Santa Clara Valley
Urban Runoff
Pollution Prevention Program

Watershed Monitoring and Assessment Program




Integrated Monitoring Report

Part C: Pesticides & Toxicity Monitoring Status Report

Water Years 2020 –2025 (October 2019 – September 2025)

Submitted in compliance with provisions C.8.h.iii.(3) and C.8.h.v of NPDES Permit No. CAS612008, Order No. R2-2022-018

March 31, 2026

EOA inc.

This report is submitted by the agencies participating in the

Santa Clara Valley
Urban Runoff
Pollution Prevention Program

City of Campbell	City of Milpitas	City of Santa Clara
City of Cupertino	City of Monte Sereno	City of Saratoga
City of Los Altos	City of Mountain View	City of Sunnyvale
Town of Los Altos Hills	City of Palo Alto	County of Santa Clara
Town of Los Gatos	City of San José	Valley Water

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ACCWP	Alameda Countywide Clean Water Program
BAMSC	Bay Area Municipal Stormwater Collaborative
BASMAA	Bay Area Stormwater Management Agency Association
BMP	Best Management Practice
CASQA	California Stormwater Quality Association
CCCWP	Contra Costa Clean Water Program
CEDEN	California Environmental Data Exchange Network
CWA	(Federal) Clean Water Act
DF	Detection Frequency
DPR	(California) Department of Pesticide Regulation
DQO	Data Quality Objective
FY	Fiscal Year
IMR	Integrated Monitoring Report
IPM	Integrated Pest Management
LCS	Laboratory Control Sample
LC50	Lethal Concentration 50
LID	Low Impact Development
MDL	Method Detection Limit
MPC	Monitoring and Pollutants of Concern
MQO	Measurement Quality Objectives
MRP	Municipal Regional Permit
MS/MSD	Matrix Spike/Matrix Spik Duplicate
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PEC	Probable Effects Concentrations
PM	Performance Metric
PRM	Pathogen Related Mortality
PUR	(California) Pesticide Use Reporting
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QAPrP	Quality Assurance Program Plan
QA/QC	Quality Assurance/Quality Control
RMC	Regional Monitoring Coalition
RPD	Relative Percent Difference
SCCWRP	Southern California Coastal Water Research Project
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program

SOP	Standard Operating Procedure
SPoT	Stream Pollution Trends Program
SSA	Solano Stormwater Alliance
SSID	Stressor/Source Identification
SURF	Surface Water Database
SWAMP	Surface Water Ambient Monitoring Program
SWPP	Surface Water Protection Program
TMDL	Total Maximum Daily Load
TEC	Threshold Effects Concentrations
TOC	Total Organic Carbon
TST	Test of Significant Toxicity
TU	Toxicity Unit
UCMR	Urban Creeks Monitoring Report
UPAs	Urban Pesticide Amendments
USEPA	United States Environmental Protection Agency
WQO	Water Quality Objective
WY	Water Year

1.0 INTRODUCTION

This *Integrated Monitoring Report (IMR) Part C: Pesticides & Toxicity Monitoring Status Report, Water Years[1] (WY) 2020-2025* was prepared by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP or Program). Along with other San Francisco Bay Area public agencies, SCVURPPP member agencies share a common National Pollutant Discharge Elimination System (NPDES) permit to discharge municipal stormwater to receiving water bodies, referred to as the Municipal Regional Permit (MRP).

The MRP was first adopted by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB or Regional Water Board) on October 14, 2009, as Order R2-2009-0074 (SFBRWQCB 2009; referred to as MRP 1.0), and was updated and reissued on November 19, 2015, as Order R2-2015-0049 (SFBRWQCB 2015; referred to as MRP 2.0). The current and third version of the MRP (i.e., MRP 3.0; SFBRWQCB 2022) was issued by the Regional Water Board as Order R2-2022-0018 and became effective July 1, 2022. The next iteration of the MRP (MRP 4.0) is anticipated to be adopted in July 2027.

This report fulfills the requirements of Provision C.8.h.iii.(3) and Provision C.8.h.v of MRP 3.0 for summarizing Pesticides & Toxicity monitoring accomplishments from the preceding water year (i.e., WY 2025) conducted in compliance with Provision C.8.g (Pesticides & Toxicity Monitoring) of the MRP[2]. Additionally, in compliance with Provision C.8.h.v, this report summarizes the methods and study designs; lessons learned; and data, results, analyses, and conclusions for all samples collected since the prior IMR (i.e., since WY 2019), as well as providing recommendations for changes to Provision C.8.g in future permits. All data covered here have also been submitted to the California Environmental Data Exchange Network (CEDEN). A budget summary of Provision C.8.g monitoring, also required per Provision C.8.h.v, has been submitted as a separate “Part E” of the IMR.

1.1 Monitoring Requirements

Toxicity testing provides a tool for assessing the toxic effects (acute and chronic) of all chemicals in samples of receiving waters or sediments, and allows the cumulative effect of the pollutants present in the sample to be evaluated. Because different test organisms are sensitive to different classes of chemicals and pollutants, toxicity testing is conducted using several different organisms. Sediment and water chemistry analysis for a variety of potential pollutants is conducted synoptically with toxicity testing to provide preliminary insight into the possible causes of toxicity should it be observed.

Pesticide and toxicity monitoring in urban creeks during wet and dry weather was required by both MRP 2.0 and MRP 3.0. There were slight differences between the two permits’ requirements, including eliminating the carbaryl analyses from MRP 3.0 and restructuring report contents. Monitoring requirements for WY 2020 – WY 2025 are summarized in the sections below.

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[1] Most hydrologic monitoring occurs for a period defined as a Water Year, which begins on October 1 and ends on September 30 of the named year. For example, Water Year 2025 (WY 2025) began on October 1, 2024 and concluded on September 30, 2025.

[2] Monitoring data collected pursuant to other C.8 provisions (e.g., LID Effectiveness Monitoring, Trash Monitoring, and Pollutants of Concern Monitoring), and a Budget Summary are reported in other Parts of the SCVURPPP Integrated Monitoring Reporting (IMR) series for WYs 2020-2025.

1.1.1 Dry Weather

Provision C.8.g of MRP 2.0 and MRP 3.0 required the Program to sample two stream sites each year during the dry season for toxicity and sediment chemistry analysis. The MRPs provided examples of possible monitoring location types, including sites with suspected or past toxicity results, existing bioassessment sites, or creek restoration sites. Dry weather monitoring includes:

- Toxicity testing in water using five species: *Ceriodaphnia* dubia (chronic survival and reproduction), *Pimephales promelas* (larval survival and growth), *Selenastrum capricornutum* (growth), *Hyalella azteca* (survival) and *Chironomus dilutus* (survival).
- Toxicity testing of bedded sediment using two species: *Hyalella azteca* (survival) and *Chironomus dilutus* (survival).
- Sediment chemistry analysis for pyrethroids (bifenthrin, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin), fipronil and its degradates (MRP 3.0 only; fipronil-sulfone, fipronil-desulfinyl, fipronil sulfide),[3] carbaryl (MRP 2.0 only), polycyclic aromatic hydrocarbons (PAHs), metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc), total organic carbon (TOC), and sediment grain size.

1.1.2 Wet Weather

Provision C.8.g.iii of MRP 2.0 and MRP 3.0 required Permittees to collect samples from the water column during storm events for toxicity and pesticide analysis. Sample locations must be representative of urban watersheds (i.e., bottom of watershed locations). Wet weather monitoring includes:

- Toxicity testing in water using five species: *Ceriodaphnia* dubia (chronic survival and reproduction), *Pimephales promelas* (larval survival and growth), *Selenastrum capricornutum* (growth), *Hyalella azteca* (survival) and *Chironomus dilutus* (survival).
- Water chemistry analysis for pyrethroids (bifenthrin, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin), fipronil and its degradates (MRP 3.0 only; fipronil-sulfone, fipronil-desulfinyl, fipronil sulfide), and imidacloprid[4].

Provision C.8.g.iii of MRP 2.0 and MRP 3.0 provided two options to determine the number of wet weather samples required. If Provision C.8.g.iii sampling is conducted by the Bay Area Municipal Stormwater Collaborative (BAMSC)[5] Regional Monitoring Coalition (RMC) on behalf of all MRP Permittees, a collective total of 10 wet weather samples is required, with a minimum of six samples collected by the end of the third water year of the permit term (i.e., WY 2018 for MRP 2.0 and WY 2024 for MRP 3.0). If Provision C.8.g.iii. sampling is conducted by SCVURPPP, at least two wet weather samples are required per year. RMC members agreed to

[3] Fipronil degrades via UV exposure, oxidation, and hydrolysis to form four principal degradates: fipronil desulfinyl, fipronil sulfide, fipronil sulfone, and fipronil amide. The degradates tend to be more stable and persistent than the parent compound; therefore, SCVURPPP added the first three of the degradates to the monitoring program in WY 2017.

[4] Imidacloprid had to be analyzed using a method that achieves a reporting level of 0.01 ppb.

[5] The BAMSC was organized by the Bay Area Stormwater Management Agencies Association (BASMAA) Board of Directors to continue the information sharing and permittee advocacy functions of BASMAA in an informal manner after BASMAA's dissolution in 2021.

collaborate on implementation of the wet weather monitoring requirements during both permit terms.

Wet weather water chemistry and toxicity monitoring was completed during WY 2018 (MRP 2.0 and WY 2023 (MRP 3.0). The WY 2018 wet weather monitoring event included three sites in Santa Clara County satisfying MRP 2.0 requirements. The WY 2018 data are reported in the WY 2018 Urban Creeks Monitoring Report (UCMR) (SCVURPPP 2019a) and the 2020 IMR (SCVURPPP 2020). The WY 2023 wet weather monitoring event included three sites in Santa Clara County (Stevens Creek, San Tomas Aquino Creek, and Guadalupe River) satisfying MRP 3.0 requirements (SCVURPPP 2024). The WY 2023 data are reported in the WY 2023 UCMR (SCVURPPP 2024) and summarized in this IMR.

1.2 Follow-up

Provision C.8.g.iv of MRP 2.0 required Permittees to identify a site as a candidate for a Stressor/Source Identification (SSID) study when analytical results indicated any of the following permit thresholds:

- A toxicity test of growth, reproduction, or survival of any test organism that is reported as "fail" in both the initial sampling and a second, follow-up sampling, and both have ≥ 50% Percent Effect;
- A pollutant is present at a concentration exceeding its water quality objective (WQO) in the Basin Plan; or
- For pollutants without WQOs, results exceed Probable Effects Concentrations (PECs) or Threshold Effects Concentrations (TECs) as defined in MacDonald et al. (2000).

The MRP 3.0 follow-up requirements do not require permittees to conduct SSID projects. However, Provision C.8.g.iv of MRP 3.0 does require Permittees to report samples that exceed the thresholds listed above in the next UCMR.

1.3 Regional Monitoring Coalition

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.[6] The RMC was originally formed in early 2010 as a collaboration among several Bay Area Stormwater Management Agencies Association (BASMAA) members and MRP Permittees[7] to develop and implement regionally coordinated water quality monitoring programs that improve stormwater management in the region and address water quality monitoring required by the MRP. The BAMSC took over coordination of the RMC in 2020 and the collaboration allows Permittees and the Regional Water Board to improve their ability to collectively answer core management questions in a cost-effective and scientifically rigorous way. Participation in the RMC is facilitated through the BAMSC Monitoring and Pollutants of Concern (MPC) Subcommittee.

The goals of the RMC are to:

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[6] Provision C.8.g of MRP 3.0 also encourages Permittees to collaborate with the California Department of Pesticide Regulation for data collection and analysis.

[7] The BAMSC RMC partners include SCVURPPP, Alameda Countywide Clean Water Program (ACCWP), Contra Costa Clean Water Program (CCCWP), San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), and the Solano Stormwater Alliance (SSA).

