potentially for referral to the Regional Water Board for further investigation and potential abatement. The sediment samples were collected from manholes, storm drain inlets, driveways, streets, and sidewalks in the public right-of-way (ROW), including locations adjacent to high interest parcels with land uses associated with PCBs such as old industrial, electrical and recycling and/or other characteristics potentially associated with pollutant discharge (e.g., poor housekeeping, unpaved areas). Based on the data gathered to-date, SMCWPPP is

working with the City of San Carlos to develop referrals for three properties, and evaluating next steps at several other potential source properties.

- One of the 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs was also analyzed for total and dissolved copper. An additional four creek water samples were collected for copper analysis from upstream and downstream locations in two creeks (Atherton and Redwood Creeks) during a large January 2017 storm event. One of the downstream stations was also sampled for copper during spring baseflow conditions. Copper concentrations were higher at bottom-of-the-watershed stations in both creeks compared to stations higher in the watersheds), suggesting an influence by stormwater runoff.
- The upstream and downstream stations in Atherton and Redwood Creeks were concurrently sampled for nutrients during the large January 2017 storm event. Three of these stations were also sampled for nutrients during spring baseflow conditions. In Atherton Creek, nitrate, total nitrogen, dissolved orthophosphate and phosphorus concentrations were higher at the downstream station compared to the upstream station. However, TKN and ammonia concentrations were lower at the downstream station, suggesting an organic source of nitrogen in the upper watershed. Nutrient concentrations in both creeks were higher during the January storm sampling event compared to the spring baseflow event, suggesting that nutrient loads to San Francisco Bay from these creeks is higher during storm events.
- With one exception, none of the WY 2017 water samples exceeded applicable water quality objectives (WQOs). The exception was the stormwater runoff sample analyzed for copper. However, WQOs generally are applied to receiving waters, not stormwater runoff, and it is likely that mixing in the receiving water downstream of the outfall would have diluted the copper. In addition, higher hardness in the creek compared to the stormwater runoff would have reduced the bioavailability of the copper in the receiving water.

### 5.1.5 POC Monitoring Planned by SMCWPPP in WY 2018

In WY 2018, SMCWPPP will continue to collect and analyze POC samples in compliance with Provision C.8.f of the MRP. Yearly minimum requirements will be met for all monitoring parameters. In addition, SMCWPPP will continue helping the RMP's STLS to select its WY 2018 PCBs and mercury monitoring stations that are located in in San Mateo County. POC monitoring activities in WY 2018 will include the following:

- SMCWPPP, in coordination with the RMP STLS, will continue conducting PCBs and mercury monitoring that focuses on San Mateo County WMAs containing high interest parcels with land uses potentially associated with PCBs such as old industrial, electrical and recycling. This will include collecting additional composite samples of stormwater runoff from outfalls at the bottom of WMAs and grab sediment samples within the WMAs. Objectives will include attempting to identify source properties within WMAs, identifying which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls, and prioritizing WMAs for potential future investigations.
- At least eight PCBs and mercury samples that address Management Question #3 (Management Action Effectiveness) must be collected by the end of year four of the permit (i.e., by 2020). SMCWPPP is currently working with BASMAA to implement a regional project that addresses POC Management Action Effectiveness. The study design, approved in August 2017 by the BASMAA Project Management Team (which

includes representatives from the SMCWPPP), addresses the effectiveness of hydrodynamic separator (HDS) units and various types of biochar-amended bioretention soil media (BSM) at removing PCBs and mercury from stormwater. Findings from the regional project will be reported in the WY 2018 UCMR which will be submitted by March 31, 2019. Findings will also be used to support SMCWPPP's Reasonable Assurance Analysis (RAA).

