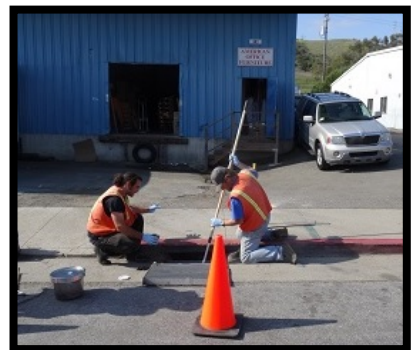
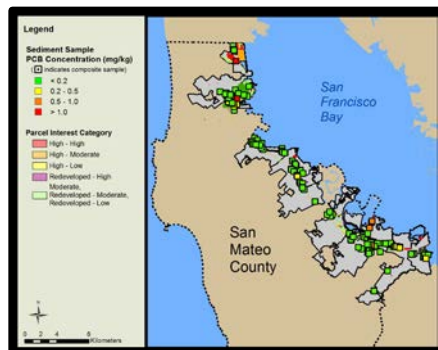


Progress Report: Identification of Watershed Management Areas for PCBs and Mercury



*Submitted in Compliance with
NPDES Permit No. CAS612008, Provision C.11.a.iii / C.12.a.iii*



April 1, 2016

TABLE OF CONTENTS

TABLE OF CONTENTS	I
LIST OF TABLES.....	I
LIST OF FIGURES	I
LIST OF ABBREVIATIONS	II
1.0 INTRODUCTION	1
2.0 DEVELOPMENT OF WATERSHED MANAGEMENT AREAS	2
2.1. TERMINOLOGY	2
2.2. WMA SELECTION PROCESS	3
2.2.1. Summary of GIS Data Layers and Databases Developed/Utilized	4
2.2.2. Step No.1 – Initial Screening (Parcel-based)	5
2.2.3. Step No.2 – Detailed Screening (Parcel-based)	5
2.2.4. Step No.3 – Field Monitoring (Catchment-based)	8
3.0 WMAs IDENTIFIED TO-DATE.....	14
4.0 EXISTING AND PLANNED CONTROL MEASURES.....	18
5.0 PLANNED NEAR-TERM NEXT STEPS	19
6.0 REFERENCES.....	21

LIST OF TABLES

TABLE 1. NUMBER OF TOTAL, POTENTIAL HIGH INTEREST, AND HIGH INTEREST PARCELS IN SAN MATEO COUNTY IDENTIFIED THROUGH THE SCREENING PROCESS.....	6
TABLE 2. PRELIMINARY CLASSIFICATION OF 110 STORMWATER CATCHMENTS OF INTEREST.....	15
TABLE 3. CHARACTERISTICS OF THE PRELIMINARILY IDENTIFIED WATERSHED MANAGEMENT AREAS (WMAs) IN SAN MATEO COUNTY.....	16

LIST OF FIGURES

FIGURE 1. HIGH INTEREST PARCELS FOR PCBs IN SAN MATEO COUNTY.....	7
FIGURE 2. STORMWATER CATCHMENTS OF INTEREST FOR PLANNING THE WY2015 FIELD MONITORING PROGRAM IN SAN MATEO COUNTY.....	10
FIGURE 3. PCBs CONCENTRATIONS IN SEDIMENTS COLLECTED IN SAN MATEO COUNTY DURING THE WY2015 FIELD MONITORING PROGRAM.	11
FIGURE 4. MERCURY CONCENTRATIONS IN SEDIMENTS COLLECTED IN SAN MATEO COUNTY DURING THE WY2015 FIELD MONITORING PROGRAM.	12
FIGURE 5. PCBs CONCENTRATIONS IN SEDIMENTS COLLECTED IN SAN MATEO COUNTY DURING 2000-2014.	13
FIGURE 6. PRELIMINARILY IDENTIFIED WATERSHED MANAGEMENT AREAS (WMAs) IN SAN MATEO COUNTY.....	17

LIST OF ABBREVIATIONS

ABAG	Association of Bay Area Governments
BASMAA	Bay Area Stormwater Management Agencies Association
BMPs	Best Management Practices
CW4CB	Clean Watersheds for a Clean Bay
CWA	Clean Water Act
FY	Fiscal Year
GI	Green Infrastructure
MPC	Monitoring and Pollutants of Concern
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollution Discharge Elimination System
PCBs	Polychlorinated Biphenyls
POC	Pollutant of Concern
POTW	Publically Owned Treatment Works
RAA	Reasonable Assurance Analysis
RMP	Regional Monitoring Program for Water Quality in San Francisco Bay
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
TMDL	Total Maximum Daily Load
WY	Water Year
WMA	Watershed Management Area

1.0 INTRODUCTION

Fish tissue monitoring in San Francisco Bay has revealed bioaccumulation of polychlorinated biphenyls (PCBs), mercury, and other pollutants. The levels found are thought to pose a health risk to people consuming fish caught in the Bay. As a result of these findings, an interim advisory has been issued on the consumption of fish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act (CWA) "Section 303(d) list" due to elevated levels of PCBs, mercury, and other pollutants. In response, the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) has developed Total Maximum Daily Load (TMDL) water quality restoration programs targeting PCBs and mercury in the Bay. The general goals of the TMDLs are to identify sources of PCBs and mercury to the Bay, implement actions to control the sources, and restore water quality.

The PCBs and mercury TMDLs stipulate that a 90% reduction in PCBs and 50% reduction in mercury found in discharges from urban stormwater runoff to the Bay are needed to achieve water quality standards and restore beneficial uses. Provisions C.11 and C.12 of first Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP 1.0; Order R2-2009-0074) required Permittees to implement pilot-scale control measures during the permit term to reduce PCBs and mercury discharges from Municipal Separate Storm Sewer Systems (MS4s). These pilot studies were intended to enhance our collective knowledge about the costs and benefits of different Best Management Practices (BMPs) to control PCBs and mercury. The recently reissued permit (MRP 2.0, Order R2-2015-0049) requires municipal agencies to move from pilot-scale work to focused implementation and defined load reduction goals (e.g., 3 kg/year region-wide for PCBs). The strategies and BMPs that will be applied to meet the load reduction goals are anticipated at a minimum to include:

- Source property identification and referral for investigation and abatement;
- Stormwater green infrastructure; and
- Management of PCBs in building materials during demolition.

Provisions C.11.a.iii (1) and C.12.a.iii (1) of MRP 2.0 require Permittees to report on progress towards the development of a prioritized list of watersheds and management areas where PCBs and/or mercury control measures are currently being implemented or will be implemented during the MRP 2.0 permit term, and the monitoring data and other information used to select these areas. The selection of these management areas, designated watershed management areas (WMAs), is currently being conducted at the stormwater catchment scale by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) and its member agencies. This process is an important aspect of the efforts of SMCWPPP and its member agencies to identify and control sources of PCBs and mercury to the MS4s within the County. The objectives of this progress report were to:

- Describe the WMA selection process being implemented by SMCWPPP and its member agencies, which is generally consistent with other Bay Area stormwater management program efforts as coordinated through the Bay Area Stormwater Management Agencies Association (BASMAA);
- Provide an overview of the next steps planned to continue addressing the requirements of MRP 2.0 provisions C.11 and C.12, including refining the lists and maps of WMAs and identifying existing and planned control measures for PCBs and mercury within the WMAs.

2.0 DEVELOPMENT OF WATERSHED MANAGEMENT AREAS

The selection and classification of WMAs is a multi-year process designed to identify the land areas in San Mateo County that contribute relatively higher loads of PCBs and mercury to MS4s, and therefore should be the focus of control measure implementation. The process being implemented by SMCWPPP and its member agencies is generally consistent with the framework developed by BASMAA agencies in consultation with Regional Water Board staff in preparation for MRP 2.0 PCB and mercury load reduction requirements. Consistent with the permit requirements, the selection of WMAs is primarily focused on PCBs, with assumed ancillary/secondary benefits for controlling mercury.