1. Assist Permittees in complying with requirements in provision C.8 (Water Quality Monitoring) of the MRP;
2. Develop and implement regionally consistent monitoring approaches and designs in the Bay Area, through the improved coordination among RMC participants and other agencies (e.g., Regional Water Board) that share common goals; and
3. Stabilize the costs of creek monitoring by reducing duplication of effort and streamlining reporting.

1.4 Reporting Requirements

Permittees are required to submit annual Pesticides & Toxicity Monitoring Status Reports no later than March 31 with each UCMR, reporting on all data collected during the foregoing water year. Provision C.8.h.iii.(3) requires that Pesticides & Toxicity Monitoring Status Reports include the information listed below.

(a) A complete Water Year Summary Table that lists the monitoring sites, with a row for each site. The table columns contain: Site ID; creek name; latitude; longitude; permittee jurisdiction(s); water column toxicity (acute); water column toxicity (chronic); sediment toxicity (acute); sediment toxicity (chronic); and sediment chemistry. For each site, list the site information and check the parameters sampled at that site.[8] *Provide a statement of the data quality and an analysis of the data, including:*

- *(i) Discuss monitoring data relative to prior conditions, beneficial uses and applicable water quality standards as described in the Basin Plan, Ocean Plan, and California Toxics Rule and other applicable water quality control plans;*
- *(ii) Where appropriate, develop hypotheses to investigate regarding pollutant sources, trends, and BMP effectiveness;*
- *(iii) Identify and prioritize water quality impairments;*
- *(iv) Identify and potential sources (and actual, if known) of water quality impairments, and provide sufficient justification for those potential sources;*
- *(v) Describe follow-up actions;*
- *(vi) evaluate the effectiveness of existing management actions; and*
- *(vii) identify additional management actions needed to address water quality impairments.*

In lieu of the WY 2025 UCMR detailed above, Permittees are required to submit a comprehensive Integrated Monitoring Report (IMR) no later than March 31, 2026. This IMR reports on all of the data collected since the previous IMR (i.e., WY 2020 – WY 2025), and includes the information listed below as required by provision C.8.h.v.

(1) The information described in Provisions C.8.h.iii. (1)-(3), pertaining to the monitoring data collected during the preceding (third) water year of the Permit term;

(2) A comprehensive analysis of all data collected pursuant to Provision C.8. since the previous Integrated Monitoring Report, and may include other pertinent studies

[8] The required information is provided in multiple tables to improve clarity.

(3) For POCs, methods, data, calculations, load estimates, and source estimates for each POC parameter, as applicable;

(4) A budget summary for each monitoring requirement (for each year of the Permit term); and

(5) With cause and justification, recommendations for changes to any of the elements of Provision C.8 in future Permit terms.

The remainder of this report presents the required reporting information since the last IMR was issued for WY 2014 – WY 2019 (SCVURPPP 2020) and includes Pesticides & Toxicity Monitoring actions conducted by the Program on behalf of all SCVURPPP Permittees.

2.0 METHODS

Water quality data were collected and reviewed in accordance with California Surface Water Ambient Monitoring Program (SWAMP) comparable methods and procedures described in the RMC Standard Operating Procedures (SOPs; BASMAA 2016) and the associated Quality Assurance Project Plan (QAPP; BASMAA 2020). These documents are updated as needed to optimize applicability. Where applicable, monitoring data were collected using methods comparable to those specified by the SWAMP Quality Assurance Program Plan (QAPrP)[9], and were submitted in SWAMP-compatible format to the Regional Water Board. The SOPs were developed using a standard format that describes health and safety cautions and considerations, relevant training, site selection, and sampling methods/procedures, including pre-fieldwork mobilization activities to prepare equipment, sample collection, and de-mobilization activities to preserve and transport samples.

2.1 Sample Collection

Water and sediment samples for pesticides and toxicity monitoring were collected in accordance with SWAMP-comparable methods and procedures described in the RMC SOPs (BASMAA 2016) and the associated QAPP (BASMAA 2020). Before sampling, field personnel conduct a qualitative assessment of the proposed sampling site to identify appropriate sampling locations. This is particularly necessary for sediment sampling, which requires the presence of fine-sediment depositional areas that can support at least five sub-sites within a 100-meter reach.

Water samples were collected using standard grab sampling methods. The required number of labeled bottles were filled and placed on ice to cool to < 6˚C. The laboratories were notified of the impending sampling delivery to meet sample hold times. Procedures used for sampling and transporting water samples are described in SOP FS-2 (BASMAA 2016).

Sediment samples were collected after water sample collection. Sediment samples were collected from the top 2 cm at each sub-site beginning at the downstream-most location and continuing upstream. Field staff walk in an upstream direction, carefully avoiding disturbance of sediment at collection sub-sites. Sediment samples were placed in a compositing container, thoroughly homogenized, and then aliquoted into separate jars for chemical or toxicological analysis using standard clean sampling techniques (see SOP FS-6, BASMAA 2016).

Samples were submitted to respective laboratories under RMC SOP FS-9 Chain of Custody procedures and field data sheets were reviewed per SOP FS-13 (BASMAA 2016).

2.2 Laboratory Analysis Methods

The RMC participants, including SCVURPPP, agreed to use the same laboratories for individual parameters, developed standards for contracting with the labs, and coordinated shared quality assurance samples. All samples collected by RMC participants were analyzed and reported per SWAMP-comparable methods as described in the QAPP (BASMAA 2020). Analytical laboratory methods, reporting limits, and holding times for chemical water quality parameters are also described in the QAPP. Analytical laboratory contractors in WY 2020 – WY 2025 included CalTest, Inc. (water and sediment chemistry) and Pacific EcoRisk, Inc. (water and sediment toxicity).

[9]The current SWAMP QAPrP is available at: https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/swamp-qaprp-2022.pdf

2.3 Data Evaluation

2.3.1 Water and Sediment Toxicity

Toxicity data evaluation required by MRP 2.0 and MRP 3.0 involves first assessing whether the samples are toxic to the test organisms relative to the laboratory control treatment via statistical comparison using the Test of Significant Toxicity (TST) statistical approach. For samples with toxicity (i.e., those that "failed" the TST), the Percent Effect is evaluated. The Percent Effect compares sample endpoints (survival, reproduction, growth) to the laboratory control endpoints. Both the statistical comparison (e.g., TST) and the comparison of the sample results to the laboratory control (e.g., Percent Effect) are determined by the laboratory. If a sample is reported as "fail" with ≥ 50% Percent Effect, a follow-up sample is collected. During MRP 2.0, if both the initial and follow-up sample are reported as "fail" with ≥ 50% Percent Effect, the site was added to the list of candidate SSID projects. During MRP 3.0, this scenario resulted in Regional Water Board notification in the next UCMR.

2.3.2 Water and Sediment Chemistry

Provision C.8.g.iv of MRP 2.0 and MRP 3.0 require that chemical pollutant data from water and sediment monitoring are compared to the corresponding WQOs from the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan; SFBRWQCB 2024) for each analyte sampled. During MRP 2.0, if concentrations in the samples exceeded the associated WQOs and thresholds, then the site at which the exceedances were observed was added to the list of candidate SSID projects. During MRP 3.0, any analytical results that exceed WQOs or permit thresholds must be listed in the subsequent UCMR. The Basin Plan, however, does not contain numeric WQOs for the chemical analytes that are required to be monitored as part of MRP Provision C.8.g.

For pollutants without WQOs, Provision C.8.g.iv of MRP 2.0 and MRP 3.0 require that monitoring data are compared to PECs and TECs as defined by MacDonald et al. (2000). PEC and TEC quotients are calculated as the ratio of the measured concentration to the respective PEC and TEC values from MacDonald et al. (2000). During MRP 2.0, all sites with results where a PEC or TEC quotient is equal to or greater than 1.0 were added to the list of candidate SSID projects. During MRP 3.0, these data are reported in the next UCMR.

The PECs and TECs are listed in MacDonald et al. (2000) for total PAHs, rather than the individual PAHs that are reported by the laboratory. Total PAH concentrations were calculated by summing the concentrations of the 25 individual PAHs that were measured by SCVURPPP. Concentrations equal to one-half of the respective laboratory method detection limits (MDLs) were substituted for non-detect data so that calculations and statistics could be computed. Therefore, some of the TEC and PEC quotients may be artificially elevated due to the method used to account for filling in non-detect data.

The TECs for bedded sediments are very conservative values that do not consider site specific background conditions and therefore may not be very useful in identifying real water quality concerns in receiving waters. All sites in Santa Clara County are likely to have at least one TEC quotient equal to or greater than 1.0. This is due to high levels of naturally occurring chromium and nickel in local ultramafic geologic formations (i.e., serpentinite) and soils. These conditions are considered when making decisions about follow-up investigations.

The MRPs do not specify follow-up actions for pyrethroid or fipronil sediment chemistry data, perhaps because pyrethroids are ubiquitous in the urban environment and little is known about fipronil distribution. However, SCVURPPP computed toxic unit (TU) equivalents for individual pyrethroid results based on available literature values for pyrethroids in sediment LC50 values.[10] Because organic carbon mitigates the toxicity of pyrethroid pesticides in sediments, the LC50 values were derived on the basis of TOC-normalized concentrations. Therefore, the pesticide concentrations as reported by the lab were divided by the measured TOC concentration at each site, and the TOC-normalized concentrations were then used to compute TU equivalents for each constituent. Concentrations equal to one-half of the respective laboratory MDLs were substituted for non-detect data so that these statistics could be computed, potentially resulting in artificially elevated results.

2.4 Statement of Data Quality

A comprehensive Quality Assurance/Quality Control (QA/QC) program was implemented by SCVURPPP covering all aspects of pesticides and toxicity monitoring. QA/QC procedures were implemented as specified in the RMC QAPP (BASMAA 2020) and monitoring was performed according to protocols specified in the RMC SOPs (BASMAA 2016). Both documents were adapted from the methods detailed in the SWAMP QAPrP. In accordance with the QAPP, data were assessed for seven data quality attributes: (1) Representativeness, (2) Comparability, (3) Completeness, (4) Sensitivity, (5) Contamination, (6) Accuracy, and (7) Precision. These seven attributes are compared to Data Quality Objectives (DQOs), which were established to ensure that data collected are of adequate quality and sufficient for the intended uses and are based on Measurement Quality Objectives (MQOs). DQOs address both quantitative and qualitative assessment of the acceptability of data – representativeness and comparability are qualitative while completeness, sensitivity, precision, accuracy, and contamination are quantitative assessments.

Overall, the results of the QA/QC review suggest that the pesticides and toxicity monitoring data generated during WY 2020 – WY 2025 were of sufficient quality for the purposes of this monitoring program. Some data were flagged in accordance with QA/QC protocols, and some were flagged by the QA Officer as questionable; however, no data were rejected. Details of the QA/QC review for SCVURPPP Pesticides & Toxicity monitoring conducted in WY 2025 are presented below; details from prior years were presented previously (SCVURPPP 2021, 2022, 2023, 2024, 2025a).

Toxicity

- For the first time in SCVURPPP monitoring history, water samples exhibited significant toxicity to *Selenastrum capricornutum* (green algae). Significant *S. capricornutum* toxicity was also observed at most other RMC sites for the July 22, 2025 sampling event. Significant toxicity to this test organism (i.e., failed TST), above or below Percent Effect thresholds for MRP resampling (i.e., 50%) or Water Board evaluation (i.e., 20%), is extremely rare in RMC dataset. With one exception (an ACCWP sample from WY 2014), the July 22, 2025 results are the only instances of significant *S. capricornutum* toxicity in the entire RMC dataset, which extends back to WY 2012 and includes wet weather and dry season samples. The widespread occurrence of toxicity across nearly all July 22, 2025 RMC samples suggests a potential issue related to laboratory protocols or sample collection containers rather than true water column toxicity. However, the Program's data validation process identified no exceedances of applicable DQOs for these samples. As a result, the QA Officer flagged the *S. capricornutum* results as "questionable data." The

[10] The LC50 is the concentration of a given chemical that is lethal on average to 50% of test organisms.