- At least eight samples that address Management Question #5 (Trends) must be collected by the end of year four of the permit (i.e., 2020). SMCWPPP will continue to participate in the STLS Trends Strategy Team to help meet this requirement. The STLS Trends Strategy Team, initiated in WY 2015, is currently developing a regional monitoring strategy 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. Analysis of recent and historical data collected at region-wide loadings stations suggests that PCB concentrations are highly variable. Therefore, a monitoring design to detect trends with statistical confidence may require more samples than is feasible with current financial resources. The STLS Trends Strategy Team is continuing to evaluate available data from the Guadalupe River watershed to explore more economical monitoring opportunities. The Team is also considering modeling options that could be used in concert with monitoring to detect and predict trends in POC loadings. A Trends Strategy Road Map is currently being developed.
- SMCWPPP will also continue to work with the State's Stream Pollution Trends (SPoT) Monitoring Program to help address Management Question #5 (Trends). SPoT conducts annual dry season monitoring (subject to funding constraints) of sediments collected from a statewide network of large rivers. The goal of the SPoT Monitoring Program is to investigate long-term trends in water quality. 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, sediment analytes include PCBs, mercury, toxicity, pesticides (Phillips et al. 2014).
- SMCWPPP will collect two copper and two nutrient water samples concurrently with its MRP Provision C.8.g.iii, Wet Weather Pesticides and Toxicity Monitoring, which targets two bottom-of-the-watershed stations during storm events. An additional two copper and nutrient samples will be collected at the same stations during the spring season when hydrographs are receding.
- SMCWPPP will continue to participate in the RMP, including the RMP's STLS and CEC Strategy (see Section 2.5).

## 5.2 Small Tributaries Loading Strategy

The RMP Small Tributaries Loading Strategy was developed in 2009 by the STLS Team, which includes representatives from BASMAA, Regional Water Board staff, RMP staff, and technical advisors and is overseen by the Sources, Pathways, and Loadings Workgroup (SPLWG). The objective of the STLS is to develop a comprehensive planning framework to coordinate POC monitoring/modeling between the RMP and RMC participants. In 2017, the following management policies and decisions were identified:

- Refining pollutant loading estimates for future TMDL updates,
- Informing provisions of the current and future versions of the MRP,
- Identifying small tributaries to prioritize for management actions, and
- Informing decisions on the best management practices for reducing concentrations and loads.

The sections below describe the tasks implemented by the RMP STLS in WY 2017 to address the relevant management policies.

### 5.2.1 Wet Weather Characterization

With a goal of identifying watershed sources of PCBs and mercury, STLS field monitoring in WY 2017 continued to focus on collection of storm composite samples in the downstream reaches of catchments located throughout the region. In WY 2017, 17 catchments ranging in size from 0.09 $km^2$ to 36.57 $km^2$ and representing engineered MS4 drainage areas throughout the Bay Area were sampled during storm events. Storm composite water samples were analyzed for concentrations of PCBs, total mercury, and suspended sediment concentration. In addition, a pilot study was continued at a subset of locations to collect fine sediments using specialized settling chambers. A full description of the methods and results from WY 2015, WY 2016, and WY 2017 monitoring is included in **Appendix E** (Pollutants of Concern Reconnaissance Monitoring Final Progress Report, Water Years 2015, 2016, and 2017).

In WY 2017, four catchments were targeted in San Mateo County based on recommendations by SMCWPPP staff evaluating land uses in the County that have the highest likelihood of generating PCBs in stormwater runoff. Three of the San Mateo County sampling stations were located at manholes accessing the MS4; one was located in Colma Creek. The SMCWPPP considered these data during the process to prioritize WMAs (see Section 5.1.1).

Wet weather characterization monitoring by the RMP STLS is planned to continue in WY 2018.

#### Findings

The RMP STLS has a growing database of nearly 75 stations that have been sampled at least once during wet weather events for PCBs, mercury, and SSC since 2003. (Some stations have also been sampled for a larger suite of constituents.) Prior to WY 2015, most of the stations were located in natural creeks, whereas the 55 stations sampled in WY 2015 through WY 2017 were primarily located in small catchments draining primarily old industrial land uses. At 16 of the stations, a second sample was collected with either a Hamlin or Walling tube remote sediment sampler.