2.1. Terminology

This section summarizes important terminology used in this report. As noted above, *watershed management areas* (WMAs) are priority watersheds or stormwater catchments in the urban landscape where PCBs and/or mercury control measures are currently being implemented or will be implemented during the MRP 2.0 permit term, to the extent that feasible and cost-effective controls can be identified. The WMA identification process assumes that all areas in the urban landscape that drain to the Bay fall within one of three PCBs *interest* categories. All areas will eventually be further prioritized based on opportunity for PCB load reductions. PCBs areas of interest vary in geographic area and are generally identified at the parcel scale (smallest) through the stormwater catchment scale (largest). The three *interest* categories have the following characteristics:

- **High Interest** – Parcels, broader land areas, or stormwater catchments associated with land uses (most commonly old industrial, electrical, recycling, railroad, and military) that have a relatively higher likelihood of having elevated concentrations of PCBs (≥ 0.5 mg/kg) in street dirt, sediment from the MS4, or in stormwater runoff (particle concentration). These areas generally have not been redeveloped and do not contain stormwater treatment facilities.
- **Moderate Interest** – Parcels, broader land areas, or stormwater catchments associated with land uses (typically older non-industrial urban land uses) that have limited risk factors associated with PCBs. These areas generally have not been redeveloped and do not contain stormwater treatment facilities. Moderate interest areas are less likely to have elevated concentrations of PCBs.
- **Low/no Interest** – Parcels, broader land areas, or stormwater catchments associated with land uses (usually newly urbanized areas, redeveloped areas that have stormwater treatment, open spaces, and parks) where PCBs are typically found at low levels or below detection limits. Low/no interest areas are unlikely to have elevated concentrations of PCBs.

High interest areas where concentrations of PCBs in sediment have been confirmed via collection of samples in the field to equal or exceed 0.5 mg/kg are further classified as *PCBs source areas* and designated WMAs for PCBs. Because these areas are typically defined at the stormwater catchment scale, further investigation (i.e., a *source investigation*) is often needed to better characterize the geographic extent of elevated PCBs within a WMA and pollutant sources at the parcel scale. A *source property* is a property (composed of one or multiple adjacent parcels) that has been identified (usually via a *source investigation*) as discharging sediments or stormwater runoff with elevated levels of PCBs to an MS4 or receiving water body.

In addition to categorizing areas in the urban landscape according to pollutant *interest* as described above, a likely future step in the process to reduce PCBs and mercury discharges to MS4s will be performing a type of feasibility analysis referred to here as an *opportunity analysis*. As WMAs and source properties are identified and confirmed, *opportunity analyses* will be conducted to evaluate the feasibility of SMCWPPP and its member agencies implementing effective controls in an area and the associated costs of implementation. The analysis will address factors such as property ownership, cost of oversight, regulatory authority, logistical considerations, and timeframe to achieve benefit from implementation of available and feasible control measures. Opportunity analysis will result in areas being placed in categories with the following characteristics:

- **High Opportunity** – Parcels, broader land areas, or stormwater catchments that provide a relatively high opportunity for cost-effective PCBs and mercury controls such as referral to the Regional Water Board for subsequent investigation and remediation. PCBs concentrations in street dirt, sediment from the MS4, or in stormwater runoff (particle concentration) are generally equal to or greater than about 0.5 mg/kg.
- **Moderate Opportunity** – Parcels, broader land areas, or stormwater catchments that provide a relatively moderate opportunity for cost-effective PCBs and mercury controls. These include areas where additional PCB or mercury load reductions could be achieved as the urban landscape is redeveloped and/or retrofitted with green infrastructure, providing the opportunity for integration of PCBs (and mercury) load reductions with other drivers and funding sources such as transportation projects. PCBs concentrations in street dirt, sediment from the MS4, or in stormwater runoff (particle concentration) generally fall in the range of roughly 0.2 - 0.5 mg/kg.
- **Low Opportunity** – Parcels, broader land areas, or stormwater catchments that have low or urban background PCBs and mercury concentrations and/or provide low or no opportunity for cost-effective controls. PCBs concentrations in street dirt, sediment from the MS4, or in stormwater runoff (particle concentration) typically are less than about 0.2 mg/kg.¹

2.2. WMA Selection Process

In 2015, SMCWPPP staff worked with other BASMAA agency staff to develop a general framework for identifying areas of interest and opportunity for PCBs and mercury controls. This iterative framework was adapted by SMCWPPP to include the following four steps that occur first at the parcel-scale (steps No.1 & No.2) and then at the catchment-scale (steps No.3 & No.4):

1. **Initial Screening (Parcel-scale)** - Identify parcels that were industrialized in 1980 or earlier (i.e., old industrial parcels) or have other land uses associated with PCBs (i.e., electrical, recycling, railroad, and military). These parcels are potential high interest areas.
2. **Detailed Screening (Parcel-scale)** - Prioritize potential high interest areas based on the evaluation of existing information on current land uses and practices (e.g., redevelopment status, extent and quality of pavement, level of current housekeeping, any history of stormwater violations, and presence of electrical or heavy equipment, tanks, or stormwater treatment) identified via land use analysis, local institutional/historical knowledge, and surveys of site conditions (windshield, Google Street View, and/or aerial photograph).

¹ Based on the available dataset on sediment samples collected from streets and MS4s throughout the Bay Area to-date and analyzed for PCBs, roughly 80% of the sediment samples have total PCBs concentrations lower than 0.2 mg/kg.

3. **Field Monitoring (Catchment-scale)** - Collect sediment and/or stormwater runoff samples in the public right-of-way (i.e., streets or stormwater conveyance system) in catchments that contain high interest parcels and analyze for PCBs, mercury and ancillary analytes. Based on the results and historical sediment sample analysis data, identify potential or confirmed WMAs.
4. **Opportunity Analysis (Parcel or Catchment-scale)** – Making use of the data collected during the above screening and field monitoring steps and other pertinent data, perform an opportunity analysis as described previously. Control measures will focus on parcels or portions of WMAs where opportunities for cost-effective load reduction actions by Permittees are identified.

It is important to note that the above process to screen parcels and collect samples at higher priority sites within catchments (first three of above steps) is driven by PCBs, but all field samples are analyzed for mercury in addition to PCBs.

For PCBs and mercury field monitoring programs (e.g., Step No. 3 above), in the Bay Area collection of sediment samples has often been selected over collecting stormwater runoff samples during storm events. Sediment samples can be collected any time of the year and are relatively easy and inexpensive to collect relative to stormwater runoff samples. However, high spatial and temporal variability in the concentrations of PCBs and mercury has been observed in sediments. In addition, implementing targeting sediment monitoring designs is often hindered by the limited numbers of accessible locations within stormwater conveyances where sufficient sediments accumulate to collect samples. This is not surprising since MS4s are designed to be self-flushing. In addition, particle size distribution analyses of sediment found in the MS4 often reveal a greater proportion of larger particle sizes (e.g., sands and gravels) since finer sediments are more easily mobilized by stormwater runoff and may be flushed away from depositional areas. A limitation of using sediment monitoring in public right-of-way to attempt to identify source properties is that many industrial parcels have private storm drains plumbed directly to the MS4, so there is no overland flow of water and sediment from the property to the public right-of-way. As a result of these inherent challenges, sediment monitoring may produce false negative results, meaning that pollutants are not detected at elevated concentrations even if there is a source within the area targeted. However, the results of past field studies suggest that sediment sampling can identify at least some drainages with relatively elevated levels of PCBs and potentially point to source areas within these drainages (KLI and EOA 2002; SMSTOPPP 2002, 2003, 2004; Yee and McKee 2010; and SMCWPPP 2015).

More detailed descriptions of the first three steps of the above process, including monitoring data and other information obtained and analyzed to-date to identify and prioritize WMAs, are provided in the following subsections.

