Technical Review Committee

June 13, 2024
9:00 AM – 3:30 PM

HYBRID MEETING
In Person
SFEI
First Floor Conference Room

Remote Access
https://us06web.zoom.us/my/sfeiconfcw1
Meeting ID: 88380356016
Dial by your location:
+1 669 900 6833 US (San Jose)
+1 253 215 8782 US (Tacoma)

AGENDA

1.	**Introductions and Review Agenda**	9:00 (10 min) Bridgette DeShields
2.	**Decision: Approve Meeting Summary from March 26, 2024, Review/Confirm/Set Dates for Future Meetings** <u>Scheduled meetings</u> Steering Committee: ● August 12, 2024 ● November 4, 2024 (+ MYP Workshop) Technical Review Committee: ● September 24, 2024 ● December 12, 2024 Annual Meeting: ● October 16, 2024	9:10 (10 min) Bridgette DeShields

	Materials: ● TRC Meeting Summary, see pages 8-25 Desired outcomes: ● Approve meeting summary ● Confirm meeting dates	
3.	**Information: SC Meeting Summary from April 15, 2024** Materials: SC Meeting Summary, see pages 26-41 Desired outcome: ● Informed Committee	9:20 (10 min) Amy Kleckner
4.	**Information: USEPA San Francisco Bay Program Office Funds** The RMP may be eligible to receive USEPA Program Office funds for the current fiscal year. In order to do so, USEPA would need to determine that funding the RMP can be an exception to their usual competitive bidding requirements. An update on the process will be provided. Materials: Slides presented at meeting Desired outcome: ● Informed Committee	9:30 (15 min) Jay Davis
5.	**Discussion: Presentation of Special Study Proposals Recommended by Workgroups** Over the last three months, the RMP workgroups met to develop proposals for special studies in 2025. For this agenda item, the recommended proposals and other outcomes of the WG meetings will be briefly summarized by the workgroup leads, followed by an opportunity for the TRC to ask clarifying questions. TRC recommendations for funding will be made in the next agenda item. Materials: ● Summary tables and proposals, see pages 42-176 Summary tables and full-text of proposals are posted on the calendar page for the meeting: **Bay RMP Technical Review Committee Meeting | San Francisco Estuary Institute**	9:45 (45 min) Workgroup Leads

	Desired outcome: ● Discussion and clarification on proposed studies.	
	Break	10:30 (10 min)
5.	**Discussion: Presentation of Special Study Proposals Recommended by Workgroups (continued)** Desired outcome: ● Discussion and clarification on proposed studies.	10:40 (50 min) Workgroup Leads
6.	**Decision: Recommendation for Special Studies for 2025** RMP Special Studies are identified and funded through a three-step process. Workgroups recommend studies for funding to the TRC. The TRC weighs input from all the workgroups and then recommends a slate of studies to the Steering Committee. The Steering Committee makes the final funding decision. The TRC will need to prioritize proposals to reach the amount of RMP funding available ($2.1M). Additional funding may become available from SEP settlements and EPA funding so proposals should be ranked beyond the base funding budget. Desired outcomes: ● Recommendation to Steering Committee on a suite of studies for the 2025 RMP totaling **$2,105,257** ● A prioritized list of additional studies to be funded if the special studies budget is higher or if additional funds become available.	11:30 (60 min) Bridgette DeShields
	Lunch	12:30 (45 min)
7.	**Discussion: 2024 S&T Monitoring Update and Plans for 2025** Update on implementation of the 2024 S&T monitoring efforts. Review plans for S&T monitoring in 2025. Initial discussion on additional S&T monitoring elements to include using USEPA San Francisco Bay Program Funds. Materials: Slides presented at meeting. Desired outcomes: ● Informed Committee ● Input on S&T implementation ● Input on additional elements to include using USEPA funds	1:15 (45 min) Amy Kleckner

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8.	**Decision: Update List of RMP Projects Eligible for Supplemental Environmental Project Funding and Recommend Allocation of Existing SEP Funds** The RMP could receive SEP funds during 2024-2025 that could be used to fund additional special studies. Therefore, TRC feedback is needed to revise the list of eligible projects for SEP funding. The process for making these recommendations will be to answer the following questions: ● Should any of the projects be removed because they have been completed or are no longer a priority for the RMP? ● Are there any unfunded 2025 special studies proposals that should NOT be added to the list? If not, then all of the unfunded studies recommended by the WGs will be added to the list. ● Are there any studies on the list that are high priority for MMP funds? Materials: Current List of Candidate Supplemental Environmental Projects, pages 177-179 Desired outcome: ● Recommendation to the Steering Committee for the list of RMP projects eligible for Supplemental Environmental Project funding. ● Identify any priorities for funding using MMP funds	2:00 (30 min) Bridgette DeShields
9.	**Discussion: Plus/Delta on Workgroup Meetings** Over the last three months, the RMP workgroups met to provide updates on current studies underway and develop proposals for special studies in 2025. TRC feedback is requested to Desired outcome: ● Feedback on 2024 workgroup meetings	2:30 (20 min) Jay Davis
10.	**Discussion: Communications Update** Brainstorm on speakers for the RMP Annual Meeting. Discuss the 2024 Pulse. Materials: Slides presented at the meeting Desired outcomes: ● Ideas for speakers ● Update on Pulse	2:50 (20 min) Jay Davis

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11.	**Information: Status of Deliverables and Action Items** Materials: Deliverables and Action Item tables, pages 180-191 Desired outcome: ● Informed committee ● Feedback on progress and due dates	3:10 (10 min) Amy Kleckner
12.	**Discussion: Plan Agenda Items for Future Meetings** Desired outcome: ● Identify future agenda items	3:20 (5 min) Amy Kleckner, Jay Davis
13.	**Discussion: Plus/Delta**	3:25 (5 min) Bridgette DeShields
	Adjourn	3:30

Recently Completed RMP Reports/Products

Foley, M. M.; Davis, J. A.; Buzby, N. 2024. **Selenium Concentrations in Water and Clams in North San Francisco Bay, 2019-2020**. SFEI Contribution No. 1116. San Francisco Estuary Institute: Richmond, CA.

Mayer P. M., Moran K. D., Miller E. L., Brander S. M., Harper S. , Garcia-Jaramillo M., Carrasco-Navarro V., Ho V. T., Burgess R. M., Thornton Hampton L. M., Granek E. F., McCauley M., McIntyre J. K., Kolodziej E. P., Hu X. ,. Williams A. J. , Beckingham B. A., Jackson M. E., Sanders-Smith R. D.,Fender C. L., King G. A., Bollman M., Kaushal S. S., Cunningham B. E., Hutton S. J., Lang J., Goss H. V., Siddiqui S., Sutton R. , Lin D., Mendez M. . 2024. **Where the rubber meets the road: Emerging environmental impacts of tire wear particles and their chemical cocktails**, Science of The Total Environment, Volume 927, 171153, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2024.171153. https://www.sciencedirect.com/science/article/pii/S0048969724012920

Paterson, K.; Miller, E.; Lin, D. 2024. **Microplastics Monitoring and Science Strategy for San Francisco Bay 2024 Revision**. SFEI Contribution No. 1144. San Francisco Estuary Institute: Richmond, CA.

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REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY

sfei.org/rmp

Bay RMP Technical Review Committee Meeting

March 26, 2024

Meeting Summary

Attendees

TRC Member	Affiliation	Representing	Present
Alicia Chakrabarti	EBMUD	POTW	**Y**
Mary Lou Esparza	Central Contra Costa Sanitary District	POTW	**N**
Tom Hall	EOA, Inc.	POTW	**Y**
Heather Peterson	City and County of SF	CCSF	**Y**
Samantha Engelage	City of Palo Alto	POTW	**Y**
Bridgette DeShields*	Integral Consulting	Refineries	**Y**
Chris Sommers	BAMSC (EOA, Inc.)	Stormwater	**Y**
Shannon Alford	Port of San Francisco	Dredgers	**N**
Richard Looker	SF Bay Regional WQCB	Water Board	**N**
Luisa Valiela	US EPA	US EPA-IX	**Y**
Ian Wren	Baykeeper	NGOs	**N**
Jamie Yin	US Army Corps of Engineers	USACE	**N**

Staff and Others

- Jay Davis – SFEI
- Amy Kleckner – SFEI
- Martin Trinh – SFEI
- Don Yee – SFEI
- Becky Sutton – SFEI
- Alicia Gilbreath – SFEI
- Kelly Moran – SFEI
- Diana Lin – SFEI
- Scott Dusterhoff – SFEI
- Dave Senn – SFEI
- Melissa Foley – SFEI
- Matthew Heberger – SFEI
- Lester McKee – SFEI
- Jen Trudeau – SFEI
- Adam Wong – SFEI
- Warner Chabot – SFEI
- Gerardo Martinez – SFBRWQCB
- Xavier Fernandez – SFBRWQCB
- Bryan Frueh – City of San Jose
- Jade Ishii – USACE

1. Introductions and Review Agenda (00:05:00)

Bridgette DeShields opened the meeting with a round of introductions and a brief review of the day's agenda. The TRC welcomed Jade Ishii who was attending in place of Jamie Yin, USACE representative. Key agenda items include updates on the RMP's wet season sampling, S&T monitoring, introducing SFEI's new watershed modeler, and workgroup updates.

2. Decision: Approve Meeting Summary from January 22, 2024, Review/Confirm/Set Dates for Future Meetings (00:07:30)

Bridgette asked the group for any final comments on the previous meeting's summary. Receiving no comments, Bridgette confirmed the dates for upcoming meetings. The Committee confirmed the next TRC meeting for June 13, 2024 and scheduled the following meetings for September 24, 2024 and December 12, 2024. Amy Kleckner confirmed the RMP Annual Meeting for October 16, 2024. The Multi-Year Planning Meeting will be held on November 4, 2024.

Action Item:
- Send out calendar invites for September 24, 2024 and December 12, 2024 TRC meetings (Martin Trinh, April 1, 2024)

Decisions:
- Chris Sommers motioned to approve the meeting summary. Luisa Valiela seconded the motion. The motion was carried by all present members.

3. Information: SC Meeting Summary from January 22, 2024 (00:12:30)

Amy Kleckner presented a summary of the last Steering Committee meeting.

After introductions and the approval of the previous SC meeting summary, Beth Birmingham provided an RMP financial update for Q4 of 2023.

Amy summarized the incomplete projects from 2023 and earlier. For 2020, there are two incomplete projects: the North Bay margins report and the Se in NB clams and water report; both of which are in finalization and expected in the next couple of weeks. 2021 has seven incomplete projects, two of which are now completed: CECs in Urban Stormwater manuscript has been submitted and the Nutrients Light Attenuation and moored sensors technical report. The rest are expected to be completed in 2024. 2022 has eight incomplete projects, most of which are nearing completion this year. 2023 has several projects that are incomplete but expected to complete on time and two projects, Sediment Flux at Richmond Bridge and the STLS Regional Model Development, both of which are delayed and new timelines for completion are still in development.

The SC approved an additional $10,800 to complete the Integrated Watershed Monitoring and Modeling Strategy special study. The SC approved finalization of the Multi-Year Plan (MYP) with some minor edits. An adjustment was made to the S&T set-side withdrawal amount to account for a bookkeeping error made in the first draft. The SC approved the SEP Proposals List as is.

Luisa presented information on the EPA Program Office Update, similar to the presentation the TRC received in December. The discussion focused on preparing for potential funding increases and ensuring effective allocation of resources.

Craig Jones and Sam McWilliams provided an update on the progress and objectives of the In-Bay Modeling of Sediment and Contaminants project. Sam provided an overview of sediment transport modeling, the presentation then went on to modeling objectives and the importance of developing models aligned with management goals while avoiding unnecessary complexity. Sam described refinements made to the watershed dynamic model to evaluate sediment loads from nine distinct subregions of the San leandro Bay watershed. The in-Bay model refinements included improvements in grid resolution and focusing on silt fractions associated with PCBs. Sam then discussed using sediment data to estimate PCB transport. Other discussion points included sediment deposition patterns, distribution comparisons, and next steps.

Jay led the communications discussion which focused on the 2024 Pulse and the plan to model it as an update to the 2013 edition. There was also mention of dedicating more than one session of the Annual Meeting to CECs to tie it into the 2024 Pulse.

Finally, Amy reviewed the status of RMP deliverables and action items. Suggested agenda items for the April 15 meeting included a data services report, introduction of the new watershed modeler, new Se plan, updated S&T plans, and potential plans for future EPA funding.

4. Information: Wet Season Sampling Update (00:18:30)

Alicia Gilbreath from SFEI provided an update on stormwater sampling efforts for the current wet season. She provided details on the rainfall received so far this season, indicating that it had been moderate to good in various regions, with some areas slightly below normal. She mentioned an upcoming storm and preparations for deploying remote samplers and manual sampling.

Alicia emphasized the growth and diversification of project goals in recent years, including expanded pollutant monitoring, piloting of remote samplers in previously inaccessible areas, bioretention monitoring, and near-field S&T sampling. She highlighted the addition of new staff, including two new full time staff who have taken on more leadership roles in project activities as well as assistance from Watershed Project interns.

Regarding current projects, Alicia reported progress on manual sampling and deploying remote samplers at multiple locations and sampling events conducted. Alicia emphasized the importance of manual sampling due to its flexibility and ability to closely monitor field conditions, but stressed the burgeoning role of remote samplers. SFEI will continue to sample stormwater manually, but remote samplers stand to become a very transformational part of SFEI's stormwater monitoring toolkit. Once developed, they offer the capability of sampling many more sites per storm and the cost per site (from prep to post-storm processing and shipping) will be about half that of manual sampling. Alicia reported significant progress in site reconnaissance and database development for stormwater sampling in the Bay Area. They identified approximately 75 flow-gauged locations and conducted site visits during the previous summer, determining that over 50 of them were suitable for SFEI Mayfly deployment. However, obtaining permits for deployment posed a significant challenge, requiring considerable effort. Despite this, the team has successfully deployed samplers at seven locations this year, with permits secured for an additional four sites and ongoing efforts to obtain permits for five more locations.

Alicia discussed challenges related to obtaining permits for stormwater sampling efforts. She noted that while some municipalities readily issued permits, others posed substantial hurdles. The process was described as time-consuming and, in some cases, costly, with permit fees reaching up to $600 per site. Alicia emphasized the variability in permit issuance, noting that approximately one-third of municipalities readily approved permits, while others required extensive time and effort to secure approvals. Additionally, she mentioned the impact of staff turnover within municipalities on the permit process, which further complicated efforts to navigate permit requirements consistently.

Alicia shared insights into the lessons learned from pilot remote sampler deployments, including gaining experience, design improvements, and limitations such as sampler tubing contamination. Alicia discussed challenges related to tubing contamination in the sampling process. She explained that certain analytes were prone to contamination from soft tubing used with peristaltic pumps. Despite efforts to mitigate contamination, such as exploring alternative tubing materials, Alicia acknowledged ongoing concerns regarding the accuracy and reliability of sampled data. This issue raised questions about the suitability of current sampling methods and highlighted the need for continued research and development to address tubing contamination effectively.

Alicia noted that the small number of containers used in sampling leads to a limited number of analytes being assessed, as laboratories are hesitant to split samples for CECs. This limitation underscores the importance of considering alternative sampling methods alongside Mayfly and ISCO. Despite their efficacy, these methods are hindered by soft tubing contamination, affecting only a few compounds, albeit crucial ones for San Francisco Bay. SPLWG advisors recommended continuing with Mayfly/ISCO while exploring other options. Notably, the samplers, with their current tubing, perform well for PFAS and the Kolodziej lab tire/road chemicals suite. The team also discussed tweaks and improvements made this year, including an automated baseflow level adjustment and a lower drag configuration for hanging installations. Additionally, limitations due to sampling head height were identified, with a maximum height of three meters due to decreased pumping rates beyond that. Furthermore, although the current system is limited to three bottles due to drilling constraints and practical considerations, the Mayfly system has the capacity for up to five containers.

Alicia also addressed the topic of vacuum samplers, outlining both their potential benefits and associated challenges. She emphasized the advantages of vacuum samplers in facilitating high-flow sampling rates, which could enhance the collection of stormwater samples with greater efficiency compared to traditional methods. However, Alicia also highlighted several concerns raised during the discussion regarding the practical implementation of vacuum samplers.

One notable concern involved the need for standardization and calibration protocols to ensure the accuracy and reliability of data collected using vacuum samplers. Meeting participants expressed the importance of establishing consistent procedures for calibrating equipment across different sampling sites to minimize variability and ensure data comparability. Additionally, there were discussions about the potential influence of environmental factors, such as temperature and humidity, on the performance of vacuum samplers, highlighting the need for further research to understand and address these potential sources of variability.

Furthermore, Alicia mentioned discussions around the logistical challenges associated with deploying vacuum samplers in diverse field conditions, including urban and industrial environments. Issues such as accessibility to sampling sites, power requirements, and equipment maintenance were identified as important considerations for effectively implementing vacuum sampling strategies. Overall, while vacuum samplers offered promising opportunities for improving stormwater sampling practices, the TRC acknowledged the importance of addressing these technical and logistical challenges to maximize their utility and reliability in environmental monitoring efforts.

The discussion expanded to include reflections on data usage and accuracy, particularly concerning the deployment of monitoring equipment and its implications for data interpretation. Alicia underscored the importance of understanding data limitations and ensuring clarity in data utilization.

5. Discussion: S&T Monitoring Update (00:50:00)

Amy provided an update on the S&T monitoring planned for 2024, including water, bird eggs, sport fish, and marine mammals. She began by discussing with a focus on dry season water samples for comparison during the wet season, marking the final year of the water monitoring pilot. Bird egg collection began in March, with marine mammal sampling in its second year.

Wet weather water sampling was conducted in both the near-field and deep Bay. There were two storm events during the wet season and one sampling during the dry season. This includes setting up four near-field stations and four deep Bay stations to capture variation in water quality. The analytes for analysis included PFAS, TOP, bisphenols, OPEs, and stormwater CECs. Samples from Storm 1 were obtained from near-field stations on 12/21/23 and from deep Bay stations on 1/11/24. Storm 2 samples were collected from near-field stations on 1/23/24 and from deep Bay stations on 2/1/24. All collected samples have been shipped to the labs for analysis, with plans to collect dry season samples during the upcoming summer.

For bird egg sampling, changes were made to streamline the process and minimize shipping delays. The sampling focus is solely on Double-crested Cormorants, with samples to be collected by USGS-WERC staff, with the contract nearing finalization. Analysis will include Hg and Se by MLML, while PFAS, PCBs, PBDEs, and legacy pesticides will be analyzed by SGS-AXYS. A notable change from 2022 is that MLML will handle homogenization, sub-sampling, compositing, and sample distribution, scheduled for April 2025. Moss Landing will handle homogenization and subsampling to reduce the number of times eggs need to be shipped. Results from the analyses are expected to be reported to SFEI by Summer 2025.

The Sport Fish Strategy Team convened on December 18 to discuss the design for 2024. Key species targeted for sampling include striped bass, shiner surfperch, white croaker, and halibut, with no sampling of white sturgeon this year due to this species being listed as protected. Fish collection will be conducted by ICF. Analysis will include Hg and Se by MLML, and PFAS, PCBs, PBDEs, and legacy pesticides will be analyzed by SGS-AXYS. This round of sampling will see expanded PFAS monitoring, inclusion of PCB PMU sampling, and non-target analysis. Additionally, there will be expanded archiving for CECs and microplastics. Collaboration with the SWAMP Realignment initiative is also underway.

In 2024, the second year of a two-year special study on marine mammals is underway, aiming to sample 10 harbor seals and 10 harbor porpoises, prioritizing animals recovered within the Bay. PFAS analysis of liver and serum will be conducted by SGS AXYS, while non-target analysis (NTA) of liver and blubber will be handled by the Crimmins lab (AEACS, Clarkson Univ.) and NTA of blubber by the Hoh lab (SDSU). The Marine Mammal Center is tasked with sample collection. The deliverable, a recommendation on the S&T study design, is expected by June 2025. In 2023, liver samples from three harbor seals and blubber and serum from six harbor seals were collected, with no samples obtained from harbor porpoises. Collaborators are considering alternative options if sample numbers remain below target, potentially analyzing archived samples.

In addition, a study on selenium impacts on aquatic life was discussed, involving sampling water and sturgeon tissue near a refinery discharge point in Carquinez Strait. To investigate potential impacts of Martinez Refining Company (MRC) discharging selenium above its wasteload allocation, the Water Board has required MRC to monitor possible effects of selenium on Sacramento splittail and white sturgeon. In March and April 2024, sturgeon muscle tissue samples will be collected from at least 8 adults using non-lethal sampling techniques. In November and December 2024, splittail filet samples will be gathered from a minimum of 12 adults, along with egg-ovary tissue samples from at least 6 fish. Additionally, starting from March 27, 2024, monthly water samples will be collected within 500 feet of Discharge Point 001. USGS will analyze fish tissue samples for total selenium in Summer 2024. Brooks Applied Labs will analyze the water samples for selenite (Se(IV)), selenate (Se (VI)), and total selenium after every 6 sampling events. Collected data will be compared to the muscle tissue and water column TMDL targets in Basin Plan Table 7.2.4-1, while splittail egg-ovary data will be evaluated with literature values. Amy noted the USGS's lab relocation to Mountain View, with plans to analyze tissue samples for selenium. The sampling permit for sturgeon collection was noted to expire in December 2025, highlighting the need for timely analysis.

Further discussions revolved around community engagement efforts, challenges in integrating engagement with sampling activities, and potential expansions of S&T monitoring of other species or regions. The importance of community involvement and trust-building through data collection was emphasized.

6. Information: Introducing Our New Watershed Modeler (01:18:20)

Jay introduced Matt Heberger as the new watershed modeler, replacing Tan Zi. Notably, Matt had previously served as the program manager for the Delta RMP and exhibits a fervent dedication to watershed modeling, akin to Alicia's passion for monitoring. Jay noted that they will make an excellent team. Matt shared that he is currently in Paris following the completion of his PhD but anticipated returning to Richmond in August. Matt provided an overview of his academic and professional background, starting with his degrees in agricultural and biological engineering and civil and environmental engineering, culminating in a recent PhD in Earth sciences from Sorbonne University in Paris. He elaborated on his MS thesis research focused on watershed loading models for bacteria in the Mystic River, Massachusetts, emphasizing the importance of predicting bacteria levels to preempt beach closures. Transitioning to his consulting experience at CDM Smith in Cambridge, Massachusetts, he detailed his work on hydrology and hydraulics projects, notably on the Merrimac River, addressing various water quality challenges. Subsequently, he shared his tenure at the Pacific Institute in Oakland, where he delved into diverse water issues, including sea-level rise, groundwater, and desalination.

Matt's presentation then covered his global experiences, including his time at the Paris Observatory, where he engaged in earth observation using remote sensing data to study the water cycle. He provided a description of his PhD research, focusing on optimizing water cycle estimates globally using optimization methods and machine learning. Additionally, he discussed his volunteer work with nonprofits in Mali, West Africa, emphasizing his commitment to public health and education. Transitioning to his love for open science and open-source software, Matt shared his GitHub page and personal website, showcasing his global watershed delineation tool. Finally, he outlined his aspirations for contributing to the Bay RMP, emphasizing his expertise in hydrologic science, watershed modeling, and pollutant loading, along with his background in project management and facilitation.

Jay commended Matt's extensive experience and skills, particularly noting his patience, a valuable trait given his role in the Delta Regional Monitoring Program. Matt expressed his gratitude and eagerness to connect with everyone further.

7. Information: Workgroup Planning Update (01:29:45)

To begin this item, Jay provided an update on the potential significant funding from the EPA and the process involved in securing it. Jay described the proposal development process, emphasizing the need to intensify the annual planning cycle to align with the new funding opportunity. Multiple proposals were discussed, encompassing various work areas, including RMP, NMS, WRMP, PCBs, PFAS, and WQIF projects. It was noted that some projects may overlap and contribute to multiple buckets, underscoring the interconnectedness of the work.

Jay noted that the EPA has over $20 million available for FY24, with an additional $54 million per year expected in subsequent years. The Regional Monitoring Program (RMP) might receive some of the FY24 funds, which need to be committed by June and awarded by September, requiring an approved exception memo and workplan from the RMP. The Steering Committee (SC) should approve a funding amount at the upcoming April SC meeting, emphasizing the importance of including environmental justice and climate adaptation. RMP should target a first-year grant of $5-7 million, with a match requirement of 25%. The SC guidance to Workgroups and staff is to aim for a 50% funding increase in 2025 and eventually a 100% increase over the next few years.

Leading off for the Emerging Contaminants Workgroup, Becky Sutton of SFEI discussed Tier 1 proposals. Strategy funding would require $70K while stormwater contaminants of emerging concern monitoring will cost $300K. Plastic additives in water would require $173K or $235K if sediment is added. Quaternary ammonium compounds (QACs) in water would cost $106K or $164K if sediment was added. This would be follow up work to the draft report just released by Becky and Bill Arnold. Synthetic dyes in sediment, water, wastewater and stormwater is an early outgrowth of the workgroup's data mining exercise where it will look at targeted data and additional priorities. This would be an additional exploration. Non-target analysis (NTA) of bay fish would be conducted for a second year for $76K and could be done with a new partner. NTA of fiber in stormwater will look at plastic additives expelled from textiles and fibers for $124K. A stormwater in vitro toxicity screening would test a new method developed by the EPA for $26K.

Becky proceeded to review the Tier 2 proposals for the ECWG. Augmented stormwater CECs monitoring aimed to extend previous work in monitoring contaminants of emerging concern (CECs) in stormwater, possibly with additional funding to enhance monitoring efforts for $150K. Becky proposed a PFAS nuclear magnetic resonance (NMR) analysis, utilizing advanced analytical techniques to comprehensively analyze per- and polyfluoroalkyl substances (PFAS) in various matrices such as wastewater, stormwater, and bay samples for $380K. A journal paper on tire wear emissions will collaborate with a European laboratory to assess tire wear based on chemical markers, potentially contributing to the understanding of tire-related pollutants in the environment for $15K. An analysis on tire rubber markers will conduct detailed analyses of tire particles using paralysis gas chromatography-mass spectrometry (GCMS), enhancing the accuracy of tire wear particle measurements in stormwater samples for $105K. Becky proposed a PFAS analysis add-on to stormwater depth monitoring pilot proposed incorporating PFAS analysis into an existing pilot study on stormwater microplastics, aiming to evaluate the impact of different depth sampling on PFAS evaluation that would be $55K. Finally, an analysis on PFAS wet deposition pathways project would involve community groups to collect samples and share data, focusing on assessing PFAS contamination through wet deposition pathways, with particular attention to the importance of rainfall data for exposure assessment. This effort would cost either $185K or $320K. Focusing on rainfall data importance for exposure assessment and would include involvement of community groups to gather samples and share data.

For the Sediment Workgroup, Scott Dusterhoff presented the Tier 1 Proposals, stressing that the dollar amounts were flexible. In Tier 1, Scott proposed three main project ideas in addition to $50K for strategy and coordination. Firstly, the Bay conceptual model, which was completed two years ago, would be updated. The workgroup would consider whether to update it at the bay scale or sub-embayment scale. This would cost $50K. Secondly, the workgroup would develop a work plan for studies supporting hydrodynamic model calibration, focusing on assessing erodibility and sediment flocculation impacts on settling velocity for $75K. The group also proposed a pilot project for using satellite imagery to determine suspended sediment concentration, aiding in assessing sediment flux in the Bay for $125K. Tier 2 proposals included developing a shoreline change analysis for areas such as St. Pablo Bay ($75K), monitoring flux at key bay cross-sections like the Golden Gate or other key Bay cross sections ($100K) , and continuing flux and deposition monitoring on mudflats and marshes, potentially at new locations ($100K). Additionally, he suggested continuing monitoring at US Army Corps shallow stations and for bathymetric data collection ($100K).

For the Sources, Pathways, and Loadings Workgroup (SPLWG), Alicia Gilbreath presented the team's Tier 1 proposals. In Tier 1, proposals included a strategy and coordination budget aimed at enhancing internal and external coordination for monitoring and modeling needs ($65K). Alicia also presented a tidal area remote sampler project addressing ongoing needs and permit-related expenses ($10K). Lastly, there will be PCB and Mercury monitoring and modeling to support load and trend assessment, focusing on estimating model uncertainties and providing monitoring design recommendations for $167K. Tier 2 proposals included GIS improvements in watershed delineation and land use integration to support modeling, data interpretation and site selection decision-making ($60K-$100K). Another proposal involved full stormwater systems management and equipment upgrades to automate sampling processes and enhance data management for ($60K-$100K).

For the Microplastics Workgroup, Diana Lin outlined the Tier 1 proposals, including $20K for strategy funding. The first proposal featured a stormwater pilot study that hoped to continue exploring sampling biases between single-depth and depth-integrated methods for an additional year ($94K). The next proposal would update tireware particle analysis to complement microplastic analysis using FTIR spectroscopy, addressing the need for comprehensive particle assessment. Additionally, the workgroup plans to leverage the 2025 Status and Trends water cruise monitoring to collect smaller microplastic water samples, enhancing previous data by capturing microplastics as small as 10 micrometers, crucial for evaluating toxicity and understanding particle size distribution in ambient water samples. This effort would cost $182K. Transitioning to Tier 2 proposals, Diana presented a study to analyze microplastics in sport fish, utilizing specimens collected during the status and trends for fish monitoring ($130K). Lastly, the tire rubber marker analysis would be conducted in conjunction with the ECWG ($105K).

Jay presented the proposals from the PCB Workgroup. The Tier 1 proposal primarily focuses on strategy and coordination ($10K) as the group already has substantial funding secured for modeling work from Destination Clean Bay and other sources. Tier 2 introduced a proposal driven by the modeling team to gather empirical data supporting modeling efforts in San Leandro Bay, involving the deployment of sensor arrays to track sediment and other parameters, aiming to enhance modeling accuracy. Finally, he shared a cross workgroup proposal on creating a fixed station watershed monitoring network that would span the SPLWG, ECWG, SedWG, and PCBWG.

Jay emphasized the need for coordination between all of the workgroups and other initiatives to ensure alignment and avoid duplication of efforts. Additionally, there was mention of potential future data needs dependent on factors like regulatory reviews and adaptation efforts, indicating a dynamic approach to research prioritization. Beyond PCB-specific proposals, there was a broader consideration for conceptual designs and targeted monitoring efforts aimed at understanding runoff management and identifying areas of environmental impact across the Bay Area.

8. Discussion: Status & Trends and Program Management Planning Update (02:32:50)

Amy provided a detailed review of the Status and Trends Plan for 2025, which outlined various initiatives and their corresponding budgets. The plan included allocations for USGS Moored Sensors ($400k), Nutrient Cruises ($283k), Toxic Contaminants in Dry Season Water ($265k), CTR & Organics ($88k), NTA ($12k), Passives ($51k), Archives ($85k), Reporting ($14k), and Lab Intercomparison Studies ($30k), totaling $1,228,000. Amy noted that North Bay Selenium monitoring was not included in the plan for 2025 but was planned for 2026; however, given the decision to pause sampling in 2024, consideration was given to adjusting the plan to include selenium monitoring in 2025.

Amy discussed utilizing USEPA Bay Program Funds for Status & Trends Monitoring, including addressing the insufficient budget for NTA in 2025-6, support for SWAMP Realignment-related sport fishwork (including community fish collection and additional sampling locations like Hunters Point), continuation of S&T pilot studies such as wet season water sampling, increasing sampling stations to cover more regions of the Bay, increasing storm event sampling, and considering harbor seals and selenium monitoring.

Amy also highlighted the need for internal and external coordination, technical oversight, contract and financial management, and governance to support the expansion of projects and partnerships. She proposed efforts to increase coordination between workgroups, external partners, and technical oversight for project deliverables. Additionally, she suggested allocating more funds for proposal development, literature review, QA, and data services to ensure efficient management and timely processing of datasets.

A new idea was introduced to establish an equipment maintenance budget using RMP funds to purchase and maintain field and lab equipment, including YSI and regularly scheduled calibrations, remote sampler and ISCO maintenance costs, peristaltic pumps, safety harnesses, CTD replacement, and lab improvements. The initiatives aim to strengthen the RMP's capabilities, enhance data quality, and support the growing needs of the Status and Trends program.

9. Discussion: 2023 Interlaboratory Comparison Study Results and QA Update (03:03:36)

Don Yee of SFEI provided a detailed discussion on the 2023 interlaboratory comparison study. The purpose of the study was to assess the agreement among different labs conducting PFAS analysis in water. These labs included SGS AXYS, serving as the primary S&T contract lab, Eurofins, which has been utilized in some SFEI studies, and Enthalpy. Each lab was provided with samples for analysis, ensuring comprehensive coverage of the study parameters.

Water samples from two sites, one near-field station and one deep Bay S&T station, were chosen for the comparison. Each lab was provided with sufficient volumes of sample for analysis, including duplicates and matrix spikes. Different methods of analysis were discussed, with preference given to non-spike options for more realistic results. A Bay sample (LSB089Ww) and triplicate samples from the near-field Palo Alto station were provided to the primary analytical lab, AXYS, for thorough analysis. Two of the near-field samples were analyzed as lab duplicates by AXYS, while the third near-field sample served as a matrix spike.

Furthermore, a deep Bay sample and near-field triplicate samples were also provided to other labs for analysis. Eurofins analyzed the extra near-field samples as a lab duplicate and matrix spike, while Enthalpy conducted additional analyses as matrix spike and matrix spike duplicate. Overall, the labs demonstrated consistency, with results generally within ~30% of each other, particularly for PFxSs and PFxAs, which were the only compounds detected.

Further discussion revolved around upcoming intercomparison studies, particularly focusing on tissue analyses. The feasibility of conducting such studies, especially with fish samples, was explored. Concerns were raised about mass limitations for certain species like sturgeon and the need for adequate sample collection for multiple labs. Appropriate species will be selected for testing and Don will coordinate with labs capable of conducting the analyses.

Additionally, Don addressed issues related to CECs contamination in water samples with efforts underway to improve field blank collection methods and identify the sources of contamination.

Finally, there was deliberation on selecting labs for future intercomparison studies, with a focus on those capable of analyzing PFAS and PCBs. Budgetary considerations were discussed, along with the importance of selecting labs based on their capabilities and track record. Plans were made to collaborate closely on selecting suitable species for testing and coordinating with labs to ensure standardized procedures and reliable results. In summary, the intercomparison studies highlighted the comparable performance of the participating labs, with no lab demonstrating obvious superiority. The results obtained were deemed sufficient for qualitative comparisons, although larger sample sets would be preferred for quantitative applications and potential lab switches.

Don also presented on the 2023 copper and hardness intercomparison study, where the primary lab, Brooks Applied, analyzed samples from all sites for dissolved and particulate copper and calculated hardness. However, the results of this study were still pending. Additionally, CCSF provided split samples from historical stations for comparison, with results appearing in a similar range as past data.

Future intercomparison studies in 2024 will most likely focus on tissue.

10. Information: 2021 Copper and Cyanide Rolling Averages Data Update (03:31:00)

Martin Trinh of SFEI shared results for the 2021 copper and cyanide rolling averages. The rolling averages for both copper and cyanide were updated based on the latest data. These rolling averages included data from the past three sampling years, specifically 2017, 2019, and 2020.

Samples were collected from various locations, including the South and Lower South Bay, the Central Bay, and Suisun and San Pablo Bay. Overall, it was observed that the levels of copper and cyanide remained below trigger levels, indicating satisfactory water quality. However, there were slight increases in the rolling averages for cyanide, particularly in the South and Lower South Bay areas due to one high sample in each subembayment from 2019.

The TRC discussed the significance of these trends, with considerations for assessment of legislative actions on brake pads and the effectiveness of source control measures. There was a focus on understanding the impact of legislation on water quality and the need for evidence-based policy decisions. They discussed the availability of the updated data and the timeline for future data releases. Martin stated that the 2023 data were undergoing quality assurance processes and would be available soon.

Further questions were raised regarding detection limits and the possibility of utilizing alternative methods to achieve lower detection limits in Bay water analysis. However, it was acknowledged that finding such methods might be challenging given current technological limitations.

11. Discussion: Communications Update (03:53:10)

Jay began the agenda item by highlighting the work on the upcoming 2024 Pulse. Jay announced that there are copies of the RMP Update available. The discussion then shifted to the 2024 Pulse, where CECs (Contaminants of Emerging Concern) will be highlighted, similar to the 2013 edition. Work will begin on an updated guide to CECs in the Bay in early 2024, with additional text added to address Jay's suggestions for improvements. The TRC suggested the inclusion of a sidebar on challenges, followed by risk profiles. Tom volunteered someone at the Water Board to provide some input on the draft. Both the Water Board and DTSC will have featured articles in the Pulse and there will be sidebars on the tiered risk-based framework, EPA and PFAS: Sources to Solutions, DPR and pesticides, State Board CEC Strategy, and Essential Use Approach.

Jay moved on to discuss the planning for the upcoming 2024 RMP Annual Meeting. The TRC discussed potential keynote speakers and presenters for different sessions, recognizing the importance of securing engaging and knowledgeable speakers who could address relevant topics effectively. Ideas were shared regarding experts in the field, including those with experience in watershed modeling, water quality perspectives, and environmental advocacy.

The agenda for the Annual Meeting will be crafted to cover a range of topics relevant to the organization's objectives and current environmental challenges. The TRC considered sessions on various subjects such as sediment studies, stormwater updates, PFAS contamination, and wastewater management. The TRC considered dedicating more than one session of the Annual Meeting to CECs, potentially tying it in with Pulse discussions.The aim will be to provide attendees with a comprehensive overview of ongoing research, initiatives, and issues.

The TRC also touched upon the structure of the sessions, considering the optimal flow of topics and the inclusion of panel discussions or interactive elements to engage the audience. Chris proposed potentially featuring presentations by advisors followed by staff presentations. In addition to content planning, logistical aspects of the Annual Meeting were also addressed. Discussions included considerations such as the format of the event (in-person or virtual), scheduling, budgeting, and accommodating speakers' availability. The meeting organizers also reflected on past events to identify lessons learned and areas for improvement in terms of logistics and execution.

Finally, the meeting participants discussed strategies for promoting the Annual Meeting and ensuring effective communication with attendees. This included considerations for marketing materials, registration processes, and leveraging various communication channels to reach the target audience. The aim was to maximize attendance and engagement while ensuring that relevant stakeholders were informed about the event.

12. Information: Status of Deliverables and Action Items (02:52:30)

Amy highlighted the completion of several deliverables, including the 2021 copper and cyanide rolling averages, distribution of participation letters to BACWA and WSPA, and payment of honoraria and gifts to science advisors. She reemphasized the completion of S&T wet weather water sampling for the wet season. Despite a team member being on leave, the data services team managed to update the sample data archive database with all the archives and bird eggs collected in 2022. The final deliverable for 2021 Nutrients special study was a technical memo on semi-imposed light extinction estimates for biochemical modeling applications in San Francisco Bay. Amy noted the completion of the 2024 RMP QAPP update, which is now posted on the website, as it facilitated contract negotiations with Destination Clean Bay. The CEC modeling exploration report is also completed. Additionally, the stormwater CECs manuscript has been submitted.

Amy also addressed overdue deliverables, such as the MTC Bay Area land use update, the STLS regional model development, the stormwater monitoring strategy for CECs, 2020 S&T Design report, and RWSM update and technical report.

Delayed deliverables include the STLS WY21 POC Reconnaissance Monitoring, which required an update of data for the Advanced Data Analysis. This project is waiting on input from BAMSC, Lester has been in contact with Lisa Sabin to discuss next steps. The North Bay Selenium in clams and water report has had all data through 2022/2023 run through DS. The USGS data release for 2010-2016 is coming soon, with Shaun Baseman working to finalize this. Work on the NTA Sediment Data Manuscript and Fact Sheet has slowed, prioritized behind CEC strategy revisions and 2025 ECWG proposal prep. Work on the PFAS in Archived Sport Fish Manuscript has slowed, prioritized behind CEC strategy revisions and 2025 ECWG proposal prep, and the QACs report, delayed until summer 2024.

Deliverables due before the next TRC meeting include the Impact of Remediation Actions on San Leandro Bay Recovery from PCB Contamination technical report, which is currently under review with the PCBWG and aiming to be finalized in April. Wastewater partners needed more time on the The QACs in Bay wastewater SEP but the intention is to have the report ready for the ECWG meeting. Don and Data Services are still working on the reanalysis for the Final Margins report. This was prioritized behind the 2023 lab intercomparison results, Bird Egg PFAS QA for ECWG, and the ambient Bay numbers update for the BCDC. With help from Miguel on QA ancillary datasets, the 2021 QA Summary Report for S&T Activities should be completed by June. A draft of the North Bay Selenium in clam and water data report (2019-2020) has been sent for review by the Selenium workgroup, aiming for finalization in April. The 2020 S&T Design Report will be completed without review from Tom Grieb. Finally, the Sediment Deposition on SB Marsh (Whales Tail) report will be submitted this month.

13. Discussion: Plan Agenda Items for Future Meetings (04:27:50)

The group was aware the June meeting would focus mostly on special study prioritization. The Annual Meeting and RMP Pulse will be discussed.

14. Discussion: Plus/Delta

Overall, the group commended Jay and Amy on the efficient meeting. The TRC particularly appreciated the RMP's sustained efforts on S&T monitoring. In-person attendees appreciated Bridgette's cake and noted how productive the meetings were in person.

About the RMP

RMP ORIGIN AND PURPOSE

In 1992 the San Francisco Bay Regional Water Board passed Resolution No. 92-043 directing the Executive Officer to send a letter to regulated dischargers requiring them to implement a regional multi-media pollutant monitoring program for water quality (RMP) in San Francisco Bay. The Water Board's regulatory authority to require such a program comes from California Water Code Sections 13267, 13383, 13268 and 13385. The Water Board offered to suspend some effluent and local receiving water monitoring requirements for individual discharges to provide cost savings to implement baseline portions of the RMP, although they recognized that additional resources would be necessary. The Resolution also included a provision that the requirement for a RMP be included in discharger permits. The RMP began in 1993, and over ensuing years has been a successful and effective partnership of regulatory agencies and the regulated community.

The goal of the RMP is to collect data and communicate information about water quality in San Francisco Bay in support of management decisions.

This goal is achieved through a cooperative effort of a wide range of regulators, dischargers, scientists, and environmental advocates. This collaboration has fostered the development of a multifaceted, sophisticated, and efficient program that has demonstrated the capacity for considerable adaptation in response to changing management priorities and advances in scientific understanding.

RMP PLANNING

This collaboration and adaptation is achieved through the participation of stakeholders and scientists in frequent committee and workgroup meetings (see Organizational Chart, next page).

The annual planning cycle begins with a workshop in October in which the Steering Committee articulates general priorities among the information needs on water quality topics of concern. In the second quarter of the following year the workgroups and strategy teams forward recommendations for study plans to the Technical Review Committee (TRC). At their June meeting, the TRC combines all of this input into a study plan for the following year that is submitted to the Steering Committee. The Steering Committee then considers this recommendation and makes the final decision on the annual workplan.

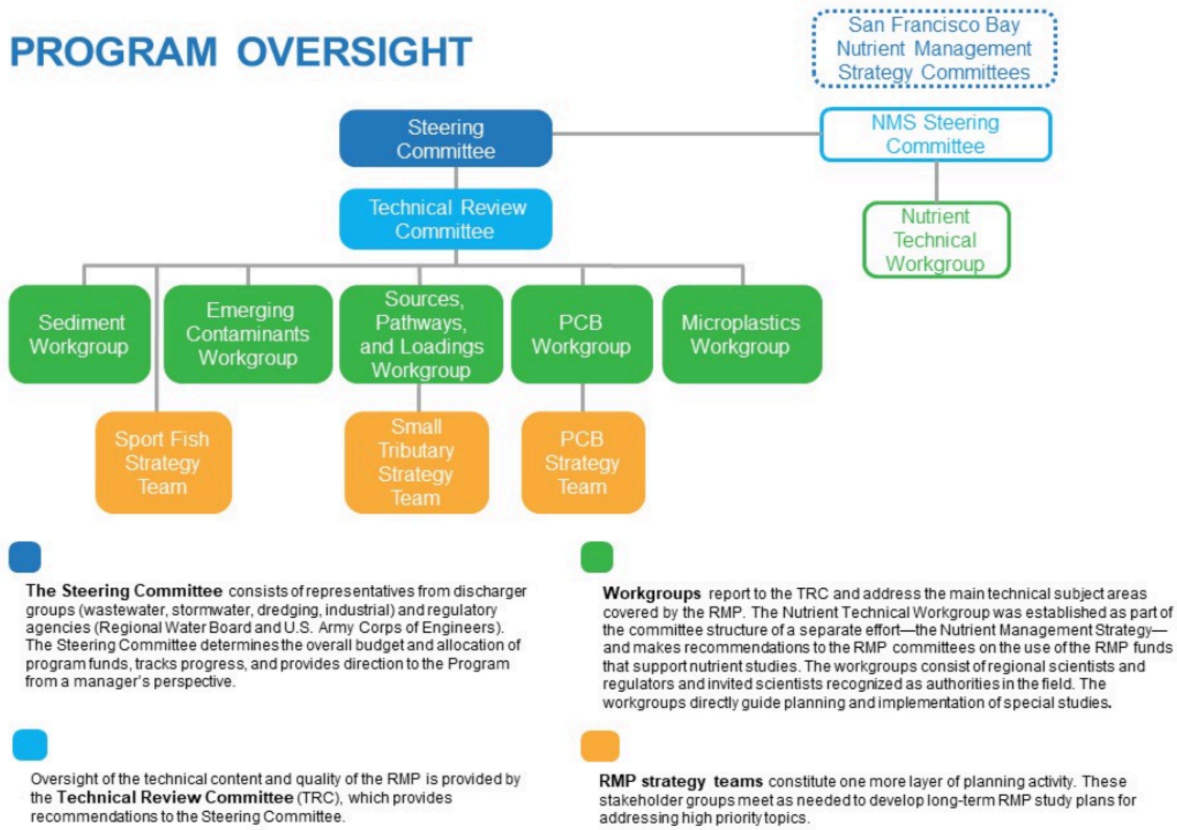
In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon, so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each of the workgroups and teams develops five-year plans for studies to address the highest priority management questions for their subject area. Collectively, the efforts of all these groups represent a substantial body of deliberation and planning.

PURPOSE OF THIS DOCUMENT

The purpose of this document is to summarize the key discussion points and outcomes of a workgroup meeting.

Governance Structure for the
Regional Monitoring Program for Water Quality in San Francisco Bay

Figure 1. Collaboration and adaptation in the RMP is achieved through the engagement of stakeholders and scientists in frequent committee and workgroup meetings.



REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY
sfei.org/rmp

Bay RMP Steering Committee Meeting

April 15, 2024
San Francisco Estuary Institute

Meeting Summary

Attendees

SC Member	**Affiliation**	**Representing**	**Present**
Eric Dunlavey	City of San Jose	POTW-Large	**Y**
Amanda Roa	Delta Diablo	POTW-Small	**Y**
Karin North**	City of Palo Alto	POTW-Medium	**Y**
Adam Olivieri	BAMSC / EOA, Inc.	Stormwater	**Y**
Cameron Carr	Bay Planning Coalition	Dredgers	**Y**
Ellie Covington	US Army Corps of Engineers	USACE	**N**
Tom Mumley*	SF Bay Regional WQCB	Water Board	**Y**
Maureen Dunn	Chevron	Refineries	**Y**

* Chair, ** Vice Chair, alternates in gray and italicized

Staff and Others:

- Jay Davis, SFEI
- Amy Kleckner, SFEI
- Martin Trinh, SFEI
- Beth Birmingham, SFEI
- Luisa Valiela, EPA
- Matt Heberger, SFEI
- Xavier Fernandez, SFBRWQCB

1. Introductions and Review Goals for the Meeting (00:02:30)

Tom Mumley began the meeting with a brief round of introductions, giving a special welcome to Cameron Carr who is attending as an interim representative for Bay Planning Coalition. He then reviewed the day's agenda. Key agenda items included presentations on the USEPA San Francisco Bay Program Office funds, introducing SFEI's new watershed modeler, workgroup planning updates, Status & Trends (S&T) updates, and the upcoming 2024 RMP Pulse.

2. Summary from SC Meeting on January 22, 2024; Confirm Dates for Future Meetings (00:03:50)

Tom Mumley asked the group for any final comments on the previous meeting's summary. Receiving no comments, he continued to confirm the dates for upcoming meetings. The SC meeting was confirmed for August 12, 2024, and the proposed date for the Multi-Year Planning (MYP) Workshop/SC meeting was approved for November 4, 2024. The Technical Review Committee (TRC) will meet on June 13, 2024, September 24, 2024, and December 12, 2024. The RMP Annual Meeting has been confirmed for October 16, 2024.

