RMP Sources, Pathways and Loadings Workgroup Meeting

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An addendum to this package will be sent out next week and include the SPLWG Strategy Update as well as one more Tier 2 proposal: Stormwater CEC Modeling and Data Analysis.

RMP Sources, Pathways and Loadings Workgroup Meeting

May 20, 2024 09:00 AM – 3:00 PM

HYBRID MEETING

In Person
In-person: First floor conference room at SFEI

Remote Access

Join Zoom Meeting
https://us06web.zoom.us/j/7699356044?omn=84267209406

Meeting ID: 769 935 6044

Dial in: +1 669 900 6833 US (San Jose)

AGENDA

1.	**Introductions and Meeting Goals** The goals for this meeting are to: • Provide the Water Board and Permittee perspectives on the SPLWG management questions • Provide updates on recent and ongoing SPLWG activities • Inform group of project proposals in other workgroups that relate to SPLWG • Receive review and advice on SPLWG proposals for 2025 • Prioritize special study proposals for funding Meeting materials: 2023 SPLWG Meeting Notes, pages 5-17	09:00 Jay Davis
2.	**Information: SPLWG Stakeholder Perspectives** Water Board briefing on its schedule, plans and data needs for the upcoming TMDL reviews for PCBs and Mercury. Water Board and Municipalities briefing on the SPLWG science needed to support management and policy decision making. Desired Outcome: Informed Workgroup	09:15 Richard Looker, Setenay Frucht, Chris Sommers

3.	**Information: Strategy Update** The SPLWG is currently updating the guiding strategy and management questions for the workgroup. This revision process was funded in 2023 and last year the group came to a consensus on revised management questions. Strategy development is ongoing and the workgroup will hear the progress and discuss possible revisions. Meeting materials: Draft SPLWG Strategy Update, forthcoming in Addendum Desired Outcome: Informed Workgroup, consensus on draft Strategy and/or necessary revisions to come to consensus	09:40 Alicia Gilbreath, Lester McKee, Matt Heberger
	10 minute break	10:45
4.	**Project Update: Watershed Dynamic Model (WDM) Development to Estimate Watershed Loads** The watershed modeling team will describe progress of the multi-year WDM modeling project. Phase 3 of model development (underway but behind schedule) adds pollutants with PCBs and Hg as pilots. A related project, the integrated watershed-Bay modeling strategy, links Bay watershed and receiving water models. Additionally, staff will present a plan for the use of $50K in annual model maintenance funds for 2024. Meeting materials: Memo on proposed use of model maintenance funds in 2024, pages 18-19. Desired Outcomes: Informed Workgroup; feedback on modeling design and modeling strategy. Approval of model maintenance plan.	10:55 David Peterson, Kyle Stark, Pedro Avellaneda, Matt Heberger
5.	**Project Update: Stormwater Monitoring Activities** RMP stormwater monitoring activities in Water Year 2024 included monitoring for legacy pollutants (PCBs and Hg) at flow gauges to support modeling, monitoring for PCBs in watersheds that discharge to priority margin units, and pilot testing a remote sampler for deployment in tidally influenced areas. In this presentation, the SPLWG will hear about the stormwater monitoring accomplishments over the season and the experiences with the remote sampler deployments. Desired Outcome: Informed Workgroup, feedback on next steps of tidal remote sampler	11:50 Alicia Gilbreath, Jennifer Dougherty, Don Yee
	Lunch (30 minutes)	**12:30**
6.	**Summary of Proposed RMP Studies related to Stormwater and Proposed SPLWG Studies for 2025** The SPLWG science leads will present the stormwater-related monitoring and modeling activities in the other workgroups as well as a large regional collaborative project to develop a fixed-station monitoring network funded by the EPA. Then the leads will present the Tier 1 and Tier 2 proposed special studies for SPLWG funding in 2025. Tier 1 proposals are the highest priority projects for the workgroup and match the total allotted funding to the workgroup from last year. Tier 2 proposals have been selected from a long list of potential important workgroup projects and are presented in the event additional funding becomes available.	1:00 Matt Heberger, Alicia Gilbreath, Kelly Moran

	Clarifying questions may be posed, however, the workgroup is encouraged to hold substantive comments for the next agenda item. Desired Outcome: Informed Workgroup Meeting materials: 2024 Special Studies Proposals, pages 20-43.	
7.	**Discussion of Recommended Studies for 2025 - General Q&A, Prioritization** The workgroup will discuss and ask questions about the proposals presented. The goal is to gather feedback on the merits of each proposal and how they can be improved. The workgroup will then consider the studies as a group, ask questions of the Principal Investigators, and begin the process of prioritization by stakeholders. Desired Outcome: Clarify questions answered by scientific leads.	1:45 Jay Davis
	10 minute break	2:40
8.	**Closed Session - Decision: Recommendations for 2025 Special Studies Funding** RMP Special Studies are identified and funded through a three-step process. Workgroups recommend studies for funding to the Technical Review Committee (TRC). The TRC weighs input from all the workgroups and then recommends a slate of studies to the Steering Committee (SC). The SC makes the final funding decision. For this agenda item, the SPLWG is expected to decide (by consensus) on a prioritized list of studies to recommend to the TRC. To avoid an actual or perceived conflict of interest, the Principal Investigators for proposed special studies are expected to leave the meeting during this agenda item. Desired Outcome: Recommendations from the SPLWG to the TRC regarding which special studies should be funded in 2025 and their order of priority.	2:50 Jay Davis
9.	**Report Out on Recommendations**	3:20 Jay Davis
	Adjourn	3:30

RMP Sources, Pathways and Loadings Workgroup Meeting

May 23, 2023 09:00 AM – 3:00 PM

MEETING SUMMARY

1.	**Introductions and Goals for This Meeting**	09:00
2.	**Information: SPLWG Stakeholder Perspectives**	09:15
3.	**Information: Strategy and Management Questions Review and Upcoming Update**	09:35
4.	**Scientific Update: Watershed Dynamic Model (WDM) Development to Support Watershed Loads**	11:00
5.	**Scientific Update: Stormwater Monitoring Activities**	11:40
6.	**Summary of Proposed SPLWG Studies for 2024**	12:45
7.	**Discussion of Recommended Studies for 2024 - General Q&A, Prioritization**	1:30
8.	**Closed Session - Decision: Recommendations for 2024 Special Studies Funding**	2:20
9.	**Report Out on Recommendations**	2:50

