FINAL

RMP Microplastic Workgroup Meeting

April 30, 2024
San Francisco Estuary Institute

Meeting Summary

MPWG Science Advisors	Affiliation	Present
Chelsea Rochman	University of Toronto	Yes
Barbara Beckingham	College of Charleston	Yes

Attendees

Adam Wong (SFEI)
Amanda Roa (Delta Diablo)
Amy Kleckner (SFEI)
Andy Gray (UC Riverside)
Alyssa Demko (DTSC)
Artem D. (EBMUD)
Barbara Baginka (SFRWQB)
Bridgette DeSheilds (Integral Consulting)
Carolynn Box (NOAA)
Champagne Rosa (SacSewer)
Charlie Herring (NOAA)
Chris Sommers (SCVURPPP)
Christine Sur (OPC)
Christy Kehoe (NOAA Marine Debris Program)
Diana Lin (SFEI)
Dicle Yardimici (DTSC)
Don Yee (SFEI)
Elisabeth Rødland (NIVA)
Erica Kalve (SWRCB)
Ezra Miller (SFEI)
Gerardo Martinez (SFRWQB)
Jay Davis (SFEI)
Jaylyn Babitch (City of San Jose)
Kayli Paterson (SFEI)
Kelly Moran (SFEI)
Leah Thornton Hampton (SCCWRP)
Luisa Valiela (US EPA Region 9)
Maggie Monahan (SFRWQB)
Martin Trinh (SFEI)
Matt Keene (Sac County DWR)
Rebecca Sutton (SFEI)
Sami Harper (SFRWQB)
Shelly Walther (LA County Sanitation District)
Simret Yigzaw (City of San Jose)
Susanne Brander (Oregon State University)
Sutapa Ghosal (CDPH)
Stacy Luell (Herrera)
Tom Mumley (SFRWQB)
Tony Hale (SFEI)
Valerie Hanley (DTSC)
Win Cowger (Moore Institute for Plastic Pollution Research)

1. Introductions and Goals for this Meeting

Amy Kleckner began by highlighting remote meeting tips, reviewing the Zoom platform functionalities, and giving a land acknowledgment to the Native peoples of the San Francisco Bay Area. She also presented the group with guidelines for inclusive conversations. Amy then introduced the workgroup advisors and continued with a brief roll call for the various groups present to introduce themselves.

Amy then briefly reviewed the meeting agenda and gave an overview of the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), including the program's goals, history, management questions, monitoring structure, and budget. In particular, Amy highlighted the total special studies budget for this year at $1.54M. Additionally, the USEPA San Francisco Program Office anticipates providing $54M per year to the San Francisco Bay region. With the anticipated additional funding available from the USEPA, the RMP Steering Committee guided workgroups to aim for a 50% increase in funding for 2025 and a 100% increase starting in 2026. Guidance was given for the proposals to include environmental justice and climate adaptation elements.

2. Information: Quantifying Tire Wear Particles

Amy Kleckner introduced Elisabeth Rødland, who started the workgroup meeting by giving an overview of what they are doing at the Norwegian Institute for Water Research (NIVA) related to tires and tire wear particles. NIVA is the leading research institute in Norway for water-related topics. They do a lot of research in urban areas, focusing on water from roads, cities, and other terrestrial environments that ends up in rivers and other water sources. Their focus at the moment related to tire particles is on the quantification of tire particles and chemicals, the toxicity of tires and their environmental impact, the transport and fate of tire particles and tire-related chemicals to the environment, and projects looking at treatment for tire particles with a focus on road-related runoff. She briefly introduced the many analytical methods for tire analysis in environmental samples. NIVA focuses on bulk analysis using a variety of methods and instruments, such as ICP-MS, LC-MS, GC-MS, and Pry/TED-GC-MS analysis. An ideal chemical marker for analysis of tire particles in environmental samples would have the following characteristics: present in most/all tire materials, stable and does not leach out of the tires, tire-specific, has concentrations above the background level and can be analyzed with a simple but robust method. Elisabeth stated that currently such an ideal "Goldilocks" chemical marker has not been identified. There is a lot of variation in the chemical composition among different types of tires (e.g., passenger vehicles versus trucks; summer versus winter tires). NIVA has found a lot of variation in the composition of rubber markers such as SBR+BR and NR, metals, and tire-related chemicals such as 6PPD across many different types of tested tires commonly used in Oslo, Norway. This variation in tire composition can make quantifying tire particles in environmental samples (which come from many different types of tires) difficult and adds uncertainty to quantification. NIVA has also examined the toxicity impacts of different individual tire types, such as winter studded and summer tires, and their relative toxicity. Toxicity studies were conducted with freshwater algae and zebrafish using environmentally relevant concentrations of tire wear particles they had measured in runoff previously. They found tires from trucks were more toxic than the other tires tested. The toxicity study was only conducted using four tires, but it shows a large range in the toxicological impacts of different tires.