Action Item:

- Send out calendar invitations for the November 4, 2024 SC meeting (Martin Trinh, May 1, 2024)

Decision:

- Eric Dunlavey motioned to approve the meeting summary. Adam Oliveri seconded the motion. The motion was carried by all present members.

3. Information: TRC Meeting Summary from March 26, 2024 (00:05:20)

The March 26th TRC meeting began with the usual agenda items. Following these items, Alicia Gilbreath presented an update on this year's wet season sampling efforts. Alicia emphasized the growth and diversification of project goals in recent years, including expanded pollutant monitoring, piloting of remote samplers in previously inaccessible areas, bioretention monitoring, and near-field S&T sampling. She reported on the progress on current manual sampling, and deployment of remote samplers at multiple locations and sampling events. She discussed the challenges faced this year related to obtaining permits for stormwater sampling efforts. With the efforts to obtain permits being time consuming and often costly, Alicia also emphasized the variability in permit issuance, noting that about ⅓ of municipalities readily approved permits while others were requiring extensive time and effort to obtain. She shared some of the lessons learned this year during the piloting of the remote samplers. Alicia also highlighted the recent blank test of vacuum samplers meant to address tubing contamination issues and the discussion raised concerns about the practical implementation of vacuum samplers. The TRC acknowledged that the technical and logistical challenges discussed need to be further addressed.

The next agenda item was an update on S&T monitoring. Amy began with an update on the wet season water sampling pilot study which is in its third and final year. All wet season samples have been collected and we now only need to collect once during the dry season to complete the three-year pilot study of the new water design. Changes were made to bird egg sample processing for this year. In an effort to streamline the delivery of the bird eggs to the labs, the RMP has asked Moss Landing to do the post-collection processing, compositing, and aliquoting instead of SGS AXYS this time around. This will result in the eggs only crossing the international border once instead of twice and potentially eliminate some of the permitting and shipping issues that held up the process last time. In addition, the eggs will be shipped through an AXYS facility in WA where there has been better success with keeping samples temperature-controlled during shipping. However, MLML could not fit the effort in until April 2025. Sport fish monitoring is well into the planning stages. ICF will handle the sampling and this year's effort will include a focus on PFAS monitoring and coordination with the SWAMP Realignment. 2024 is year two of a two-year pilot study on marine mammals and is currently underway. The Marine Mammal center is once again handling sample collection and the aim is to sample 10 harbor porpoises and 10 harbor seals. Amy also introduced details of a non-RMP study ("Selenium Impacts on Aquatic Life") which involves the sampling of water and fish from Carquinez Strait for selenium.

In the next agenda item, the TRC was introduced to SFEIs new watershed modeler who will also be introduced today.

Next Jay presented information on workgroup planning efforts, which began with an update on the potential significant funding from the EPA San Francisco Bay Program Office. He then turned it over to the workgroup leads who summarized the proposals they are planning to present to their workgroups. Afterwards Jay emphasized the need for coordination between all the workgroups to ensure alignment and avoid duplication of efforts.

The next agenda item focused on future Status and Trends monitoring and how the potential future EPA funding might be utilized there as well. This is something the SC will also be discussing in this meeting today.

Don Yee then provided a summary of the results of the 2023 Interlaboratory Comparison Study. The purpose of the study was to assess the agreement among different labs conducting PFAS analysis in water. The three labs compared were SGS AXYS, Enthalpy, and Eurofins. Overall the labs demonstrated consistency, with results generally within ~30% of each other. Discussions then turned to upcoming intercomparison studies with particular focus on tissue testing and leveraging this year's S&T monitoring efforts.

Martin Trinh then shared the results of the 2021 Cu and CN rolling averages update. The results showed that the levels of copper and CN remained below trigger levels. Those results are posted and can be found on the website. We plan to have the 2023 rolling averages updated by the end of the year.

Jay gave an update on Communications starting with highlighting the upcoming 2024 Pulse and then moving on to discussing plans for the RMP Annual Meeting which will also be discussed here today. The meeting participants discussed potential speakers, structure of the sessions, and strategies for promoting the Meeting and ensuring effective communications with attendees with the goal of maximizing attendance and engagement.

4. Information: RMP Financial Update for 2024 Quarter 1 (00:17:45)

Beth Birmingham provided the regular financial update for Q1 of 2024. For 2024, 11% of funds have been expended on the year, with invoices being sent out soon. There is a surplus of $56. The 2023 budget has been 70% expended, with 99% of invoiced fees collected. Only two invoices remain. There was a surplus of $98k due to $118,250 in SEP funds supporting part of task 45 Sediment Delivery to Marshes in Central and North Bays. The 2022 budget has been 87% expended, with 100% of invoiced fees collected. There is a surplus of $18k that has been reduced from $138k in the previous quarter after funding for various projects was approved by the SC. For 2021, 87% of funds have been expended with 100% of invoiced fees collected. There is a surplus of $3.5K. For 2020, 94% of the budget has been expended and 100% of fees have been collected. For years 2019 and 2018, 95% and 98% of the budges have been expended respectively and all fees collected. The RMP is ready to unencumber 2018. Beth paused to address any questions and received a request to explain why they kept books open for many years. She explained that ongoing projects spanning multiple years necessitated keeping the books open until all projects were completed and expenses paid, allowing for clean transitions of funds into reserves. Amy added that contracts with subcontractors also influenced the decision to keep books open, as they preferred not to create new contracts every year.

The RMP requested that a total of $60,731 will be unencumbered from the 2018 budget and added to the undesignated funds. This amount consists of a $61,149 surplus from closed programmatic and S&T tasks and a $418 deficit from closed Special Studies Tasks. Beth reported no changes to the Undesignated Funds Balance since the November meeting. Beth noted the Q1 LAIF interest rates for 2024 have not been posted. She then reviewed additional funds managed, including undesignated, designated, and set-aside funds, highlighting the balance and allocation status. Jay elaborated on the funding process, explaining the ups and downs in the fund contributions due to the status and trend program's monitoring schedule. Tom discussed the accumulation of funds from mandatory minimum penalties for wastewater permit violations, which could augment the budget for special projects. To conclude the item, Beth shared that by the end of April 2024; there will be $179,289 in unallocated SEP funds, of which $19.5k remaining to be received.

Decision:

- Karin North motioned to approve the request for unencumbered for the 2018 budget. Amanda Roa seconded the motion. The motion was carried by all present members.

5. Information: Introducing Our New Watershed Modeler (00:32:55)

Jay introduced Matt Heberger as the new watershed modeler, replacing Tan Zi. Notably, Matt had previously served as the program manager for the Delta RMP and exhibits a fervent dedication to watershed modeling, akin to Alicia's passion for monitoring. Jay noted that they will make an excellent team. Matt shared that he is currently in Paris following the completion of his PhD but anticipated returning to Richmond in August. Matt provided an overview of his academic and professional background, starting with his degrees in agricultural and biological engineering and civil and environmental engineering, culminating in a recent PhD in Earth sciences from Sorbonne University in Paris. He elaborated on his MS thesis research focused on watershed loading models for bacteria in the Mystic River, Massachusetts, emphasizing the importance of predicting bacteria levels to preempt beach closures. Transitioning to his consulting experience at CDM Smith in Cambridge, Massachusetts, he detailed his work on hydrology and hydraulics projects, notably on the Merrimac River, addressing various water quality challenges. Subsequently, he shared his tenure at the Pacific

Institute in Oakland, where he delved into diverse water issues, including sea-level rise, groundwater, and desalination.

Matt's presentation then covered his global experiences, including his time at the Paris Observatory, where he engaged in earth observation using remote sensing data to study the water cycle. He provided a description of his PhD research, focusing on optimizing water cycle estimates globally using optimization methods and machine learning. Additionally, he discussed his volunteer work with nonprofits in Mali, West Africa, emphasizing his commitment to public health and education. Transitioning to his love for open science and open-source software, Matt shared his GitHub page and personal website, showcasing his global watershed delineation tool. Finally, he outlined his aspirations for contributing to the Bay RMP, emphasizing his expertise in hydrologic science, watershed modeling, and pollutant loading, along with his background in project management and facilitation.

Jay commended Matt's extensive experience and skills, particularly noting his patience, a valuable trait given his role in the Delta Regional Monitoring Program. Matt expressed his gratitude and eagerness to connect with everyone further.

6. Information: USEPA San Francisco Bay Program Office Funds (00:45:55)

Jay notified the SC that the EPA has introduced a list of 11 priority areas for funding through their new Program Office. This list, which will be updated annually, is still in draft form. However, Jay noted that the list is expected to remain largely unchanged when finalized. Luisa Valiela confirmed that the list is indeed still a draft and is anticipated to be finalized by the end of April, pending the completion of a new process and signature requirements. She noted that only minor wording changes are expected.

Jay emphasized the significance of these 11 funding categories, especially highlighting the inclusion of the RMP (Regional Monitoring Program) and NMS (Nutrient Management Strategy) as critical priorities. Additional notable categories include funding for PCB and PFAS management. Further discussion focused on the importance of the regional consensus that is developed in the RMP in setting priorities for these topics, facilitated by workgroups and RMP governance structure. The RMP can play a pivotal role in helping the EPA allocate funding efficiently.

Jay reviewed discussions from a January meeting where the SC recommended increasing the program's budget by 50% for the next fiscal year. This recommendation is being actively implemented, with workgroups developing study ideas and planning for this budget increase.

Luisa then explained the immediate need to allocate current fiscal year funds, which must be allocated by the end of September. She mentioned that $5 to $7 million could be available for the RMP. Luisa also noted that the funding level is expected to continue at approximately $54 million annually for fiscal year 2025 and beyond, necessitating strategic planning to utilize these funds effectively.

To secure these funds, the RMP must first obtain an exception memo, justifying the RMP's exemption from the general EPA competitive solicitation process. This memo will outline the rationale and a general list of work areas. Jay will work with Tom and Luisa on finalizing this memo. Once the exception is approved, Step 2 will be the development of a detailed workplan with specific tasks and deliverables by the end of June. The goal is to have the agreement in place by the end of September (Step 3).

Jay also highlighted the importance of addressing environmental justice and climate adaptation in their funding requests, aligning with EPA's priorities. He reassured the SC that the program has sufficient matching funds to meet the required 25% match.

Jay proposed an initial request of $6 million for the next two fiscal years, $2 million in FY24 and $4 million in FY25. The next three years would each request $4 million, bringing the five-year total request to $18 million. Jay emphasized the need for careful planning to avoid overburdening existing staff.

Jay emphasized the importance of enhancing data management and public accessibility to RMP data. He acknowledged current challenges in data accessibility and expressed a commitment to improving this aspect as the RMP expands. Tom noted that the exception memo did not require too much specificity, leaving room for future flexibility. Tom also noted that the RMP could expand its data management program with future funds.

7. Information: Workgroup Planning Updates (01:26:30)

In this item, the RMP's workgroup leads provided planning updates for their respective workgroups. Workgroup proposals will be prioritized at the June TRC meeting and approved by the SC in August. Jay noted the workgroups had organized the special study proposals into two tiers: Tier 1 for funding from the planned RMP special study pot and Tier 2 for alternate funding sources such as SEPs or the USEPA SF Bay Program Office funds.

Leading off for the Emerging Contaminants Workgroup, Becky Sutton of SFEI discussed Tier 1 proposals. Strategy funding would require $70K while stormwater CEC monitoring will cost $300K. Plastic additives in water would require $173K or $235K if sediment is added. Quaternary ammonium compounds (QACs) in water would cost $106K or $164K if sediment was added. This would be followup work to the draft report just released by Becky and Bill Arnold. Synthetic dyes in sediment, water, wastewater and stormwater is an early outgrowth of the workgroup's data mining exercise where it will look at targeted data and additional priorities. This would be an additional exploration for $171K. Non-target analysis (NTA) of Bay fish would be conducted for a second year for $76K and could be done with a new analytical partner. NTA of fibers in stormwater will look at plastic additives leached from textiles and fibers for $124K. A stormwater in vitro toxicity screening would test a new method developed by the EPA for $26K.

Becky proceeded to review the Tier 2 proposals for the ECWG. Augmented stormwater CECs monitoring aimed to extend previous work in monitoring contaminants of emerging concern (CECs) in stormwater, possibly with additional funding to enhance monitoring efforts for $150K. Becky proposed a PFAS nuclear magnetic resonance (NMR) analysis, utilizing advanced analytical techniques to comprehensively analyze per- and polyfluoroalkyl substances (PFAS) in various matrices such as wastewater, stormwater, and bay samples for $380K. A journal paper on tire wear emissions will collaborate with a European laboratory to assess tire wear based on chemical markers, potentially contributing to the understanding of tire-related pollutants in the environment for $15K. An analysis on tire rubber markers will conduct detailed analyses of tire particles using paralysis gas chromatography-mass spectrometry (GCMS), enhancing the accuracy of tire wear particle measurements in stormwater samples for $105K. Becky proposed a PFAS analysis add-on to stormwater depth monitoring pilot proposed incorporating PFAS analysis into an existing pilot study on stormwater microplastics, aiming to evaluate the impact of different depth sampling on PFAS evaluation that would be $55K. Finally, an analysis on PFAS wet deposition pathways project would involve community groups to collect samples and share data, focusing on assessing PFAS contamination through wet deposition pathways, with particular attention to the importance of rainfall data for exposure assessment. This effort would cost either $185K or $320K. Focusing on rainfall data importance for exposure assessment and would include involvement of community groups to gather samples and share data.

For the Sediment Workgroup, Scott Dusterhoff presented the Tier 1 Proposals, stressing that the dollar amounts were flexible. In Tier 1, Scott proposed three main project ideas in addition to $50K for strategy and coordination. Firstly, the Bay conceptual model, which was completed two years ago, would be updated. The workgroup would consider whether to update it at the bay scale or sub-embayment scale. This would cost $50K. Secondly, the workgroup would develop a work plan for studies supporting hydrodynamic model calibration, focusing on assessing erodibility and sediment flocculation impacts on settling velocity for $75K. The group also proposed a pilot project for using satellite imagery to determine suspended sediment concentration, aiding in assessing sediment flux in the Bay for $125K. Tier 2 proposals included developing a shoreline change analysis for areas such as San Pablo Bay ($75K), tributary sediment load monitoring ($100K), monitoring flux at key bay cross-sections like the Richmond Bridge ($100K), and continuing flux and deposition monitoring on mudflats and marshes, potentially at new locations ($100K). Additionally, he suggested continuing monitoring at US Army Corps shallow stations and for bathymetric data collection (TBD).

For the Sources, Pathways, and Loadings Workgroup (SPLWG), Alicia Gilbreath presented the team's Tier 1 proposals. In Tier 1, proposals included a strategy and coordination budget aimed at enhancing internal and external coordination for monitoring and modeling needs ($65K). Alicia also presented a tidal area remote sampler project addressing ongoing needs and permit-related expenses ($10K). Lastly, there will be PCB and Mercury monitoring and modeling to support load and trend assessment, focusing on estimating model uncertainties and providing monitoring design recommendations for $167K. Tier 2 proposals included GIS improvements in watershed delineation and land use integration to support modeling, data interpretation and site selection decision-making ($60K-$100K). Another proposal involved full stormwater systems management and equipment upgrades to automate sampling processes and enhance data management for ($60K-$100K). Large storm event contingency funds planning and implementation would cost $175K, while discharge rating curve sampling would be $90K. Loads/trends monitoring at Mallard Island would cost $150-$200K and a trend analysis update for Guadalupe River would be around $60K.

For the Microplastics Workgroup, Diana Lin outlined the Tier 1 proposals, including $20K for strategy funding. The first proposal featured a stormwater pilot study that hoped to continue exploring sampling biases between single-depth and depth-integrated methods for an additional year ($100K). Additionally, the workgroup plans to leverage the 2025 Status and Trends water cruise monitoring to collect smaller microplastic water samples, enhancing previous data by capturing microplastics as small as 10 micrometers, crucial for evaluating toxicity and understanding particle size distribution in ambient water samples. This effort would cost $202K. Transitioning to Tier 2 proposals, Diana presented a study to analyze microplastics in sport fish, utilizing specimens collected during the 2024 status and trends sport fish monitoring ($130K).

Lastly, the tire rubber marker analysis would be conducted in conjunction with the ECWG ($105K).

Jay presented the proposals from the PCB Workgroup. The Tier 1 proposal only covers on strategy and coordination ($10K) as the group already has substantial funding secured for modeling work from Destination Clean Bay and other sources. Tier 2 introduced a proposal driven by the modeling team to gather empirical data supporting modeling efforts in San Leandro Bay, involving the deployment of sensor arrays to track suspended sediment and other parameters, aiming to enhance modeling accuracy. Finally, he shared a cross workgroup proposal on creating a fixed station watershed monitoring network that would span the SPLWG, ECWG, SedWG, and PCBWG.

Jay emphasized the need for coordination between all of the workgroups and other initiatives, particularly the Regional Monitoring Program (RMP), to ensure alignment and avoid duplication of efforts. Additionally, there was mention of potential future data needs dependent on factors like regulatory reviews and adaptation efforts, indicating a dynamic approach to research prioritization. Luisa expressed that a public facing dashboard would be helpful and inquired if this could be implemented on the website. The EPA expects to see investment in data analysis and management and that communicating through the website should be a priority for SFEI. Jay noted that SFEI is currently overhauling the Institute website with Jay working on mapping the last RMP revision to the new format.

8. Discussion: Program Management and Status and Trends 2025 (02:02:30)

Jay and Amy provided updates on RMP program management and S&T 2025 planning. Jay emphasized the need for extensive enhancements across several areas to accommodate the anticipated growth in workload. Internal and external coordination will require increased budgets for new hires and enhanced collaboration between workgroups, external partners, and labs. This expansion will ensure effective project management and coordination as the scope of the RMP widens.

Technical oversight will also require more hours dedicated to internal and external review of deliverables. This step is critical for maintaining the quality and accuracy of the RMP’s outputs. As the RMP grows, contract and financial management will also need additional funding to handle more contracts.

Governance processes must evolve to support the expanding staff's participation in SC, TRC, and workgroup meetings. The RMP needs to increase general WG funds to facilitate proposal development, literature reviews, and internal coordination within WGs. Additionally, the budget for maintaining and editing the sample archive database must grow from its current $8K to accommodate the increased use of archived samples.

RMP funds must also be allocated for an equipment maintenance budget. This budget will cover the acquisition of new YSIs and the implementation of regularly scheduled calibrations. It will also support the maintenance costs of remote samplers and ISCOs, which need to be fired up and tested every six months. Other essential equipment such as peristaltic pumps, new vacuum pumps for lab and field use, safety harnesses, and CTD replacements will be included in this budget.

SFEI lab improvements are a crucial part of support of the RMP and NMS. These improvements will include expanding and upgrading freezer capacity to meet the increased storage needs of our growing sample volume.

Looking ahead to the S&T 2025 planning, the RMP has identified several key initiatives. The multi-year plan for 2025 includes resuming the selenium project, which had been paused in 2024 to reassess the best way forward. Additionally, non-target analysis in S&T, initially budgeted at $12,000, now requires a significantly larger budget for realistic execution. This method, which involves advanced techniques to identify various substances in water samples, holds great promise for enhancing the RMP's CEC monitoring capabilities.

There is a push for more extensive environmental justice work, aligning with EPA's emphasis on this area. In the RMP, this can involve additional fish monitoring and expanding the RMP's community fish collection efforts, particularly in regions like Hunters Point. The RMP also plans to continue wet weather sampling by increasing the number of stations and events sampled. Other potential expansions include more frequent selenium sampling, incorporating more sound-based stations, and enhancing sediment monitoring.

Finally, the RMP aims to improve its reporting and analysis capabilities, support manuscript writing, and upgrade systems for better sample tracking. This includes developing a sites database and modernizing field data collection methods through the use of tablets and phones, thereby reducing reliance on traditional pen and paper.

These strategic enhancements across various facets of program management and monitoring are essential to meet the growing demands and maintain the high standards of our work. As the RMP moves forward, careful planning and allocation of resources will be pivotal in achieving these objectives.

9. Discussion: Communications (02:27:00)

Jay opened discussion to brainstorm ideas for the upcoming RMP Pulse and Annual Meeting. Jay has been working with Becky and her team to begin writing profiles and summaries for the highest priority contaminants, with the process set to commence immediately. He presented an outline of the project highlighting changes from the 2013 edition and new elements to be included.

Jay emphasized the need to identify authors for a management article, particularly seeking collaboration between the Water Board and DTSC. Tom suggested that Maggie from the Water Board and representatives from DTSC could contribute, with an immediate call for potential authors to start drafting. Sidebars accompanying the management article include the tiered risk-based framework, sources to solutions for EPA and PFAS, DPR and pesticides, the state board's CEC strategy, and the essential use approach.

Moving to the Annual Meeting, the focus was on the agenda and key sessions. The highlight of the meeting would be a series of talks by RMP science advisors, focusing on RMP and beyond. These talks aim to leverage the expertise of the world-class advisors involved in the RMP workgroups. Jay sought approval to start lining up speakers, which is a crucial step at this stage.

Other presentations were considered, including general RMP highlights and the significant funding increase for the program. The meeting would maintain a strong focus on CECs, similar to the previous year, with at least two blocks dedicated to this topic. An article summarizing the RMP CEC strategy will also be highlighted at the Annual Meeting. The meeting will feature a block of advisor presentations from the Emerging Contaminants Work Group (ECWG), including speakers like Derek Muir, Bill Arnold discussing QACs in wastewater, and a potential third advisor. Karin recommended Ed Kolodziej, who could present on Next Gen. Rob Budd of DPR and Dan Villanueve, suggested by Becky, are other potential speakers, with Luisa noting the need for more female representation. The CECs discussion will extend to include a second block, covering the CEC Strategy, ethoxylated surfactants (with either Jennifer Dougherty or Diana) and PFAS sources to solutions, for which Jay recommends Kelly. Tom raised the question of whether we can present more than just a proposal, to which Karin suggested discussing the example of the phase-out of PBDEs and the similar transition to moving from detection to management for PFAS.

Additionally, the meeting will cover PCB modeling in the Bay and watershed modeling by Pedro, sediment, and nutrients with highlights from the Nutrient Management Strategy (NMS), SPL, and microplastics.

10. Discussion: Status of RMP Deliverables and Action Items (02:50:50)

Amy reviewed the deliverables and action items with the SC. Amy highlighted the completion of several deliverables, including the 2021 copper and cyanide rolling averages, distribution of participation letters to BACWA and WSPA, and payment of honoraria and gifts to science advisors. She emphasized the completion of S&T wet weather water sampling for the wet season. Despite a team member being on leave, the data services team managed to update the sample data archive database with all the archives and bird eggs collected in 2022. The final deliverable for 2021 Nutrients special study was a technical memo on semi-imposed light extinction estimates for biochemical modeling applications in San Francisco Bay. Amy noted the completion of the 2024 RMP QAPP update, which is now posted on the website, as it facilitated contract negotiations with Destination Clean Bay. The CEC modeling exploration report is also completed. Additionally, the stormwater CECs manuscript has been submitted.

Amy also addressed overdue deliverables, such as the MTC Bay Area land use update, the STLS regional model development, 2020 S&T Design report, and RWSM update and technical report.

Delayed deliverables include the STLS WY21 POC Reconnaissance Monitoring, which required an update of data for the Advanced Data Analysis. This project is waiting on input from BAMSC, Lester has been in contact with Lisa Sabin to discuss next steps. The North Bay Selenium in clams and water report has had all data through 2022/2023 run through DS. Work on the NTA Sediment Data Manuscript and Fact Sheet has slowed, prioritized behind CEC strategy revisions and 2025 ECWG proposal prep. Work on the PFAS in Archived Sport Fish Manuscript has slowed, prioritized behind CEC strategy revisions and 2025 ECWG proposal prep, and the QACs report, delayed until summer 2024.

Deliverables due before the next SC meeting include the Impact of Remediation Actions on San Leandro Bay Recovery from PCB Contamination technical report, which is currently under review with the PCBWG and aiming to be finalized in April. Wastewater partners needed more time on the The QACs in Bay wastewater SEP but the intention is to have the report ready for the ECWG meeting. Don and Data Services are still working on the reanalysis for the Final Margins report. This was prioritized behind the 2023 lab intercomparison results, Bird Egg PFAS QA for ECWG, and the ambient Bay numbers update for the BCDC. With help from Miguel on QA ancillary datasets, the 2021 QA Summary Report for S&T Activities should be completed by June. A draft of the North Bay Selenium in clam and water data report (2019-2020) has been sent for review by the Selenium workgroup, aiming for finalization in April. The

2020 S&T Design Report will be completed without review from Tom Grieb. The Sediment Deposition on SB Marsh (Whales Tail) report will be submitted soon. The Integrated Watershed monitoring and modeling strategy report as well as the PFAS in archived sport fish effort will also be completed before the August meeting.

Action Item:

- Schedule meeting to discuss event based monitoring (Amy Kleckner, May 1, 2024)

11. Discussion: Plan Agenda Items for Future Meetings (02:59:00)

The main items for the August SC meeting include voting on special study funding, planning the agenda for the MYP workshop, fee discussions and Annual Meeting talks. Given the agenda is already full, a technical update from SFEI was deemed optional. The charter will potentially have to be revised given Tom's retirement. Tom suggested an item on dredging community fees

12. Discussion: Plus/Delta (03:06:00)

The group commended Amy and SFEI for hosting the hybrid meeting and keeping on time. Karin particularly appreciated the staff introductions.

Adjourn

About the RMP

RMP ORIGIN AND PURPOSE

In 1992 the San Francisco Bay Regional Water Board passed Resolution No. 92-043 directing the Executive Officer to send a letter to regulated dischargers requiring them to implement a regional multi-media pollutant monitoring program for water quality (RMP) in San Francisco Bay. The Water Board's regulatory authority to require such a program comes from California Water Code Sections 13267, 13383, 13268 and 13385. The Water Board offered to suspend some effluent and local receiving water monitoring requirements for individual discharges to provide cost savings to implement baseline portions of the RMP, although they recognized that additional resources would be necessary. The Resolution also included a provision that the requirement for a RMP be included in discharger permits. The RMP began in 1993, and over ensuing years has been a successful and effective partnership of regulatory agencies and the regulated community.

The goal of the RMP is to collect data and communicate information about water quality in San Francisco Bay in support of management decisions.

This goal is achieved through a cooperative effort of a wide range of regulators, dischargers, scientists, and environmental advocates. This collaboration has fostered the development of a multifaceted, sophisticated, and efficient program that has demonstrated the capacity for considerable adaptation in response to changing management priorities and advances in scientific understanding.

RMP PLANNING

This collaboration and adaptation is achieved through the participation of stakeholders and scientists in frequent committee and workgroup meetings (see Organizational Chart, next page).

The annual planning cycle begins with a workshop in October in which the Steering Committee articulates general priorities among the information needs on water quality topics of concern. In the second quarter of the following year the workgroups and strategy teams forward recommendations for study plans to the Technical Review Committee (TRC). At their June meeting, the TRC combines all of this input into a study plan for the following year that is submitted to the Steering Committee. The Steering Committee then considers this recommendation and makes the final decision on the annual workplan.

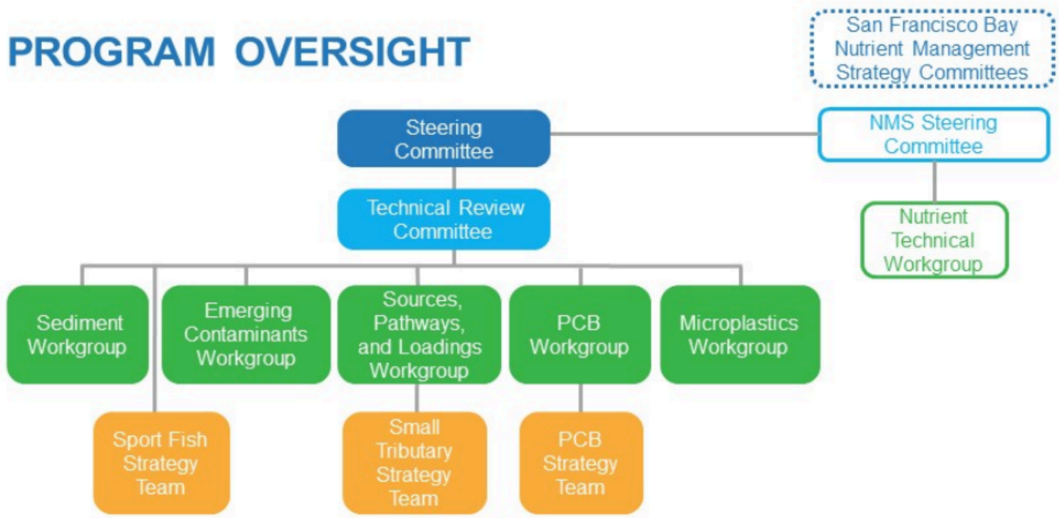
In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon, so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each of the workgroups and teams develops five-year plans for studies to address the highest priority management questions for their subject area. Collectively, the efforts of all these groups represent a substantial body of deliberation and planning.

PURPOSE OF THIS DOCUMENT

The purpose of this document is to summarize the key discussion points and outcomes of a workgroup meeting.

Governance Structure for the
Regional Monitoring Program for Water Quality in San Francisco Bay

Figure 1. Collaboration and adaptation in the RMP is achieved through the engagement of stakeholders and scientists in frequent committee and workgroup meetings.



The Steering Committee consists of representatives from discharger groups (wastewater, stormwater, dredging, industrial) and regulatory agencies (Regional Water Board and U.S. Army Corps of Engineers). The Steering Committee determines the overall budget and allocation of program funds, tracks progress, and provides direction to the Program from a manager's perspective.

Workgroups report to the TRC and address the main technical subject areas covered by the RMP. The Nutrient Technical Workgroup was established as part of the committee structure of a separate effort—the Nutrient Management Strategy—and makes recommendations to the RMP committees on the use of the RMP funds that support nutrient studies. The workgroups consist of regional scientists and regulators and invited scientists recognized as authorities in the field. The workgroups directly guide planning and implementation of special studies.

Oversight of the technical content and quality of the RMP is provided by the **Technical Review Committee** (TRC), which provides recommendations to the Steering Committee.

RMP strategy teams constitute one more layer of planning activity. These stakeholder groups meet as needed to develop long-term RMP study plans for addressing high priority topics.

Table 1: Summary of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	PI / Agency	Funding Request	Ranking	Time sensitive	Multi-year study	Multi-workgroup study	Notes	Agenda Package Page Numbers
Emerging Contaminants	Stormwater CECs Monitoring and Modeling 2025	Moran / SFEI	$300,000 - $450,000	Tier 1 ($300,000) Tier 2 - #1 ($150,000)	Y	N	Y	Early release of RMP funds requested	50-64
Emerging Contaminants	Plastic Additives in Bay Water and Archived Sediment	Mendez / SFEI	$170,750 - $310,920	Tier 1 ($235,200)	N	Y	N	Bay Water Only $170,760, + $65, 350 (Archived Sediment), + $74,820 (Stormwater)	65-74
Emerging Contaminants	Quarternary Ammonium Compounds (QACs) in Bay Water and Stormwater	Mendez / SFEI	$111,000 - $174,000	Tier 1 ($106,000)	N	Y	N	Bay Water Only $111k, Bay water and Stormwater $174k	75-81
Emerging Contaminants	Nontarget Analysis of San Francisco Bay Fish (Year 2)	Miller / SFEI	$76,000	Tier 1	Y	N	N	year 2 of a two year project	82-90
Emerging Contaminants	Stormwater In Vitro Toxicity Screening	Miller / SFEI	$26,000	Tier 1	Y	N	N	Early release of RMP funds requested	91-99
Emerging Contaminants	Tire Rubber Marker Analysis for Tire Wear Particle Quantification	Lin / SFEI	$105,000	Tier 2 - #2	Y	Y	Y		100
Emerging Contaminants	PFAS NMR Analysis in Wastewater, Stormwater, and Bay Matrices	Mendez / SFEI	$125,000	Tier 2 - #3	Y	N	N	$125k Year1, est. $200-260k Year 2	101
Emerging Contaminants	Nontarget and Target Analysis of Fibers and Urban Stormwater	Lin / SFEI	$123,700	Tier 2 - #4	N	N	Y	Early release of RMP funds requested	102-119
Emerging Contaminants	PFAS Rainwater (Wet Deposition Pathway) Community Science: Phase 1 Planning	Mendez / SFEI	$60,000	Tier 2 - #5	N	N	N	$60k Phase1, est. $200-400k for implementation	120
Emerging Contaminants	PFAS Analysis Add-On to Stormwater Depth Monitoring Pilot	Lin / SFEI	$55,000	Tier 2 - #6	Y	N	N	Early release of RMP funds requested	121
Emerging Contaminants	Nontarget Analysis Add-On to Stormwater 2025 Monitoring	Miller / SFEI	$36,000	Tier 2 - ?	Y	N	N	Early release of RMP funds requested	122
	Total		**$1,188,450 - $1,541,620**						
Microplastic	Microplastics Stormwater Monitoring Pilot (Year 2 of 2)	Lin / SFEI	$106,200	1	Y	N	N	Early release of RMP funds requested	123-131
Microplastic	Microplastics in San Francisco Bay Sport Fish	Lin / SFEI	$130,000	2	N	N	N		132
	Total		**$236,200**						
Nutrients	Moored sensor high-frequency observation network	Senn / SFEI	$250,000	N/A	Y	Y	N		
	Total		**$250,000**						
Sediment	Develop a study plan to improve characterization of bed sediments and settling velocity to advance sediment transport modeling for San Francisco Bay	Lacy / USGS	$106,900	1	Y	N	N		133-139
Sediment	Shoreline Change in San Francisco Bay	Braud / SFEI	$50,000	2	N	Y	N	$50k Year 1, approx. $30k Year 2	140-141
Sediment	Suspended Sediment Flux Measurements at Richmond-San Rafael Bridge, California	Hart / USGS	$15,000	3	Y	N	N		142
Sediment	Refining the Conceptual Understanding of Sediment Transport in San Pablo Bay	Stark / SFEI	$65,000	4	N	N	N		143-149
Sediment	Sediment Dynamics in a Fluvially Influenced Salt Marsh	Nowacki & Lacy / USGS	$121,500	5	Y	Y	N		150-151
	Total		**$358,400**						
Sources Pathways and Loading	Integrated Monitoring and Modeling to Support PCBs and Mercury Watershed Loads Uncertainties Assessment and Monitoring Design (Year 2 of 3)	Avellaneda / SFEI	$110,000	Tier 1	N	Y	N		152-160
Sources Pathways and Loading	Tidal Area Remote Sampler Pilot - Year 3	Gilbreath / SFEI	$15,000	Tier 1	Y	Y	N		161-167
Sources Pathways and Loading	Stormwater CECs Modeling and Data Analysis	Avellaneda / SFEI	$39,000	Tier 1	Y	N	Y		168

Table 1: Summary of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	PI / Agency	Funding Request	Ranking	Time sensitive	Multi-year study	Multi-workgroup study	Notes	Agenda Package Page Numbers
Sources Pathways and Loading	GIS Improvements to Support Modeling, Data Interpretation, and Site Selection	Heberger / SFEI	$40,000	Tier 2	N	N	N		169-170
Sources Pathways and Loading	Stormwater Systems Management and Equipment Upgrades	Gilbreath / SFEI	$80,000	Tier 2	Y	N	N	Early release of RMP funds requested	171
Sources Pathways and Loading	Develop Discharge Rating Curves at County-Operated Stage Monitoring Stations	Heberger / SFEI	$30,000	Tier 2	N	N	N		172-174
Sources Pathways and Loading	Add-on to Stormwater Contaminants of Emerging Concern (CECs) Monitoring and Modeling 2025 Project to Include Additional Non-CECs Analytes	Gilbreath / SFEI	$50,000	Tier 2	Y	N	Y	Early release of RMP funds requested	175-176
	Total		**$364,000**						
PCBs	San Leandro Bay OPTICS Study	Scheu / Integral	$600,000		Y	N	N	To be funded from separate PCB pot	
PCBs	Mapping Mudflat Morphodynamics	Yee / SFEI	$25,000		Y	N	N	To be funded from separate PCB pot	
PCBs	Sediment Trap Reconnaissance	Yee / SFEI	$22,000		Y	N	N	To be funded from separate PCB pot	
	Total								

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
Emerging Contaminants	Stormwater CECs Monitoring and Modeling 2025	$300,000 - $450,000	This project will continue implementing the RMP stormwater CECs integrated monitoring and modeling program in water year 2025 (October 2024-September 2025). It builds on prior stormwater CECs RMP projects that have identified priority near-term management questions, identified the modeling and data analysis approach to address these management questions, developed and piloted the SFEI Mayfly remote sampler, and are currently framing out the RMP stormwater CECs monitoring design. These projects are collecting data and supporting the overallstormwater CECs monitoring program framework development through the RMP "Stormwater CECs Approach" project that is slated for completion in late 2024. This proposal includes a range of costs to prove the option to expand its scope should additional funds become available to the RMP from the EPA Program Office.	Task 1. Project management and coordination with non-RMP funding sources - Fall 2024 - Fall 2025 Task 2. Stakeholder and science advisor engagement —Informal stakeholder and advisor meetings - Fall 2024-Fall 2025 —One SST meeting - Summer-Fall 2025 —Three RMP presentations (ECWG/SPLWG, TRC and SC - Spring 2025 Task 3. CEC modeling and data analysis —Inform monitoring design - Summer 2025 —Draft Technical Report - October 31, 2025 —Final Technical Report - December 12, 2025 Task 4. Stormwater CECs work integrated scientific systems development and cross-task and cross-project team coordination - Fall 2024-Summer 2025 Task 5. Stormwater CECs monitoring —ECWG and SPLWG presentations - Spring 2025 —Presentation to and discussion with the SST - Summer-Fall 2025 —Data uploaded to CEDEN - December 2025 Task 6. Remote Sampler continued improvement —ECWG and SPLWG updates - Spring 2025 —Updated sampler design summary - December 2025 Task 7. Initiate site selection and permitting for water year 2026 - Summer 2025
Emerging Contaminants	Plastic Additives in Bay Water and Archived Sediment	$170,750 - $310,920	Plastic additives are an extensive group of chemicals used in the production of plastics. Many are ubiquitous in the environment and known to be toxic. The RMP has previously found organophosphate esters (OPEs) and bisphenols in the Bay and pathways, and is continuing monitoring a key subset of these contaminants via Status and Trends. Further monitoring already approved for 2024 will examine both of these classes along with multiple other plastic additive classes in wastewater. To build on these efforts, we propose a study to assess the concentrations of plastic additives in Bay water and (optionally) archived sediment to inform our understanding of the fate and effects of these contaminants in the Bay. Data developed as part of this proposed study would result in addition of multiple new plastic additive chemicals and classes to the RMP tiered risk-based framework for emerging contaminants.	Task 1. Develop Sampling Plan (Ship Archived Sediment) June 2025 Task 2. Field Sampling – Water (Dry Season) Summer 2025 Task 3. Field Sampling – Water (Wet Season) & Stormwater Fall 2025 to Spring 2026 Task 4. Laboratory Analysis October 2026 Task 5. QA/QC & Data Management February 2027 Task 6. Presentation at ECWG April 2027 Task 7. Draft Report June 2027 Task 8. Final Report August 2027
Emerging Contaminants	Quarternary Ammonium Compounds (QACs) in Bay Water and Stormwater	$111,000 - $174,000	Quaternary ammonium compounds (QACs) are widely used as antimicrobials and for other purposes in a variety of consumer products. The COVID-19 pandemic significantly increased use of products containing QACs, which likely increased release to the environment. Recent analysis of wastewater has found notable levels of QACs in influent, effluent, and biosolids with many of those commonly found in influent linked to disinfectant products. A smaller set of samples of sediment, Bay water, and stormwater have also exhibited the presence of QACs. Currently the limited number of measurements available result in classification of these contaminants as Possible Concern within the tiered risk-based framework. We propose a study to assess the concentrations of at least 20 QACs in Bay water and (optionally) stormwater to understand the transport, fate, and effects of these contaminants in the Bay. Data developed as part of this proposed study would be sufficient for more definitive placement of QACs within the tiered risk-based framework.	Task 1. Develop Sampling Plan June 2025 Task 2. Field Sampling – Water (Dry Season) Summer 2025 Task 3. Field Sampling – Water (Wet Season) & Stormwater Fall 2025 to Spring 2026 Task 4. Laboratory Analysis September 2026 Task 5. QA/QC & Data Management December 2026 Task 6. Presentation at ECWG April 2027 Task 7. Draft Report June 2027 Task 8. Final Report August 2027
Emerging Contaminants	Nontarget Analysis of San Francisco Bay Fish (Year 2)	$76,000	Contaminants in sport fish may have both human and wildlife health implications. The RMP has been monitoring selected contaminants in sport fish for many years but has never done any nontarget analysis of this matrix. This two-year study leverages 2024 Status and Trends sport fish monitoring to collect sport fish samples for nontarget analysis. Year 1, funded in 2024, included developing a sampling plan and sample collection. Year 2 will cover the laboratory and data analysis and reporting. This type of analysis will provide a means to identify unanticipated contaminants that may merit follow-up targeted monitoring. It will also allow comparison of San Francisco Bay fish contaminant profiles with those of fish from other locations such as the Great Lakes. Anticipated study outcomes would include priorities and recommendations for future investigations	Task 1. Work with S&T Sport Fish Strategy Team to develop sampling plan (funded) - Spring 2024 Task 2. Sample collection (funded) Summer 2024 Task 3. Lab and data analysis Spring 2025 – Spring 2026 Task 4. Presentation to ECWG and TRC April 2026 Task 5. Draft manuscript September 2026 Task 6. Final manuscript December 2026

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
Emerging Contaminants	Stormwater In Vitro Toxicity Screening	$26,000	In vitro bioassay monitoring of environmental samples can detect possible biological effects that may not be predictable solely from targeted chemical analyses of the same samples or traditional individual chemical risk screening methods. The USEPA Center for Computational Toxicology and Exposure (CCTE) and EPA Region 10 are piloting using a rainbow trout gill cell high-throughput assay to detect toxicity of stormwater samples and compare between different locations. This is an imaging-based means of cell phenotype profiling with fluorescent dyes to quantify cellular-level changes in responseto chemical exposure. This bioassay uses rainbow trout, which is both a common toxicity testing model and a Bay-relevant organism, to test for cytotoxicity and sub-cellular effects. We leveraged ongoing RMP stormwater sampling efforts during the water year 2024 wet season to collect a modest number of samples for pro bono extraction and analysis by CCTE. This project proposal covers Bay Area-specific data analysis and interpretation as well as coordination with EPA Region 10 and CCTE for data analysis and reporting. This project represents early implementation of an element of the RMP CEC strategy, namely strategic incorporation of novel toxicological methods to inform management.	Task 1. Sample collection and extraction - Winter 2024 (Complete; pro bono) Task 2. Coordination with EPA project Spring 2024 – Fall 2025 Task 3. Lab and data analysis Spring 2024 – Fall 2025 Task 4. Presentation to ECWG April 2026
Emerging Contaminants	Tire Rubber Marker Analysis for Tire Wear Particle Quantification	$105,000	Tire Wear Particles (TWPs) may be the biggest source of microplastics to the Bay, and are also a source of tire-related contaminants. Norwegian Institute for Water Research (NIVA) scientists have developed state of the art methods for quantifying tire wear particles using reference tire materials to estimate relationships between emissions of TWPs from different types of vehicles and tires with different marker content. While NIVA has developed a tire database for tires used in Norway, no such reference database has been published for California tires. Because tire rubber composition varies due to brand, car type, area weather, and intended use, creating a representative regional tire database is important for improving the accuracy of estimated tire wear concentrations in environmental samples. This proposal would analyze tire tread rubber from a representative set of new tires for the Bay Area. NIVA will analyze samples using pyrolysis GC-MS to quantify various tire markers to develop a reference database. Results will be publicly shared through a peer-reviewed manuscript led by NIVA, and integrated into future RMP and SFEI reports. Overall, developing a robust database is critical for quantifying tire wear particles in the region and state.	Task 1. Develop study design March 2025 Task 2. Collect tire rubber samples September 2025 Task 3. Laboratory Analysis February 2026 Task 4. Data analysis, interpretation, and reporting June 2026
Emerging Contaminants	PFAS NMR Analysis in Wastewater, Stormwater, and Bay Matrices	$125,000	PFAS are ubiquitous in Bay matrices and considered a High Concern in the RMP tiered risk-based framework. Most Bay studies to date have focused on targeted analytical methods analyzing up to 40 individual PFAS, which does not adequately capture the overall presence of PFAS in the environment. Preliminary application of broader methods has illustrated the significant presence of unknown PFAS in Bay matrices. A new approach uses Fluorine-19 nuclear magnetic resonance (19F NMR) spectroscopy to more broadly detect and quantify fluorine-containing compounds, including PFAS. This method provides information on the relative presence of different fluorinated functional groups, which provides insight as to the dominant types of PFAS and other fluorinated compounds present. We propose applying this new 19F NMR method to wastewater and stormwater samples that will be undergoing analysis with multiple PFAS methods as part of RMP and USEPA-funded work. Complementary analysis will allow broader insights as to the utility of 19F NMR. Limited analysis of available extracts of other Bay matrices (sediment, bird eggs, sport fish, marine mammals) is included. Overall, this proposed project would supplement current and future PFAS work to better characterize the presence, transport, and fate of fluorochemicals in the Bay.	Task 1. Develop Study and Sampling Plan March 2025 Task 2. Ship Available Extracts (EPA 1633) & Archived Samples April 2025 Task 3. Laboratory Analysis and Reporting (Bay Matrices); Decision on request to proceed with year two - July 2025 Task 4. Field Sampling - Stormwater Fall-Spring 2026 Task 5. Field Sampling - Wastewater Spring-Summer 2026 Task 6. Ship Available Sample Extracts (EPA 1633; WW & SW) Summer-Fall 2026 Task 7. Laboratory Analysis (WW & SW) December 2026 Task 8. Presentation to ECWG Meeting April 2027 Task 9. Draft Manuscript May 2027 Task 10. Final Manuscript for submission June 2027
Emerging Contaminants	Nontarget and Target Analysis of Fibers and Urban Stormwater	$123,700	Synthetic apparel and textiles represent a large and growing source of chemical and microplastic fiber contamination globally. Microplastic fibers are the dominant form of microplastics observed in Bay matrices, and load estimates suggest urban stormwater runoff to be the dominant transport pathway. Fibers may pose ecotoxicity concerns linked to their physical form as well as to the leaching of harmful chemical additives and transformation products. The RMP Emerging Contaminants and Microplastics Workgroups jointly propose to conduct nontarget analysis and target PFAS analysis on textile fibers and urban stormwater runoff to identify textile-related contaminants that have the potential to impact Bay water quality. This study would leverage an independent ongoing study led by SFEI to investigate whether tumble air-dryers are an important source of microplastic fibers to the Bay. Nontarget analysis can indicate the presence of plastic additives in fibers released to the environment, and statistical chemical fingerprinting techniques can be used to explore linkages between fibers and urban stormwater runoff. Observations may point to chemicals that have been overlooked in previous targeted monitoring in stormwater samples and merit quantitative analysis.	Task 1. Develop sampling plan November 2024 Task 2. Stormwater sample collection November - March 2024 Task 3. Lab analysis June 2025 Task 4. Computational analysis and interpretation September 2025 Task 5. Draft Report March 2026 Task 6. Presentation at ECWG April 2026 Task 7. Final Report June 2026

