

POTW Participation in CECs Studies

BACWA White Paper

PRELIMINARY DRAFT

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Background

The Regional Monitoring Program (RMP) forms the core of water quality, sediment quality, and tissue monitoring in the San Francisco Bay. Historically, each Publicly Owned Treatment Works (POTW) was responsible for performing receiving water monitoring as part of its individual NPDES Permit. The RMP was created in 1993 through Regional Board Resolution No. 92-043 that directed the Executive Officer to implement a Regional Monitoring Plan in collaboration with permitted dischargers pursuant to California Water Code, Sections 13267, 13383, 13268, and 13385. The goal was to replace individual receiving water monitoring requirements for dischargers with a comprehensive Regional Monitoring Program.

The Regional Monitoring Program’s specific objectives are to:

- Describe the distribution and trends of pollutant concentrations in the Estuary;
- Project future contaminant status and trends using best understanding of ecosystem processes and human activities;
- Describe sources, pathways, and loading of pollutants entering the Estuary;
- Measure pollution exposure and effects on selected parts of the Estuary ecosystem (including humans);
- Compare monitoring information to relevant benchmarks, such as total maximum daily load (TMDL) targets, tissue screening levels, water quality objectives, and sediment quality objectives; and
- Effectively communicate information from a range of sources to present a more complete picture of the sources, distribution, fate, and effects of pollutants and beneficial use attainment or impairment in the Estuary ecosystem.

The RMP has been investigating Contaminants of Emerging Concern (CECs) since 2001, and established a formal workgroup to address the issue in 2006. The RMP Emerging Contaminants Workgroup (ECWG) includes representatives from RMP stakeholder groups including POTWs, regional scientists, and an advisory panel of expert researchers that work together to address the Workgroup's guiding management questions.

- Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?
- What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?
- What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?
- Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?
- Are they predicted to increase or decrease in the future?
- What are the effects of management actions?

The overarching goal of the ECWG is to develop cost-effective strategies to identify and monitor CECs to support management actions to minimize impacts to the Bay. The ECWG guides an annual process of contaminant evaluation and long-term planning and optimization to respond to new RMP data and the rapidly evolving body of science on CECs.

Following this process for over a decade, the RMP has generated one of the world's most comprehensive datasets for CECs in an estuarine ecosystem. While RMP stakeholders are the primary audience and user of RMP data and communications, the Program informs broader decision-making through outreach to state and federal agencies.

The RMP first published a formal CEC Strategy in 2013 as part of a continuous effort to refine approaches for supporting the management of CECs in San Francisco Bay. Periodic revision of the Strategy is essential given the rapid evolution of the science surrounding emerging contaminants; in 2017, the RMP completed its first revision of the RMP's CEC Strategy, which was then updated in 2018.

For CECs known to occur in the Bay, the RMP prioritizes CECs using a tiered risk-based framework, as illustrated in Figure 1. This prioritization framework guides future monitoring proposals for each of these contaminants, the results of which, in turn, provide key data to update evaluations of potential risk. The criteria listed below are used for placement in each tier.

Figure 1. RMP’s Risk-based tiered framework

	RISK LEVEL DESCRIPTION	MONITORING STRATEGY	WATER QUALITY MANAGEMENT ACTIONS
HIGH CONCERN	Bay occurrence data suggest a high probability of a moderate or high level effect on Bay wildlife.	Studies to support TMDL or alternative management plan.	303(d) listing.* TMDL or alternative management plan.* Aggressive control/treatment actions for all controllable sources.
MODERATE CONCERN	Bay occurrence data suggest a high probability of a low level effect on Bay wildlife.	Consider including in Status and Trends monitoring. Special studies of fate, effects, sources, pathways, and loadings.	Action plan/strategy. Aggressive pollution prevention. Low-cost control/treatment actions.
LOW CONCERN	Bay occurrence data suggest a high probability of no effect on Bay wildlife.	Discontinue or conduct periodic screening level monitoring in water, sediment, or biota. For CECs previously considered moderate concern, maintain Status and Trends monitoring for at least two cycles. Periodic screening level monitoring for chemical(s) detected in wastewater or stormwater to track trends.	Low-cost source identification and control. Low-level pollution prevention. Track product use and market trends.
POSSIBLE CONCERN	Potential for concerns or uncertainty in measured Bay concentrations or toxicity thresholds suggest uncertainty in the level of effect on Bay wildlife.	Screening level monitoring to determine presence in water, sediment, or biota. Screening level monitoring for presence in wastewater or stormwater.	Maintain (ongoing/periodic) effort to identify and prioritize emerging contaminants of potential concern. Track international and national efforts to identify high priority CECs. Develop biological screening methods and identify available analytical methods.