Stevens Creek sample exceeded the Percent Effect threshold for retesting; therefore, a follow-up sample was collected on September 16, 2025, and no significant *S. capricornutum* toxicity was observed.

- Toxicity samples for the test species *Pimephales promelas* (fathead minnow) from both sites were retested following evidence of Pathogen Related Mortality (PRM). Retesting was conducted using ambient water collected on July 22, 2025, with an increased number of replicates to minimize the potential for further pathogen transmission. Retest results indicated significant toxicity in the Stevens Creek growth test but with a Percent Effect below the MRP trigger threshold. No evidence of PRM was observed during retesting.

Sediment Chemistry

- Field duplicate data was collected by ACCWP and shared with the RMC. RPDs were above the DQOs for four analytes: small pebble grain size (52.6%), lambda-cyhalothrin (109%), fipronil sulfone (52.5%), and naphthalene (48.3%) (Table 2.1).
- Laboratory control sample (LCS) duplicate recoveries for three PAHs were flagged because they were outside of established control limits.
- Matrix spike/matrix spike duplicates (MS/MSDs) for fipronil and its associated degradates and for esfenvalerate/fenvalerate had recoveries out of DQOs and were flagged.

Table 2.1 Summary of Relative Percent Differences (RPDs) of field duplicate data collected by ACCWP on July 22, 2025. Exceedances of the RPD Data Quality Objectives (DQOs) are highlighted.

Analyte		Unit	Original	Duplicate	RPD (%)	Exceeds DQO? (<25%)
Grain Size Distribution	Clay: <0.0039 mm	%	21.4	20.8	2.8	No
	Silt: 0.0039 to <0.0625 mm	%	33	32.2	2.5	No
	Sand: V. Fine 0.0625 to <0.125 mm	%	12.4	12	3.3	No
	Sand: Fine 0.125 to <0.25 mm	%	11.7	12.4	5.8	No
	Sand: Medium 0.25 to <0.5 mm	%	12.7	13.2	3.9	No
	Sand: Coarse 0.5 to <1.0 mm	%	5.7	6.4	11.6	No
	Sand: V. Coarse 1.0 to <2.0 mm	%	3.1	3.1	0	No
	Granule: 2.0 to <4.0 mm	%	2.1	2.3	9.1	No
	Pebble: Small 4 to <8 mm	%	1.4	2.4	52.6	Yes
	Pebble: Medium 8 to <16 mm	%	0	0	NA	No
	Pebble: Large 16 to <32 mm	%	0	0	NA	No
	Pebble: V. Large 32 to <64 mm	%	0	0	NA	No
Metals	Arsenic	mg/Kg dw	4.9	4.8	2.1	No
	Cadmium	mg/Kg dw	0.36	0.37	2.7	No
	Chromium	mg/Kg dw	38	37	2.7	No
	Copper	mg/Kg dw	61	62	1.6	No
	Lead	mg/Kg dw	28	26	7.4	No
	Nickel	mg/Kg dw	38	38	0	No
	Zinc	mg/Kg dw	359	352	2	No
TOC	Total Organic Carbon	% dw	5.1	5.1	0	No
Pyrethroids (MQO <35%)	Bifenthrin	ng/g dw	9.6	10	4.1	No
	Cyfluthrin	ng/g dw	0.43	0.48	11	No
	Lambda-Cyhalothrin	ng/g dw	0.59	2	108.9	Yes
	Cypermethrin	ng/g dw	1.2	1.3	8	No
	Deltamethrin/Tralomethrin	ng/g dw	0	0	NA	No
	Esfenvalerate/Fenvalerate	ng/g dw	13	12	8	No
	Permethrin, Total	ng/g dw	6.6	7.1	7.3	No
Fipronil	Fipronil	ng/g dw	0	0	NA	No
	Fipronil Desulfinyl	ng/g dw	0	0.19	NA	No
	Fipronil Sulfide	ng/g dw	0	0.3	NA	No
	Fipronil Sulfone	ng/g dw	0.52	0.89	52.5	Yes
Polycyclic Aromatic Hydrocarbons	Acenaphthene	ng/g dw	0	0	NA	No
	Acenaphthylene	ng/g dw	0	0	NA	No
	Anthracene	ng/g dw	17	18	5.7	No
	Benz(a)anthracene	ng/g dw	0	0	NA	No
	Benzo(a)pyrene	ng/g dw	0	0	NA	No
	Benzo(b)fluoranthene	ng/g dw	0	0	NA	No
	Benzo(e)pyrene	ng/g dw	0	0	NA	No
	Benzo(g,h,i)perylene	ng/g dw	0	0	NA	No
	Benzo(k)fluoranthene	ng/g dw	0	0	NA	No
	Biphenyl	ng/g dw	0	0	NA	No
	Chrysene	ng/g dw	0	0	NA	No
	Dibenz(a,h)anthracene	ng/g dw	0	0	NA	No
	Dibenzothiophene	ng/g dw	0	0	NA	No
	Dimethylnaphthalene, 2,6-	ng/g dw	29	35	18.8	No
	Fluoranthene	ng/g dw	97	117	18.7	No
	Fluorene	ng/g dw	0	0	NA	No
	Indeno(1,2,3-c,d)pyrene	ng/g dw	0	0	NA	No
	Methylnaphthalene, 1-	ng/g dw	0	0	NA	No
	Methylnaphthalene, 2-	ng/g dw	0	0	NA	No
	Methylphenanthrene, 1-	ng/g dw	0	0	NA	No
	Naphthalene	ng/g dw	18	11	48.3	Yes
	Perylene	ng/g dw	0	0	NA	No
	Phenanthrene	ng/g dw	43	51	17	No
	Pyrene	ng/g dw	148	159	7.2	No
	Trimethylnaphthalene, 2,3,5-	ng/g dw	0	0	NA	No

3.0 RESULTS AND DISCUSSION

This section describes the results of toxicity testing, sediment chemistry, and pesticide monitoring (collectively referred to as pesticides and toxicity monitoring) conducted during the period from WY 2020 through WY 2025 in compliance with Provision C.8.g of MRP 2.0 and MRP 3.0. Historical data from WY 2016 through WY 2019 collected by SCVURPPP, as well as relevant pesticides and toxicity monitoring results from programs external to SCVURPPP, are also discussed.

From WY 2016 through WY 2025, dry weather water and sediment toxicity and sediment chemistry monitoring was conducted by SCVURPPP at two sites: Stevens Creek (37.4098, -122.0691) in the City of Mountain View, and San Tomas Aquino Creek (37.3886, -121.9685) in the City of Santa Clara (Figure 3.1). Stevens Creek was targeted due to past toxicity results. In 2010, Stevens Creek was added to the Clean Water Act (CWA) Section 303(d) list of impaired waterbodies due to toxicity in the water column, including toxicity to *H. azteca.* Although no data have recently been published, Regional Water Board staff is analyzing Stevens Creek toxicity to understand the impairment in preparation for development of a Total Maximum Daily Load (TMDL).[11] San Tomas Aquino Creek was targeted as a typical urban creek. Specific stations along the creeks were identified based on the likelihood that they would contain fine depositional sediments during dry season sampling and would be safe to access during wet weather sampling.

Wet weather sampling requirements were satisfied in WY 2023 for MRP 3.0 and in WY 2018 for MRP 2.0. During both years, wet weather water samples were taken from the Stevens Creek and San Tomas Aquino Creek dry weather monitoring sites, as well as a third site on a different creek (Calabazas Creek in WY 2018 and Guadalupe River in WY 2023; Figure 3.1). The Guadalupe River station (205GUATRM) was selected in coordination with the California Department of Pesticide Regulation's (DPR) Surface Water Protection Program (SWPP). This station is part of DPR's FY 2020-21 *Surface Water Monitoring for Pesticides in Urban Areas of Northern California* (Alvarado 2023). Coordination with the DPR provided the state agency with expanded storm monitoring capabilities.

Pesticide and toxicity monitoring results are described in the sections below. Conclusions are provided in Section 4.0.

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11 https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/stevenscktoxicity.html#:~:text=Stevens%20Creek%20was%20identified%20in,survival%2C%20growth%2C%20or%20reproduction

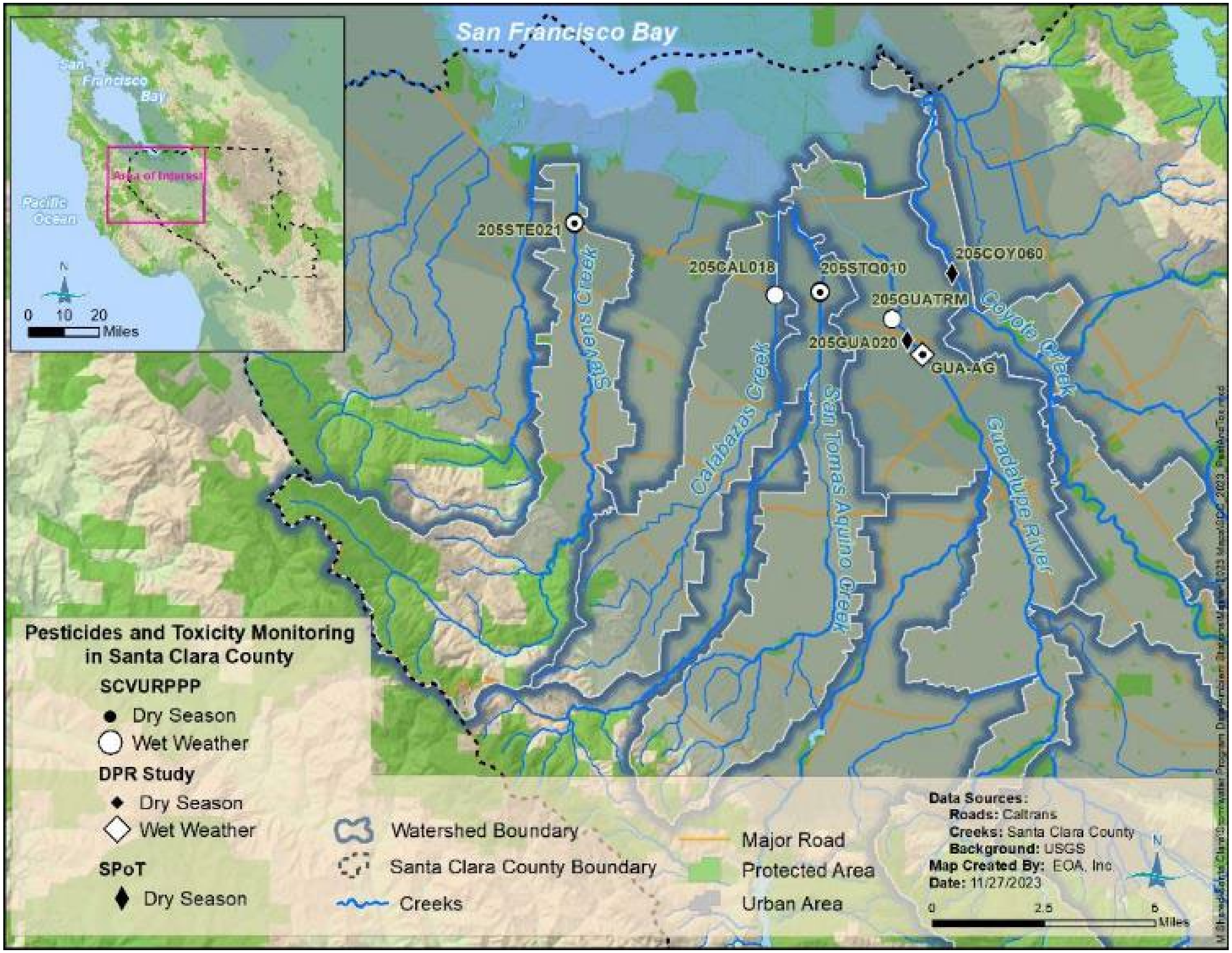

Figure 3.1 Pesticides and toxicity sampling stations in the Santa Clara Basin during WY 2016 through WY 2025.

