

Watershed Monitoring and Assessment Program



Urban Creeks Monitoring Report *Water Quality Monitoring* *Water Year 2014 (October 2013 – September 2014)*

Submitted in compliance with Provision C.8.g.iii of NPDES Permit # CAS612008

March 15, 2015

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 Municipal Regional National Pollutant Discharge Elimination System (NPDES) Stormwater Permit (MRP)¹. The RMC includes the following participants:

- Clean Water Program of Alameda County (ACCWP)
- Contra Costa Clean Water Program (CCCWP)
- San Mateo County Wide 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 Sanitation and Flood Control District (Vallejo)

This Urban Creeks Monitoring Report complies with the MRP Reporting Provision C.8.g.iii for reporting of all data collected pursuant to Provision C.8 in Water Year 2014 (October 1, 2013 through September 30, 2014). Data presented in this report were produced under the direction of the RMC and the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) using probabilistic and targeted monitoring designs as described herein.

In accordance 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 Program Plan (QAPP; BASMAA, 2014a) and BASMAA RMC Standard Operating Procedures (SOPs; BASMAA, 2014b). Where applicable, monitoring data were derived using methods comparable with methods specified by the California Surface Water Ambient Monitoring Program (SWAMP) QAPP². Data presented in this report were also submitted in electronic SWAMP-comparable formats by SCVURPPP to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) on behalf of SCVURPPP Co-permittees and pursuant to Provision C.8.g.ii.

¹ The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) issued the MRP to 76 cities, counties and flood control districts (i.e., Permittees) in the Bay Area on October 14, 2009 (SFRWQCB 2009). 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 QAPP 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
ARP	Alum Rock Park
BASMAA	Bay Area Stormwater Management Agency Association
BASMAA BOD	BASMAA Board of Directors
B-IBI	Benthic Macroinvertebrate Index of Biological Integrity
BOD	Biological Oxygen Demand
CADDIS	Causal Analysis/Diagnosis Decision Information System
CCCWP	Contra Costa Clean Water Program
CEDEN	California Environmental Data Exchange Network
CRAM	California Rapid Assessment Method
CW4CB	Clean Watersheds for Clean Bay
DPS	Distinct Population Segment
EMAF	Ecological Monitoring and Assessment Framework
FSURMP	Fairfield Suisun Urban Runoff Management Program
HDI	Human Disturbance Index
MPC	Monitoring and Pollutants of Concern Committee
MRP	Municipal Regional Permit
MWAT	Maximum Weekly Average Temperature
MYP	Multi-Year Monitoring Plan
NPDES	National Pollution Discharge Elimination System
PAHs	Polycyclic Aromatic Hydrocarbons
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyls
PEC	Probable Effect Concentration
POC	Pollutants of Concern
POTW	Publicly Owned Treatment Works
QAPP	Quality Assurance Project Plan
RMC	Regional Monitoring Coalition
RMP	Regional Monitoring Program
RWQCB	Regional Water Quality Control Board
RWSM	Regional Watershed Spreadsheet Model
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SCVWD	Santa Clara Valley Water District
SFEI	San Francisco Estuary Institute
SFRWQCB	San Francisco Regional Water Quality Control Board
SMCWPPP	San Mateo County Water Pollution Prevention Program
SOP	Standard Operating Procedures
SPLWG	Sources, Pathways, and Loadings Workgroup
SPoT	Statewide Stream Pollutant Trend Monitoring
SSID	Stressor/Source Identification
S&T	Status and Trends Monitoring Program
STLS	Small Tributary Loading Strategy
SWAMP	Surface Water Ambient Monitoring Program
TEC	Threshold Effect Concentration
TOC	Total Organic Carbon

SCVURPPP Urban Creeks Monitoring Report

TRC	Technical Review Committee
TU	Toxic Unit
UCMR	Urban Creeks Monitoring Report
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
WQO	Water Quality Objective

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1.0 INTRODUCTION

This Urban Creeks Monitoring Report (UCMR) was prepared by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), on behalf of its 15 member agencies (13 cities/towns, the County of Santa Clara, and the Santa Clara Valley Water District) subject to the National Pollutant Discharge Elimination System (NPDES) stormwater permit for Bay Area municipalities referred to as the Municipal Regional Permit (MRP; Order R2-2009-0074) issued by the San Francisco Regional Water Quality Control Board (SFRWQCB or Regional Water Board) on October 14, 2009. This report fulfills the requirements of MRP Provision C.8.g.iii for comprehensively interpreting and reporting all monitoring data collected during Water Year 2014 (WY2014; October 1, 2013 – September 30, 2014) pursuant to Provision C.8 of the MRP. Monitoring data presented in this report were submitted electronically to the SFRWQCB by SCVURPPP and may be obtained via the San Francisco Bay Area Regional Data Center (<http://water100.waterboards.ca.gov/ceden/sfei.shtml>).

Chapters in this report are organized according to the following topics and MRP provisions. Several of the topics are summarized briefly in this report but described fully in appendices.

- San Francisco Estuary Receiving Water Monitoring (MRP Provision C.8.b)
- Creek Status Monitoring (MRP Provision C.8.c), including local targeted monitoring and SCVURPPP's contribution to the regional probabilistic monitoring program (Appendix A)
- Monitoring Projects (MRP Provision C.8.d):
 - Stressor/Source Identification (Appendix B)
- Pollutants of Concern (POC) Monitoring (MRP Provision C.8.e.i) (Appendix C)
- Long-Term Trends Monitoring (MRP Provision C.8.e.ii)
- Citizen Monitoring and Participation (MRP Provision C.8.f)
- Recommendations and Next Steps

Figure 1.1 illustrates locations the monitoring stations associated with Creek Status Monitoring conducted in WY2014, the Stressor/Source Identification (SSID) projects, the BMP Effectiveness Investigation, the Geomorphic Project, POC Monitoring, and Long-Term Trends Monitoring conducted at Stream Pollution Trend (SPoT) stations.

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 Stormwater Program, and/or individually. In June 2010, Permittees notified the 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 BASMAA Regional Monitoring Coalition (RMC). With notification of participation in the RMC, Permittees were required to commence water quality data collection by October 2011. In a November 2, 2010 letter to the Permittees, the 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 Bay Area Stormwater Management Agencies Association (BASMAA) Regional Monitoring Coalition (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 2012) to provide a framework for implementing regional monitoring and assessment activities required under MRP provision C.8. The RMC Work Plan summarizes RMC projects planned for implementation between Fiscal Years 2009-10 and 2014-15. 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). A total of 27 regional projects are identified in the RMC Work Plan, based on the requirements described in provision C.8 of the MRP.

Regionally implemented activities in the RMC Work Plan are conducted under the auspices of BASMAA, a 501(c)(3) non-profit organization comprised of 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, approved by the BASMAA BOD. MRP Permittees, through their stormwater program representatives on the BASMAA BOD and its subcommittees, collaboratively authorize and participate in BASMAA regional projects or tasks. Regional project costs are 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 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
Clean Water Program of Alameda County (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 County Wide 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 Sanitation and Flood Control District

2.0 SAN FRANCISCO ESTUARY RECEIVING WATER MONITORING (C.8.B)

As described in MRP provision C.8.b, 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 the San Francisco Estuary (RMP). Since the adoption of the MRP, SCVURPPP has complied with this provision by making financial contributions to the RMP directly or through stormwater programs. Additionally, SCVURPPP actively participates in RMP committees and work groups as described in the following sections, which also provide a brief description of the RMP and associated monitoring activities conducted during WY2014.

The RMP is a long-term monitoring program that is discharger funded and 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 Permittees, publicly owned treatment works (POTWs), dredgers, and industrial dischargers.

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.

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 and redesigned in 2007 based on a more rigorous statistical design that enables the detection of trends. The Technical Review Committee (TRC) 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. In WY2014, the S&T Program was comprised of the following program elements that collect data to address RMP management questions described above:

- Long-term water, sediment, and bivalve monitoring
- Episodic toxicity monitoring
- Sport fish monitoring
- USGS hydrographic and sediment transport studies
 - Factors controlling suspended sediment in San Francisco Bay
 - Hydrography and phytoplankton
- Triennial bird egg monitoring (cormorant and tern)

Additional information on the S&T Program and associated monitoring data are available for downloading 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 on an annual basis. Studies usually are 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 and standing workgroups 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 Steering Committee. In WY2014, Pilot and Special Studies focused on the following topics:

- Continuous monitoring of nutrients and dissolved oxygen at moored sensors
- Nutrients loads modeling
- Algal toxins monitoring
- Small fish monitoring
- Emerging contaminants monitoring

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).

In WY2014, a considerable amount of RMP and Stormwater Program staff time was spent overseeing and implementing special studies associated with the RMP's Small Tributary Loading Strategy (STLS) and the STLS Multi-Year Monitoring Plan (MYP). 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 tributaries to the San Francisco Bay. Additional information is provided on STLS-related studies under Section 5.0 (POC Loads Monitoring) of this report.

2.3 Participation in Committees, Workgroups and Strategy Teams

In WY2014, SCVURPPP actively participated in the following RMP Committees and workgroups:

- Steering Committee (SC)
- Technical Review Committee (TRC)
- Sources, Pathways and Loadings Workgroup (SPLWG)
- Contaminant Fate Workgroup (CFWG)
- Exposure and Effects Workgroup (EEWG)
- Emerging Contaminant Workgroup (ECWG)
- Sport Fish Monitoring Workgroup
- Toxicity Workgroup
- Strategy Teams (e.g., PCBs, Mercury, Dioxins, Small Tributaries, Nutrients)

Committee and workgroup representation was provided by Permittee, stormwater program staff, and/or individuals designated by RMC participants and the BASMAA BOD. Representation included participating in meetings, reviewing technical reports and work products, co-authoring or reviewing articles included in the RMP's *Pulse of the Estuary*, 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 representatives (on behalf of Permittees) during MPC and/or BASMAA BOD meetings to ensure Permittees' interests were represented.