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
Emerging Contaminants	PFAS Rainwater (Wet Deposition Pathway) Community Science: Phase 1 Planning	$60,000	Recent stormwater analysis has highlighted its importance as a pathway for PFAS discharge to the Bay with levels of individual PFAS similar to those found in wastewater. Wet deposition (i.e., rainwater) itself has been shown to contain PFAS at levels above US EPA drinking water health advisories, even in remote areas across the globe. At present, we lack local data on PFAS in precipitation that would allow us to draw conclusions about the overall importance of this pathway relative to outdoor PFAS sources distributed within the surrounding watershed. We propose investigating the presence of PFAS in rainwater in the Bay Area to establish baseline background data, elucidate its potential influence on stormwater concentrations, allow estimation of direct wet deposition to the Bay, and understand the community impacts of rainwater contamination. To evaluate a wide swath of the Bay Area, this study would incorporate citizen science to robustly monitor wet deposition including directly working together with SFEI staff and Bay communities (and their members) to establish 10 to 20 simple rainwater collection stations for use across three storms. Both targeted methods and total oxidizable precursor (TOP) assay will be used for PFAS analysis for comparison to stormwater with the potential to include additional methods such as analysis of ultra-short-chain PFAS. The study and sampling plan, including training and outreach materials, will be co-developed with participating community organizations with a budget for their engagement and sampling efforts. In addition to typical deliverables (i.e., report), this project would involve community outreach efforts to share the results such as a "town hall" style meeting presenting the results of the report and development of a concise fact sheet. Overall, this proposed project would supplement current and future PFAS work while building our efforts to integrate and collaborate with local Bay communities on science that impacts us all.	Task 1. Outreach, Develop Study and Sampling Plan (co-developed with community organizations) August 2025 Phase Two: If funding to implement the plan is obtained Task 2. Field Sampling - Rainwater Fall 2025-Spring 2026 Task 3. Laboratory Analysis June 2026 Task 4. QA/QC and Data Management September 2026 Task 5. Draft Report and Community Outreach December 2026 Task 6. Final Report and Community Outreach March 2027 Task 7. Presentation to ECWG April 2027
Emerging Contaminants	PFAS Analysis Add-On to Stormwater Depth Monitoring Pilot	$55,000	A funded Microplastic Workgroup pilot study will collect urban stormwater samples in two locations during a storm event. Simultaneous samples will be collected at 3 different depths (surface, mid-depth, near-bottom) in the deepest part of the channel to test the hypothesis that the channel is sufficiently well-mixed to reasonably conduct single-depth sampling in most Bay Area channels. The proposed study would leverage this stormwater sample collection effort by collecting additional stormwater samples for PFAS analysis to provide an initial dataset to evaluate whether single-depth stormwater sampling is supported by field measurements. The RMP's stormwater monitoring program is developing automated remote samplers that would likely be sampling for PFAS at a single depth during the storm. Considering the RMP investments in PFAS stormwater monitoring, this would be a small pilot study to evaluate the representativeness of stormwater sampling approaches. Results will be reported with the report deliverable for the MPWG stormwater pilot study.	Task 1. Collect PFAS stormwater samples March 2025 Task 2. Laboratory Analysis August 2025 Task 3. Data management and QA/QC December 2025 Task 4. Data analysis and reporting February 2025
Emerging Contaminants	Nontarget Analysis Add-On to Stormwater 2025 Monitoring	$36,000		Task 1. Collect NTA stormwater samples April 2025 Task 2. Laboratory analysis July 2025 Task 3. Reporting of contaminants detected, lessons learned September 2025
	Total	**$1,188,450 - $1,541,620**		
Microplastic	Microplastics Stormwater Monitoring Pilot (Year 2 of 2)	$106,200	In 2019, the San Francisco Bay Microplastics Project identified urban stormwater runoff as the major pathway for microplastics entering the Bay. More recent investigations on the sources and pathways of microplastics revealed that tire-wear particles and other smaller microplastics were under-counted in previous investigations due to collection and analytical methods. In addition, while depth-integrated sampling was prioritized for the 2019 study to better characterize microplastics in the full water column, this approach requires considerable labor resources relative to stormwater samples collected using unmanned, automated sample collection at a single depth, which is a more likely sampling scenario for any kind of automated sampling program. This proposed pilot field study will take pilot steps to evaluate whether single-depth sampling within the water channel is adequately comparable to depth-integrated sampling during storm flow conditions in the channel. Specifically, we will take simultaneous single-depth samples at three different depths (surface, mid-depth, near-bottom) at two field sites at five times during one storm each and compare the microplastics content of these samples using advanced laboratory techniques that characterize tire wear and other fine particles. Funding for this special study proposal was split over 2 years, and this proposal is for the remaining portion of funds needed to	Task 1. Develop study design and approach June 2024 Task 2. Site selection and field reconnaissance August 2024 Task 3. Sample collection completed and shipped to laboratories March 2025 Task 4. Laboratory analysis completed and reported to SFEI September 2025 Task 5. Draft technical report January 2026 Task 6. Final technical report February 2026
Microplastic	Microplastics in San Francisco Bay Sport Fish	$130,000	Plastic additives are an extensive group of chemicals used in the production of plastics. Many are ubiquitous in the environment and known to be toxic. The RMP has previously found organophosphate esters (OPEs) and bisphenols in the Bay and pathways, and is continuing monitoring a key subset of these contaminants via Status and Trends. Further monitoring already approved for 2024 will examine both of these classes along with multiple other plastic additive classes in wastewater. To build on these efforts, we propose a study to assess the concentrations of plastic additives in Bay water and (optionally) archived sediment to inform our understanding of the fate and effects of these contaminants in the Bay. Data developed as part of this proposed study would result in addition of multiple new plastic additive chemicals and classes to the RMP tiered risk-based framework for emerging contaminants.	Task 1. Laboratory analysis September 2025 Task 2. Draft manuscript January 2026
	Total	**$236,200**		
Nutrients	Moored sensor high-frequency observation network	$250,000	Bay-wide cruises have been critical to our understanding of the system. The Bay is spatially and temporally heterogeneous, however, and monthly measurements miss changes in water quality that are driven by short time scale processes, including tidal forcing, wind, and biological cycles. The eight sensors in the moored, high-frequency observation network in South Bay collect water quality data every 15 minutes and contribute to our understanding of Bay processes that affect nutrient and chlorophyll dynamics.	Sensor maintainace; data management

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
	Total	**$250,000**		
Sediment	Develop a study plan to improve characterization of bed sediments and settling velocity to advance sediment transport modeling for San Francisco Bay	$106,900	We propose to develop a study plan to improve modeling of sediment transport in San Francisco Bay through a combination of data collection and modeling. The plan will address two topics: 1) characterizing bed sediment properties including erodibility; and 2) representing settling velocity of particles in suspension. This proposal responds to the need identified in the RMP Sediment Workgroup Sediment Modeling and Monitoring Workplan (SMMWP) for a literature review and detailed workplan to address these two topics. Sediment transport models require specification of parameters related to each of these topics, yet both are poorly constrained by field measurements and are characterized by complex physical processes which are difficult to measure and model. Because of these complexities, a study plan reviewing existing knowledge and proposing an approach for constraining these parameters will increase the likelihood for success in the RMP effort to improve sediment transport modeling in the Bay.	Convene technical workshop to inform the study plan (Task 2) - June 2025 Presentation to stakeholders through RMP SedWG (Task 3) - October 2025 Draft report presenting study plan for improving characterization of settling velocity and bed sediments to advance sediment transport modeling in San Francisco Bay (Task 4) - January 2026 Final report (Task 5) - March 1, 2026
Sediment	Shoreline Change in San Francisco Bay	$50,000	Understanding shoreline change is crucial for addressing sediment budgets at the local level and comprehending bayland dynamics at the embayment scale. This project aims to tackle pressing questions about which wetlands and mudflats are most vulnerable to loss due to sea level rise and how we can strategically manage these changes to achieve desired future states. Past efforts in San Pablo Bay (Beagle et al. 2015) have laid a solid foundation of methods for understanding shoreline dynamics and evaluating geomorphic change. This proposal seeks to build on that knowledge and provide foundational data to address priorities identified by the Sediment Workgroup, such as understanding sediment transport processes (MQ#3.3), assessing erosion or progradation of marsh edges (MQ#3.4), and evaluating changes in sediment budgets under varying climatic and land use conditions (MQ#3.5). By leveraging readily available data (NOAA) and utilizing improved automated techniques (Farris et al. 2019), this study will create a more comprehensive dataset covering the major rivers/bay-fronting shorelines of San Francisco Bay from 1850 to 2020, with an emphasis on shorelines of the past 15 years. Recognizing that different shoreline edge typologies (scarp, ramp, etc: Beagle et al. 2015) require unique mapping techniques for accurate change detection, we propose creating a vector dataset of the modern shoreline that classifies these marsh edge types. Key tasks will include compiling historical NOAA T-Sheet-derived shorelines (1850's-1980's), creating a shoreline typology dataset, deriving shorelines from recent aerial imagery using automated techniques, and completing a technical methods report. This work is envisioned as the initial phase in a broader collaborative effort with the Wetlands Regional Monitoring Program (WRMP) to understand and manage shoreline changes across the Bay. The methodologies developed and lessons learned will inform and improve future iterations of shoreline mapping. Each task will be coordinated with the WRMP technical advisory committee. The outcomes will provide crucial data to address the question: what have been the shoreline position changes over the past 150 years? Ultimately, the project will produce vector datasets showing major river/bay-fronting shorelines of the whole Bay encompassing the last 150 years, and a modern shoreline dataset classifying the type of shoreline edge to enable more accurate delineation and contextual analysis of shoreline variability.	1. Historical Shorelines Data Package Spring 2025 2. Shoreline Typology Data Package Summer 2025 3. Recent Past Shoreline Data Package Winter 2025 4. Technical Methods report submitted and presented to Sediment Workgroup Spring 2026
Sediment	Suspended Sediment Flux Measurements at Richmond-San Rafael Bridge, California	$15,000	This proposal is to expand upon an already funded project to collect cross-channel transects using an acoustic doppler current profiler (ADCP) to measure both velocity and acoustic backscatter (ABS) at Richmond-San Rafael Bridge cross-section (RIC) **in water year (WY) 2025.** We request further funds to install an additional continuous water-quality sensor at the RIC transect location to collect high-frequency data during the study period. The exact location and/or type of additional sensor is not yet determined, and preliminary transects are currently being done to decide what would be most useful. The sensor would be either 1) a turbidity sensor deployed at the western shoal or eastern channel at the bridge to be used as a surrogate for suspended-sediment concentration (SSC); or 2) an ADCP mounted at one of the bridge platforms. This additional sensor data will be used to help supplement the transect data, along with the existing real-time station at RIC (USGS station #375607122264701), to better understand how sediment flux varies temporally during the study period. The collection of this additional sediment data will supplement the transect data we will collect by adding an additional continuous data location to monitor cross-sectional variations between boat based ADCP measurements. This work will directly address SedWG modeling/monitoring question 3.2 which pertains to sediment flux at key Bay cross-sections. This budget includes the collection of additional data during the cross-channel transects in the form of surrogate optical turbidity to calculate SSC and/or ADCP velocity data. Preliminary transects will be completed in May 2024 to determine what equipment, location(s), and deployment methods are best to support transecting. Additional equipment used during study will be project owned and no new equipment will be required, but any equipment that is requested to stay on site long term will need to be funded for purchase.	Data release including all new project data including ADCP transects and velocity-integrated point-SSC samples - December 2025 Model archive summary detailing the ABS-SSC empirical model to convert ADCP transects to sediment flux measurements - December 2025 Presentation to RMP Sediment Workgroup - May 2026

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
Sediment	Refining the Conceptual Understanding of Sediment Transport in San Pablo Bay	$65,000	McKnight et al. (2023) recently completed a conceptual model of fine sediment (i.e., sediment silt-sized and smaller) for San Francisco Bay. The report offered a high-level understanding of how fine-grained sediment moves at different scales within the Bay. This effort concluded with a set of key knowledge gaps and uncertainties. Among these was a recommendation to refine our understanding of the dynamic processes (e.g., between marshes and mudflats, changes in the erodible sediment pool) in individual subembayments. This proposed effort is intended to be coupled with ongoing work through Destination Clean Bay, an EPA-funded effort that focuses on developing support tools for supporting multi-benefit water quality improvements, including funds to identify high priority data collection and data gaps for regional model development. Analysis through Destination Clean Bay will focus on updates to the fine-grained conceptual understanding of San Francisco Bay (McKnight et al. 2023). With this proposal, we focus on refining the conceptual understanding of two specific elements within the San Pablo Bay subembayment: compiling an updated evaluation of local tributary sediment loads within the subembayment and developing a deeper understanding of the tributary-marsh-erodible sediment pool pathway. The results of the proposed study are intended to act as a framework for understanding the Bay's subembayments at a more refined and deeper scale.	Progress Presentation at the annual Sediment Workgroup Meeting - May 2025 Draft Technical report submitted to SedWG - April 2026 Presentation to SedWG - May 2026 Financial technical report completed - August 2026
Sediment	Sediment Dynamics in a Fluvially Influenced Salt Marsh	$121,500	Salt marshes provide essential protection against storm impacts to coastal communities but are severely vulnerable to sea-level rise and other hazards. Determining their level of resilience is crucial to predicting their future evolution. Syntheses of measurements made in salt marshes over the past 20–30 years have produced metrics that indicate marsh health or vulnerability (Nowacki & Ganju 2019). Most of these metrics have been derived in microtidal marshes not subject to direct river inputs and without management interventions. Although these metrics are hypothesized to be universal across salt marshes, they have not yet been rigorously tested in fluvially influenced, restored marsh environments. Such research is aligned with the RMP's interest in the importance of local watersheds as a marsh sediment source. It also can inform the RMP Sediment Workgroup's monitoring/modeling science question 4.4 which addresses accretion rates and fluxes in marshes, mudflats, and shoals in relation to waves and localsediment supply. We propose to assess sediment fluxes in a mudflat–salt marsh environment adjacent to the Petaluma River known as Gray's Marsh which was recently restored through an unintentional breach. This proposal will leverage work at the proposed site already funded by the RMP in 2024 to assess the decadal-scale physical response of marshes to restoration. We will deploy instrumentation for two deployments of 2–3 months each during wet and dry seasons to measure waves, currents, suspended-sediment concentration, and suspended-sediment flux within the river and in channels of the mudflat–marsh platform. We will also measure mudflat and marsh sediment deposition along three transects following similar methods to the study by Lacy & Thorne funded by the RMP in 2021. We will collect topo-bathymetric elevation data to determine the tidal and seasonal physical and sedimentary dynamics of this system, which is both fluvially influenced and recently restored. We will also test sediment-provenance approaches to determine the originating watershed of the sediment accumulating in the marsh. By measuring sediment flux and accretion during the wet and dry seasons, we aim to determine the relative importance of fluvial- vs. Bay-derived sediment to long term rates of accretion in this restored marsh. This work will also contribute to our understanding of how sediment transport and accumulation in marshes are influenced by site-specific attributes such as fluvial influence, which will help inform future marsh restoration prioritization and methods.	Data release: salt-marsh and Petaluma River time-series data (PCMSC) - 9/2026 Data release: deposition and accretion (WERC) - 9/2026 Presentation to RMP and at selected conferences - 5/2027 Report (draft paper) investigating the dynamics of sediment exchange between the salt marsh and its fluvial source and sediment accretion on the mudflat and marsh submitted to RMP - 6/2027
	Total	**$358,400**		
Sources Pathways and Loading	Integrated Monitoring and Modeling to Support PCBs and Mercury Watershed Loads Uncertainties Assessment and Monitoring Design (Year 2 of 3)	$110,000	This proposal is for Year 2 of 2 for the integrated monitoring and modeling activities for PCBs and Hg. In this study, we propose to: continue the second year of a two-year monitoring study to support the PCBs and Hg loads estimation, estimate model uncertainties, determine model sensitivities to parameter and data weaknesses, and provide PCBs and Hg monitoring design recommendations. The outcomes are envisioned to also provide an improved structure as a starting point for monitoring and modeling any future contaminant of interest.	Wet season 2024 samples collected and sent for lab analysis (Year 1) 04/2024 Laboratory analysis, QA, & Data Management (Year 1) 09/2024 Presentations to the SPLWG meeting (Year 2) 05/2025 Draft Final Report (Year 2) 12/2025 Final Report (Year 3) 03/2026
Sources Pathways and Loading	Tidal Area Remote Sampler Pilot - Year 3	$15,000	This proposal is for $15,000 in additional funds to finish the Tidal Area Remote Sampler Pilot (SPLWG 2023 full proposal added as an appendix for reference). The goals of the previously funded two-year project were to complete development and pilot testing of a proven remote sampler design, and characterization of stormwater from eight old industrial areas influenced by tides. In addition to meeting these goals, the additional funds will allow us to resample one of the sites sampled last year where the sampler was vandalized and no sample was collected, as well as provide for an additional year of project management.	Pilot testing during rainy season 04/2025 Update presentation at SPLWG on the results to date 05/2025 Data upload to CEDEN 12/2025 Draft Report 1/2026 Final Report 3/2026

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
Sources Pathways and Loading	Stormwater CECs Modeling and Data Analysis	$39,000	Recently, SFEI recommended using the Regional Watershed Spreadsheet Model (RWSM) for estimating loads of contaminants of emerging concern (CEC). Additional funding will facilitate the expansion of the initial phase of this work under Task 3 of the Stormwater CECs Modeling and Modeling 2025 project. This endeavor will be coordinated with research on PFAS sources and solutions, with the anticipation of completing urban stormwater PFAS load estimates by 2028, followed by the identification of PFAS product categories contributing to San Francisco Bay contamination. The expanded funding will enable the development and assessment of new geospatial datasets to support stormwater CEC modeling, potentially including updates to RWSM. Results will be documented in the Stormwater CEC '25 project report, providing recommendations for future phases anticipated in 2026.	Expanded draft report Stormwater CEC modeling and data analysis October 2025 Expanded final report: Stormwater CEC modeling and data analysis December 2025
Sources Pathways and Loading	GIS Improvements to Support Modeling, Data Interpretation, and Site Selection	$40,000	This special study provides for the collection and processing of geographic datasets to support improved monitoring and modeling across Bay watersheds. We foresee two tasks: Task 1: Staff will work with local municipal separate storm sewer systems (MS4s) to obtain updated maps of urban drainage systems to then create a workplan for updating regional watershed maps based on these data. The eventual uses for such data by the RMP are for: 1) updated base maps for the Watershed Dynamic Model (WDM) and Regional Watershed Spreadsheet Model (RWSM), 2) monitoring site selection, and 3) understanding pollutant sources. Task 2: Development of the WDM has been hindered by the lack of consistently updated land use/land cover data. We currently rely on snapshots of urban land use published by the Metropolitan Transportation Commission (MTC) in 2005 and 2020. Better representation of land use and how it changes over time will allow for more realistic estimates of runoff, sediment, and pollutant loading. A variety of new data products are available from both government and commercial vendors. Many of these new datasets make use of satellite remote sensing and artificial intelligence. The outcomes of this task would be 1. a survey of the current landscape of options, 2. a pilot analysis of sample datasets, 3. a recommendation of suitability of newer datasets for RMP uses, and 4. a workplan and budget for any future work identified.	Presentation to SPLWG May 2026 Detailed workplan for future GIS data acquisition and/or development* may be included in the forthcoming 2025 Stormwater CEC modeling and data analysis report and/or Watershed Dynamic Modeling (WDM) report. - May 2026
Sources Pathways and Loading	Stormwater Systems Management and Equipment Upgrades	$80,000	This project is to update the systems and equipment that underlie the stormwater monitoring program, which have not kept pace with the growing stormwater monitoring needs of the RMP. There are multiple areas in which greater efficiency is needed to continue expanding the program and delivering the highest quality data in the most efficient way. Key areas that immediately need to be addressed include: Automation and streamlining sampling processes and sampling-related documentation, including preparation processes, in-field collection and data logging processes, and post-storm shipping, logging, and data management systems; development of a "go/no go" decision tree, both for manual and automated sampler deployments; improving our monitoring sites database, and systems for efficiently logging information about site reconnaissance, site visits, sampler deployments, etc.; expanded team training to build labor capacity; purchasing flow monitoring equipment; and labor time to contact other major sampling programs to identify best systems processes and the latest monitoring method technologies.	Discussions with other sampling programs, expanded team trainings, decision tree process developed, sampling and shipping SOPs revised, data management systems weaknesses identified - December 2024 SPLWG presentation update - May 2025 Sites database improvements, data management systems weaknesses/inefficiencies improved - August 2025 Ongoing identification and implementation of systems and equipment upgrades as funding allows - December 2025
Sources Pathways and Loading	Develop Discharge Rating Curves at County-Operated Stage Monitoring Stations	$30,000	Streamflow or discharge is critically important for evaluating the fate and transport of aquatic pollutants. It is also vital for the calibration and verification of watershed models, which are currently at the heart of the RMP strategy for evaluating loads of sediment, legacy pollutants such as PCBs and mercury, and emerging contaminants. The Regional Watershed Spreadsheet model (RWSM) and the Watershed Dynamic Model (WDM) are both calibrated using flow observations mostly from USGS gages, however, there are large gaps in coverage for San Mateo, Contra Costa, Marin, and Solano Counties (Figure 1). Cities, counties, water suppliers, and flood control districts operate a number of "stage-only" gauges, collecting continuous observations of water-surface elevation. This information can be used to estimate discharge (in m^3/s or cubic feet per second, cfs) by creating a relationship (called a rating curve) between recorded stage and discharge based on measurements over a wide range of flow conditions to minimize extrapolation errors. This project is to develop rating curves at select stage-only locations that fill the biggest gaps in existing coverage. Budget is included to select sites with workgroup oversight, collaborate with partners, obtain permits, perform flow measurements, QAQC and publish the flow data.	Presentation to the SPL workgroup May 2026 Detailed workplan for future rating curve development May 2026
Sources Pathways and Loading	Add-on to Stormwater Contaminants of Emerging Concern (CECs) Monitoring and Modeling 2025 Project to Include Additional Non-CECs Analytes	$50,000	The Stormwater Contaminants of Emerging Concern Monitoring and Modeling 2025 (Stormwater CECs '25) proposed project includes CEC sampling using three different sample collection methods. For two of the methods (using a larger full-sized remote sampler and manual sampling), it is possible to collect extra bottles for additional analytes and this proposal is to provide funding for that purpose. Two goals underlie the proposed additional analyte collection: 1) to opportunistically obtain stormwater monitoring data about other pollutants of concern in the Bay, and 2) to inform CECs monitoring data interpretation, such as examining whether observed variability in CECs levels is consistent with our understanding of the variability of other constituents in urban runoff. Several additional analytes could meet these two goals. In addition to ranking this proposal against the other Tier 2 proposals, we are requesting the SPLWG recommend a budget allocation and prioritization of the proposed analytes.	Stormwater Additional Non-CECs Analytes monitoring Spring 2025 Data uploaded to CEDEN December 2025
	Total	**$364,000**		

Table 2: Short Descriptions of Proposals for RMP Special Studies in 2025

Workgroup	Study Name	Budget	Summary	Deliverables
PCBs	San Leandro Bay OPTICS Study	$600,000	Up to 6 locations in SLB will be monitored by OPTICS instrumentation. Around ~20 water samples per location are desired in order to establish a robust correlation between the parameters measured by the in situ instrumentation (none of them measuring COCs directly) and concentrations obtained from lab analysis of collected water grab samples. Samples will be collected for two or more precipitation events as close as practicable to the OPTICS monitoring points (same depth and position in channel cross section) without disturbing or damaging the instrumentation. Samples for the 6 locations will be collected for the same events, but may not be strictly synoptic as likely only one field crew is available for each event, and transiting between stations, setup, and collection will take about one half hour per location per sample collected. Within each event at each location, an attempt will be made to collect at least one sample on the rising or peak stage, and one on a falling stage (2 grabs each from 6 locations will take ~6 hours). For events lasting longer than 6 hours, collection of a third sample may be possible. Each event will thus yield 12-18 samples. At least one collection effort will be made during a period of no precipitation, to capture flux primarily due to tidal flows only. At the desired level of effort (~100 samples), at least 4 wet weather events and one or more dry period in the spring-neap tidal cycle can be collected. The budget table below assumes that grab samples can be collected from shorelines, bridges, or overhangs near the OPTICS sensors, without requiring a vessel. Deployment of the instrumentation far away from such structures would require use of a vessel and additional budget. The products will be a short technical report and the reported data in SFEI's regional database and uploaded to CEDEN.	Task 1. Coordinate with Integral on OPTICS siting Sep 2024 Task 2. Obtain permits/permissions Oct 2024 Task 3. Field collections Dec 2024 -Mar 2025 Task 4. Lab analysis Jan-May 2025 Task 5. PCBWG presentation, draft and final technical report May-Jul 2025
PCBs	Mapping Mudflat Morphodynamics	$25,000	We therefore propose purchasing satellite imagery from another source such as Planet with finer (3-5m) lateral resolution, and adapting the DEA methods for using this alternative image source. LIDAR surveys were conducted over different portions of SLB in 2019 and 2021, so surface elevations can be derived for the different areas from imagery ending in these two years, to compare the agreement between LIDAR and imagery methods. In the future, estimates of the intertidal sediment surface can be repeated at 5 to 10 year intervals to characterize the change and validate models of sediment fate in areas of particular interest such as SLB. The approach could also be applied to assess change in areas near wetland restoration, or the basic DEA approach using Landsat/Sentinel applied to the	Task 1. Develop Study Plan with stakeholders and modelers Jan-Feb 2025 Task 2. Purchase imagery Feb 2025 Task 3. Conduct analysis Mar-Apr 2025 Task 4. Review draft maps with stakeholders & modelers May 2025 Task 5. Final elevation maps & draft technical report May-June 2025 Task 6. PCBWG presentation, final technical report May-Jul 2025
PCBs	Sediment Trap Reconnaissance	$22,000	In studies conducted in collaboration with the Luthy group in San Leandro Bay and Steinberger Slough/Redwood Creek, passive screened-jar sediment traps were deployed alongside the polyethylene film passive sampling devices (PSDs). At high flow sites where the buried PSD plates placed in the channel center were dislodged, the jar traps were similarly dislodged. However, at the remaining sites, where PSDs were placed along the channel edge or in generally lower energy flow, the sediment traps successfully collected settled sediment. These simple sediment traps are easily constructed (glass jars with screened lids), inexpensive, and unobtrusive. Multiple traps can easily be placed along a reach of a creek or stormwater channel and analyzed separately or composited. Collected samples with low total solids can be analyzed as water samples, and those with high solids (>10g) can be treated as sediment samples. Thus reconnaissance samples of this type can easily be added into groups of samples analyzed for other projects in the same matrix. Aside from analysis costs, the primary costs of this effort would be deployment and retrieval of the sediment traps (likely <1 hour per site), and obtaining permission or permits for deployment. Based on the long timelines and occasionally expensive permits requested for permission to deploy the SFEI autosamplers, a majority of sites may end up being placed along the Bay edge at the ends of creeks; although the resultant samples will have a strong signal of tidal resuspension and redistribution, local gradients of high concentration pathways are likely still evident (as was found in SLB). Currently 10 sites are proposed, but the number could be easily scaled up. Results would be reported to the workgroup and interested stakeholders in the form of a short technical report.	Task 1. Develop Study Plan with stakeholders and modelers Jan-Feb 2025 Task 2. Purchase imagery Feb 2025 Task 3. Conduct analysis Mar-Apr 2025 Task 4. Review draft maps with stakeholders & modelers May 2025 Task 5. Final elevation maps & draft technical report May-June 2025 Task 6. PCBWG presentation, final technical report May-Jul 2025
	Total	**$647,000**		

Emerging Contaminants Strategy for 2025

Summary: Increasing interest in emerging contaminants from the San Francisco Bay Regional Water Board, RMP stakeholders, and the general public is reflected in headline news and management actions at local, state, and federal levels. The staff and effort needed to manage the RMP's CECs focus area has increased significantly in recent years. For the RMP CEC Strategy to remain relevant and timely, it needs to be updated annually with new information and study findings from the RMP and others. In addition, a higher level of coordination and integration within and across workgroups is essential to optimize RMP resources.

Core deliverables include tracking new information regarding contaminant sources, occurrence, and toxicity and updating the RMP's tiered risk-based framework via an ECWG presentation and, as appropriate, a CEC Strategy Update document; responding to requests for information from the Water Board, state agencies, and RMP stakeholders; and coordinating pro bono analyses by partners. To accomplish all of these tasks, $70,000 is requested.

Estimated Cost:	$70,000
Oversight Group:	ECWG
Proposed by:	Rebecca Sutton (SFEI)
Time Sensitive:	Yes

TASKS AND TIMELINE

Deliverable	Due Date
Task 1. Information gathering on contaminant sources, occurrence, and toxicology from a variety of sources (e.g., literature review, scientific conferences) throughout the year to inform Task 4	Year-round
Task 2. Assistance to the Water Board and other RMP stakeholders concerning scientific information and presentations relating to emerging contaminants	Year-round
Task 3. Coordination of pro bono studies conducted in collaboration with Status and Trends monitoring activities	Year-round
Task 4. Updates to the RMP CEC tiered risk-based framework and related documents; presentation at spring ECWG meeting	Spring 2026

Special Study Proposal: Stormwater Contaminants of Emerging Concern (CECs) Monitoring and Modeling 2025

Summary: This project will continue implementing the RMP stormwater CECs integrated monitoring and modeling program in water year 2025 (October 2024-September 2025). It builds on prior stormwater CECs RMP projects that have identified priority near-term management questions, identified the modeling and data analysis approach to address these management questions, developed and piloted the SFEI Mayfly remote sampler, and are currently framing out the RMP stormwater CECs monitoring design. These projects are collecting data and supporting the overall stormwater CECs monitoring program framework development through the RMP "Stormwater CECs Approach" project that is slated for completion in late 2024. This program is being guided by a Stormwater CECs Stakeholder-Science Advisor Team (SST). The SST includes representatives from the Steering Committee and Technical Review Committee, as well as science advisors and stakeholders.

This project is designed to mesh with two RMP-related grant projects funded by EPA's San Francisco Bay Water Quality Improvement Fund (WQIF): Destination Clean Bay and PFAS Sources to Solutions. This project is supported by a separate, approved 2024 RMP project for purchasing and/or building remote samplers capable of collecting stormwater during storm events ("remote sampler purchase project"). This proposal includes a range of costs to prove the option to expand its scope should additional funds become available to the RMP from the EPA Program Office.

We request early release of funds to initiate implementation of this project in summer 2024 to ensure we can be prepared for the fall start of the wet season.

Estimated Cost:	$300,000 (base RMP funding) - $450,000 (including Tier 2 funding)
Oversight Group:	ECWG and SPLWG, Stormwater CECs Stakeholder-Science Advisor Team
Proposed by:	Kelly Moran, Alicia Gilbreath, Pedro Avellaneda, Don Yee, Rebecca Sutton
Time Sensitive:	Yes; early release of funds requested to prepare for the wet season.

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Project management and coordination with non-RMP funding sources	Fall 2024-Fall 2025
Task 2. Stakeholder and science advisor engagement —Informal stakeholder and advisor meetings —One SST meeting —Three RMP presentations (ECWG/SPLWG, TRC and SC)	 Fall 2024-Fall 2025 Summer-Fall 2025 Spring 2025
Task 3. CEC modeling and data analysis	

—Inform monitoring design —Draft Technical Report —Final Technical Report	Summer 2025 October 31, 2025 December 12, 2025
Task 4. Stormwater CECs work integrated scientific systems development and cross-task and cross-project team coordination	Fall 2024-Summer 2025
Task 5. Stormwater CECs monitoring —ECWG and SPLWG presentations —Presentation to and discussion with the SST —Data uploaded to CEDEN	 Spring 2025 Summer-Fall 2025 December 2025
Task 6. Remote Sampler continued improvement —ECWG and SPLWG updates —Updated sampler design summary	 Spring 2025 December 2025
Task 7. Initiate site selection and permitting for water year 2026	Summer 2025

Background

CECs are a diverse group of substances with different sources, chemical properties, and fate. A multi-year RMP stormwater CECs monitoring project identified the presence of CECs in urban stormwater runoff (Peter et al., submitted; Tian et al., 2021). Available data from this and other RMP CECs sampling are relatively limited, but provide a strong weight of evidence that stormwater is a major pathway for many CECs to enter San Francisco Bay. Importantly, prior to water year 2024, RMP CECs monitoring, which has focused on understanding the potential for CECs to occur in stormwater, has not been designed to address other management questions, such as estimating loads of CECs discharged to the Bay.

The RMP is developing a stormwater CECs monitoring approach that addresses both Emerging Contaminant Workgroup (ECWG) and Sources, Pathways, and Loadings Workgroup (SPLWG) management questions. A cornerstone of the new stormwater CECs monitoring approach is the integration of monitoring and modeling designs to maximize the value of each sampling event. A second key element of the stormwater CECs monitoring approach is the use of remote samplers to reduce sample collection costs and increase the number of samples that can be collected during each storm event. Through the deployment of remote samplers, more data can be obtained in a more diverse array of locations as compared to manual sampling.

The near-term focus is on developing a modeling and monitoring approach to answer three near-term priority management questions:

1. Load. How does the local watershed runoff load to San Francisco Bay compare to loads from other pathways?

   This entails order-of-magnitude load estimates and is interpreted in the context of Bay management questions, which guide the RMP efforts to consider chemical fate, organism exposures, and exposure timing in the Bay.

2. Changes. (a) Are presence or concentration in local watershed runoff changing over time? (b) Are presence, concentration, or load expected to change in the future?

   This is a “trends light” concept, which would provide insights on a multi-year time scale while not requiring datasets robust enough to identify statistically significant trends.

3. Sources. (a) What are the likely sources? (b) What land features correlate with presence, concentration, and load in runoff?

   “Sources” is defined as true sources, such as products and contaminated sites and includes consideration of all pathways between source and stormwater runoff, including air deposition and groundwater transport.

This project depends on work in progress on multiple projects currently underway including the 2023 Stormwater CECs Approach project (anticipated completion in 2024) and the Stormwater CECs Modeling & Monitoring 2024 project (remote sampler improvements; CEC modeling plan; pilot stormwater CECs monitoring). Consequently, some elements of the necessary work remain in flux and will be refined in consultation with the SST as the project proceeds.

This project is being integrated with two RMP-related grant projects. The recently initiated “Destination Clean Bay” project is a multi-faceted Bay monitoring and modeling project funded by EPA’s SF Bay Water Quality Improvement Fund (WQIF) 2022. It will use the monitoring data generated by this project to support watershed and Bay model development. The EPA WQIF 2023 “PFAS Sources to Solutions” project is expected to start in summer 2024. It integrates stormwater, wastewater, and Bay monitoring, conceptual modeling, stormwater and wastewater preliminary loads modeling, data analysis, and commercial product PFAS testing toward the goal of informing management action, including prioritizing PFAS-containing products for potential regulatory action under California’s Safer Consumer Products Program.

Study Objectives and Applicable RMP Management Questions

Table 1. Study objectives and questions relevant to the RMP ECWG management questions.

Management Question	Study Objective	Example Information Application
1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?	N/A	N/A
2) What are the sources, pathways, loadings, and processes leading to the presence of individual CECs or groups of CECs in the Bay?	Implement CECs integrated monitoring and modeling and move from piloting to full use of remote samplers.	Implementing monitoring projects to address near-term priority stormwater CECs management questions, such as to determine whether stormwater pathway loads of various CEC families are large or small relative to other pathways flowing into the Bay.
3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?	N/A	N/A
4) Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?	Conduct monitoring capable of informing general understanding of changes in CECs presence in the stormwater pathway.	Understanding the changes in presence of CECs in the stormwater pathway.
5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?	N/A	N/A
6) What are the effects of management actions?	N/A	N/A

Approach

In water year 2025, we propose to complete piloting and preparations for full implementation of the new Stormwater CECs Monitoring and Modeling Approach. The

Approach will involve use of remote samplers and will integrate monitoring and modeling designs.

During water year 2024, we have been refining the design of the SFEI Mayfly remote sampler and pilot testing it in house and at various stormwater monitoring locations. Through these pilot tests and deployments we have been refining processes for remote sampler programming, mounting options, and efficient installation and retrieval. The pilots have clarified the types of locations feasible for the Mayfly. Due to unanticipated challenges with obtaining stormwater sampling location permits, this year's piloting was less robust than we had planned. During the upcoming wet season, we anticipate expanded pilot work and preparing to transition from pilot-scale to full implementation of the SFEI Mayfly monitoring.

Blank testing of the SFEI Mayfly and a larger, more traditional remote sampler (ISCO) revealed contamination of samples by a few bisphenol and organophosphate ester (OPE) chemicals (SGS AXYS tested for OPEs, bisphenols, and PFAS - see Yee et al. 2024 for analyte lists; the Kolodziej laboratory tested for other stormwater CECs including 6PPD-quinone - see vehicle/tire-related suite from Hou et al., 2019). Negligible PFAS contamination was identified. Both samplers showed similar contamination, suggesting the soft tubing required for their peristaltic pumps as the likely contamination source. While the contamination was limited to a few chemicals, some of these chemicals are risk drivers for the Bay (bisphenol A, and the OPEs TCIPP and TBOEP). Consequently, the SST recommended that the RMP continue with the SFEI Mayfly, starting with PFAS, while in parallel exploring alternative approaches that might avoid contamination.

We completed additional research on soft tubing options, which identified several potential options that Dr. Heather Stapleton (Duke University) is testing for OPE content (no laboratory was identified to conduct a full suite of bisphenols content measurements on tubing samples). We also identified two commercially available, larger (ISCO-comparable) samplers (Manning, Aquamatic) that use vacuum for sample collection instead of peristaltic pumps, thus eliminating contact with soft tubing. We blank-tested both options (analyzing PFAS targeted and TOP, OPEs, bisphenols, and tire/road related chemicals) and are currently awaiting results. We plan to review all of these testing results with the SST to inform sampler design and sampler selection for the upcoming water year.

This proposal does not include costs for activities funded by the related grants. Destination Clean Bay grant funds will pay for laboratory analysis, data management and CEDEN data uploads for stormwater monitoring for non-PFAS chemicals (OPEs, bisphenols, and tire/road chemicals), laboratory analysis for any sampler blank testing, as well as for a portion of SFEI labor.

PFAS Sources to Solutions funds will pay for PFAS conceptual model development (which will support this project's modeling work), laboratory analysis for PFAS in stormwater samples (targeted and TOP), stormwater PFAS data management and data uploads to CEDEN, and travel to share findings at a stormwater or monitoring conference such as the California Stormwater Quality Association (CASQA) Conference in fall 2025.

<u>Task 1: Project management and coordination with non-RMP funding sources</u>
This project will be funded by a minimum of three funding sources (RMP and two EPA WQIF grants), with a potential for funding by an additional source (EPA Program Office 2024). This task will provide SFEI staff with the capacity to coordinate the project's financial and scientific management across three funding sources and the various requirements associated with each funding source.

If additional funding becomes available, additional Task 1 funding will be required to meet the additional funding source requirements, to expand the budget controls, and to help the project team ensure work is properly tracked for each funder.

<u>Task 2: Stakeholder and science advisor engagement</u>
We will convene a meeting of the SST to support model development and to refine the program based on anticipated phased implementation of the monitoring design. We anticipate holding one SST meeting in addition to extensive informal individual and small group engagement with stakeholders and advisors. We will provide a project update at spring 2025 RMP workgroup meeting(s) and plan to share findings at a stormwater or monitoring conference such as the California Stormwater Quality Association (CASQA) Conference in fall 2025.

If additional funding becomes available, this task would be expanded to start the process for selecting a small group of fixed stormwater monitoring locations to support addressing near-term priority CECs management questions and other RMP and stakeholder data needs. This would entail engaging stakeholders and science advisors across RMP workgroups to obtain input toward developing a multi-benefit long-term design and staff time to develop and refine a list of proposed sites.

<u>Task 3: Stormwater CEC modeling and data analysis</u>
This task will implement the first phase recommendations of the 2024 RMP Stormwater CECs Modeling Work Plan task, which is to be completed in late 2024. The CECs modeling work plan will address the “Loads” and “Sources” near-term priority management questions noted above.

The work on this task will be coordinated with the PFAS conceptual model being developed under the PFAS Sources to Solutions grant. Due to the opportunity provided by the PFAS grant, we anticipate that the first implementation for stormwater CECs load modeling will be for PFAS. Specifically, the grant anticipates that SFEI will prepare a technical report “Urban PFAS Loads Estimates” in 2028. The grant also includes substantial work toward identifying PFAS sources, i.e., specific categories of PFAS products most likely to contribute PFAS to San Francisco Bay. The grant workplan includes product research, product PFAS content measurements, the conceptual model identifying pathways between products and San Francisco Bay, and laboratory and data management costs associated with RMP stormwater sampling. SFEI plans to build off the conceptual model and the combined RMP and municipal stormwater PFAS dataset anticipated to be available by 2027 (potentially >100 samples) to use data-driven methods to explore potential linkages between monitoring data and products (most likely by exploring land use/land feature correlations).

To address the loads management question, the 2024 CECs modeling workplan will lay out the first steps to implement the recommendations of the recently completed RMP report *Modeling Stormwater Loads of Contaminants of Emerging Concern: Literature Review and Recommendations* (Avellaneda & Zi, 2024). This report recommended that we use a hybrid data-driven and spatially distributed approach for regional stormwater load estimation and recommended that initial load estimates be made using the RMP's Regional Watershed Spreadsheet Model (RWSM).

We expect the modeling workplan will include updating and adapting the RWSM to support CECs load estimates. Modeling and data analysis for CECs will require extensive work to develop underlying datasets. In response to regional challenges updating Bay Area land use data and the desire to explore land features other than land use, this task would include evaluation of other available datasets, including artificial intelligence enhanced data. Additionally, we anticipate exploring consideration of climatic factors in the data statistical analysis. All of this work would be coordinated with the parallel PFAS conceptual model development.

If additional funds become available, we would expand work on development of underlying datasets. These datasets could include, for example, geospatial information on land features such as directly connected impervious areas, roofing areas identified as a source of PFAS, and solar panel areas. This geospatial information will be used to update the RWSM.

In addition, this task will include providing modeling expertise and preliminary PFAS data analysis to support stormwater sampling location selection for water year 2026 (October 2025 - September 2026). The preliminary data analysis will provide an opportunity to use the information from PFAS product research and the grant-funded PFAS conceptual model to consider how we will address the "sources" management question, specifically "what land features correlate with presence, concentration, and load in runoff?" As only a limited dataset will be available in 2025, such work will not be a focus of 2025 activities, but this early work will inform recommendations for next steps.

To support these novel model development activities, if additional funding becomes available, this task's budget would be expanded to include funding for an expert consultant with expertise on conceptual and stormwater modeling of chemicals in urban outdoor environments to support the SFEI modeling team.

The results of this task will be documented in a report with recommendations for the next phase of this work, which we anticipate conducting in 2026.

<u>Task 4: Stormwater CECs Work Integrated Scientific Systems Development and Cross-Task and Cross-Project Team Coordination</u>
This task includes project team meetings to keep this multi-faceted project on track, to develop operating systems supporting the long-term implementation of integrated stormwater CECs modeling and monitoring (e.g., workflows and shared team physical and digital resources), and to ensure consistency and coordination among the interlinked elements of this and related stormwater and Bay CECs monitoring and modeling projects. We anticipate (almost) biweekly high-level meetings with staff from the emerging contaminants, stormwater monitoring, stormwater modeling, project leadership, and RMP science leadership teams and occasional (every 2-3 months) meetings with a larger group of key scientific staff to work through scientific issues on specific project elements.

<u>Task 5: Stormwater CECs Monitoring</u>
The CECs monitoring approach for water year 2025 entails three elements, using three different sample collection methods: the SFEI Mayfly portable remote sampler; a larger full-sized remote sampler; and manual sampling. The budget range for this task reflects fewer samples at the lower end of the range and more samples (up to the maximum in each category) at the upper end of the range.

The first element entails expanded pilot work and preparing to transition from pilot deployment to water year 2026 full implementation of remote SFEI Mayfly samplers for monitoring PFAS (only). Remaining pilot deployments of the remote samplers will provide necessary real-world experience with larger-scale remote sampler monitoring, starting with smaller deployments (e.g., 2-4 samplers per event) and moving to larger deployments (e.g., up to 8 samplers per event, with a potential stretch goal of 12). The SFEI Mayfly uses soft-sided “cubitainer” samplers. Two containers will be collected by each sampler during each event, one each anticipated to be analyzed by SGS AXYS for PFAS target and total oxidizable precursor [TOP] analysis (see Yee et al. 2024 for analyte lists; lab selection pending completion of grant-related requirements). We anticipate a total of 20 sets of samples (PFAS target and TOP) from 4 or more events.

If additional funding becomes available, we will be able to try for 24 sets of samples (i.e., four additional remote sampler deployments with one PFAS target and one PFAS TOP analysis from each deployment).

The second element, piloting a full-sized sampler to test out the approach for future permanent, fixed location deployments, will involve temporary installation of a large multi-container automated remote sampler (e.g., ISCO peristaltic pump or Manning or Aquamatic vacuum pump), for up to two storm events. The multi-bottle capacity of the samplers will allow collection of samples to be analyzed by SGS AXYS for OPEs, bisphenols, and PFAS target and TOP (see Yee et al. 2024 for analyte lists), by the Kolodziej laboratory for other stormwater CECs including 6PPD-quinone (vehicle/tire-related suite from Hou et al., 2019), and by SFEI staff for suspended sediment concentration (SSC). For all analytes, QA samples will include one field blank, one duplicate sample, and one matrix spike sample.

If additional funding becomes available, we will be able to pilot the sampler during a third storm event, collecting samples for the same analytes listed above.

Both elements one and two will involve training additional staff in remote sampler preparation, programming, deployment, and retrieval methods.

The third element will entail limited manual sampling for multiple contaminants at locations that are infeasible for SFEI Mayfly installation and/or locations that are candidates for future permanent fixed sampling locations. We anticipate two sampling locations, one storm event at each site, 1 to 2 locations per storm event, plus one duplicate and one field blank. Samples collected will be analyzed by SGS AXYS for OPEs, bisphenols, and PFAS target and TOP (see Yee et al. 2024 for analyte lists), by the Kolodziej laboratory for other stormwater CECs including 6PPD-quinone (vehicle/tire-related suite from Hou et al. 2019), and by SFEI staff for suspended sediment concentration (SSC). For all analytes, QA samples will include one field blank and one duplicate sample (we propose to rely on the matrix spike described above).

If additional funding becomes available, we will be able to expand manual sampling to four additional locations, one storm event at each site, collecting samples for the same analytes listed above.

Prior to the initiation of this project, in Summer 2024, we will start identifying sampling locations in consultation with stakeholders and acquire permits to place the remote samplers and work at the selected sites. We anticipate this pre-project work will be funded by the Destination Clean Bay grant. This site selection process will give special focus on sites likely to be candidates for a potential future fixed-station monitoring network.

Additional tasks to implement stormwater monitoring are pre-season storm preparation, staff training, pre-storm remote sampler setup (e.g., programming, tubing installation, battery charging), and cleaning equipment.

After each event, remote sampler installation and performance will be evaluated to inform procedures for subsequent installations. Lessons learned about the installation and use of remote samplers will be incorporated into the Stormwater CECs Approach report, future sampling designs, and (as appropriate) into the sampler refinement work (Task 6).

The Destination Clean Bay and PFAS Sources to Solutions grants will fund QA/QC evaluation of the data and, after QA/QC evaluation, data upload to the California Environmental Data Exchange Network (CEDEN). QA/QC findings will be evaluated in detail to inform future stormwater CECs monitoring design and laboratory analysis. Data interpretation will be limited, focused on evaluating outcomes and informing future monitoring design. We do not anticipate a full report on this year's data, as the Stormwater CECs Approach will establish a multi-year reporting and data interpretation process. PFAS monitoring data will be summarized and included in a 2028 report under the PFAS Sources to Solutions grant.

The study team will evaluate the outcome of the monitoring experience, which will inform future Stormwater CECs monitoring design. Update presentations will be given to the ECWG and SPLWG and results will be reviewed with the SST.

<u>Task 6: Remote Sampler Continued Improvement</u>
This task has two potential elements: SFEI Mayfly improvements and potentially work to prepare for use of vacuum samplers.

SFEI Mayfly improvement tasks may entail blank testing of any promising peristaltic pump soft tubing alternatives, physical modifications of the design based on additional deployment experience, the high priority task of continued exploration of options to add telemetry capabilities for post-installation control of the remote sampler operations, which would simplify programming, provide better ability to respond to changing weather forecast when using the remote samplers, and reduce deployment costs.

If the blank test results for vacuum samplers are promising, this task would include materials and activities to support in-office operational testing (e.g., for pump head height and programming) and their pilot deployment under the task above (e.g., construction of parts to support necessary collection containers, implementing telemetry controls).

If additional sampler blank QA-testing is needed, it will be conducted following procedures similar to those used for the spring 2023 and spring 2024 field blank testing of the current SFEI Mayfly design and the vacuum samplers, i.e., pumping laboratory water through the sampler at a remote location selected to minimize potential environmental contamination (e.g., from ambient air). Field blank samples will be analyzed by SGS AXYS for OPEs, bisphenols, and (if appropriate for the design) PFAS (see Yee et al. 2024 for analyte lists). Field blanks will also be analyzed for other stormwater CECs including 6PPD-quinone (vehicle/tire-related suite from Hou et al. 2019). Data QA review and interpretation will include evaluating samplers for potential contamination and examining pilot data in the context of available stormwater CECs monitoring data. Blank testing analytical costs would be funded by the Destination Clean Bay grant.