Attendees

Name	**Affiliation**
Alicia Gilbreath	SFEI
Amy Kleckner	SFEI
Bonnie de Barry	SMCWPPP
Chris Sommers	Santa Clara County Program, EOA
Craig Jones	Integral
Daniel Lee	Geosyntec
David Peterson	SFEI
Diana Lin	SFEI
Don Yee	SFEI

Gerardo Martinez	SFBRWQCB
Jay Davis	SFEI
Jennifer Dougherty	SFEI
Jon Butcher	Tetra Tech, Technical Advisor
Kayli Paterson	SFEI
Kelly Moran	SFEI
Kevin Huniu	City of Portland
Kyle Stark	SFEI
Lester McKee	SFEI
Lisa Austin	Geosyntec
Lisa Sabin	EOA
Lisa Welsh	Geosyntec
Luisa Valiela	EPA Region 9
Martin Trinh	SFEI
Paul Salop	Applied Marine Sciences
Pedro Avellaneda	SFEI
Richard Looker	SFBRWQCB
Rob Carson	MCSTOPPP
Robert Budd	CDPR, Technical Advisor
Seteney Bozkurt Frucht	SFBRWQCB
Steve Corsi	USGS, Technical Advisor
Tan Zi	SFEI
Tom Jobes	Independent, Technical Advisor
Tom Mumley	SFBRWQCB

1. Introductions and Goals for This Meeting

Jay Davis welcomed attendees to the 2023 San Francisco Bay Regional Monitoring Program (RMP) Sources Pathways and Loadings Workgroup (SPLWG or WG) annual meeting. He gave a brief overview of the RMP, which focuses on addressing Management Questions. All workgroups are currently updating their Management Questions with an overall goal of updating the RMP's Multi-Year Workplan.

The goal for the meeting was to prioritize Special Study proposals that in total ask for $400k in funding. Past funding for this workgroup is around $300k, so this WG was tasked with prioritizing and editing proposals. There were two other proposals being presented at this meeting that would not compete for Special Study funding, and the WG was tasked with evaluating them for technical soundness and whether they align with the goals of the WG.

2. Information: SPLWG Stakeholder Perspectives

Richard Looker, representing the Water Board, and Chris Sommers, representing storm water agencies, gave an update on the regulatory process from the past year. They gave an overarching view of the reasoning behind efforts in this WG, giving context to the Management Questions to frame the discussion about revisions to those questions this year.

Richard began by saying the challenge in recent years is that we're in a transition period between legacy contaminants and CECs. There are three broad classifications of pollutants that we are trying to deal with simultaneously: legacy contaminants, CECs, and sediment. The SPLWG Management Questions are over a decade old. They were formulated with legacy contaminants in mind. It's time to revisit them and make sure they're robust, flexible and comprehensive to deal with all contaminants of focus for this WG. We need to follow the concepts included in MQs, but need to adjust them.

Chris discussed priority information needs. There are still information needs for legacy contaminants both at the parcel (which properties or buildings need abatement or controls?), and to get better estimates of loading at watershed and regional scales to inform regulatory decisions and tell us how well we're managing. Data for CECs are at a much less refined, lower resolution scale. We are able to apply knowledge from work on legacy contaminants to monitor and manage CECs. Sources can be a geographic area, and also a material or product in use. It's important to determine how to regulate them with policy at the state or federal level, and with many environmental agencies. The main focus is on the stormwater pathway, and less on wastewater and air, which are also discussed. We actively try to understand new issues before they become major water quality issues. That has not been the typical approach in managing contaminants, so we are unique in many ways.

Tom Mumley noted that this WG has been primarily focused on urban stormwater. We've pushed the envelope with what's required in permits for municipalities. There is overlap when putting legacy contaminants behind us and transitioning focus to CECs. There is a

lot of support from wastewater stakeholders, although they are not here today. We need to figure out the balance between all stakeholders as we continue to push the envelope. We benefit from collaboration from municipalities and the RMP team, and have gotten more efficient with communications. There is a challenge of how far the RMP goes relative to municipality (funder) responsibility.

Luisa Valiela agreed with Chris and Richard's summary. She highlighted things the EPA is focused on such as revisiting assumptions for legacy contaminants, for example the air deposition pathway for PCBs, as well as questions surrounding material testing. Jay Davis suggested that the PCB Workgroup is the best forum for technical questions regarding PCBs. Chris proposed to have discussions about trading information, the trajectory of work by municipalities and regulators, and identifying information gaps to better gather or share data. Setenay said she had been coordinating with Richard, Luisa, and Tom M. to have a meeting in the fall with Chris and others.

When asked if the Hg TMDL might be revisited in 2030, Tom Mumley said, "yes."

3. Information: Strategy and Management Questions Review and Upcoming Update

Jay Davis and Alicia Gilbreath presented on the update. The group then discussed the revisions to each Management Question.

MQ1

Old question: What are the loads or concentrations of Pollutants of Concern (POCs) from small tributaries to the Bay?
Proposed revision: What are the sources, pathways, and loadings of contaminants and sediment to the Bay?

Chris Sommers said it was sufficiently broad. Luisa liked the revision, but asked if there was any concern about making the MQ too broad by just saying "contaminants"? Richard Looker didn't see a downside or risk of it being too broad. The bigger risk is being too narrow. Tom Mumley asked how microplastics would fit in. Are they a contaminant? The word "contaminant" is associated with direct impacts on human health. Based on Water Code definitions, "pollutant" is broader than "contaminant". Chris agreed that "pollutant" is a better word for this purpose. "Contaminant" has implications for beneficial use, too. Jon Butcher noted that the term "pollutant" has a specific definition in the Clean Water Act that should be considered, but it is still in line with the purpose of this question.

Setenay Bozkurt Frucht noted that sediment is a pollutant under the Water Code. Chris suggested the word "sediment" remain because it can be a pollutant and resource. Rob Budd asked if sediment is too broad, and whether the group is focused on sediment-bound pollutants. Alicia said the group is interested in sediment and deposition and its impacts on the health of the Bay. Including all aspects of sediment would be in support of the Sediment Workgroup. Chris added that they tried to address needs beyond pollutants for broader understanding of ecological health of the bay, although his

doesn't fit with the RMP's historic contaminant focus. They have worked to make sure the WG thinks about sediment as a resource. Jay added that sediment supply for marsh restoration is of interest in the region and for the RMP. Tom Jobes said he supports keeping sediment as a separate item. He gave an example that on the Florida coast, excess freshwater can be considered a pollutant.

MQ2

Old question: Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by POCs?
Proposed revision: Which are the highest priority sources and pathways of contaminants that adversely impact or potentially adversely affect the Bay's environmental quality?