2.2.1. Summary of GIS Data Layers and Databases Developed/Utilized

The identification and prioritization of WMAs requires a great deal of both spatial and non-spatial data collection and management from multiple Permittees in San Mateo County. SMCWPPP guided and facilitated the development of the data management system for Permittees to provide consistency in the process. SMCWPPP maintains a geodatabase that contains all relevant Geographical Information System (GIS) data associated with PCB and mercury source identification

and control measure implementation in San Mateo County. Existing GIS data layers include, but are not limited to, the following:

- All parcels within San Mateo County with associated information such as land use, address, and ownership;
- High interest parcels and associated attributes developed during the initial and detailed screening processes, including redevelopment status, extent and quality of pavement, level of current housekeeping, presence of electrical or heavy equipment, tanks, or stormwater treatment;
- Confirmed PCBs source areas and parcels and associated WMAs;
- Stormwater catchment and watershed boundaries;
- Storm drain network for each Permittee; and
- All readily available PCBs or mercury analysis data from sediment and stormwater runoff sampling.

In addition, the location of a number of facility types that are potentially associated with either PCBs or mercury have been identified and mapped as “points” in GIS datalayers. These facility types include those associated with electrical generation, known mercury emitters, metal manufacturing, drum recycling, metal recycling, shipping, automotive recycling, general recycling, and those known to have or historically have had PCBs in use. This information was primarily gathered by the San Francisco Estuary Institute (SFEI) as part of the Urban Stormwater BMPs project (funded by a Proposition 13 grant) and contains data from a variety of sources including the California Air Resources Board, Envirostor, Superfund, Department of Toxic Substances Control, and the California State Water Resources Control Board. The list of facility types was previously described in SMCWPPP’s Integrated Monitoring Report – Part C (SMCWPPP 2014a).

2.2.2. Step No.1 – Initial Screening (Parcel-based)

As a first step, a screening process was developed to identify all parcels within San Mateo County that are of potential high interest for PCBs. These parcels have old industrial (i.e., were industrialized in 1980 or earlier, before PCBs were banned from manufacture and most uses), electrical, recycling, railroad, or military land uses. All parcels with these land uses were extracted from the 2005 land use layer developed by the Association of Bay Area Governments (ABAG).

To improve this GIS data layer, the County of San Mateo Assessor’s land use data were screened to add additional parcels meeting the age of development and land use criteria. This process ultimately identified 4,004 potential high interest parcels for PCBs within the portions of San Mateo County that drain to San Francisco Bay.

2.2.3. Step No.2 – Detailed Screening (Parcel-based)

The detailed screening prioritized the 4,004 potential high interest parcels based on an evaluation of available existing information related to risk factors for PCBs. The information evaluated included current land uses and practices (e.g., redevelopment status, extent and quality of pavement, level of current housekeeping, any history of stormwater violations, and presence of electrical or heavy equipment, tanks, or stormwater treatment) identified via land use analysis and surveys of site conditions (windshield, Google Street View, and/or aerial photograph). During the detailed screening, Permittee staff from jurisdictions with potential high interest parcels assisted with the prioritization so that local institutional/historical knowledge was incorporated into the

process. In addition, the detailed screening eliminated parcels in portions of San Mateo County that do not drain to San Francisco Bay.

Of the 4,004 potential high interest parcels, a total of 1,579 parcels were designated high interest. The detailed screening process was conservative in that when uncertainties in the available information made prioritization challenging, the process erred on the side of designating a property as high interest. Properties not designated high interest via the detailed screening were often light industrial businesses such as offices or shipping and properties significantly redeveloped after 1980 into housing or office buildings. The results of the parcel-based analysis (i.e., Steps No.1 and No.2) are summarized in Table 1. Figure 1 provides an overview of the location of the high interest parcels identified in San Mateo County.

Table 1. Number of total, potential high interest, and high interest parcels in San Mateo County identified through the screening process.

San Mateo County Permittee	Number of Parcels		
	Total	Potential High Interest	High Interest ¹
Atherton	2,592	2	2
Belmont	8,275	110	28
Brisbane	2,208	150	76
Burlingame	8,694	321	111
Colma	578	23	10
Daly City	23,980	118	20
East Palo Alto	5,017	153	125
Foster City	9,286	23	3
Half Moon Bay	6,067	28	0
Hillsborough	4,082	3	3
Menlo Park	10,106	185	94
Millbrae	6,623	40	21
Pacifica	12,751	37	0
Portola Valley	1,811	0	0
Redwood City	20,715	426	192
San Bruno	12,807	185	44
San Carlos	10,979	441	169
City of San Mateo	28,308	373	167
Unincorporated San Mateo County	24,363	575	225
South San Francisco	18,121	808	287
Woodside	2,346	3	2
Total	219,709	4,004	1,579

¹ High interest properties were only identified in portions of San Mateo County that drain to San Francisco Bay.

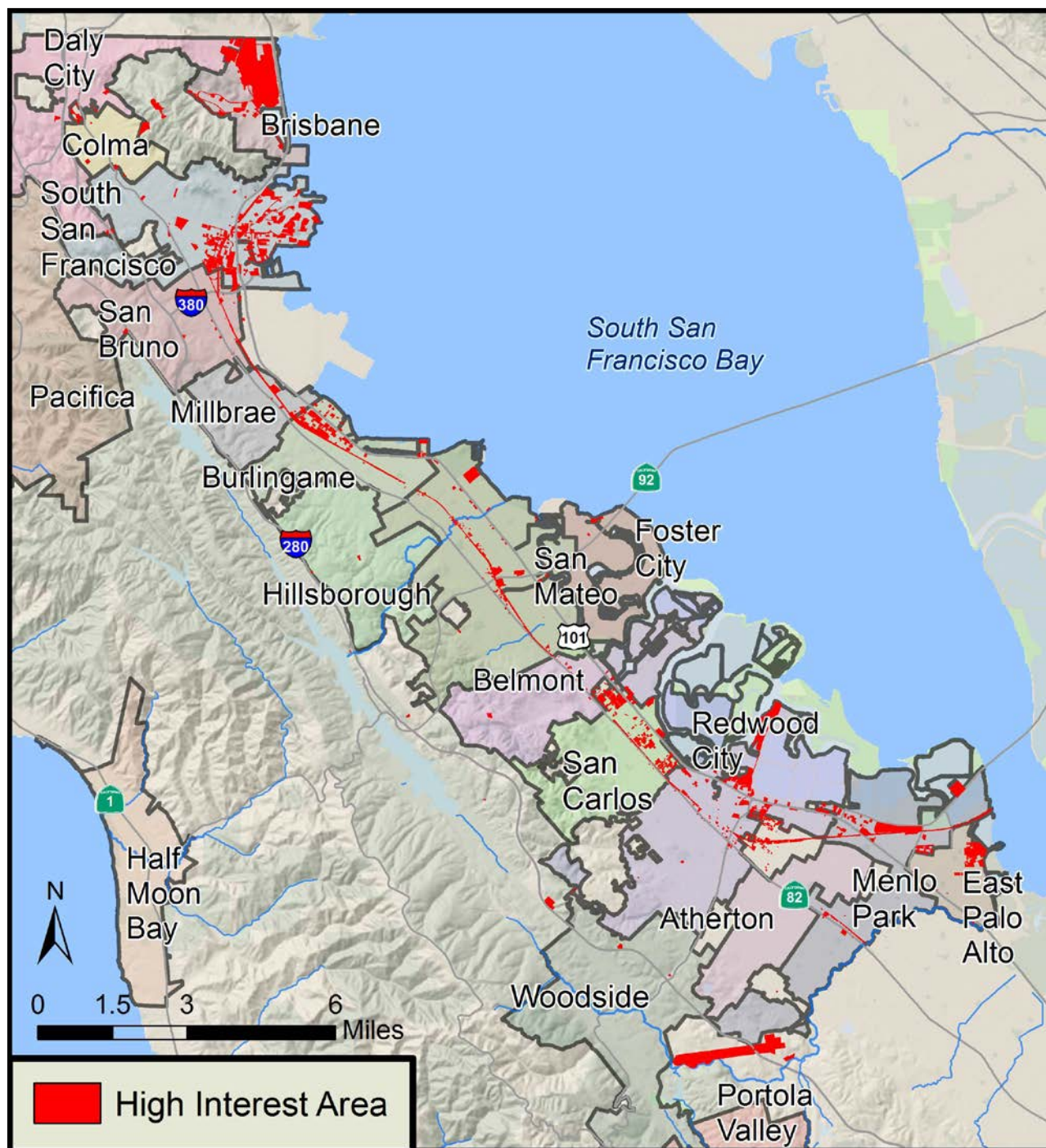


Figure 1. High interest parcels for PCBs in San Mateo County.