If additional funds are available, this task would be expanded to include work toward developing telemetry controls for the full-sized samplers envisioned for installation at fixed stormwater monitoring locations and exploration of a vacuum-based alternative design for the SFEI Mayfly.

Presentations on progress will be given to the ECWG and SPLWG. The scientific team will evaluate the outcome of the sampler improvement effort with the SST to inform the stormwater CECs monitoring design as well as the plan for purchasing and building additional remote samplers under the remote sampler purchase project. If the SFEI Mayfly design is modified, a revised summary of the revised sampler design, with photos, will be prepared.

Task 7. Initiate site selection and permitting for water year 2026.
This task is proposed only if additional funds are available. Efforts to pilot the SFEI Mayfly remote sampler were limited by the long timelines necessary to obtain permits for its temporary installation at sampling locations. Based on this experience, we anticipate the need to start site selection and permitting each year in June to ensure we are prepared for the upcoming wet season. Under this task, in June 2025, we will start identifying sampling locations in consultation with stakeholders and begin acquiring permits/permission to place remote samplers and collect samples at the selected sites. The budget assumes that this task provides seed funding for an early start; storm season preparations will be included in the Stormwater CECs water year 2026 budget.

Budget

The Project budget will include Labor, subcontracted expert advisor services, and direct costs. The budget lists costs to be covered by the DCB ($100,000) and PFAS Source to Solutions ($251,000 - $260,000) grants, but these amounts are not included in the totals which represent only the RMP funding request.

Table 2. Budget

Labor	**2025 - Base (hours)**	**Base + Tier 2 (hours)**	**Tier 2 activities**
Task 1. Project management and coordination with non-RMP funding sources	$20,000 (95)	$30,000 (140)	Increased management complexity with more funding sources
Task 2. Stakeholder and science advisor engagement	$45,000 (215)	$65,000 (310)	Initiate site selection for permanent network
Task 3. Stormwater CEC modeling and data analysis	$55,000 (320)	$70,000 (400)	Increased work on underlying data sets to support modeling and

			data analysis
Task 4. Stormwater CECs work integrated scientific systems development and cross-task team coordination	$35,000 (180)	$35,000 (180)	n/a
Task 5. Stormwater Monitoring Base program max. # of sets of samples: --24 Remote (PFAS target and TOP) --2 Manual & 2 large autosampler (PFAS target and TOP, OPEs, bisphenols, Kolodziej lab tire/road chemicals) --5 QA samples (all analytes)	$145,000 (850)	$199,750 (1,100)	Additional samples (4 remote sets; 4 manual sets; 1 large autosampler set)
Data technical services --PFAS target and TOP (PFAS grant) --OPEs, bisphenols, Kolodziej lab tire/vehicle chemicals (DCB)	$20,000 (120) $31,500 (190)	$20,000 (120) $31,500 (190)	Limited additional work for additional samples
Task 6. Remote sampler continued improvement	$30,000 (150)	$40,000 (200)	More resources to develop telemetry for large samplers; try design for mayfly vacuum sampler
Task 7. Initiate site selection and permitting for water year 2026	$0	$5,000 (30)	Start site selection/ permitting in June
Develop PFAS conceptual model (PFAS grant)	$200,000 (1,100)	$200,000 (1,100)	n/a
Subcontracts			
<u>Laboratory</u> PFAS targeted + TOP (PFAS grant) OPEs, Bisphenols, Kolodziej lab tire/vehicle chemicals (DCB)	$27,521 $15,201	$36,062 $23,646	Additional samples
Consultant to support stormwater CEC modeling	$0	$20,000	Added staff-like senior expert to support modeling work
Direct Costs			
Sampling Travel	$800	$1,300	Additional samples
Conference travel (PFAS grant)	$3,250	$3,250	n/a
Equipment, supplies, shipping	$15,120	$18,932	Additional samples

Permit fees	$7,200	$9,900	Additional samples
Total RMP funding request	**$300,000**	**$450,000**	Additional Tier 2 RMP funding

Budget Justification

SFEI Labor
Labor hours for SFEI staff to complete all project elements.

Data Technical Services
Standard RMP data management procedures will be used. Data for stormwater samples will be uploaded to CEDEN. These costs are anticipated to be funded by the Destination Clean Bay and PFAS Sources to Solutions grants.

Laboratory Costs
Laboratory costs are anticipated to be funded by the Destination Clean Bay and PFAS Sources to Solutions grants.

Other Direct Costs
Other direct costs are anticipated to include travel, shipping, potentially sampler testing related equipment, and other miscellaneous sampling-related equipment.

Permit fees for temporary installation of remote samplers are a new cost identified from the SFEI Mayfly pilot monitoring in water year 2024. The budget assumes permit fees averaging $600 per site are required for 50% of remote and large autosampler sampling events. (Manual sampling has typically required minor or no permit fees.)

Sampling travel includes sampling-associated driving costs. Conference travel is for a project-related presentation at a professional conference, such as the California Stormwater Quality Association (CASQA) conference.

We anticipate purchasing and building the remote samplers and any ISCO or vacuum samplers to be used for this project under the approved RMP 2024 Remote Sampler Purchase project.

Early Funds Release Request
If this project is approved, we request early release of funds for use in 2024 to support parallel projects and to initiate monitoring during the wet season.

Reporting

Reporting for Task 2 will include the SST and RMP presentations. Task 3 will include a technical report (draft and final). Reporting for both Task 5 and 6 will include update presentations to the ECWG and SPLWG, as well as presentations to and discussions with the SST. For Task 5, stormwater monitoring data will be uploaded to CEDEN. For Task 6, a summary (draft and final) of the final sampler design, with photos, will be prepared

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Special Study Proposal: Plastic Additives in Bay Water, Archived Sediment, and Stormwater

Summary: Plastic additives are an extensive group of chemicals used in the production of plastics for a variety of consumer, commercial, and industrial applications. Many of the chemical classes that comprise plastic additives are ubiquitous in the environment. In addition, several of these compounds are known to be toxic and exhibit a variety of effects on humans and animals. The RMP has previously found organophosphate esters (OPEs) and bisphenols in wastewater, stormwater, Bay water, and sediment, and is continuing monitoring a key subset of these contaminants via Status and Trends. Further monitoring already approved for 2024 will examine both of these classes along with multiple other plastic additive classes in wastewater.

To build on these efforts, we propose a study to assess the concentrations of plastic additives in Bay water as well as (optionally) archived sediment and stormwater to inform our understanding of the fate and effects of these contaminants in the Bay. Data developed as part of this proposed study would result in addition of multiple new plastic additive chemicals and classes to the RMP tiered risk-based framework for emerging contaminants.

Estimated Cost: Plastic Additives in ***Only*** Bay Water: $170,750
(Add-on) Plastic Additives in Archived Sediment: $65,350
(Add-on) Plastic Additives in Stormwater: $74,820

Oversight Group: ECWG
Proposed by: Miguel Méndez, Rebecca Sutton (SFEI), Da Chen (Jinan/SIU)
Time Sensitive: No

PROPOSED DELIVERABLES AND TIMELINE (ALL MATRICES)

Deliverable	Due Date
Task 1. Develop Sampling Plan (Ship Archived Sediment)	June 2025
Task 2. Field Sampling – Water (Dry Season)	Summer 2025
Task 3. Field Sampling – Water (Wet Season) & Stormwater	Fall 2025 to Spring 2026
Task 4. Laboratory Analysis	October 2026
Task 5. QA/QC & Data Management	February 2027
Task 6. Presentation at ECWG	April 2027
Task 7. Draft Report	June 2027
Task 8. Final Report	August 2027

Background

Plastic additives are an extensive group of chemicals that can include antioxidants, flame retardants, plasticizers, UV stabilizers, and several other compounds (Chen et al., 2021). Recent RMP studies resulted in classification of two classes of plastic additives, organophosphate esters (OPEs) and bisphenols, as High and Moderate Concerns for San Francisco Bay, respectively (Shimabuku et al., 2022). A high priority subset of compounds within each of these classes is now incorporated into ongoing Status and Trends monitoring activities.

However, the plastic additives included in ongoing RMP monitoring represent only a handful of the high production volume plastic additives in widespread use today. For example, a pro bono addition to the 2017 RMP monitoring of OPEs and bisphenols in Bay water included preliminary (pilot) characterization of 14 other plastic additives. All 14 were detected in the 2017 survey, with 5 of 14 analyzed found in greater than 50% of samples. One additive, tri(2-ethylhexyl) trimellitate (TOTM; also known as tris(2-ethylhexyl)benzene-1,2,4-tricarboxylate) exceeded its marine predicted no effect concentration (PNEC) of 6 ng/L at four sites, with a maximum concentration over an order of magnitude higher than its PNEC. Aquatic toxicity information as well as environmental occurrence data for many of these plastic compounds is limited.

Plastic additives enter the environment through multiple pathways from their substantial consumer and industrial uses, notably from wastewater and stormwater. Both OPEs and bisphenols have been observed in Bay Area wastewater and stormwater, often at comparable concentrations (Sutton et al., 2019; Mendez et al., 2022; Peter et al., submitted). Other plastic additives have not been previously measured in local wastewater or stormwater.

This proposal outlines a study to monitor a broad array of plastic additives in Bay water, archived sediment, and stormwater to continue building our understanding of the transport and fate of these contaminants to the Bay. This study will augment current efforts to monitor the same contaminants in wastewater in 2024, as well as recent monitoring of OPEs and bisphenols in stormwater to understand the relative influence of these pathways and their concentrations in the Bay. Further, these data can provide further insight into temporal or spatial trends in the Bay. The results from this study will support the categorization of numerous newly monitored plastic additives in the RMP's tiered risk-based framework.

Study Objectives and Applicable RMP Management Questions

The purpose of this study is to assess the concentrations of plastic additives in Bay water, archived sediment, and stormwater to improve our understanding of the fate of these contaminants in the Bay. The proposed study would provide data sufficient for risk screening for numerous contaminants not previously monitored in the Bay. Additionally, we will compare levels of plastic additives in different embayments to monitor potential regional spatial patterns of contamination, and in different seasons to provide insights as to the influence of wastewater and stormwater pathways. Evaluation of both water and sediment can provide information relevant to partitioning and fate in the Bay. For a subset of analytes, comparisons to concentrations measured in previous years will provide preliminary information on potential temporal trends.

Table 1. Study objectives and questions relevant to the RMP ECWG management questions.

Management Question	Study Objective	Example Information Application
1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?	Characterize levels of plastic additives in Bay water, archived sediment, and stormwater	Risk screening will result in placement of multiple contaminants and classes in the tiered risk-based framework
2) What are the sources, pathways, loadings, and processes leading to the presence of individual CECs or groups of CECs in the Bay?	Characterize levels of plastic additives in Bay water during the wet and dry seasons as well as stormwater	Seasonal differences in concentrations may be linked to the influence of wastewater vs. stormwater pathways
3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?	Comparison of plastic additives concentrations in Bay water, archived sediment, and stormwater	Specific plastic additives are anticipated to be present in different environmental matrices due to partitioning behavior
4) Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?	Compare current concentrations to previously measured values	Preliminary information on temporal trends can be assessed for a subset of the contaminants in Bay water This study will provide baseline information that can be used to evaluate changes with time for other plastic additives
5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?	N/A	N/A
6) What are the effects of management actions?	N/A	N/A

Approach

Bay Water Sampling

Collection of Bay water samples will be coordinated with the RMP S&T dry season water monitoring cruise in the summer of 2025 and wet season monitoring activities in water year 2026. All samples will be grab samples of Bay water (400 mL in 500 mL amber bottles), consistent with previous efforts. During the dry season water cruise, 13 of 22 sites will be sampled along with collection of a field duplicate and two field blanks. These samples will be targeted at specific sites where previous high detections of OPEs and bisphenols have occurred including wastewater and stormwater impacted areas in the South Bay.

During the wet season, all 16 field samples will be subject to monitoring for plastic additives. Wet season sampling includes two sets of samples collected at 4 near-field sites and 4 deep Bay stations. The 4 near-field sites will be sampled directly after a storm while the 4 deep Bay sites will be sampled within three weeks of the same storm. Overall, for this study, 19 wet season samples (including a duplicate and two field blanks) will be collected.

Dry and wet season monitoring (field samples and QA) will total 35 samples.

Archived Sediment Sampling

A subset of 15 sediment samples archived from 36 sites during the 2023 RMP S&T sediment cruise encompassing the deep Bay, near-field, and margins sites will be used for this study. These sites will be targeted to include areas in the Lower South Bay, where OPEs and bisphenols have been shown to be in greater concentrations in previous studies, as well as any areas that may have high concentrations based on current and past Bay water and wastewater effluent data.

Stormwater Sampling

Based on sampling efforts and available funding, there is an opportunity to analyze up to eight stormwater samples from multiple sites across the Bay. This proposal includes staff budgets to visit up to three sites of specific interest for plastic additives, and assumes leveraging other stormwater monitoring efforts for additional samples.

Analytical Methods

Samples will be analyzed by Dr. Da Chen's laboratory (at Jinan University and Southern Illinois University), which previously analyzed bisphenols and OPEs in Bay water and wastewater, and will be analyzing plastic additives in wastewater in 2024. Dr. Chen's team will use their existing method, which uses a Shimadzu HPLC coupled to an AB Sciex 5500 Q Trap MS/MS (Toronto, Canada). This method can include analysis of up to 160 plastic additives (see Appendix, Table 3), including a suite of 24 OPEs, 16 bisphenols, 41 phthalates, 10 non-phthalate plasticizers, 40 antioxidants, and 29 UV stabilizers (Chen et al., 2021).

Budget

Table 2. Budget

Expense	Estimated Hours (Range; all matrices)	Bay Water Only	Archived Sediment (Add-on)	Stormwater (Add-on)
Labor				
Study Design	35-75	$5,600	$2,500	$4,000
Sample Collection	20-200	$3,000	$1,500	$27,500
Data Technical Services		$33,000	$15,000	$12,000
Analysis and Reporting	280-435	$45,000	$13,000	$12,000
Subcontracts				
Dr. Da Chen, Jinan/SIU		$76,650	$32,850	$17,520
Direct Costs				
Equipment		$1,000		$300
Travel		$2,000		
Shipping		$4,500	$500	$1,500
Grand Total		***$170,750***	***$65,350***	***$74,820***

<u>Budget Justification</u>

SFEI Labor
Labor hours are estimated for SFEI staff to manage the project, develop the study design, support sample collection (including shipment of archived samples), analyze data, review toxicological risks, present findings, and write a report including recommendations on future related monitoring. Data analysis can include examination of any preliminary temporal trends, spatial trends, comparison of observations across matrices, and investigation of linkages to potential pathways of importance to the Bay.

Due to the extensive list of analytes, analysis and reporting will require significant additional effort to fully assess the toxicological risks of these contaminants to the Bay.

Data and Technical Services
To minimize costs, data will undergo RMP QA/QC review and be formatted for CEDEN but not uploaded. Due to the extensive list of analytes, a broader budget has been provided to fully QA/QC all data.

Laboratory Costs (Dr. Da Chen, Jinan/SIU)
Analytical costs per sample are estimated at $2,190. Field samples collected for Bay water include 13 samples in the dry season and 16 samples in the wet season, with each effort including a field duplicate and two field blanks, resulting in a total analytical cost of $76,650. Additional analysis of 15 sediment samples is $32,850 and 8 stormwater samples is $17,520.

Direct Costs
Equipment: An estimate of miscellaneous supplies associated with Bay water sampling and stormwater sampling.
Travel: An estimate of travel costs to present the study at a scientific conference.
Shipping: An estimate of shipping water and archived sediment samples from San Francisco, CA to Carbondale, IL.

Reporting

Findings will be presented at the spring ECWG meeting in 2027. A draft report will be prepared by 06/30/27 and be reviewed by the ECWG and TRC. Comments will be incorporated into the final report, published by 08/31/27.

References

Chen, Y., Shi, Y., Liu, X., Liu, R., Chen, D., 2021. The High Complexity of Plastic Additives in Hand Wipes. Environ. Sci. Technol. Lett. 8, 639–644. https://doi.org/10.1021/acs.estlett.1c00381

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Appendix

Table 3. OPEs, bisphenols, and other plastic additives (Chen et al., 2021); specific analyte list may be refined as part of study design.

Group	Analyte	Full Name
Organophosphate Esters	BPA-BDPP	Bisphenol A bis(diphenylphosphate)
	BPDPP	t-butylphenyl diphenyl phosphate
	CDP	Cresyl diphenyl phosphate
	EHDPHP	2-Ethylhexyl-diphenyl phosphate
	IDDPP	Isodecyl diphenyl phosphate
	RDP	Resorcinol bis(diphenyl phosphate)
	T2IPPP	Tris(2-isopropylphenyl) phosphate
	T35DMPP	Tris(3,5-dimethylphenyl) phosphate
	TBOEP	Tris(2-butoxyethyl) phosphate
	TBP	Tributyl phosphate
	TCEP	Tris(2-chloroethyl) phosphate
	TCIPP	Tris(2-chloroisopropyl) phosphate
	TCrP	Tricresyl phosphate
	TDBPP	Tris(2,3-dibromopropyl) phosphate
	TDCIPP	Tris(1,3-dichloro-2-propyl) phosphate
	TEHP	Tris(2-ethylhexyl) phosphate
	TEP	Triethyl phosphate
	TPhP	Triphenyl phosphate
	TPrP	Tripropyl phosphate
	V6	Tetrakis(2-Chloroethyl)dichloroisopentyldiphosphate
Bisphenols	BPA	4,4'-(1-Methylethylidene) bisphenol
	BPAF	4,4'-(Hexafluoroisopropylidene) diphenol
	BPAP	4,4′-(1-Phenylethylidene) bisphenol
	BPB	4,4'-(1-Methylpropylidene) bisphenol
	BPBP	4,4'-(Diphenylmethylene) diphenol
	BPC	2,2-Bis(4-hydroxy-3-methylphenyl) propanone
	BPC-dichloride	4,4'-(2,2-Dichlorovinylidene)bisphenol
	BPE	4,4'-Ethylidenebisphenol
	BPF	4,4'-Methylenebisphenol
	BPG	4-[2-(4-hydroxy-3-propan-2-yl-phenyl)propan-2-yl]-2-propan-2-yl-phenol
	BPM	4,4′-(1,3-Phenylenediisopropylidene) bisphenol
	BPP	4,4'-[1,4-Phenylenebis(1-methylethane-1,1-diyl)] bisphenol
	BPPH	5,5'-Isopropylidenebis(2-hydroxybiphenyl)
	BPS	Bis(4-hydroxyphenyl) sulfone

Group	Analyte	Full Name
	BP-TMC	4,4'-(3,3,5-Trimethyl-1,1-cyclohexanediyl) bisphenol
	BPZ	4,4'-Cyclohexylidenbisphenol
Phthalates	BBzPh	Butylbenzyl phthalate
	iBCHPh	Isobutylcyclohexyl phthalate
	DAPh	Diallyl phthalate
	DBPh	Di-n-butyl phthalate
	DiBPh	Diisobutyl phthalate
	DiBzPh	Dibenzyl phthalate
	DiDPh	Diisodecyl phthalate
	DEPh	Diethyl phthalate
	DEHPh	Bis(2-ethylhexyl) phthalate
	BMPPh	Bis(4-methyl-2-pentyl) phthalate
	DHPh	Dihexyl phthalate
	DiHPh	Diisohexyl phthalate
	DNPh	Dinonyl phthalate
	DiNPh	Diisononyl phthalate
	DPePh	Di-n-pentyl phthalate
Phthalates	DiPePh	Diisopentyl phthalate
	DPhPh	Diphenyl phthalate
	DPiPh	Diphenyl isophthalate
	DPrPh	Di-n-propyl phthalate
	DiPrPh	Diisopropyl phthalate
	DUPh	Diundecyl phthalate
Mono-phthalates	MBPh	Mono-n-butyl phthalate
	MiBPh	Monoisobutyl phthalate
	MBzPh	Monobenzyl phthalate
	MCHPh	Monocyclohexyl phthalate
	MEPh	Monoethyl phthalate
	MEHPh	Monoethylhexyl phthalate
	MHePh	Mono-2-heptyl phthalate
	MHxPh	Monohexyl phthalate
	MiNPh	Monoisononyl phthalate
	MOPh	Mono-n-octyl phthalate
	MPePh	Mono-n-pentyl phthalate
	MiPrPh	Monoisopropyl phthalate
	MEHHPh	Mono (2-ethyl-5-hydroxyhexyl) phthalate
	MEOHPh	Mono (2-ethyl-5-oxohexyl) phthalate

Group	Analyte	Full Name
	MCPPh	Mono (3-carboxypropyl) phthalate
Non-phthalate plasticizers Non-phthalate plasticizers	ATBC	Acetyl tri-n-butyl citrate
	DiBA	Diisobutyl adipate
	DBA	Dibutyl adipate
	DiDeA	Diisodecyl adipate
	DiDeAz	Diisodecyl azelate
	DEHA	Bis(2-ethylhexyl) adipate
	DHeNoA	Di(n-heptyl,n-nonyl) adipate
	DINCH	Di-isononylcyclohexane-1,2-dicarboxylate
	TCaT	Tricapryl trimellitate
	TOTM	Trioctyl trimellitate
UV stabilizers: benzothiazoles	2-Me-BTH	2-Methylbenzothiazole
	2-Mo-BTH	2-(Morpholinothio)-benzothiazole
	2-Me-S-BTH	2-(Methylthio)-benzothiazole
	2-OH-BTH	2-Hydroxybenzothiazole
UV stabilizers: benzotriazoles	1-H-BTR	1-Hydrogen-benzotriazole
	5-Cl-BTR	5-Chloro-benzotriazole
	5-Me-1-H-BTR	5-Methyl-1-hydrogenbenzotriazole
	1-OH-BTR	1-Hydroxybenzotriazole
	UV-234	2-(2H-benzotriazol-2-yl)-4,6-bis(1-methyl-1-phenylethyl)phenol
	UV-320	2-(3,5-Di-tert-butyl-2-hydroxyphenyl) 2H-benzotriazole
	UV-326	2-Tert-butyl-6-(5-chloro-2H-benzotriazol-2-yl)-4-methylphenol
	UV-327	2,4-Di-tert-butyl-6-(5-chloro-2H-benzotriazol-2-yl)phenol
	UV-328	2-(2H-benzotriazol-2-yl)-4,6-di-tert-pentylphenol
	UV-350	2-(3-Sec-butyl-5-tert-butyl-2-hydroxyphenyl)benzotriazole
	UV-P	2-(2-Hydroxy-5-methylphenyl) benzotriazole
	UV-PS	2-(5-Tert-butyl-2-hydroxyphenyl) benzotriazole
UV stabilizers: benzophenone	BP1	2,4-Dihydroxybenzophenone
	BP3	2-Hydroxy-4-methoxybenzophenone
	BP4	2-Hydroxy-4-methoxybenzophenone-5-sulfonic acid hydrate
	BP6	2,2-Dihydroxy-4,4-dimethoxybenzophenone
	BP8	2,2′-Dihydroxy-4-methoxybenzophenone
	4-OH-BP	4-Hydroxybenzophenone
UV stabilizers: others	4-MBC	3-(4-Methylbenzylidene) camphor
	BMDM	4-Tert-Butyl-4′-methoxydibenzoylmethane
	IAMC	Isoamyl 4-methoxycinnamate
	OC	2-Ethylhexyl 2-cyano-3,3-diphenyl-2-propenoate

Group	Analyte	Full Name
	ODPABA	Octyl dimethyl-p-aminobenzoic acid
	OMC	Ethylhexyl methoxycinnamate
Antioxidants	BHA	2(3)-Tert-butyl-4-hydroxyanisole
	BHT-OH	2,6-Di-tert-butyl-4-(hydroxymethyl)phenol
	BHT-CHO	3,5-Di-tert-butyl-4-hydroxybenzaldehyde
	BHT-COOH	3,5-Di-tert-butyl-4-hydroxybenzoic acid
	3,5-DTBH	11-Methyldodecyl3-[4-hydroxy-3,5-bis(2-methyl-2-propanyl)pheny]propanoate
	4-tOP	4-(1,1,3,3-Tetra-methylbutyl)phenol
	AO245	hydroxy-3-methyl-5-(2-methyl-2-propanyl)phenyl]propanoate}
	AO259	1,6-Hexanediylbis{3-[4-hydroxy-3,5-bis(2-methyl-2-propanyl)phenyl]propanoate}
	AO425	2,2'-Methylenebis(4-ethyl-6-tert-butylphenol)
	AO565	4-[[4,6-Bis(octylsulfanyl)-1,3,5-triazin-2-yl]amino]-2,6-ditert-butylphenol
Antioxidants	AO697	(1,2-Dioxo-1,2-ethanediyl)bis(imino-2,1-ethanediyl)bis{3-[4-hydroxy-3,5-bis(2-me thyl-2-propanyl)phenyl]propanoate}
	AO1035	Sulfanediyldi-2,1-ethanediylbis{3-[4-hydroxy-3,5-bis(2-methyl-2-propanyl)phenyl] propanoate}
	AO1081	2,2'-Thiobis(6-tert-butyl-p-cresol)
	AO1098	N,N'-1,6-Hexanediylbis{3-[4-hydroxy-3,5-bis(2-methyl-2-propanyl)phenyl]propan amide}
	AO1222	Diethyl 3,5-di-tert-butyl-4-hydroxybenzyl phosphonate
	AO2246	2,2'-Methylenebis(6-tert-butyl-4-methylphenol)
	AO3790	Tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)isocyanurate
	AO22E46	2,2'-(1,1-Ethanediyl)bis[4,6-bis(2-methyl-2-propanyl)phenol]
	AO44B25	4,4'-Butylidenebis(6-tert-butyl-m-cresol)
	AO-TBM6	4,4'-Thiobis(6-tert-butyl-m-cresol)
	diAMS	Bis[4-(2-phenyl-2-propyl)phenyl]amine
	DBHA	Dibenzylhydroxylamine
	DET	N,N'-diethylthiourea
	DTG	1,3-Di-o-tolylguanidine
	DPG	1,3-Diphenylguanidine
	DPT	1,3-Diphenyl-2-thiourea
	DPPD	N,N'-Diphenyl-1,4-benzenediamine
	PANA	N-Phenyl-1-naphthylamine
	BBOT	2,2'-(2,5-Thiophenediyl)-bis(5-tert-butylbenzoxazole)
	MMBI	Methyl-2-mercaptobenzimidazole

Special Study Proposal: Quaternary Ammonium Compounds (QACs) in Bay Water and Stormwater

Summary: Quaternary ammonium compounds (QACs) are surfactants widely used as antimicrobials and for other purposes in a variety of consumer products. The recent COVID-19 pandemic significantly increased use of products containing QACs, which had a likely impact on their release to the environment. Recent analysis of wastewater has found notable levels of QACs in influent, effluent, and biosolids with many of those commonly found in influent linked to disinfectant products. A smaller set of samples of sediment, Bay water, and stormwater have also exhibited the presence of QACs. Currently the limited number of measurements available result in classification of these contaminants as Possible Concern within the RMP tiered risk-based framework for emerging contaminants in the Bay.

We propose a study to assess the concentrations of at least 20 QACs in Bay water and (optionally) stormwater to understand the transport, fate, and effects of these contaminants in the Bay. Data developed as part of this proposed study would be sufficient for more definitive placement of QACs within the tiered risk-based framework.

Estimated Cost:	Monitor QACs ***Only*** in Bay Water: $111,000 Monitor QACs in Bay Water and Stormwater: $174,000
Oversight Group:	ECWG
Proposed by:	Miguel Méndez, Rebecca Sutton (SFEI), Bill Arnold (UMinn)
Time Sensitive:	No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Develop Sampling Plan	June 2025
Task 2. Field Sampling: Water (Dry Season)	Summer 2025
Task 3. Field Sampling: Water (Wet Season) & Stormwater	Fall 2025 to Spring 2026
Task 4. Lab Analysis	September 2026
Task 5. QA/QC & Data Management	December 2026
Task 6. Presentation at ECWG	April 2027
Task 7. Draft Manuscript	June 2027
Task 8. Final Manuscript	August 2027

Background

Quaternary ammonium compounds, or QACs, are a major class of primarily cationic (positively charged) surfactants with important antimicrobial, anti-static, and surfactant properties. Because some QACs have major uses as antimicrobial active ingredients, recent increases in use occurred in response to COVID-19. Many of these compounds are designated as high production volume chemicals.

QACs are used in a wide swath of consumer, industrial, and medical products, which has led to considerable amounts ending up in wastewater. Research on the fate of QACs indicates effluents and biosolids from WWTPs as a major culprit in environmental contamination (Arnold et al., 2023; Clara et al., 2007; Li et al., 2014; Pati and Arnold, 2020). The unique cationic and hydrophobic properties of QACs lead to adsorption onto particles, particularly those with high organic matter content and/or minerals with negatively charged surfaces (Zhang et al., 2015). QACs are constructed to be biocidal and have been shown to be toxic to a variety of aquatic organisms including algae, invertebrates, fish, and microorganisms (Nałęcz-Jawecki et al., 2003; Sandbacka et al., 2000; Zhu et al., 2010).

The earliest study of QACs in San Francisco Bay focused on sediment, with several QACs found at sites across the Bay, especially the Lower South Bay where the influence of wastewater and stormwater are particularly strong compared to the rest of the Bay (Miller et al., 2020). A recent multiyear study focused primarily on QACs in wastewater, and found them in influent, effluent, and biosolids. Interestingly, QACs detected at the highest levels in influent were commonly used in disinfectant products, indicating these as a large source of PFAS to wastewater. Decreasing levels from influent to effluent indicate their effective removal.

However, the levels entering the Bay are still of concern, with six measurements in Bay water samples collected in 2021 showing levels similar to effluent concentrations. Though toxicity risk screening is limited, available thresholds indicate 90th percentile levels in Bay samples may pose a risk to aquatic wildlife. Analysis of stormwater at two Bay sites exhibited concentrations in line with effluent levels, though their QACs fingerprint was notably different.

This proposal outlines a study to examine QACs in Bay water and (optionally) stormwater to further elucidate transport, fate, and effects of these contaminants. This study will build on recent efforts to monitor these contaminants in wastewater while providing further baseline water data to fully determine their presence and potential impacts. These data can provide further insight into any temporal or spatial trends in Bay water, especially in the Lower South Bay. The results from this study will allow the categorization of QACs in the RMP’s tiered risk-based framework.

Study Objectives and Applicable RMP Management Questions

The purpose of this study is to assess QACs in Bay water and stormwater to improve our understanding of these contaminants into the Bay. Comparisons to limited data from previous years in Bay water will aid in this analysis. Levels in stormwater and wastewater pathways will also be compared to help identify the relative importance of these pathways to Bay contamination.

Table 1. Study objectives and questions relevant to the RMP ECWG management questions.

Management Question	Study Objective	Example Information Application
1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?	Characterize levels of QACs in Bay water	Risk screening will result in placement of QACs in the tiered risk-based framework
2) What are the sources, pathways, loadings, and processes leading to the presence of individual CECs or groups of CECs in the Bay?	Characterize levels in Bay Area stormwater and compare concentrations and profiles to recent wastewater data Characterize Bay water levels of QACs during the wet and dry seasons	Comparison of stormwater concentrations and profiles with previously collected wastewater data may provide insights on sources and the relative influence of these pathways Seasonal differences in concentrations may be linked to the influence of wastewater vs. stormwater pathways
3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?	N/A	N/A
4) Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?	Compare current Bay water concentrations to previously measured values	Preliminary information on temporal trends can be assessed for a subset of the contaminants in Bay water This study will provide baseline information that can be used to evaluate changes with time for QACs
5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?	N/A	N/A
6) What are the effects of management actions?	N/A	N/A

Approach

Bay Water Sampling

Collection of Bay water samples will be coordinated with the RMP S&T dry season water monitoring cruise in the summer of 2025 and wet season monitoring activities in water year 2026. All samples will be grab samples of Bay water (3 L in polycarbonate bottles), consistent with previous efforts.

During the dry season water cruise, all 22 sites will be sampled along with the collection of two duplicates and two field blanks.

Similarly, during the wet season, all 16 field samples will be subject to monitoring for QACs. Wet season sampling includes two sets of samples collected at 4 near-field sites and 4 deep Bay stations. The 4 near-field sites will be sampled directly after a storm while the 4 deep Bay sites will be sampled within three weeks of the same storm. Overall, 21 wet season samples (including two field replicates and three field blanks) will be collected.

Dry and wet season monitoring (field samples and QA) will total 47 samples.

Stormwater Sampling

Based on sampling efforts and available funding, there is an opportunity to analyze up to eight stormwater samples from multiple sites across the Bay. This proposal includes staff budgets to visit up to three sites of specific interest for QACs, and assumes leveraging other stormwater monitoring efforts for additional samples.

Analytical Methods

Samples will be analyzed by Dr. Bill Arnold at the University of Minnesota using a previously published method (Mahony et al., 2023). At least 20 analytes will be evaluated, which represent some of the important subgroups of QACs (Appendix, Table 3). The analyte list may be expanded to include additional compounds compatible with the current extraction method, especially those of regulatory/stakeholder interest. The stormwater add-on includes additional funds to explore further method development. Briefly, samples will be spiked with three surrogate standards, extracted by methods specific to each matrix, cleaned up by solid-phase extraction (SPE), and then analyzed via liquid chromatography triple quadrupole mass spectrometry (LC/MS-MS). Concentrations in all samples are calculated via internal standard quantification. Limits of detection are provided in the Appendix.

Budget

Table 2. Budget

Expense	Estimated Hours (Range)	Bay Water Only	Bay Water & Stormwater
Labor			
Study Design	30-55	$5,000	$9,000
Sample Collection	30-200	$4,500	$32,000
Data Technical Services		$14,000	$23,000
Analysis and Reporting	120-160	$20,000	$26,000
Subcontracts			
University of Minnesota		$60,000	$75,000
Direct Costs			
Equipment		$1,000	$1,000
Travel		$2,000	$2,000
Shipping		$4,500	$6,000
Grand Total		**$111,000**	**$174,000**

Budget Justification

SFEI Labor
Labor hours are estimated for SFEI staff to manage the project, develop the study design, support sample collection, analyze data, review toxicological risks, present findings, and write a report including recommendations on future related monitoring. Costs for sample collection include SFEI staff assisting to collect samples, leveraging ongoing S&T sampling and stormwater sampling where possible.

Data and Technical Services
To minimize costs, data will undergo RMP QA/QC review and be formatted for CEDEN but not uploaded.

Laboratory Costs (Dr. William Arnold, University of Minnesota)
The contract with the laboratory would cover six months of staff time and supplies. Assuming a negotiated indirect rate of 10%, the total cost would range from $60,000 to $75,000, depending on scope.

Direct Costs
Equipment: An estimate of miscellaneous supplies associated with Bay water and stormwater sampling.
Travel: An estimate of travel costs to present the study at a scientific conference.
Shipping: An estimate of shipping water and stormwater samples from San Francisco, CA to Minneapolis, MN.

Reporting

Findings will be presented at the spring ECWG meeting in 2027. The analytical partner will lead preparation of a report in the form of a manuscript to be submitted to a peer reviewed journal; SFEI staff will assist with preparation. A draft manuscript will be reviewed by the ECWG and RMP leadership in June 2027, and a revised manuscript will be submitted to the journal in August 2027. In addition, a summary of the data, risk screening, and monitoring strategy for QACs will be included in a future CEC Strategy Update document.

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Appendix

Table 3. List of QACs Analytes.

Abbreviation	Target Compound	LOD (ng/L)*
C10-ATMAC	decyltrimethylammonium	0.02
C12-ATMAC	dodecyltrimethylammonium	0.2
C14-ATMAC	tetradecyltrimethylammonium	0.5
C16-ATMAC	hexadecyltrimethylammonium	0.2
C18-ATMAC	octadecyltrimethylammonium	1.0
C8-BAC	octyldimethylbenzyllammonium	0.02
C10-BAC	decyldimethylbenzylammonium	0.03
C12-BAC	dodecyldimethylbenzylammonium	0.6
C14-BAC	tetradecyldimethylbenzylammonium	0.8
C16-BAC	hexadecyldimethylbenzyllammonium	0.4
C18-BAC	octadecyldimethylbenzylammonium	0.4
C8-DADMAC	dioctyldimethylammonium	~1
C8/C10-DADMAC	dioctyldimethylammonium/didecyldimethylammonium	1.1
C10-DADMAC	didecyldimethylammonium	0.9
C12-DADMAC	didodecyldimethylammonium	0.4
C14-DADMAC	ditetradecyldimethylammonium	0.2
C16-DADMAC	dihexadecyldimethylammonium	0.6
C18-DADMAC	dioctadecyldimethylammonium	2.3
C12-ETBAC	dodecyldimethylethylbenzyllammonium	0.5
C14-ETBAC	tetradecyldimethylethylbenzyllammonium	0.9

*LODs are concentrations in the original sample after a 1000-fold concentration.

Special Study Proposal: Nontarget Analysis of San Francisco Bay Fish (Year 2)

Summary: Contaminants in sport fish may have both human and wildlife health implications. The RMP has been monitoring selected contaminants in sport fish for many years but has never done any nontarget analysis of this matrix. This two-year study leverages 2024 Status and Trends sport fish monitoring to collect sport fish samples for nontarget analysis. Year 1, funded in 2024, included developing a sampling plan and sample collection. Year 2 will cover the laboratory and data analysis and reporting. This type of analysis will provide a means to identify unanticipated contaminants that may merit follow-up targeted monitoring. It will also allow comparison of San Francisco Bay fish nontarget analysis contaminant profiles with those of fish from other locations such as the Great Lakes. Anticipated study outcomes would include priorities and recommendations for future investigations of newly identified CECs of potential concern observed in sport fish.

Estimated Cost:	$76,000
Oversight Group:	ECWG
Proposed by:	Ezra Miller & Rebecca Sutton (SFEI), Bernard Crimmins (AEACS, Clarkson University)
Time Sensitive:	Yes, year 2 of a two-year project

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Work with S&T Sport Fish Strategy Team to develop sampling plan (funded)	Spring 2024
Task 2. Sample collection (funded)	Summer 2024
Task 3. Lab and data analysis	Spring 2025 – Spring 2026
Task 4. Presentation to ECWG and TRC	April 2026
Task 5. Draft manuscript	September 2026
Task 6. Final manuscript	December 2026

Background

Sport fish in San Francisco Bay are an important matrix in which to understand the contaminant profile, as they are consumed by both people, particularly in low-income and immigrant communities practicing subsistence fishing, as well as by apex predators like cormorants and harbor seals. The RMP began sport fish monitoring in 1997, and Status and Trends samples are collected every five years (most recently in 2019) during the summer season. Data collected through this monitoring program not only provide updates on the status and long-term trends of contaminants in Bay sport fish, but are also used to update human health consumption advisories and evaluate the effectiveness of regulatory and management efforts to reduce the impacts of contaminants of concern in the Bay (Buzby et al. 2019).

Status and Trends sport fish contaminant monitoring by the RMP is focused on a limited list of contaminants: mercury, polychlorinated biphenyls (PCBs), dioxins, selenium, polybrominated diphenyl ethers (PBDEs), and select per- and polyfluoroalkyl substances (PFAS). However, investigations of sport fish and other wildlife collected from other highly urbanized coastal sites indicate that these regularly monitored contaminants represent only a small fraction of the total number of bioaccumulative contaminants present in aquatic life. While the RMP has been monitoring sport fish for many years, to date there has never been any nontarget analysis of Bay sport fish.

Nontarget analysis, a key element of the RMP's CEC Strategy, can help to provide a measure of assurance that the RMP is not missing unexpected yet potentially harmful contaminants simply because of failures to predict their occurrence based on use or exposure prioritization criteria. This type of nontarget study can lay the foundation for future targeted CECs monitoring by helping to identify new potential contaminants of concern without *a priori* knowledge of their occurrence. The RMP has conducted successful nontarget analysis of nonpolar, fat-soluble compounds in bivalve tissue and seal blubber (Sutton and Kucklick 2015), and polar, more water-soluble compounds in Bay water and wastewater effluent (Sun et al. 2020; Overdahl et al. 2021), as well as in fire-impacted stormwater (Miller et al. 2021). Nontarget analysis of marine mammal tissues is also currently underway as part of a pilot study to inform the RMP's Status and Trends program design.

The proposed two-year study will employ a non-targeted analytical approach to examine samples of Bay sport fish to assess the contaminant profiles in the food chain and identify potential additional contaminants for future monitoring. Year one of the study, funded in 2024, included developing a sampling plan and sample collection. Year two (2025) will cover the laboratory and data analysis and reporting.

Results may indicate the presence of contaminants accumulating in Bay food chains that are not typically analyzed in targeted monitoring studies. Alternatively, should results reveal that most compounds of concern for wildlife and human health are already included in targeted monitoring, this study will help confirm that current Bay monitoring sufficiently captures priority contaminants.

Study Objectives and Applicable RMP Management Questions

Table 1. Study objectives and questions relevant to the RMP ECWG management questions.

Management Question	Study Objective	Example Information Application
1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?	Screen CECs identified via nontarget analysis for potential toxicity concerns, future monitoring needs, and data gaps.	Do any newly identified CECs merit follow-up targeted monitoring?
2) What are the sources, pathways, loadings, and processes leading to the presence of individual CECs or groups of CECs in the Bay?	Evaluate chemical profiles for evidence of source types.	Do variations in site profiles suggest influence of any specific sources?
3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?	Assess results of nontarget analysis for the presence of unanticipated transformation products.	Do the results of nontarget analysis indicate transformation of parent compounds into unanticipated contaminants with potential concerns for Bay wildlife or human health?
4) Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?	N/A	N/A
5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?	N/A	N/A
6) What are the effects of management actions?	N/A	N/A

Approach

<u>Bay Fish Sampling</u>

Although the RMP S&T biota monitoring design was updated in 2022, the design for sport fish remains largely the same, with samples collected every five years. This project involves collection of additional fish samples in conjunction with the 2024 S&T sport fish monitoring, using an "opportunistic" sampling approach planned with the help of the sport fish S&T team. Twelve homogenized composite samples of shiner surfperch, of a minimum 40 g each (20 g per analysis), will be collected. Half of this mass will be collected in teflon-free plastic jars for PFAS NTA analysis, and half will be in glass jars with Teflon-lined lids for non-polar compound analysis.

Shiner surfperch is a core RMP sport fish species and is a good species for spatial comparisons because individuals have small home ranges. The RMP has found that shiner surfperch is an excellent indicator of spatial variation for other contaminants such as PCBs. The five existing core S&T stations that have always been sampled as part of S&T monitoring will continue to be monitored, including San Pablo Bay, Berkeley, Oakland, San Francisco Waterfront, and South Bay (may include Redwood Creek, Artesian Slough, and/or Coyote Creek) (Figure 1 green dots). This project samples both expected relatively less contaminated sites such as San Pablo Bay and Berkeley, as well as sites with expected higher contaminant loads such as San Leandro Bay and the South Bay. Shiner surfperch will also be collected from the Priority Margin Unit locations to track PCB trends (Figure 1 orange dots). Fish are collected using otter trawls.

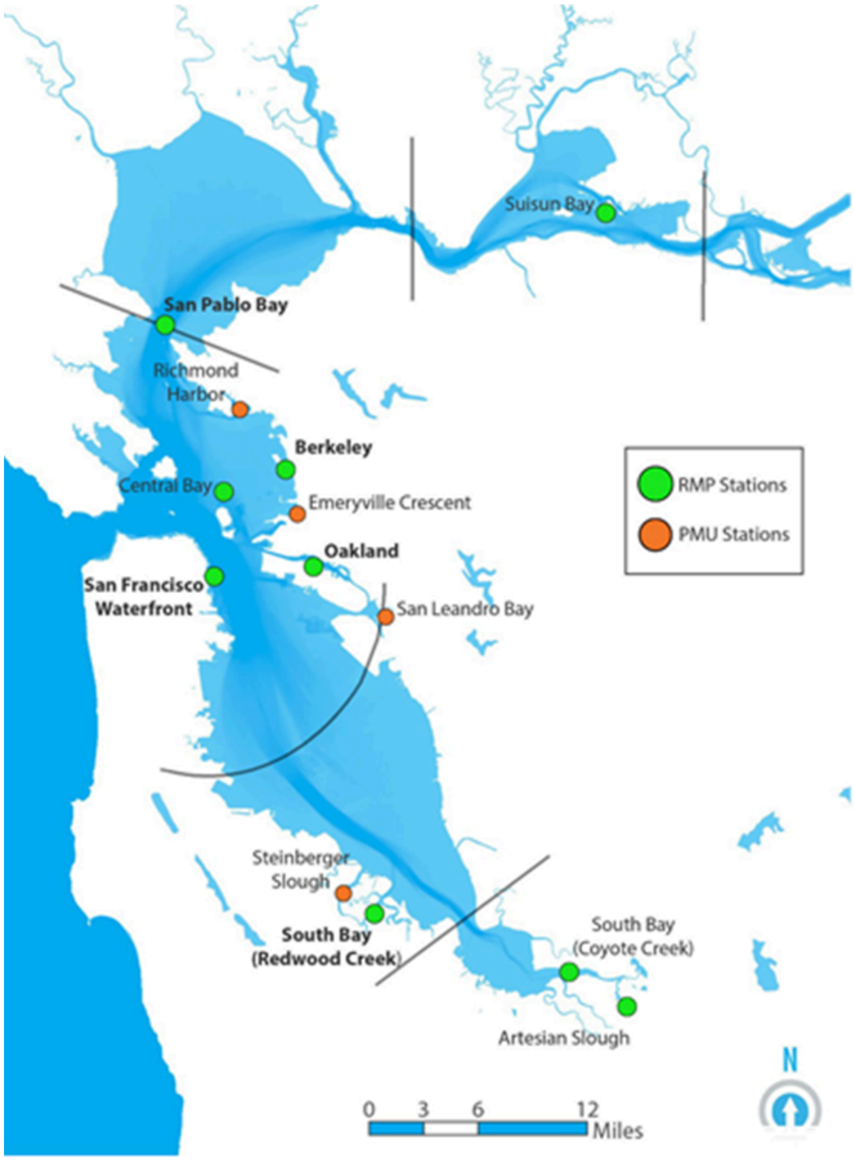

Figure 1. RMP S&T sport fish sampling locations. The green circles with bold names represent the five core stations included in the S&T Program (South Bay includes three locations – Redwood Creek, Artesian Slough, and Coyote Creek). Shiner surfperch will also be collected from the Priority Margin Unit locations to track PCB trends (orange circles).

Analytical Methods

This study will focus on shiner surfperch. Shiner surfperch are too small to be filleted, so they are processed whole but with head, tail, and viscera removed.

For nontarget screening (Crimmins lab; AEACS, Clarkson University), fish tissue samples will be processed and analyzed using two methods: one to look for non-polar compounds, and another to look for polar compounds, especially fluorinated polar compounds such as PFAS. In addition to nontarget analyses, ancillary data such as % lipid will be collected.

For non-polar compounds, dichloromethane (DCM) will be eluted through desiccated fish tissue homogenates followed by size exclusion chromatography for lipid removal (Fernando et al., 2018). Extracts will then be analyzed using a two-dimensional gas chromatography equipped with a high-resolution time of flight mass spectrometer (GC×GC-HRT, LECO) in accordance with Fernando et al. (2018) and Renaguli et al. (2020). The GC×GC resolves the extract mixture into 1000's of individual components. The exact mass spectra of these components will be compared against a reference library containing over 500,000 chemicals to identify components in the tissues. Previously, this analysis has only been performed using electron impact ionization. The new system also has electron capture negative chemical ionization capabilities (ECNI). This mode selects for compounds that generate negative ions (halogenated components) and is traditionally used by low resolution instruments to quantify legacy halogenated chemicals (e.g., polybrominated diphenyl ethers). The new system is one of few available in the world that provides enhanced sensitivity of ECNI and 2-D chromatographic (GC×GC) and exact mass (30,000) resolution. The result will be a list of halogenated species for each tissue and concentration estimates using one or more representative reference standards. Compound identifications will be qualified by retention time, library matching, and spectral interpretation with exact mass accuracy (< 5 ppm).