Setenay suggested changing "contaminant" to "pollutant." All agreed.
Alicia asked if sediment needed to be called out. Richard suggested using "pollutants" and having a footnote that explains what that means, and include sediment in that footnote. Clarify that we care about it as a resource. The idea is to reduce wordiness in the Management Question. Tom Mumley said the footnote idea was good.
Alicia said in the past "Pollutants of Concern" was thought of only as PCBs, when it also included Hg, so everyone needs to be on the same page when we define "pollutants".

Tom M. didn't like the term "highest", which could ignore other high priorities. He suggested changing that to "high." Tom M. noted that this question focuses on what causes adverse impacts, so this is not about the beneficial aspect of sediment. Luisa Valiela agreed with Tom M. that "sediment" is not needed here because the premise is related to Bay impairments. She asked if we are trying to keep the Management Question broad for pollutants that are or potentially are impacting the Bay. If that's the case, it shouldn't say "highest priority" at all. Or, are we using this to prioritize what we can use funding for when it comes to Bay impairments? Richard responded that there is management value for getting information for ranking sources, pathways, and loading. How do we rank watersheds? We want to attack areas that have the highest loading with our limited resources. He said there was nothing wrong with mentioning priority here. Managers want information to guide where to start. Luisa thought the old question was better for that purpose. Chris recalled why they went away from the old question. He said the term "leverage" has a management implication, and not only is it a priority, but actions can be taken to address it. For CECs the actions are to be determined. It could be high-priority, but we may not know what to do about it. He was supportive of changing "highest" to "high."

Chris then said that he thought "environmental quality" was broad, and wondered what that gets at (beneficial uses?). If sediment isn't being considered as a resource, then we need to focus on pollutant impacts. Richard said that "environmental quality" was a more generic way of dealing with the concept of impairment. There could be situations where we're dealing with a pollutant without an established impairment, but we could see a trend of worsening environmental quality.

Richard added to Chris's note on "leverage" versus "priority." Leverage is a feature of the source or pathway (size, location), and includes the concept of a relationship to beneficial use. For CECs, we don't know about leverages, and might just be looking at sources. "Priority" can encompass the kinds of work we'll do for the range of pollutants we're evaluating. It doesn't specify beneficial use, but doesn't preclude that.

Jon Butcher responded to multiple points made above. He said that "highest priority" is redundant. Just say "priority." He also supported changing "contaminants" to "pollutants." He noted that the Clean Water Act definition of pollutant explicitly includes sediment. He then asked why we don't we just say "beneficial uses" because that includes impact on biota, human health and anything else that impairs environmental quality.

Ultimately, the group agreed upon "Which are the priority sources" to begin the question.

Alicia asked the group if they would be okay with replacing "environmental quality" with "beneficial uses." Richard thought that was okay. He had avoided that because it is a regulatory term.

Don asked if we address sediment in any other Management Questions besides MQ1. He wanted to be sure it was getting due consideration in each question. Jay said sediment will be explained in a footnote. Tom M. said that we're pushing the envelope of the RMP to take on sources of sediment to the Bay. It is accounted for in the RMP Sediment Workgroup, which has a broader perspective, by design. He didn't see the RMP taking on efforts to characterize sediment sources. Don suggested that sediment be taken off of MQ1 for consistency.

Lester agreed with Jon and said that brevity and accuracy is important. He was worried about footnotes. Typically, they want to get these all on one screen for presentations. Footnoting might lose information in some modes of communication. Tom M. heeded Lester's thought, and said he had no interest in seeing that footnote carried into every communication. It will be documented in the write-up.

MQ3

Old question: How are loads or concentrations of POCs from small tributaries changing on a decadal scale?

Proposed revision: Are levels of individual contaminants or contaminant classes changing over time in the sources, pathways and loadings? What factors or management interventions have contributed to the change?

No discussion, all agree on the wording as long as "contaminants" is replaced by "pollutants."

MQ4

Old question: Old MQ4: Which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff? Old MQ5: What are

Proposed revision: What are the most effective management actions that can be implemented in the region to address pollutant pathways and sources, and where should they be implemented to have the greatest impact?

Chris suggested removing the word “most,” and Tom Mumley agreed.

Tom Jobes noted that the second part of MQ3 seems to overlap MQ4. He asked if the second part of MQ3 needed to be there. Jay said that MQ3 is more about trends and MQ4 is more about forecasting. Alicia said they are linked. Tom J. pointed out the overlap for discussion: Richard said MQ3 has factors or management because there can be non-management factors that contribute to change. The two questions are distinguished by time. All questions are related. There could be activities that fit in one of these questions better than the other, so they’re useful.

Chris suggested that the word “impact” be changed to “benefit.” Jay noted that adverse impact is in MQ2. Seemed to be agreement on “benefit.”

The strategy update outline will be sent out in mid June. Early September will be the next Core Group meeting. Jay welcomed everyone to continue to think of these questions. This was a major step forward.

4. Scientific Update: Watershed Dynamic Model (WDM) Development to Support Watershed Loads

Tan Zi introduced the progress update on the Watershed Dynamic Model (WDM). David Peterson presented updates to the new land use layer used in the WDM and general changes with this update. Kyle Stark presented ongoing efforts to optimize potency factors using water samples with known drainage areas. Next steps include source area inventory and representation, Green Stormwater Infrastructure (GSI) data collection and effectiveness simulations, and completing a draft report in the winter. Tan proposed that they move forward with the interim MTC land use data rather than wait for MTC to finish their work on an unknown timeline. He also proposed to merge the 2022 and 2023 reports into one. Tan then briefly introduced the integrated watershed strategy.

Opening the discussion, Jon Butcher expressed that the team seems to be on a reasonable path. He suggested that they might need to do their own QA/QC on the interim land use data. Rob Budd and Steve Corsi agreed that the approach looked good.

Tom Mumley raised a concern about the extra effort required to model every contaminant in both the particulate and dissolved phases, when the desired end result is total loading. Don responded that it is best to keep the phases separate because we don’t know how CECs behave, and that gives us flexibility and may prove critical in identifying pathways. Jon mentioned that it’s important to simulate both particulate and dissolved phases separately. For particle reactant pollutants, one major source can be storage of such pollutants in streambeds and sludge in pipes, which is not necessarily attributable to current loads but can be remobilized. Lester noted that we do have the

RWSM that is capable of modeling total concentrations without separating dissolved and particulate and that might be the chosen model for some pollutants moving forward.