Up to date information, including the most recent CEC Strategy, can be found at the RMP’s Emerging Contaminants webpage¹.

¹ <https://www.sfei.org/programs/sf-bay-regional-monitoring-program#tab-1-4>

POTW Participation in RMP CECs Program

POTWs are a key pathway for some CECs to the SF Bay, including the CECs that are identified to be of “moderate” concern, such as fipronil, PFOS/PFOA, and nonylphenols. Sampling of CECs in wastewater effluent has been a major component of many of the studies conducted through the RMP. Past studies have looked at POTWs as sources of pharmaceuticals, pesticides, and more recently, microplastics. Over the previous decade, the need for effluent studies was identified by the RMP staff and ECWG, then a call was put out to POTWs to volunteer in these studies.

The Bay Area Clean Water Agencies (BACWA), joint powers agency whose members own and operate POTWs throughout the SF Bay Region, has worked with the RMP to ensure that there was adequate participation in these studies. As the CECs program moves forward, there is interest in ensuring that the POTWs participating in these studies are representative of wastewater effluent quality from all POTWs.

The purpose of this White Paper is to provide the data that can be used to identify POTWs that the RMP can consider “representative” for CECs studies.

The following characteristics were identified as pertinent because of their potential impacts on CECs in wastewater effluent:

- Location by subembayment
- Source water – surface vs. groundwater, potential agricultural impacts
- Number of connections
- Population served
- Type of Treatment
 - Secondary
 - Advanced Secondary/Filtration
 - Disinfection type
- Average dry weather flow treated
- Discharge to Bay
- Industrial users, number of the following:
 - Airports
 - Military Bases
 - Electroplating Facilities
 - Hospitals
 - Commercial Laundry
 - Pet Groomers
 - Refineries
 - Textile or leather production plants
 - Carpet manufacturers
 - Car wash centers and automobile repair service centers
 - Plant nurseries, cannabis growing operations (include size of operation and type e.g. hydroponics)

Note: BACWA pretreatment committee will review this list and comment on the feasibility of obtaining this information.

Benefits of CECs Program Management through RMP

Different approaches have been discussed for monitoring CECs in aquatic ecosystems through the State of California, including requirements in individual NPDES permits, and a State-wide monitoring program. The San Francisco Bay Region is fortunate to have a mature and sustainable CECs program. Among the advantages of this program, over once where

- CEC science and strategy planning happens under one umbrella and is directed by scientists and stakeholders. There are not competing or duplicative studies.
- CECs monitoring is tailored to the specific questions that need to be answered in the SF Bay to maximize use of limited funds.
- Quality control for CECs monitoring data is managed by the RMP science team. In a system where dischargers directly input lab data into a database, this level of quality assurance is not present.

POTWs funding RMP CECs Program

The RMP participants, including dredgers, stormwater agencies, and municipal and industrial dischargers that hold Water Board permits for waste discharge into the Estuary, fund the RMP as a requirement of their permits. Each year a portion of this funding was allocated to CECs studies, but by 2016, as overall RMP funding was decreasing due to diminishing contribution from the dredgers, an alternative source of funding was sought.