3.1 Toxicity

3.1.1 WY 2025 Dry Weather Results

Table 3.1 summarizes toxicity testing results for water and sediment samples collected on July 22, 2025, as well as follow-up water samples collected on September 16, 2025. The July 22, 2025 sampling event was a regionally coordinated effort among RMC programs, during which shared sediment chemistry samples were collected by ACCWP. Dry-weather conditions were present during both the initial and follow-up sampling events. Follow-up sampling on September 16, 2025 consisted of water samples for *C. dubia* (reproduction) testing from San Tomas Aquino Creek, triggered by a failed TST with a 56 Percent Effect, and *S. capricornutum* (growth) testing from Stevens Creek, triggered by a failed TST with a 72 Percent Effect.[12]

- **San Tomas Aquino Creek (205STQ010).** Three of seven water toxicity endpoints and both sediment toxicity endpoints in the initial July 22, 2025 samples exhibited significant toxicity. The *C. dubia* (reproduction) test was the only endpoint with a Percent Effect exceeding the 50% MRP resampling trigger. The *C. dubia* result in the follow-up water sample, collected on September 16, 2025, remained significantly toxic, with a 20 Percent Effect (Table 3.1). The cause of the observed *C. dubia* toxicity in San Tomas Aquino Creek water samples is unknown and does not appear to be explained by the synoptic sediment chemistry results described in Section 3.2.1. However, bifenthrin, cyfluthrin, permethrin, and lambda-cyhalothrin were detected at quantifiable concentrations. Additional discussion of *C. dubia* toxicity is provided below. Samples were collected from the right bank of the creek, just upstream of Mission College Boulevard (Figure 3.2).
- **Stevens Creek (205STE021).** Four of the seven water toxicity endpoints and neither of the two sediment endpoints in the initial July 22, 2025 samples exhibited significant toxicity. The *S. capricornutum* (growth) test was the only endpoint with a Percent Effect exceeding the 50% MRP resampling trigger. The cause of the *S. capricornutum* toxicity is unknown and the results were flagged as “questionable data” by the QA Officer (see Section 2.4 for additional information). The resampled *S. capricornutum* test did not exhibit significant toxicity (Table 3.1). The sample station was accessed via the Stevens Creek Trail, north of Highway 101 on the creek’s left bank (Figure 3.3).

[12] The July 22, 2025 *S. capricornutum* results were flagged as “questionable data” by the for QA Officer; see Section 2.4 for additional information.

Figure 3.2 From left: San Tomas Aquino Creek (205STQ010), downstream view and upstream view on July 22, 2025. Third from left: Resample of 205STQ010, downstream view and upstream view on September 16, 2025 (Photo credit: Integral).

Figure 3.3 From left: Stevens Creek (205STE021), downstream view and upstream view on July 22, 2025. Third from left: Resample of 205STE021, downstream view and upstream view on September 16, 2025 (Photo credit: Integral).

Table 3.1 Summary of SCVURPPP dry weather toxicity results for WY 2025. Highlighted cells indicate significant toxicity; bold cells indicate a Percent Effect ≥50%.

Site	Organism	Test Type	Unit	Results		% Effect	TST Value	Follow up needed (TST "Fail" and ≥50%)
				Lab Control	Organism Test			
205STQ010 San Tomas Aquino Creek July 22, 2025	**Water**							
	Ceriodaphnia dubia	Survival	%	90	90	0%	NA[a] (Pass)	No
		Reproduction	Num/Rep	30	13	**56%**	**Fail**	**Yes**
	Pimephales promelas [d]	Survival	%	95	98	-3%	Pass	No
		Growth	mg/ind	0.45	0.44	3%	Pass	No
	Chironomus dilutus	Survival	%	100	88	13%	Fail	No
	Hyalella azteca	Survival	%	94	98	-4%	Pass	No
	Selenastrum capricornutum [e]	Growth	cells/ml	2175000	1315000	40%	Fail	No
	Sediment							
	Chironomus dilutus	Survival	%	86	70	19%	Fail	No
	Hyalella azteca	Survival	%	95	55	42%	Fail	No
205STE021 Stevens Creek July 22, 2025	**Water**							
	Ceriodaphnia dubia	Survival	%	90	90	0%	NA[a] (Pass)	No
		Reproduction	Num/Rep	30	17	44%	Fail	No
	Pimephales promelas [d]	Survival	%	95	83	13%	Pass	No
		Growth	mg/ind	0.45	0.39	15%	Fail	No
	Chironomus dilutus	Survival	%	100	93	8%	Pass	No
	Hyalella azteca [b]	Survival	%	94	74	21%	Fail	No
	Selenastrum capricornutum [e]	Growth	cells/ml	2175000	612500	**72%**	**Fail**	**Yes**
	Sediment							
	Chironomus dilutus	Survival	%	86	80	7%	Pass	No
	Hyalella azteca	Survival	%	95	88	8%	Pass	No
205STQ010 San Tomas Aquino Creek September 16, 2025	**Water**							
	Ceriodaphnia dubia [c]	Reproduction	Num/Rep	35	28	20%	Fail	No
205STE021 Stevens Creek September 16, 2025	**Water**							
	Selenastrum capricornutum	Growth	cells/ml	2245000	2360000	-5%	Pass	No

[a] TST analysis is not performed for survival endpoint - a percent effect <25% is considered a "Pass", and a percent effect ≥25% is considered a "Fail."
[b] One organism went missing during maintenance; nine organisms used for stats for replicates C and D.
[c] Replicate J was excluded from reproduction analysis due to at least 50% of all "J" replicates in the test being loaded with male organisms; 9 replicates used in stats. Adult in replicate J was male and excluded from reproduction analysis; 9 replicates used in statistics.
[d] Pathogen Related Mortality observed in both samples collected on July 22. Follow-up testing included increasing replicates to prevent contamination.
[e] July 22 *S. capricornutum* results flagged as “questionable data” by QA Officer.

3.1.2 WY 2016 – WY 2025 Results Summary

Toxicity results from water and sediment samples collected in compliance with MRP 2.0 and MRP 3.0 from WY 2016 through WY 2025 are summarized in Table 3.2. These data include annual dry season samples, wet weather samples from WY 2018 and WY 2023, and fourteen follow-up samples. Details of the toxicity tests conducted in WY 2025 are presented in Section 3.1.1, while results from toxicity tests conducted in WY 2016 through WY 2024 are documented in prior reports (SCVURPPP 2017, 2018, 2019a, 2020, 2021, 2022, 2023, 2024, 2025a).

From WY 2016 through WY 2025, three sediment endpoints and 11 water endpoints from dry season samples exhibited significant toxicity relative to the laboratory control, with a Percent Effect exceeding the MRP resampling criteria of 50% (see Section 2.3.1 for a description of toxicity data evaluation). Among retested dry season samples, approximately 25% exhibited significant toxicity, while 17% exhibited both significant toxicity *and* a Percent Effect greater than 50%. In addition, 25 out of 180 initial dry season sample test results exhibited significant toxicity but did not exceed the MRP resampling trigger of 50%.

In WY 2018 and WY 2023, three water endpoints from wet weather samples exhibited significant toxicity relative to the laboratory control, with a Percent Effect exceeding the MRP resampling criteria of 50%. Two of the three retests exhibited significant toxicity but did not exceed the MRP resampling trigger of 50%.

Review of the 10-year toxicity summary in Table 3.2 indicates the following:

- **H. azteca.** Toxicity to *H. azteca*, a test organism known to be sensitive to pyrethroid pesticides, was observed in dry season sediment samples from San Tomas Aquino Creek in WY 2022, WY 2023, and WY 2025, as well as in a dry season water sample from Stevens Creek in WY 2025. None of these dry season samples exceeded the MRP trigger for resampling. In wet weather samples, significant toxicity was observed in four of six water samples, with retesting required for three samples (San Tomas Aquino Creek and Calabazas Creek in WY 2018 and Guadalupe River in WY 2023). Retesting of these wet weather water samples resulted in significant toxicity with Percent Effect values below 50%, except for the WY 2018 San Tomas Aquino Creek retest, which did not exhibit significant toxicity (Table 3.2).

  Pyrethroid pesticides tend to accumulate in sediment, and concentrations measured in sediment samples collected synoptically with dry-season toxicity samples (summarized for WY 2016–WY 2025 in Table 3.7) occasionally approached or exceeded levels of concern (i.e., a toxic unit [TU] equivalent of 1.0). Specifically, the sum of pyrethroid TUs exceeded 1.0 in a San Tomas Aquino Creek sample in WY 2022 and in Stevens Creek samples in WY 2016 and WY 2020. However, long-term monitoring conducted by the Stream Pollution Trends (SPoT) program indicates that pyrethroid concentrations in sediment have generally decreased since WY 2012 (SCVURPPP 2019b). It remains unclear whether the *H. azteca* toxicity observed in SCVURPPP samples is directly attributable to pyrethroids or to other toxic constituents present in the creeks. Notably, SCVURPPP did not observe sediment toxicity in Stevens Creek during WY 2016 through WY 2025 (Table 3.2).

- ***C. dilutus.*** Toxicity to *C. dilutus*, a test organism known to be sensitive to neonicotinoids (e.g., imidacloprid) and fipronil, was observed in six dry season sediment samples, all from San Tomas Aquino Creek. Three of these samples required retesting: WY 2019, WY 2021, and WY 2022.[13] Of the two retests conducted, one exhibited significant toxicity (WY 2022), but it was below the MRP trigger of 50%. Toxicity to *C. dilutus* was observed in six dry season water samples, three from San Tomas Aquino Creek (WY 2017, WY 2020, WY 2025) and three from Stevens Creek (WY 2018, WY 2019, WY 2023); however, none had a Percent Effect value exceeding the MRP trigger. Toxicity to *C. dilutus* was not observed in any of the six wet weather water samples collected in WY 2018 and WY 2023. Although fipronil and its degradates are rarely detected in synoptic sediment chemistry samples, it appears plausible that the water quality impacts associated with pyrethroid pesticides may be decreasing, while impacts associated with their replacements (i.e., neonicotinoids) may be increasing as these types of pesticides have gained market share.

- ***C. dubia* (reproduction).** The test organism, *C. dubia*, is a freshwater cladoceran or "water flea" that is highly sensitive to diazinon, a pesticide that has been phased out in urban areas. Toxicity to *C. dubia* was not observed in any wet weather samples. However, of the 32 dry season water samples with observed significant toxicity (including retests), over half (n=19) were attributable to *C. dubia* reproduction toxicity (San Tomas Aquino Creek = 9, Stevens Creek = 10). Six of these 19 samples exhibited Percent Effect values exceeding the MRP trigger of 50%. The specific cause of the chronic *C. dubia* toxicity in San Tomas Aquino and Stevens Creeks is unknown and does not appear to be explained by synoptic sediment chemistry results.

  Statewide, unexplained chronic *C. dubia* toxicity has been reported, along with within- and between-laboratory variability in toxicity magnitude and concerns regarding false-positive results. An evaluation conducted by SWAMP in conjunction with the Statewide Toxicity Provisions adopted by the State Water Resources Control Board on December 1, 2020 (Resolution No. 2020-0044) indicated that variability in *C. dubia* toxicity results may be associated with inconsistencies in laboratory QA procedures. In response, the State Water Resources Control Board requested a nearly three-year special study conducted by the Southern California Coastal Water Research Project (SCCWRP), which was completed in September 2023 (Brent et al. 2023). This study evaluated sources and levels of variability in laboratory *C. dubia* toxicity testing and provided recommendations for regulators, regulated entities, and laboratories to improve data quality and inform future toxicity provisions.