Tom M. then discussed source area analysis. He wanted to be sure we can adjust land use categories where we have knowledge that land use doesn't match, or where sub-parcel scale source area information exists. What caught his attention was that the Transportation class was comparable to Old Industrial. Not all road surfaces will be like Old Industrial land use. For instance, CalTrans has a particular type of pavement that retains sediment well, and may do the same for PCBs.

David mentioned that an issue with MTC land use was gaps between roads and other parcels, and those Right of Way gaps were grouped into the Transportation class. He suggested a separate meeting to discuss the details.

Chris Sommers agreed we need a separate meeting for this discussion. He provided thoughts on the potency factor analysis. The current method assigns a point to underlying land use and assumes that land use is the contributor to the pollutant sample. It's not that simple. Samples on a street or near a catch basin could have contributions from neighboring land uses. We need to be more creative than simply overlaying our samples on the land use layer. Transportation is tough because it is not mutually exclusive from all other land uses around it. Other than caulking or expansion joint issues, roadways themselves are not generally sources for PCBs. They are transported by wind, water, or vehicles onto the roadway. This needs further discussion.

Second, the data were collected over a long time period and the current method is not considering time. We should discuss whether old data are the same as new data, and how land use may have changed between sample dates. He also hasn't seen the new MTC data layer, but they found issues with the ABAG version in the past.

Lastly, in previous models source categories and buffer areas were our best guesses at the time. We now have a lot more data that we should use to support potency factors rather than making predictions of where source areas exist. We can now associate monitoring data with known sources. Then we can model those areas and calibrate those areas. Source areas should be considered as a different land use class. We do need to have a series of meetings to talk through this with the advisors being involved.

Tom M. emphasized that we need to work together to get MTC's final data, not the interim data. He had reservations about simulating potency factors rather than developing them empirically. As long as there is some sort of validation we can work with that especially if we can make adjustments. Tom M. asked the team to proceed with caution on the Greening Stormwater Infrastructure effectiveness task because available data have a lot of variability.

Jon responded to the source area concerns. Analysis should not simply use the point on a map, but try to characterize the contributing flow area. He also mentioned that roads have a lot of transformers on them so they are sources in some places. Chris said that dirt samples do not have an associated drainage area, so some way of buffering could help get a better representation of what it depicts.

Richard Looker discussed the issue of time in the analysis. Conceptually you are attempting to define the potency factors for a land use category. There is uncertainty with the variability in data and applying those samples to a large study area. There will inevitably be mismatches between the data and land uses. He asked if data could be weighted based on confidence that a sample represents a land use correctly (possibly giving more weight to more recent samples). Kyle said that assigning weights for the importance of individual data points can be done. Chris asked why the analysis can't use land uses assigned to a time frame close to each sample. Tan said that we only have two data layers for urban land use: ABAG 2005 and the new MTC Interim data.

Luisa asked in the chat: what land use data category would we expect the following to "show up" under? Airports, rr lines, PGE infrastructure. Or expect these land use cover data to not cover these properties per se?
Don replied to Luisa, some of these classifications will probably need verification and QC since at a microscale their uses changed for some of them between maps, when there was no/minimal underlying change in function (some areas around Oakland and Hayward airports had odd changes for example).

5. Scientific Update: Stormwater Monitoring Activities

Alicia gave an update on stormwater monitoring activities over that past year. Jay encouraged the group to see the presentations sent out with the agenda package. Chris thanked the stormwater team for the hard work.

6. Summary of Proposed SPLWG Studies for 2024

Presentation 1: Pedro Avellaneda presented the first proposal on integrated modeling and monitoring. Tom Mumley asked for more information on monitoring. Pedro said with this proposal, monitoring efforts will sample two storms for three watersheds. Alicia noted that last year a two-year study was proposed, and this covers the second year of that study. Tom M. asked that the background be documented in the proposal. Of those three watersheds, Guadalupe and Walnut Creek are large and mixed land uses with units of interest. Corte Madera is primarily residential. He asked if sampling two storms was adequate. Alicia said Gadalupe was included to extend the temporal series of samples, and the other two for spatial extension of modeling verification. This was a two year study, but two storms at a site aren't enough. They were proposing two to three years so that two storms each year would result in four to six samples. Richard asked for that explanation to be included in the proposal. Tom M. said this explanation shows that they'll improve data richness.

Lisa Austin asked if funding for the final phase 1 report was included in the $261k for phase1 and $121k for phase 2. If the final phase 1 report should be in year 2, that would be helpful for budget distribution. Tan said it's split between year 1 and 2. There's an option for just one report at the end. The initial intention was to have an annual report, but from a project perspective having one report is better.

Presentation 2: Jennifer Dougherty presented on the proposed pilot study using a detection dog team for source tracing of PCBs in Old Industrial areas of the San Leandro Bay (SLB) watershed. Jon Butcher was interested if the Washington Department of Ecology was using the program in remedial efforts. Jennifer said Seattle Public Utility is using it in two situations, for identifying unknown sources and when having difficulty identifying specific contributing areas at known source sites.Tom Mumley said these dogs are used on a regular basis, and essentially the proof of concept has been proven. This proposed project would be to validate it in the Bay Area, but seems that it would work here.

Tom M. raised the concern about whether Oakland and Alameda County participate and take results and put them into action. Lisa Austin noted that the Alameda County Clean Water Program and the City of Oakland was not notified about this project. They have collected and provided a lot of street dirt data in this watershed. The San Mateo program has been thinking about doing a study with the same organization. John Conan at EOA is taking the lead on that. BAMSC is interested and willing to collaborate, but it requires a conversation prior to developing a study like this in a local jurisdiction. Chris asked why the study area was selected and if there is an option to change the location to where partners are more supportive. Alicia said the SLB watershed was attractive for a number of reasons but it can be moved to wherever collaborating partners are interested.

Lisa A. said this study could be useful for evaluating representative land use types rather than specific areas where we know a source exists. That would be a more interesting question: can a dog be used to identify other areas other than heavy Old Industrial. For instance, a business park with a lot of broken concrete filled with caulk. We haven't been able to evaluate those areas in more detail. Jennifer said Jasper has been used to detect caulk on buildings in urban centers. Alicia said there are a number of study opportunities here. They were interested in SLB because the Elmhurst watershed draining to SLB has elevated levels, but no identified source. Ultimately, collaboration with stakeholders about location is needed.