In 2015, BACWA worked with the SF Regional Water Board to review the costs and benefits of the routine monitoring required by agencies' individual NPDES permits, and concluded that significant resources were being spent on monitoring for pollutants that were rarely detected. BACWA and the SF Regional Water Board reached an agreement to reallocate resources from low-value effluent testing to the RMP. The strategy reflects the need to shift our effort from contaminants that were of concern historically, largely due to industries that are no longer located in the region, to emerging priorities. In April 2016, the Regional Water Board adopted order R2-2016-0008, which establishes opt-in Alternative Monitoring and Reporting Requirements for municipal NPDES permittee, and which can raise a maximum of \$289K per year for RMP studies.

Data characterizing POTWs

This section presents data used to determine representation for CECs studies.

POTW Location

Figure 2. POTW Location by subembayment



Population and Flows

Table 1: Population and flows

	# connections served (2014)	Estimated Population	2014 ADWF (mgd)	2017/18 Flow to Bay
American Canyon	5,562	16,800	1.2	1.4
Benicia	9,569	28,000	2	2
Burlingame	1,600	37,000	2.7	2.8
CCCSD	115,109	500,000	33.8	35.4
CMSA	52,161	105,000	4.7	9.3
Delta Diablo	57,700	200,000	12.5	
DSRSD	53,509		9.2	9.6
EBDA ^a				59.7
EBMUD	160,000	685,000	49	52.5
FSSD	38,800	140,000	11.8	13.4
Hayward ^a	32,000	153,000	11.1	
Las Gallinas	15,800	30,000	2.1	1.4
Livermore	29,500	83,600	6.7	
Millbrae	6,550	22,000	1.6	1.5
Mt. View SD	10,500	21,900	1.2	1.3
Napa SD	36,000	82,700	12.6	4.6
Novato SD	28,700	60,000	4.1	3
Oro Loma SD ^a	47,000	126,000	12	
Palo Alto		220,000	18	18.4
Petaluma	25,300		?	3.2
Pinole	11,215	40,000	2.8	2.5
Richmond ^b	20,000		6	
Rodeo	2,967	8,900	0.4	0.6
San Jose	483,667	1,400,000	76	87
San Leandro ^a	15,300	60,000	4.86	
San Mateo	37,823	155,000	10.3	10.4
Sewerage Agency of Southern Marin	14,800	29,500	2.8	2.3
SFO	n/a	n/a	1.1	1.2
SFPUC	450,000	580,000	58	57.4
Sausalito Marin City Sanitary district	6,500	10,756	1.3	1.2
SSF		110,500	8.4	7.6
Sunnyvale	28,314	148,000	12.9	10.6
Sonoma	17,200	36,000	3	0
Silicon Valley Clean Water		199,000	13.7	14
Treasure Island		2,900		0.3
Union Sanitary District ^a	111,184	347,000	22	

Vallejo	37,845	117,000	9	9.2
West County WD ^b	32,300	100,000	8	
West County Agency ^b				9.8

^aEBDA provides the outfall to the SF Bay for the City of Hayward, Oro Loma Sanitary District, the City of San Leandro, and Union Sanitary District.

^bWest County Agency provides the outfall to the SF Bay for the City of Richmond and West County Wastewater District.

Treatment Technology

Treatment technology can impact the removal of CECs through wastewater treatment by biodegradation and partitioning to solids. Disinfection technology will impact the formation of disinfection byproducts. Table 3 shows the treatment technologies used at each POTW.

Table 2. Treatment Technologies.