Acknowledging that dynamic climatic conditions and individual storm characteristics may affect data interpretation, the following conclusions have been identified:

- PCBs positively correlate with impervious cover, old industrial land use, and mercury. They inversely correlate with watershed area.
- The positive relationship between PCBs and mercury is relatively weak, probably due to the larger role of atmospheric recirculation in the mercury cycle and the differences in use history of each POC.
- Neither PCBs nor mercury have strong correlations with other trace metals (As, Cu, Cd, Pb, and Zn). Therefore, there is no support for the use of trace metals as surrogate investigative tools for either PCBs or mercury sources.
- The testing of the remote samplers showed mixed results and further testing is needed to determine their utility in investigating PCB and mercury sources.
- Resampling of some stations (i.e., those that return lower than expected concentrations) is recommended to test for false negatives.

### 5.2.2 Regional Watershed Spreadsheet Model

The Regional Watershed Spreadsheet Model (RWSM) is a land use based planning tool for estimation of annual POC loads from small tributaries to San Francisco Bay at a regional scale. Development of the RWSM began in 2010 and, in WY 2017, the STLS Team (with support and input from BASMAA representatives) published a beta version of the RWSM tool-kit.

The RWSM is based on the idea that to accurately assess total contaminant loads entering San Francisco Bay, it is necessary to estimate loads from local watersheds. “Spreadsheet models” of stormwater quality provide a useful and relatively inexpensive means of estimating regional scale watershed loads. Spreadsheet models have advantages over mechanistic models because the data for many of the input parameters required by mechanistic models may not currently exist; mechanistic models also require large calibration datasets which require a significant investment of time and resources to collect.

The RWSM is based on the assumption that an estimate of mean annual **volume** for each land use type within a watershed can be combined with an estimate of mean annual **concentration** for that same land use type to derive a **load** which can be aggregated for a watershed or many watersheds within a region of interest. It may be used to provide hypotheses about which sub-regions or watersheds export relatively higher or lower loads to the Bay relative to area. It can also serve as a baseline for analyzing changes in loadings due to large scale changes in land use (e.g., associated with redevelopment and new development) and runoff (e.g., associated with climate change and changes in impoundment). However, the RWSM is less reliable for predicting real loadings for individual watersheds and for estimating load changes in relation to implementation of treatment BMPs.

The RWSM beta tool-kit published in June 2017 includes:

- Hydrology Model coded using ArcPy and drawing on a user interface accessible through ArcGIS;

- Pollutant Model Spreadsheet for taking the outputs from the Hydrology Model and inputting land use coefficients to estimate pollutant loads;
- Two optional calibration tools – a spreadsheet for manual calibration, and an R script for an optimized automated calibration; and
- User Manual

Testing of the RWSM beta tool-kit by some of the BASMAA RMC partners began in WY 2017 and will continue into WY 2018. The STLS will continue to support the RWSM in WY 2018. If warranted, and in consultation with the STLS and the SPLWG, a more sophisticated dynamic simulation model (i.e., SWMM, HSPF) may be developed in future years. As the modeling team at SFEI becomes more proficient with alternative water-based platforms (i.e., SWMM, HEC-RAS) through development of the Green Plan-IT tool, a more sophisticated basis may be adopted in future years. Decisions on model improvements will be made in consultation with the STLS and the SPLWG.

### 5.2.3 STLS Trends Strategy

In WY 2017, the STLS Trends Strategy team continued to meet periodically. The STLS Trends Strategy was initiated in 2015 by recommendation of from the SPLWG which advised the STLS to define where and how trends may be most effectively measured in relation to management effort so that data collection methods deployed over the next several years will support this management information need. The STLS Trends Strategy team is comprised of SFEI staff, RMC participants, and Regional Water Board staff. Invitations to key meetings are expanded to additional interested parties (e.g., EPA), and technical advisors (e.g., USGS) are consulted to review specific technical work products.