Polar compound nontarget analysis will be performed in accordance with Crimmins et al. (2014) and Fakouri Baygi et al. (2021). Tissue homogenates will be extracted using methods described in Point et al. (2019) and then analyzed by ultra-high performance liquid chromatography-quadrupole time-of-flight mass spectrometry (UPLC-QToF) in electrospray ionization (ESI) mode. The instrument will be configured to operate in a data-independent MS/MS mode, alternating between low and high-energy channels to capture precursor and product ions for identification and confirmation of detected species. The data files will be analyzed using an algorithm developed in-house to screen for halogenated acids including polyfluorinated acids (Fakouri Baygi et al., 2016; Fakouri Baygi et al., 2021). The data reduction will consist of isolating species containing halogenated acid, ether, and sulfonate moieties.

The contaminant profiles for San Francisco Bay sport fish will be compared to profiles acquired previously from Great Lakes sport fish using the same sample preparation and analytical methods.

Budget

Table 2. Budget

Expense	Estimated Hours	Estimated Cost
Labor		
Study Design and Coordination	12	2,000
Data Technical Services	0	0
Analysis and Reporting	125	24,000
Subcontracts		
AEACS, LLC		50,000
Direct Costs		
Equipment		0
Shipping		0
Grand Total		**76,000**

Budget Justification

This proposal describes year two of a two-year study with a total budget of $99,000 (split between the two years). Year one ($23,000) covered study design, equipment, and shipping, while sample collection was covered via Status and Trends. Year two ($76,000) covers analysis and reporting.

SFEI Labor
Labor hours are estimated for SFEI staff to manage the project, develop the study design in collaboration with partners, support sample collection, analyze data, review toxicological risks, present findings, and assist with manuscript development.

Data Technical Services
Standard RMP data management procedures have not been developed for nontarget data. These data will not be uploaded to CEDEN.

Sample Collection
The estimated cost for collecting extra fish samples during the S&T collection efforts was $25,000, funded under the S&T fish monitoring budget. These extra fish samples can be archived if year two of this study is not funded for 2025.

Laboratory Costs
The Crimmins Laboratory (AEACS, Clarkson University) can provide nontarget analysis using two different methods on up to 12 fish tissues for a total cost of $50,000 (including 25% indirect rate). This budget includes both analysis and manuscript preparation. The analysis and reporting would take place during year 2 of the study.

Reporting

Results will be presented to the ECWG at the spring 2026 meeting, and may also be presented at a TRC meeting; a draft manuscript led by the Crimmins lab will serve as the RMP technical report for this project (draft for RMP review due September 2026, submission-ready draft[1] due December 2026).

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Special Study Proposal: Stormwater In Vitro Toxicity Screening

Summary: Recent RMP studies have demonstrated the ubiquitous presence and complexity of CEC mixtures in Bay Area urban stormwater runoff. In vitro bioassay monitoring of environmental samples can detect possible biological effects that may not be predictable solely from targeted chemical analyses of the same samples or traditional individual chemical risk screening methods. The USEPA Center for Computational Toxicology and Exposure (CCTE) and EPA Region 10 are piloting using a rainbow trout gill cell high-throughput assay to detect toxicity of stormwater samples and compare between different locations. This is an imaging-based means of cell phenotype profiling with fluorescent dyes to quantify cellular-level changes in response to chemical exposure. This bioassay uses rainbow trout, which is both a common toxicity testing model and a Bay-relevant organism, to test for cytotoxicity and sub-cellular effects. We leveraged ongoing RMP stormwater sampling efforts during the water year 2024 wet season to collect a modest number of samples for pro bono extraction and analysis by CCTE. This project proposal covers Bay Area-specific data analysis and interpretation as well as coordination with EPA Region 10 and CCTE for data analysis and reporting. This project represents early implementation of an element of the RMP CEC strategy, namely strategic incorporation of novel toxicological methods to inform management.

Estimated Cost:	$26,000
Oversight Group:	ECWG
Proposed by:	Ezra Miller (SFEI), Dan Villeneuve (USEPA)
Time Sensitive:	Yes; leverages current EPA one-year project; early release of funds requested

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	**Due Date**
Task 1. Sample collection and extraction	Winter 2024 (complete; pro bono)
Task 2. Coordination with EPA project	Spring 2024 – Fall 2025
Task 3. Lab and data analysis	Spring 2024 – Fall 2025
Task 4. Presentation to ECWG	April 2026

Background

Traditional chemical risk screening and prioritization methods generally rely on individual chemical occurrence and toxicity data. Traditional toxicity testing and threshold development methods rarely account for possible additive toxicity or interactions between chemicals (i.e., synergistic or antagonistic effects), except in the case of additive toxicity from multiple chemicals within a structural class with the same known mode of action (e.g., pyrethroids). However, chemicals may also influence one another's toxicity by affecting each other's uptake, metabolism, excretion, or toxicodynamics. This can modify the magnitude and sometimes also the nature of the toxic effect of a mixture compared to the effects of each individual chemical component of the mixture. Single substances present below their individual effect thresholds may thus still result in combined mixture effects (Kienzler et al., 2019; Silva et al., 2002).

Incorporation of in vitro bioassay monitoring approaches could support improved characterization of potential hazards to ecological receptors from the complex mixtures of CECs present in the Bay. Bioassay monitoring of environmental samples can detect possible biological effects that may not be predictable solely from chemical analyses of the same samples (Blackwell et al., 2019). Cell bioassays can complement traditional targeted chemical monitoring to screen for both known and unknown chemicals according to toxic mode of action. This screening can then be followed up with a more traditional assessment of individual contaminants and/or nontargeted chemical analysis to identify potential causative agents. This approach has been successfully used to prioritize sites for further monitoring in Southern California using endocrine-responsive and aryl hydrocarbon receptor cell assays (Mehinto et al., 2017, 2023). The Science Advisory Panel for CECs in California's Aquatic Ecosystems, convened at the request of the State Water Resources Control Board to provide unbiased science-based recommendations for monitoring strategies of CECs across the State, supports the use of bioassays as a way to provide additional information of value when screening for new substances in the environment that may have adverse bioactivity (Drewes et al., 2023). The RMP has a limited history of applying this type of bioassay monitoring. A pilot study testing six sites in the Lower South Bay of San Francisco Bay for estrogenic activity detected no activity in water and was less conclusive for sediment due to concerns about incomplete extraction of contaminants (Denslow et al., 2018).

Since the pilot study testing for estrogenic activity, the RMP has moved to focus its efforts not only on Bay monitoring but also on monitoring and modeling in contaminant pathways, especially wastewater effluent and urban stormwater runoff. Recent RMP studies have demonstrated the ubiquitous presence and complexity of CEC mixtures in Bay Area urban stormwater runoff (Peter et al., submitted). However, these types of expansive chemical assessments are costly and still likely provide only partial coverage of the full suite of contaminants present. For example, targeted analytical methods rarely capture the occurrence of transformation products, which in some cases can be more toxic than their parent CECs. Even when we have occurrence data for a compound, prioritization for monitoring and management is often hindered by a lack of toxicological data and, therefore, unknown or low-confidence toxicity thresholds. There is also the potential for difficult-to-predict mixture effects. Therefore, further exploration of in vitro screening of environmental samples is warranted. Following the Toxicology Strategy for CECs in the Bay (Miller et al., 2020), this approach should focus first on major pathways to the Bay (e.g., stormwater), as these waters will have a stronger signal due to their higher concentrations. The focus should also be on the most relevant molecular initiating events and corresponding endpoints for CECs; while estrogenicity is perhaps the most well-understood toxicity pathway due to its human health relevance, other modes of action such as neurotoxicity or teratogenicity may be more important for Bay contaminants and biota.

The Organisation for Economic Co-operation and Development test guideline 249 (OECD TG249) assay for cell viability testing in rainbow trout gill cells has an excellent correlation to in vivo survival data of rainbow trout, which is both a common toxicity testing model and a Bay-relevant organism. Scientists at the USEPA Center for Computational Toxicology and Exposure (CCTE) have developed an OECD TG249-inspired assay conducted in 384-well format that also allows for screening for more subtle (i.e., non-lethal) toxic effects. In the EPA assay, the OECD TG249 testing is paired with imaging-based high-throughput phenotypic profiling (HTPP, ‘Cell Painting’; Nyffeler et al., 2021, 2023) conducted in parallel to obtain information about sub-cytotoxic bioactivity of chemicals. This method uses fluorescent dyes to visualize subcellular structures and to quantify cellular-level morphological changes in response to chemicals or other perturbations. Cell Painting is a high-throughput and cost-effective bioactivity screening method that detects effects associated with many different molecular mechanisms in an untargeted manner, enabling rapid in vitro hazard assessment. This new low cost, high-throughput test system can now be used to screen large libraries of chemicals for cytotoxicity and phenotypic effects on fish gill cells.

EPA Region 10 is currently piloting using this rainbow trout gill cell assay to detect toxicity of stormwater samples, compare stormwater toxicity between different locations, and prioritize locations for follow-up monitoring and management. Salmonids like rainbow trout are especially vulnerable to toxicity from the tire-derived contaminant 6PPD-quinone, which has been frequently detected in Bay Area stormwater (Peter et al., submitted). The toxicity of 6PPD-quinone and many other stormwater contaminants is still poorly understood, with only limited acute lethality data currently available, making a high-throughput bioassay especially valuable for predicting potential for adverse effects on aquatic biota. Because the assay is run in a 384-well plate format, there is plenty of room for extra samples, and EPA CCTE has generously offered to extract and analyze a small set of Bay Area stormwater samples for the RMP pro bono. The EPA project is a one-year project, in which Region 10 stormwater sampling is occurring summer 2024, with the bulk of laboratory and data analysis planned for Fall 2024 – Spring 2025.

We leveraged ongoing RMP and other SFEI stormwater sampling efforts during the water year 2024 wet season (January-February 2024) to collect a modest number of samples and sent these to CCTE for pro bono extraction and analysis. This project proposal covers Bay Area-specific data analysis and interpretation as well as coordination with EPA Region 10 and CCTE for data analysis and reporting.

Study Objectives and Applicable RMP Management Questions

Table 1. Study objectives and questions relevant to the RMP ECWG management questions.

Management Question	Study Objective	Example Information Application
1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?	Screen Bay Area stormwater for potential toxicity concerns.	Can this type of in vitro toxicity testing capture toxicity concerns that may be missed by traditional chemical analysis?
2) What are the sources, pathways, loadings, and processes leading to the presence of individual CECs or groups of CECs in the Bay?	Compare available chemical profiles with toxicity data to inform CEC prioritization. Evaluate watershed characteristics in comparison with toxicity data to inform future monitoring design.	Does bioassay data correlate with chemical data? Do variations in site profiles suggest different toxicity profiles?
3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?	N/A	N/A
4) Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?	N/A	N/A
5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?	N/A	N/A

6) What are the effects of management actions?	N/A	N/A

Approach

<u>Sample Collection</u>

We leveraged ongoing RMP and other SFEI stormwater sampling efforts during the water year 2024 wet season to collect both first flush grab samples and time-weighted composites across the hydrograph of each sampled storm at the sites described in Table 2.

Table 2. Sampled sites

Location	Type of Watershed	Storm Date(s)	Other Analytes
Pescadero Creek	large, rural	Jan 31*	SSC only
Guadalupe Creek	medium, half-urban	Jan 31	PCBs, Hg, SSC
Walnut Creek	medium, half-urban	Jan 31	PCBs, Hg, SSC
Visitacion Valley	small, urban	Jan 31*; Feb 18	Hg, SSC, total and dissolved metals, stormwater CECs, tire particles
Crocker Amazon	small, urban	Apr 13; May 4	Hg, SSC, total and dissolved metals, pesticides, PCBs, stormwater CECs, tire particles
Mission Bay Circle	small, urban	May 4	Hg, SSC, total and dissolved metals, pesticides, PCBs, dioxins, stormwater CECs, tire particles
Candlestick Point	small, urban	Apr 13**; May 4	Hg, SSC, total and dissolved metals, microplastics, disinfection byproducts, stormwater CECs, tire particles

* samples were delayed in shipping and slightly exceeded the 96 hour hold time

** grab sample only

All samples were collected in amber glass bottles, kept on ice, and shipped to the CCTE lab for extraction within 96 hours of sampling.

Laboratory Analysis

Samples were extracted using Waters Oasis HLB solid phase extraction columns, eluted in methanol, evaporated to dryness, solubilized in dimethylsulfoxide (DMSO) at a 1000x concentration (relative to ambient), and kept frozen until analysis.

Extracts were analyzed for 6PPD and 6PPD-quinone following EPA Draft Method 1634 (USEPA, 2023). For the Cell Painting Assay, rainbow trout gill cells are plated in 384-well format. One day after plating, media is exchanged, and the cells are treated with the sample extracts (diluted at least 300x). After 24 h of exposure, viability stains (alamar blue, CFDA-AM, neutral red) are applied and measured using a plate reader. Plates are labeled to visualize seven different cellular structures, followed by imaging and quantification.

Budget

Table 3. Budget

Expense	Estimated Hours	Estimated Cost
Labor		
Study Design, Coordination with EPA	45	8,000
Stormwater Sample Collection		0
Data Technical Services	0	0
Analysis and Reporting	95	18,000
Subcontracts		
n/a		0
Direct Costs		
Equipment		0
Shipping		0
Grand Total		**26,000**

Budget Justification

SFEI Labor

Labor hours are estimated for SFEI staff to manage the project, develop the data analysis design in collaboration with partners, analyze data, present findings, and assist with EPA report development as necessary.

Data Technical Services

Standard RMP data management procedures have not been developed for in vitro bioassays. These data will not be uploaded to CEDEN.

Sample Collection

Collection of stormwater samples has already occurred, leveraging sampling efforts for other stormwater projects.

Laboratory Costs

EPA is performing all sample extraction and rainbow trout gill cell assays pro bono.

Reporting

Results will be presented to the ECWG at the spring 2026 meeting, and may also be presented at a TRC meeting. Results and recommendations for future use of this assay will be incorporated into a future CEC Strategy Update.

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Tire Rubber Marker Analysis for Tire Wear Particle Quantification

Summary: Tire Wear Particles (TWPs) may be the biggest source of microplastics to San Francisco Bay, and are also a source of tire-related contaminants.
Norwegian Institute for Water Research (NIVA) scientists have developed state of the art methods for quantifying tire wear particles[1,2]. Reference materials of tire samples are used to estimate TWP using estimated relationships between emissions of tire materials from different types of vehicles and tires with different marker content. While NIVA has developed a tire database for tires used in Norway, no such reference database has been published for California tires. And while the U.S. Tire Manufacturers Association (USTMA) and the Tire Industry Project (TIP) have provided reference material (https://www.ustires.org/cmtt), they have not provided information as to types of tires used, and therefore it is not possible to ascertain whether the material is representative of what is in use in California. Because tire rubber composition varies due to brand, car type, area weather, and intended use, creating a representative regional tire database is important for improving the accuracy of estimated tire wear concentrations in environmental samples.
This proposal would analyze tire tread rubber from a representative set of new tires for the San Francisco Bay region (approximately 30 tires, each analyzed in triplicate[3,4]). Representative samples would include tires commonly used by passenger vehicles, and light trucks/SUVs, which represent a cumulative 76% of cars driven in California[5]. NIVA will analyze samples using pyrolysis GC-MS to quantify various tire markers to develop a reference database for tire material based on SF Bay Area regional tire trends. Results will be publicly shared through a peer-reviewed manuscript led by NIVA and supported by SFEI. Results will also be integrated into future RMP and SFEI reports to more accurately quantify TWPs analyzed via pyrolysis GC-MS. Overall, developing a robust database is critical for quantifying tire wear particles in the region and state. The data from this study could be used to update measurements of tire wear particles in Bay stormwater runoff.

Estimated Cost:	$105,000
Oversight Group:	ECWG and MPWG
Proposed by:	Diana Lin, Kayli Paterson, Kelly Moran, Rebecca Sutton (SFEI), and Elisabeth R⌀dland (NIVA)
Time Sensitive:	Yes, to inform other tire quantification studies in the Bay and state

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Develop study design	March 2025
Task 2. Collect tire rubber samples	September 2025
Task 3. Laboratory Analysis	February 2026
Task 4. Data analysis, interpretation, and reporting	June 2026

[1] Composed of styrene butadiene rubber and butadiene rubber) using pyrolysis GC-MS to quantify the mass of 4 different marker combinations for comparison: M4 (benzene, methylstyrene, ethylstyrene, butadiene dimer), M3 (methylstyrene, ethylstyrene, butadiene dimer), 4-vinylcyclohexene (4-VCH) and butadienes (butadiene dimer, styrene butadiene dimer and styrene butadiene trimer.
[2] Rodland et al., 2022. https://www.sciencedirect.com/science/article/pii/S0304389421020604
[3] Popular brands and models include Michelin Defender2, Yokohama YK-GXT, and Goodyear Eagle LS2
[4] Jefferson, A. 2023. *Tire Market: Top Brands & Retailers in 2023*. Traqline.com.
[5] Moran et al., 2023. SFEI Technical Report #109. Richmond, CA

PFAS NMR Analysis in Wastewater, Stormwater, and Bay Matrices

Summary: Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of fluorine-rich, chemically stable compounds widely used in consumer and industrial products. PFAS are ubiquitous in Bay matrices and considered a High Concern in the RMP tiered risk-based framework due to concentrations in biota linked to potential human health risks. Bay studies to date have focused on targeted analytical methods analyzing up to 40 individual PFAS, which does not adequately capture the overall presence of PFAS in the environment. Preliminary application of broader methods (e.g., total oxidizable precursors [TOP] assay, adsorbable organofluorine [AOF] analysis) has illustrated the significant presence of unknown PFAS in Bay matrices. Each of these broader methods has limitations, and as yet no standardized method exists to comprehensively characterize PFAS.

A new approach uses Fluorine-19 nuclear magnetic resonance (^{19}F NMR) spectroscopy to more broadly detect and quantify fluorine-containing compounds, including PFAS and other pollutants.[1,2] This method not only provides an aggregated measure of organofluorine, it also provides information on the relative presence of different fluorinated functional groups, which provides insight as to the dominant types of PFAS present. We propose applying ^{19}F NMR to wastewater and stormwater samples undergoing analysis with multiple PFAS methods as part of RMP and USEPA-funded work. Complementary analysis using multiple analytical techniques will allow broader insights as to the utility of ^{19}F NMR. In addition, wastewater and stormwater samples are expected to have suitable concentrations for this analysis, which is less sensitive than targeted methods. We recommend a phased approach involving method development in year one on a limited number of available extracts of Bay matrices (sediment, bird eggs, sport fish, marine mammals), followed by analysis of stormwater and wastewater in year two. Overall, this proposed project would supplement current and future PFAS work to better characterize the presence, transport, and fate of fluorochemicals in the Bay.

Estimated Cost:	\$125,000 (year one); est. \$200,000-260,000 (year two)
Oversight Group:	ECWG
Proposed by:	Miguel Mendez, Diana Lin, Rebecca Sutton (SFEI), Bill Arnold (UMinn)
Time Sensitive:	Yes

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Develop Study and Sampling Plan	March 2025
Task 2. Ship Available Extracts (EPA 1633) & Archived Samples	April 2025
Task 3. Laboratory Analysis and Reporting (Bay Matrices); Decision on request to proceed with year two	July 2025
Task 4. Field Sampling - Stormwater	Fall-Spring 2026
Task 5. Field Sampling - Wastewater	Spring-Summer 2026
Task 6. Ship Available Sample Extracts (EPA 1633; WW & SW)	Summer-Fall 2026
Task 7. Laboratory Analysis (WW & SW)	December 2026
Task 8. Presentation to ECWG Meeting	April 2027
Task 9. Draft Manuscript	May 2027
Task 10. Final Manuscript for submission	June 2027

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[1] Bhat, A. P.; Pomerantz, W. C. K.; Arnold, W. A. Finding Fluorine: Photoproduct Formation during the Photolysis of Fluorinated Pesticides. *Environ. Sci. Technol.* **2022**, *56* (17), 12336–12346. https://doi.org/10.1021/acs.est.2c04242.

[2] Bhat, A. P.; Pomerantz, W. C. K.; Arnold, W. A. Fluorinated Pharmaceutical and Pesticide Photolysis: Investigating Reactivity and Identifying Fluorinated Products by Combining Computational Chemistry,19F NMR, and Mass Spectrometry. *Environ. Sci. Technol.* **2024**, *58* (7), 3437–3448. https://doi.org/10.1021/acs.est.3c09341.

Special Study Proposal: Nontarget and Target Analysis of Fibers and Urban Stormwater

Summary: Synthetic apparel and textiles represent a large and growing source of chemical and microplastic fiber contamination globally. Microplastic fibers are the dominant form of microplastics observed in Bay matrices, and load estimates suggest urban stormwater runoff to be the dominant transport pathway. Fibers may pose ecotoxicity concerns linked to their physical form as well as to the leaching of harmful chemical additives and transformation products into aquatic ecosystems. Some chemical classes considered to be of High or Moderate Concern in the Bay according to the RMP's tiered risk-based framework are used as additives in synthetic textiles, including per- and polyfluoroalkyl substances (PFAS). These chemicals represent only a small fraction of textile-related chemical additives that may be transported to the Bay via fiber releases.

The RMP Emerging Contaminants and Microplastics Workgroups jointly propose to conduct nontarget analysis and target PFAS analysis on textile fibers and urban stormwater runoff to identify textile-related contaminants that have the potential to impact Bay water quality. This study would leverage an independent ongoing study led by SFEI to investigate whether tumble air-dryers are an important source of microplastic fibers to the Bay. Nontarget analysis can indicate the presence of plastic additives in fibers released to the environment, and statistical chemical fingerprinting techniques can be used to explore linkages between fibers and urban stormwater runoff. Observations may point to chemicals that have been overlooked in previous targeted monitoring in stormwater samples and merit quantitative analysis in the Bay or loading pathways.

Estimated Cost:	$123,700
Oversight Group:	ECWG and MPWG
Proposed by:	Diana Lin and Rebecca Sutton (SFEI), Roxana Sühring (Toronto Metropolitan University)
Time Sensitive:	No, samples can be archived

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Develop sampling plan	November 2024
Task 2. Stormwater sample collection	November - March 2024
Task 3. Lab analysis	June 2025
Task 4. Computational analysis and interpretation	September 2025
Task 5. Draft Report	March 2026
Task 6. Presentation at ECWG	April 2026
Task 7. Final Report	June 2026

Background

The San Francisco Bay Microplastic Study (Sutton et al., 2019) examined microplastic loadings from wastewater and urban stormwater pathways. Fibers accounted for approximately half of the microplastics observed in both the wastewater (55% fibers) and urban stormwater runoff pathway (39% fibers). Fibers in wastewater are likely to come from laundering textiles. SFEI is currently leading a two-year study (funded by California Sea Grant and California Ocean Protection Council) to investigate whether household tumble air-dryers may be a significant source of fibers to urban stormwater runoff (Dryer Study). The Dryer Study provides an opportunity to leverage sample collection efforts to collect microplastics from textiles from diverse households in the region. Despite the recognition that apparel and textiles may be a significant source of microplastic emissions to the environment (through laundering, drying, wear and abrasion), there has been limited attention to date on the release of chemical additives together with microplastic fiber emissions. This is an important data gap because many different additives are used in apparel and other textiles to improve their performance for different applications. Furthermore, additives used in textiles are often not chemically bound to the plastic polymer and therefore may be easily released from the microplastic fiber into the environment (Chen et al., 2022).

Many plastic additives can be used in substantial amounts in textile manufacturing (Chen et al., 2022). Some of these plastic additives have been observed in wastewater and urban stormwater runoff and environmental matrices. Researchers at Toronto Metropolitan University have developed a list of 124 plastic additives that are persistent, mobile, and toxic (PMT) and merit further monitoring. Prioritization criteria included registration for use in Canada, modeled high emissions from wastewater treatment plants (low removal), and high likelihood of being overlooked by regulations that focus on bioaccumulation potential (Fries et al., 2022).

The RMP is increasingly focused on urban stormwater runoff monitoring based on a growing body of evidence that this previously overlooked pathway is important not only for legacy contaminants but also for emerging contaminants and microplastics. However, Bay Area stormwater has not yet been characterized via nontarget analysis. Nontarget analysis is an important component of the Contaminants of Emerging Concern Strategy to identify unanticipated contaminants that may have been overlooked in targeted monitoring.

This proposal will implement nontarget suspect screening analysis on Bay stormwater samples and microplastic fibers collected from households to screen for contaminants that may have been overlooked previously in RMP monitoring. The suspect screening approach compares analytical spectra from samples to a library of compounds with known spectra. The suspect screening list in this study will include 124 persistent, mobile, and toxic contaminants that have been prioritized and characterized by Toronto Metropolitan University. Stormwater samples and microplastic fibers will also be analyzed for PFAS via target and suspect screening methods. The results from this study will inform coordination among the Emerging Contaminants Workgroup, Microplastics Workgroup, and Sources Pathways, and Loadings Workgroup.

Study Objectives and Applicable RMP Management Questions

Table 1. Study objectives and questions relevant to the RMP ECWG management questions and MPWG management questions.

Management Question	Study Objective	Example Information Application
1) Which CECs have the potential to adversely impact beneficial uses in San Francisco Bay?	Screen CECs identified in urban stormwater runoff and microplastic fiber samples via nontarget analysis.	Do any newly identified CECs merit follow-up targeted monitoring?
2) What are the sources, pathways, loadings, and processes leading to the presence of individual CECs or groups of CECs in the Bay?	Screen CECs identified in microplastic fibers and urban stormwater runoff samples via nontarget analysis. Conduct time series leachate studies from microplastic fibers.	Do chemical fingerprints suggest influence of microplastic fibers on urban stormwater pathway? What CECs in microplastic fibers are most likely to mobilize in the urban stormwater runoff pathway?
3) What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?	N/A	N/A
4) Have levels of individual CECs or groups of CECs changed over time in the Bay or pathways? What are potential drivers contributing to change?	N/A	N/A
5) Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?	N/A	N/A
6) What are the effects of management actions?	Explore linkage between microplastic fibers and CECs observed in urban stormwater.	Can mitigation of microplastic fiber emissions also impact CEC loadings via stormwater to the Bay?

Approach

Study Design

The primary goal will be to conduct nontarget analysis on microplastic fibers collected from dryers and in urban stormwater runoff samples.

As part of the separate Dryer Study, in 2024 SFEI will be collecting microplastic fibers outside of household and laundromat building dryer vent exhaust in order to estimate emission rates from drying operations. SFEI anticipates collecting between 40-80 samples (depending on the number of identified sampling locations and samples collected at each location). Microplastics fiber composition analysis will be performed by the Desert Research Institute (DRI). Each sample will be sub-sampled, and fibers will be individually enumerated, dimensions and colors recorded, and composition will be determined via microscope enabled FTIR (μFTIR). Samples will be archived at room temperature and away from sunlight.

For this present study, we will use the remaining samples not used by DRI to composite up to 20 samples that will be shipped to Toronto Metropolitan University for analysis. Samples may be composited based on the dominant polymer in each sample—e.g. compositing samples that are predominantly cotton or polyester.

Stormwater sample collection will seek to leverage and coordinate with other related studies to collect urban stormwater samples. We will target sampling stormwater events at 3–8 watershed locations, and the actual number of sampling locations will depend on whether there are other related studies that can be leveraged to support stormwater sample collection. If possible, sites will be selected based on greater proportion of urban land use in the watershed, with an emphasis on proximity to residential communities and reduced sample collection costs due to existing sample collection underway as part of other studies. There will be focus on capturing the first fall flush at sites if feasible, using established RMP storm size criteria. Duplicate samples will be collected in amber glass (for nontarget PMT analysis, with no head space in filled containers) and HDPE (for PFAS) containers. QA/QC samples collected will include at least one field duplicate and two field blanks. Samples will be archived at 4℃ until ready to be shipped to Toronto Metropolitan University for analysis.

Analytical Methods
Samples will be analyzed by Dr. Roxana Sühring's laboratory (Assistant Professor at Toronto Metropolitan University). Dr. Sühring's is an expert on the analysis of plastic additives. She is the principal investigator on a Government of Canada funded study to identify microplastic sources using environmental forensic fingerprinting techniques.

Briefly, up to 20 composite microplastics samples (0.2 g dryer lint subsample) will be leached under full-spectrum UV irradiation using filtered lake water for 30 days. One mL samples will be collected at 4 time points (e.g., days 2, 7, 14, and 30) to determine the leaching kinetics for different persistent, mobile, and toxic (PMT) plastic additives. Leaching kinetics have been shown to be essential for distinguishing contaminants that are adsorbed onto the surface of plastics (i.e., representative of contaminants in the surrounding environment) from plastic additives that are present in the plastic (Fries and Sühring, 2023).

Stormwater samples will be spiked with an in-house isotope-labeled benchmark mix and analyzed for PMT plastic additives using a liquid-liquid extraction developed by Environment and Climate Change Canada and adapted at the Emerging Contaminants Lab (Sühring et al., 2020). In short, 500 mL of filtered water will be added to a pre-cleaned glass separation funnel and shaken vigorously with 10 mL dichloromethane (DCM). The DCM will be collected in a glass vial and the extraction repeated for a total of three times. The combined 30 mL extracts per sample will be evaporated under a gentle stream of nitrogen and reconstituted in acetonitrile for instrumental analysis. Samples will be analyzed using a previously validated method for the analysis of persistent, mobile, and toxic (PMT) plastic additives via accelerated leaching followed by high-performance liquid chromatography coupled with time-of-flight mass spectrometry (HPLC-QToF-MS) (Fries and Sühring, 2023). The resulting high-resolution mass-spectrometry data will be analyzed for at least 124 PMT plastic additives (Fries et al., 2022) (Table 3).

In addition, up to 20 composite microplastic samples (dryer lint subsamples that are replicates of subsamples analyzed for PMT plastic additives above) will be analyzed for PFAS using target and suspect screening methods. Microplastic samples will be extracted using total oxidizable precursor assay by adapting published methods such as photoTOP or direct TOP (Zweigle, 2023). Oxidation prior to extraction is important for detecting widely used side-chain fluorinated polymers that may not be extractable otherwise (Zweigle, 2023). Samples will then be extracted and undergo rapid quantitative analysis of 30 PFAS (Table 4) in selected leachate samples using HPLC-QToF-MS as well as suspect screening for an additional 137 PFAS. These methods enable the detection of a wide range of PMT plastic additives with minimal analyte losses as well as the highly selective and sensitive analysis of targeted PFAS (online-SPE) without the need for extensive sample preparation. Stormwater samples will also be analyzed for PFAS using target quantitative methods and qualitative suspect screening analyses.

The nontarget and target data will be analyzed using a combination of univariate (Wilcoxon rank test) and multivariate (principal component analysis) statistical approaches to evaluate similarities and differences among samples. Unique chemical fingerprints can be explored to identify potential chemical source linkages between textile fibers and stormwater samples.

Budget

Table 2. Budget

Expense	Estimated Hours	Budget
Labor		
Study Design	95	$20,000
Sample Collection	96	$20,000
Data Management and QA	70	$22,000
Analysis and Reporting	160	$29,000
Subcontracts		
Toronto Metropolitan University		$38,000
Direct Costs		
Equipment		$1,000
Shipping		$4,000
Open Access Publication		$2,000
Grand Total		**$136,000**

Budget Justification

SFEI Labor
Study Design: Labor hours are estimated for SFEI staff to manage the project, develop the study design in coordination with other leveraged studies, including the Dryer Study and multiple stormwater sample collection efforts.

Sample Collection: Microplastic fibers will be collected separately through the Dryer Study. For stormwater samples, labor hours are estimated to fully staff 2 stormwater sample collection events/locations. We anticipate being able to leverage other related stormwater sampling collection efforts to collect samples from additional locations.

Data Management and QA: Note nontarget analysis will not go through standard RMP QA/QC procedures, which were developed for targeted analysis. Limited SFEI labor hours are included for the SFEI data management team to track and manage field sampling forms, laboratory data reporting, and provide consultation on QA/QC considerations. PFAS Target data will go through RMP QA/QC review but will not be uploaded to CEDEN.

Analysis and Reporting: Labor hours are estimated for SFEI staff to support Toronto Metropolitan University in synthesis and interpretation of data and support report writing. Additionally, SFEI staff will lead preliminary toxicological review using the CEC's tiered risk-based framework.

Subcontracts: Laboratory Costs (Dr. Roxana Sühring, Toronto Metropolitan University)
Analytical costs per sample are estimated at $200. Twenty microplastic fiber samples will be analyzed in duplicate, through leaching studies over 4 time points for a total of 160 microplastic fiber leachate samples (20 microplastic fiber samples x 2 duplicates x 4 timepoints = 160 analyses). Budget includes analysis of eight urban stormwater runoff samples, including one field duplicate and one field blank for a total of 10 samples. For the combined nontarget analysis of microplastic fiber and stormwater samples, analytical costs are estimated to be $34,000. An additional $2,000 is included to partially support a PhD student to lead the computational analysis for chemical fingerprinting.

Additionally, Dr. Sühring and her students will lead reporting and analysis, which will be provided as in-kind support.

Direct Costs
Equipment: Budget is included for miscellaneous supplies needed to collect stormwater samples, including sample bottles, tubing, solvents for cleaning equipment.
Shipping: Budget is included to ship stormwater samples from SFEI to Toronto, Canada; as well as shipping dryer samples from Reno, NV to Toronto, Canada.
Publication**:** Budget is included to pay for open access journal publication.

Reporting

A draft report will be in the form of a draft manuscript prepared by 3/31/26 to be reviewed by the ECWG and TRC. Comments will be incorporated into the final report, which will be in the form of a draft manuscript ready for publication.

References

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Zweigle, J., 2023. Non-extractable PFAS in functional textiles – characterization by complementary methods: oxidation, hydrolysis, and fluorine sum parameters. Environ. Sci.

Table 3. Priority suspect screening list of 124 persistent, mobile, contaminants via HPLC-MS analyses. Specific analyte list may be refined as part of study design.

CAS	Name	Function(s)
68-22-4	(17α)-hydroxy-19-norpregn-4-en-20-yn-3-one	Other
156-60-5	(1E)-1,2-dichloroethene	Blowing Agent
98-82-8	(1-methylethyl)-benzene	Catalyst, Colorant, Crosslinking Agent, Filler, Intermediates, Lubricant, Other Processing Aids
131-57-7	(2-hydroxy-4-methoxyphenyl)phenyl-methanone	Antioxidant, Colorant, Filler, Light Stabilizer, Other Processing Aids
13676-54-5	1,1'-(methylenedi-4,1-phenylene)bis-1H-Pyrrole-2,5-dione	Crosslinking Agent, Intermediates, Other Processing Aids
162881-26-7	1,1'-(phenylphosphinylidene)bis[1-(2,4,6-trimethylphenyl)-methanone	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Other Processing Aids
920-66-1	1,1,1,3,3,3-hexafluoro-2-Propanol	Intermediates
107-46-0	1,1,1,3,3,3-hexamethyl-disiloxane	Colorant, Intermediates, Lubricant, Other Processing Aids
71-55-6	1,1,1-trichloroethane	Lubricant, Odor Agent, Other Processing Aids, Plasticizer, Solvent
1493-13-6	1,1,1-trifluoro-methanesulfonic acid	Other
127-18-4	1,1,2,2-tetrachloroethene	Colorant, Intermediates, Lubricant, Other Processing Aids, Solvent
79-00-5	1,1,2-trichloroethane	Intermediates
79-01-6	1,1,2-trichloroethene	Catalyst, Colorant, Intermediates, Light Stabilizer, Lubricant, Odor Agent, Other Processing Aids, Solvent
3006-86-8	1,1'-cyclohexylidenebis[2-(1,1-dimethylethyl)peroxide]	Antioxidant, Catalyst, Crosslinking Agent, Initiator, Other Processing Aids, Plasticizer
75-35-4	1,1-dichloroethylene	Filler, Flame Retardant, Intermediates, Monomer, Odor Agent, Other Processing Aids

CAS	Name	Function(s)
111-96-6	1,1'-oxybis[2-methoxy-ethane]	Lubricant, Other Processing Aids, Solvent
115-10-6	1,1'-oxybis-methane	Biocide, Blowing Agent, Colorant, Filler, Intermediates, Lubricant, Odor Agent, Other Processing Aids, Viscosity Modifier
67-68-5	1,1'-sulfinylbis-methane	Blowing Agent, Other Processing Aids, Solvent
119-64-2	1,2,3,4-tetrahydro-naphthalene	Colorant, Intermediates
87-61-6	1,2,3-trichlorobenzene	Other
96-18-4	1,2,3-trichloropropane	Colorant, Crosslinking Agent, Intermediates, Monomer, Other Processing Aids, Solvent
120-82-1	1,2,4-trichlorobenzene	Other
81-07-2	1,2-benzisothiazol-3(2H)-one 1,1-dioxide	Biocide, Colorant, Filler, Intermediates, Other Processing Aids
106-93-4	1,2-dibromoethane	Flame Retardant, Intermediates, Lubricant, Other Processing Aids
95-50-1	1,2-dichlorobenzene	Biocide, Colorant, Filler, Lubricant, Plasticizer, Solvent
107-06-2	1,2-dichloroethane	Intermediates, Monomer, Odor Agent, Other Processing Aids
78-87-5	1,2-dichloropropane	Other
83-32-9	1,2-dihydro-acenaphthylene	Biocide, Colorant, Intermediates
100-97-0	1,3,5,7-Tetraazatricyclo[3.3.1.13,7]decane	Colorant, Crosslinking Agent, Filler, Intermediates, Monomer, Other Processing Aids
108-80-5	1,3,5-Triazine-2,4,6(1H,3H,5H)-trione	Biocide, Catalyst, Crosslinking Agent, Flame Retardant, Initiator, Intermediates, Light Stabilizer

CAS	Name	Function(s)
108-78-1	1,3,5-Triazine-2,4,6-triamine	Colorant, Filler, Flame Retardant, Intermediates, Light Stabilizer, Monomer, Other Processing Aids, Plasticizer
108-67-8	1,3,5-trimethyl-benzene	Colorant, Crosslinking Agent, Filler, Lubricant, Other Processing Aids
13674-87-8	1,3-Dichloro-, 2,2',2''-phosphate 2-propanol	Flame Retardant, Plasticizer
541-73-1	1,3-dichlorobenzene	Other
280-57-9	1,4-Diazabicyclo[2.2.2]octane	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Other Processing Aids
123-91-1	1,4-dioxane	Colorant, Filler, Intermediates, Odor Agent, Other Processing Aids
479-27-6	1,8-Naphthalenediamine	Other
109-70-6	1-bromo-3-chloropropane	Intermediates
13674-84-5	1-Chloro-, 2,2',2''-phosphate 2-propanol	Blowing Agent, Colorant, Filler, Flame Retardant, Intermediates, Other Processing Aids, Plasticizer
100-00-5	1-chloro-4-nitrobenzene	Other
95-14-7	1H-Benzotriazole	Antioxidant, Biocide, Colorant, Filler, Light Stabilizer, Lubricant, Other Processing Aids
80-15-9	1-methyl-1-phenylethylhydroperoxide	Biocide, Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Lubricant, Monomer, Other Processing Aids
88-72-2	1-methyl-2-nitro-benzene	Other
99-99-0	1-methyl-4-nitro-benzene	Other
482-89-3	2-(1,3-dihydro-3-oxo-2H-indol-2-ylidene)-1,2-dihydro-3H-indol-3-one	Colorant

CAS	Name	Function(s)
88-85-7	2-(1-methylpropyl)-4,6-dinitrophenol	Plasticizer
2440-22-4	2-(2H-benzotriazol-2-yl)-4-methyl-phenol	Antioxidant, Colorant, Filler, Intermediates, Light Stabilizer, Other Processing Aids
13472-08-7	2,2'-(1,2-diazenediyl)bis[2-methyl-butanenitrile]	Catalyst, Colorant, Crosslinking Agent, Initiator, Monomer, Other Processing Aids
78-67-1	2,2'-(1,2-diazenediyl)bis[2-methyl-propanenitrile]	Blowing Agent, Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Other Processing Aids
81-11-8	2,2'-(1,2-ethenediyl)bis[5-amino-benzenesulfonic acid]	Colorant
76-05-1	2,2,2-trifluoro-acetic acid	Other
22094-93-5	2,2'-[(2,2',5,5'-tetrachloro[1,1'-biphenyl]-4,4'-diyl)bis(2,1-diazenediyl)]bis[N-(2,4-dimethylphenyl)-3-oxo-butanamide]	Biocide, Colorant, Filler, Lubricant, Other Processing Aids
5468-75-7	2,2'-[(3,3'-dichloro[1,1'-biphenyl]-4,4'-diyl)bis(2,1-diazenediyl)]bis[N-(2-methylphenyl)-3-oxo-butanamide]	Biocide, Colorant, Filler, Lubricant, Other Processing Aids
5567-15-7	2,2'-[(3,3'-dichloro[1,1'-biphenyl]-4,4'-diyl)bis(2,1-diazenediyl)]bis[N-(4-chloro-2,5-dimethoxyphenyl)-3-oxo-butanamide]	Biocide, Colorant, Filler, Intermediates, Lubricant, Other Processing Aids
6358-37-8	2,2'-[(3,3'-dichloro[1,1'-biphenyl]-4,4'-diyl)bis(2,1-diazenediyl)]bis[N-(4-methylphenyl)-3-oxo-butanamide]	Colorant, Filler
3033-62-3	2,2'-oxybis[N,N-dimethyl-ethanamine]	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Other Processing Aids
108-20-3	2,2'-oxybis-propane	Other
6674-22-2	2,3,4,6,7,8,9,10-octahydro-pyrimido[1,2-a]azepine	Colorant, Other Processing Aids

CAS	Name	Function(s)
2554-06-5	2,4,6,8-tetraethenyl-2,4,6,8-tetramethyl-cyclotetrasiloxane	Colorant, Crosslinking Agent, Intermediates, Lubricant, Other Processing Aids
118-79-6	2,4,6-tribromophenol	Biocide, Flame Retardant, Intermediates, Other Processing Aids
126-86-3	2,4,7,9-tetramethyl-5-decyne-4,7-diol	Biocide, Colorant, Filler, Lubricant, Other Processing Aids
120-83-2	2,4-dichlorophenol	Other
584-84-9	2,4-diisocyanato-1-methyl-benzene	Blowing Agent, Catalyst, Colorant, Crosslinking Agent, Filler, Intermediates, Monomer, Other Processing Aids
87-62-7	2,6-dimethyl-benzenamine	Other
83016-70-0	2-[[2-[2-(dimethylamino)ethoxy]ethyl]methylamino]-ethanol	Colorant, Filler, Other Processing Aids
88-44-8	2-amino-5-methyl-benzenesulfonic acid	Colorant, Intermediates
78-51-3	2-butoxy-, 1,1',1"-phosphate ethanol	Colorant, Flame Retardant, Intermediates, Lubricant, Other Processing Aids, Plasticizer
115-96-8	2-Chloro-, 1,1',1"-phosphate ethanol	Flame Retardant, Intermediates, Odor Agent, Other Processing Aids, Plasticizer, Viscosity Modifier
1634-04-4	2-methoxy-2-methyl-propane	Other
71868-10-5	2-methyl-1-[4-(methylthio)phenyl]-2-(4-morpholinyl)-1-propanone	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Light Stabilizer, Other Processing Aids
15214-89-8	2-methyl-2-[(1-oxo-2-propen-1-yl)amino]-1-propanesulfonic acid	Intermediates, Monomer
110553-27-0	2-methyl-4,6-bis[(octylthio)methyl]-phenol	Antioxidant, Colorant, Heat Stabilizer, Light Stabilizer, Other Processing Aids
88-19-7	2-methyl-benzenesulfonamide	Colorant, Intermediates, Plasticizer

CAS	Name	Function(s)
79-46-9	2-nitropropane	Colorant, Intermediates, Other Processing Aids, Solvent
77-73-6	3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	Colorant, Filler, Intermediates, Lubricant, Monomer, Other Processing Aids, Plasticizer
108-42-9	3-chloro-benzenamine	Other
1761-71-3	4,4'-methylenebis(cyclohexylamine)	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Monomer, Other Processing Aids
6864-37-5	4,4'-methylenebis[2-methyl-cyclohexanamine]	Colorant, Crosslinking Agent, Filler, Intermediates, Monomer, Other Processing Aids
101-77-9	4,4'-methylenebis-benzenamine	Antioxidant, Catalyst, Colorant, Crosslinking Agent, Initiator, Intermediates, Lubricant, Monomer, Other Processing Aids
80-51-3	4,4'-oxybis-, 1,1'-dihydrazide benzenesulfonic acid	Blowing Agent, Crosslinking Agent, Other Processing Aids
80-08-0	4,4'-sulfonylbis-benzenamine	Catalyst, Crosslinking Agent, Initiator, Intermediates, Monomer, Other Processing Aids
80-09-1	4,4'-sulfonylbis-phenol	Biocide, Colorant, Flame Retardant, Monomer, Other Processing Aids
121-57-3	4-amino-benzenesulfonic acid	Plasticizer
123-30-8	4-aminophenol	Other
100-40-3	4-ethenyl-cyclohexene	Flame Retardant, Intermediates, Odor Agent
100-43-6	4-ethenyl-pyridine	Other
36888-99-0	5,5'-(1H-isoindole-1,3(2H)-diylidene)bis-2,4,6(1H,3H,5H)-pyrimidinetrione	Colorant

CAS	Name	Function(s)
57-41-0	5,5-diphenyl-2,4-imidazolidinedione	Other
2855-13-2	5-amino-1,3,3-trimethyl-cyclohexanemethanamine	Antistatic Agent, Colorant, Crosslinking Agent, Filler, Intermediates, Lubricant, Monomer, Other Processing Aids
3380-34-5	5-chloro-2-(2,4-dichlorophenoxy)-phenol	Biocide, Colorant, Light Stabilizer, Odor Agent
1912-24-9	6-chloro-N2-ethyl-N4-(1-methylethyl)-1,3,5-triazine-2,4-diamine	Other
120-12-7	Anthracene	Antioxidant, Colorant, Plasticizer
95-16-9	Benzothiazole	Catalyst, Colorant, Crosslinking Agent, Initiator
80-43-3	Bis(1-methyl-1-phenylethyl) peroxide	Catalyst, Crosslinking Agent, Filler, Initiator, Intermediates, Lubricant, Other Processing Aids, Plasticizer, Viscosity Modifier
108-90-7	Chlorobenzene	Colorant, Crosslinking Agent, Filler, Intermediates, Other Processing Aids
75-00-3	Chloroethane	Other
75-01-4	Chloroethene	Colorant, Filler, Flame Retardant, Intermediates, Monomer, Other Processing Aids
74-87-3	Chloromethane	Blowing Agent, Colorant, Intermediates, Other Processing Aids
75-77-4	Chlorotrimethylsilane	Colorant, Intermediates, Other Processing Aids
107-66-4	Dibutyl ester phosphoric acid	Filler, Intermediates, Lubricant, Other Processing Aids
75-71-8	Dichlorodifluoromethane	Other

CAS	Name	Function(s)
119-61-9	Diphenyl-methanone	Antioxidant, Biocide, Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Light Stabilizer, Odor Agent, Other Processing Aids
85-42-7	Hexahydro-1,3-isobenzofurandione	Colorant, Crosslinking Agent, Intermediates, Lubricant, Monomer, Other Processing Aids
119-65-3	Isoquinoline	Other Processing Aids
330-54-1	N'-(3,4-dichlorophenyl)-N,N-dimethyl-urea	Biocide, Catalyst, Crosslinking Agent, Initiator, Other Processing Aids
103-90-2	N-(4-hydroxyphenyl)-acetamide	Intermediates, Monomer
97-74-5	N,N,N',N'-tetramethyl-thiodicarbonic diamide ([(H2N)C(S)]2S)	Catalyst, Crosslinking Agent, Initiator, Other Processing Aids
60-00-4	N,N'-1,2-ethanediylbis[N-(carboxymethyl)-glycine	Antioxidant, Biocide, Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Lubricant, Odor Agent, Other Processing Aids
97-39-2	N,N'-bis(2-methylphenyl)-guanidine	Crosslinking Agent
67-43-6	N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-glycine	Biocide, Colorant, Filler, Intermediates, Lubricant, Odor Agent, Other Processing Aids
284-95-7, 2680-03-7	N,N-dimethyl-2-propenamide	Monomer, Other Processing Aids
102-06-7	N,N'-diphenyl-guanidine	Catalyst, Crosslinking Agent, Filler, Initiator, Light Stabilizer, Other Processing Aids, Plasticizer
102-08-9	N,N'-diphenyl-thiourea	Antioxidant, Catalyst, Crosslinking Agent, Initiator, Light Stabilizer
5026-74-4	N-[4-(2-oxiranylmethoxy)phenyl]-N-(2-oxiranylmethyl)-2-oxiranemethanamine	Intermediates, Other Processing Aids

CAS	Name	Function(s)
3030-47-5	N1-[2-(dimethylamino)ethyl]-N1,N2,N2-trimethyl-1,2-ethanediamine	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Other Processing Aids
91-20-3	Naphthalene	Biocide, Catalyst, Colorant, Filler, Light Stabilizer, Lubricant, Odor Agent, Other Processing Aids, Solvent
3622-84-2	N-butyl-benzenesulfonamide	Filler, Other Processing Aids, Plasticizer
461-58-5	N-cyanoguanidine	Catalyst, Colorant, Crosslinking Agent, Filler, Initiator, Intermediates, Other Processing Aids
3710-84-7	N-ethyl-N-hydroxy-ethanamine	Light Stabilizer
98-95-3	Nitrobenzene	Other
100-61-8	N-methyl-benzenamine	Colorant, Lubricant
56-23-5	Tetrachloromethane	Colorant, Other Processing Aids, Solvent
67-66-3	Trichloromethane	Colorant, Other Processing Aids
78-40-0	Triethyl ester phosphoric acid	Antioxidant, Colorant, Crosslinking Agent, Filler, Flame Retardant, Intermediates, Other Processing Aids, Plasticizer

Table 4: Quantitative analysis of 30 target PFAS using using HPLC-QToF-MS

PFAS name	Acronym
2,2-difluoropropanedioic Acid	DFPdA
Perfluorobutanoic acid (Heptafluorobutyric acid)	PFBA
Perfluoro-3-methoxypropanoic acid	PFMOPrA
Perfluorobutanesulfonic acid	PFBS
Perfluoro(2-ethoxyethane)sulfonate	PFEESA
Perfluoropentanoic acid	PFPeA
Perfluoro(4-methoxybutanoic) acid	PFMOBA
2,3,3,3-Tetra-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid	HFPO-DA (Gen X)
Perfluoro-3,6-dioxaheptanoic acid	PFDHA
Perfluoro-1-pentanesulfonate	PFPeS
Perfluorohexanoic acid	PFHxA
4:2 Fluorotelomer sulfonic acid	4:2 FTS
Perfluorohexanesulfonamide	FHxSA
Perfluorohexanesulfonic acid	PFHxS
Perfluoroheptanoic acid	PFHpA
Perfluoro-1-heptanesulfonate;	PFHpS
Dodecafluoro-3H-4,8-dioxanonanoate	DONA
Perfluorooctanoic acid	PFOA
6:2 Fluorotelomer sulfonic acid	6:2 FTS
Perfluorooctanesulfonic acid	PFOS
9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	9Cl-PF3OUdS
Perfluoro-1-(perfluoroethyl)cyclohexanesulfonic acid	PFECHS
Perfluorononanoic acid	PFNA
Perfluorononanesulfonic acid	L-PFNS
Perfluorodecanoic acid	PFDA
8:2 Fluorotelomer sulfonic acid	8:2 FTS
11-chloroeicosafluoro-3-oxaundecane-1-sulfonate;	11Cl-PF3OUdS
Perfluoroundecanoic acid	PFUnA
2-(N-Ethylperfluorooctanesulfonamido)acetic acid	N-EtFOSAA
Perfluorododecanoic acid	PFDoDA

PFAS Rainwater (Wet Deposition Pathway) Community Science: Planning Proposal

Summary: Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of fluorine-rich, chemically stable compounds widely used in consumer and industrial products. PFAS are ubiquitous in Bay matrices and considered a High Concern in the RMP tiered risk-based framework due to concentrations in biota linked to potential human health risks. Elsewhere, PFAS have been detected in rain at levels above USEPA drinking water maximum contaminant levels (MCLs), even in remote areas across the globe.[1,2] At present, we lack local data on PFAS in precipitation that would allow us to draw conclusions about the overall importance of this pathway to the Bay, including direct deposition to Bay surface water as well as inputs via urban stormwater runoff.