AS = Activated Sludge; TF = Trickling Filter; BNR = Biological Nutrient Removal; MBR = Biological Membrane Reactor

	Secondary Treatment Type	Disinfection Type	Advanced secondary/filtration (y/n)
American Canyon	MBR	UV	y
Benicia	AS and Rotating Biological Contactor (RBC)	Liquid Chlorine	n
Burlingame	AS	Sodium Hypochlorite	n
CCCSD	AS	UV	n
CMSA	TF/AS	Liquid Chlorine	n
Delta Diablo	TF/Solids contact	Sodium Hypochlorite	n
DSRSD	AS	Liquid Chlorine	n
EBMUD	High Purity Oxygen	Sodium Hypochlorite	n
FSSD	Oxidation Towers/AS	UV	y
Hayward	TF/Solids contact	Sodium Hypochlorite	n
Las Gallinas	Rock TF, nitrification TF, deep bed granular filter	Liquid Chlorine	n
Livermore	AS	Sodium Hypochlorite	n
Millbrae	AS	Sodium Hypochlorite	n

Mt. View SD	TF, nitrification biotower	UV	y
Napa SD	AS	Sodium Hypochlorite	n
Novato SD	AS	UV	n
Oro Loma SD	AS	Sodium Hypochlorite	n
Palo Alto	TF/AS	UV	y
Petaluma	AS	UV/Sodium Hypochlorite	n
Pinole	AS	Liquid Chlorine	n
Richmond	AS	Sodium Hypochlorite	n
Rodeo	AS	Sodium Hypochlorite	n
San Jose	AS/BNR	Liquid Chlorine	y
San Leandro	TF/AS	Sodium Hypochlorite	n
San Mateo ^a	AS	Sodium Hypochlorite	n
Sewerage Agency of Southern Marin	TF	Liquid Chlorine	n
SFO	AS	Liquid Chlorine	n
SFPUC	High Purity Oxygen	Sodium Hypochlorite	n
Sausalito Marin City Sanitary district	TF	Liquid Chlorine	n
SSF	AS	Liquid Chlorine	n
Sunnyvale	TF/DAF/Dual Media Filtration	Chlorine Gas	y
Sonoma	AS	Chlorine Gas	n
Silicon Valley Clean Water	TF/AS	Liquid Chlorine	n
Treasure Island	TF	Sodium Hypochlorite	n
Union Sanitary District	AS	Sodium Hypochlorite	n
Vallejo	TF/Solids Contact	Liquid Chlorine	n
West County WD	AS	Sodium Hypochlorite	n

^a San Mateo is in the process of an upgrade to BNR/MBR

Water sources

There are six major water wholesalers and large retailers serving residents in the service area of Bay area POTWs:

- Contra Costa Water District (CCWD) - CCWD's primary source of water supply is the United States Bureau of Reclamation's Central Valley Project (CVP).
- East Bay Municipal Utilities District (EBMUD) - EBMUD delivers water from the Mokelumne River watershed, supplemented with water from East Bay watershed reservoirs. Water from the EBMUD is not expected to include groundwater, or be influenced by agricultural drainage.
- SFPUC Region Water System (RWS) – The SFPUC delivers water imported from the Hetch Hetchy reservoir, as well as reservoirs in the Alameda Watershed and Peninsula Watershed. Water from the SFPUC is not expected to include groundwater, or be influenced by agricultural drainage.
- Santa Clara Valley Water District – SCVWD – Sources of supply for the District include natural groundwater recharge, local surface water, imported surface water from the State Water Project (SWP) and CVP, and transfers. Imported water from the SWP and CVP is expected to have some impact from agricultural drainage at its source in the SF Delta.
- Sonoma County Water Agency (SCWA) – The Russian River provides most of the Water Agency's water supply with groundwater supply from the Santa Rosa Plain as a secondary source. Water from the Russian River is expected to have some impact from agricultural drainage.
- Zone 7 –The SWP is Zone 7's largest water supply, and is supplemented by local surface water and groundwater. Imported water from the SWP and CVP is expected to have some impact from agricultural drainage at its source in the SF Delta.

Information about the water supplies in the sewersheds of each POTW is presented in the Water Agencies' Urban Water Management Plans (UWMP), which are available on DWR's website². The POTWs for each Water Agency are reported in Table 6.3 of each UWMP. For each POTW, Table x identifies the Water Agencies supplying their service area, the agencies' water sources, and whether there may be an agricultural influence on the source water supply, or if groundwater is a significant supply source. Most areas are served by smaller retailers who provide a combination of water purchased from wholesalers, and local surface or groundwater.