2.2.4. Step No.3 – Field Monitoring (Catchment-based)

The following sections summarize sediment and stormwater runoff monitoring conducted in San Mateo County during the past 15 years.

Sediment Monitoring - WY2015

As a next step in the identification of WMAs, in WY2015 SMCWPPP implemented a field monitoring program comprised of targeted sediment sampling, informed by the results of the parcel-level screening (above Steps No.1 and No.2). The general goal was to continue identifying potential source catchments for further study and planning of feasible and cost-effective pollutant controls.

The monitoring was conducted in compliance with Provision C.8.e.i of MRP 1.0, Pollutant of Concern (POC) Monitoring. Sediments were collected from MS4s in San Mateo County (e.g., storm drain lines beneath manholes, storm drain inlets, and pump station sumps) and from locations in the public right-of-way upstream of the MS4 (e.g., street gutters). Given the large number of high interest parcels (1,579) to potentially monitor, the WY2015 sediment monitoring program was designed to collect samples in stormwater catchment locations that drain the highest density of high interest parcels. Of the 380 urban catchments within San Mateo County that have 24-inch or larger diameter outfalls (SMCWPPP 2014b), 110 catchments with high densities of high interest parcels were identified as catchments of interest (Figure 2) for planning the targeted sampling. Old industrial areas not prioritized as high interest in Step No.2 were not explicitly considered in the selection of these catchments, but the most of these parcels were also located within the 110 catchments.

A total of 101 sediment samples were collected and analyzed for PCBs congeners, total mercury, and ancillary analytes. Concentrations of PCBs and mercury in the sediment samples are summarized in Figures 3 and 4, respectively. Total PCBs (i.e., sum of 40 PCB congeners) concentrations ranged from less than 0.01 mg/kg to 1.46 mg/kg with an average of 0.11 mg/kg and a median of 0.04 mg/kg. A total of five samples exceeded the 0.5 mg/kg threshold selected by the BASMAA Monitoring and Pollutants of Concern Committee as an approximate benchmark for identifying areas that should be considered for future investigation. Total mercury concentrations ranged from 0.03 mg/kg to 3.59 mg/kg with an average of 0.22 mg/kg and a median of 0.10 mg/kg. There is currently no comparable BASMAA benchmark for mercury; however, two samples exceeded 1.0 mg/kg (SMCWPPP 2015).

As described above, the sampling design specifically targeted sample stations at locations that drain parcels that were prioritized as high interest for PCBs. However, a strong correlation between the results of the screening and the sampling results was not observed, and only five percent of the samples had total PCBs concentrations exceeding the 0.5 mg/kg threshold. This suggests that continuing to identify additional PCBs source areas in San Mateo County may be challenging. Much of the PCBs load to MS4s appears to be coming from sources that are less elevated and more diffuse and will likely be more challenging to control. Thus data collected to-date suggest that the somewhat diffuse nature of PCBs contamination within the urban landscape may eventually require extending the timeline needed to meet TMDL load reduction goals (SMCWPPP 2015).

Sediment Monitoring - 2000 through 2014

This section briefly summarizes sediment and stormwater runoff monitoring conducted in San Mateo County during the period from 2000 to 2014, i.e., before the WY2015 field monitoring described above. During this period over 160 sediment samples were collected in San Mateo County, mainly from streets and MS4s (e.g., storm drain lines beneath manholes, storm drain inlets,

and pump station sumps), with most samples collected in the public right-of-way (KLI and EOA 2002; SMSTOPPP 2002, 2003, 2004; Yee and McKee 2010; and SMCWPPP 2015). Figure 5 summarizes concentrations of PCBs found in sediment samples collected during this time period.

A relatively large number of sediment samples have been collected in the two adjacent Pulgas Creek pump station catchments in San Carlos (see Figure 5 inset), an old industrial area that has been the subject of several investigations and is known to have elevated concentration of PCBs in sediments and stormwater runoff. Sediment sampling in 2002 and 2003 revealed elevated levels of PCBs in the pump station wet well and the storm drain line leading to the pump station from the southern half of the catchment. Subsequent sampling showed elevated concentrations along Bransten Road in the northern catchment and in several locations in the southern catchment including along Industrial Road, Center Street, Washington Street, and Varian Street (KLI and EOA 2002; SMSTOPPP 2003; and Yee and McKee 2010). Investigation of the Pulgas Creek pump station catchments is ongoing, and several related reports are under development, mostly through SMCWPPP's participation in the grant-funded Clean Watersheds for a Clean Bay (CW4CB) project.

Stormwater Runoff Monitoring

During the past several years, the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) has conducted stormwater runoff monitoring in San Mateo County and other parts of the Bay Area through its Small Tributary Load Strategy (STLS). The monitoring in San Mateo County has been coordinated with SMCWPPP, with SMCWPPP staff often assisting with selection of sampling stations and coordination with staff from local agencies. Monitoring objectives have included characterizing PCBs and mercury concentrations in stormwater runoff from the bottom of selected urban catchments with potential pollutant source areas and estimating pollutant loading rates from some catchments. With the exception of samples collected at the bottom of the Pulgas Creek pump station catchments, PCBs particle concentrations (i.e., ratio of PCBs to suspended sediment concentration) have been relatively low (less than 0.2 mg/kg) in the stormwater runoff samples collected to-date (McKee et al. 2012; McKee et al. 2013; Gilbreath et al. 2014; and McKee et al. 2016 DRAFT). Consistent with sediment monitoring results, stormwater runoff samples from the Pulgas Creek pump station catchments have shown very high levels of PCBs. For example, the PCBs concentration in one particularly elevated sample from the southern Pulgas pump station catchment was 6,670,000 picogram/L, which is nearly a factor of seven greater than the highest concentration measured at any other sampling station within the Bay Area.