Many local community groups have expressed concern about PFAS exposures and health, particularly in relation to fish consumption. We propose convening members of interested community groups to establish a collaborative plan to investigate the presence of PFAS in rainwater in the Bay Area, which would provide baseline data to understand the potential influence of this pathway on the Bay. The planning process would provide a community forum to learn about PFAS and discuss the impacts of rainwater contamination on communities. The planned study would be expected to incorporate citizen science to robustly monitor wet deposition through simple rainwater collection stations for use across multiple storms; samples would be analyzed via multiple methods (e.g., standard and ultra-short-chain targeted methods; total oxidizable precursor (TOP) assay). Included within the budget for this planning process is support for SFEI to develop relationships with interested community organizations, as well as support to allow members of these organizations to engage thoroughly with the planning process. Overall, this proposed planning project would increase SFEI engagement and collaboration with underserved communities. Once the plan has been established, SFEI could lead or support the effort to gain funding for collaborative implementation.

Estimated Cost:	$60,000 (Task 1 only); separate proposal required later to implement the plan (est. $200-$400k)
Oversight Group:	ECWG
Proposed by:	Miguel Mendez, Jennifer Dougherty, Martin Trinh, Don Yee, Diana Lin
Time Sensitive:	No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Outreach, Develop Study and Sampling Plan (co-developed with community organizations)	August 2025
Phase Two: If funding to implement the plan is obtained	
Task 2. Field Sampling - Rainwater	Fall 2025-Spring 2026
Task 3. Laboratory Analysis	June 2026
Task 4. QA/QC and Data Management	September 2026
Task 5. Draft Report and Community Outreach	December 2026
Task 6. Final Report and Community Outreach	March 2027
Task 7. Presentation to ECWG	April 2027

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[1] Cousins, I. T.; Johansson, J. H.; Salter, M. E.; Sha, B.; Scheringer, M. Outside the Safe Operating Space of a New Planetary Boundary for Per- and Polyfluoroalkyl Substances (PFAS). *Environ. Sci. Technol.* **2022**. https://doi.org/10.1021/acs.est.2c02765.

[2] Kim, Y.; Pike, K. A.; Gray, R.; Sprankle, J. W.; Faust, J. A.; Edmiston, P. L. Non-Targeted Identification and Semi-Quantitation of Emerging per- and Polyfluoroalkyl Substances (PFAS) in US Rainwater. *Environ. Sci.: Processes Impacts* **2023**, *25* (11), 1771–1787. https://doi.org/10.1039/D2EM00349J.

PFAS Analysis Add-on to Stormwater Depth Monitoring Pilot

Summary: The RMP has funded a special study to pilot stormwater sampling approaches for microplastics. This funded MPWG pilot study will collect urban stormwater samples in two locations during a storm event. Simultaneous samples will be collected at 3 different depths (surface, mid-depth, near-bottom) in the deepest part of the channel to test the hypothesis that the channel is sufficiently well-mixed to reasonably conduct single-depth sampling in most Bay Area channels. Single-depth sampling is often used in RMP stormwater monitoring for PCBs and emerging contaminants based on previous evaluations that suspended sediment is sufficiently well-mixed during storm events to justify this approach. The MPWG pilot study is conducting the first evaluation of this approach for microplastics.

The current proposed study would leverage funded stormwater sample collection efforts by collecting additional stormwater samples for per- and polyfluoroalkyl substances (PFAS) analysis to provide an initial dataset to evaluate whether single-depth stormwater sampling is supported by field measurements. Samples will be analyzed using Total Oxidizable Precursor assay (TOP method) and EPA Draft Method 1633 (Target method). PFAS are a broad class of fluorine-rich specialty chemicals that span a wide range of physico-chemical properties and come from many different potential sources. Some PFAS are likely to be more strongly associated with suspended sediment, while others may be more strongly associated with different microplastics. PFAS as a class are classified as High Concern within the RMP's tiered risk-based framework, and a priority for stormwater monitoring efforts. The RMP's stormwater monitoring program is also developing automated remote samplers that would likely be sampling at a single depth during the storm. Considering the RMP investments in PFAS stormwater monitoring, this would be a small pilot study to evaluate the representativeness of stormwater sampling approaches. Results will be reported with the report deliverable for the MPWG stormwater pilot study.

Estimated Cost: $55,000
Oversight Group: ECWG
Proposed by: Diana Lin (SFEI)
Time Sensitive: Yes

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Collect PFAS stormwater samples	March 2025
Task 2. Laboratory Analysis	August 2025
Task 3. Data management and QA/QC	December 2025
Task 3. Data analysis and reporting	February 2025

Nontarget Analysis Add-on to Stormwater 2025 Monitoring

Summary: The RMP is developing a stormwater CECs monitoring approach that addresses both Emerging Contaminant Workgroup (ECWG) and Sources, Pathways, and Loadings Workgroup (SPLWG) management questions. At the spring 2024 ECWG meeting, stakeholders and experts recommended adding nontarget analysis (NTA) to this effort. NTA is an advanced analytical approach that can be used to identify potentially concerning contaminants that are novel or unexpected. This powerful tool based on mass spectrometry provides a broad, open-ended view of thousands of synthetic and naturally derived chemicals simultaneously, in contrast to more typical targeted analysis of known contaminants with which you can only observe what you are looking for.

This proposed study would leverage stormwater sample collection efforts by collecting additional stormwater samples for NTA. Anticipated stormwater monitoring in water year 2025 includes limited manual sampling for multiple contaminants at locations that are infeasible for SFEI Mayfly (remote sampler) installation and/or locations that are candidates for future permanent fixed sampling locations. Manual sampling is recommended for NTA sample collection as it avoids potential background contamination by the tubing and materials used in both large and small remote sampling devices (e.g., ISCO pump, SFEI Mayfly). At the UC Davis laboratory of Dr. Tom Young, samples will be subjected to two types of NTA, allowing a more comprehensive assessment of the presence of both polar and nonpolar contaminants. Contaminants will be tentatively identified via matching to available spectral libraries.

Considering the RMP investments in stormwater CECs monitoring, we would recommend consistent application of NTA to a limited number of manually collected stormwater samples for multiple years, resulting in sufficient data for broader interpretation at a later date. Given this proposed study design, results for the first year would consist of a spreadsheet of contaminant detections, alongside any recommendations to optimize future sample collection.

Estimated Cost:	$36,000
Oversight Group:	ECWG
Proposed by:	Rebecca Sutton and Ezra Miller (SFEI), Tom Young (UC Davis)
Time Sensitive:	Yes; early release of funds requested to prepare for the wet season

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Collect NTA stormwater samples	April 2025
Task 2. Laboratory analysis	July 2025
Task 3. Reporting of contaminants detected, lessons learned	September 2025

Special Study Proposal: Pilot Study for Field Collection Methods and Particle Distribution Analysis of Microplastics in Urban Stormwater to San Francisco Bay (Year 2)

Summary: In 2019, the San Francisco Bay Microplastics Project identified urban stormwater runoff as the major pathway for microplastics entering the Bay. More recent investigations on the sources and pathways of microplastics revealed that tire-wear particles and other smaller microplastics were under-counted in previous investigations due to collection and analytical methods. In addition, while depth-integrated sampling was prioritized for the 2019 study to better characterize microplastics in the full water column, this approach requires considerable labor resources relative to stormwater samples collected using unmanned, automated sample collection at a single depth, which is a more likely sampling scenario for any kind of automated sampling program.

This proposed pilot field study will take pilot steps to evaluate whether single-depth sampling within the water channel is adequately comparable to depth-integrated sampling during storm flow conditions in the channel. Specifically, we will take simultaneous single-depth samples at three different depths (surface, mid-depth, near-bottom) at two field sites at five times during one storm each and compare the microplastics content of these samples using advanced laboratory techniques that characterize tire wear and other fine particles.

Funding for this special study proposal was split over 2 years, and this proposal is for the remaining portion of funds needed to complete the project. The final deliverable will be a draft and final technical report.

Estimated Cost:	$106,200 for Year 2 (Year 1 funded: $78,100)
Oversight Group:	MPWG
Proposed by:	Diana Lin, Alicia Gilbreath, Lester McKee, Rebecca Sutton (SFEI)
Time Sensitive:	Yes, inform statewide plastics monitoring strategy, year two of a two-year study

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Develop study design and approach	June 2024
Task 2. Site selection and field reconnaissance	August 2024
Task 3. Sample collection completed and shipped to laboratories	March 2025
Task 4. Laboratory analysis completed and reported to SFEI	September 2025
Task 5. Draft technical report	January 2026
Task 6. Final technical report	February 2026

Background

Through the San Francisco Bay Microplastics Project (Sutton et al., 2019), SFEI researchers identified urban stormwater runoff as the dominant pathway for microplastics entering the Bay. Average microplastic concentrations in urban stormwater runoff were over 100 times greater than average wastewater effluent concentrations. SFEI used a previously developed Regional Watershed Spreadsheet Model (RSWM) to extrapolate measured results and estimated that on the order of 7 trillion microplastic particles were entering the Bay per year from urban stormwater runoff. Tire-wear particles and fibers were the most abundant types of microplastics in urban stormwater runoff, and combined represented most of the microplastics observed in urban stormwater samples. More recent literature review, synthesis, and analysis (Moran et al., 2021; Moran et al., 2023) funded by the RMP and others has revealed that tire-wear particles and other smaller microplastics were under-counted in previous investigations due to the 125 µm sieve size used during field sampling, as well as the density separation methods used to extract microplastics from the samples.

In addition to sieve sizes and analytical density separation techniques, another important method consideration for field sampling is whether vertical depth integration is critical for measuring stormwater runoff concentrations, or whether water column concentrations are sufficiently well-mixed that sampling at a single depth in the water column is sufficient for answering RMP management questions. During the original Microplastics Project, depth-integrated sampling was conducted at most urban stormwater sites. However, the RMP studies at Guadalupe River at Hwy 101, Jan Jose, and Zone 4 Line A at Cabot Blvd, Hayward found that suspended sediment concentration profiles were sufficiently well-mixed during storm flow events to utilize single-depth sampling in the channel thalweg (deepest portion of channel) when vertically-integrated sampling is logistically not practical (personal communication with Lester McKee). Considering that microplastics are likely to have even slower settling velocities compared to suspended sediment (due to their lower density and larger surface area), we hypothesize that most microplastics may be sufficiently well-mixed in storm flows in many channels and that single-depth sampling may also be sufficient for microplastics. If single-depth sampling is found to be sufficient for microplastic stormwater sampling, this would open up more opportunities to leverage the RMP's developing urban stormwater monitoring program, including the development of automated remote samplers that would likely be sampling at a single depth.

Given the importance of the urban stormwater runoff pathway for microplastics, it is important to collect more urban stormwater data in the Bay area to inform and improve upon previous findings. **This study would evaluate microplastics concentration depth profiles during stormwater flows and provide recommendations for future urban stormwater monitoring needs. Additionally, this study would provide more comprehensive information about the distribution of microplastics in Bay stormwater runoff by capturing and analyzing microplastics that were under-represented in previous efforts.**

The California Ocean Protection Council (OPC) and State Water Board (SWB) have funded the Southern California Coastal Water Research Project (SCCWRP) to develop standardized field sampling methods for stormwater flows and other matrices that can be used to collect statewide microplastic monitoring data. This proposal provides an important opportunity to coordinate and collaborate to inform key data gaps about the characterization and distribution of microplastics in urban stormwater runoff, as well as their vertical distribution and transport, and to inform appropriate field sampling and analytical methods for monitoring. Coordinating RMP efforts with the OPC/SCCWRP effort will allow for greater context for interpreting urban stormwater runoff sampling results in the Bay Area and Southern California and piloting urban stormwater sampling methods that are appropriate for the smaller creeks and rivers in the Bay Area compared to the large concrete river channels in southern California. Recommendations from this study could also inform future statewide monitoring priorities and methods.

Study Objectives and Applicable RMP Management Questions

Table 1. Study objectives and questions relevant to the RMP ECWG management questions.

Management Question	Study Objective	Example Information Application
1) What are the levels of microplastics in the Bay? What are the risks of adverse impacts?	*Not applicable*	*Not applicable*
3) What are the sources, pathways, processes, and relative loadings leading to levels of microplastics in the Bay?	- Pilot sampling approaches for microplastics in urban stormwater that are suitable for the Bay Area's watersheds - Measure microplastic concentrations in urban stormwater	-What is the composition of microplastics in urban stormwater runoff ? - What uncertainties and biases are introduced from different sampling approaches? - How do results compare with previous urban stormwater runoff measurements?
4) Are microplastic levels changing over time? What are the potential drivers contributing to changes?	*Not applicable*	*Not applicable*
5) What are the anticipated impacts of management actions?	*Not applicable*.	*Not applicable*

Approach

Study design development

With the year one funding we have started coordinating with other researchers investigating microplastics in stormwater flows to refine the study design. We have refined our sampling and analysis approaches and identified analytical partners, which are further described below.

In this pilot study, we will collect samples in the 2024/25 wet season to compare microplastic urban stormwater collection efforts at three different depths (surface, mid-depth, near-bottom) in creek flow in order to evaluate the importance of using vertically-integrated urban stormwater samples that are expected to be representative of water column concentrations. We will select two watershed sampling sites where well-mixed conditions (as known for suspended sediment) are likely during typical storm events based on previous stormwater team experience. It is important to start this pilot study at more ideal locations (for mixing) because results can be more easily interpreted to understand whether there are important differences between microplastics and suspended sediment hydrology (since suspended sediment is expected to be well-mixed). If results in this pilot study do indicate conditions are well-mixed for microplastics, then we can further explore less ideal conditions. Site accessibility for sample set up will also be critical. More urban watersheds are preferred, where higher microplastic loadings are expected. Additionally, sampling at location with a flow gauge is preferred to provide more information about flow volume and velocity during stormwater sampling.

Urban stormwater sample collection

During a storm, we will collect simultaneous sample sets at three different depths (surface, mid-depth, near-bottom) in the channel using three different ISCO pumps where the intake tubes are attached to a sampling pole that will be placed in the water column in or near the deepest portion of the channel (thalweg). Over the course of the storm and at varying flow rates (preferably including base flow, first flush and peak flows), we will collect four separate sample sets plus an additional “field duplicate” set collected as close as possible in time (four sets plus one duplicate at three depths = 15 samples) at each location. This approach will provide a rich data set for comparison of the three depths for pilot-level statistical evaluation of differences in microplastic concentration and composition.

At the onset of sample collection, we will also measure and record turbidity using a portable turbidimeter. These measurements would give us real-time information on how well-mixed the water column is for suspended sediment. Field staff will record ancillary data to characterize storm and field conditions on field forms.

The urban stormwater for microplastics analysis will be pumped through a stack of sieves similar to previously deployed methods (Sutton et al., 2019) with a few important improvements. Stacked sieves will include 355 μm, 125 μm, 53 μm. The addition of the

53 µm allows capture of smaller microplastic size fractions that were not captured previously. These smaller sieves have recently been successfully deployed to collect urban stormwater runoff samples entering bioretention rain gardens in San Francisco. Sample volumes for microplastics are anticipated to be 10–30 L and will be determined based on anticipated levels of microplastics. Best practices will be used to avoid sample contamination, including collection of at least one field blank at each site.

We expect tire wear particles to be abundant in stormwater samples, particularly particles smaller than the 53 µm size fraction. We will collect two 1-L bulk water samples for analysis of tire wear particles using LDIR (Laser Directed Infrared Spectroscopy) and pyrolysis GC-MS for tire wear counts and mass quantification, respectively. Samples to be analyzed by LDIR will be shipped directly to Clemson University for analysis. Samples to be analyzed with pyrolysis GC-MS will be sub-sampled (exact volume to be determined based on tire wear particle concentration in samples) and filtered onto a 0.4 µm cellulose filter at SFEI, and shipped to NIVA for analysis of tire wear particles using pyrolysis GC-MS. The remainder of the 1-L bulk sample will be filtered onto a separate pre-weighed filter and measured for total suspended solids concentration at SFEI.

<u>Microplastic analysis</u>

Microplastic samples (collected using sieves) will be analyzed by Moore Institute of Plastic Pollution Research (MIPPR) in Long Beach, CA. MIPPR is currently undergoing evaluations, and anticipates being one of the first laboratories in the world to be accredited for microplastics analysis. They have already passed the first phase of accreditation and anticipate being accredited by summer of 2024. Samples will be extracted using a combination of density separation and digestion (depending on the contents in the samples). Blanks and spikes will be conducted to estimate particle losses and contamination rates. Samples will be quantified for microplastic counts down to 50 µm sized particles. Particle polymer type, counts, morphology, and size will be reported to understand the composition of microplastics. Particles between 50–500 µm will be automatically characterized using hyperspectral imaging FTIR. The Moore Institute has developed a novel data analysis pipeline and spectral reference library to automate the analysis of their hyperspectral maps. Particles larger than 500 µm will be characterized using visual microscopy and a subset of the particles (at least 100 per sample) will be assessed for polymer type. To reduce analytical costs, only 2 field duplicates will be sent for analysis for a total of 28 samples (3 depths x 4 times points x 2 sites = 24 field samples + 2 field blanks).

One liter bulk water samples received at Baruch Institute at Clemson University will be analyzed for tire wear particles counts. Tire wear particles between ~10 µm–500 µm will be automatically characterized using an Agilent 8700 Laser Direct Infrared (LDIR) Chemical Imaging System. Once received, the samples will be filtered and, depending on contents, subjected to a digestion to reduce organic matter. The sample will be transferred to gold-coated polyethylene terephthalate filters for analysis by an Agilent 8700 Laser Direct Infrared (LDIR) Chemical Imaging System. A recent study has applied LDIR to the particle-scale detection of tire and road wear particles down to 20 µm in size in road-impacted urban soils using rubber components as the tire marker(Xiao et al., 2024). If feasible (based on resources because quantifying additional types of microplastics will add analyzing time to the instrument), other types of microplastics will also be quantified and reported.

Filtered (on 0.4 µm cellulose filter) samples sent to Elisabeth Rødland at Norwegian Institute for Water Research (NIVA) will be quantified for tire wear particle mass using pyrolysis GC-MS. NIVA researchers have developed state of the art methods for quantifying tire wear particles (composed of styrene butadiene rubber and butadiene rubber) using pyrolysis GC-MS to quantify the mass of 4 different marker combinations for comparison: M4 (benzene, methylstyrene, ethylstyrene, butadiene dimer), M3 (methylstyrene, ethylstyrene, butadiene dimer), 4-vinylcyclohexene (4-VCH) and butadienes (butadiene dimer, styrene butadiene dimer and styrene butadiene trimer). Results will be reported on a mass basis for each sample.

<u>Data interpretation</u>
We will compare the levels of microplastics, tire wear particles, and suspended sediments solids at the three different depths. We will also compare the composition of microplastics at the three different depths. We will test our hypothesis that single-depth measurements are sufficiently representative of the water column during storm flow conditions. Based on results, we will discuss implications and recommendations for future microplastics stormwater monitoring.

Based on this initial set of results, we will provide a recommendation on whether additional study is advised to answer the question: Can simplified single-depth sampling methods be used to representatively (appropriate for estimating loads) measure microplastics (or a subset of microplastics) samples in urban stormwater runoff during well-mixed flow conditions? We will also provide recommendations for future urban stormwater monitoring to address RMP microplastic data needs as outlined in the RMP Microplastics Strategy Revision (Paterson et al., 2024).

Particle counts and size distribution for tire wear particles from the LDIR method will be compared to the mass-based quantification from pyrolysis GCMS. Results will be used to discern whether there is stratification of different types of tire wear particle by size.
<u>Communication</u>
Results will be summarized in a technical report that will include recommendations for next steps in urban stormwater monitoring. If appropriate, a draft manuscript will be developed focusing on comparing the different analytical methods applied for microplastics and tire wear particles. Results will be shared with RMP, SCCWRP, OPC, and SWB to inform future monitoring efforts.

Budget

Table 2. Budget

Expense	Estimated Hours	Estimated Cost
Labor		
Study design	65	12,300
Sample Collection	150	35,500
Data management	48	8,300
Analysis and Reporting	190	30,800
Subcontracts		
Microplastics laboratory analysis via FTIR/Raman spectroscopy (Moore Institute of Plastic Pollution Research or equivalent laboratory)	N/A	61,600
Tire wear particle analysis via LDIR		8,000
Tire wear particle analysis via pyrolysis GC-MS		16,000
Direct Costs		
Supplies		10,000
Travel and shipping		2,000
Grand Total		**184,300**
Subtract Year 1 funded amount		**-78,100**
Year 2 Funding Request		**106,200**

Budget Justification

Study design
SFEI staff will coordinate with other researchers investigating microplastics in stormwater to refine the study design and data analysis. Hours are also included for internal and external meetings to finalize the study design.

Sample collection

SFEI hours are estimated to staff 2 storm sampling events with four staff members. This includes staff time needed for preparing for sampling events, event monitoring and sampling, post-event sample processing and filtering, and packaging for shipment.

Data management
Data management services include developing field sampling templates, compiling field data sheets, developing reporting template for analytical laboratories, communications with the laboratory, consultation with QA officer, and preliminary data analysis. Data will not be uploaded to a public database.

Analysis and Reporting
SFEI hours are estimated for data analysis and interpretation. Project updates will be shared during MPWG meetings. Results and findings will be summarized in a draft and final report.

Subcontracts/Laboratory Costs
Sample analytical costs from MIPPR for microplastics analysis via FTIR spectroscopy are estimated to be up to $2,200/sample for 28 samples (24 field samples + 2 field blanks). Sample analytical costs from NIVA for tire wear quantification via pyrolysis GC-MS are estimated to be up to $250/sample for 64 samples ([30 field samples + 2 field blanks] x 2 duplicates). Sample analytical costs from Clemson University and College of Charleston for tire wear particle analysis via LDIR are estimated to be up to $267/sample for 30 samples.

Direct Costs
Direct costs will cover sampling supplies, including 15 sets of sieves, sample bottles, cleaned pump tubing, laboratory supplies and shipping costs.

Reporting

Deliverables will include a draft and final technical report.

References

Cowger, W., Gray, A. B., Guilinger, J. J., Fong, B., & Waldschläger, K. 2021. Concentration Depth Profiles of Microplastic Particles in River Flow and Implications for Surface Sampling. *Environmental Science & Technology*, 55(9), 6032–6041. https://doi.org/10.1021/acs.est.1c01768

Moran, K. D., Miller, E. L., Méndez, M., Moore, S., Gilbreath, A. N., Sutton, R., & Lin, D. 2021. A Synthesis of Microplastic Sources and Pathways to Urban Runoff. Contribution No. 1049. San Francisco Estuary Institute, Richmond, California.

Moran, K. D., Gilbreath, A. N., Méndez, M., Lin, D., Sutton, R., 2023. Tire Wear: Emissions Estimates and Market Insights to Inform Monitoring Design. SFEI Contribution No. 1109. San Francisco Estuary Institute, Richmond, CA.

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Xiao, N., Wang, Y., Guo, Z., Shao, T., Dong, Z., Xing, B. 2024. Tire plastic and road-wear particles on Yujing Expressway in the restoration area of Mu Us Sandy Land: Occurrence characteristics and ecological risk screening. Journal of Hazardous Materials. 468:133860. https://doi.org/10.1016/j.jhazmat.2024.133860

Special Study Proposal: Microplastics in San Francisco Bay Sport Fish

Summary: In summer 2024, as part of RMP Status and Trends monitoring, sport fish will be collected and analyzed for a suite of contaminants. This project would leverage this sample collection effort and analyze striped bass (*Morone saxatilis)* and shiner surfperch (*Cymatogaster aggregata*) to assess the level of exposure in the Bay food web to microplastics. Results will be compared to previously measured Bay prey fish and fish in other published studies. Striped bass and shiner surfperch are popular for human consumption and are important to analyze to assess potential human exposure routes to microplastics. The final deliverable will be a draft manuscript prepared by the University of Toronto with assistance from SFEI.

Striped bass are the most popular sport fish for consumption in the Bay, and a species that is higher in the food chain and provides an integrated signal for regions of the Bay because of its wide foraging behavior and opportunistic consumption of lower trophic level fish. Shiner surfperch are an abundant and popular sport fish species that feeds on invertebrates in the benthic zone and exhibits high site fidelity, making them useful for assessing spatial differences in contaminants. In total, up to 50 whole shiner surfperch will be collected from sites within the Central Bay and South Bay and San Pablo Bay (Table 1). Additionally, up to 20 striped bass where the gut, liver, and muscle tissue from one side of the fish will be collected. Field blank samples will be collected as open cleaned foil samples during sample dissection, and and stored with the fish samples after dissection. These samples will be sent to University of Toronto for microplastics analysis and reporting.

Table 1. Sport fish samples available for microplastic analysis.

	Shiner Surfperch	Striped Bass
Central Bay		10
San Francisco	10	
Berkeley	10	
South Bay	10	10
San Leandro Bay	10	
San Pablo Bay	10	
Totals	**50**	**20**

Estimated Cost: $130,000
Oversight Group: Microplastic Workgroup
Proposed by: Diana Lin (SFEI) and Chelsea Rochman (University of Toronto)
Time Sensitive: No, samples will be archived

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	***Due Date***
Task 1. Laboratory analysis	September 2025
Task 2. Draft manuscript	January 2026

Develop a study plan to improve characterization of bed sediments and settling velocity to advance sediment transport modeling for San Francisco Bay

Summary: We propose to develop a study plan to improve modeling of sediment transport in San Francisco Bay through a combination of data collection and modeling. The plan will address two topics: 1) characterizing bed sediment properties including erodibility; and 2) representing settling velocity of particles in suspension. This proposal responds to the need identified in the RMP Sediment Workgroup Sediment Modeling and Monitoring Workplan (SMMWP) for a literature review and detailed workplan to address these two topics. Sediment transport models require specification of parameters related to each of these topics, yet both are poorly constrained by field measurements and are characterized by complex physical processes which are difficult to measure and model. Because of these complexities, a study plan reviewing existing knowledge and proposing an approach for constraining these parameters will increase the likelihood for success in the RMP effort to improve sediment transport modeling in the Bay.

Estimated Cost: $106,900

Time sensitive: Yes. Other elements in the SMMWP depend on this effort.

Oversight Group: RMP Sediment Workgroup (SedWG)

Proposed by: Jessie Lacy[1], Oliver Fringer[2], Rachel Allen[3], and Lester McKee[4]
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[3] USGS Woods Hole Coastal and Marine Science Center, rallen@usgs.gov
[4] San Francisco Estuary Institute, lester@sfei.org

Proposed Deliverables and Timeline

Deliverable	Due Date
Convene technical workshop to inform the study plan (Task 2)	June 2025
Presentation to stakeholders through RMP SedWG (Task 3)	October 2025
Draft report presenting study plan for improving characterization of settling velocity and bed sediments to advance sediment transport modeling in San Francisco Bay (Task 4)	January 2026
Final report (Task 5)	March 1, 2026

Background

Numerical sediment transport models (STMs) can help resource managers in San Francisco Bay make decisions on a wide array of topics including phytoplankton dynamics, pollutant fate and transport, sediment availability for wetlands restoration, and dredged material management. The ability of numerical models to simulate large spatial scales and predict future conditions make them powerful tools for decision makers. Sediment transport in San Francisco Bay (the Bay) has been simulated with a variety of modeling systems including UnTrim (e.g. Bever et al. 2013), SCHISM (e.g. Wang et al., 2020), ROMS (e.g. Ganju and Schoellhamer, 2010), SUNTANS (e.g. Chou et al. 2018), and the Deltares suite of models (e.g. Van der Wegen et al. 2011, Allen et al 2021). All these model systems accurately compute hydrodynamics including currents, waves, and salinity transport. However, the sediment transport implementations of these models, like all STMs, are less accurate than the hydrodynamics owing to the inherent difficulty in modeling cohesive and mixed (sand/cohesive) sediments. Cohesive and mixed sediments exhibit complex flocculation, settling, and erosion physics that are nearly impossible to parameterize (e.g., Winterwerp et al. 2021), are not completely understood, and are difficult to measure or observe in the field. With such poorly constrained physics, tuning STMs to match observations is challenging (e.g., Allen et al., 2021) and best professional judgment is therefore typically used.

STMs can simulate suspended-sediment concentration (SSC), suspended-sediment flux (SSF), and geomorphic change. These quantities are governed by mixing and transport, erosion, and settling of sediment. While predictive equations for mixing and transport are incorporated in STMs, there are no such equations for the processes of erosion and settling; instead they are parameterized, with parameter values specified by the user. We propose to develop a study plan to constrain parameters related to erosion and settling through a combination of data collection and modeling. For both processes, the required input parameters are not well constrained by field observations in the Bay (or elsewhere) and the relevant physical properties or processes are difficult to measure and vary in time and spatially across the Bay, as summarized below. In both cases, it is likely that a combination of observations and model tuning or sensitivity analysis will be the best approach to parameterization.

1) STMs require specification of bed sediment particle size(s) and erosion rates (erodibility). Erosion can be represented in different ways; often models require erodibility parameters such as critical shear stress and an erosion rate coefficient, as well as depth of the erodible sediment layer(s). These properties may be specified based on available data or may be used as tuning parameters in model calibration. Sediment properties vary spatially and temporally in the Bay, but the extent to which inclusion of this variation in STMs improves performance is not clear. Erodibility parameters characterize the erosion response to bed shear stress, which in cohesive sediments can be influenced by physical and biotic properties as well as the history of physical forcing (Grabowski et al., 2011). Laboratory and *in-situ* methods have been developed for measuring erodibility, yet results from the various methods do not always agree well (Tolhurst et al, 2009) due to both the difficulty in measuring the relevant processes and differences in definition of the parameters between methods. An alternative to measuring erodibility directly is to use indicators of bed erodibility in cohesive sediments such as disaggregated bed-sediment particle size distributions and sediment bulk density, which are relatively straightforward to measure.

2) Most STM's track multiple particle size classes in suspension, each of which is characterized by a fixed settling velocity. One or more size classes may represent flocs, but flocculation and floc break-up, which alter the particle size, are not represented. Selection of the settling velocity for each size class is challenging due to lack of empirical data. Settling velocity is a function of particle size and density, and in muddy systems such as San Francisco Bay, is strongly influenced by flocculation dynamics. Flocculation is influenced by gradients in physical, chemical, and biologic processes. Field observations in the Bay reveal formation and break up of flocs over daily tidal cycles and differences in floc size between spring and neap tides (Allen et al. 2019), as well as significant spatial variation in floc size across the estuary (Manning and Schoellhamer, 2013). The relationship between particle size and settling velocity is complex for flocs, so estimating settling velocity from particle size is not straightforward. Measurement of floc properties, such as size, density, minerogenic and biogenic content, could help link settling velocity to particle size, but these properties are challenging to measure in the field. While STM's that simulate flocculation processes have been developed (e.g. Sherwood et al, 2018), these models require additional parameters that are difficult if not impossible to measure, such as the fractal dimension (Dyer and Manning 1999) or the critical yield stress for floc break up (Son and Hsu, 2009). Thus, it is not clear that this approach improves model performance for predicting large-scale or long-term sediment fluxes.

The Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) is currently developing an in-Bay model for sediment and contaminant fate using Delft3D-FM (DFM), building on the San Francisco Bay-Delta Community Model (Martyr-Koller et al. 2017). The in-Bay model is initially being developed to apply to contaminant transport, which will require incorporation of important sediment transport processes in the Bay (Jones et al. 2022). Oliver Fringer's 2025 Special Study proposal to the RMP SedWG to assimilate satellite remote sensing of surface suspended sediment into the DFM model will help to constrain some of the parameters required for cohesive sediment transport modeling. The study plan proposed here will work in concert with the Fringer project to support and improve the in-Bay model as well as other STMs for the Bay.

Study Objectives and Applicable RMP Management Questions

This project addresses RMP SedWG Management question 5 (Table 1), specifically science questions 5.2 and 5.3 identified in the SedWG Sediment Modeling and Monitoring Workplan (McKee et al. 2023).

The goal of this project is to develop a study plan to constrain parameters that are important for modeling sediment transport in San Francisco Bay through a combination of data collection and modeling. The plan will address the two topics described in **Background**: 1) characterizing the sediment bed and 2) representing the settling velocity of particles in suspension. Our proposal responds to the need identified in the SMMWP for a literature review and detailed workplan to address each of these topics. For both topics we will develop an integrated observational and modeling plan, starting from existing data and model capabilities, using modeling to determine data needs, collecting data, and using data to check model performance, in an iterative manner. For both topics the goal is to collect data to constrain the range of each parameter, and at the same time use the model to guide data collection, by determining what level of accuracy and spatial or temporal resolution of the parameters is useful for improving model performance.

Table 1: RMP Sediment Workgroup management questions addressed by the proposed project.

Management question	Monitoring/modeling science questions from SMMWP
MQ5: What are the concentrations of suspended sediment in the Estuary and its subembayments?	5.2 How does bed erodibility vary around the Bay in relation to physical factors such as texture, tides, and waves, and biotic factors such as phytobenthos and bioturbation?
	5.3 How do flocculation processes and floc sizes vary throughout the Bay in relation to SSC, water column depth, tides, wind, and other drivers, and how do these influence settling velocity?

Approach

Task 1: Literature review and study plan outline

For each topic, we will review the literature on field observations, laboratory studies, and model sensitivity to the relevant parameters. For data availability and parameter estimation we will focus on San Francisco Bay studies, and for observational and modeling approaches we will consider estuaries worldwide.

We will outline a three-year study plan to address both topics through a combination of data collection and modeling. This initial outline will provide a structure for eliciting feedback through a workshop (Task 2) and from select reviewers outside the workshop. The structure and content of the document will reflect the initial thinking of the project team, and while we expect it to include building blocks for the final report, it may be structured differently or take the form of a presentation or outline. The expected content is outlined in Task 4.

Task 2. Convene a technical workshop

We will convene a one-day workshop for 20-25 regional scientists involved in modeling and observational studies of sediment transport in San Francisco Estuary as well as representatives of the RMP SedWG. The goal of the workshop is to gather input on the study plan and identify and refine approaches, for the three-year effort. The workshop will consist of scientific presentations and discussion of the study plan outline. We anticipate holding the workshop at Stanford University in summer 2025.

Task 3. Presentation to RMP stakeholders

After revising the study plan based on the technical workshop (Task 2), we will present it to RMP stakeholders at a half-day meeting convened by the RMP SedWG. The purpose of the meeting will be to get feedback on the scope, budget, and where applicable alternative approaches for the study plan. A revised outline of the study plan will be distributed to attendees prior to the meeting.

Task 4. Draft the study plan (final report)

Following the workshop and stakeholder meeting, we will complete a draft study plan and submit it to the RMP for review. The study plan will consist of:

1) Literature review for each of the two topics
2) Plan for three-year combined observational and modeling study for each of the two topics, including:
    - definition of a spatial scale or study area(s) for observational and modeling work
    - scope, methods, and estimated cost of initial data collection
    - scope, identification of model(s), and estimated cost of initial modeling
    - identification of model output(s) to be used for evaluating performance (e.g., suspended-sediment concentration or suspended-sediment flux)
    - a plan for iterating between modeling and measurements
    - estimated budget for the three-year study

Task 5: Final report

Following revision, the final report will be submitted by March 1, 2026 so it is available for the RMP SedWG 2026 proposal cycle.

Budget and justification

USGS budget includes salary and benefits for Lacy, Allen, and Andrew Stevens (a USGS modeler) and travel funds for Allen to attend the workshop.

Stanford budget includes salary and fringe benefits for Fringer and funds to run the workshop, which includes breakfast, lunch, and coffee/refreshments for 30 attendees ($2,500). The indirect cost rate is assumed to be 54.4%.

SFEI budget includes salary and benefits for SFEI staff.

Expense	USGS	Stanford University	SFEI
Task 1	$13,000	$11,000	$6,000
Task 2	$3,000	$2,500	$1,500
Task 3	$1,000	$500	$3,500
Task 4	$11,000	$10,000	$8,000
Task 5	$2,000	$1,000	$1,000
Subtotal	$30,000	$25,000	
Indirect	$18,300	$13,600	
Total	**$48,300**	**$38,600**	**$20,000**

Grand total: $106,900

In-kind and leveraged contributions for the project: USGS and Stanford PI's expect to spend more time than budgeted on this effort.

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Special Study Proposal: Shoreline Change in San Francisco Bay

Understanding shoreline change is crucial for addressing sediment budgets at the local level and comprehending bayland dynamics at the embayment scale. This project aims to tackle pressing questions about which wetlands and mudflats are most vulnerable to loss due to sea level rise and how we can strategically manage these changes to achieve desired future states. Past efforts in San Pablo Bay (Beagle et al. 2015) have laid a solid foundation of methods for understanding shoreline dynamics and evaluating geomorphic change. This proposal seeks to build on that knowledge and provide foundational data to address priorities identified by the Sediment Workgroup, such as understanding sediment transport processes (MQ#3.3), assessing erosion or progradation of marsh edges (MQ#3.4), and evaluating changes in sediment budgets under varying climatic and land use conditions (MQ#3.5).

Year One: *$50,000*

- Compile historical shorelines using NOAA T-sheet-derived data spanning from the 1850s to the 1980s.
- Create a marsh typology vector dataset to classify various marsh edge types (e.g., scarp, ramp), drawing on the methodologies outlined by Beagle et al. (2015).
- Begin developing methods for delineating shorelines from recent aerial imagery using improved automated techniques (ex: Farris et al. 2019).

Year Two: *Approximately $30,000*

- Apply the developed methods to delineate recent shorelines, focusing on the major rivers/bay-fronting shorelines of San Francisco Bay from 2010 to 2020
- Create a comprehensive data package of recent past shoreline data
- Produce a technical methods report detailing the methodologies used.

This work is envisioned as the initial phase in a broader collaborative effort with the Wetlands Regional Monitoring Program (WRMP) to understand and manage shoreline changes across the Bay. The methodologies developed and lessons learned will inform and improve future iterations of shoreline mapping. Each task will be coordinated with the WRMP technical advisory committee. The outcomes will provide crucial data to address the question: what have been the shoreline position changes over the past 150 years? Ultimately, the project will produce vector datasets showing major river/bay-fronting shorelines of the whole Bay encompassing the last 150 years, and a modern shoreline dataset classifying the type of shoreline edge to enable more accurate delineation and contextual analysis of shoreline variability.

Estimated Cost: $50,000 (Year 1 of a 2-year effort)
Oversight Group: Sediment Workgroup
Proposed by: Alex Braud, Lester McKee, Jeremy Lowe, and Scott Dusterhoff
Time Sensitive: No

Proposed Deliverables and Timeline:

Deliverable	Budget	Due Date
1. Historical Shorelines Data Package	$7,000	Spring 2025
2. Shoreline Typology Data Package	$23,000	Fall 2025
3. RMP Sed WG Presentation		Spring 2026

References:

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Special Study Proposal: Suspended-Sediment Flux Measurements at Richmond-San Rafael Bridge, California

This proposal is to expand upon an already funded project to collect cross-channel transects using an acoustic doppler current profiler (ADCP) to measure both velocity and acoustic backscatter (ABS) at Richmond-San Rafael Bridge cross-section (RIC) in water year (WY) 2025. We request further funds to install an additional continuous water-quality sensor at the RIC transect location to collect high-frequency data during the study period. The exact location and/or type of additional sensor is not yet determined, and preliminary transects are currently being done to decide what would be most useful. The sensor would be either 1) a turbidity sensor deployed at the western shoal or eastern channel at the bridge to be used as a surrogate for suspended-sediment concentration (SSC); or 2) an ADCP mounted at one of the bridge platforms. This additional sensor data will be used to help supplement the transect data, along with the existing real-time station at RIC (USGS station #375607122264701), to better understand how sediment flux varies temporally during the study period. The collection of this additional sediment data will supplement the transect data we will collect by adding an additional continuous data location to monitor cross-sectional variations between boat based ADCP measurements. This work will directly address SedWG modeling/monitoring question 3.2 which pertains to sediment flux at key Bay cross-sections.

This budget includes the collection of additional data during the cross-channel transects in the form of surrogate optical turbidity to calculate SSC and/or ADCP velocity data. Preliminary transects will be completed in May 2024 to determine what equipment, location(s), and deployment methods are best to support transecting. Additional equipment used during study will be project owned and no new equipment will be required, but any equipment that is requested to stay on site long term will need to be funded for purchase.

Estimated Cost: Cost for additional supplemental station for study:
$15,000 per additional sensor and to process data for publishing (CY2025)

Cost to keep ADCP on site past study period:
$40,000 for ADCP + $16,000 servicing (annual)

Oversight Group: RMP Sediment Workgroup
Proposed by: David Hart, U.S. Geological Survey - California Water Science Center

Proposed Deliverables and Timeline

Deliverable	Due Date
Data release including all new project data including ADCP transects and velocity-integrated point-SSC samples	December 2025
Model archive summary detailing the ABS-SSC empirical model to convert ADCP transects to sediment flux measurements	December 2025
Presentation to the RMP Sediment Workgroup	May 2026

RMP Special Study Proposal: Refining the Conceptual Understanding of Sediment Transport in San Pablo Bay

Estimated Cost	$65,000
Time sensitive	No
Oversight Group	Sediment Workgroup

Summary

McKnight et al. (2023) recently completed a conceptual model of fine sediment (i.e., sediment silt-sized and smaller) for San Francisco Bay. The report offered a high-level understanding of how fine-grained sediment moves at different scales within the Bay. This effort concluded with a set of key knowledge gaps and uncertainties. Among these was a recommendation to refine our understanding of the dynamic processes (e.g., between marshes and mudflats, changes in the erodible sediment pool) in individual subembayments.

This proposed effort is intended to be coupled with ongoing work through Destination Clean Bay, an EPA-funded effort that focuses on developing support tools for supporting multi-benefit water quality improvements, including funds to identify high priority data collection and data gaps for regional model development. Analysis through Destination Clean Bay will focus on updates to the fine-grained conceptual understanding of San Francisco Bay (McKnight et al. 2023). With this proposal, we focus on refining the conceptual understanding of two specific elements within the San Pablo Bay subembayment: compiling an updated evaluation of local tributary sediment loads within the subembayment and developing a deeper understanding of the tributary-marsh-erodible sediment pool pathway. The results of the proposed study are intended to act as a framework for understanding the Bay's subembayments at a more refined and deeper scale.

Proposed by Kyle Stark, Lester McKee, Alex Braud, and Scott Dusterhoff (SFEI)

Proposed Deliverables and Timeline

Deliverable	Due Date
Progress presentation at the annual Sediment Workgroup meeting	May 2025
Draft technical report submitted to the Sediment Workgroup	April 2026
Presentation to the Sediment Workgroup	May 2026
Final technical report completed	August 2026

Project Background and Overview

Sediment is a critical resource that is essential for sustaining San Francisco Bay tidal marshes and mudflats (or baylands) under a changing climate. Currently, there are approximately 80,000 acres of baylands that will need an increased sediment supply to keep pace with sea-level rise (Dusterhoff et al. 2021). In addition, tens of thousands of acres of restored tidal marsh planned throughout the Bay will need sediment to fill subsided areas and maintain tidal marsh elevation into the future. Changes in watershed sediment supply, along with changes in bayland extent, and sediment extraction from waterways have led to significant changes to the dynamics of sediment exchange within the Bay (Schoellhamer 2011, Barnard et al. 2013). Understanding these dynamics is crucial for evaluating the health of the Bay and predicting the effects of climate change.

McKnight et al. (2023) recently completed a conceptual model of fine sediment (i.e., sediment silt-sized and smaller) for the Bay. The report offered a high-level understanding of how fine-grained sediment moves around at different scales within the Bay. The effort concluded with a set of key knowledge gaps and uncertainties and recommendations for addressing them. Among these were a set of priority actions, including a recommendation to "…refine modeling of suspended sediment concentrations in Bay subembayments to account for more dynamic processes, such as mixing, flocculation, bioturbation, and variation over time." The report concluded that while the general pathways of sediment movement to the Bay are understood, the dynamic processes within subembayments (e.g., between marshes and mudflats, changes in the erodible sediment pool) are less understood. Other recent work has attempted to provide an accounting of sand-sized sediment and transport throughout the Bay (McKee et al. 2023a).

These data gaps and recommendations form the basis for several of the identified priorities of the Sediment Workgroup. Several priority science questions (SQs) were identified in the development of the Sediment Workgroup's Bay Sediment Modeling and Monitoring Workplan (SMMWP) (McKee et al. 2023b). The Workplan was designed to match the Sediment Workgroup management questions (MQs) with more specific, forward-looking projects that translate these MQs into actionable science questions.Several of these questions are aligned with this proposal, including: improving understanding of sediment transport processes and pathways within subembayments (SQ 3.3), assessing current and future sediment budgets (SQ 3.5), increasing deposition rates at marsh restoration sites (SQ 4.2), and evaluating accretion/erosion rates and fluxes between individual marshes, mudflats, and shallow subtidal shoals (SQ 4.4).