3.0 CREEK STATUS MONITORING (C.8.C)

Provision C.8.c 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 stormwater program are described in Table 8.1 of the MRP. Based on the implementation schedule described in MRP Provision C.8.a.ii, creek status monitoring coordinated through the RMC began in October 2011.

The RMC's regional monitoring strategy for complying with MRP Provision C.8.c - Creek Status Monitoring - 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 program to assess the status of beneficial uses in local creeks within its Program (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).

Creek status monitoring data from WY2014 were submitted to the Water Board by SCVURPPP. The analyses of results from creek status monitoring conducted by SCVURPPP in WY2014 are summarized below and presented in detail in Appendix A (SCVURPPP Creek Status Monitoring Report).

The probabilistic monitoring design was developed to remove bias from site selection such that ecosystem conditions can be objectively assessed on local (i.e., SCVURPPP) and regional (i.e., RMC) scales. Probabilistic parameters consist of bioassessment, nutrients and conventional analytes, chlorine, water and sediment toxicity, and sediment chemistry. Twenty probabilistic sites were sampled by SCVURPPP in WY2014. An additional three non-urban sites were sampled by the San Francisco Regional Water Quality Control Board (SFRWQCB) as part of the Surface Water Ambient Monitoring Program (SWAMP), in collaboration with SCVURPPP.

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, pathogen indicators and riparian assessments using methods, sampling frequencies, and number of stations required in Table 8.1 of the MRP. Hourly water temperature measurements were recorded during the dry season at ten sites using HOBO® temperature data loggers in Guadalupe Creek (n=5) and Stevens Creek (n=5). 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 three sites in Stevens Creek. Water samples were collected at five sites for analysis of pathogen indicators (*E. coli* and fecal coliform). Riparian assessments were conducted at probabilistic sites using the California Rapid Assessment Method (CRAM).

Probabilistic and targeted Creek Status monitoring stations are listed in Table 3.1 and mapped in Figure 3.1. (and Figure 1.1, with other types of monitoring stations).

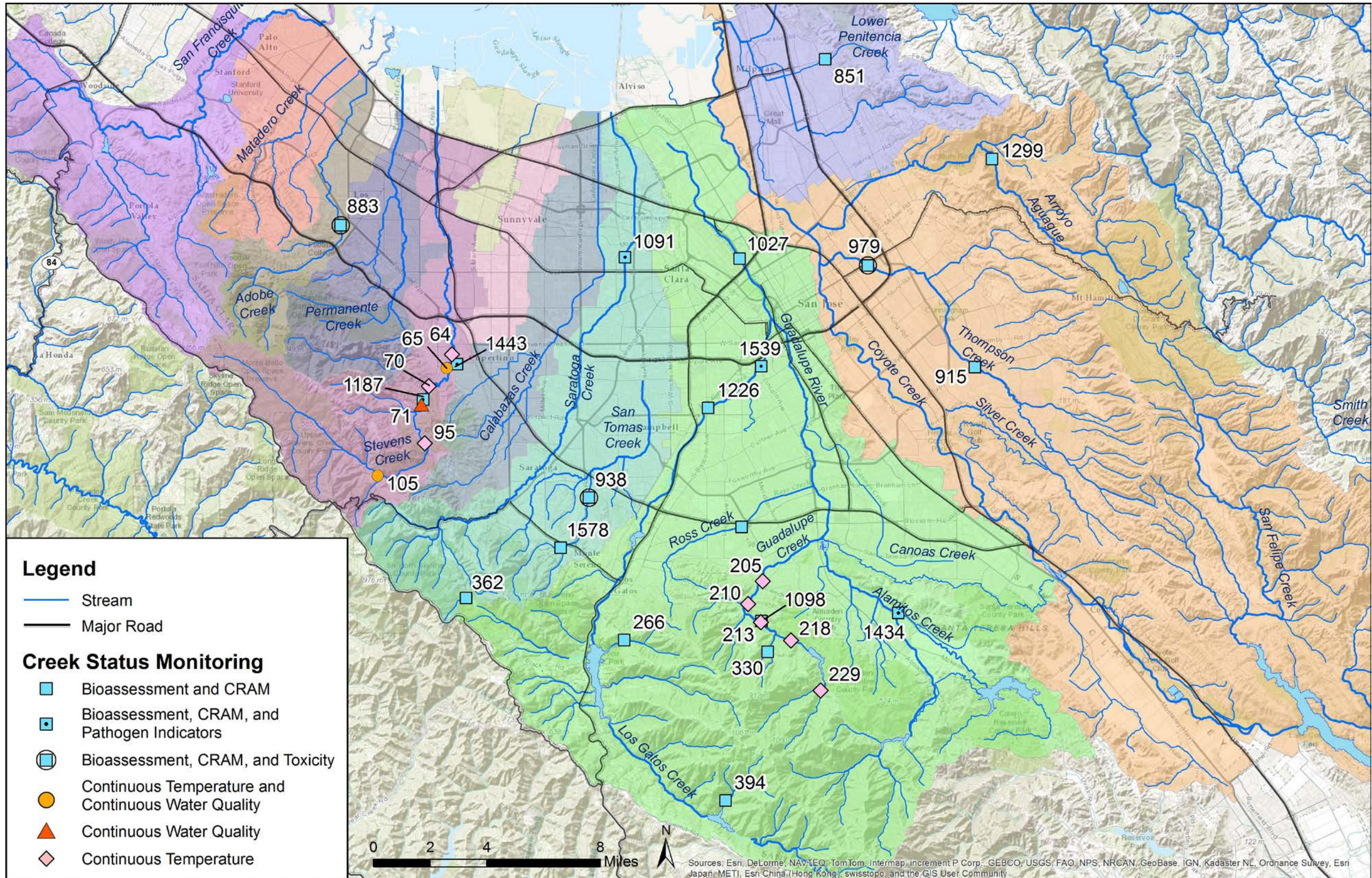


Figure 3.1. Map of SCVURPPP Program Area, major creeks, and stations monitored in WY2014 in compliance with MRP Provision C.8.c.

SCVURPPP Urban Creeks Monitoring Report

Table 3.1. MRP Provision C.8.c Creek Status monitoring stations in Santa Clara County, WY2014.

Map ID	Station Number	Watershed	Creek Name	Land Use	Latitude	Longitude	Probabilistic Monitoring		Targeted Monitoring			
							Bioassessment, Nutrients, General WQ	Toxicity, Sediment Chemistry	CRAM	Temp	Cont WQ	Pathogen Indicators
266	205R00266	Guadalupe River	Limekiln Creek	NU	37.20297	-121.97351	x		x			
322	205R00322	Coyote Creek	Arroyo Aguague	NU	37.36018	-121.73720	x					
330	205R00330	Guadalupe River	Hick's Creek	NU	37.19825	-121.90036	x		x			
362	205R00362	Guadalupe River	Lyndon Canyon	NU	37.21993	-122.05424	x		x			
394	205R00394	Guadalupe River	Austrian Gulch	NU	37.13783	-121.92191	x		x			
851	205R00851	Lower Penitencia Creek	Los Coches Creek	U	37.43828	-121.87107	x		x			
883	205R00883	Adobe Creek	Adobe Creek	U	37.37108	-122.11822	x	x	x			
915	205R00915	Coyote Creek	Thompson Creek	U	37.31356	-121.79463	x		x			
938	205R00938	San Tomas Aquino	San Tomas Aquino Creek	U	37.26063	-121.99153	x	x	x			
979	205R00979	Coyote Creek	Lower Silver Creek	U	37.35479	-121.84920	x	x	x			
1027	205R01027	Guadalupe River	Guadalupe River	U	37.35753	-121.91463	x		x			
1091	205R01091	Saratoga Creek	Saratoga Creek	U	37.35815	-121.97311	x		x			x
1098	205R01098	Guadalupe River	Guadalupe Creek	U	37.21056	-121.90357	x		x			
1187	205R01187	Stevens Creek	Stevens Creek	U	37.30044	-122.07617	x		x			x
1226	205R01226	Guadalupe River	Los Gatos Creek	U	37.29708	-121.93080	x		x			
1299	205R01299	Coyote Creek	Arroyo Aguague	U	37.39781	-121.78597	x		x			
1306	205R01306	Guadalupe River	Ross Creek	U	37.24872	-121.91370	x		x			
1434	205R01434	Guadalupe River	Arroyo Calero	U	37.21388	-121.83368	x		x			x
1443	205R01443	Stevens Creek	Stevens Creek	U	37.31478	-122.06098	x		x			x
1539	205R01539	Guadalupe River	Los Gatos Creek	U	37.31390	-121.90366	x		x			x
1578	205R01578	San Tomas Aquino	San Tomas Aquino Creek	U	37.24035	-122.00593	x		x			
64	205STE064	Stevens Creek	Stevens Creek		37.31873	-122.06143				x		
65	205STE065	Stevens Creek	Stevens Creek		37.31321	-122.06412				x	x	
70	205STE070	Stevens Creek	Stevens Creek		37.30592	-122.07321				x		
71	205STE071	Stevens Creek	Stevens Creek		37.30253	-122.07487					x	
95	205STE095	Stevens Creek	Stevens Creek		37.28269	-122.07527				x		
105	205STE105	Stevens Creek	Stevens Creek		37.26958	-122.09925				x	x	
205	205GUA205	Guadalupe River	Guadalupe Creek		37.22685	-121.90283				x		
210	205GUA210	Guadalupe River	Guadalupe Creek		37.21748	-121.91031				x		
213	205GUA213	Guadalupe River	Guadalupe Creek		37.21018	-121.90386				x		
218	205GUA218	Guadalupe River	Guadalupe Creek		37.20280	-121.88845				x		
229	205GUA229	Guadalupe River	Guadalupe Creek		37.18241	-121.87341				x		

The first 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 Table 8.1 of the MRP. A summary of trigger exceedances observed for each site is presented below in Table 3.2. Sites where triggers are exceeded may indicate potential impacts to aquatic life or other beneficial uses and are considered for future evaluation of stressor source identification (SSID) projects (see Section 4.0 for a discussion of ongoing and completed SSID projects).