Lisa A. asked about the long-term vision for doing this work. Would a team be brought in from Seattle, or could local dogs be trained? Richard pointed out that it's been piloted, and it works. What we don't know is the scalable factor. How fast can we survey an area of a certain type? We need a pilot to focus on the operational aspect of this, not to prove the dog can do it. If successful, we would like to scale up to potentially screen thousands of acres of Old Industrial area using grant resources to do that. He suggested the group establish a way to use grant funding to possibly hire this team for a bigger contract. Alicia said this dog has uniquely been trained for PCBs, and this is an established program that can train more dogs. Jennifer said in the 2020 pilot study they were able to cover 16 blocks within 2 hours with prep work that included determining the age of buildings so they could bypass buildings newer than 1980. The average number is 8-12 blocks per 2 hours and the dog needs a break. The ideal conditions were about 4 hours of work per day.

Tom said the request for early release is unusual and that it's very early. The steering committee doesn't meet until Aug. 10 and doesn't adopt a budget until November. The

project couldn't begin until the third week in August if everything is all set up to fall into place.

Presentation 3: Alicia presented a proposal for year 2 of the tidal area remote sampler pilot. Tom Mumley said that one sample per site seems too low and suggested two samples at four sites. Don said it depends on priorities. Testing is partly focused on the mount dislodging or other damage. In that case, a second event would not be much different unless it varies in size. The study is not focused on getting a representative sample of the watershed, but rather about testing the situations the method can be used.

Chris asked if the variability between sites is of greater importance than the variability between storms. Don said the difference between sites is more important. We know it works in some areas. If there is a failure, we want to try that again to adjust for that failure. This will allow flexibility to move toward more variety. Don said 5 sites were sampled last year, and this would be an additional 8 sites for a sample size of 10-13. However, issues at Belmont Creek might require further testing at that site. It's a highly energetic system and we may want to try different mounting systems there.

Tom M. asked why analysis of Hg would be needed when this is thinking ahead to CECs. Alicia noted that dropping analysis of samples would save $20k-$25K, but Chris said that every opportunity to take samples should be taken. Don said testing the sampling mechanisms is important because there will be similar challenges with CECs.

Presentation 4: Alicia presented a general proposal to purchase remote samplers. Jay reminded the group that in the closed session they should make a decision of whether this is technically sound and a good use of RMP funds.

Presentation 5: Tan Zi presented the general proposal for the WDM maintenance. Chris Sommers had logistical questions about how the planning and feedback process will work. Would it involve developing a workplan and then getting budget approved, or developing the workplan after budget approval. Tan said that proposed tasks with the associated budget would be proposed at the beginning of each year, then at the first quarter TRC meeting, it would be reviewed for approval.

Tom Mumley thought the maintenance spending was premature, with development of the model ongoing. $50k in 2024 seemed too early. The Steering Committee will want documentation on the reason for starting in 2024. Conceptually, Tom M. is on board.

Jon Butcher asked if Tan had modified the LSPC code from EPA and Tetra Tech versions? Tan said no, he is using the EPA version. Jon said they may need to pursue some updates to code because it doesn't run fast, he's concerned the code is difficult to understand and it doesn't have good internal documentation. It is important that someone other than Tan knows that code.

Tom Jobes noted that the hydrology and sediment models are complete, and it is worth starting maintenance on those. He asked what would be done in the year 3 reevaluation.

Tan said the hope is that every 3 years the model doesn't need to be recalibrated, but the modeling results would be verified. Every 5 years it is good to think about recalibration. That's why the proposal has more frequent reevaluation than recalibration.

Jon asked where the update to land use fits into the model maintenance. Tan said that once there is a final release, versions need to be compared to see if there is a big change. If there is substantial change, the model may need to be calibrated. This fund could be a buffer to fund that effort. Lester added that they hope to have land use updated in incremental years, which would be good for modeling, but challenging to fund efforts involved in that process. MTC has discussed frequent updates, but those efforts are unknown.

7. Discussion of Recommended Studies for 2024 - General Q&A, Prioritization

Tan offered an option for adjusting the budget for the monitoring & modeling proposal. To reduce the $261k first year budget, it could be possible to move some modeling budget for the sensitivity analysis into the second year. Most modeling tasks can happen in the second year. With that change, we could move $40k to the next year for roughly $220k in year one and $160k in year two.

Tom Jobes asked if there is synergy or competition between the tidal sampler deployment pilot and the purchase of remote samplers. Alicia said there is synergy because they involve the same type of sampler. The deployment of tidal remote samplers does not include funding for improvements of the sampler, just testing deployment scenarios. Tom J. asked if it is possible to do one instead of the other Alicia and Don said, yes. They are not reliant on one another. Kelly noted there is no guarantee that the remote sampler will be the SFEI Mayfly. Sampler selection for the CECs monitoring will be made in consultation with the special advisory team for the development of the RMP's stormwater CECs approach. It will depend on the outcome of sampler blank testing and container adherence testing. We are currently awaiting lab results for these tests. There is a real possibility that we need to use different containers and/or different samplers for at least some CECs families.

Rob Budd asked about the level of effort needed to expand the current modeling and monitoring framework to other chemicals. He asked if the same level of monitoring would be required or if modeling could be done based on physicochemical properties. He was concerned the model is so specific to Hg and PCB that it can't be applied to other chemicals. Pedro said the work in the proposal is specifically for PCBs and Hg, but expanding to other contaminants is possible and it will depend on different mechanisms involved. For those associated with sediment, this model will work. Tan said the uncertainty analysis in this proposed project will result in uncertainties for PCBs, Hg, flow, and sediment simulations, and the last two will be useful for modeling other contaminants. He said it is yet to be determined if the potency factor method will be used for a given CEC. Once we settle on methodology for simulating CECs, we can discuss leveraging this model for those contaminants.

Steve Corsi said he liked the autosampler proposal. Field testing seems to show that they work in the field. The main question is whether there will be contamination in the sampling process. He asked if the primary concern is contamination or logistical. Don said there are some logistic concerns. So far this has been tested in small urban watersheds. There are questions of whether we need to go beyond that for things like underground channels. The question of contamination is relevant, but the flow regimes that the sampler can survive also need to be determined. Don was confident that more than half the time deployment will go well, but extreme flows and other scenarios have not been evaluated. Steve asked that if contamination is found, are they open to change materials? Don said they are open to changing almost every component in the sample train. If sample containers are switched to glass, steps need to be taken to protect against breakage, which is feasible. Kelly added that deployment scenarios so far show from the deployment capability perspective, it would work for the CECs program.

8. Closed Session - Decision: Recommendations for 2024 Special Studies Funding

Those involved with the proposed Special Studies left the room while the rest of the WG prioritized projects.