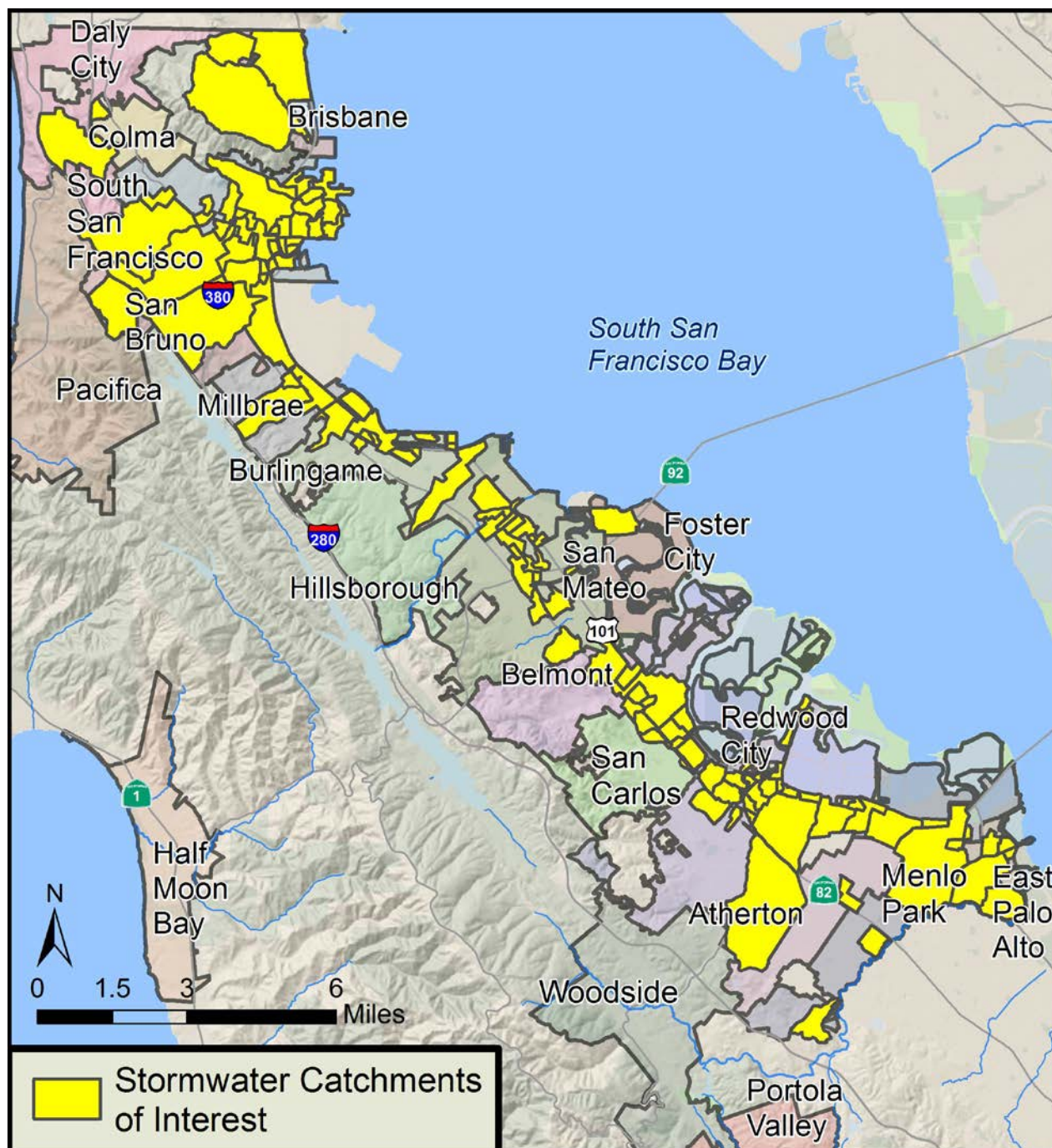


Figure 2. Stormwater catchments of interest for planning the WY2015 field monitoring program in San Mateo County.

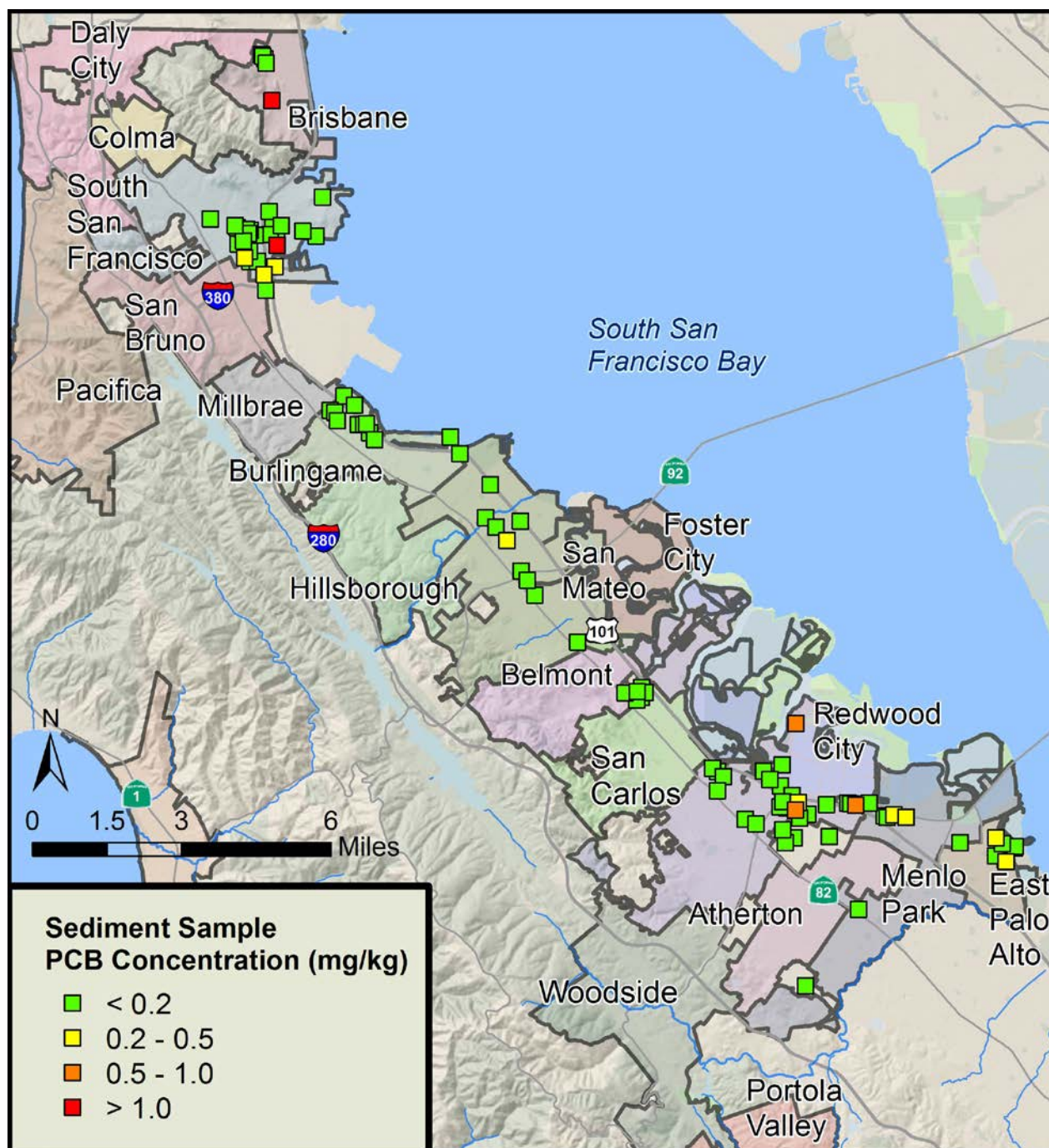


Figure 3. PCBs concentrations in sediments collected in San Mateo County during the WY2015 field monitoring program.