The second management question (***Are conditions in local receiving waters supportive of or likely supportive of beneficial uses?***) is addressed primarily through calculation of indices of biological integrity (IBI) using benthic macroinvertebrate data collected at probabilistic sites and sites sampled prior to MRP implementation. Biological condition scores were compared to physical habitat and water quality data collected synoptically with bioassessments to evaluate whether any correlations exist that may explain the variation in IBI scores.

Biological Condition

- The California Stream Condition Index (CSCI) tool was used to assess the biological condition for benthic macroinvertebrate data collected at probabilistic sites. There were five sites rated as likely intact condition (CSCI score ≥ 0.92); three sites rated as possibly intact condition (CSCI score 0.79 – 0.92); one site rated as likely altered condition (CSCI score 0.63 – 0.78) and eleven sites rated as very likely altered condition (≤ 0.63) (Figure 3.2).
- An Algae IBI, based on combination of soft algae and diatom metrics (referred to as “H20”), was used to evaluate benthic algae data collected synoptically with BMIs at probabilistic sites. No condition categories have been developed for “H20” algae IBI scores. The algae IBI results should be considered preliminary until additional research shows that these tools perform well for data collected in Santa Clara County.
- Algae IBI scores were not well correlated with CSCI scores ($R^2 = 0.31$), indicating responses of algae to stressors differ compared to BMIs.
- There was very little difference in CSCI scores between perennial (n=16) and non-perennial (n=4) sites. In contrast, Algae IBI scores were generally lower at perennial sites compared to non-perennial sites. Both CSCI scores and Algae IBI scores had good response to different levels of urbanization (calculated as percent impervious area).
- Environmental variables that had significant correlation to CSCI scores include epifaunal substrate score, percent impervious and chloride. Environmental variables that had significant correlation to Algae IBI scores included epifaunal substrate, CRAM score, Unionized Ammonia and Total Kjeldahl Nitrogen).

Nutrients and Conventional Analytes

- Nutrients (nitrogen and phosphorus), algal biomass indicators, and other conventional analytes were measured in samples collected concurrently with bioassessments which are conducted in the spring season. Trigger thresholds for chloride, unionized ammonia, and nitrate were not exceeded.

Water Toxicity

- Water toxicity samples were collected from three sites during two sample events (winter storm event and summer). No water toxicity samples exceeded MRP trigger thresholds.

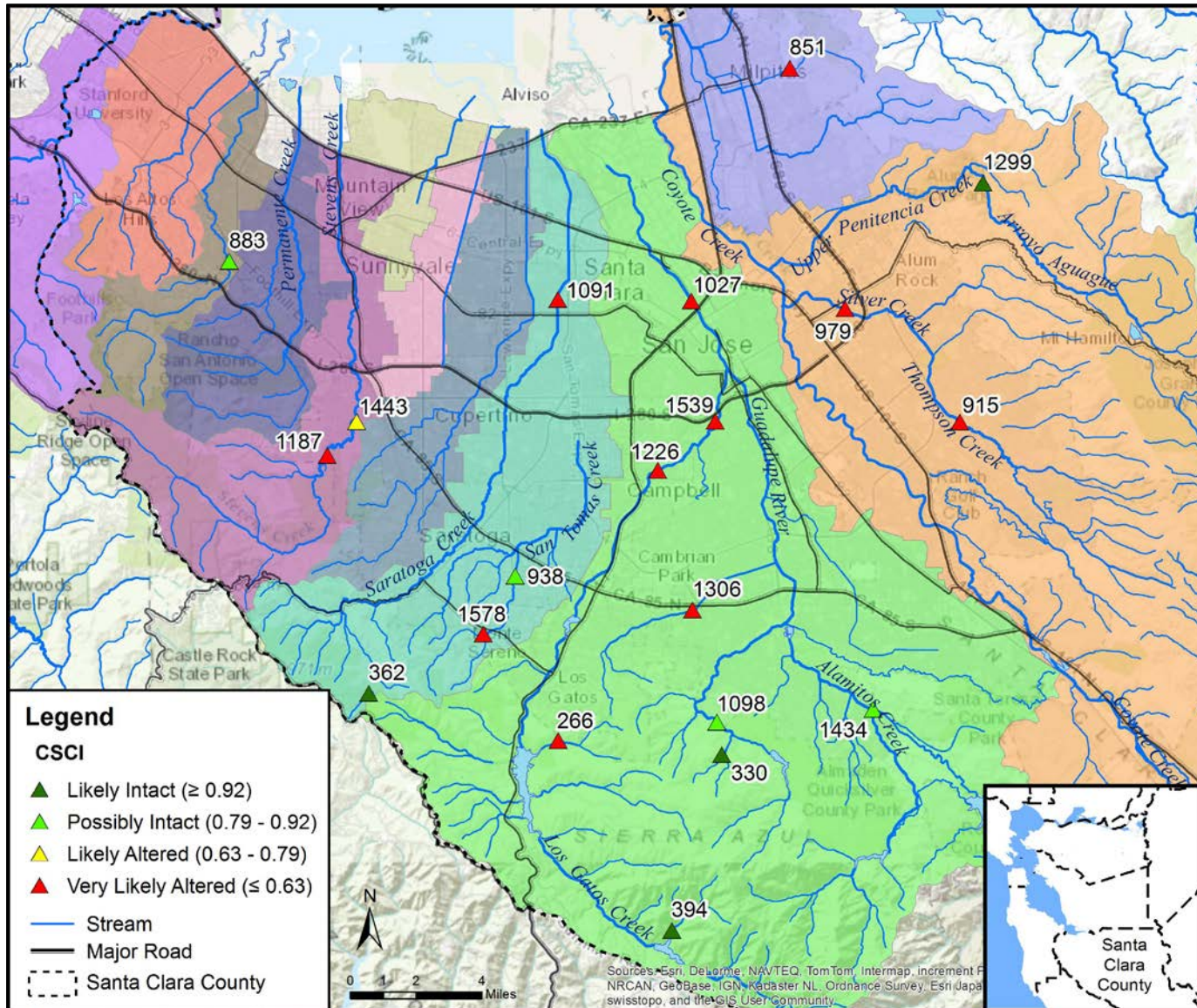


Figure 3.2. CSCI condition category for sites sampled in WY2014, Santa Clara County.

Sediment Toxicity

- Sediment toxicity and chemistry samples were collected concurrently with the summer water toxicity samples. None of the sites exceeded the MRP trigger for sediment toxicity. All three sites exceeded the trigger threshold for sediment chemistry.

Spatial and Temporal Variability of Water Quality Conditions

- Median water temperatures continuously measured in Guadalupe Creek (n=5) and Stevens Creek (n=5) were generally highest at sites downstream of the reservoirs and lowest at sites upstream of the reservoirs. Dry channel conditions occurred upstream of the reservoirs in Guadalupe Creek and Stevens Creek beginning in the months of June and July, respectively.
- Continuous general water quality monitoring was conducted at three sites in Stevens Creek during two two-week periods in June and August. Median dissolved oxygen concentrations were lowest (range 6.0 – 6.4 mg/L) for both sampling events at site 205STE071, located just downstream Stevens Creek Reservoir. Median dissolved oxygen concentrations were relatively consistent at all three sites between spring and late summer sample events.

Potential Water Quality Impacts to Aquatic Life

- There were no exceedances of the Mean Weekly Average Temperature (MWAT) threshold at any of the sites upstream of either Guadalupe Creek (n=1) or Stevens Creek (n=2) Reservoirs, suggesting that water temperatures support rearing habitat for resident rainbow trout in these reaches. However, the intermittent flow and dry channel conditions above both reservoirs during the summer and fall season of 2014 would significantly limit the amount of potential habitat available to trout.
- Three of the four sites below Guadalupe Creek Reservoir exceeded the MWAT threshold trigger between 17% and 49% of the time during WY2014. The monitoring location below the fish ladder (site 205GUA105) never exceeded the threshold, suggesting areas downstream of the dam provide habitat with temperatures that are more suitable for steelhead. The three sites below Stevens Creek Reservoir exceeded the MWAT threshold trigger between 14% and 54% of the time during WY2014.
- Cool water releases below dams provide adequate summer rearing conditions in relatively low elevation habitats that historically were too warm to support steelhead or were seasonally dry. The extended drought type conditions during WY2014 have resulted in dramatically low water levels in both Guadalupe and Stevens Creek Reservoirs, resulting in lower than normal baseflows and releases and higher than normal water temperatures downstream of the dam.
- The WQO for DO in waters designated as having cold freshwater habitat (COLD) beneficial uses (i.e., 7.0 mg/L) was not met in 98% - 100% of measurements taken at the site below the dam (205STE071) and was not met in 32% - 40% of measurements taken at McClellan Ranch (205STE065) during both sampling events in 2014. The WQO for WARM (5.0 mg/L) was periodically exceeded, but the total number of exceedances were not above the 20% criteria to cause a trigger.
- Values for pH measured at three Stevens Creek sites during WY2014 were within WQOs.

Potential Impacts to Water Contact Recreation

- Pathogen indicator densities were measured at five of the probabilistic sites during WY2014. Threshold triggers for fecal coliform and *E. coli* were exceeded at one site in Los Gatos Creek (205GUA050) and one site in Saratoga Creek (205SAR005).
- 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. As a result, the comparison of pathogen indicator

results to water quality objectives and criteria for full body contact recreation, may not be appropriate and should be interpreted cautiously.