  The SCCWRP study identified numerous factors that may influence *C. dubia* toxicity test results. Laboratory evaluations and interlaboratory comparisons demonstrated that testing procedures varied substantially among laboratories, with no two laboratories conducting *C. dubia* toxicity tests in the same manner (Brent et al. 2023). Observed differences included, but were not limited to, dilution water preparation, food sources, feeding methods, test chamber design, test volumes, light intensity, and organism health assessments. The study recommended guidance for laboratory best practices, accreditation, and training, while also identifying constraints that limit the interpretation of certain findings. Overall, the primary concern identified by the study was laboratory performance rather than the toxicity test method itself.

  Robertson-Bryan, Inc. (2025) evaluated the five Performance Metrics (PMs) recommended by Brent et al. (2023): control survival, control reproduction, coefficient of variation for reproduction, percent minimum significant difference, and reference toxicant

[13] Due to a transcription error, the WY 2019 retest was inadvertently skipped. However, the same site was sampled for this toxicity endpoint in WY 2020.

point estimates for reproduction. Of the 12 state-accredited laboratories included in the study, six were categorized as "below expectations" with 17 of 52 (33%) control water blank samples failing the TST, and two labs were categorized as "meets expectations" with 3 of 18 (17%) control water blank samples failing the TST. These results indicate that false positive responses are relatively common for the *C. dubia* reproduction endpoint. The study recommends that laboratories routinely document PM data and assessment results as part of internal quality assurance activities and continually work toward improved performance.

In addition, in preparation for reissuance of the SWAMP QAPrP in 2013, the SWAMP Toxicity Work Group examined conductivity tolerance in freshwater toxicity test species with respect to the relationship between sample water conductivity and observed toxicity. The evaluation determined that *C. dubia* survival and reproduction may be negatively affected at both high and low conductivities (SWAMP 2013). The SWAMP Toxicity Work Group (2013) recommended the use of "appropriate controls" when sample water conductivity exceeds 1,900 µS/cm or is less than 100 µS/cm, because *C. dubia* test organisms cultured under standard laboratory conditions (e.g., 310 to 360 µS/cm) may experience mortality or reduced reproduction when exposed to such waters. In consideration of these findings, SCVURPPP evaluated conductivity measurements from toxicity monitoring samples collected between WY 2012 and WY 2020 and compared them to laboratory control water conductivities and associated test results. In nearly all cases, sample water conductivity differed from laboratory control water by several hundred µS/cm (mean difference of approximately 433 µS/cm). However, no correlation was identified between *C. dubia* toxicity results and differences in conductivity between sample and laboratory control waters.

Table 3.2 Toxicity test result summary, WY 2016 – WY 2025. The Percent Effect is indicated for test results with toxicity relative to the lab control. Test results with toxicity exceeding the MRP threshold of 50 Percent Effect are highlighted.

Station ID	Creek	Date	Water Year	Season	Sediment		Water						
					C. dilutus	H. azteca	C. dubia		P. promelas		C. dilutus	H. azteca	S. capricornutum
					Survival	Survival	Survival	Reproduction	Survival	Growth	Survival	Survival	Growth
San Tomas Aquino Creek Dry Season Samples													
205STQ010	San Tomas Aquino Cr	7/11/2016	WY 2016	Dry	**Yes** (18%)	No	No	No	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	7/13/2017	WY 2017	Dry	No	No	No	**Yes** (30%)	No	No	**Yes** (11%)	No	No
205STQ010	San Tomas Aquino Cr	7/17/2018	WY 2018	Dry	No	No	No	No	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	7/23/2019	WY 2019	Dry	**Yes (56%)**	No	No	**Yes** (31%)	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	8/28/2019	WY 2019	Dry [a]	No	--	No	--	--	--	--	--	--
205STQ010	San Tomas Aquino Cr	7/22/2020	WY 2020	Dry	No	No	No	**Yes (67%)**	No	No	**Yes** (31%)	No	No
205STQ010	San Tomas Aquino Cr	9/9/2020	WY 2020	Dry [a]	--	--	--	No	--	--	--	--	--
205STQ010	San Tomas Aquino Cr	6/23/2021	WY 2021	Dry	**Yes (57%)**	No	No	**Yes** (45%)	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	8/18/2021	WY 2021	Dry [a]	--	--	No	No	--	--	--	--	--
205STQ010	San Tomas Aquino Cr	7/12/2022	WY 2022	Dry	**Yes (100%)**	**Yes** (47%)	No	No	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	9/6/2022	WY 2022	Dry [a]	**Yes** (25%)	--	--	--	--	--	--	--	--
205STQ010	San Tomas Aquino Cr	7/18/2023	WY 2023	Dry	**Yes** (47%)	**Yes** (41%)	No	**Yes** (44%)	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	7/9/2024	WY 2024	Dry	No	No	No	**Yes (56%)**	No	No	No	No	No
205STQ010	San Tomas Aquino Cr	9/18/2024	WY 2024	Dry [a]	--	--	--	**Yes (58%)**	--	--	--	--	--
205STQ010	San Tomas Aquino Cr	7/22/2025	WY 2025	Dry	**Yes** (19%)	**Yes** (42%)	No	**Yes (56%)**	No	No	**Yes** (13%)	No	**Yes** (40%) [c]
205STQ010	San Tomas Aquino Cr	9/16/2025	WY 2025	Dry [a]	--	--	--	**Yes** (20%)	--	--	--	--	--
Stevens Creek Dry Season Samples													
205STE021	Stevens Cr	7/11/2016	WY 2016	Dry	No	No	No	No	**Yes** (27%)	No	No	No	No
205STE021	Stevens Cr	7/13/2017	WY 2017	Dry	No	No	No	**Yes (80%)**	No	No	No	No	No
205STE021	Stevens Cr	8/15/2017	WY 2017	Dry [a]	--	--	No	No	--	--	--	--	--
205STE021	Stevens Cr	7/17/2018	WY 2018	Dry	No	No	No	No	No	No	**Yes** (24%)	No	No
205STE021	Stevens Cr	7/23/2019	WY 2019	Dry	No	No	No	**Yes (73%)**	No	No	**Yes** (18%)	No	No
205STE021	Stevens Cr	9/18/2019	WY 2019	Dry [a]	--	--	No	**Yes** (47%)	--	--	--	--	--
205STE021	Stevens Cr	7/22/2020	WY 2020	Dry	No	No	**Yes** (30%)	**Yes (79%)**	No	No	No	No	No
205STE021	Stevens Cr	9/9/2020	WY 2020	Dry [a]	--	--	--	No	--	--	--	--	--
205STE021	Stevens Cr	6/23/2021	WY 2021	Dry	No	No	**Yes** (40%)	**Yes (57%)**	No	No	No	No	No
205STE021	Stevens Cr	8/18/2021	WY 2021	Dry [a]	No	--	--	NA [b]	--	--	--	--	--
205STE021	Stevens Cr	7/12/2022	WY 2022	Dry	No	No	No	**Yes** (24%)	No	No	No	No	No
205STE021	Stevens Cr	7/18/2023	WY 2023	Dry	No	No	No	**Yes (57%)**	No	No	**Yes** (13%)	No	No
205STE021	Stevens Cr	9/11/2023	WY 2023	Dry [a]	--	--	--	**Yes (54%)**	--	--	--	--	--
205STE021	Stevens Cr	7/9/2024	WY 2024	Dry	No	No	No	**Yes** (41%)	No	No	No	No	No
205STE021	Stevens Cr	7/22/2025	WY 2025	Dry	No	No	No	**Yes** (44%)	No	**Yes** (15%)	No	**Yes** (21%)	**Yes** (72%) [c]
205STE021	Stevens Cr	9/16/2025	WY 2025	Dry [a]	--	--	--	--	--	--	--	--	No
Wet Weather Samples													
205STQ010	San Tomas Aquino Cr	1/8/2018	WY 2018	Wet	--	--	No	No	No	No	No	**Yes (56%)**	No
205STQ010	San Tomas Aquino Cr	3/1/2018	WY 2018	Wet [a]	--	--	No	--	--	--	--	No	--
205STQ010	San Tomas Aquino Cr	11/8/2022	WY 2023	Wet	--	--	No	No	No	No	No	No	No
205STE021	Stevens Cr	1/8/2018	WY 2018	Wet	--	--	No	No	No	No	No	**Yes** (28%)	No
205STE021	Stevens Cr	11/8/2022	WY 2023	Wet	--	--	No	No	No	No	No	No	No
205CAL018	Calabazas Cr	1/18/2018	WY 2018	Wet	--	--	No	No	No	No	No	**Yes (60%)**	No
205CAL018	Calabazas Cr	3/1/2018	WY 2018	Wet [a]	--	--	--	--	--	--	--	**Yes** (12%)	--
205GUATRM	Guadalupe River	11/8/2022	WY 2023	Wet	--	--	No	No	No	No	No	**Yes (63%)**	No
205GUATRM	Guadalupe River	1/10/2023	WY 2023	Wet [a]	--	--	--	--	--	--	--	**Yes** (40%)	--

[a] Resample. [b] Laboratory error. [c] Flagged as “questionable data” by QA Officer.

3.2 Sediment Chemistry

3.2.1 WY 2025 Results

Sediment chemistry results from WY 2025 were evaluated using TEC and PEC quotients. In addition, toxicity unit (TU) equivalents for pyrethroids and fipronil were evaluated to inform stormwater management. See Section 2.3.2 for a description of chemistry data evaluation.

Table 3.3 presents metals and PAH concentrations and corresponding TEC quotients for sediment samples collected on July 22, 2025, from Stevens Creek and San Tomas Aquino Creek. TEC quotients were calculated as the measured concentration divided by the TEC value, consistent with MacDonald et al. (2000).[14] The TECs are extremely conservative and are intended to identify concentrations below which harmful effects on sediment-dwelling organisms are unlikely to be observed.

At both sites, at least three constituents had TEC quotients greater than 1.0 (Table 3.3), including chromium, nickel, and copper. Zinc also exceeded the TEC in San Tomas Aquino Creek. Elevated nickel and chromium concentrations are commonly observed in watersheds draining serpentine and other ultramafic geologic formations, which are prevalent in Santa Clara County. Accordingly, exceedances of the chromium and nickel TECs at both sites are not unexpected and are consistent with regional background conditions. Concentrations of chromium and nickel observed in WY 2025 were comparable to those reported in previous monitoring years (SCVURPPP 2024).

Zinc concentrations in WY 2025 samples were also similar to those measured in prior years. While zinc can occur naturally in ultramafic geologic formations, it may also originate from anthropogenic sources such as urban runoff.

Table 3.3 Threshold Effect Concentration (TEC) quotients for WY 2025 sediment chemistry constituents. Highlighted and bolded values indicate TEC quotient ≥ 1.0.

	TEC	205STE021			205STQ010		
		Stevens Creek			San Tomas Aquino Creek		
Metals (mg/kg DW)		**Concentration**	**Quotient**		**Concentration**	**Quotient**	
Arsenic	9.79	2.60	0.27		2.70	0.28	
Cadmium	0.99	0.30	0.30		0.32	0.32	
Chromium	43.40	65	**1.50**		44	**1.01**	
Copper	31.60	36	**1.14**		48	**1.52**	
Lead	35.80	18	0.50		18	0.50	
Nickel	22.70	64	**2.82**		45	**1.98**	
Zinc	121	116	0.96		186	**1.54**	
PAHs (ug/kg DW)							
Total PAHs	1,610	1034	0.64	a,b	239	0.15	a
# Constituents with TEC quotient ≥ 1.0		**3**			**4**		

[a] Concentration was below the method detection limit (MDL) for most PAHs. TEC quotient calculated using 1/2 MDL.
[b] TEC quotient calculated using some estimated concentrations below the reporting limit but above the MDL (J-flagged).