Study Objectives and Applicable RMP Management Questions

This study will produce a detailed conceptual understanding of sediment transport processes within the San Pablo Bay subembayment. The work will build on other previous efforts from the San Francisco Bay Regional Monitoring Program (RMP) Sediment Workgroup studies, including the Bay sediment conceptual model (McKnight et al., 2023), Spatial variability of sediment accretion in San Francisco Bay restorations (Lacey and Thorne, in progress), and Special Study on Bulk Density (McKnight et al. 2020). The output from this proposed project is intended to be coupled with ongoing work through Destination Clean Bay, an EPA-funded effort that focuses on support tools for multi-benefit water quality improvements. Analysis through Destination Clean Bay will focus on updates to the bay-wide conceptual understanding. When combined with this proposal, these efforts will accomplish two goals: update the bay-wide conceptual understanding and provide a framework to understand subembayments at a deeper level.

Specifically, this proposal will address three data gaps that have been identified within the SMMWP. First, this effort will compile available data related to local tributary sources of sediment to the subembayment. These data are largely already compiled, but our efforts will focus on evaluating recent changes to sediment delivery and explore how sediment supply may change over the next 20 years. Second, the proposed effort will refine our understanding of the exchanges between tributaries, marshes, mudflats, and erodible sediment pool. The erodible sediment pool is defined as any shallow subtidal area within the San Francisco Bay (mean low low water to 12 feet below mean low low water) containing sediment that can be mobilized and transported (McKnight et al. 2023). Rudimentary understanding of this pathway was defined bay-wide, but this pathway is another datagap that can be.Our focus will be on updating this understanding with new datasets, some of which have been produced through this RMP Workgroup.

The two focus areas defined in this proposal were chosen because of how they directly relate to the long-term goals of the Sediment Workgroup (Table 1). This proposal focuses largely on a deeper conceptual framework of two critical components of San Pablo Bay. From these conceptual efforts, we hope to identify missing datasets that are needed to develop Bay-wide dynamic models of sediment movement. These models have already been identified in the SMMWP and include the WARMER model (Swanson et al. 2014, Buffington et al. 2021) and the Deltares DFM model (Achete et al. 2015, Nederhoff et al. 2021). The focus areas of this proposal were identified as areas of high uncertainty within the current modeling domain. By building a conceptual understanding of these areas, we hope to improve the Bay-wide ability to accurately model sediment movement throughout the San Francisco Bay.

Table 1: RMP Sediment Workgroup management questions addressed by the proposed project

Management Question	Modeling / Monitoring Science Question
3. What are the sources, sinks, pathways, and loadings of sediment and sediment-bound contaminants to and within the Bay and subembayments? 4. How much sediment is passively reaching tidal marshes and restoration projects and how could the amounts be increased by management actions?	SQ 3.3. What are the main sediment transport processes and pathways within subembayments? SQ 3.5. What is the current sediment budget and how is the sediment budget changing? SQ4.2 What actions can we undertake to increase deposition rates in restoration sites? SQ4.4 What are the accretion/erosion rates and fluxes between individual marshes, mudflats, and shallow subtidal shoals?

Approach

Task 1 Literature review and advisor sub-team

This task focuses on gathering information related to sediment dynamics in the San Pablo Bay subembayment. Previous investigations of the subembayment (Ganju et al. 2004, Schoellhamer et al. 2008) will be combined with information from more modern efforts (e.g., Beagle et al. 2015, McKnight et al. 2023). This task will also include funds to convene an Sediment Workgroup sub-team, composed of a subset of the Sediment Workgroup members. This group will be convened with two goals in mind: advising the literature and data gathering efforts associated with the San Pablo Bay subembayment. The sub-team will be informed about ongoing efforts (such as the Destination Clean Bay effort) so that they may recommend ideas that lead to cost-sharing and efficiencies between the various ongoing work.

Task 2 Subembayment analysis

This task focuses on producing a refined understanding of sediment dynamics within the San Pablo Bay subembayment. Our intention is to focus on expanding the conceptual understanding of two specific elements: compiling an updated understanding of local tributary sediment within the subembayment and developing a deeper understanding of the tributary-marsh-sediment pool pathway. Other analyses may be needed, such as assessing the size and state of the area where wave resuspension is likely to occur. The effort will consist of:

- Augmenting existing tributary delivery estimates with the latest data from the last 10 years. When physical sampling is absent, utilize already existing RMP products (Zi et al. 2022).
- Refining the McKnight et al. (2023) conceptual model of the tributary-marsh-sediment pool pathway using an updated set of literature, as determined by the Workgroup sub-team.

Task 3 Report and scientific communication

Results of the study will be compiled into a technical report, anticipated to be completed by early 2026. This report will be presented to the RMP Sediment Workgroup, Technical Review Committee, and Steering Committee for review and acceptance. We will provide a project update at the spring 2025 RMP workgroup meeting(s) and plan to share findings at a sediment oriented conference in Fall 2025. The findings from the analysis will be archived to SFEI's server and be available to support future studies from other workgroups and stakeholders.

Budget Justification

The proposed work can be completed in one year with an estimated cost of $65,000. The expected deliverable is a final technical report focused on the San Pablo Bay subembayment.

Task	Estimated Labor Hours	Advisor Funds	Estimated Total Cost
1. Literature review and advisor sub-team	60	$6,000	$16,000
2. Subembayment analysis	185	--	$29,000
3: Report and scientific communication	125	--	$20,000
Total	**370**	--	**$65,000**

Labor

This is a reference and data gathering effort, combined with some desktop analysis. Funding is intended to support SFEI staff.

Advisor sub-team

This references funding for convening the advisory team. Funding will be provided to the advisors following the established SFEI guidelines.

Reporting

The draft of the technical report will be submitted for review in April 2026 to the RMP Sediment Workgroup, TRC, and SC. A final report is planned for delivery in August 2026.

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Special study proposal: Sediment dynamics in a fluvially influenced salt marsh

Salt marshes provide essential protection against storm impacts to coastal communities but are severely vulnerable to sea-level rise and other hazards. Determining their level of resilience is crucial to predicting their future evolution. Syntheses of measurements made in salt marshes over the past 20–30 years have produced metrics that indicate marsh health or vulnerability (Nowacki & Ganju 2019). Most of these metrics have been derived in microtidal marshes not subject to direct river inputs and without management interventions. Although these metrics are hypothesized to be universal across salt marshes, they have not yet been rigorously tested in fluvially influenced, restored marsh environments. Such research is aligned with the RMP's interest in the importance of local watersheds as a marsh sediment source. It also can inform the RMP Sediment Workgroup's monitoring/modeling science question 4.4 which addresses accretion rates and fluxes in marshes, mudflats, and shoals in relation to waves and local sediment supply.

We propose to assess sediment fluxes in a mudflat–salt marsh environment adjacent to the Petaluma River known as Gray's Marsh which was recently restored through an unintentional breach. This proposal will leverage work at the proposed site already funded by the RMP in 2024 to assess the decadal-scale physical response of marshes to restoration. We will deploy instrumentation for two deployments of 2–3 months each during wet and dry seasons to measure waves, currents, suspended-sediment concentration, and suspended-sediment flux within the river and in channels of the mudflat–marsh platform. We will also measure mudflat and marsh sediment deposition along three transects following similar methods to the study by Lacy & Thorne funded by the RMP in 2021. We will collect topo-bathymetric elevation data to determine the tidal and seasonal physical and sedimentary dynamics of this system, which is both fluvially influenced and recently restored. We will also test sediment-provenance approaches to determine the originating watershed of the sediment accumulating in the marsh. By measuring sediment flux and accretion during the wet and dry seasons, we aim to determine the relative importance of fluvial- vs. Bay-derived sediment to long term rates of accretion in this restored marsh. This work will also contribute to our understanding of how sediment transport and accumulation in marshes are influenced by site-specific attributes such as fluvial influence, which will help inform future marsh restoration prioritization and methods.

Estimated Cost: $121,500
Oversight Group: RMP Sediment Working Group
Proposed By: Daniel Nowacki & Jessie Lacy (USGS PCMSC), Karen Thorne (USGS WERC)
Time Sensitive: Potentially yes (site may be slated for dredge disposal in the future)

Proposed deliverables and timeline

Deliverable	Due date
Data release: salt-marsh and Petaluma River time-series data (PCMSC)	9/2026
Data release: deposition and accretion (WERC)	9/2026
Presentation to RMP and at selected conferences	5/2027
Report (draft paper) investigating the dynamics of sediment exchange between the salt marsh and its fluvial source and sediment accretion on the mudflat and marsh submitted to RMP	6/2027

References

Nowacki, D.J., Ganju, N.K., 2019, Simple metrics predict salt-marsh sediment fluxes, Geophysical Research Letters 46, doi:10.1029/2019GL083819.

SPLWG Special Study Proposal: Integrated Monitoring and Modeling to Support PCBs and Mercury Watershed Loads Uncertainties Assessment and Monitoring Design (Year 2 of 3)

Note: This proposal describes a 3-year long project. Funding for Year 1 was approved by the RMP Steering Committee in 2023 and is currently underway. The original proposal described the work being completed in 2 years, and this version extends the timeline to 3 years. This change was made at the recommendation of the SPLWG. The revised timeline makes sense as the modeling work is several months behind schedule.

This proposal is largely unchanged from the one reviewed by the RMP Technical Review Committee and Steering Committee in the fall of 2023, with important changes highlighted.

Summary: The Sources, Pathways, and Loadings Workgroup (SPLWG) has done extensive work on the design and implementation of modeling and monitoring techniques to support estimates of stormwater flows, suspended sediment (SS), and contaminant concentrations and loads in the local tributaries to the Bay. The RMP has also monitored stormwater throughout the region for the last 22 years, providing foundational data to support watershed model development. With the recent development of the Watershed Dynamic Model (WDM), flow, suspended sediment, and PCBs and Hg loads from local tributaries can be estimated at an hourly time step. SFEI is currently finalizing a strategy for integrated modeling and monitoring. The goal of this integrated approach is to answer important management questions related to the sources, pathways, and loadings of contaminants. One important use of the integrated set of models and observations will be the PCB TMDL revision planned for 2028.

This proposal is for Year 2 of 3 of the integrated monitoring and modeling activities for PCBs and mercury (Hg). In this study, we propose to: estimate model uncertainties, determine model sensitivities to key parameters, and provide PCBs and Hg monitoring design recommendations. The output will also provide an improved framework for monitoring and modeling future contaminants of interest.

Estimated Cost: $110K for Year 2 (2025); ($217K was funded for Year 1 in 2024; we expect to request an additional $57K in Year 3 to complete Phase 3 WDM development)
Oversight Group: SPLWG
Proposed by: Pedro Avellaneda, Alicia Gilbreath, Matthew Heberger, and Lester McKee (SFEI)
Time Sensitive: No

Proposed Deliverables and Timeline

Deliverable	Due Date
Wet season 2024 samples collected and sent for lab analysis (Year 1)	04/2024

Laboratory analysis, QA, & Data Management (Year 1)	09/2024
Presentations to the SPLWG meeting (Year 2)	05/2025
Draft Final Report (Year 2)	12/2025
Final Report (Year 3)	03/2026

Background

The San Francisco Bay TMDLs call for a 50% reduction in Hg loads by 2028 and a 90% reduction in PCB loads by 2030, respectively. To implement these TMDLs, the Municipal Regional Permit for Stormwater (MRP) (SFRWQCB, 2009; 2015; 2022) called for the implementation of control measures to reduce PCB and Hg loads from urbanized tributaries. The MRP has also identified additional information needs associated with improving understanding of sources, pathways, loads, trends, and management opportunities for contaminants. In response to the MRP requirements and information needs, a set of management questions (MQs; see Table 1) have been used to guide RMP and regional stormwater-related monitoring and modeling activities.

Over the past two decades, the SPLWG and Bay Area Municipal Stormwater Collaborative (BAMSC) have focused on answering MQs 1, 2, and 4 in relation to PCBs and Hg, mainly based on an intensive field-based monitoring approach, and identifying watersheds exhibiting high relative concentrations to help prioritize areas for greater management focus. In recognition of the need to answer MQ3 (How are loads or concentrations of POCs from small tributaries changing on a decadal scale?), starting in 2019, the regional Watershed Dynamic Model (WDM) has so far been developed for hydrology (Phase 1) and sediment (Phase 2) simulation with load modeling of PCBs and Hg (Phase 3) being completed presently. Future applications of the WDM could also be developed to provide a mechanism for evaluating the potential for management actions and management impact on future pollutant loads or concentrations in support of MQ5.

Whereas in the past we have relied on collecting empirical data to estimate loads to the Bay margins and Bay food web, going forward we plan to use an integrated modeling-monitoring approach to address management questions more effectively. Monitoring design driven by modeling needs can lead to more accurate, efficient, and effective modeling, thus improving decision-making. However, the datasets to support a robust model calibration of PCBs and Hg for the Bay Area need improvement. To help verify the WDM load estimation to the Bay from local watersheds over time, a two-year monitoring study was proposed and funded in 2022 to collect load monitoring data (data with both concentration and flow rate) from three watersheds. The monitoring data from these three watersheds will help to fill the data gaps in two ways: PCB samples at Guadalupe River will extend the time series at that location, which will be used to support the temporal aspect of model calibration and explore temporal trends, and samples collected at Arroyo Corte Madera del Presidio and Walnut Creek will fill the spatial calibration weaknesses in the present model. The first year of the monitoring study was approved in summer 2022 and sampling was conducted at the three watersheds during water year (WY)

2023. We propose to continue the second year of load monitoring in WY 2024.

The WDM Phase 3 work - estimating PCBs and Hg loads from local tributaries is currently underway, and will be completed in 2024. However, the WDM is currently calibrated against the loading data of PCBs and Hg from only seven sampled watersheds, representing less than 5% of the modeling domain for PCBs, and less than 0.5% for Hg. Improving the spatial representation with additional data collected in this proposed monitoring task will improve the calibration and decrease the degree of uncertainty. Even with this additional data, however, uncertainty in the PCBs and Hg load estimation will remain. In the case of PCBs, with a revision of the PCBs TMDL planned for 2028, a new robust estimate of PCB load and quantified model uncertainties are needed to link management effort with load reduction progress and to link to the enhanced in-Bay fate modeling that is also being conducted under guidance from the PCB Workgroup. To better assess the uncertainty of PCB load estimation and provide recommendations for monitoring design to reduce uncertainty, a Monte Carlo simulation-based uncertainty study is proposed for 2025. The WDM will also be used to evaluate different monitoring designs. The integrated effort proposed here is a pilot study to use the WDM to guide monitoring design in order to reduce uncertainties of load estimation. The workflow, method and tools we hope to develop in this study for PCBs and Hg can be modified and refined for a broader use in the future.

Study Objectives and Applicable RMP Management Questions

The proposed monitoring effort will provide load monitoring data to fill spatial gaps and to extend existing load monitoring time series. The pilot uncertainty analysis study will quantify the prediction uncertainty associated with PCB and Hg loads estimated by the WDM and evaluate different monitoring designs and parameter sensitivities to answer following questions:

1. What model parameters contribute greatest to model uncertainties?
2. What is the uncertainty of WDM load estimation?
3. What is a suggested monitoring design to reduce uncertainties and support load estimation?

This proposed work is a pilot study to support an integrated monitoring and modeling strategy. The WDM can be used to assess monitoring strategies and quantify how informative they are for load estimation. We anticipate that the workflow, methods, and tools developed in this study can be applied to other contaminants in the future.

The objectives of the project and how the information will be used are shown in Table 1 relative to the SPLWG high-level management questions.

Table 1. Study objectives and questions relevant to SPLWG management questions.

Management Question	Study Objective	Example Information Application
Q1: What are the loads or concentrations of Pollutants of Concern (POCs) from small tributaries to the Bay?	Use paired load sampling to support load estimation. Modeling analysis provides uncertainty estimates of the load predictions from WDM.	The model will produce an estimate of PCBs concentrations and loads at selected watersheds with uncertainty ranges.
Q2: Which are the “high-leverage” small tributaries that contribute or potentially contribute most to Bay impairment by POCs?	Provide modeled load from different tributaries to in-Bay transport and fate model to evaluate the contribution from different tributaries	The model can provide tributary loadings to priority margin units for the in-Bay model to simulate the contaminant transport and fate at those regions.
Q3: How are loads or concentrations of POCs from small tributaries changing on a decadal scale?	Uncertainty analysis of the load estimation will help quantify the possible ranges of load estimation.	Model outputs of PCBs (load and uncertainties) can help us understand the uncertainty of trend estimation.
Q4: Which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff?	Understanding uncertainties caused by land-use relevant parameters can help with the source area identification.	The model uncertainty caused by land use relevant parameters can be used to assess the uncertainties of yield simulation from source areas.
Q5: What are the measured and projected impacts of management action(s) on loads or concentrations of POCs from small tributaries, and what management action(s) should be implemented in the region to have the greatest impact?	Understanding uncertainties caused by land-use relevant parameters can help with the management action effectiveness evaluation.	The model uncertainty caused by land use and control measure relevant parameters can be used to assess the uncertainties of management effectiveness simulations.

Approach

Load Monitoring

Site selection and monitoring design were completed in the first year (WY 2023) of this two-year load monitoring study. Using our standard mobilization criteria and discrete sampling methods for load evaluation (collecting one or two samples on the rising limb, one at the peak, and one or two samples on the recession limb of the hydrograph for a total of four to five samples per storm) (Gilbreath et al., 2015), during WY 2023 we collected samples over two storms on Guadalupe River and Walnut Creek, and during three storms on Arroyo Corte Madera del Presidio. WY 2023 was very wet and we were able to sample sizable storms at each location. Arroyo Corte Madera del Presidio was also sampled during the first of the season flush. We propose to continue load monitoring at the three selected watersheds (Guadalupe River, Walnut Creek, and Arroyo Corte Madera del Presidio) in WY 2024 such that we will complete the two-year study with four to five storms sampled per location with 16-25 discrete samples at each. Data with this level of detail can be used to explain the physics of local rainfall-runoff based sediment transport and contaminant buildup and washoff processes, and verify the representations of those processes in the WDM.

Samples will be collected during rainfall events that are forecast to exceed 0.5 inches of rainfall in a 6-hour period. A minimum rainfall of 0.5 inches represents the best compromise between active pollutant transport processes and the avoidance of false starts - when a field team is deployed but fails to sample due to the lack of rainfall. Discrete samples will be collected using either a D-95 suspended using a crane and winch assembly (larger channels) or an ISCO pumping sampler (smaller channels) following clean hands procedures using appropriately prepared and calibrated sampling equipment.

Water samples will be analyzed for PCBs, Hg, and SSC. SGS AXYS Analytical will analyze for PCBs, Brooks Applied Laboratories will analyze for Hg, and SFEI will analyze the water samples for SSC. We have long experience working with these laboratories and expect the data to be high quality.

Load Modeling Uncertainty Analysis

The Watershed Dynamic Model (WDM) has been calibrated using monitoring data at several locations around the region; however, uncertainties of model predictions such as streamflow and suspended sediment load (SSL) are unavoidable. This uncertainty is due to lack of process representation, poor initial boundary conditions, measurement errors, uncertainties in parameter choices, and, as mentioned above, the limited nature of the calibration data. Estimating uncertainty in the WDM is an important step in assessing the reliability of model predictions and making informed decisions based on model results. There are three key stakeholder questions that need to be resolved. We will perform the analysis over the course of to years, 2024 and 2025.

1. **What model parameters contribute greatest to model uncertainties?**

As a first step in the overall uncertainty analysis, we will identify key model parameters that influence the variation of pollutant loads. The initial pool of key model parameters will include parameters related to streamflow and sediment, PCBs, and Hg transport. A model parameter can be allowed to change within a predetermined range (e.g., ±10% of a default value) and the predicted model output summarized by keeping the other parameters fixed. For example, a 10% chance can be applied to the initial pool of key model parameters. If a 10% change in a parameter value generates a 5% change (or higher) in the pollutant load, then that parameter will be kept for uncertainty quantification. By repeating the process with other model parameters, we will identify the influence of individual parameters on model output and create a prioritized parameter list for uncertainty quantification.

2. **What is the uncertainty of WDM load estimation?** Having a quantitative understanding of uncertainty (±A%) and a qualitative understanding of potential biases (high, low) will improve confidence in the load estimates for decision-making.

We propose to quantify the uncertainty of WDM load estimation by using a Monte Carlo (MC) based method. For example, two widely applied methods are the Generalized Likelihood Uncertainty Estimation (GLUE; Baven and Binley, 2014) and the Approximate Bayesian Computation (Sadegh and Vrugt, 2014). Within the GLUE framework, we will select a likelihood measure to reflect the agreement between the simulated and observed pollutant loads. Also, we will choose uniform prior probability distributions for the model parameters. Using these distributions, a large number of parameter sets (e.g.,10,000) will be drawn to perform the simulations. A parameter set will be considered acceptable if the likelihood function is above a predefined threshold that represents the agreement between the simulated and observed pollutant loads. The acceptable parameter sets will represent a plausible range of model uncertainty.

With the prioritized parameter list for uncertainty quantification, the Monte Carlo method will deliver a subset of model simulations (e.g., time series for SSC, PCBs, and Hg) that are deemed to be consistent with the observed data. The WDM currently has seven sub-regions. We propose to apply the Monte Carlo simulation method to test one sub-region of the WDM with the best water quality data availability . The subset of model simulations will allow us to estimate pollutant loads and provide an estimate of load uncertainty (±A%). Data weaknesses and how they might contribute to low or high bias will be discussed qualitatively.

3. **What is a suggested monitoring design to reduce uncertainties and support load estimation?** A key outcome of an integrated modeling-monitoring approach to answering management questions is cost efficiency. How does this coupled approach lead to lower longer term costs and more nimble answers to pressing management questions?

There are three sub-questions that will help us answer this key stakeholder question: 1) Did adding additional monitoring on Guadalupe in 2023 and 2024 improve the model calibration for trends through time? 2) Did adding two additional watersheds improve the spatial calibration? 3) In hindsight, even if uncertainties are greater, would similar loads be predicted using fewer watersheds for calibration with fewer water years of data? We will produce two model outputs: 1) estimated pollutant loads considering *only* hydrologic forcing (e.g., rainfall, evapotranspiration) for the WYs 2023 and 2024, and 2) estimated pollutant loads considering the hydrology and water samples collected during WYs 2023 and 2024 which were intended to help improve the temporal and spatial aspects of the model. These two model outputs will allow us to detect differences in estimated pollutant loads (and their range of variation) with and without the additional two-year load monitoring effort. Based on these numerical experiments, we will make recommendations for future monitoring design.

Contaminants of Emerging Concern (CEC) can adsorb onto sediment particles through physical and chemical interactions. Once adsorbed, CEC can persist in sediments for long periods of time with potential for release back into the water column. Since the WDM can simulate sediment loads associated with surface runoff, we anticipate that the uncertainty analysis work can be applied to the simulation of sediment-associated CECs.

The tasks for the uncertainty analysis include:

<u>Year 1 (Funded, currently underway in 2024)</u>

1. WDM modification

Currently, a user of the WDM populates model parameters via its graphical user interface. The source code of the WDM will need to be adapted to facilitate integration with a Monte Carlo based calibration technique. We propose to modify the source code to allow automation of the Monte Carlo simulation process.

2. Uncertainty method and tool development
We propose to identify an appropriate method for uncertainty quantification and develop a tool to integrate the WDM and the uncertainty quantification method.

Year 2 (focus of this proposal):

3. Parameter sensitivity analysis
A sensitivity analysis will be conducted on key modeling parameters to help us identify priority parameters as major contributors to model uncertainties.

4. Pilot uncertainty quantification
The uncertainty quantification will be applied to a test sub-region of the WDM using a priority parameter list identified in task 3.

5. Model performance evaluation using data from the two year (2023 and 2024) load monitoring campaign
The WDM will produce output (e.g., time series for SSL, PCBs, and Hg) with and without considering monitoring data from the two year load monitoring activities. We will test for any changes in the estimated pollutant loads, and range of variation, due to the newly available dataset.

Year 3 (future work, not covered in this proposal):

6. Regional uncertainty quantification
We will apply the uncertainty quantification method to regions not considered in Year 1.

Budget

The following budget represents estimated costs for this special study (Table 2).

Table 2. Proposed budget cost estimates.

	Year 1 (2024)		Year 2 (2025)		Year 3 (2026)*		Total	
Task	**Hours**	**Cost ($)**	**Hours**	**Cost ($)**	**Hours**	**Cost ($)**	**Hours**	**Cost ($)**
Uncertainty analysis	400	$62,000	360	$50,400	250	$35,000	1140	$165,600
Stormwater monitoring and data management	484	$71,820					484	$71,820
Report and scientific communication	98	$15,190	260	$40,882	80	$12,579	377	$59,060
Project management and science overview	100	$22,134	85	$18,814	40	$8,854	180	$39,841
Subcontracts								
SGS AXYS Analytical, Brooks Applied Laboratories		$37,000						$37,000
Direct Costs								
Equipment		$2,050						$2,050
Travel		$2,100						$4,200
Shipping		$4,500						$4,500
Total	**1082**	**$216,794**	**1099**	**$110,096**		**$56,433**	**2181**	**$384,071**

* Year 2 expenses have been split into

<u>Budget Justification</u>

Labor Costs: Labor costs include staff time for monitoring and modeling efforts. It will support staff time to conduct fieldwork and data management, develop WDM uncertainty analysis tool, perform calibration/verification, process model results, and write up technical reports; and get technical support from related other parties; and senior staff contributions and review.

Laboratory Costs: Up to 30 independent samples will be analyzed each year, including field duplicates and field blanks. Analyses will be conducted for PCBs, mercury, and suspended sediment concentration.

Data Management Costs: Data services will include quality assurance and upload to CEDEN.

Reporting Costs: Preparation of draft and final reports on the results will be completed.

Deliverables

- Presentations at SPLWG workgroup meetings
- Draft report (Year 2) and Final project report (Year 3)
- Monitoring data will be made available for the public via CEDEN.
- Model simulation results will be archived in the SFEI server and available upon request.

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SPLWG Special Study Proposal: Tidal Area Remote Sampler Pilot - Year 3

Project Description

This proposal is for $15,000 in additional funds to finish the Tidal Area Remote Sampler Pilot (SPLWG 2023 full proposal added as an appendix for reference). The goals of the previously funded two-year project were to complete development and pilot testing of a proven remote sampler design, and characterization of stormwater from eight old industrial areas influenced by tides. Although there were no budget overruns last year, sampling needs to be completed in the upcoming rainy season. The additional funds will allow us to resample one of the sites sampled last year where the sampler was vandalized and no sample was collected, as well as provide for an additional year of project management.

Estimated Cost: $15k (these are additional funds requested to finish project)
Oversight Group: STLS/SPLWG
Proposed by: A Gilbreath, D Yee, and L McKee (SFEI)
Time Sensitive: Yes, to keep momentum and finish project

Proposed Deliverables and Timeline

Deliverable	Due Date
Pilot testing during rainy season	04/2025
Update presentation at SPLWG on the results to date	05/2025
Data upload to CEDEN	12/2025
Draft Report	1/2026
Final Report	3/2026

Budget

The following budget represents estimated costs for this special study (Table 2).
Table 2. Proposed budget.

Expense	Estimated Hours	Estimated Cost
Labor		
Additional Field Deployment and Project Management	90	$15,000
Total Requested for WY 2024		**$15,000**

<u>Budget Justification</u>
Labor Costs: 90 hours of staff time to resample one location and implement project management for an additional year of the project.

Appendix 1 for reference:

SPLWG Special Study Proposal: Tidal Area Remote Sampler Pilot - Year 2

Summary

Old industrial land use disproportionately supplies PCB and Hg mass loads to the Bay. The Municipal Regional Stormwater Permit (MRP) calls for controlling these discharges and a lot of effort has already occurred in non-tidal industrial watersheds, but knowledge about sources and source areas in tidally-influenced areas remains limited due to the challenges associated with sampling in tidal areas. Last year a new remote sampler that addressed these challenges was developed to sample the tidally-influenced industrial landscape. Two samplers were built that automatically collect stormwater samples when freshwater storm runoff is detected. The samplers were deployed at three tidally influenced sites to assess for performance and test alternative methods for physically securing the sampler, but no sampling for lab analysis was completed. In the proposed study, field staff will deploy the equipment at eight sites to capture water samples for PCB and Hg analysis. This study will solidify our experience and understanding on the field deployment of these samplers. The outcome will be a completed and proven sampler design and characterization of stormwater from eight old industrial areas influenced by tides. The deliverable of this project will be quality-assured PCB and Hg data made available through the CD3 web tool, and a report detailing the methods and results of the pilot study.

Estimated Cost: $107k; Carry over from 2023: $45k; Total Requested for 2024: $62k
Oversight Group: STLS/SPLWG
Proposed by: A Gilbreath, D Yee, and L McKee (SFEI)
Time Sensitive: No

Proposed Deliverables and Timeline

Deliverable	Due Date
Pilot testing during rainy season	04/2024
Update presentation at SPLWG on the results to date	05/2024
Data upload to CEDEN	12/2024
Draft Report	1/2025
Final Report	3/2025

Background

Old industrial land use is the main source of the greatest yields and total mass of PCB loads in the region (Wu et al., 2017), but at this time due to sampling logistics, only the non-tidal portions have been well-sampled (Gilbreath and McKee, 2022). Most of the Bay Area's heavy industrial areas, historically serviced by rail and ship-based transport, are located in close proximity to the shoreline. To date, the RMP has sampled stormwater from nearly 100 watersheds and drainages in the region. However, sampling for PCBs and HgT since WY 2003 has included just 34% of the old industrial land use in the region. Of the *remaining* older industrial land use yet to be sampled across all the counties, 48% of it lies within 1 km and 74% within 2 km of the Bay. These areas are more likely to be tidally influenced, and are often not well serviced by public roads.

Tidal areas are very difficult to sample because of a lack of public right-of-ways and a range of tidal-related constraints near the Bay such as bidirectional flow, the timing of tides with storms, the need for boat access to outfalls to install equipment and take samples, complex mixing, and water column stratification. With great patience and effort, some sampling in tidally influenced areas has occurred during the last seven years. To be able to sample these areas, tides that are sufficiently low (site-dependent) must align with storms of sufficient intensity. Additionally, to warrant mobilization for these events to the exclusion of other sampling in the region, these conditions need to be met for some minimum time period (e.g. minimally 2-3 hours) to account for potentially shifting storm timing. Tidal sites get the highest priority during each storm event in which these requirements are met, and yet such opportunities have been rare. Further, we only have so much field capacity to sample each event, so we are limited in the number of tidal sites we can sample when these conditions occur. For several years, the Pollutants of Concern (POC) reconnaissance report stated: "A different sampling strategy may be required to effectively assess what pollution might be associated with these areas and to better identify sources for potential management" (Gilbreath and McKee, 2022).

In response to this challenge, two RMP projects funded the development and early pilot testing of a remote sampler in WY 2023. The EPA had developed a remote, micro-pump sampler and successfully used it over 100 times (Kahl et al., 2014). This formed the prototype from which SFEI developed a modified variant in WY 2023. USGS is currently working on modifications to the EPA design as well, and SFEI benefitted from discussions with USGS about sampler development. This modified variant, the "SFEI Mayfly," is suitable for both CECs sampling in non-tidal pipes and storm drains further upstream, as well as for sampling in tidal areas. The sampler is a compact, automated micro-pump sampler such that staff need not be present during sampling, and can be deployed and retrieved during lower tides prior to and after a storm. Although the samplers may be inundated at times with tidal waters, a salinity sensor triggers the sampler only during low salinity periods when urban stormwater is dominant. The data logger on the sampler is also telemetered such that remote access to real-time data is available over the internet. It is currently not enabled to program remotely, though this would be a highly beneficial feature for a variety of reasons and has been proposed as part of the remote sampler proposal.

Last year, in addition to developing the samplers, we deployed them during storm events at three tidal locations (as well as two non-tidal locations), all of which were mostly successful. These were pilot testing locations to assess the feasibility of field deployment only. No samples were submitted for analysis as these were not locations where information on PCBs or Hg was desired. Some lessons were learned in this pilot phase that will be applied in future sampling. The sampler was in development most of the rainy season and we only began field deployments towards the end of the season, therefore we were not able to collect samples desirable for lab analysis. There is approximately $45,000 in remaining funds for the project, and we propose to carry that over into this year and thus lessen the cost of the proposed project by that same amount (see Budget Table 2).

In this study, we propose to deploy these samplers for collection of Hg and PCBs and data analysis at eight locations. This study will solidify our experience and understanding on the field deployment of these samplers, and identify industrialized or other urban drainage areas on the Bay margin for further investigation and management consideration, thus providing a much-needed new tool for stormwater managers.

Study Objectives and Applicable RMP Management Questions

The goal of this project is to further modify and deploy a remote sampler for sampling in tidal areas.

The near-term objectives of the sampling approach will be to (a) deploy the sampler at eight sites, and (b) collect PCBs, Hg, and SSC samples at each site and have these samples analyzed by commercial labs.

Table 1. Study objectives and questions relevant to SPLWG management questions.

Management Question	Study Objective	Example Information Application
Q1: What are the loads or concentrations of Pollutants of Concern (POCs) from small tributaries to the Bay?	Deploy a remote sampler to collect POC data in tidal areas that we have previously been unable to sample due to tidal constraints.	What are the concentrations of POCs downstream of industrialized areas close to the Bay margin?
Q2: Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by POCs?	Indirect, via answering Q1	Identify high leverage drainages to sensitive Bay margins downstream of tidally influenced industrial areas.

Management Question	Study Objective	Example Information Application
Q3: How are loads or concentrations of POCs from small tributaries changing on a decadal scale?	N/A	N/A
Q4: Which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff?	Indirect, via answering Q1	Confirm/refute if high PCB concentrations are found downstream of suspected PCB source areas.
Q5: What are the measured and projected impacts of management action(s) on loads or concentrations of POCs from small tributaries, and what management action(s) should be implemented in the region to have the greatest impact?	N/A	N/A

Approach

Our approach during this second year of work with the SFEI Mayfly is to deploy the samplers at eight locations where PCB measurements are desired. The intent is to deploy the two sampling units that are currently built at two different locations during four storm events for a total of eight locations.

In this study, we will work with the BAMSC team to select suitable and desirable locations for deployment. We will either access sites by land or utilize a low draft boat or other means to access tidal sites downstream from old industrial areas. There we would anchor the coarse-screened micro-pump sampler and an auto-logging micro salinity probe in the water column. The sampling equipment would be installed just prior to a storm and retrieved after. The whole water sample would be analyzed for suspended sediment, PCB, and Hg concentrations.

Budget

The following budget represents estimated costs for this special study (Table 2).

Table 2. Proposed budget.

Expense	Estimated hours	Estimated Cost
Labor		
Field Deployments	168	$33,840
Project Management	60	$9,712
Data Management	90	$12,600
Reporting - SOP Development and Report	156	$30,480
Subcontracts		
SGS AXYS Analytical, Brooks Applied Laboratories, USGS		$12,065
Direct Costs		
Equipment		$6,000
Travel		$330
Shipping		$1,800
Grand Total for WY 2024	474	**$106,827**
Total Remaining for WY 2023		**$44,800**
Total Requested for WY 2024		**$62,027**

<u>Budget Justification</u>
Labor Costs: 574 hours of staff time to research and modify the remote sampler, deploy the sampler, analyze the data, and present to SPLWG in spring 2024.

<u>Early Funds Release Request</u>
If this project is approved, we request early release of funds for use in 2023. We would begin modifying the remote sampler in fall of 2023 such that we are ready for deployments in Water Year 2024 (which begins fall of 2023).

Reporting

The data for the remote sampler will be presented to SPLWG in the spring of 2024. Additionally all data will be uploaded to CEDEN and a technical report (draft and final) will detail the methods and a brief presentation of the results. Further, a detailed Standard Operating Procedure document will be created to describe the sampler development and operation.

References

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Stormwater Contaminants of Emerging Concern (CECs) Modeling and Data Analysis

Summary: Recently, SFEI recommended using the Regional Watershed Spreadsheet Model (RWSM) to estimate loads of contaminants of emerging concern (CEC). To support CEC load estimates, the CEC Modeling Work Plan, currently in preparation, is expected to include steps toward updating the RWSM and developing underlying datasets. This additional funding will be used to expand the implementation of the first phase of the CEC Modeling Work Plan under Task 3 of the proposed Stormwater CECs Modeling and Monitoring 2025 project.

This work will be coordinated with the PFAS conceptual model and product research conducted under the PFAS Sources to Solutions grant. Due to the opportunity provided by the PFAS grant, we anticipate that the first implementation of stormwater CECs load modeling and detailed data analysis related to product sources will be for PFAS. Specifically, the grant anticipates that SFEI will complete urban stormwater PFAS load estimates and identify specific categories of PFAS products most likely to contribute PFAS to San Francisco Bay in 2028. We anticipate the expanded funding will be used in conjunction with other current and proposed projects to develop, assess, and potentially pilot use of new geospatial data sets to specifically support stormwater CEC modeling and data analysis, potentially even including updating the RWSM to pilot use of a new data set. The results of this task will be documented within the Stormwater CEC '25 project modeling and data analysis task report, which will be expanded to include this additional work and any additional recommendations for the next phase of work anticipated in 2026.

Estimated Cost:	$39K
Oversight Group:	SPLWG
Proposed by:	Pedro Avellaneda, Matthew Heberger, Kelly Moran
Time Sensitive:	Yes, to implement the CECs modeling workplan at the pace necessary to support completion of PFAS load estimates and stormwater monitoring data analysis anticipated in the PFAS Sources to Solutions grant

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Expanded draft report Stormwater CEC modeling and data analysis	October 2025
Expanded final report: Stormwater CEC modeling and data analysis	December 2025

Special Study Proposal: GIS Improvements to Support Modeling, Data Interpretation, and Site Selection

Summary: This special study involves background research and workplan development related to geographic datasets to support improved monitoring and modeling of Bay watersheds. It covers two separate tasks. The first is related to better delineation of drainage areas in urbanized areas. The second task relates to finding or developing better data on land use and land cover and how it has changed over time.

Task 1: In urban areas, topography is generally insufficient for watershed boundary delineation, as the flow patterns are largely dictated by the built environment. Currently, we rely on storm drain mapping published between 1997 and 2007 by Oakland Museum.[1] However, significant population growth, new construction, and redevelopment throughout the Bay Area renders these data obsolete for many areas. For this task, staff will work with local municipal separate storm sewer systems (MS4s) to determine whether they have updated maps of urban drainage systems. The outcome of this effort will be a workplan for updating regional watershed maps based on these data. The eventual uses for such data by the RMP are for: 1) updated base maps for the Watershed Dynamic Model (WDM) and Regional Watershed Spreadsheet Model (RWSM), 2) monitoring site selection, and 3) understanding pollutant sources.

Task 2: Development of Bay Area watershed models has been hindered by the lack of consistently updated land use/land cover data.[2] We currently rely on snapshots of urban land use published by the Metropolitan Transportation Commission (MTC) in 2005 and 2020. Better representation of land use and how it changes over time will allow for more realistic estimates of runoff, sediment, and pollutant loading. A variety of new data products are available from both government and commercial vendors. Many of these new datasets make use of satellite remote sensing and artificial intelligence. SFEI has also developed in-house expertise in applying machine learning methods to identify features in satellite imagery and multispectral data. Therefore, we will also weigh the possibility of creating Bay Area land cover datasets ourselves, which would then be made public and could become a valuable resource to local agencies. As part of this task, we will consult with RMP science advisors and stakeholders, as they may possess in-house data or have valuable experience working with commercial datasets.

The outcomes of Task 2 will be 1. a survey of the current landscape of options, 2. comparison of these to in-house options for data generation, 3. a pilot analysis of sample datasets, and 4. a recommendation of suitability of newer datasets for RMP uses.

[1] Creek Mapping Project, Oakland Museum of California. https://explore.museumca.org/creeks/crkmap.html

[2] At present, RMP staff are assessing new data sources to identify land features related to PFAS (solar panels, roofing materials). This proposal builds upon and expands the focus to include land uses (e.g., industrial, commercial, residential) and land cover (trees, buildings, roads, parking lots).

Estimated Cost: $40K
Oversight Group: SPLWG
Proposed by: Matthew Heberger, Alicia Gilbreath, Amy Kleckner
Time Sensitive: No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Presentation to SPLWG	May 2026
Detailed workplan for future GIS data acquisition and/or development*	May 2026

* may be included in the forthcoming 2025 Stormwater CEC modeling and data analysis report and/or Watershed Dynamic Modeling (WDM) report.

Special Study Proposal: Stormwater Systems Management Upgrades

Summary: All of the RMP workgroups rely on the stormwater monitoring program overseen by the SPLWG for support to answer management questions, and the program has been expanding dramatically over the last 5-10 years. The systems and equipment that underlie this program have not kept pace with the growing stormwater monitoring needs of the RMP and there are multiple areas in which greater efficiency is needed to continue expanding the program and delivering the highest quality data in the most efficient way. Key areas that immediately need to be addressed include:

- Automation and streamlining sampling processes and sampling-related documentation, including preparation processes, in-field collection and data logging processes, and post-storm shipping, logging, and data management systems. (approximately $40k)
- Development of a “go/no go” decision tree, both for manual and automated sampler deployments. We anticipate needing two slightly different decision-making processes, as more lead time and preparation is required for automated sampler deployment than for manual sampling. (approximately $5k-$10k)
- Improving our monitoring sites database, and systems for efficiently logging information about site reconnaissance, site visits, sampler deployments, etc. (approximately $20k)
- Expanded team training to build labor capacity. (approximately $10k-$15k)

As part of these improvements, we plan to contact other major sampling programs to identify best systems processes and the latest monitoring method technologies. Although we have listed specific areas and approximations of spending in each category, we expect that areas of additional improvements may be identified as high priorities as we progress through the year and we will adjust budget allocations as needed to address those priorities.

Estimated Cost:	$80k; early release requested to support WY 2025 monitoring
Oversight Group:	SPLWG
Proposed by:	Alicia Gilbreath, Amy Kleckner, Kelly Moran
Time Sensitive:	Yes, to efficiently meet the expanding needs of the stormwater monitoring program; requesting early release of funds

PROPOSED DELIVERABLES AND TIMELINE*

Deliverable	Due Date
Discussions with other sampling programs, expanded team trainings, decision tree process developed, sampling and shipping SOPs revised, data management systems weaknesses identified	December 2024
SPLWG presentation update	May 2025
Sites database improvements, data management systems weaknesses/inefficiencies improved	August 2025
Ongoing identification and implementation of systems and equipment upgrades as funding allows	December 2025

*Timeline shifted back if funds not released early.

Special Study Proposal: Develop discharge rating curves at county-operated stage monitoring stations

This proposal is to perform the planning necessary to develop a new set of rating curves for rivers and streams draining to the Bay. Background research and stakeholder consultation will lead to a workplan for fieldwork and desktop analysis that may be performed in 2026 or thereafter. It is focused on developing more detailed datasets of streamflow or discharge, which is critically important for evaluating the fate and transport of aquatic pollutants. It is also vital for the calibration and verification of watershed models, which are at the heart of the RMP strategy for evaluating loads of sediment, legacy pollutants such as PCBs and mercury, and emerging contaminants. The Regional Watershed Spreadsheet model (RWSM) and the Watershed Dynamic Model (WDM) are both calibrated using flow observations, mostly from USGS gages. However, there are large gaps in coverage for San Mateo, Contra Costa, Marin, and Solano Counties (Figure 1). This proposal allows us to begin filling that gap. Once rating curves are developed, it will allow us to estimate discharge going forward, but they can also be applied to historic stage observations, thus allowing us to create rich new historic datasets.

Cities, counties, water suppliers, and flood control districts operate a number of "stage-only" gauges, collecting continuous observations of water-surface elevation. This information can be used to estimate discharge (in m³/s or cubic feet per second, cfs) by creating a relationship between recorded stage and discharge. This relationship is referred to as a "rating curve," an example of which is shown in Figure 2. To create a rating curve, one must take flow measurements at a range of flows. These are then plotted, often on a semi-log scale, and a curve is fit to the points. In order to be useful, a rating curve should be based on measurements over a wide range of flow conditions, as it is not recommended to extrapolate outside the range of observed flows (Kennedy, 1984).

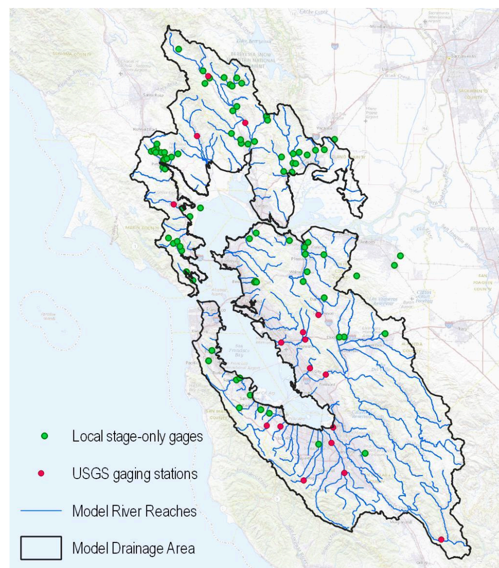

Figure 1.USGS Bay Area gages for discharge (red) and stage (green). Does not include local agency discharge gauges.

Developing rating curves at these locations cost-effectively leverages investments by local agencies, as they have already installed the stage measurement and telecommunication devices. Sites can be identified which fill the biggest gaps in existing coverage. Budget is included to select sites with workgroup oversight, and collaborate with partners.

The first task will be to select sites for rating curve development. SFEI staff have already compiled a data table of stage monitoring locations. An important task will be to screen out unsuitable sites, such as those that are tidal or have a significant backwater effect, for example at locations that are immediately upstream of a confluence. Candidate sites are ones where the stage-discharge relationship is stable, and not sensitive to changes in flow level. A site should be accessible even during high flows (bridges are ideal), and should be free of excessive vegetation or sedimentation (Mosley and McKerchar, 1992, p. 8.12). Candidate sites do not necessarily need to be wadeable.

We will conduct an inventory of sites where accurate flow estimation is feasible. We will also contact local agencies and contractors to determine if there are existing discharge observations or unpublished rating curves that we can use or build upon. Developing a detailed work plan, with input from advisors and stakeholders, will allow us to be ready if and when funding becomes available.

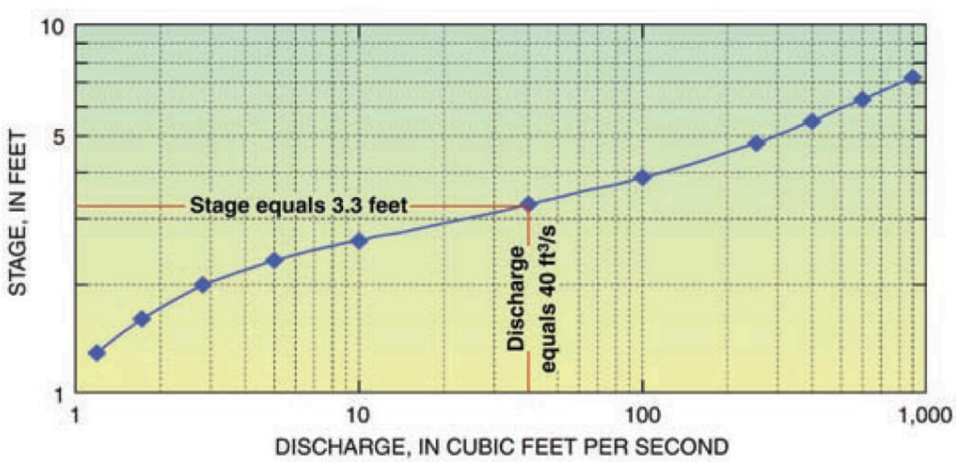

Figure 2. Example rating curve, courtesy of USGS (public domain).

We will consider where there may be synergies with existing or planned contaminant monitoring. There is an advantage to having estimates of flow and concentration at the same site, to estimate loads and to develop a better understanding of how contaminant loads change over the course of a storm. For example, do they exhibit high concentrations at the beginning of storm runoff, and lower concentrations on the “receding limb” of the hydrograph? This so-called hysteresis effect could indicate washoff from impervious land surfaces. On the other hand, a more constant ratio of concentration to runoff could indicate point sources or groundwater sources. This type of information is useful for developing and refining conceptual models for how contaminants enter waterways.