Table 3.2. Summary of SCVURPPP trigger threshold exceedance analysis in WY2014. "No" indicates samples were collected but did not exceed the MRP trigger; "Yes" indicates an exceedance of the MRP trigger

Station Number	Creek	Bioassessment	Nutrients	Chlorine	Water Toxicity	Sediment Toxicity	Sediment Chemistry	Temperature	Continuous WQ	Pathogen Indicators
205R00266	Limekiln Creek	Yes	No	No	--	--	--	--	--	--
205R00330	Hick's Creek	No	No	No	--	--	--	--	--	--
205R00362	Lyndon Canyon	No	No	No	--	--	--	--	--	--
205R00394	Austrian Gulch	No	No	No	--	--	--	--	--	--
205R00851	Los Coches Creek	Yes	No	No	--	--	--	--	--	--
205R00883	Adobe Creek	No	No	No	No	No	Yes	--	--	--
205R00915	Thompson Creek	Yes	No	No	--	--	--	--	--	--
205R00938	San Tomas Aquino Creek	No	No	No	No	No	Yes	--	--	--
205R00979	Lower Silver Creek	Yes	No	Yes	No	No	Yes	--	--	--
205R01027	Guadalupe River	Yes	No	No	--	--	--	--	--	--
205R01091	Saratoga Creek	Yes	No	Yes	--	--	--	--	--	Yes
205R01098	Guadalupe Creek	No	No	No	--	--	--	--	--	--
205R01187	Stevens Creek	Yes	No	Yes	--	--	--	--	--	No
205R01226	Los Gatos Creek	Yes	No	No	--	--	--	--	--	--
205R01299	Arroyo Aguague	No	No	No	--	--	--	--	--	--
205R01306	Ross Creek	Yes	No	Yes	--	--	--	--	--	--
205R01434	Arroyo Calero	No	No	No	--	--	--	--	--	No
205R01443	Stevens Creek	Yes	No	No	--	--	--	--	--	No
205R01539	Los Gatos Creek	Yes	No	No	--	--	--	--	--	Yes
205R01578	San Tomas Aquino Creek	Yes	No	No	--	--	--	--	--	--
205STE064	Stevens Creek	--	--	--	--	--	--	Yes	--	--
205STE065	Stevens Creek	--	--	--	--	--	--	No	Yes	--
205STE071	Stevens Creek	--	--	--	--	--	--	Yes	Yes	--
205STE095	Stevens Creek	--	--	--	--	--	--	No	--	--
205STE105	Stevens Creek	--	--	--	--	--	--	No	No	--
205GUA205	Guadalupe Creek	--	--	--	--	--	--	Yes	--	--
205GUA210	Guadalupe Creek	--	--	--	--	--	--	No	--	--
205GUA213	Guadalupe Creek	--	--	--	--	--	--	No	--	--
205GUA218	Guadalupe Creek	--	--	--	--	--	--	Yes	--	--
205GUA229	Guadalupe Creek	--	--	--	--	--	--	No	--	--

Management Implications

The Program's Creek Status Monitoring program (consistent with MRP Provision C.8.c) focuses on assessing the water quality condition of urban creeks in the Santa Clara Valley and identifying stressors and sources of impacts observed. Although the sample size from WY2014 (overall n=20; urban n=16) is not sufficient to develop statistically representative conclusions regarding the overall condition of all creeks, it is clear that most urban portions 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 and in-stream habitat complexity, and other modifications to the watershed and riparian areas associated with urban development that has occurred over the past 50 plus years in the contributing watersheds. Additionally, water quality conditions associated with pyrethroid pesticides present in creek sediments at concentrations known to adversely affect sensitive aquatic organisms (i.e., LC50s), and episodic or site specific increases temperature and decreased dissolved oxygen (particularly in lower creek reaches) are not optimal for aquatic life in local creeks.

The Program and its Co-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 develop (LID) methods, such as rainwater harvesting and use, infiltration and biotreatment are now required as part of development and redevelopment projects. These LID measures are expected to reduce the impacts of urban runoff and associated impervious surfaces on stream health.
- In compliance with MRP provision C.9, the Program and Co-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. Through these efforts, it is estimated that the amount of pyrethroids observed in urban stormwater runoff will decrease by 80-90% over time, and in turn significantly reduce the magnitude and extent of toxicity in local creeks.
- Trash loadings to local creeks are also being reduced through implementation of new control measures in compliance with MRP provision C.10 and other efforts by Co-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.
- 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) Co-permittees continue to implement programs that are designed to prevent non-stormwater discharges during dry weather and reduce the exposure of contaminants to stormwater and sediment in runoff during rainfall events.
- Additionally, in compliance with MRP provision C.13, copper in stormwater runoff is reduced through implementation of controls such as architectural and site design requirements, street sweeping, and participation in statewide efforts to significantly reduce the level of copper vehicle brake pads.

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 (e.g., SCVWD's 2010 Flood Protection and Stream Stewardship Master Plan). Through the continued implementation of MRP-associated and other watershed stewardship programs, SCVURPPP anticipates that stream conditions and water quality in local creeks will continue to

improve overtime. 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 implemented to “green” the “grey” infrastructure and disconnect impervious areas constructed over the course of the past 50 plus years will take time to implement. Consequently, it may take several decades to observe the outcomes of these important, large-scale improvements to our watersheds in our local creeks. Long-term creek status monitoring programs designed to detect these changes over time are therefore beneficial to our collective understanding of the condition and health of our local waterways.

4.0 MONITORING PROJECTS (C.8.D)

Three types of monitoring projects are required by provision C.8.d of the MRP:

1. Stressor/Source Identification Projects (C.8.d.i);
2. BMP Effectiveness Investigations (C.8.d.ii); and,
3. Geomorphic Projects (C.8.d.iii).

The overall scopes of these projects are generally described in the MRP and the RMC Work Plan. The results of projects conducted by SCVURPPP are described in the sections below and Figure 1.1 maps where these studies were (or are being) conducted.

4.1 Stressor/Source Identification Projects

The purpose of the Stressor/Source Identification Projects (SSID) is to complete monitoring tasks to address requirements listed under Provision C.8.d.i of the MRP. This MRP provision requires that SCVURPPP conduct three monitoring projects to identify and isolate potential sources and/or stressors associated with observed water quality impacts. Creeks considered for SSID projects are those with creek status monitoring results that exceed the triggers identified in Table 8.1 of the MRP.

SCVURPPP completed two SSID projects in WY2013 in Guadalupe Creek and Coyote Creek. Results of the Guadalupe Creek and Coyote Creek SSID projects were included in the Integrated Monitoring Report (SCVURPPP 2014). The third SSID project, in Upper Penitencia Creek, was initiated in WY2013 and will continue through WY2015. See Figure 1.1 for the general watershed locations for each project. The Upper Penitencia Creek SSID project is described in more detail in Section 4.1.1 below.

4.1.1 Upper Penitencia Creek SSID Project

Creek status monitoring conducted in WY2012 and WY2013 showed poor biological condition at two sites in Upper Penitencia Creek based on benthic macroinvertebrate data and Southern California Benthic Macroinvertebrate Index of Biological Integrity (SoCal B-IBI) scores. In addition, MRP Provision C.8.c temperature trigger exceedances were measured in this creek. Based on these findings, SCVURPPP initiated a SSID project in Upper Penitencia to evaluate potential factors causing low biological condition scores.

The Causal Analysis/Diagnosis Decision Information System (CADDIS) framework was used to identify and evaluate probable stressors and sources affecting biological condition in Upper Penitencia Creek. CADDIS was developed by the US EPA as an online guidance application for users to conduct causal assessments (US EPA 2010). The online tool provides a logical, step-by-step framework for Stressor Identification for biologically impacted aquatic ecosystems. The following steps associated with the CADDIS process were applied:

- Define the type and location of the impact to be evaluated (i.e., the case)
- Identify potential causal factors impacting biological condition;
- Analyze existing data for links between stressor indicators and biological response;
- Identify information gaps to better inform probable cause
- Develop monitoring plan to address data gaps

A number of factors that may be reducing the biological condition in the urban reach of Upper Penitencia Creek were evaluated: increased temperature, altered flow regime, altered physical habitat, reduced dissolved oxygen, nutrients, and pesticides. Existing data sources suggest that increased temperature resulting from percolation pond releases to the creek is the likely cause of poor biological condition.

During WY2015, water quality and physical habitat conditions will be further evaluated by implementing a coordinated and integrated sampling design that will measure the biological conditions across a range of stressor gradients. The study area includes an approximately one mile reach of Upper Penitencia Creek between Piedmont Avenue and Dorel Drive. Monitoring activities will include bioassessments (both BMI and algae) conducted synoptically with continuous temperature, sediment chemistry and toxicity, physical habitat, and nutrients.

It is important to note that in early spring 2014, existing drought conditions resulted in dry channel conditions for majority of Upper Penitencia Creek as early as April 2014. In addition, all water imports from the State Water Project to the Santa Clara Basin were stopped for conservation measures, and SCVWD stopped releases into Upper Penitencia Creek from the percolation pond. As a result, the creek went dry before bioassessments could be conducted. Thus, bioassessment sampling for this monitoring project will be dependent upon suitable flow throughout the study area to allow water quality and biological sampling.

The Upper Penitencia Creek Stressor Source Identification Project Work Plan is attached as Appendix B.

4.2 BMP Effectiveness Investigation

Provision C.8.d.ii of the MRP requires SCVURPPP Permittees to investigate the effectiveness of one stormwater treatment or hydrograph modification control measure. The control measures used to fulfill requirements in provisions C.3, C.11, or C.12 may be used to fulfill this requirement provided the investigation includes a range of pollutants generally found in urban runoff.