² https://wuedata.water.ca.gov/uwmp_plans.asp

Table 3: Source Water Supplies

WW Agencies	Water Agency	Sources	Groundwater supply (y/n)	Potential Agricultural Impacts (y/n)
American Canyon	American Canyon City Of	SWP, City of Vallejo (see below)	n	y
Benicia	City of Benicia	SWP, Sacramento River, Solano Project (Lake Baryessa), local surface water	n	y
Burlingame	Hillsborough Town Of	SFPUC RWS	n	n
	Burlingame City Of	SFPUC RWS	n	n
CCCSD	Martinez City Of	CCWD	n	y
	Contra Costa Water District	Central Valley Project, other Delta supplies	n	y
	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n
CMSA	Marin Municipal Water District	Local surface water	n	n
Delta Diablo	Contra Costa Water District	Central Valley Project, other Delta supplies	n	y
	Antioch City Of	Delta, and Contra Costa Canal (CCWD)	n	y
	Pittsburg City Of	CCWD, and local groundwater	y	y
	Golden State Water Company - Bay Point	CCWD, and local groundwater	y	y
DSRSD	Zone 7	State Water Project, Local surface Water, Local Groundwater, Imported Surface Water from Byron-Bethany Irrigation District	y	y
	Pleasanton City Of	Zone 7, and local groundwater	y	y
	Dublin San Ramon Services District	Zone 7	y	y
	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n
EBMUD	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n

Fairfield-Suisun Sewer District (FSSD)	Suisun - Solano Water Authority	SWP, Solano Project (Lake Barryessa)	n	y
Hayward	Hayward City Of	SFPUC RWS	n*	n
LGVSD	Marin Municipal Water District	Local surface water	n	n
Livermore	Zone 7	State Water Project, Local surface Water, Local Groundwater, Imported Surface Water from Byron-Bethany Irrigation District	y	y
	California Water Service Company Livermore	Zone 7 (SWP), and local groundwater	y	y
	Livermore City Of	Zone 7	y	y
	Pleasanton City Of	Zone 7, and local groundwater	y	y
Millbrae	Millbrae City Of	SFPUC RWS	n	n
Mt. View Sanitary District	Contra Costa Water District	Central Valley Project, other Delta supplies	n	y
	Martinez City Of	CCWD	n	y
Napa Sanitation District	American Canyon City Of	State Water Project, City of Vallejo (see below)	n	y
	Napa City Of	SWP, local surface water	n	y
Novato Sanitary District	North Marin Water District	SCWA, local surface water	y	y*
Oro Loma Sanitary District	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n
Palo Alto	California Water Service Company Los Altos/Suburban	SCVWD (State Water Project, Central Valley Project), Local Groundwater	y	y
	California Water Service Company Mid Peninsula	SFPUC RWS	n	n
	East Palo Alto City Of	SFPUC RWS	n	n
	Mountain View City Of	SFPUC RWS, SCVWD, and local groundwater	y	y
Petaluma	City of Petaluma	SCWA, local groundwater	y	y
Pinole/Hercules	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n
Richmond	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n
Rodeo Sanitary District	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n