Table 3.4 presents metals and PAH concentrations and corresponding PEC quotients for sediment samples collected on July 22, 2025. The PECs are intended to identify concentrations

[14] MacDonald et al. (2000) does not provide TEC or PEC values for pyrethroids or fipronil. Pesticides are compared to LC50 values in Table 3.6.

above which toxicity to benthic-dwelling organisms are predicted to be probable. Only one constituent had a PEC quotient greater than 1.0: nickel in Stevens Creek, with a PEC quotient of 1.32 (Table 3.4). Nickel is an abundant metal in local serpentine soils, and this result is consistent with PEC exceedances observed in previous SCVURPPP sediment monitoring.

Table 3.4 Probable Effect Concentration (PEC) quotients for WY 2025 sediment chemistry constituents. Bolded values indicate PEC quotient ≥ 1.0.

	PEC	205STE021			205STQ010		
		Stevens Creek			San Tomas Aquino Creek		
Metals (mg/kg DW)		**Concentration**	**Quotient**		**Concentration**	**Quotient**	
Arsenic	33.0	2.60	0.08		2.70	0.08	
Cadmium	4.98	0.30	0.06		0.32	0.06	
Chromium	111	65	0.59		44	0.40	
Copper	149	36	0.24		48	0.32	
Lead	128	18	0.14		18	0.14	
Nickel	48.6	64	**1.32**		45	0.93	
Zinc	459	116	0.25		186	0.41	
PAHs (ug/kg DW)							
Total PAHs	22,800	1034	0.0454	a,b	239	0.0105	a
# Constituents with TEC quotient ≥ 1.0		**1**			**0**		

[a] Concentration was below the method detection limit (MDL) for most PAHs. PEC quotient calculated using 1/2 MDL.
[b] PEC quotient calculated using some estimated concentrations below the reporting limit but above the MDL (J-flagged).

Table 3.5 presents pesticide concentrations, TOC-normalized concentrations, published LC50 values, and corresponding TU equivalents for sediment samples collected on July 22, 2025, from San Tomas Aquino Creek and Stevens Creek. Many pyrethroids and all analyzed fipronil species were not detected above the MDL concentration. For these constituents, the TU equivalents were calculated using ½ the MDL concentration. Three pyrethroids in the San Tomas Aquino Creek sample and two in the Stevens Creek sample were detected at concentrations above the MDL but below the reporting limit and are reported as estimated (J-flagged) values. The TU equivalents for these constituents were calculated using the estimated concentrations.

No individual constituent had a TU equivalent exceeding 1.0. In addition, the sum of all pyrethroid TUs was below 1.0 at both sites (approximately 0.3 for Stevens Creek and 0.6 for San Tomas Aquino Creek). The highest individual TU equivalents were associated bifenthrin in Stevens Creek (0.12) and San Tomas Aquino Creek (0.34). Bifenthrin has been identified as the leading cause of pyrethroid-related toxicity in urban environments (Ruby 2013) and is the most frequently detected insecticide monitored by the DPR's SWPP (Alvarado and McClanahan 2024; see Section 3.4.1). These results indicate that, although pyrethroids (including bifenthrin) were present in the targeted creeks, concentrations were below levels of concern in WY 2025.

Table 3.5 Pesticide concentrations and calculated toxic unit (TU) equivalents, July 22, 2025.

			205STE021 Stevens Creek				205STQ010 San Tomas Aquino Creek			
	Unit	LC50	Concentration		Normalized to TOC	TU Equivalent	Concentration		Normalized to TOC	TU Equivalent
Total Organic Carbon	%	NA	3.1		NA	NA	3.8		NA	NA
Pyrethroid										
Bifenthrin	µg/g dw	0.52	0.0020		0.0645	0.1241	0.0067		0.1763	0.3391
Cyfluthrin, total		1.08	0.0024		0.0774	0.0717	0.0014		0.0368	0.0341
Cypermethrin, total		0.38	0.0003	b	0.0081	0.0212	0.0009	b	0.0239	0.0630
Deltamethrin/Tralomethrin		0.79	0.0001	a	0.0032	0.0041	0.0007	b	0.0184	0.0233
Esfenvalerate/Fenvalerate, total		1.54	0.0002	a	0.0065	0.0042	0.0007	b	0.0184	0.0120
Cyhalothrin, Total lambda-		0.45	0.00060	b	0.0194	0.0430	0.0016		0.0421	0.0936
Permethrin, Total		10.83	0.0039	a	0.1258	0.0116	0.0033		0.0868	0.0080
Sum of TU Equivalents						**0.28**	Sum of TU Equivalents			**0.57**
Other MRP Pesticides of Concern										
Fipronil	ng/g dw	306	0.0650	a	2.0968	0.0069	0.0700	a	1.8421	0.0060
Fipronil Desulfinyl		NA [c]	0.0850	a	2.7419	NA	0.0900	a	2.3684	NA
Fipronil Sulfide		435	0.0850	a	2.7419	0.0063	0.0900	a	2.3684	0.0054
Fipronil Sulfone		158	0.2150	a	6.9355	0.0439	0.2300	a	6.0526	0.0383

[a] Concentration was below the method detection limit (MDL). TU equivalents calculated using 1/2 MDL.

[b] TU equivalent calculated from estimated concentration below the reporting limit but above the MDL (J-flagged).

[c] No available LC50 value for Fipronil Desulfinyl.

In accordance with the MRP, grain size analyses were conducted on both WY 2025 sediment samples (Table 3.6). The Stevens Creek sample consisted of 29.7% fines (i.e., 12% clay and 17.7% silt). The San Tomas Aquino Creek sample consisted of 59.5% fines (i.e., 15.2% clay and 44.3% silt).

Table 3.6 Summary of grain size for the two locations sampled in Santa Clara County during WY 2025.

Grain Size (%)		205STE021	205STQ010
		Stevens Creek	San Tomas Aquino Creek
Clay	<0.0039 mm	12.0%	15.2%
Silt	0.0039 to <0.0625 mm	17.7%	44.3%
Sand	V. Fine 0.0625 to <0.125 mm	12.3%	11.3%
	Fine 0.125 to <0.25 mm	21.0%	9.9%
	Medium 0.25 to <0.5 mm	22.7%	12.4%
	Coarse 0.5 to <1.0 mm	9%	4.1%
	V. Coarse 1.0 to <2.0 mm	5.1%	2.9%
Granule	2.0 to <4.0 mm	3.7%	3.1%
Pebble	Small 4 to <8 mm	1.6%	2.7%
	Medium 8 to <16 mm	0%	0.0%
	Large 16 to <32 mm	0%	0%
	V. Large 32 to <64 mm	0%	0%

Note: Sum of grain size values for both sites is greater than 100% due to the laboratory analytical methods used.

3.2.2 WY 2016 – WY 2025 Summary

PEC and TEC Quotients

From WY 2016 to WY 2025, no sediment samples had PEC quotients (i.e., the less conservative of the two sediment chemistry evaluation criteria) greater than 1.0 for any analyte other than chromium and nickel. Chromium and nickel are excluded from this PEC and TEC evaluation because their concentrations are primarily influenced by naturally occurring serpentine formations that are prevalent in the monitored watersheds.

Excluding chromium and nickel, there were 10 samples in the WY 2016 - WY 2025 dataset with TEC quotients ≥ 1.0, the more conservative sediment chemistry evaluation criterion. Constituents and locations with TEC quotients ≥ 1.0 were as follows:

- Total PAHs in Stevens Creek during WYs 2017 and 2018;
- Zinc in Stevens Creek and San Tomas Aquino Creek during WY 2020;
- Copper in Stevens Creek and San Tomas Aquino Creek during WYs 2020, 2022, and 2025;
- Lead and copper in Stevens Creek during WY 2023; and
- Zinc in San Tomas Aquino Creek during WYs 2024 and 2025.

TU Equivalents

Table 3.7 summarizes published LC50 values and corresponding TU equivalents for sediment samples collected from San Tomas Aquino Creek and Stevens Creek during WY 2016 through WY 2025. For readability, TU equivalents are not shown for individual pesticides reported as non-detect; however, these values are included in the sum-of-pyrethroids TU equivalents and were calculated using ½ the MDL concentration. For constituents reported as estimated (J-flagged), TU equivalents were calculated using the estimated concentrations.

Carbaryl, fipronil desulfinyl, and fipronil sulfide have not been detected in any sample during the monitoring period.[15] Fipronil was detected in both creeks during WY 2016 at estimated (J-flagged) concentrations that were well below the LC50. In WY 2020, fipronil sulfone was detected in the San Tomas Aquino Creek sample at a quantifiable concentration, resulting in a TU equivalent of 0.12.

Sum-of-pyrethroids TU equivalents were similar between the two creeks, ranging from 0.22 (WY 2017) to 1.70 (WY 2022) in San Tomas Aquino Creek and from 0.11 (WY 2017) to 1.30 (WY 2020) in Stevens Creek. No consistent temporal or geographic patterns were evident across the 10-year dataset.

Grain Size

Table 3.8 summarizes percent fines (clay and silt) from grain size analyses conducted during WY 2016 through WY 2025. Sediment toxicity results and sum-of-pyrethroids TU equivalents are included in Table 3.7 for comparison. On average, percent fines were somewhat higher at the San Tomas Aquino Creek monitoring station (29%) compared to the Stevens Creek monitoring station (19%).

Both creeks exhibited periodic increases in fine sediment deposition over the monitoring period, which may be influenced by interannual variability in rainfall or operational activities conducted by Valley Water within their contributing watersheds. No consistent relationships between percent fines and either sediment toxicity or sum-of-pyrethroids TU equivalents were evident across the 10-year dataset.

[15] Carbaryl was eliminated from the list of required analytes in MRP 3.0.

Table 3.7. Toxicity Unit (TU) equivalent summary for Santa Clara County sediment samples, WY 2016 – WY 2025. See Table 3.5 for WY 2025 concentration data.