The Trends Strategy document and Technical Appendix, drafted in WY 2016, serves as a foundation for this effort. The main document summarizes the background, management questions, and guiding principles of the Trends Strategy. It also describes coordination between the RMP and BASMAA within the context of the MRP, proposed tasks to answer the management questions, anticipated deliverables, and the overall timeline. The current priority POCs are PCBs and mercury, and trend indicators under consideration (i.e., PCBs concentrations and particle-ratio concentrations) were identified within the context of existing datasets (e.g., POC loading stations) and TMDL timelines. However, the Strategy recognizes that priorities can change in the future. The Technical Appendix (Melwani et al. 2016) presents an evaluation of variability and statistical power for detecting trends based on POC loading station PCBs data. It presents sample size and revisit frequency scenarios needed to detect declining trends in PCBs in 25 years with > 80% statistical power. Due to high variability in baseline PCBs concentrations, the modeled sampling scenarios would likely be too expensive and thus unrealistic to implement. Therefore, the Technical Appendix recommends additional analyses and monitoring that should be considered prior to developing a trends monitoring design.

In WY 2017, the STLS Trends Strategy team followed up on some of the recommendations from the Technical Appendix. A statistical model for trends in PCBs loads in the Guadalupe River (as a case study) was developed. The model incorporates the significant turbidity-PCB relationships that exist and evaluates climatic, seasonal, and inter-annual factors as potential drivers of PCB loads. More intensive review of the Guadalupe River dataset resulted in two main findings: 1) No trends in PCBs loads were apparent for the period of 2003 through 2014: 2) A monitoring design that includes sampling least two storms in 13 out of 20 years (with 4 to 6 grab samples per storm) would detect inter-annual trends of 25% or more over 20 years with >

80% power[13] (Melwani et al. 2018). Results of the statistical analyses were presented at key stages in the analysis to USGS technical advisors with expertise in trends analysis of water data. It is uncertain how the Guadalupe River model and analysis could be applied to other watersheds which have distinct characteristics.

In WY 2018, the Trends Strategy team is updating the Trends Strategy document to include an evaluation of how various tasks to date have and could be used to address the five POC information needs from the MRP (see list at the beginning of Section 5.0). This review will focus on the Guadalupe River statistical analysis, RWSM, BASMAA source identification and BMP effectiveness monitoring, and POC loads monitoring (loading stations and wet weather characterization). The updated document will also propose conceptual ideas for a regional load model that may be supplemented, optimized, and/or calibrated with data from field monitoring. A five-year workplan with estimates of annual budget allocations will be presented.

### 5.2.4 Guadalupe River Loading Station Contingency Monitoring

POC loads monitoring activities were conducted from 2003 through 2014 in the Guadalupe River near the Highway 101 overpass. These efforts occurred via a combination of RMP, SCVURPPP and Santa Clara Valley Water District (SCVWD) funding and were generally aimed at developing robust estimates of annual mercury and other POC loading to the Bay from the watershed (see Section 5.2.3 for more information). One key information gap that remains is the concentrations and loading associated with high intensity storm events that necessitate the release of water from reservoirs located in the upper watershed. These events rarely occur and, for the past few years, the Program has been prepared to institute contingency monitoring to sample water at the Highway 101 station in the event of a qualifying storm. In WY 2017, a qualifying event occurred and was successfully sampled.

McKee et al. (2018) describes monitoring methods and results from the five-day sampling event that occurred in January 2017. SFEI staff implemented an adaptive sampling strategy and captured a total of 14 samples over five days. During that time, flow peaked three times in response to heavy and prolonged rainfall. **Figure 5.2** (i.e., Figure 4 from McKee et al. 2018) illustrates how mercury concentrations varied throughout the storm hydrograph.

[13] Power is defined as the probability of detecting a trend of a certain magnitude during a specified monitoring period (years), where a Type I error rate is set at 5%.