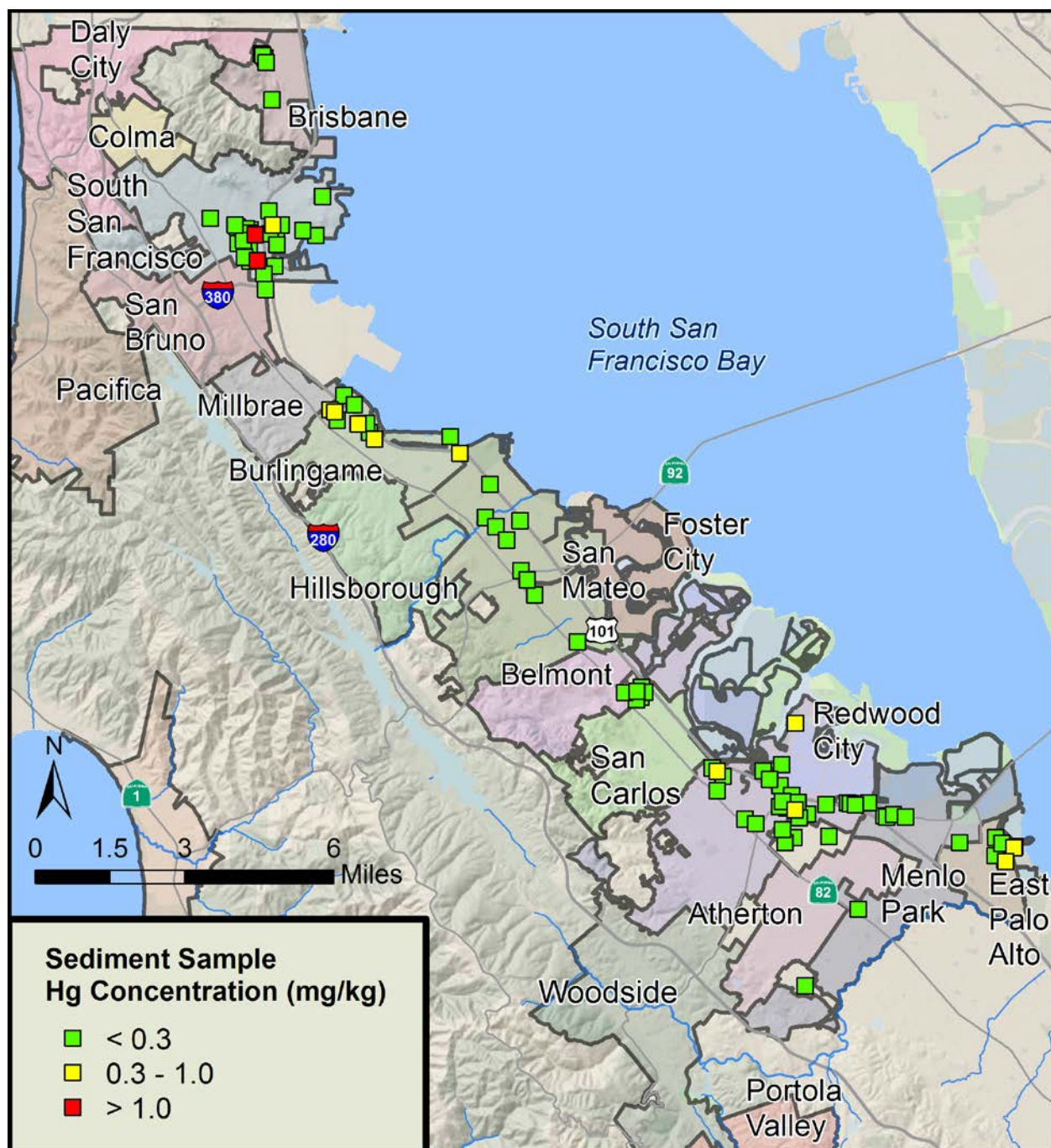


Figure 4. Mercury concentrations in sediments collected in San Mateo County during the WY2015 field monitoring program.

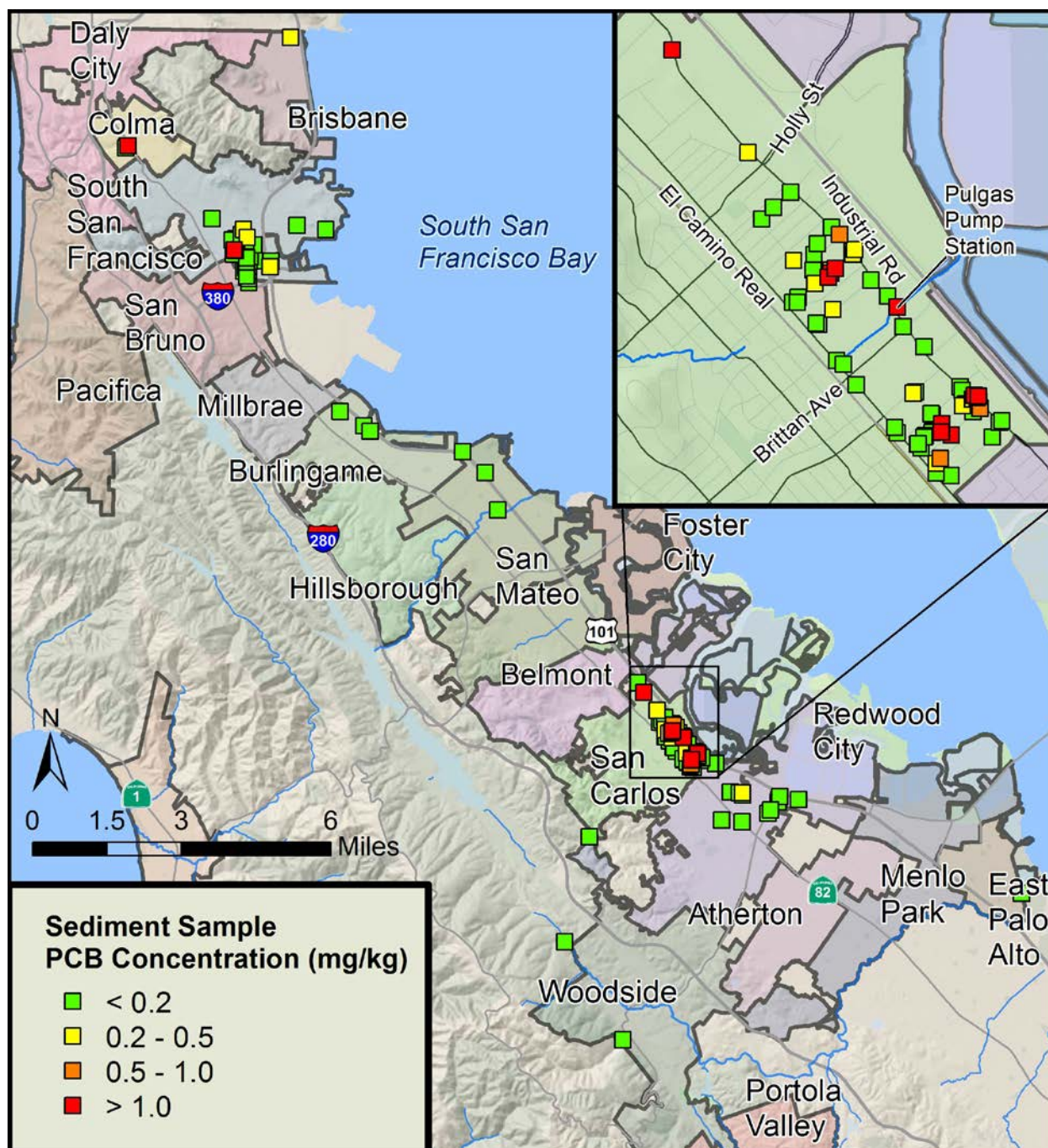


Figure 5. PCBs concentrations in sediments collected in San Mateo County during 2000-2014.

3.0 WMAs IDENTIFIED TO-DATE

Permittees are required to develop a prioritized list of watersheds and management areas where PCBs and/or mercury control measures are currently being implemented or will be implemented during the MRP 2.0 permit term. Stormwater catchments were selected as the initial geographical scale at which WMAs are being identified in San Mateo County. Catchment delineations are based on stormwater runoff drainage patterns and hydrology in the County. This type of information should tie-in well with modeling that will be conducted as part of the Reasonable Assurance Analyses (RAA) for PCBs and mercury that are also required by MRP 2.0. SMCWPPP and its member agencies will likely track and report control measure implementation and associated load reduction benefits by WMAs.

As described previously, SMCWPPP conducted a screening process that covered all land areas in San Mateo County that drain to the Bay. The process identified 110 catchments with high densities of high interest parcels, designated catchments of interest (see Section 2.2.4 and Figure 2). Table 2 and Figure 6 provide a preliminary classification of these stormwater catchments based on the available applicable field monitoring data described earlier. Table 2 and Figure 6 designate a catchment with two or more elevated sediment or stormwater runoff samples (> 0.5 mg/kg PCBs, particle concentration for stormwater runoff) as being a “confirmed WMA” ($n = 2$). A catchment with a single sample elevated for PCBs is designated a “potential WMA” ($n = 8$). The remaining catchments ($n = 100$) are designated “remaining catchments of interest”. Table 3 provides additional information regarding selected characteristics of the 10 confirmed or potential WMAs.

Table 2. Preliminary classification of 110 stormwater catchments of interest.