Analyte			Pyrethroids								Other MRP Pesticides of Concern				
			Bifenthrin	Cyfluthrin	Cypermethrin	Deltamethrin	Esfenvalerate	Lambda-cyhalothrin	Permethrin	**Sum of Pyrethroids**	Carbaryl	Fipronil	Fipronil desulfinyl	Fipronil sulfide	Fipronil sulfone
		LC50 [c]	0.52 (µg/g dw)	1.08 (µg/g dw)	0.38 (µg/g dw)	0.79 (µg/g dw)	1.54 (µg/g dw)	0.45 (µg/g dw)	10.83 (µg/g dw)	-	NA [d]	306 (ng/g dw)	NA [d]	435 (ng/g dw)	158 (ng/g dw)
Station ID	**Creek**	**Date**													
205STQ010	San Tomas Aquino	7/11/2016	0.39	0.15	0.15 [b]	0.11 [b]	<MDL	<MDL	0.03	**0.88** [ab]	<MDL	0.01 [b]	-	-	-
205STQ010	San Tomas Aquino	7/13/2017	0.07 [b]	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL	**0.22** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/17/2018	0.39	0.15	0.15 [b]	0.11 [b]	<MDL	<MDL	0.03	**0.88** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/23/2019	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL	**0.43** [a]	<MDL	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/22/2020	0.54	0.08	0.07	<MDL	<MDL	0.06	0.01	**0.77** [a]	<MDL	<MDL	<MDL	<MDL	0.12
205STQ010	San Tomas Aquino	6/23/2021	0.49	0.08	<MDL	<MDL	<MDL	0.04 [b]	<MDL	**0.69** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/12/2022	0.83	0.15	0.28	0.30	<MDL	0.06 [b]	0.03	**1.70** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/18/2023	0.14	0.03	0.06 [b]	0.20	<MDL	0.05 [b]	0.01	**0.50** [ab]	NA	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/9/2024	0.29	0.07	0.05 [b]	<MDL	<MDL	0.03 [b]	0.01	**0.50** [ab]	NA	<MDL	<MDL	<MDL	<MDL
205STQ010	San Tomas Aquino	7/22/2025	0.34	0.03	0.06 [b]	0.02 [b]	0.01 [b]	0.09	0.01	**0.57** [b]	NA	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/11/2016	0.78	0.13	0.03 [b]	0.19	<MDL	<MDL	0.03	**1.21** [ab]	<MDL	0.01 [b]	-	-	-
205STE021	Stevens Creek	7/13/2017	0.07	<MDL	0.02 [b]	<MDL	<MDL	<MDL	0.002	**0.11** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/17/2018	0.12 [b]	<MDL	0.03 [b]	0.10	<MDL	<MDL	<MDL	**0.29** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/23/2019	0.15 [b]	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL	**0.40** [a]	<MDL	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/22/2020	0.59	0.14	0.31	<MDL	<MDL	0.26	<MDL	**1.30** [a]	<MDL	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	6/23/2021	0.27	0.07	<MDL	0.09	<MDL	<MDL	<MDL	**0.51** [a]	<MDL	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/12/2022	0.37 [b]	0.04 [b]	0.14 [b]	0.32 [b]	<MDL	<MDL	0.03	**0.90** [ab]	<MDL	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/18/2023	0.14	0.04	0.04 [b]	<MDL	<MDL	0.03 [b]	0.01	**0.30** [ab]	NA	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/9/2024	0.42 [b]	0.03 [b]	0.11 [b]	<MDL	<MDL	<MDL	<MDL	**0.70** [ab]	NA	<MDL	<MDL	<MDL	<MDL
205STE021	Stevens Creek	7/22/2025	0.12	0.07	0.02 [b]	<MDL	<MDL	0.04 [b]	<MDL	**0.28** [ab]	NA	<MDL	<MDL	<MDL	<MDL

dw = dry weight
a. Total calculated using 1/2 MDLs for some individual pyrethroids.
b. The TU equivalent calculated from estimated concentration below the reporting limit but above the MDL (J-flagged).
c. Sources: Amweg et al. 2005 and Maund et al. 2002 for pyrethroids; Maul et al. 2008 for fipronil compounds.
d. No available LC50 value for carbaryl or fipronil desulfinyl.

Table 3.8. Summary of percent fines (clay and silt) compared to sediment toxicity and sum of pyrethroids TU equivalents for San Tomas Aquino Creek and Stevens Creek, WY 2016 - WY 2025.

Analyte			Sediment Toxicity		Sum of Pyrethroids	Percent Fines (Clay and Silt)
			C. dilutus	*H. azteca*		
Station ID	Creek	Date	Survival	Survival	TU Equivalents	
205STQ010	San Tomas Aquino	7/11/2016	Yes (18%)	No	0.88 [ab]	15
205STQ010	San Tomas Aquino	7/13/2017	No	No	0.22 [ab]	4.7
205STQ010	San Tomas Aquino	7/17/2018	No	No	0.88 [ab]	25
205STQ010	San Tomas Aquino	7/23/2019	Yes (56%)	No	0.43 [a]	5.2
205STQ010	San Tomas Aquino	7/22/2020	No	No	0.77 [a]	26
205STQ010	San Tomas Aquino	6/23/2021	Yes (57%)	No	0.69 [ab]	22
205STQ010	San Tomas Aquino	7/12/2022	Yes (100%)	Yes (47%)	1.70 [ab]	47
205STQ010	San Tomas Aquino	7/18/2023	Yes (47%)	Yes (41%)	0.50 [ab]	34
205STQ010	San Tomas Aquino	7/9/2024	No	No	0.50 [ab]	49
205STQ010	San Tomas Aquino	7/22/2025	Yes (19%)	Yes (42%)	0.57 [b]	60
205STE021	Stevens Creek	7/11/2016	No	No	1.21 [ab]	8.0
205STE021	Stevens Creek	7/13/2017	No	No	0.11 [ab]	14
205STE021	Stevens Creek	7/17/2018	No	No	0.29 [ab]	24
205STE021	Stevens Creek	7/23/2019	No	No	0.40 [a]	10
205STE021	Stevens Creek	7/22/2020	No	No	1.30 [a]	22
205STE021	Stevens Creek	6/23/2021	No	No	0.51 [a]	15
205STE021	Stevens Creek	7/12/2022	No	No	0.90 [ab]	25
205STE021	Stevens Creek	7/18/2023	No	No	0.30 [ab]	33
205STE021	Stevens Creek	7/9/2024	No	No	0.70 [ab]	9.8
205STE021	Stevens Creek	7/22/2025	No	No	0.28 [ab]	30

a. Total calculated using 1/2 MDLs for some individual pyrethroids.
b. The TU equivalent calculated from estimated concentration below the reporting limit but above the MDL (J-flagged).

3.3 Wet Weather Water Chemistry

The wet weather sites for WY 2018 included the dry weather locations on San Tomas Aquino Creek and Stevens Creek. Results were reported in the WY 2018 UCMR (SCVURPPP 2019a). The concentrations of most pesticides, with the exception of bifenthrin and fipronil compounds, were below the MDL, meaning that these analytes were reported as non-detects. There are no WQOs specified in the Basin Plan for water column pesticide analytes. As a result, no WQO or MRP trigger threshold exceedance analysis was performed on wet weather pesticide data during WY 2018. Pesticide concentrations were compared to United States Environmental Protection Agency (USEPA) benchmarks for chronic toxicity (USEPA 2016). Stevens Creek had bifenthrin and fipronil concentrations above the USEPA benchmarks for invertebrates. San Tomas Aquino Creek also had fipronil concentrations above USEPA thresholds for chronic invertebrate toxicity (SCVURPPP 2019a).

The wet weather sites for WY 2023 included the dry weather locations on San Tomas Aquino Creek and Stevens Creek as well as a DPR site on the Guadalupe River. The concentrations of many pesticides analyzed were below the MDL, meaning that these analytes were reported as non-detects (SCVURPPP 2024). Stevens Creek had the lowest number of detected pyrethroids (n=1) while San Tomas Aquino and the Guadalupe River had three and four pyrethroids detected at quantifiable levels, respectively. Fipronil and two of its degradates (desulfinyl and sulfone) were detected at quantifiable levels at all three sites. Several compounds were detected at levels not quantifiable (i.e., J-flagged). Overall, concentrations of most constituents were highest in the Guadalupe River sample.

Pesticide concentrations were compared to USEPA benchmarks for chronic toxicity (USEPA 2016). The lowest USEPA benchmarks for invertebrate chronic toxicity were exceeded for all bifenthrin, cyfluthrin, and cyhalothrin results. The permethrin concentration from the Guadalupe River sample was just above the lowest USEPA benchmark (SCVURPPP 2024).

3.4 Third-Party Monitoring Efforts

Several programs external to SCVURPPP are conducting or have conducted similar pesticides and toxicity monitoring studies within the region and statewide. These studies provide valuable data for comparison against SCVURPPP findings to view water quality in a broader spatial and temporal context.

3.4.1 DPR Surface Water Protection Program (SWPP) Monitoring

The DPR SWPP is one of the largest pesticide monitoring and management efforts currently being undertaken in California. Pesticide studies conducted by the DPR SWPP evaluate the frequency of pesticide detections in MS4 and receiving water sites (at any concentration) and make use of a variety of USEPA Aquatic Life Benchmarks for many pesticide compounds (USEPA 2016). The DPR provides web access to their monitoring reports which contain detailed analyses of USEPA Aquatic Life Benchmark[16] exceedance rates. The DPR also maintains the Surface Water Database (SURF) to provide public access to quantitative pesticide data from a wide array of surface water monitoring studies. This database could be queried in the future to allow for the leverage of DPR monitoring data in more complex analyses of SCVURPPP pesticide data.

The DPR SWPP's ongoing study 329 (Northern California Urban Areas) and study 320 (Southern California Urban Areas) have consistently found bifenthrin and imidacloprid among the pesticides detected at the highest concentrations in those urban study areas. Fipronil is commonly detected, but not as much as its degradates, especially fipronil sulfone. Lowest benchmark thresholds from the USEPA have been exceeded for pyrethroids and fipronil samples (SCVURPPP 2025a). Recent detection frequencies from study 329 (Alvarado and McClanahan 2024, 2025) suggest lower instances of detection for similar pesticides found at higher frequencies in study 320 (Budd 2023).

[16] USEPA Aquatic Life Benchmarks are estimates of the minimum concentrations of pesticides in water expected to present a risk of concern for freshwater organisms. These benchmarks are informational values used as part of the decision-making process for pesticide registration. They are not regulatory, nor do they automatically become part of a state's water quality standards.

3.4.2 SPoT Monitoring Program

The SWAMP SPoT Monitoring Program conducts annual dry season monitoring (subject to funding constraints) of sediments collected from a statewide network of large rivers. The goal of the SPoT Program is to investigate long-term trends in water quality. Sites are targeted in bottom-of-the-watershed locations with slow water flow and appropriate micromorphology to allow deposition and accumulation of sediments, which include stations near the mouth of Coyote Creek and the Guadalupe River (Phillips et al. 2014) (Figure 3.1). In most years, sediments are analyzed for toxicity, with metals, polychlorinated biphenyls (PCBs), mercury, organic pollutants, and pesticides (including pyrethroids and fipronil and its degradates) analyzed on a less frequent schedule. The most recent technical report prepared by SPoT program staff was published in 2020 and describes ten-year trends from the initiation of the program in 2008 through 2017 (Phillips et al. 2020).

4.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations based on a review of WY 2016–WY 2025 pesticides and toxicity monitoring data generated in compliance with Provision C.8.g of the MRP and presented in the preceding sections of this report.

All monitoring and data validation were conducted using methods consistent with the BASMAA RMC QAPP (BASMAA 2020) and associated SOPs (BASMAA 2016).

4.1 Conclusions

Pesticides and toxicity monitoring, including toxicity testing of water and sediment samples and sediment chemistry analyses, was conducted during WY 2025 in compliance with Provision C.8.g of the MRP. Dry weather samples were collected from Stevens Creek and San Tomas Aquino Creek at stations that have been monitored for pesticides and toxicity since WY 2016 under MRP 2.0 and MRP 3.0.

Based on initial toxicity testing results, a dry weather water resample was required for the *C. dubia* reproduction test in San Tomas Aquino Creek. The resample also exhibited statistically significant toxicity; however, the Percent Effect (20%) was below the MRP resampling threshold. Summaries of toxicity and chemistry results are provided below.

4.1.1 Data Evaluation Summary

Dry weather monitoring requirements include toxicity testing of five test species in water samples and two test species in sediment samples. The test organism *H. azteca*, required for both water and sediment samples, is known to be sensitive to pyrethroid pesticides, while *C. dilutus* is known to be sensitive to neonicotinoids.

A two-tiered approach is used to assess toxicity. First, organism responses from ambient samples are statistically compared to responses from appropriate laboratory control samples (i.e., TST). Second, the magnitude of response is evaluated using a threshold value, or "Percent Effect." If the MRP resampling criterion of 50 Percent Effect is exceeded, a follow-up sample is required.

Sediment chemistry data for metals and PAHs are evaluated using TECs and PECs published by MacDonald et al. (2000). In Santa Clara County, chromium and nickel frequently exceed TECs and, in some cases, PECs due to their association with naturally occurring serpentine formations underlying regional hillslopes. As a result, these metals are not prioritized for follow-up management actions. Sediment chemistry data for pyrethroid and fipronil pesticides are evaluated using TOC–normalized LC50 values, expressed as TU equivalents.