9. Report Out on Recommendations

Chris Sommers reported the results of the closed door session to the entire WG. These recommendations will go to the Technical Review Committee for prioritization of all projects across workgroups, then to the Steering Committee for final funding decisions.

The highest priority was the integrated modeling and monitoring strategy. The group took Tan's suggestion of moving the sensitivity analysis and reporting into year 2. The second highest rating was the tidal area remote sampler pilot project. The group went back and forth on how many sites to include, but ultimately would like to fund the full site number, but allow the TRC to adjust if needed. Finally, the group decided to recommend funding the PCB detection dog project at $25k, however the project needed better scoping. The scope of the project could shift to work needed in development of a grant proposal to get higher levels of funding. Reasons for this include uncertainty with municipal partnerships, the handler and dog, and whether the pricing for Aroclor samples is correct or if that is the appropriate methodology. The group suggested possibly moving over the proof of concept in the Bay area and taking steps to fully launch the project. If the RMP funds are in the right place, this WG would like to fund development of a more robust proposal.

Regarding the integrated modeling and monitoring proposal, Jay requested more details on the uncertainty analysis and ability to utilize the model for other contaminants. The WG advisors will look at revised proposals before they are sent to the Technical Review Committee.

Memo

From: Matthew Heberger, SFEI

To: RMP Sources, Pathways, and Loadings Workgroup

Date: April 23, 2024

Re: Proposed Watershed Dynamic Model Maintenance Activities

The RMP 2024 Workplan included a $50,000 budget for maintenance of the Bay Watershed Dynamic Model (WDM). As described in the project proposal, the purpose was to create an annual fund for ongoing model maintenance and improvement tasks. Each year, around April, "the modeling team will provide a proposed task list and estimated budget for COW review, TRC review, and SC approval." A number of possible tasks were listed including:

- Model simulation extension
- Data updates and calibration
- Capacity building and training
- Model updates and improvements
- Outreach and communication

In this memo, we present our proposed list of model maintenance activities for 2024, along with a brief description and budget.

Model inputs have already been gathered through December 2023 as a part of other modeling projects at SFEI, thus there is no need to update the model input data to bring it up to date. However, other elements of the input data could be improved. Further, we have received a handful of requests for model input files and model outputs, clear evidence that there is interest in our model among the scientific and management communities. Proposed activities respond to these needs, as well as the need for staff training. Planned tasks include:

1. **Training in LSPC and BASINS for modeling staff**. EPA occasionally hosts online or in-person training courses. Or this could simply cover staff time to work through tutorials on new features or modules that staff are not familiar with. Relevant staff are Matt Heberger, Pedro Avellaneda, and possibly others, according to their interest and availability.
2. **Create a model webpage / dashboard**. This would cover creation of a dedicated webpage (at sfei.org, under the RMP pages) for the WDM. The main purpose is to make the modeling work more findable, accessible, and transparent. For other modelers, it would allow for the download of model input and output files. For a more general audience, it will also include an interactive map showing the model domain and locations of gages used for model calibration, along with some visualization of model

goodness of fit for flow and sediment, to be expanded to cover other constituents in the future.

3. **Update / clean up weather and climate data scripts**. At present, model inputs of climate data (precipitation, wind speed, temperature, potential evapotranspiration) are downloaded and processed by a handful of ad hoc scripts in Python and R written by staff. We may be able to save time and streamline this process by using the BASINS weather data processor (related to Task #1 above). The scripts should be better documented to make them more future-proof with any unanticipated staff changes. Finally, there is some evidence that the stochastic disaggregation algorithm used to convert precipitation from a daily to an hourly time step (needed by the model) has some undesirable characteristics. We would investigate replacing the current method with one based on observations. Model output at an hourly time step is required to support the work of the in-bay modeling team.
4. **Update model simulation of evapotranspiration.** Recent evidence has come to light that the WDM's simulation of potential evapotranspiration (PET) is not very accurate. In this task, we would investigate the source of this problem, and consider replacing the existing data source (the assimilation model NLDAS) with a better source of PET observations.

Budget

Staff member	Role	Task 1. Staff training	Task 2. Web dashboard	Task 3. Script Devpt	Task 4. PET Fix	Total Hours	Total Expense
Pedro Avellaneda	Environmental scientist	24	8	4	40	76	$11,628
Matt Heberger	Environmental scientist	24	64	16	20	124	$18,972
Kyle Stark	Environmental scientist	24	24	64	8	120	$15,960
Lester McKee	Senior scientist (oversight and input)	2	4	2	2	10	$2,510
	Total	**74**	**100**	**86**	**70**	**330**	**$49,070**

Special Studies Proposed for 2025

Tier	Proposal name	Budget
Tier 1	Integrated Monitoring and Modeling to Support PCBs and Mercury Watershed Loads Uncertainties Assessment and Monitoring Design (Year 2 of 2)	$167k
Tier 1	Tidal Area Remote Sampler Pilot - Yr 3	$15k
Tier 2	GIS Improvements to Support Modeling, Data Interpretation, and Site Selection	$80k
Tier 2	Stormwater Systems Management and Equipment Upgrades	$80-$180k
Tier 2	Mallard Island PCB Load Trends Monitoring	$120k
Tier 2	Add-on to Stormwater Contaminants of Emerging Concern (CECs) Monitoring and Modeling 2025 Project to Include Additional Non-CECs Analytes	Up to $52.4k
Tier 2	Develop Discharge Rating Curves at County-Operated Stage Monitoring Stations	$30-$188k
Tier 2	Guadalupe PCB Load Trends	$60k
Tier 2	Stormwater CEC modeling and Data Analysis (see addendum)	$39k
	SPLWG Strategy Funding Statement	$65k

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

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 that ring the Bay. The RMP has monitored stormwater throughout the region over the last 20+ years, providing the 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 scale. The SPLWG is now building an integrated modeling and monitoring framework to further address the PCBs and Hg management questions, such as the PCB TMDL reconsideration planned for 2028.

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.

Estimated Cost: $167K for Year 2 (2025); ($217K was funded for Year 1 in 2024)
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 2)	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 Year 3 work - estimating PCBs and Hg loads from local tributaries - will be completed in 2023. 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 reconsideration 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 2024. 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.
Management Question	**Study Objective**	**Example Information Application**
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:

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.