Permittee	Preliminary Classification			Total Catchments
	Watershed Management Areas		Remaining Catchments of Interest	
	Confirmed	Potential		
Atherton/Redwood City	-	-	1	1
Belmont/San Carlos	-	-	1	1
Belmont/San Mateo	-	-	1	1
Belmont/Unincorporated	-	-	1	1
Brisbane	-	1	1	2
Burlingame	-	-	8	8
Burlingame/San Mateo	-	-	1	1
Colma/Daly City	-	-	1	1
Daly City	-	-	1	1
Daly City/South San Francisco	-	-	1	1
Daly City/Unincorporated	-	-	1	1
East Palo Alto	-	-	5	5
Foster City	-	-	1	1
Menlo Park	-	-	5	5
Menlo Park/East Palo Alto	-	-	1	1
Menlo Park/Redwood City	-	1	2	3
Menlo Park/Unincorporated	-	-	1	1
Millbrae	-	-	2	2
Millbrae/San Bruno	-	-	1	1
Redwood City	-	1	17	18
Redwood City/San Carlos	-	1	0	1
Redwood City/ Unincorporated	-	1	1	2
San Bruno	-	-	1	1
San Bruno/South San Francisco	-	1	2	3
San Carlos	2	1	5	8
San Mateo	-	-	16	16
South San Francisco	-	1	22	23
Total	2	8	100	110

Table 3. Characteristics of the preliminarily identified watershed management areas (WMAs) in San Mateo County.

Watershed Management Area Classification	Catchment ID	Permittee(s)	Receiving Water	Acres	Percent Catchment Area that is High Interest Parcels	Number of Sediment Samples > 0.5 mg/kg Total PCBs	Maximum Sediment Sample Concentration (mg/kg)		Maximum PCBs to Suspended Sediment Concentration Ratio in Stormwater (mg/kg)
							Total Mercury	Total PCBs	
Confirmed	210 (Pulgas P.S. ¹ South)	San Carlos	Pulgas Creek	140	23%	9	1.10	192.91	37.36
	31 (Pulgas P.S. North)	San Carlos	Pulgas Creek	99	27%	4	0.35	1.61	2.15
Potential	379	Redwood City / Unincorporated	Atherton Creek	802	14%	1	0.39	0.93	NA
	75	San Carlos	Steinberger Slough	66	58%	1	1.84	20.29	NA
	291	San Bruno/South San Francisco	Colma Creek	194	33%	1	0.12	2.72	NA
	358	South San Francisco	Colma Creek	32	22%	1	0.15	1.46	NA
	17	Brisbane	Guadalupe Valley Creek	1,638	3%	1	0.07	1.22	NA
	1011	Redwood City/San Carlos	Steinberger Slough	507	12%	1	0.63	0.72	NA
	1000	Redwood City	San Francisco Bay	148	75%	1	0.96	0.57	NA
	239	Menlo Park / Redwood City	Atherton Creek	36	29%	1	0.13	0.57	NA

¹P.S. – Pump Station

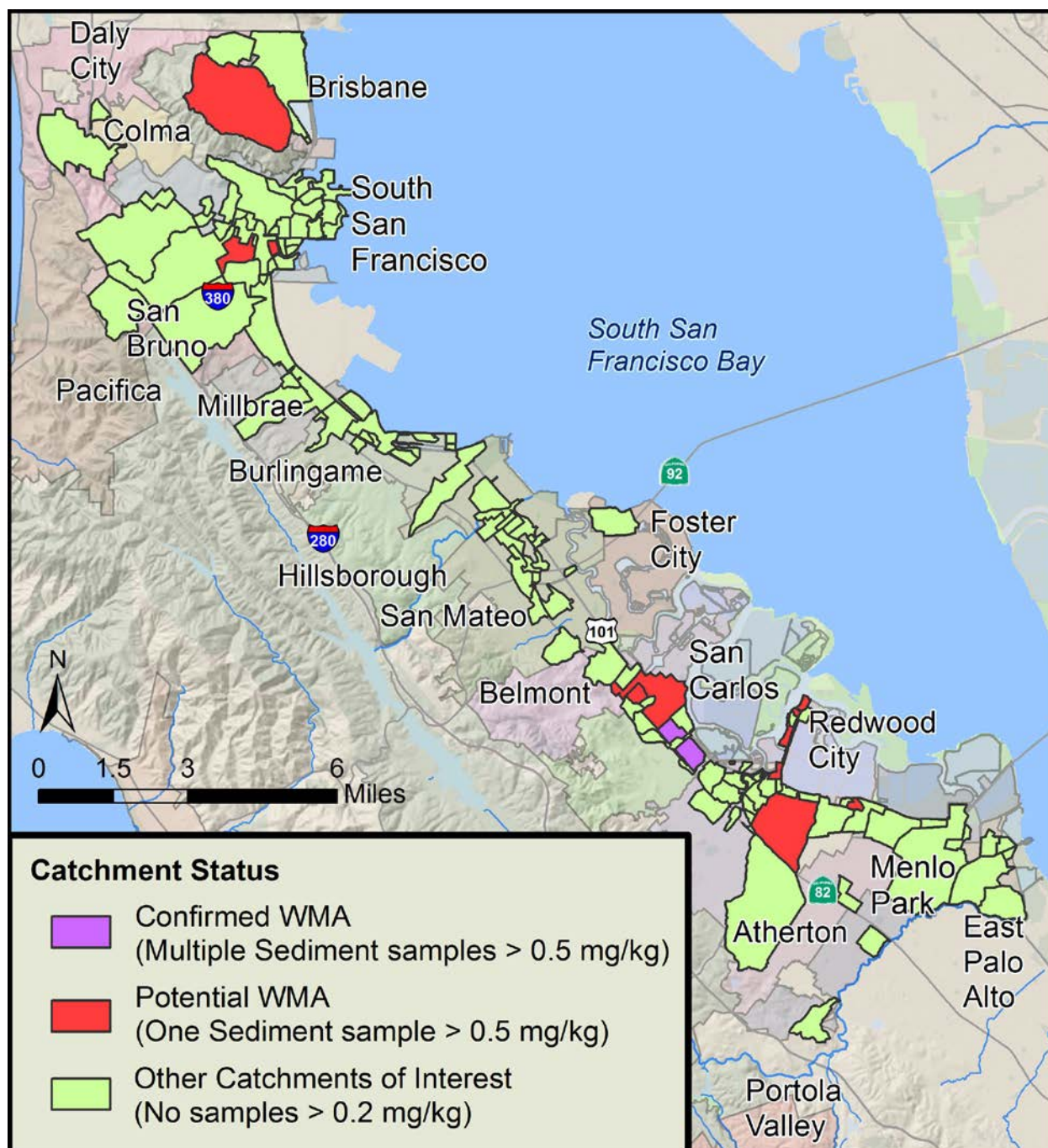


Figure 6. Preliminarily identified watershed management areas (WMAs) in San Mateo County.

4.0 EXISTING AND PLANNED CONTROL MEASURES

Beginning with the 2016 Annual Reports, MRP 2.0 Provisions C.11.a.iii(2) and C.12.a.iii(2) require Permittees to list watersheds and management areas where control measures for mercury and PCBs are currently implemented or will be implemented during the term of permit along with an implementation schedule. The initial report (due by September 31, 2016) also must include the following:

- The number, type and locations and/or frequency (if applicable) of control measures;
- The description, scope and start date of pollution prevention measures;
- For each structural control and non-structural control BMP, interim implementation progress milestones and as schedule for milestone achievement; and
- Clear statements of the roles and responsibilities of each participating Permittee for implementation of pollution prevention or control measures identified by Permittees.

In subsequent annual reports Permittees are required to provide updates to the initial information presented with their 2016 Annual Reports.

Permittees are also required to demonstrate achievement of PCBs load reductions during the term of the Permit and quantify ancillary load reduction benefits for mercury. Permittees are currently participating in a BASMAA regional project to update the load reduction accounting system outlined in the MRP 2.0 factsheet. This accounting system will require the identification and geographical tracking of control measure implementation over time. The types of PCBs and mercury control measures currently being implemented or under evaluation by SMCWPPP and its member agencies include those described briefly below. Additional details on existing and planned control measures will be included in SMCWPPP's 2016 Annual Report.