Through the Clean Watersheds for Clean Bay project (CW4CB) and modeling conducted in compliance with Provision C.3.iii (Green Streets Pilot Projects), the Program is conducting a number of stormwater treatment effectiveness investigations in collaboration with the RMC. Specific to SCVURPPP Permittees, the Program is currently conducting effectiveness investigations at a stormwater treatment device in the Leo Avenue watershed (City of San Jose) as part of the CW4CB project. The CW4CB monitoring design at Leo Avenue includes paired influent and effluent sampling and volume/flow measurements to calculate Polychlorinated Biphenyl (PCB) and mercury load reductions. CW4CB analytical constituents include suspended sediments, total organic carbon, lead, mercury, and PCBs. Additional constituents generally found in stormwater runoff (e.g., nutrients, cadmium, chromium, copper, nickel, zinc) were added by the Program to supplement the CW4CB investigation. Samples were collected and flow volumes were measured during two storm events in WY2014. Due to low precipitation in WY2014, the program was extended through WY2015 and the CW4CB Final Report is anticipated in January 2016. Two additional storms will be targeted in WY2015. Results will be summarized in the Program's WY2015 Urban Creeks Monitoring Report that is due to the Water Board by March 15, 2016.

4.3 Geomorphic Project

MRP Provision C.8.d.iii requires Permittees to conduct a geomorphic monitoring project intended to answer the management question:

- How and where can our creeks be restored or protected to cost-effectively reduce the impacts of pollutants, increased flow rates, and increased flow durations of urban runoff?

The provision requires that Permittees select a waterbody/reach, preferably one that contains significant fish and wildlife resources, and conduct one of three types of projects. SCVURPPP elected to conduct a geomorphic study to help in the development of regional curves which help estimate equilibrium channel conditions for different sized drainages. As part of this Geomorphic Study, SCVURPPP surveyed bankfull geometries at two consecutive riffles in Coyote Creek above Coyote Reservoir near USGS gaging station #11169800 (Coyote Creek near Gilroy, CA). The survey location is mapped in Figure 1.1 and results of the Geomorphic Study were described in the Integrated Monitoring Report (SCVURPPP 2014).

5.0 POC LOADS MONITORING (C.8.E)

Pollutants of Concern (POC) loads monitoring is required by Provision C.8.e.i of the MRP. Loads monitoring is intended to assess inputs of POCs to the Bay from local tributaries and urban runoff, assess progress toward achieving wasteload allocations (WLAs) for TMDLs, and help resolve uncertainties associated with loading estimates for these pollutants. In particular, there are four priority management questions that need to be addressed through POC loads monitoring:

1. Which Bay tributaries (including stormwater conveyances) contribute most to Bay impairment from POCs?
2. What are the annual loads or concentrations of POCs from tributaries to the Bay?
3. What are the decadal-scale loading or concentration trends of POCs from small tributaries to the Bay?
4. What are the projected impacts of management actions (including control measures) on tributaries and where should these management actions be implemented to have the greatest beneficial impact?

The RMP Small Tributaries Loading Strategy (STLS) was developed in 2009 by the STLS Team, which included 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 loads monitoring/modeling between the RMP and RMC participants. With concurrence of participating Regional Water Board staff, the framework presents an alternative approach to the POC loads monitoring requirements described in MRP Provision C.8.e.i, as allowed by Provision C.8.e. The framework is updated periodically with summaries of activities and products to date. The current version (Version 2013a) of the STLS Multi-Year Plan (MYP) was submitted with the Regional Urban Creeks Monitoring Report in March 2013 (BASMAA 2013). The MYP includes four main elements that collectively address the four priority management questions for POC monitoring:

1. Watershed modeling (Regional Watershed Spreadsheet Model),
2. Bay Margins Modeling,
3. Source Area Runoff Monitoring, and
4. Small Tributaries Watershed Monitoring.

The STLS MYP elements and activities conducted during WY2014 are described in the Sections below.

5.1 Regional Watershed Spreadsheet Model

The STLS Team and SPLWG continued to provide oversight in WY2014 to the development and refinement of the Regional Watershed Spreadsheet Model (RWSM), which is a planning tool for estimation of overall POC loads from small tributaries to San Francisco Bay at a regional scale. The RWSM is being developed by SFEI on behalf of the RMP, with funding from both the RMP and BASMAA regional projects.

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 cheap tool for estimating regional scale watershed loads. Spreadsheet models have advantages over mechanistic models because the data for many of the input parameters required by those models do not currently exist, and also require large calibration datasets which take money and time to collect.

Development of a spreadsheet model for the Bay has been underway since 2010 and to-date, models and software development have been completed for water and copper, and draft models have been completed for suspended sediments, PCBs, and mercury. Resulting loads estimates for PCBs and

mercury appear to be approximately 3-fold too high leading to the conclusion that accuracy and precision at small (e.g., watershed) scales is challenged by the regional nature of the calibration process and the simplicity of the model. However, the RWSM can be used for estimating regional scale annual average loads and could be useful for determining relative loading between sub-regions and more polluted versus less polluted watersheds. During 2014, work was planned to improve these models based on improved GIS layers being developed by BASMAA, an improved iterative calibration technique, and an improved method of modeling that includes generation of ranges in loads estimates as a component of the modeling process. The 2014 work remains on hold pending GIS layer delivery.

Tasks for 2015 depend upon the outcomes of the work for 2014. Possible uses of the 2015 funds include improving the basis of the model by shifting the model to a water based starting point or completing further structural improvements to the sediment based model, or incorporation of additional calibration watersheds and BASMAA studies. Decisions will be made in consultation with the STLS and after discussions at the SPLWG meeting slated for May, 2015.

5.2 Small Tributaries Watershed Monitoring

The STLS MYP includes intensive monitoring at a total of six “bottom-of-the watershed” stations over several years to accumulate data needed to calibrate the Regional Watershed Spreadsheet Model and assist in developing loading estimates from small tributaries for priority POCs. Monitoring is also intended to provide a limited characterization of additional lower priority analytes. WY2014 was the third year of monitoring activities at four stations that were set up and mobilized beginning in October 2011. Two additional stations were established in October 2012 to complete the monitoring network.

1. Lower Marsh Creek (Contra Costa County), established WY2012
2. Guadalupe River (Santa Clara County), established WY2012
3. Lower San Leandro Creek (Alameda County), established WY2012
4. Sunnyvale East Channel (Santa Clara County), established WY2012
5. North Richmond Pump Station (Contra Costa County), established WY2013
6. Pulgas Pump Station (San Mateo County), established WY2013

In WY2014, the stations in Lower Marsh Creek, Guadalupe River and Pulgas Pump Station were operated by CCCWP, SCVURPPP, and SMCWPPP, respectively, on behalf of RMC participants. The stations in the Sunnyvale East Channel and North Richmond Pump Station were operated by SFEI on behalf of the RMP, as was the Lower San Leandro Creek Station in its first year before operation was transferred to ACCWP in summer 2012. Stations in Santa Clara County are mapped in Figure 1.1.

Monitoring methods implemented by SFEI are documented in the POC Monitoring Field Instruction Manual. This is a living document that is frequently updated on an as-needed-basis. The current version is dated September 2013. SCVURPPP follows the same instructions but may allow for minor modifications depending on site-specific conditions. Laboratory analyses are implemented according to the BASMAA RMC Quality Assurance Project Plan (QAPP; BASMAA 2014a).

For WY2014, BASMAA (on behalf of all RMC participants) contracted with SFEI to coordinate laboratory analyses, data management and data quality assurance. The goal was to ensure data consistency among all watershed monitoring stations.

During WY2014 storms, discrete and composite samples were collected at two SCVURPPP POC loads (bottom-of-watershed) monitoring stations over the rising, peak and falling stages of the hydrographs. Samples collected were analyzed for multiple analytes (Table 5.1) consistent with MRP provision C.8.e. The turbidity of the water flowing through each station was recorded continuously during the entire wet weather season. Receiving water samples were collected and analyzed from a total of five storms:

WY2014

- six storms at the Sunnyvale East Channel Station
- four storms at the Guadalupe River Station

Complete results of POC monitoring conducted by the STLS team are presented in Appendix C. This section focuses on comparisons of WY2014 water quality data to applicable numeric WQOs and toxicity thresholds.

Table 5.1. Laboratory analysis methods used by the STLS Team for POC (loads) monitoring in WY2014.

Analyte	Analytical Method	Analytical Laboratory
Carbaryl	EPA 632M	DFC WPCL ^a
Fipronil	EPA 619M	DFC WPCL
Suspended Sediment Concentration	ASTM D3977	Caltest
Total Phosphorus	SM4500-P E	Caltest
Nitrate	EPA 300.0	Caltest
OrthoPhosphate	SM 4500-P E	Caltest
PAHs	AXYS MLA-021 Rev 10	AXYS ^b
PBDEs	AXYS MLA-033 Rev 06	AXYS
PCBs	AXYS MLA-010 Rev 11	AXYS
Pyrethroids	EPA 8270M_NCI	Caltest
Total Methylmercury	EPA 1630	Caltest
Total Mercury	EPA 1631E	Caltest
Copper	EPA 1638	Caltest
Selenium	EPA 1638	Caltest
Total Hardness	SM 2340 C	Caltest
Total Organic Carbon	SM 5310 B	Caltest

^a California Department of Fish and Game Water Pollution Control Laboratory

^b AXYS Analytical Services Ltd.

5.2.1 Comparisons to Numeric Water Quality Objectives/Criteria for Specific Analytes

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, an assessment of data collected at the SCVURPPP POC monitoring stations in WY2014 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:

Freshwater vs. Saltwater - POC monitoring data were collected in freshwater receiving water bodies above tidal influence and therefore comparisons were made to freshwater water quality objectives/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 creeks monitored.

Acute vs. Chronic Objectives/Criteria - For POC monitoring required by provision C.8.e, data were collected in an attempt to develop more robust loading estimates from small tributaries. Therefore, detecting the concentration of a constituent in any single sample was not the primary driver of POC monitoring. 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” water quality objectives/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. For analytes for which no water quality objectives/criteria have been adopted, comparisons were not made.

It is important to note that acute WQOs or criteria have only been promulgated for a small set of analytes collected at POC monitoring stations. These include objectives for trace metals (i.e., copper, selenium and total mercury). Table 5.2 provides a comparison of data collected in WY2014 to applicable numeric WQOs/criteria adopted by the San Francisco Bay Water Board or the State of California for these analytes.