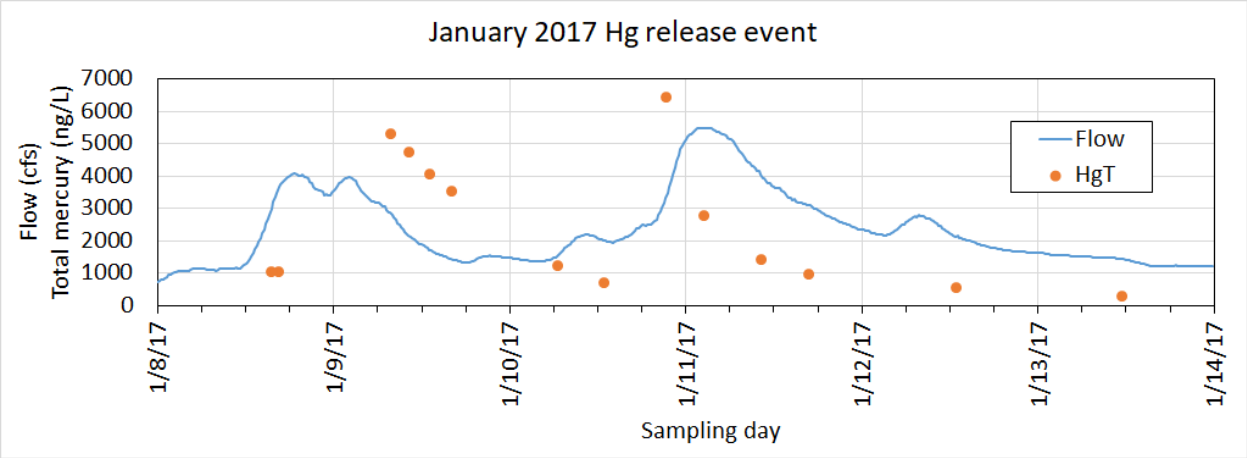


Figure 5.2. January 2017 storm hydrograph and total mercury concentrations in Guadalupe River at Highway 101 (Figure 4 from McKee et al. 2017; flow data are provisional and subject to change).

Two methods were applied to estimate mercury loads during the event. The first method was used to generate a load estimate for every 15-minute interval during the sampling period (using linear interpolation between grab samples) and resulted in a total event load of 70 kg. The second method combined a flow-weighted average concentration with total event flow for a load estimate of 82 kg. Approximately 86% of the load is assumed to emanate from the historic mining district in the upper watershed, rather than the urbanized areas in the lower watershed. Regardless of which method is used, a load equivalent of more than half of the previously estimated average annual baseline load for the Guadalupe River was transported during this one storm. The loads during this one storm exceeded the TMDL wasteload allocation of 9.4 kg/year by a factor of greater than 7. These findings illustrate the very episodic nature of loads in this system.

**Comparison to Applicable Water Quality Standards**

MRP provision C.8.g.iii requires RMC participants to assess all data collected pursuant to provision C.8 for compliance with applicable water quality standards. In compliance with this requirement, comparisons of data collected in the Guadalupe River in WY 2017 to applicable numeric WQO is provided below.

When conducting a comparison to applicable WQOs/criteria, certain considerations should be taken into account to avoid the mischaracterization of water quality data:

**Discharge vs. Receiving Water** – WQOs apply to receiving waters, not discharges. WQOs are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses. POC monitoring data collected as part of the wet weather characterization effort (Section 5.2.1) were not collected in receiving waters; instead, they were collected within the engineered storm drain network where WQOs do not apply.

**Freshwater vs. Saltwater** - POC monitoring data were collected in freshwater, above tidal influence and therefore comparisons were made to freshwater WQOs/criteria.

**Aquatic Life vs. Human Health** - Comparisons were primarily made to objectives/criteria for the protection of aquatic life, not objectives/criteria for the protection of human health to support the consumption of water or organisms. This decision was based on the assumption that water and organisms are not likely being consumed from the stations monitored.

**Acute vs. Chronic Objectives/Criteria** - Monitoring was conducted during episodic storm events and results do not likely represent long-term (chronic) concentrations of monitored constituents. POC monitoring data were therefore compared to "acute" WQOs/criteria for aquatic life that represent the highest concentrations of an analyte to which an aquatic community can be exposed briefly (e.g., 1-hour) without resulting in an unacceptable effect.

Of the analytes monitored in Guadalupe River in WY 2017, WQOs or criteria have only been promulgated for total mercury. Therefore, the comparison of data collected in WY 2017 to applicable numeric WQOs or criteria adopted by the Regional Water Board is limited to total mercury.