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)		Total	
Expense	**Hours**	**Cost ($)**	**Hours**	**Cost ($)**	**Hours**	**Cost ($)**
Uncertainty analysis	400	$62,000	740	$103,600	1140	$165,600
Stormwater monitoring and data management	484	$71,820			484	$71,820
Report and scientific communication	98	$15,190	279	$43,870	377	$59,060
Project management and science overview	100	$22,134	80	$17,707	180	$39,841
Subcontracts						
SGS AXYS Analytical, Brooks Applied Laboratories		$37,000				$37,000
Direct Costs						
Equipment		$2,050				$2,050
Travel		$2,100		$2,100		$4,200
Shipping		$4,500				$4,500
Total	**1082**	**$216,794**	**1099**	**$167,277**	**2181**	**$384,071**

Budget Justification

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.

Reporting

- Presentations at SPLWG meeting
- Final report
- 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. 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.

Estimated Cost: $15k; 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**

Budget Justification
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**

Budget Justification
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.

Early Funds Release Request
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

Gilbreath, A.N., Hunt, J.A., Yee, D., and McKee, L.J., 2019. Pollutants of concern (POC) reconnaissance monitoring final progress report, water years (WYs) 2015 - 2018. A technical report prepared for the RMP, SPLWG, STLS. Contribution No. 942. SFEI, Richmond, CA. https://www.sfei.org/documents/pollutants-concern-reconnaissance-monitoring-water-years-2015-2018

Gilbreath, A.N., and McKee, L.J., 2021. Pollutants of Concern Reconnaissance Monitoring Progress Report, Water Years 2015-2020. SFEI Contribution #1061. San Francisco Estuary Institute, Richmond, California. https://www.sfei.org/documents/pollutants-concern-reconnaissance-monitoring-progress-report-water-years-2015-2020

Kahl, M.D., Villeneuve, D.L., Stevens, K., Schroeder, A., Makynen, E.A., Lalone, C.A., Jensen, K.M., Hughes, M. Holmen, B.A., Eid, E., Durhan, E.J., Cavallin, J.E., Berninger, J., and Ankley, G.T. 2014. An inexpensive, temporally integrated system for monitoring occurrence and biological effects of aquatic contaminants in the field. Environmental Toxicology and Chemistry, Vol. 33, 7, pp 1584-1595.

SFRWQCB, 2015. California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, Order No. R2-2015-0049, NPDES Permit No. CAS612008. November 19, 2015. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/R2-2015-0049.pdf

Wu, J., Gilbreath, A.N., McKee, L.J., 2017. Regional Watershed Spreadsheet Model (RWSM): Year 6 Progress Report. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), Sources, Pathways and Loadings Workgroup (SPLWG), Small Tributaries Loading Strategy (STLS). Contribution No. 811. San Francisco Estuary Institute, Richmond, California. http://www.sfei.org/documents/regional-watershed-spreadsheet-model-rwsm-year-6-final-report

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

Summary: This special study provides for the collection and processing of geographic datasets to support improved monitoring and modeling across Bay watersheds. 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. 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. 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 the WDM 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. 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.

Estimated Cost: $80K
Oversight Group: SPLWG
Proposed by: Matthew Heberger, Alicia Gilbreath, Amy Kleckner
Time Sensitive: No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Project scope	February 2025
Draft project report	October 2025
Final project report	November 2025

[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).

Special Study Proposal: Stormwater Systems Management and Equipment Upgrades

Summary: All of the RMP workgroups rely on the stormwater monitoring program 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. (scaleable, up to $80k ($40k if awarded lower funding))

- 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. ($10k)
- Improving our monitoring sites database, and systems for efficiently logging information about site reconnaissance, site visits, sampler deployments, etc. ($20k)
- Expanded team training to build labor capacity. (scaleable, up to $20k ($10k if awarded lower funding))
- Purchasing flow monitoring equipment ($50k (2nd tier priority; only purchased if awarded higher funding)).

As part of these improvements, we plan to contact other major sampling programs to identify best systems processes and the latest monitoring method technologies.

Estimated Cost:	$80k - $180k; 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, purchase of velocity meter	December 2024
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	August 2026

*Timeline shifted back if funds not released early.

Special Study Proposal: Mallard Island PCB Load Trends Monitoring

Summary: The Sacramento River is a major source of PCB loads to the Bay. The 2009 *PCB TMDL and Basin Plan Amendment* estimated the flux at Mallard Island as 11 kg/yr, or 31% of the average external load. Monitoring at Mallard Island was done from 2001 to 2010 (David et al., 2015). Several factors may have contributed to changes in PCB loading in the last 14 years: (1) new development and redevelopment associated with population increases in the Central Valley, (2) building demolition and older industrial area redevelopment, (3) active management efforts in relation to DTSC and EPA policy, (4) the natural processes of soil off gassing and microbial degradation, and (5) the downward trends in suspended sediment loads.

An updated set of observations will contribute important information for future revisions to the SF Bay PCB TMDL, expected in 2028. For example, if PCB load from the Delta has decreased, although it may have little influence on the recovery rate of local priority margin units where the highest PCB contamination is found, the PCB mass entering the Bay does influence long-term recovery at a regional scale.

A total of 30 PCB samples will be collected across up to three Delta outflow events focusing on large rain events (not snowmelt). This relatively large number of samples will ensure we can make a robust estimate of the load for the sampled year. This can then be compared to PCB and sediment load and flow conditions of the six previous sampling years. The budget for this proposal is much less than the $800k that was historically spent to monitor multiple analytes at Mallard Island over the six years. The outcome of this project would be an updated dataset on concentration and loads of PCBs at Mallard Island. Although the focus of this proposal is on PCBs, given additional budget, other constituents may be analyzed, such as mercury, selenium, or emerging contaminants.

Estimated Cost: $120K
Oversight Group: SPLWG
Proposed by: Lester McKee, Alicia Gilbreath
Time Sensitive: No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Contracting and field planning	October, 2024
Winter season field work during 3 storms	November 2024 to May 2025
Draft and final project report	September, 2025 and November 2025

REFERENCES

David, N., D. C. Gluchowski, J. E. Leatherbarrow, Don Yee, L. J. McKee, and Neil K. Ganju. “Estimation of Contaminant Loads from the Sacramento-San Joaquin River Delta to San Francisco Bay.” Water Environment Research 87, no. 4 (April 1, 2015): 334–46. https://doi.org/10.2175/106143015X14212658613721

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 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. Below is a list of the proposed pollutants 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 options below present funding necessary under each of these scenarios for several analytes. The budgets include data management (DM) and QA of the data, which are 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.