All samples collected in WY2014 were below applicable numeric WQOs (i.e., freshwater acute objective for aquatic life) for copper, mercury and selenium. Stormwater management activities are currently underway for copper (via MRP provision C.13), mercury (via MRP provision C.11), and selenium (via MRP provision C.14).

For all other analytes measured via POC monitoring (e.g., pyrethroid pesticides and polycyclic aromatic hydrocarbons), the State of California has yet to adopt numeric WQOs applicable to beneficial uses of interest. For these analytes, an assessment of compliance of applicable water quality standards cannot be conducted at this time. Descriptive statistics of these results are included in Appendix C.

Table 5.2. Comparison of WY2014 POC (loads) monitoring data to applicable numeric water quality objectives.

Analyte	Fraction	Freshwater Acute Water Quality Objective for Aquatic Life ^a	Unit	# Samples > Objective	
				Sunnyvale East Channel	Guadalupe River
Copper	Dissolved	13 ^b	µg/L	0/6	0/4
Selenium	Total	20	µg/L	0/6	0/4
Mercury	Total	2.1	µg/L	0/22	0/16

^a San Francisco Bay Water Quality Control Plan (SFRWQCB 2013)

^b The copper water quality objective is dependent on hardness; therefore, comparisons were made based on hardness values of samples collected synoptically with samples analyzed for copper. The objective presented in the table is based on a hardness of 100 mg/L.

5.2.2 Summary of Toxicity Testing Results

In addition to comparisons of data for specific analytes, the results of toxicity testing conducted on water samples collected during storm events in WY2014 were also evaluated in the context of adopted water quality objectives. Toxicity testing was conducted at each POC monitoring station using four different types of test organisms:

- *Pimephales promelas* (freshwater fish)
- *Hyalella azteca* (amphipod)
- *Ceriodaphnia dubia* (crustacean)
- *Selenastrum capricornutum* (algae)

Both acute and chronic endpoints were recorded. A summary of toxicity results for Sunnyvale East Channel and Guadalupe River in WY2014 is presented in Table 5.3. The number of samples with significant toxicity are listed.

Table 5.3. Summary of WY2014 toxicity testing results for SCVURPPP POC monitoring stations.

Receiving Water	<i>Pimephales promelas</i>		<i>Hyalella azteca</i>	<i>Ceriodaphnia dubia</i>		<i>Selenastrum capricornutum</i>
	Significant Reduction in Survival	Significant Reduction in Growth	Significant Reduction in Survival	Significant Reduction in Survival	Significant Reduction in Reproduction	Significant Reduction in Growth
Sunnyvale East Channel	0/6	0/6	5/6	0/6	0/6	0/6
Guadalupe River	1/4	2/4	3/4	0/4	0/4	0/4

Of the organisms exposed to water collected from SCVURPPP POC monitoring stations in WY2014, consistent toxicity was only observed for the amphipod *Hyalella azteca* (80% of samples). To a lesser extent acute (survival) and chronic (growth) toxic endpoints were observed for *Pimephales promelas* in Guadalupe River water samples as well. For all other organisms, no toxic endpoints were observed in WY2014.

Observations of toxicity to *H. azteca* are similar to those from recent wet weather monitoring conducted in Southern California (Riverside County 2007, Weston Solutions 2006), the Imperial Valley (Phillips et al. 2007), the Central Valley (Weston and Lydy 2010), and the Sacramento-San Joaquin Delta (Werner et al., 2010), where follow up toxicity identification evaluations indicated that pyrethroid pesticides were almost certainly the cause of the toxicity observed. Based on recent studies conducted in California receiving waters, pyrethroid pesticides have also been identified as the likely current causes of sediment toxicity in urban creeks (Ruby 2013, Amweg et al. 2005, Weston and Holmes 2005, Anderson et al. 2010). These results are not unexpected given that *H. azteca* is considerably more sensitive to pyrethroids than other species tested as part of the POC monitoring studies (Palmquist 2008).

To further explore the potential causes of toxicity to *H. azteca* in the WY2014 samples, pyrethroid concentrations in water samples collected at the same time as the toxicity samples were compiled and compared to thresholds (i.e., LC50s) known to be lethal to *H. azteca*. LC50s were identified through a review of the scientific literature and are only available for a limited number of types of pyrethroids.³ The results of these comparisons are provided in Table 5.4.

³ Adverse effects concentrations for pyrethroids presented in Table 5.4 are not adopted water quality objectives and should not be used to draw conclusions about compliance with water quality standards. The comparison contained in this table is only intended to facilitate an evaluation of the potential need for further evaluation of the stressors causing the toxicity.

Table 5.4. *Hyalella azteca* water toxicity sample results and concentrations of pesticides detected.

Receiving Water	Sample Date	Mean % Survival <i>H. azteca</i>	Significant Effect	Bifenthrin (ng/L)	Cyfluthrin (ng/L)	Cypermethrin (ng/L)	Delta/ Tralomethrin (ng/L)	Esfenvalerate (ng/L)	Permethrin (ng/L)	Carbaryl (ng/L)
LC50 (ng/L)				7.7 ^a	2.3 ^a	2.3 ^a	10 ^b	8 ^c	48.9 ^d	2100 ^e
Sunnyvale East Channel	2/6/2014	32%	Yes	5.6	13	4.8	1.2 ^f	2	19	14 ^f
	2/26/2014	64%	Yes	5.2	4	2.6	0.6 ^f	0.9	11 ^f	--
	2/28/2014	72%	Yes	3.3	6.4	3.2	1.9 ^f	1	22	--
	3/29/2014	90%	No	2	3.2	6	0.9 ^f	0.5	26	--
	3/31/2014	64%	Yes	18	6.1	4.1	1.5 ^f	1	18	--
	4/1/2014	74%	Yes	11	11	3.2	1.2 ^f	2.8	29	--
Guadalupe River	11/20/2013	84%	Yes ^g	6.1	5.5	1.9	1.3 ^f	0.2 ^f	12 ^e	64
	2/6/2014	80%	Yes ^g	6	6.4	5	2.8 ^f	--	14 ^e	29
	2/28/2014	94%	No	3.5	2.4	1.1 ^f	--	--	7.2 ^e	12 ^e
	4/1/2014	72%	Yes	3.5	3.1	1.4 ^f	--	--	9.2 ^e	28

^a As reported by D. Weston, University of California, Berkeley.

^b LC50 values for *Hyalella Azteca* unavailable. LC50 values listed are for *Daphnia magna* as reported by Xiu et al. (1989)

^c Werner et al., unpublished

^d Brander et al. (2009)

^e USEPA (2012)

^f Measured below the reporting limit

^g Significant compared to control sample based on statistical test - probability less than critical p-value. The sample has greater similarity to control sample, The percent effect is equal to or smaller than evaluative threshold.

Dashes represent concentrations less than method detection limits.

Bold values exceed the LC50.

Results suggest that the concentration of one or more pyrethroid pesticides was above levels known to cause significant reduction in the survival to *H. azteca*. Specifically, observed concentrations of cyfluthrin were greater than LC50s in all samples, including those samples in which, no significant toxicity was observed. Similarly, cypermethrin results were greater than the LC50 in all Sunnyvale East Channel samples, including the one sample without a significant reduction in *H. azteca* survival.

Given the results of previous toxicity studies conducted in receiving waters throughout California, it appears likely that pyrethroids could have caused toxicity to *H. azteca* observed at the SCVURPPP stations and that pesticide applicators are switching from bifenthrin to cyflurhtrin and cypermethrin. Management actions designed to reduce the impacts of pesticide-related toxicity are outlined in the TMDL and Water Quality Attainment Strategy for Diazinon and Pesticide-related Toxicity in Urban Creeks TMDL, and are currently underway via provision C.9 of the MRP.

5.2.3 POC Loads Monitoring in WY2015

Based on the lessons learned through the implementation of the STLS Multi-Year Plan in Water Years 2012, 2013 and 2014; and the reprioritization of near-term information needs, SCVURPPP and its RMC

partners are implementing a revised approach to POC Loads monitoring in FY 2014-15⁴. The alternative monitoring approach was discussed at numerous STLS workgroup meetings during FY 13-14⁵ and was agreed upon by STLS members, including Water Board staff, as the best approach to addressing near-term high priority information needs regarding PCB and mercury sources and loadings. The approach will be implemented in compliance with MRP provision C.8.e⁶ beginning in the fall of 2014. The alternative approach includes the discontinuation of most POC loads monitoring stations sampled in previous Water Years and includes the implementation of the following activities by SCVURPPP and/or the RMP via the STLS workgroup:

- **PCB and Mercury Opportunity Area Analysis (SCVURPPP)** - As part of the development of PCB and mercury loading estimates presented in Part C of the Program's Integrated Monitoring Report, SCVURPPP (in collaboration with the San Francisco Estuary Institute) developed preliminary GIS data layers illustrating potential PCB and mercury source areas. These data layers along with existing data on PCBs/mercury concentrations in sediment and stormwater represent the current state-of-knowledge of source areas for these pollutants in the Santa Clara Valley. These preliminary data layers, however, are based on limited and potentially outdated information on land uses and current activities at properties that may contribute or limit the level of pollutants transported to the Bay via stormwater. In an effort to collect additional information on current land uses, facility practices and contributions of PCBs and mercury from these properties, SCVURPPP is planning to conduct a *PCB and Mercury Opportunity Area Analysis* as part of the Program's revised POC loads monitoring approach in FY 14-15 to assist Permittees in identifying source areas in the Santa Clara Valley (i.e., within the SCVURPPP program area). The outcome of this activity will be a refined understanding and maps of PCB/mercury source area locations, which if managed may provide further load reduction opportunities during future NPDES permit terms.
- **POC Monitoring (RMP/STLS)** - Working through the STLS workgroup, SCVURPPP also plans to coordinate/collaborate with RMP staff on the implementation of a stormwater characterization field study that is intended to complement the opportunity area analysis described above. The goal of the project is to assist Permittees in identifying watershed sources of PCBs and mercury through sampling of stormwater and sediment transported from the watershed to stormwater conveyances during storm events. This monitoring will be funded through the RMP and will begin in the fall/winter of 2014.
- **Guadalupe River Contingency Monitoring (SCVURPPP)** – POC loads monitoring activities have been conducted for nearly a decade on the Guadalupe River near the Highway 101 overpass. These efforts have 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. 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, but the Program intends to institute contingency monitoring in FY 14-15 to sample water at the Highway 101 station should a qualifying storm event occur.