4.1.2 WY 2025 Results

In WY 2025, SCVURPPP conducted dry weather pesticides and toxicity monitoring at two stations: Stevens Creek and San Tomas Aquino Creek.

- Statistically significant toxicity was observed in water samples from both creeks for several test organisms. However, only *C. dubia* (reproduction) in San Tomas Aquino Creek and *S. capricornutum* in Stevens Creek exceeded the MRP resampling criterion of 50 Percent Effect (Table 3.1). The follow-up water sample collected from San Tomas Aquino Creek for *C. dubia* testing also exhibited significant toxicity, but the percent effect was below the resampling threshold. No toxicity to *S. capricornutum* was observed in the Stevens Creek follow-up sample.

- For the first time in SCVURPPP monitoring history, statistically significant toxicity to the green algae test species, *S. capricornutum,* was observed, with the Stevens Creek sample exceeding the MRP resampling criterion. Because similar anomalous results were reported by other RMC programs, the *S. capricornutum* results were flagged as "questionable data" by the QA officer.
- No sediment toxicity was observed in Stevens Creek. In San Tomas Aquino Creek, sediment samples exhibited statistically significant toxicity to both test species; however, percent effects were below the MRP resampling criterion (Table 3.1).
- Pesticide concentrations in WY 2025 sediment samples were low, with no TOC-normalized concentration of any individual pyrethroid greater than 1 TU equivalent. Two pyrethroid pesticides were detected at quantifiable levels in Stevens Creek and four were detected in San Tomas Aquino Creek (Table 3.5). The sum-of-pyrethroids TU equivalents for both sites were below 1 TU equivalent.
- Similar to prior years, common serpentine-derived metals (chromium and nickel) were found at concentrations exceeding the TEC for both creeks. Copper exceeded the TEC threshold for both creeks. Zinc exceeded the TEC threshold for San Tomas Aquino Creek. Nickel was the only PEC threshold that was exceeded (Table 3.4).
- Consistent with prior years, serpentine-derived metals (chromium and nickel) exceeded TECs at both sites. Copper exceeded the TEC at both creeks, and zinc exceeded the TEC at San Tomas Aquino Creek. Nickel was the only constituent that exceeded a PEC threshold (Table 3.4).

4.1.3 WY 2016 – WY 2025 Data Summary

The results of pesticides and toxicity monitoring conducted in San Tomas Aquino Creek and Stevens Creek during WY 2016 through WY 2025 were evaluated to assess potential trends.

- ***C. dilutus* toxicity.** Of the 26 water samples analyzed (20 dry weather and 6 wet weather), six dry weather samples were significantly toxic to *C. dilutus*, a test organism known to be sensitive to neonicotinoids (e.g., imidacloprid) and fipronil; however, none of these samples had a Percent Effect greater than 50% (Table 3.3). In contrast, of the 23 dry weather sediment samples, seven (all from San Tomas Aquino Creek) were significantly toxic to *C. dilutus*, of which three had a Percent Effect greater than 50%.
- **H. azteca toxicity.** *H. azteca*, a test organism known to be sensitive to pyrethroids, had only one significantly toxic result in dry weather water samples, which occurred in Stevens Creek during WY 2025 (Table 3.2). In contrast, *H. azteca* toxicity was observed in water samples from both creeks and Calabazas Creek during wet weather monitoring in WY 2018. Wet weather monitoring conducted in WY 2023 also identified *H. azteca* toxicity in a Guadalupe River water sample; however, no toxic effects were observed in Stevens Creek or San Tomas Aquino Creek during that event. Of the 20 dry weather sediment samples analyzed, three samples (all from San Tomas Aquino Creek) were significantly toxic to *H. azteca*, but Percent Effects were below the 50 Percent Effect threshold.
- ***C. dubia* toxicity.** *C. dubia* is a freshwater flea that is highly sensitive to diazinon, a pesticide that has been phased out in urban areas. Toxicity to *C. dubia* was not observed in any wet weather samples. However, of the 32 dry season water samples with observed significant toxicity (including retests), more than half (n = 19) were attributable to *C. dubia* reproduction toxicity (San Tomas Aquino Creek = 9; Stevens

Creek = 10). Six of these samples exhibited Percent Effect values exceeding the MRP trigger of 50%. The specific cause of the chronic *C. dubia* toxicity observed in these creeks remains unknown and does not appear to be explained by synoptic sediment chemistry results. Similar unexplained chronic *C. dubia* toxicity has been reported statewide, and SCCWRP has identified laboratory best practices, accreditation, and training as important measures to reduce variability and inconsistencies in laboratory QA procedures (Brent et al. 2023).

- **Metals and PAHs.** Between WY 2016 and WY 2025, no sediment samples collected from San Tomas Aquino Creek or Stevens Creek had PEC quotients greater than 1.0 for any analyte other than chromium and nickel, which are primarily influenced by naturally occurring serpentine formations in the monitored watersheds. Excluding chromium and nickel, ten samples in the WY 2016–WY 2025 dataset had TEC quotients greater than or equal to 1.0, the more conservative sediment chemistry evaluation criterion. These included total PAHs in Stevens Creek during WYs 2017 and 2018; zinc in Stevens Creek and San Tomas Aquino Creek during WY 2020; copper in Stevens Creek and San Tomas Aquino Creek during WYs 2020 and 2022; copper in Stevens Creek during WY 2023; and zinc in San Tomas Aquino Creek during WYs 2024 and 2025. Copper TEC quotients also exceeded 1.0 at both creeks during WY 2025 (Table 3.3).
- **Pesticides.** Bifenthrin was the most frequently detected pesticide in SCVURPPP dry weather sediment samples, detected in 19 of the 20 samples collected from San Tomas Aquino Creek and Stevens Creek during WY 2016 through WY 2025. Other pesticides analyzed in sediment samples, including carbaryl, fipronil, and fipronil degradates, were infrequently or never detected. Sum-of-pyrethroids TU equivalents, calculated from TOC-normalized concentrations, were similar between creeks and ranged from 0.22 (WY 2017) to 1.70 (WY 2022) in San Tomas Aquino Creek and from 0.11 (WY 2017) to 1.30 (WY 2020) in Stevens Creek. No consistent temporal trends were evident across the monitoring period.

The pesticides and toxicity data collected from WY 2016 through WY 2025 provide a reference to inform stormwater management decisions in Santa Clara County watersheds and to guide the planning of future monitoring efforts.

4.2 Recommendations for MRP 3.0

The recommendations in this section address pesticides and toxicity monitoring during WY 2026 and through the remainder of the MRP 3.0 permit term. They are based on findings from ten years (WY 2016–WY 2025) of SCVURPPP pesticides and toxicity monitoring, as well as insights gained from related monitoring, data analysis, and policy development efforts conducted regionally and statewide.

- **Continued SCVURPPP monitoring.** Pesticides and toxicity monitoring will continue to be conducted during the dry season at the same two stations targeted during WY 2016 through WY 2025: Stevens Creek and San Tomas Aquino Creek.
- **External monitoring data**. Results from relevant external studies will continue to be tracked as they become available to support comparison with SCVURPPP pesticides and toxicity data. The DPR Surface Water Protection Program (SWPP) studies are particularly important for providing regional and statewide context on pesticide occurrence and aquatic effects. SWPP Study 329 is especially relevant because several monitoring locations overlap with Santa Clara County. The Program will continue to pursue opportunities to coordinate data sharing, align monitoring locations, and exchange information with other agencies, such as the co-located wet weather monitoring conducted at DPR's Guadalupe River site during WY 2023.

In compliance with provision C.9 of the MRP, the Program and Co-permittees are implementing pesticide toxicity control programs that focus on source control and pollution prevention. The control measure programs include implementation of integrated pest management (IPM) policies/ordinances, public education and outreach programs, pesticide disposal programs, and sustainable landscaping requirements for new and redevelopment projects. As required by provision C.9.g.iii of the MRP, the Program submitted a Pesticide Evaluation Report with their 2025 Annual Report, which assesses progress towards implementation of the Total Maximum Daily Load (TMDL) for Diazinon and Pesticide-Related Toxicity for Urban Creeks in the region (SCVURPPP 2025b).

Despite implementation of provision C.9 requirements, pesticide-related toxicity likely associated with urban pesticide use continues to be observed in local receiving waters. While SCVURPPP Co-permittees have authority over their own pesticide use and implement robust public outreach programs, they are pre-empted by state law from regulating pesticide use by consumers and businesses (CASQA 2025). In recognition of these limitations, the Program will continue to support efforts led by the California Stormwater Quality Association (CASQA) to engage with state and federal regulators in developing a more effective regulatory framework that proactively prevents urban water quality impacts through the pesticide registration and registration review process.

California's Pesticide Use Reporting Program (PUR) contains extensive data for nearly all types of registered pesticides and their associated applications. Ongoing analysis of PUR data help inform DPR, Permittees, and the public about potential emerging trends in registered pesticide usage. These efforts are expected to be supplemented by the statewide Urban Pesticides Amendments (UPAs), which will seek to improve consideration of surface water quality during the pesticide registration process overseen by state and federal pesticide regulatory authorities such as DPR and USEPA. Anticipated outcomes of the UPAs include reductions in pyrethroids and other pesticides in urban stormwater runoff and, ultimately, elimination of pesticide-related toxicity in local urban creeks. The UPAs may also establish a statewide monitoring program that could replace pesticides and toxicity monitoring requirements in MS4 permits such as the MRP. The objective of such a program would be to generate standardized, high-quality data at reduced cost while supporting statewide regulatory goals. At this time, the mechanism for implementing a statewide monitoring program remains uncertain but is expected to be developed over the next several years.

4.3 Recommendations for MRP 4.0

The recommendations in this section are directed toward the next iteration of the MRP (MRP 4.0), which is currently under development and anticipated to become effective on July 1, 2027. These recommendations are provided in the context of overall provision C.8 monitoring requirements, which expanded substantially from MRP 2.0 to MRP 3.0 and represent a significant portion of overall Program resources (see Part E of the IMR). The intent of these recommendations is to better align the cost of pesticides and toxicity monitoring with the stormwater management value of the resulting data.

It is assumed that pesticides and toxicity monitoring required under provision C.8.g of MRP 3.0 will continue into MRP 4.0 largely unchanged, with the goal of continuing to build long-term datasets in Santa Clara County receiving waters. However, to reduce monitoring costs while retaining core program value, the Program recommends removing *C. dubia* (reproduction), *P. promelas* (survival and growth), and *S. capricornutum* (growth) from the list of required toxicity tests. Collectively, these endpoints provide limited additional insight into receiving water quality beyond that obtained from *C. dilutus, H. azteca*, and *C. dubia* (acute) toxicity tests.

- As described in Section 3.1.2, toxicity to *C. dubia* (reproduction) is often observed in SCVURPPP samples. However, statewide interlaboratory variability (Brent et al. 2023) and the documented risk of false positives associated with this toxicity endpoint (Robertson-Bryan 2025) reduce the management value of this endpoint within the provision C.8.g monitoring program.
- Toxicity to *P. promelas* (fathead minnow) is rarely observed in SCVURPPP samples (Table 3.1) and, when present, is typically associated with PRM rather than ambient water stressors.
- Toxicity to *S. capricornutum* has been observed only once in SCVURPPP monitoring history (WY 2025). As discussed in Section 2.4, this rare result occurred region-wide and likely attributable to factors unrelated to ambient water quality.

During WY 2025, laboratory costs associated with these tests exceeded $6,000 per sample, including required reference toxicant testing *P. promelas*.

The Program looks forward to discussing potential modifications to pesticides and toxicity monitoring requirements under MRP 4.0 through the Provision C.8 workgroup process. Continued collaboration among Permittees, the Water Board, and other stakeholders will be important to evaluate monitoring objectives, data utility, and program costs, and to identify opportunities to refine monitoring requirements while maintaining protection of beneficial uses.

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