The data collected for rating curve development can also be useful for better parameterizing watershed models, helping to make them more accurate. SFEI’s watershed dynamic model in LSPC uses F-Tables to route flow from land surfaces through channels. These tables are essentially the same as a rating curve, as they relate water depth to flow volume. Hydrologists use a variety of methods to create F-Tables, using models or equations.

Nevertheless, field measurements remain the gold standard. Flow velocity, estimated via F-tables, determines the shear stress and the shear stress controls channel scour and deposition processes – which can be a significant part of the contaminant simulation. Furthermore, additional flow locations can help improve the calibration of the model. It is particularly important to calibrate to observations at multiple locations, particularly in the Bay Area with its diverse topography and many microclimates.

The output of this project will be a workplan for developing flow rating curves at sites in the Bay Area. We will consult with stakeholders on how to prioritize and recommend sites. Options for funding the field work and analysis include EPA funding, Supplemental Environmental Projects (SEPs), or funding by the RMP in coming years.

After we have selected sites, there are several options for performing the field work of collecting flow observations. SFEI could do the work in house, or we could contract with the US Geological Survey or a local consulting firm. Part of workplan development will be to obtain price quotes from qualified contractors. One option may be to contract out the field work and have SFEI staff perform the statistical analysis to develop rating curves.

We tentatively estimate that for SFEI staff to perform the field work and develop the rating curve, the cost will be approximately $26.3K per site. Thus, we could develop rating curves at 6 sites for $157.8K. These cost estimates will be further refined and elaborated in the detailed workplan. Development of a detailed workplan will also allow us to determine whether there is a need for equipment purchase or staff training.

Estimated Cost:	$30K
Oversight Group:	SPLWG
Proposed by:	Matthew Heberger, Alicia Gilbreath, Lester McKee
Time Sensitive:	No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	**Due Date**
Presentation to the SPL workgroup	May 2026
Detailed workplan for future rating curve development	May 2026

WORKS CITED

Kennedy, E. J. (1984). Discharge Ratings at Gaging Stations. In *Techniques of Water-Resources Investigations: Vol. Book 3, Chapter A10*. US Geological Survey. https://pubs.usgs.gov/twri/twri3-a10/pdf/twri_3-A10_b.pdf

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Special Study Proposal: Add-on to Stormwater Contaminants of Emerging Concern (CECs) Monitoring and Modeling 2025 Project to Include Additional Non-CECs Analytes

Summary: The Stormwater Contaminants of Emerging Concern Monitoring and Modeling 2025 (Stormwater CECs '25) proposed project includes CEC sampling using three different sample collection methods: the SFEI Mayfly portable remote sampler (PFAS only); a larger full-sized remote sampler; and manual sampling. When utilizing a full-sized remote sampler or monitoring a site manually it is possible to collect extra bottles for additional analytes and this proposal is to provide funding for that purpose. Two goals underlie the proposed additional analyte collection: 1) to opportunistically obtain stormwater monitoring data about other pollutants of concern in the Bay, and 2) to inform CECs monitoring data interpretation, such as examining whether observed variability in CECs levels is consistent with our understanding of the variability of other constituents in urban runoff. Several analytes could meet these two goals. Based on staff understanding of stakeholder and science advisor input at ECWG and SPLWG, we recommend adding sample collection and analysis for dissolved organic carbon (DOC), total organic carbon (TOC), metals, and PCBs. Representatives from BAMSC and the Water Board have been consulted about total mercury (HgT) and the agreed recommendation is to include HgT as well. (Suspended sediment concentration [SSC] is planned as part of the Stormwater CEC '25 project.)

Below is a list of the pollutants proposed for analysis, along with the budget required to add these analytes to the Stormwater CECs '25 project. It is proposed in the Stormwater CECs '25 Tier 1 project to collect two samples using the full-sized remote samplers, and two samples manually for a total of four samples (plus added QA samples). A Tier 2 proposed add-on to this project requests funding to sample a third event with a full-sized remote sampler, and four additional events manually, for a total of nine samples (plus QA samples). The budget below presents funding necessary under each of these scenarios for the analytes specified above. The budget for each analyte includes all laboratory-related labor and direct costs, including contracting, chemical analysis, field and laboratory QA samples, data reporting, and obtaining sample containers and purified water for blank samples. Per analyte, there is also a cost for the data management tasks that are necessary for QA of each analyte dataset. Additionally, the budget includes two types of fixed costs associated with the added analytes. First is the additional labor, supplies, and shipping charges associated with adding analytes. Second is the fixed cost for data management (DM) tasks (formatting, processing and data upload to CEDEN) necessary for a project regardless of the number of samples and analytes. Data Management in this first year is important for data interpretation and to inform future monitoring design. Reducing the frequency of DM and QA would be a way of reducing the annual cost in the future.

Budget:

Analyte	**Data management (EDD templates and QA) costs for each analyte (4 or 9 samples similar amount)**	**Tier 1 lab costs for 4 samples + QA samples**	**Tier 1 total cost per analyte (lab and data management for 4 samples)**	**Tier 2 lab costs for 9 samples + QA samples**	**Tier 1+2 total cost per analyte (lab and data management for 9 samples)**
PCBs	$6,300	$7,400	$13,700	$12,650	$18,950
HgT	$2,800	$855	$3,655	$1,430	$4,230
Metals suite	$2,800	$1,625	$4,425	$2,750	$5,550
DOC/TOC	$5,700	$470	$6,170	$770	$6,470
Additional labor (for field prep, deployment and retrieval, sampler programming, shipping)			$4,720		$5,900
Data management fixed costs (formatting, processing and uploading)			$6,500		$6,500
Supplies (ice, coolers, packing supplies, bottles)			$200		$400
Shipping charges			$1,000		$2,000
Total for all analytes			**$40,370**		**$50,000**

Estimated Cost: up to $50k
Oversight Group: SPLWG, ECWG
Proposed by: Alicia Gilbreath, Kelly Moran
Time Sensitive: Yes, early release of funds is requested to implement monitoring in Water Year 2025

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	**Due Date**
Stormwater Additional Non-CECs Analytes monitoring	Spring 2025
Data uploaded to CEDEN	December 2025

RMP SUPPLEMENTAL ENVIRONMENTAL PROJECT CANDIDATE LIST Updated 08-14-23

Project	Estimated Budget Range	Nexus Keywords	Geography	Matrix	Oversight Group	Project Lead	Year Proposed	Comments
Projects that have been reviewed by a RMP workgroup, and/or the Technical Review Committee, (as indicated in the Oversight Group column) and approved by the Steering Committee.								
Identification and Pilot Monitoring of High-Priority Current Use Agricultural Pesticides in Region 2	$75,000 - $125,000	Emerging Contaminants, Pesticides	North Bay	Stormwater	ECWG	SFEI	2014	
Monitoring for Halogenated Azo Dyes in Bay Sediments	$65,000 - $130,000	Emerging Contaminants, Azo dyes,	Whole Bay	Sediment	ECWG	SFEI	2020	
Monitoring Microplastics in San Francisco Bay Sport Fish	$50,000- $200,000	Microplastic, Sport Fish	Whole Bay	Sport fish	MPWG	SFEI/U. Toronto	2019	
Tire Particle/Contaminant Fate and Transport	$90,000 - $115,000	Microplastics	Whole Bay	Particles	MPWG	SFEI	2021	
Size Distribution of Microplastic Particles in SF Bay	$65,000 - $105,000	Microplastics	Whole Bay	Particles	MPWG	SFEI	2023	
Biogeochemical transformation rates in San Francisco Bay	$50,000 - $300,000	Nutrients	Whole Bay	Water	Nutrients	SFEI	2021	
Richmond Harbor PCB Conceptual Model Development	$50,000- $100,000	PCBs, Central Bay	Richmond Harbor	Sediment, Fish, Water	PCBWG	SFEI	2018	

Filling Bathymetry Data Gaps	$50,000- $250,000	Bathymetry	Whole Bay	Sediment	SedWG	USGS	2019	
Toxicity Reference Value Refinement	$30,000	Toxicity, Dredged sediment, Beneficial reuse	Whole Bay	Sediment	SedWG	SFEI	2019	
Estimation of future sediment loadings from local tributaries	$70,000	Sediment, future conditions	Whole Bay	Water	SedWG	SFEI	2021	
Napa and Sonoma Sediment Loads	$138,500	Watershed sediment supply	North Bay	Sediment	SedWG	SFEI	2022	Addition: Special Study proposal put forth for 2023 funding but not selected.
Sediment Conceptual Model(s) for Individual San Francisco Bay Segments and Subembayments	modular	Sediment	Whole Bay	Sediment	SedWG	SFEI	2023	
Identifying mechanisms controlling selenium bioavailability at the base of the food web in North versus South San Francisco Bay	$112,000	Selenium, Bioavailability, South Bay	North and South Bay	Water	SeWG	USGS	2020	
Use of Remote Stormwater Sampling Devices to Improve Temporal Coverage of Sampling	Year 1: $160,000 Year 2: $120,000	PCBs, methods development, remote samplers	Whole Bay	Stormwater	SPLWG	SFEI	2017; revised 2022	

Develop a Statistical Model for Trends Evaluation	$35,000-$50,000	Stormwater flows, pollutant loads, PCBs	Whole Bay	Stormwater	SPLWG	SFEI	2018	We will keep this idea, but change the content of previously proposed work and run it through at the SPLWG meeting.
Mallard Island Monitoring for Loads and Trends	$150,000 - $200,000	Sediment load, Delta, PCBs, Hg, Se, Pesticides microplastics, CECs, Bay mass balance	North Bay	Sediment	SedWG SPLWG ECWG	SFEI	2020	
Nutrient exchanges between SFB and the coastal ocean (export, import)	$50,000-$300,000	Nutrients	Central, South Bays	Surface Water	Nutrients	SFEI	2023	
Expanded water quality monitoring to support nutrient management decisions	$50,000-$300,000	Nutrients	Whole Bay	Surface Water	Nutrients	SFEI	2023	
Biogeochemical transformation rates in San Francisco Bay: field studies and/or synthesis/interpretation	$50,000-$300,000	Nutrients	Whole Bay	Surface Water	Nutrients	SFEI	2023	

Status of Deliverables and Action Items (10 minutes)

Desired outcomes:

- Informed committee
- Feedback on progress and due dates

Deliverables - completed!

- ☻ NB Se clam and water data report (2019-2020) SFEI Cont. # 1116
- ☻ SS: Suspended Sed in LSB - Year 2; 15 min SSC time series data from 8 stations.
- ☻ Ambient Sediment Thresholds Update
- ☻ All 2024 Workgroup Meetings
- ☻ Successful collection of 2024 S&T Bird Egg Samples
- ☻ Action Item: Council of Wisdom meeting to discuss event based monitoring (5/13/24)

Deliverables – Overdue…

- MTC Bay area land use update (SEP)
- STLS regional model development
- 2020 S&T design report
- STLS WY21 POC Reconnaissance Monitoring - Update data for the Advanced Data Analysis
- Integrated Watershed Bay Modeling Strategy and Pilot Report

Deliverables – delayed

- 2021 S&T Bird Egg data upload
- RWSM Updated model and Technical Report
- Ethoxylated surfactants in ambient water, margin sediment, and wastewater
- PCB In-Bay contaminant modeling - report

Deliverables – due before next TRC meeting (9/24)

- Final Margins Report
- 2021 QA Summary Report for S&T Activities
- Sediment Deposition on SB Marsh (Whales Tail) report
- Integrated Watershed monitoring and modeling strategy report

Bay RMP Deliverables Stoplight Report_new

	Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
1	142758	RMP SEP	20. MTC Bay Area Land Use Update	Collect and transform data relevant to RMP Stakeholders	Tony Hale	04/30/23	03/31/21	1160	🚩	⚐	3	🔴	5/24/24 - Proposal for SFEI to take on this work completed by Tony, reluctance to spend RMP SFEI funds to satisfy MTC's needs. 3/18/24 - Tony has asked Melissa and Pete to develop a cost estimate for SFEI to update and maintain the data layer on a 2 year interval. 10/13/23 - SFEI met with MTC. MTC will be releasing the dataset with our (SFEI) enhancements/fixes per Kearey dataset would be published to data.ca.gov soon "a few weeks" 9/29/23 - Tony has added Tom M. and Amy K. to email communications with MTC. Still no specific release date.
2		Bay RMP (2023)	Special Study: STLS Regional Model Development (WDM Phase 3)	Control measures impact estimation	Matt Heberger	10/30/23			⚐	🚩		🔴	5/24/24 - Memo dated 4/23 requesting additional project funding and revised timeline to be sent to the SC. Memo proposes cancelling this deliverable and moving it to Phase 4. 3/18/24 - Matt H. is being onboarded to assume this work. 10/25/23 - Tan's departure delayed deliverables associated with this project. Revised timeline in development.
3		Bay RMP	**2020 S&T Design Report**	Final Report	Jay Davis	11/01/23	06/20/23	349	🚩	⚐	?	🔴	5/24/24 - Still working to finalize. Was deprioritized behind workgroup efforts. 3/29/24 - In finalization. 3/18/24 - Waiting on Jays final review before finalization. 10/11/23 - Internal SFEI review comments due by 10/18. 7/18/23 - Waiting on comments from Tom Grieb. Moving forward incorporating comments from others. Revised timeline to completion is 9/30/23.
4		Bay RMP (2022)	Special Study: STLS WY21 POC Recon Monitoring	Update data for the Advanced Data Analysis (ADA)	Alicia Gilbreath	04/30/24	06/30/23	339	🚩	🚩	3	🔴	5/30/24 - Still waiting on input from Lisa S. 3/18/24 - Waiting on response/ input from BAMSC. 1/9/24 - Lester to follow up with Lisa Sabin to discuss next steps. 12/5/23 - WB and BAMSC are interested in providing input but need more time to coordinate. 7/18/23 - In Dec 2021 it was decided to forgo the report and instead update data for the ADA.
5		RMP SEP	23. Integrated Watershed Bay Modeling Strategy and Pilot Implementation	Report	Lester McKee	06/01/24	12/31/23	155	⚐	⚐		🔴	8/16/23 - Draft report to be completed by June 2024. Lester McKee will replace Tan Zi as lead author. Revised timeline discussed with Tom Mumley.
6		Bay RMP (2020)	6. Status and Trends Monitoring	Final Margins report	Don Yee	06/14/24	12/31/21	885	⚐	🚩	8	🟡	3/18/24 - DS continuing work on reanalysis. Due date delayed. 1/11/24 - Data services will prioritize the reanalysis. 9/6/23 - Re-analyses on some ancillary vs target analytes to be done. Limited staff capacity to do the statistical reanalysis requested. 8/16/23 - Sent to Richard L. and Luisa V. for feedback.
7		Bay RMP (2021)	3. QA and Data Services	QA Summary Report for 2021 S&T Activities	Don Yee	06/14/24	09/30/22	612	🚩	🚩	8	🟡	3/18/24 - Miguel is working thru ancillary data QA. 1/9/24 - Waiting on ancillary data to be QA'd by DS. 10/24/23 - Many 2021 datasets are still pending various steps in the QA process. AXYS Bps & OPEs just added to review list, chl-a CN still in completeness check, POC in formatting. 9/6/23 - Data has been delivered from AXYS, waiting on DS to confirm which data sets have been received.
8		Bay RMP (2024)	38. NTA of SF Bay Fish, Yr 1	Complete Sampling and Analysis Plan	Rebecca Sutton	06/15/24	01/31/24	124	⚐	🚩	2	🟡	5/30/24 - Will be included in Sport Fish SAP which is on track to finalize in mid June 3/18/24 - Waiting on Sport Fish SAP.
9		RMP SEP	24. Regional Watershed Spreadsheet Model	Updated model and Final Technical Report	Alicia Gilbreath	06/30/24	12/31/23	155	🚩	⚐	1	🟡	5/30/24 - Pedro has begun work and aims to complete by end of June 3/18/24 - Still waiting on land use update. Jan. 2023 - Waiting for land use update SEP issue date 6/5/2021.
10		Bay RMP (2021)	Selenium in Clams	Task 4. Draft Report	Amy Kleckner	06/30/24	12/31/22	520	🚩	🚩	2	🟡	3/18/24 - Estimated completion in summer 2024, USGS data release coming soon. 10/24/23 - Waiting for DS to complete QA. delayed to allow for 2022 collections before working on the report
11		Bay RMP (2021)	26. Integrated watershed modeling and monitoring implementation strategy	Complete integrated watershed modeling and monitoring implementation strategy - Final report	Lester McKee	06/30/24	09/01/21	1006	⚐	🚩	5	🟡	8/16/23 - Draft report to be completed by June 2024. Lester McKee will replace Tan Zi as lead author. Revised timeline discussed with Tom Mumley.
12		Bay RMP (2023)	Special Study: STLS Regional Model Development (WDM Phase 3)	Model data collation and preparation	Matt Heberger	06/30/24	08/30/23	278	⚐	🚩	1	🟡	5/24/24 - Memo dated 4/23 requesting additional funding and revised timeline to be sent to the SC. 3/18/24 - Matt H. is being onboarded to assume this work. 10/25/23 - Tan's departure delayed deliverables associated with this project. Revised timeline in development.
13		Bay RMP (2023)	Special Study: Suspended Sediment in LSB-Year 2	Report detailing data collection, turbidity-to-SSC calibrations, and limited, descriptive interpretation	Scott Dusterhoff	06/30/24	04/30/24	34	⚐	⚐	2	🟡	5/24/24 - Report is in review. 4/2/24 - Lilia is the lead on this project. Plan to submit the report on 5/10.
14		Bay RMP (2024)	G. 2024 Bird Egg Sampling	Sampling and Analysis Plan	Amy Kleckner	06/30/24	02/28/24	96	🚩	🚩	2	🟡	5/24/24 - Draft in review. 3/18/24 - Waiting on finalization of shipping and processing plans.
15		Bay RMP (2024)	I. 2024 S&T Lab Intercomp Studies	Complete Study Design	Don Yee	06/30/24			⚐	⚐		🟡	5/24/24 - Decision to do a PFAS tissue comparison. Plan to incorporate into the Sport Fish SAP.
16		Bay RMP (2024)	K. 2024 S&T Field Sampling Report & Support	Post wet field season garage clean up	Martin Trinh	06/30/24			⚐	⚐		🟡	
17		Bay RMP (2024)	K. 2024 S&T Field Sampling Report & Support	Annual Lab Clean Up	Martin Trinh	06/30/24			⚐	⚐		🟡	
18		Bay RMP (2024)	L. 2024 Sport Fish Monitoring	Complete Sampling and Analysis Plan	Jay Davis	06/30/24	05/01/24	33	⚐	⚐	1	🟡	5/24/24 - Draft in review 3/30/24 - In development.
19		Bay RMP (2024)	40. OPEs, BP, and Other Plastic Additives in Wastewater	Complete Sampling and Analysis Plan	Rebecca Sutton	06/30/24			⚐	⚐		🟡	
20		RMP SEP	25. Sediment Deposition on South Bay Marsh (Whales Tail)	Final Report	Scott Dusterhoff	07/01/24	04/01/24	63	⚐	⚐	2	🟡	6/3/24 - Paper is currently in co-author review, planning to submit next month 3/18/24 - Submission is planned for this month. 10/23/23 - Work is being done by Lacy and Thorne (USGS) Draft report estimated to be completed by Feb 2024.

	Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
21		Bay RMP (2021)	21. Impact of Remediation Actions on San Leandro Bay Recovery from PCB Contamination	Task 5: Final technical report	Diana Lin	07/15/24	12/31/22	520	🚩	⚐	5	🟡	5/30/24 - Still waiting on comments from Frank Gobas 4/2/24 - Waiting on comments from Frank Gobas, early May is new estimated timeline for deliverable. 3/18/24 - Currently under review with PCBWG, comments requested by 3/23, aiming for finalization by 4/15. 1/11/24 - Internal review is complete, Stanford is leading the revisions. PCBWG to review in Feb and aiming for final report in Mar. 2024. 10/24/23 - Undergoing internal review, next to be reviewed the PCBWG.
22		Bay RMP (2024)	1. Program Management	2024 Q2 RMP Financial Report	Beth Birmingham	07/24/24			⚐	⚐		🟡	
23		Bay RMP (2024)	1. Program Management	Update Deltek Program Plans for Open RMP Years	Beth Birmingham	07/25/24			⚐	⚐		🟡	
24		Bay RMP (2024)	1. Program Management	SC Meeting Stoplight Report	Amy Kleckner	07/25/24			⚐	⚐		🟡	
25		Bay RMP (2024)	2. Governance	July SC Meeting	Amy Kleckner	07/25/24			⚐	⚐		🟡	Scheduled for 8/12/24
26		Bay RMP (2023)	Ethoxylated surfactants in ambient water, margin sediment, wastewater, Part 2 (year 2of 2)	Task 3. Complete laboratory analysis of samples	Diana Lin	07/30/24	01/30/24	125	🚩	⚐	2	🟡	7/30/24 - External delay due to analytical instrument fixes needed. 4/2/24 - Unlikely that Duke will deliver results by end of April. Diana L. to follow up with Lee F. 1/11/24 - Per 2023 discussions with Lee F. (Duke) the new deadline for lab analysis has been defined as April 2024. 5/29/23 - Duke University will be conducting analysis.
27		Bay RMP (2023)	Ethoxylated surfactants in ambient water, margin sediment, wastewater, Part 2 (year 2of 2)	Task 4. QA/QC and data management	Diana Lin	07/30/24	04/30/24	34	⚐	⚐	1	🟡	7/30/24 - External delay due to analytical instrument fixes needed. 4/2/24 - Unlikely that Duke will deliver results by end of April. Diana L. to follow up with Lee F.
28		Bay RMP (2023)	Nontargeted Data Mining	Task 4. Spreadsheet of compiled data mining results	Rebecca Sutton	07/30/24			⚐	⚐		🟡	
29		Bay RMP (2022)	3. QA and Data Services	QA Summary Report for 2022 S&T Activities	Don Yee	07/31/24	09/30/23	247	🚩	⚐	2	🟡	5/28/24 - In DS queue for formatting and QA review 3/18/24 - Bird egg data from AXYS still coming in. 10/24/23 - Waiting on bird egg data and PFAS archive data.
30		Bay RMP (2022)	Special Study: PCB In-Bay contaminant modeling (SLB)	Draft Report	Jay Davis	07/31/24	05/01/22	764	🚩	🚩	2	🟡	5/24/24 - Draft report not quite ready, a detailed progress report to be provided at the PCBWG meeting. 8/16/23 - Draft report to be completed by May 2024. Revised timeline approved by the PCBWG in June 2023. 5/29/23 - A revised deliverable timeline will be developed under the guidance of the PCBWG at the spring meeting on 6/6/23. Work in 2022 focused on developing a proposal and workplan for in-Bay modeling as part of the WQIF project. Actual modeling work has begun in Q1 of 2023.
31		Bay RMP (2024)	**A. USGS Sacramento Support**	Contract - Continuous suspended sediment monitoring at 5 stations	Amy Kleckner	07/31/24			⚐	⚐		🟡	
32		Bay RMP (2024)	**B. USGS Menlo Park Support**	Contract - Monthly measurements of basic water quality at 38 stations	Amy Kleckner	07/31/24			⚐	⚐		🟡	
33		Bay RMP (2024)	L. 2024 Sport Fish Monitoring	Complete contracts	Beth Birmingham	07/31/24	06/01/24	2	⚐	⚐		🟡	5/24/24 ICF contract finalized, MLML & SGS AXYS contracts waiting until fish collections begin.
34		RMP SEP	30. Analysis and Reporting of NTA Sediment Data	Manuscript	Ezra Miller	08/01/24	12/31/23		⚐	🚩	2	🟡	3/18/24 - Work on this has slowed, prioritized behind CEC strategy revisions. 1/8/24 - In prep and distributing to analytical partners for review. Continuation of 3018-036.
35		RMP SEP	30. Analysis and Reporting of NTA Sediment Data	Fact Sheet	Ezra Miller	08/01/24	12/31/23		⚐	🚩	2	🟡	3/18/24 - Work on this has slowed, prioritized behind CEC strategy revisions. 1/8/24 - In prep and distributing to analytical partners for review.
36		Bay RMP (2022)	Special Study: CEC in Urban Stormwater Year 4	Management summary	Rebecca Sutton	08/01/24	09/30/23	247	⚐	🚩	2	🟡	4/10/24 - Delayed until summer, after ECWG etc. 3/18/24 - Manuscript submitted on 3/5. 1/9/24 - Expect after manuscript is submitted, manuscript draft expected to be distributed for external review by end of Jan. 9/6/23 - Draft manuscript is expected in October. Final manuscript expected to be submitted for publication by the end of the year.
37		Bay RMP (2022)	Special Study: PCBs in sediment and fish SS/RC	Technical Report	Jay Davis	08/01/24			⚐	⚐		🟡	10/31/23 - We have received the sediment data from AXYS, but per Adam "there's programming work goin on to resubmit the fish data."
38		Bay RMP (2024)	C. 2024 Dry season water sampling	Complete contracts	Jennifer Dougherty	08/01/24			⚐	⚐		🟡	
39		Bay RMP (2024)	C. 2024 Dry season water sampling	Complete Sampling and Analysis Plan	Jennifer Dougherty	08/28/24			⚐	⚐		🟡	
40		Bay RMP (2021)	Selenium in Clams	Task 5. Final Report	Amy Kleckner	08/30/24	02/28/23	461	🚩	🚩	2	🟡	3/18/24 - Estimated completion in summer 2024, USGS data release coming soon. delayed to allow for 2022 collections before working on the report
41		Bay RMP (2023)	Special Study: PCBs in sediment and fish SS/RC (Year 2)	Final Technical Report	Jay Davis	08/30/24			⚐	⚐		🟡	10/31/23 - We have received the sediment data from AXYS, but per Adam "there's programming work goin on to resubmit the fish data."
42	Emerging Contaminants	RMP SEP	19. Quaternary Ammonium Compounds (QACs) in Bay Area Wastewater	Technical Memo	Diana Lin	08/31/24	08/31/22		⚐	🚩	2	🟡	4/2/24 - Report in review by ECWG. 1/8/24 - Draft report received from Anna (UMN?), coordinating data delivery with DS. Additional funding from NSF increased the scope of the project. The ECWG agreed to the suggested revised due dates for the deliverables so they can include the additional data.
43		Bay RMP (2021)	F. 2021 Bird Egg Data Mgmt	Processing and upload bird egg data	Adam Wong	08/31/24	10/31/22	581	🚩	⚐	4	🟡	5/21/24 - Waiting on AXYS to report PCBs results. 3/18/24 - In DS queue for formatting and QA review. 1/9/24 - All samples have been delivered to the labs. AXYS: PFAS data has been reported, PCBs and PBDEs expected end of Jan., pesticides? Hg and Se results from MLML are with SFEI DS. 11/30/23 - Samples shipped to USGS, FedEx delays caused samples to arrive at USGS completely thawed. USGS will ship to the analytical partners in Dec. Dry ice shortage causing delay.
44		Bay RMP (2021)	DMMO Database	DMMO Database Enhancements	Cristina Grosso	08/31/24	12/31/21	885	🚩	🚩	4	🟡	1/11/24 - Still waiting on final templates from Exa, expect to get them by end of Jan, Given Michael will be on leave for 1.5 months completion now expected end of summer 2024 12/5/23 - Exa templates are in final review stages.

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45		Bay RMP (2024)	4. Annual Reporting	RMP Pulse Draft	Jay Davis	08/31/24						🟡	
46		Bay RMP (2024)	5. Communications	RMP Update to BACWA	Amy Kleckner	08/31/24						🟡	
47		Bay RMP (2024)	5. Communications	RMP Update to BPC	Amy Kleckner	08/31/24						🟡	
48		Bay RMP (2024)	I. 2024 S&T Lab Intercomp Studies	Complete contracts	Beth Ebiner	08/31/24						🟡	
49		Bay RMP (2024)	50. Stormwater CECs Monitoring & Modeling 2024	Presentation to SC/TRC	Rebecca Sutton	08/31/24						🟡	
50		Bay RMP (2024)	24. Microplastics Stormwater Monitoring Pilot	Complete Sampling and Analysis Plan	Diana Lin	08/31/24						🟡	
51		RMP SEP	29. PFAS in Archived Sport Fish Communications Supplement	Manuscript	Miguel Mendez	09/01/24	12/31/23			🚩	3	🟡	6/3/24 - Work is underway 3/18/24 - Prioritized behind work on ECWG strategy and proposals and QACs report. Submission delayed until summer 2024. 1/8/24 - Draft under review
52		Bay RMP (2022)	Special Study: Sediment delivery to marshes in C&N Bay	Report	Melissa Foley	09/01/24	12/01/23	185				🟡	Jessie Lacy and Karen Thorne (USGS) doing the work
53		Bay RMP (2023)	PFAS in Archived Sport Fish	Task 6. Final report	Miguel Mendez	09/01/24	12/30/23	156		🚩	3	🟡	6/3/24 - Work is underway. 3/18/24 - Prioritized behind work on ECWG strategy and proposals and QACs report. Submission delayed until summer 2024. 1/8/24 - Draft under review 10/24/23 - Draft manuscript expected by early Nov. Submission for publication by the end of the year. Deliverable will be satisfied thru manuscript for SEP 29.
54		Bay RMP (2024)	4. Annual Reporting	2024 Annual Meeting Agenda	Jay Davis	09/01/24						🟡	
55		Bay RMP (2024)	L. 2024 Sport Fish Monitoring	Successful collection of samples	Jay Davis	09/01/24						🟡	
56		Bay RMP (2024)	38. NTA of SF Bay Fish, Yr 1	Collect Samples	Rebecca Sutton	09/01/24						🟡	
57		Bay RMP (2023)	Special Study: Sediment Delivery to Marshes in C&N Bays: project expansion	Report (draft paper) investigating the relationships between SSC in the shallows, SSC at long-term channel stations, and sediment accretion on marshes	Melissa Foley	09/15/24			🚩		1	🟢	Jessie Lacy and Karen Thorne (USGS) conducting this work
58		Bay RMP (2024)	4. Annual Reporting	RMP Pulse Final and send to printer	Jay Davis	09/20/24						🟢	
59		Bay RMP (2024)	2. Governance	September TRC Meeting	Amy Kleckner	09/22/24						🟢	
60		Bay RMP (2023)	Special Study: STLS WY21 POC Recon Monitoring	Laboratory analysis, QA, & Data Management	Alicia Gilbreath	09/30/24						🟢	
61		Bay RMP (2024)	5. Communications	Q3 RMP eUpdate	Amy Kleckner	09/30/24						🟢	
62		Bay RMP (2024)	5. Communications	RMP Update to BAMSC	Amy Kleckner	09/30/24						🟢	
63		Bay RMP (2024)	5. Communications	RMP Update to LTMS	Amy Kleckner	09/30/24						🟢	
64		Bay RMP (2024)	5. Communications	RMP Update to WSPA	Amy Kleckner	09/30/24						🟢	
65		Bay RMP (2024)	5. Communications	RMP Update at RB2 Meeting	Amy Kleckner	09/30/24						🟢	
66		Bay RMP (2024)	5. Communications	Updates to RMP website - Q3	Martin Trinh	09/30/24						🟢	
67		Bay RMP (2024)	C. 2024 Dry season water sampling	Collect samples	Jennifer Dougherty	09/30/24						🟢	
68		Bay RMP (2024)	N. NB Se Monitoring	Sampling and analysis proposal for 2025 S&T Monitoring presented to TRC	Amy Kleckner	09/30/24						🟢	
69		Bay RMP (2024)	40. OPEs, BP, and Other Plastic Additives in Wastewater	Collect Samples	Rebecca Sutton	09/30/24						🟢	
70		Bay RMP (2024)	30. Integrated Monitoring & Modeling for PCBs and Hg Phase 1	Lab analysis, QA, & data mgmt.	Alicia Gilbreath	09/30/24						🟢	
71		RMP SEP	32. Temporal variability in sediment delivery to a North and Central SF Bay Salt Marsh	Data made publicly available	Melissa Foley	10/01/24						🟢	
72		Bay RMP (2023)	Nontargeted Data Mining	Task 3. Presentation to ECWG on additional targets	Rebecca Sutton	10/01/24	04/30/24	34	🚩		1	🟢	4/10/24 - Delayed, Eun Ha just delivered the last data set, will be rolled into the CEC strategy revision.
73		Bay RMP (2024)	4. Annual Reporting	Annual Meeting	Amy Kleckner	10/16/24						🟢	
74		Bay RMP (2024)	2. Governance	October SC Meeting	Amy Kleckner	10/20/24						🟢	
75		Bay RMP (2024)	1. Program Management	Update Deltek Program Plans for Open RMP Years	Beth Birmingham	10/24/24						🟢	
76		Bay RMP (2023)	37. Tire and roadway contaminants in wet season Bay water (year 2 of 2)	Task 4. QA/QC, data management, and data upload	Rebecca Sutton	10/30/24						🟢	

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77		Bay RMP (2022)	Special Study: PCB In-Bay contaminant modeling (SLB)	Final report	Jay Davis	10/31/24			⚑	⚑	1	●	8/16/23 - Draft report to be completed by May 2024. Revised timeline approved by the PCBWG in June 2023.
78		Bay RMP (2023)	D. 2023 Dry season Bay Water Cruise Data Mgmt	Process and upload dry season Bay water cruise data	Adam Wong	10/31/24	01/31/24	124	⚐	⚑	2	●	3/18/24 - In DS queue for formatting and QA review.
79		Bay RMP (2023)	F. 2023 Wet season water data mgmt.	Process and upload wet season water sampling data	Adam Wong	10/31/24			⚐	⚐		●	
80		Bay RMP (2023)	H. Nearfield and margins sediment & prey fish data mgmt.	Process and upload sampling data	Adam Wong	10/31/24	02/28/24	96	⚐	⚑	2	●	3/18/24 - In DS queue for formatting and QA review.
81		Bay RMP (2023)	M. Ambient Bay sediment data mgmt.	Process and upload sampling data	Adam Wong	10/31/24	02/28/24	96	⚐	⚑	2	●	3/18/24 - In DS queue for formatting and QA review.
82		Bay RMP (2024)	**F. WY24 Wet season water data mgmt.**	Process and upload wet season water sampling data	Adam Wong	10/31/24			⚐	⚐		●	
83		Bay RMP (2024)	G. 2024 Bird Egg Sampling	Complete contracts	Amy Kleckner	10/31/24	01/31/24	124	⚑	⚑	3	●	5/24/24 - MLML & SGS AXYS contracts drafted, will be finalized by the end of the year for analysis in 2025. 3/28/24 - USGS contract finalized, SGS and MLML contracts to be completed in April 2024 for work in April 2025. 3/18/24 - Nearly complete, delayed as we work out details to improve past issues with processing and shipping.
84		Bay RMP (2024)	K. 2024 S&T Field Sampling Report & Support	Post dry field season garage clean up	Martin Trinh	10/31/24			⚐	⚐		●	
85		Bay RMP (2024)	1. Program Management	2025 Multi-Year Plan	Amy Kleckner	11/01/24			⚐	⚐		●	
86		Bay RMP (2024)	1. Program Management	2025 Detailed Workplan and Budget	Amy Kleckner	11/01/24			⚐	⚐		●	
87		Bay RMP (2024)	1. Program Management	2024 Q3 RMP Financial Report	Beth Birmingham	11/01/24			⚐	⚐		●	
88		Bay RMP (2024)	1. Program Management	SC Meeting Stoplight Report	Amy Kleckner	11/01/24			⚐	⚐		●	
89		Bay RMP (2024)	**M. 2024 Sport Fish data mgmt.**	Process and upload sampling data	Adam Wong	11/01/24			⚐	⚐		●	
90		Bay RMP (2024)	42. Continuous SSC and Wave Monitoring in SB and LSB, Yr. 3	Report	Scott Dusterhoff	11/01/24			⚐	⚐		●	
91		Bay RMP (2023)	Ethoxylated surfactants in ambient water, margin sediment, wastewater, Part 2 (year 2of 2)	Task 6. Final report	Diana Lin	11/30/24			⚐	⚐		●	
92		Bay RMP (2023)	Special Study: STLS Regional Model Development (WDM Phase 3)	Final modeling report and data sharing portal	Matt Heberger	11/30/24	12/30/23	156	⚐	⚑	1	●	5/24/24 - Memo dated 4/23 requesting additional funding and revised timeline to be sent to the SC. 3/18/24 - Matt H. is being onboarded to assume this work. 10/25/23 - Tan's departure delayed deliverables associated with this project. Revised timeline in development.
93		Bay RMP (2024)	2. Governance	December TRC Meeting	Amy Kleckner	12/09/24			⚐	⚐		●	
94		Bay RMP (2023)	Special Study: STLS WY21 POC Recon Monitoring	Wet season water samples collected and sent to the labs for analysis	Alicia Gilbreath	12/30/24			⚐	⚐		●	
95		Bay RMP (2023)	Special Study: Sediment Delivery to Marshes in C&N Bays: project expansion	Presentation to Bay Delta Science or State of the Estuary Conference	Melissa Foley	12/30/24			⚐	⚐		●	Jessie Lacy and Karen Thorne (USGS) conducting this work
96		Bay RMP (2024)	P. PFAS and NTA in Marine Mammals (Yr 2)	Sample collection	Rebecca Sutton	12/30/24			⚐	⚐		●	
97		Bay RMP (2022)	Special Study: Stormwater monitoring strategy for CEC's	Final strategy (approach) document	Kelly Moran	12/31/24	09/01/23	276	⚐	⚑	1	●	4/2/24 - New timeline is estimated to finish by end of 2024. 9/6/23 - Tan's departure delayed deliverables that went into the development of this strategy document. Requires insights from ongoing modeling and data science special studies. Pending additional remote sampler design to improve functionality for other CECs. Remote sampler had some technical challenges and we are looking to our advisors for consultation on priorities and next steps. Revised timeline depends on hiring process.
98		Bay RMP (2022)	Special Study: Ethoxylated surfactants in ambient water, margin sediment, wastewater. Part 2	Final Report	Diana Lin	12/31/24	08/31/23	277	⚑	⚑	2	●	10/24/23 - Revised timeline. Draft report in development. Delay from analytical laboratory to analyze remaining sediment and wastewater samples, expected final laboratory results by end of spring 2024. Final report expected 12/31/24. 7/18/23 - Jennifer D. collecting samples this week. Waiting for updated dataset from DS to begin report. Plan is to start drafting report as soon as data is received from DS but Duke U. has still not analyzed sediment and second round of wastewater. A draft may be completed by end of the year, but final report not expected until later.
99		Bay RMP (2022)	Special Study: DMMO Database Enhancements	Make testing results accessible on the DMMO website	Cristina Grosso	12/31/24	12/31/22	520	⚑	⚑	3	●	1/11/24 - Need to complete task 3021-046 first, timeline updated. 9/11/23 - Don't foresee any issues with completing these tasks on budget and schedule. However, the DMMO Project Team has asked us to prioritize the data template testing and database enhancement work first.
100		Bay RMP (2023)	3. QA and Data Services	QA Summary Report for 2023 S&T Activities	Don Yee	12/31/24	09/30/24	-119	⚐	⚑	1	●	
101		Bay RMP (2023)	Special Study: Sediment Flux Richmond Bridge	Data release	Scott Dusterhoff	12/31/24	05/11/23	389	⚑	⚐	1	●	9/15/23 - Per David Hart at USGS: work will not move forward in WY24, but do expect it to happen in WY25 as part of a larger project with the possibility of increased funding from other groups.
102		Bay RMP (2023)	Special Study: Ground work CEC Stormwater/ Stormwater monitoring for CECs strategy	Final Brief Report as a presentation to SST and an appendix to Stormwater CEC approach	Kelly Moran	12/31/24	12/31/23	155	⚐	⚑		●	4/3/24 - Presentation to the SST was completed in 9/2023, appendix will be completed on same timeline as the approach doc. 1/9/24 -Delayed until completion of the Stormwater CECs approach final strategy document (SS 2022).
103		Bay RMP (2024)	1. Program Management	RMP Participation Letters for BACWA and WSPA Agencies	Amy Kleckner	12/31/24			⚐	⚐		●	

	Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
104		Bay RMP (2024)	1. Program Management	Honoraria Payments to Science Advisors	Amy Kleckner	12/31/24							
105		Bay RMP (2024)	3. QA and Data Services	Online Data Access CD3	Cristina Grosso	12/31/24							
106		Bay RMP (2024)	3. QA and Data Services	Database Maintenance	Adam Wong	12/31/24							
107		Bay RMP (2024)	3. QA and Data Services	Updates to SOPs and Templates	Adam Wong	12/31/24							
108		Bay RMP (2024)	3. QA and Data Services	DMMO Database Support	Cristina Grosso	12/31/24							
109		Bay RMP (2024)	5. Communications	Q4 RMP eUpdate	Amy Kleckner	12/31/24							
110		Bay RMP (2024)	5. Communications	Updates to RMP website - Q4	Martin Trinh	12/31/24							
111		Bay RMP (2024)	**H. 2024 Bird Egg Data Mgmt**	Processing and upload bird egg data	Adam Wong	12/31/24							
112		Bay RMP (2024)	J. 2024 Sample Archive	Update RMP Archives database	michaelw@sfei.org	12/31/24							
113		Bay RMP (2024)	K. 2024 S&T Field Sampling Report & Support	Field Reports Reviewed and posted to website	Amy Kleckner	12/31/24							
114		Bay RMP (2024)	L. 2024 Sport Fish Monitoring	Sport Fish Report	Jay Davis	12/31/24							
115		Bay RMP (2024)	R. WDM Model Maintenance	Update model development log	Pedro Avellaneda	12/31/24							
116		Bay RMP (2024)	31. Tidal Area Remote Sampler Pilot - Yr 2	Data upload to CEDEN	Don Yee	12/31/24							
117		Bay RMP (2024)	1. Program Management	2024 Q4 RMP Financial Report	Beth Birmingham	01/31/25							
118		Bay RMP (2024)	**D. 2024 Dry season water Data Mgmt**	Process and upload dry season water sample data	Adam Wong	01/31/25							
119		Bay RMP (2024)	40. OPEs, BP, and Other Plastic Additives in Wastewater	Final Report	Rebecca Sutton	01/31/25							
120		Bay RMP (2024)	31. Tidal Area Remote Sampler Pilot - Yr 2	Draft Report	Don Yee	01/31/25							
121		Bay RMP (2023)	Special Study: STLS WY21 POC Recon Monitoring	Interpretation & reporting for BAMSC	Alicia Gilbreath	02/28/25							
122		Bay RMP (2024)	**Q. Marine Mammals data mgmt.**	Process and upload sampling data	Adam Wong	02/28/25							
123		Bay RMP (2024)	51. PFAS in Bay Water using the TOP Assay	Final Report	Rebecca Sutton	02/28/25							
124		Bay RMP (2024)	21. Monitoring of Sediment Deposition in SLB Intertidal Areas	Draft Report	Don Yee	02/28/25							
125		Bay RMP (2024)	I. 2024 S&T Lab Intercomp Studies	Presentation to the TRC on findings from IC studies.	Don Yee	03/01/25							
126		Bay RMP (2024)	3. QA and Data Services	QA Summary Report for 2024 S&T Activities	Don Yee	03/31/25							
127		Bay RMP (2024)	31. Tidal Area Remote Sampler Pilot - Yr 2	Final Report	Don Yee	03/31/25							
128		RMP SEP	32. Temporal variability in sediment delivery to a North and Central SF Bay Salt Marsh	Final Report	Melissa Foley	04/01/25							
129		RMP SEP	26. PFAS & Chlorinated Paraffins in Bay Sediment	Report	Rebecca Sutton	04/04/25							
130		Bay RMP (2024)	37. Tire and Roadway Contaminants in Wet Season Bay Water, Yr 3	Presentation at ECWG	Rebecca Sutton	04/30/25							
131		Bay RMP (2024)	39. PFAS Synthesis & Strategy	Final Report	Rebecca Sutton	04/30/25							
132		Bay RMP (2024)	21. Monitoring of Sediment Deposition in SLB Intertidal Areas	Final Report and data upload	Don Yee	04/30/25							
133		RMP SEP	27. High speed mapping of water quality parameters on the eastern shoal of South San Francisco Bay	Data release	Ariella Chelsky	06/30/25							
134		RMP SEP	27. High speed mapping of water quality parameters on the eastern shoal of South San Francisco Bay	Technical Report	Ariella Chelsky	06/30/25							
135		Bay RMP (2023)	PFAS and NTA in Marine Mammals (year 1 of 2)	Task 5. Draft manuscript(s)	Rebecca Sutton	06/30/25							
136		Bay RMP (2023)	Special Study: STLS WY21 POC Recon Monitoring	Final report	Alicia Gilbreath	06/30/25							

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137		Bay RMP (2024)	P. PFAS and NTA in Marine Mammals (Yr 2)	S&T study design recommendations (technical memo), presentation to TRC.	Rebecca Sutton	06/30/25							
138		Bay RMP (2024)	40. OPEs, BP, and Other Plastic Additives in Wastewater	QA/QC and Data Management	Rebecca Sutton	06/30/25							
139		RMP SEP	28. SF Bay Sediment Transport and Fate Modeling	Technical Report	Dave Senn	09/05/25							
140		Bay RMP (2023)	37. Tire and roadway contaminants in wet season Bay water (year 2 of 2)	Task 7. Final short report	Rebecca Sutton	09/30/25							
141		Bay RMP (2023)	PFAS and NTA in Marine Mammals (year 1 of 2)	Task 6. Final manuscript(s)	Rebecca Sutton	09/30/25							
142		Bay RMP (2024)	44. Spatial variability of sediment accretion in SFB restorations	Data release: soil properties, digital elevation models, and RTK GPS data	Scott Dusterhoff	09/30/25							
143		Bay RMP (2024)	44. Spatial variability of sediment accretion in SFB restorations	Report	Scott Dusterhoff	03/31/26							
144		Bay RMP (2024)	40. OPEs, BP, and Other Plastic Additives in Wastewater	Presentation at ECWG	Rebecca Sutton	04/30/26							
145		Bay RMP (2024)	38. NTA of SF Bay Fish, Yr 1	Presentation to ECWG and TRC	Rebecca Sutton	04/30/26							
146		RMP SEP	31. Investigating HABs in SF Bay	Data made publicly available	Dave Senn	06/30/26							
147		RMP SEP	31. Investigating HABs in SF Bay	Technical Report	Dave Senn	06/30/26							
148		Bay RMP (2024)	38. NTA of SF Bay Fish, Yr 1	Final Manuscript	Rebecca Sutton	09/30/26							
149		Bay RMP (2024)	44. Spatial variability of sediment accretion in SFB restorations	Presentation to RMP	Scott Dusterhoff	09/30/26							

Bay RMP Action Items Stoplight Report_New

	Primary	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	# of extensions	Due Date Extended (external delay)	Due Date Extended (internal delay)	Status	Comments	Meeting Date
1	Action Items 9/19/23	Share revised draft of margins report after reanalysis	Don Yee	06/01/24	12/31/23	155	1				3/18/24 - DS continuing work on reanalyses. Due date extended.	**09/19/23**
2	MYP Action Items 11/1/23	Revisit and discuss NTA and Passive Samplers for S&T 2025/2026	Jay Davis	08/31/24							4/1/24 - Becky is developing a more realistic budget for this effort.	11/01/23
3	MYP Action Items 11/1/23	Revisit/discuss future model maintenance, equipment maintenance, continuation of S&T pilot studies, and selenium funding before 2025 MYP update	Amy Kleckner	08/31/24							3/28/24 - Kayli is developing a proposed budget for this.	11/01/23
4	SC Action Items - 01/22/24	Prepare an org chart of SFEI employees that are key players in the RMP for the MYP meeting	Amy Kleckner	08/01/24								01/22/24
5	SC Action Items - 01/22/24	Develop a timeline/plan for 2025 Se sampling to present to the TRC and SC	Amy Kleckner	08/31/24	06/01/24		1				5/24/24 - Delayed until summer	01/22/24
6	Action Items from 06/20/23	Post updated SEP list to RMP website	Martin Trinh	06/30/24	09/04/23	273	2				1/11/24 - Will be added after a key resources and documents tab is added to special studies page in the new design. 10/25/23 - Prioritized behind new SFEI website template updates. 9/6/23 - will include in Q3 website updates. Extend due date until 9/30.	06/20/23
7	**November MYP/SC**											11/01/23
8	**January SC Mtg**											01/22/24
9	**April SC Mtg**											04/15/24
10	SC Action Items - 04/15/24											04/15/24
11	**June 2023 TRC**											**06/20/23**
12	**September 2023 TRC**											**09/19/23**