In addition to these activities conducted as part of the revised POC loads monitoring approach for FY 14-15, the Program also intends to continue participating in other STLS activities during this fiscal year. The activities summarized above will be further described in a project work plan scheduled for completion in FY 14-15.

⁴ The BASMAA Phase I stormwater managers discussed the approach with the Assistant Executive Officer of the SF Bay Regional Water Quality Control Board at the August 28, 2014 monthly meeting and amended the RMC to reflect the modification.

⁵ Discussions about revised POC loads monitoring approaches for FY 13-14 (Water Year 2015) were discussed and ultimately agreed upon by Water Board staff and other STLS and RMC partners at the following STLS meetings: October 13, 2013; March 19, 2014; April 1, 2014; April 16, 2014; May 15, 2014; and June 9, 2014.

⁶ The FY 14-15 revised alternative approach summarized in this section addresses each of the POC Loads Monitoring management information needs described in provision C.8.e and will be performed at an equivalent level of monitoring effort as the effort described in this MRP provision.

6.0 LONG-TERM TRENDS MONITORING (C.8.E)

In addition to POC loads monitoring, Provision C.8.e requires Permittees to conduct long-term trends monitoring to evaluate if stormwater discharges are causing or contributing to toxic impacts on aquatic life. Required long-term monitoring parameters, methods, intervals and occurrences are included as Category 3 parameters in Table 8.4 of the MRP, and prescribed long-term monitoring locations are included in Table 8.3. Similar to creek status and POC loads monitoring, MRP Provision C.8.a (Compliance Options) allowed RMC participants to commence long-term trends monitoring in October 2011.

As described in the RMC Creek Status and Trends Monitoring Plan (BASMAA 2012), the State of California's Surface Water Ambient Monitoring Program (SWAMP) through its Statewide Stream Pollutant Trend Monitoring (SPoT) program currently monitors the seven long-term monitoring sites required by Provision C.8.e.ii. Sampling via the SPoT program is currently conducted at the sampling interval described in Provision C.8.e.iii in the MRP. The SPoT program is generally conducted to answer the management question:

- What are the long-term trends in water quality in creeks?

Based on discussions with Region 2 Water Board (SWAMP) staff, RMC participants are complying with long-term trends monitoring requirements described in MRP provision C.8.e via monitoring conducted by the SPoT program. This manner of compliance is consistent with the MRP language in provisions C.8.e.ii and C.8.a.iv. RMC representatives coordinate with the SPoT program on long-term monitoring to ensure MRP monitoring and reporting requirements are addressed. The three specific goals of the SPoT program are:

1. Determine long-term trends in stream contaminant concentrations and effects statewide.
2. Relate water quality indicators to land-use characteristics and management effort.
3. Establish a network of sites throughout the state to serve as a backbone for collaboration with local, regional, and federal monitoring.

Additional information on the SPoT program can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp. A technical report describing five-year trends from the initiation of the program in 2008 through 2012 was published in 2014 (Phillips et al. 2014).

The statewide network of SPoT sites represents approximately one half of California's watersheds and includes two stations in Santa Clara County at the base of large watersheds (Figure 1.1). Sites are targeted in locations with slow water flow and appropriate micro-morphology to allow deposition and accumulation of sediments. One of the Santa Clara County SPoT stations is located on Coyote Creek; the other is located with the POC Loading station on Guadalupe River. Stream sediments are collected annually (funding permitting) during summer base flow conditions. Sediments are analyzed for a suite of water quality indicators including organic contaminants (organophosphate, organochlorine, pyrethroid pesticides, and PCBs), trace metals, total organic carbon (TOC), and polycyclic aromatic hydrocarbons (PAHs), and polybrominated diphenyl ethers (PBDEs). Samples are also assessed for toxicity using the amphipod *Hyalella azteca* at standard protocol temperature (23°C) and cooler temperatures (15°C) that more closely reflect the ambient temperature in California watersheds. Although the data are not yet available, the SPoT analyte list was expanded in 2013 to include algal toxins (microcystin-LR) and the insecticide fipronil. Imidacloprid along with additional test organisms (*Chironomus dilutus*) more sensitive to fipronil and imidacloprid will likely be added in 2015.

The SPoT report (Phillips et al. 2014) summarizes the 2008 – 2012 data on statewide and regional scales. In addition, pollutant concentrations are correlated to SWAMP bioassessment data and land use characteristics (i.e., urban, agriculture, open space) on the 1 km, 5 km, and watershed scales. The SPoT report made the following *statewide* conclusions:

- There is a significant relationship between land use and stream pollution.
- Sediment toxicity remained relatively stable statewide between 2008 and 2011.
- Significantly more samples were toxic when tested at average ambient temperatures (15°C) compared to the standard protocol temperature (23°C). This is likely the result of the presence of pyrethroids which are slower to breakdown (metabolically) at lower temperatures (i.e., less pyrethroid is necessary to create the same toxic response).
- Percent *H. azteca* survival was significantly positively correlated with Index of Biological Integrity (IBI) scores⁷; whereas, pyrethroid pesticides and chlorinated compounds were significantly negatively correlated with IBI scores.
- IBI scores at toxic sites ranged from 0.1 to 13.6 and IBI scores at non-toxic sites ranged from 0 to 73.3, suggesting that factors other than contaminants (e.g., physical habitat) are influencing macroinvertebrate communities.
- There has been a steady decline statewide in organophosphate pesticide concentrations.

Regional conclusions include:

- Sediments from Coyote Creek and Guadalupe Creek showed marked, but statistically insignificant increases in pyrethroids.
- Sediments from Coyote Creek showed a statistically insignificant reduction in DDT.

SCVURPPP queried the SWAMP database for two Santa Clara County sites (205COY060 – Coyote Creek, and 205GUA020 – Guadalupe Creek) and evaluated the data using the same methods used to evaluate MRP Provision C.8.c sediment data. Threshold Effect Concentration (TEC) (Table 6.2) and Probable Effect Concentration (PEC) quotients (Table 6.3) as defined in MacDonald et al. (2000) were calculated for all non-pyrethroid constituents. In addition, pyrethroid Toxic Unit (TU) equivalents (Table 6.1) were calculated using TOC-normalized data and LC50 values from Maund et al. (2002) and Amweg et al. (2005).

TEC and PEC quotients for sediment concentrations of metals, PAHs, and organic contaminants at the Santa Clara County SPoT stations are generally higher than those calculated for Creek Status monitoring (Provision C.8.c. of the MRP) which was conducted in the same watersheds. These results may illustrate the ongoing movement of fine sediment and variability in sources.

⁷ IBI scores were calculated using methods that were appropriate to each region. The California Stream Condition Index (CSCI) will likely be used in the next reporting cycle.

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Table 6.1. Pyrethroid Toxic Unit (TU) equivalents for sediment chemistry constituents measured by SPoT at Santa Clara County stations. Bolded values exceeded 1.0 TU or significant toxicity.

Site ID – Creek Sample Date	LC50 (µg/g dw)	205COY060 – Coyote Creek					205GUA020 – Guadalupe Creek			
		6/17/08	6/16/09	6/30/10	7/21/11	7/5/12	6/17/08	6/30/10	7/8/11	7/5/12
Pyrethroid										
Bifenthrin	0.52	0.63	0.00	0.68	0.71	1.65	0.52	0.50	0.79	0.62
Cyfluthrin	1.08	0.00	0.00	0.09	0.31	12.1	0.00	0.13	0.14	0.42
Cypermethrin	0.38	0.12	0.00	0.09	0.08	1.28	0.22	0.13	0.08	0.11
Deltamethrin	0.79	0.00	0.00	0.35	0.58	0.00	0.00	0.00	0.55	1.62
Esfenvalerate	1.54	0.00	0.00	0.05	0.46	1.33	0.00	0.00	0.07	0.20
Lambda-Cyhalothrin	0.45	0.00	0.00	0.01	0.02	0.05	0.00	0.00	0.01	0.16
Permethrin	10.83	0.04	0.00	0.02	0.03	0.07	0.01	0.01	0.06	0.14
Sum of Toxic Unit Equivalents per Site	--	0.79	0	1.3	2.2	16	0.75	0.77	1.7	3.3
Survival as % of Control <i>Hyalella azteca</i>	--	82	76	96	92	90	89	97	95	89

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Table 6.2. Threshold Effect Concentration (TEC) quotients for sediment chemistry constituents measured by SPoT at Santa Clara County stations. Bolded values exceed 1.0.