San Jose	Milpitas City Of	SFPUC RWS, and SCVWD (CVP and SWP, not GW)	n	y
	San Jose City Of	SFPUC RWS, SCVWD (surface), and local groundwater	y	y
	San Jose Water Company	SCVWD, and local groundwater	y	y
	Santa Clara City Of	SFPUC RWS, SCVWD (surface), and local groundwater	y	y
	Great Oaks Water Company Incorporated	Local groundwater	y	n
San Leandro	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n
San Mateo	California Water Service Company Mid Peninsula	SFPUC RWS	n	n
	Hillsborough Town Of	SFPUC RWS	n	n
Sanitary District No. 5 (Tiburon)	Marin Municipal Water District	Local surface water	n	n
	SCWA	Russian River	n	y
Sewerage Agency of Southern Marin	Marin Municipal Water District	Local surface water	n	n
	SCWA	Russian River	n	y
Sausalito-Marín City Sanitary District	Marin Municipal Water District	Local surface water	n	n
	SCWA	Russian River	n	y
SFPUC	San Francisco Public Utilities Commission	SFPUC RWS (Hetch Hetchy, and local surface water)	n	n
SFO	SFO	SFPUC RWS	n	n
Silicon Valley Clean Water	California Water Service Company Bear Gulch	SFPUC RWS, local surface	n	n
	East Palo Alto City Of	SFPUC RWS	n	n
	Menlo Park City Of	SFPUC RWS	n	n
	Mid-Peninsula Water District	SFPUC RWS	n	n
Sonoma	Sonoma County Water Agency (SCWA)	Russian River, local groundwater	y	y

South San Francisco and San Bruno	California Water Service Company South San Francisco	SFPUC RWS, and local groundwater	y	n
Sunnyvale	California Water Service Company Los Altos/Suburban	SCVWD (State Water Project, Central Valley Project), Local Groundwater	y	y
	Sunnyvale City Of	SFPUC RWS, SCVWD (surface), and local groundwater	y	y
Treasure Island	Treasure Island Water System	SFPUC RWS	n	n
Union Sanitary District	Alameda County Water District	SWP, SFPUC RWS, local groundwater	y	y
Vallejo Sanitation & Flood Control District (VFCSD)	Vallejo City Of	SWP, Solano Project (Lake Barryessa), local surface water	n	y
West County Wastewater District	East Bay Municipal Utility District	Mokelumne Watershed, local surface water	n	n

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Industrial and Commercial Uses

Information to be gathered via pretreatment committee

	Airports	Military Bases	Electroplating Facilities	Hospitals	Com. Laundry	Pet Groomers	Refineries	Textile/Leather Production	Carpet Manufacturers	Car Wash Centers	Plant Nurseries
American Canyon											
Benicia											
Burlingame											
CCCSD											
CMSA											
Delta Diablo											
DSRSD											
EBDA ^a											
EBMUD											
FSSD											
Hayward ^a											
Las Gallinas											
Livermore											
Millbrae											
Mt. View SD											
Napa SD											
Novato SD											
Oro Loma SD ^a											

Palo Alto												
Petaluma												
Pinole												
Richmond ^b												
Rodeo												
San Jose												
San Leandro ^a												
San Mateo												
Sewerage Agency of Southern Marin												
SFO												
SFPUC												
Sausalito Marin City Sanitary District												
SSF												
Sunnyvale												
Sonoma												
Treasure Island												
Union Sanitary District ^a												

Vallejo											
West County WD ^b											
West County Agency ^b											

CEC Management in SF Bay – Next Steps

As described in the Tiered Risk Framework, CECs in the “moderate” tier are subject to management plans and pollution prevention. BACWA’s Bay Area Pollution Prevention Group (BAPPG) funds public outreach, and professional outreach and training for both traditional pollutants such as Fats, Oils, and Grease, mercury, and copper, as well emerging contaminants such as pharmaceuticals. BAPPG’s public facing website, baywise.org, contains public outreach materials that can be used by member and partner agencies.

In addition to public outreach, BAPPG also supports regulatory advocacy for pollutants such as pesticides, including fipronil. Over the past few years, BAPPG has partnered with the SF Regional Water Board to comment on EPA’s pesticide reregistrations, to urge them to consider pathways to the sewer when doing risk assessments.

More information about BAPPG’s Pollution Prevention activities can be found in their 2017 Annual Report³.

³ <https://bacwa.org/wp-content/uploads/2018/01/BAPPG-Annual-Report-2017-Final.pdf>