Budget Options:

Analyte	**Tier 1 Total Cost Per Analyte (4 samples)**	**Tier 1+2 Total Cost Per Analyte (9 samples)**
PCBs	$13,700	$18,950
HgT	$3,655	$4,230
Metals suite	$4,425	$5,550
Nutrients: Ammonia, Nitrate, Nitrite, Phosphate	$9,430	$10,630
DOC/TOC	$6,170	$6,470
Data Management Fixed Costs	$6,500	$6,500
Total for all analytes	**$43,880**	**$52,330**

Estimated Cost: Up to $52.4k
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 CECs monitoring	Spring 2025
Data uploaded to CEDEN	December 2025

Special Study Proposal: Guadalupe PCB Load Trends

Summary: According to the 2009 *PCB TMDL and Basin Plan Amendment*, the river contributes an average of 1.7 kg of PCBs per year to the Bay, or 8.5% of the Bay's small tributary loading of PCBs. There are a number of factors that have likely reduced watershed PCB loading since then: (1) new development and redevelopment; (2) building demolition and older industrial area redevelopment; (3) management efforts by stormwater agencies, DTSC, EPA, and the Water Board including property referrals and site cleanups, LID, changes to street sweeping in industrial areas, PG&E draining and replacing transformers, and pump stations cleanouts; and (4) natural processes of soil off-gassing and microbial degradation. The data on PCB concentrations and loads collected between 2002-2014 may not be representative of 2028 conditions when the Water Board will be crafting an updated PCB TMDL.

The RMP has already developed a trends analysis method for the Guadalupe system that incorporated turbidity-PCB relationships and removed climatic, seasonal, and inter-annual factors to assess management-related trends (Melwani et al., 2018). The method, if supported by discrete samples (not composites), has sufficient power (> 80%) to detect 25% or greater trends over a 20-year period. There was some evidence for a downward trend in PCB concentrations from 2003 to 2014, but the trend was not statistically significant (Melwani et al., 2018).

The RMP sampled PCBs on the Guadalupe River in 2017, 2023, and 2024, so there are now suitable-quality observations spanning 21 years. The objective of this work is to carry out a trend analysis of PCB concentrations in the Guadalupe River watershed. Evidence for a downward trend in PCBs would help demonstrate the effectiveness of the management efforts described above and provide valuable information to support the Reasonable Assurance Analysis that is to be completed by BAMSC by March 2026.

Estimated Cost: $60,000
Oversight Group: SPLWG
Proposed by: Lester McKee and Matthew Heberger
Time Sensitive: YES - should be completed in advance of the RAA effort by BAMSC

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
PCB, turbidity, climate and flow data compilation	January 2025
Statistical analysis and draft reporting	April 2025
External review and final project report	August 2025

REFERENCES

Melwani, A.R., Yee, D., McKee, L., Gilbreath, A., Trowbridge, P., and Davis, J.A., 2018. "Statistical Methods Development and Sampling Design Optimization to Support Trends Analysis for Loads of Polychlorinated Biphenyls from the Guadalupe River." San Francisco Estuary Institute, Contribution No. 876. https://www.sfei.org/documents/statistical-methods-development-and-sampling-design-optimization-support-trends-analysis

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

Summary: 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.

Developing rating curves at these locations cost-effectively leverages investments by local agencies which 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, collaborate with partners, obtain permits, perform flow measurements, QAQC and publish the flow data.

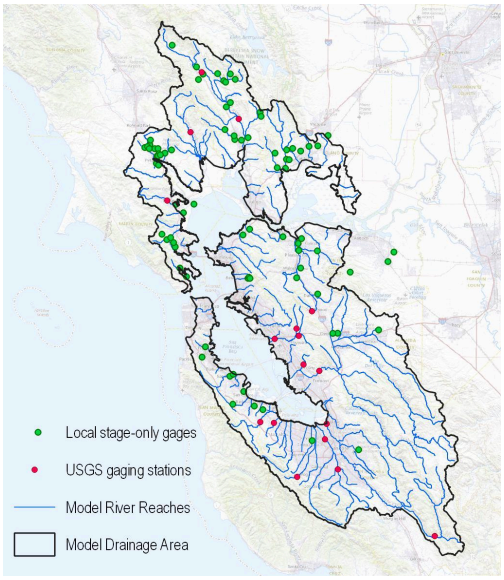

Figure 1.USGS Bay Area gages for discharge (red) and stage (green). Does not include local agency discharge gauges.

Estimated Cost: $30K + $26.3K/site (i.e. 6 sites for $157.8K) = 187.8K total
Oversight Group: SPLWG
Proposed by: Matthew Heberger, Alicia Gilbreath, Lester McKee
Time Sensitive: No

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Site selection	Winter 2024
First set of flow observations	Spring 2025
Draft rating curves	2026
Final rating curves	2027-2028

SPLWG Strategy Funding

Summary: The Sources, Pathways and Loadings Workgroup (SPLWG) provides information to RMP Stakeholders and the public that directly supports:

1. Identification and management of pollutant sources, concentrations, and loads,
2. Identification of the priority sources and pathways of pollutants that adversely impact or potentially adversely impact the Bay's environmental quality,
3. Identification of the effective management actions that can be implemented in the region to address pollutant pathways and sources, and where should they be implemented to have the greatest benefit, and
4. Whether levels of individual pollutants or pollutant classes are changing over time in the sources, pathways, and loadings to the Bay and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay.

As the SPLWG expands to provide greater monitoring and modeling support to all of the other RMP workgroups, a much higher level of coordination and integration across workgroups is necessary. Further, as we take a more integrated approach to monitoring and modeling pollutants, a greater degree of internal workgroup coordination is necessary and increases the SPLWG Strategy funding needs. Nevertheless, this coordination pays off in efficient usage of funds to address the information needs from the RMP stakeholders and the region.

To support the SPLWG program, this task will maintain bi-weekly meetings of the SFEI internal SPLWG staff; enable frequent communication and collaboration with the other RMP workgroups and staff; support meetings as necessary with the workgroup's science advisors, the BAMSC program, and Water Board representatives; and provide funding to respond to SPLWG requests throughout the year. This will be completed through internal and external meetings, planning for and development of meeting agendas and materials, preparation of meeting summaries, check-ins with SPLWG collaborators and advisors as necessary, and monitoring the agenda of and attending key external meetings.

Estimated Cost:	$65k
Oversight Group:	SPLWG
Proposed by:	Alicia Gilbreath, Matt Heberger, Kelly Moran, and Lester McKee
Time Sensitive:	Yes, to maintain management of the SPLWG