Site ID – Creek Sample Date	TEC	205COY060 – Coyote Creek					205GUA020 – Guadalupe Creek			
		6/17/08	6/16/09	6/30/10	7/21/11	7/5/12	6/17/08	6/30/10	7/8/11	7/5/12
Metals (mg/kg DW)										
Arsenic	9.79	0.71	0.58	0.75	0.82	0.68	0.69	0.65	0.60	0.55
Cadmium	0.99	0.54	0.39	0.57	0.68	0.57	0.91	1.20	0.75	1.19
Chromium	43.4	2.10	2.35	2.24	2.23	2.00	4.10	3.55	2.76	2.65
Copper	31.6	1.33	0.91	1.51	1.50	1.56	1.71	2.20	1.61	1.63
Lead	35.8	0.87	0.59	0.83	0.64	0.74	1.33	1.37	1.09	1.13
Mercury	0.18	0.79	0.54	1.59	0.79	1.01	6.06	11.00	6.83	4.33
Nickel	22.7	3.44	3.30	3.61	3.79	3.59	4.10	5.29	4.22	4.33
Zinc	121	1.29	0.98	1.50	1.42	1.74	1.96	2.13	1.58	1.88
PAHs (µg/kg DW)										
Anthracene	57.2	0.16	2.36	0.05	0.16	0.06	0.57	0.37	0.33	0.65
Fluorene	77.4	0.06	1.71	0.03	0.00	0.02	0.15	0.08	0.09	0.18
Naphthalene	176	0.08	0.38	0.04	0.06	0.02	0.15	0.09	0.07	0.07
Phenanthrene	204	0.23	5.15	0.11	0.21	0.08	0.84	0.84	0.46	0.73
Benz(a)anthracene	108	0.29	3.78	0.09	0.26	0.11	1.11	1.40	0.60	1.44
Benzo(a)pyrene	150	0.31	2.59	0.08	0.18	0.11	1.27	0.90	0.41	0.93
Chrysene	166	0.32	4.77	0.16	0.37	0.15	0.93	1.72	0.66	1.55
Dibenz[a,h]anthracene	33.0	0.49	3.67	0.15	0.48	0.13	1.02	2.09	0.95	1.40
Fluoranthene	423	0.20	0.00	0.08	0.18	0.08	1.84	1.16	0.53	0.88
Pyrene	195	0.52	0.00	0.22	0.45	0.21	0.00	2.26	1.18	1.85
Total PAHs	1,610	0.52	3.44	0.17	0.44	0.20	1.63	1.80	0.94	1.52
Pesticides (µg/kg DW)										
Chlordane	3.24	5.62	2.81	1.30	2.35	2.53	4.73	3.67	5.22	29.10
Dieldrin	1.90	1.15	0.57	0.00	0.00	0.00	1.35	0.00	0.00	0.00
Endrin	2.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptachlor Epoxide	2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lindane (gamma-BHC)	2.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum DDD	4.88	3.29	1.86	0.74	0.00	0.00	3.77	1.31	3.30	5.59
Sum DDE	3.16	6.10	3.92	1.61	2.97	2.97	5.71	2.63	3.32	3.99
Sum DDT	4.16	1.48	0.67	0.00	0.00	0.00	1.55	0.00	0.00	0.00
Total DDTs	5.28	7.85	4.59	1.65	1.78	1.78	8.12	2.78	5.04	7.56
Total PCBs	59.8	0.88	0.36	0.09	0.00	0.13	1.26	0.61	1.19	2.47

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Table 6.3. Probable Effect Concentration (PEC) quotients for sediment chemistry constituents measured by SPoT at Santa Clara County stations. Bolded values exceed 1.0.

Site ID – Creek Sample Date	PEC	205COY060 – Coyote Creek					205GUA020 – Guadalupe Creek			
		6/17/08	6/16/09	6/30/10	7/21/11	7/5/12	6/17/08	6/30/10	7/8/11	7/5/12
Metals (mg/kg DW)										
Arsenic	33.0	0.21	0.17	0.22	0.24	0.20	0.20	0.19	0.18	0.16
Cadmium	4.98	0.11	0.08	0.11	0.13	0.11	0.18	0.24	0.15	0.24
Chromium	111	0.82	0.92	0.88	0.87	0.78	1.60	1.39	1.08	1.04
Copper	149	0.28	0.19	0.32	0.32	0.33	0.36	0.47	0.34	0.35
Lead	128	0.24	0.16	0.23	0.18	0.21	0.37	0.38	0.31	0.31
Mercury	1.06	0.13	0.09	0.27	0.13	0.17	1.03	1.87	1.16	0.74
Nickel	48.6	1.61	1.54	1.69	1.77	1.67	1.92	2.47	1.97	2.02
Zinc	459	0.34	0.26	0.39	0.37	0.46	0.52	0.56	0.42	0.50
PAHs (µg/kg DW)										
Anthracene	845	0.01	0.16	0.00	0.01	0.00	0.04	0.03	0.02	0.04
Fluorene	536	0.01	0.25	0.00	0.00	0.00	0.02	0.01	0.01	0.03
Naphthalene	561	0.02	0.12	0.01	0.02	0.01	0.05	0.03	0.02	0.02
Phenanthrene	1170	0.04	0.90	0.02	0.04	0.01	0.15	0.15	0.08	0.13
Benz(a)anthracene	1050	0.03	0.39	0.01	0.03	0.01	0.11	0.14	0.06	0.15
Benzo(a)pyrene	1450	0.03	0.27	0.01	0.02	0.01	0.13	0.09	0.04	0.10
Chrysene	1290	0.04	0.61	0.02	0.05	0.02	0.12	0.22	0.08	0.20
Fluoranthene	2230	0.04	0.00	0.02	0.04	0.02	0.35	0.22	0.10	0.17
Pyrene	1520	0.07	0.00	0.03	0.06	0.03	0.00	0.29	0.15	0.24
Total PAHs	22,800	0.04	0.24	0.01	0.03	0.01	0.12	0.13	0.07	0.11
Pesticides (µg/kg DW)										
Chlordane	17.6	1.03	0.52	0.24	0.43	0.47	0.87	0.68	0.96	5.36
Dieldrin	61.8	0.04	0.02	0.00	0.00	0.00	0.04	0.00	0.00	0.00
Endrin	207.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptachlor Epoxide	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lindane (gamma-BHC)	4.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum DDD	28	0.57	0.32	0.13	0.00	0.00	0.66	0.23	0.58	0.98
Sum DDE	31.3	0.62	0.40	0.16	0.30	0.30	0.58	0.27	0.34	0.40
Sum DDT	62.9	0.10	0.04	0.00	0.00	0.00	0.10	0.00	0.00	0.00
Total DDTs	572	0.07	0.04	0.02	0.02	0.02	0.07	0.03	0.05	0.07
Total PCBs	676	0.08	0.03	0.01	0.00	0.01	0.11	0.05	0.11	0.22

7.0 CITIZEN MONITORING AND PARTICIPATION (C.8.F)

Provision C.8.f requires Permittees to encourage citizen monitoring, make reasonable efforts to seek out citizen and stakeholder information when reporting monitoring data, and demonstrate annually that they have encouraged citizen and stakeholder observations and reporting of waterbody conditions.

In WY2014, SCVURPPP, City of Sunnyvale, City of Cupertino and City of Mountain View continued to assist the Stevens Permanente Creek Watershed Council (SPCWC) in implementing a grant that funds a volunteer monitoring program. The SPCWC, which is now coordinated through Acterra (a non-profit organization that assists in managing community-based environmental activities), is generally focused on coordinating volunteer water quality monitoring, benthic macroinvertebrate bioassessments, habitat restoration projects, and general outreach and education. The grant was received by the SPCWC for funding under the Santa Clara Valley Water District's (SCVWD) Watershed Stewardship Grant Program. The grant application was accepted by the SCVWD and the volunteer monitoring program was implemented in 2011 and 2012. In support of the volunteer monitoring program, SCVURPPP provided the following in-kind services (in addition to Permittee support): 1) technical support for the implementation of both field and laboratory methods and equipment used by volunteers; 2) reviewing and commenting on monitoring data results and summary reports; 3) participation in SPCWC meetings and events; and 4) promotion of SPCWC sponsored activities through the SCVURPPP website and/or other electronic media.

Subsequent to completion of the grant-funded project, SCVURPPP and Permittees have continued to encourage volunteer monitoring in Santa Clara County. For example, the City of Palo Alto is collaborating with Acterra to engage volunteers in monitoring surface water quality at key locations in Palo Alto creeks to provide some indication of the water's ability to support aquatic life. SCVURPPP and Permittee staff has met and plan to continue to coordinate with Acterra on volunteer monitoring and provide technical advice and support.

8.0 NEXT STEPS

Water quality monitoring required by provision C.8 of the MRP is intended to assess the condition of water quality in the 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 Permittees, SCVURPPP conducts creek water quality monitoring and monitoring projects in the Santa Clara Valley (Lower South Bay) in collaboration with the Regional Monitoring Coalition (RMC), and actively participates in the San Francisco Bay Regional Monitoring Program (RMP), which focuses on assessing Bay water quality and associated impacts.

The following list of next steps will be implemented in WY2015:

- SCVURPPP will continue to collaborate with the RMC (MRP Provision C.8.a).
- SCVURPPP will continue to provide financial contributions towards the RMP and to actively participate in the RMP committees and work groups described in Section 2.0 (MRP Provision C.8.b).
- SCVURPPP will continue to conduct probabilistic and targeted Creek Status Monitoring consistent with the RMC Creek Status and Long-Term Trends Monitoring Plan (BASMAA 2012) (MRP Provision C.8.c).
- SCVURPPP will implement the monitoring strategies described in the Upper Penitencia Stressor Identification Project Work Plan (Appendix B) (MRP Provision C.8.d.i).
- SCVURPPP will continue to implement the BMP Effectiveness Investigation which consists of adding general stormwater runoff constituents to the suite of parameters monitored by the CW4CB project at Leo Avenue (MRP Provision C.8.d.ii).
- SCVURPPP will implement the revised approach to POC Loads monitoring (described in Section 5.1.3) which consists of the PCB and Mercury Opportunity Area Analysis, RMP stormwater characterization field study, and Guadalupe River contingency monitoring (MRP Provision C.8.d.e).
- SCVURPPP will continue to conduct long-term trends monitoring through the SPoT program (MRP Provision C.8.e).
- SCVURPPP will continue to encourage citizen monitoring (MRP Provision C.8.f).
- Results of WY2015 monitoring will be described in the Programs WY2015 Urban Creeks Monitoring Report that is due to the Water Board by March 15, 2016 (MRP Provision C.8.g).

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