Controls for PCBs and mercury generally fall into the following three categories (BASMAA 2014 and SMCWPPP 2014a):

- **True Source Controls (Load Avoidance)** – Controls that focus on the original source or use of a pollutant, true source controls include regulations, laws, and voluntary actions that minimize or eliminate the use of a pollutant. True source control for mercury generally consists of the reduction or elimination of mercury in devices and equipment as a result of legislation or voluntary actions by manufacturers. True source controls are unavailable for PCBs beyond the banning of manufacture and most uses of PCBs in 1979.
- **Source Controls (Load Reduction)** – Source controls are load reduction control measures that reduce the risk of the pollutant from being released into the environment from devices, materials, and/or equipment where it is used, or intercept the pollutant before it can enter stormwater runoff. Control measure types for PCBs and mercury that fall into this category include source property referral and abatement, enhanced street sweeping, enhanced MS4 and flood control facility operation and maintenance, and control of PCBs containing materials during building demolition.
- **Treatment Controls (Load Reduction)** – Treatment controls are load reduction control measures that remove pollutants from stormwater runoff via physical, biological, or chemical processes. Control measure types for PCBs and mercury that fall into this category include media filters, green infrastructure and diversions of stormwater runoff to domestic wastewater treatment plants.

5.0 PLANNED NEAR-TERM NEXT STEPS

SMCWPPP and its member agencies plan to conduct the following activities in the near-term to continue addressing MRP 2.0 requirements for PCBs and mercury:

- Continue identifying areas that will be the focus of PCBs and mercury control measure implementation over the course of MRP 2.0, including refining the current list of WMAs, identifying new WMAs, and identifying source areas within WMAs. As part of these efforts, SMCWPPP is currently performing a WY2016 stormwater runoff monitoring program that is targeting selected remaining catchments of interest (i.e., urban catchments with high densities of high interest parcels but where sediment data have revealed low PCBs concentration or where sediment data are lacking). SMCWPPP is also planning future sediment and/or stormwater runoff monitoring efforts that will inform implementation of controls in WMAs. The selection of WMAs and feasible and cost-effective control measures will be an ongoing and evolving process during MRP 2.0 as new data become available.
- Work with Public Works staff from San Mateo County local agencies with high interest land uses to look for opportunities to take credit for PCBs and mercury loads avoided due to planned removals of sediments with elevated levels of pollutants. Also evaluate opportunities to optimize existing municipal operations activities, enhance planned sediment removals, and/or identify new removal actions, as cost-effective. Potential types of maintenance activities to consider include maintenance of streets (e.g., street sweeping, flushing and capture) or MS4 infrastructure (e.g., channel desilting and cleanout and/or retrofit of detention ponds, pump stations or storm drain inlets). The general goal is to not miss these types of opportunities during the MRP 2.0 permit term.
- Evaluate opportunities to take credit for PCBs and mercury loads avoided due to existing contamination site cleanups in San Mateo County.
- Continue planning and implementing field investigations and control measure implementation in the two currently confirmed WMAs in San Mateo County, i.e., the Pulgas Creek pump station north and south drainages. This planning is being informed by the results of various pilot work conducted in these drainages and other locations in the Bay Area through the Clean Watersheds for a Clean Bay (CW4CB) grant-funded project. Data from the CW4CB projects will become available over the coming year.
- Continue following-up with Regional Water Board staff on the status of previous referrals of source properties in San Mateo County and submit new referrals as relevant data become available (e.g., through CW4CB).
- Develop a tracking mechanism and associated database for PCBs and mercury controls in San Mateo County, including green infrastructure on private properties and in the public right-of-way, to help track and credit pollutant load reductions. Begin populating the database and calculating associated pollutant load reductions. This effort will be coordinated with SMCWPPP's participation in the BASMAA regional project that is refining the PCBs and mercury load reduction accounting methodology in the MRP 2.0 factsheet. The refined accounting system will be submitted to the Regional Water Board with the 2016 Annual Reports. This effort will also be coordinated with regional efforts such as SFEI's development of a LID tracking tool.

- Participate in the BASMAA regional project to develop a sampling and analysis plan that will outline the overall design of and resources needed for a study to evaluate the magnitude and extent of PCBs in caulks/sealants used in storm drain and roadway infrastructure in the Bay Area.
- Participate in the BASMAA regional project to develop a scope-of-work and budget for the development of an implementation framework, guidelines and tools for managing materials and wastes containing PCBs during the demolition of buildings. SMCWPPP will also tailor these materials for use in San Mateo County.
- In coordination with BASMAA and working with San Mateo County Environmental Health, continue education and outreach efforts to San Mateo County residents likely to consume locally-caught fish from the Bay (e.g., strategic placement of signs, community or point of sale events, newspaper advertisements, training of healthcare workers to disseminate information, and targeted social media posts). The education and outreach will build upon MRP 1.0 efforts and focus on potential human health risks from PCBs and mercury in Bay fish and ways to reduce that risk.

6.0 REFERENCES

BASMAA (2014). Integrated Monitoring Report Part B: PCB and Mercury Loads Avoided and Reduced via Stormwater (IMR). Prepared by Geosyntec Consultants for the Bay Area Stormwater Management Agencies Association. January 23, 2014.

Gilbreath, A., Gluchowski, D., Hunt, J., Wu, J., and McKee, L. J. (2014). Pollutants of Concern (POC) Loads Monitoring Data Progress Report, Water Years (WYs) 2012 and 2013. Contribution No. 708. San Francisco Estuary Institute, Richmond, California.

Kinnetic Laboratories, Inc and EOA, Inc. (KLI & EOA). (2002). Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs, and Organochlorine Pesticides. Prepared for: Santa Clara Valley Urban Runoff Pollution Prevention Program, Contra Costa Clean Water Program, Santa Clara Countywide Stormwater Pollution Prevention Program, Marin County Stormwater Pollution Prevention Program, Vallejo. April 2002.

McKee, L.J., Gilbreath, A.N., Hunt, J.A., and Greenfield, B.K. (2012). Pollutants of Concern (POC) Loads Monitoring Data, Water Year (WY) 2011. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), Small Tributaries Loading Strategy (STLS). Contribution No. 680. San Francisco Estuary Institute, Richmond, California.

McKee L.J., Gilbreath A.N., Gluchowski D., Hunt J.A., and Wu J. (2013). Pollutants of Concern (POC) Loads Monitoring Data Progress Report: Water Years (WYs) 2012 and 2013. Richmond, CA: SFEI; 2014 pp. 1-84.

McKee, L.J., Gilbreath, A.N., Yee, D., and Hunt, J.A. (2016). Pollutants of concern (POC) reconnaissance monitoring draft progress report, water year (WY) 2015. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), Sources, Pathways and Loadings Workgroup (SPLWG), Small Tributaries Loading Strategy (STLS). Contribution No. xxx. San Francisco Estuary Institute, Richmond, California. DRAFT.

San Mateo Countywide Stormwater Pollution Prevention Program (SMSTOPPP). (2002). Case Study Investigating Elevated Levels of PCBs in Storm Drain Sediments in San Mateo County. Prepared for SMSTOPPP by EOA, Inc., Oakland, California. April 15, 2002.

San Mateo Countywide Stormwater Pollution Prevention Program (SMSTOPPP). (2003). Case Study Investigating Elevated Levels of PCBs in Storm Drain Sediments in the Pulgas Creek Pump Station Drainage, San Carlos, California, Prepared for SMSTOPPP by EOA, Inc., Oakland, California. June 2003.

San Mateo Countywide Stormwater Pollution Prevention Program (SMSTOPPP). (2004). Case Study Investigating PCBs in Storm Drain Sediments from Colma Creek, Colma, California. Prepared for SMSTOPPP by EOA, Inc., Oakland, California. May 2004.

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP). (2014a). Integrated Monitoring Report – Part C, Pollutants of Concern Load Reduction Opportunities. March 15, 2014.

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP). (2014b). Draft Delineation of Storm Drain Catchments and Prioritization for Trash Controls. Prepared for SMCWPPP by EOA, Inc., Oakland, California. April 28, 2014.

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

Yee, D., and McKee, L.J. (2010). Concentrations of PCBs and Mercury in Soils, Sediments and Water in the Urbanized Bay Area: Implications for Best Management. A technical report of the Watershed Program. SFEI Contribution 608. San Francisco Estuary Institute, Oakland, CA 94621. 36 pp. + appendix. March 31, 2010.