Six of the 14 samples collected in the Guadalupe River in WY 2017 were above the freshwater acute objective for mercury of 2.4 µg/L. Total mercury concentrations ranged from 0.28 µg/L to 6.45 µg/L with the highest concentrations occurring during storm peak flows. Mercury discharges from urban areas that drain through the MS4 are being addressed through provision C.11 of the MRP which implements the San Francisco Bay and Guadalupe River Watershed mercury TMDLs.

# 6.0 Next Steps

Water quality monitoring required by Provision C.8 of the MRP is intended to assess the condition of water quality in Bay Area receiving waters (creeks and the Bay); identify and prioritize stormwater associated impacts, stressors, sources, and loads; identify appropriate management actions; and detect trends in water quality over time and the effects of stormwater control measure implementation. On behalf of San Mateo County Permittees, SMCWPPP conducts creek water quality monitoring and other monitoring projects in San Mateo County in collaboration with the Regional Monitoring Coalition, and actively participates in the San Francisco Bay Regional Monitoring Program, which focuses on assessing Bay water quality and associated impacts.

In WY 2018, SMCWPPP will continue to comply with water quality monitoring requirements of the MRP. The following list of next steps will be implemented in WY 2018:

- SMCWPPP will continue to collaborate with the RMC (MRP Provision C.8.a).
- Where applicable, monitoring data collected and reported by SMCWPPP will be compatible with SWAMP (MRP Provision C.8.b).
- SMCWPPP will continue to provide financial contributions towards the RMP and to assist BASMAA to actively participate in the RMP committees and work groups described in Sections 2.0 and 5.0 (MRP Provision C.8.c).
- SMCWPPP will continue to conduct probabilistic and targeted Creek Status Monitoring consistent with the specific requirements of MRP Provision C.8.d.
- SMCWPPP will continue to conduct dry weather Pesticides and Toxicity Monitoring consistent with MRP Provisions C.8.g.i and C.8.g.ii.
- SMCWPPP will work with the RMC to develop and implement a wet weather Pesticides and Toxicity Monitoring program consistent with MRP Provision C.8.g.iii.
- SMCWPPP will continue to review monitoring results and maintain a list of all results exceeding trigger thresholds (MRP Provision C.8.e.i). SMCWPPP will coordinate with the RMC to initiate a region-wide goal of eight new SSID projects by the end of the permit term, including four new SSID projects by the third year of the permit (MRP Provision C.8.e.iii). This will include implementation of the Pillar Point Harbor Bacteria SSID Project.
- SMCWPPP will continue to participate in the STLS and SPLWG which address MRP Provision C.8.f POC management information needs and monitoring requirements through wet weather characterization monitoring, refinement of the RWSM, and development and implementation of the STLS Trends Strategy.
- SMCWPPP will continue implementing a POC monitoring framework to comply with Provision C.8.f of the MRP. The monitoring framework addresses the annual and total minimum number of samples required for each POC (i.e., PCBs, mercury, copper, emerging contaminants, nutrients) and each management information need (i.e., Source Identification, Contributions to Bay Impairment, Management Action Effectiveness, Loads and Status, Trends). WY 2018 monitoring will include conducting PCBs and mercury monitoring that focuses on San Mateo County WMAs containing high interest parcels with land uses potentially associated with PCBs such as old industrial, electrical and recycling. This will include collecting additional composite samples of stormwater runoff from outfalls at the bottom of WMAs and grab sediment samples within the

WMAs. Objectives will include attempting to identify source properties within WMAs, identifying which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls, and prioritizing WMAs for potential future investigations. WY 2018 monitoring will also include sampling for nutrients and copper.

- WY 2018 POC monitoring accomplishments and allocation of sampling efforts for POC monitoring in WY 2019 will be submitted in the Pollutants of Concern Monitoring Report that is due to the Water Board by October 15, 2018 (MRP Provision C.8.h.iv).
- Results of WY 2018 monitoring will be described in the Programs WY 2018 Urban Creeks Monitoring Report that is due to the Water Board by March 31, 2019 (MRP Provision C.8.h.iii).

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