Elisabeth is also evaluating “green” tires, which are marketed as being more sustainable and environmentally friendly. She believes it’s important for scientists and the public to understand what would make tires more “green” so that we can have substantive conversations with the tire industry. The tire industry is not transparent about what criteria would make such tires more “green”, such as the chemical composition (such as 6PPD content and rubber make-up) or wear rates. NIVA conducted chemical analyses to compare the composition between “green” tires and conventional tires and did not find any significant differences.

Tire particles in the environment are often a composite of different materials, such as tire tread and road particles, which is another challenge for their quantification. NIVA’s tire particle quantification method is multifaceted and involves measuring four tire rubber marker combinations to quantify styrene-butadiene and butadiene rubber using Pry-GC/MS. The markers can be adjusted to ensure matrix interferences are accounted for, as many markers are often found in other sources. A Monte Carlo prediction is used to estimate the rubber concentrations in the sample to account for the variation in different tires used in the region. This draws on information from their tire composition database, and local traffic data is added to the calculation to scale accordingly. Elisabeth has made a call to action for the “research community, tire industry, and the public sectors to collaborate to create a global open-source tire database in which information about the levels of markers used for quantification, such as the synthetic rubbers, is shared.”[1] NIVA has developed their own tire database based on the 40 tires they tested previously and additional tires that are in the process of being tested.

NIVA also has a project looking at the release of washwater from tunnels into the Oslofjord and how this affects the water and sediments. There are a lot of tunnels in Norway, and often, the washwater is not treated when released into nearby rivers and streams. Some of the washwater from the tunnels undergoes basic treatment, such as sedimentation. NIVA has looked into tire particle retention in these basic treatment systems and found high particle retention. However, some tire-related chemicals will increase in concentration in these basic treatment systems and have a high concentration when the water is released versus when it comes into the system. NIVA has expanded upon this project and is looking into whether secondary treatment after the primary sedimentation treatment can remove the contaminants in the water phase.

NIVA is also investigating rain gardens. NIVA uses an automatic ISCO sampler to collect rain garden samples and other sensor data during storm conditions.

Diana Lin commented that SFEI has a proposal to develop a San Francisco regional tire database in collaboration with Elisabeth; NIVA would analyze California-specific tire tread samples using their Pry-GC/MS methods. This is a Tier 2 proposal for USEPA funding that was reviewed by the Emerging Contaminants Workgroup (ECWG).

Tom Mumley asked if there was traction in Europe for creating an open-source tires database. Elisabeth said there are not yet efforts to create a larger tires database. There is some regulation coming to Europe with the Euro7 regulations; its focus is on how to make tires abrade less, but won’t necessarily drive changes in chemical composition. There is discussion about 6PPD as part of the Euro7 regulatory focus. Sutapa asked if there is an ingredient ubiquitous in tires that would show up in Raman spectroscopy. Elisabeth found that μFTIR does not work well to identify tire particles due to carbon black and the high quantity of particles in the sample, and doesn’t know of a good Raman marker for tires analysis. Elisabeth also clarified there are no regulations for what is considered a “green” tire.

[1] Rødland and Lin. 2023. Actions are Needed to Deal with the High Uncertainties in Tire Wear Particle Analyses. Environmental Science & Technology.

3. Information: Microplastics Studies Updates

Diana Lin gave an update on various microplastic projects, including RMP-funded projects, SFEI-led projects externally funded, and collaborations with other partners.

The RMP Microplastics Strategy is finalized and available to share publicly, after review and discussions within the MPWG. Additionally, the microplastics stormwater pilot study, which was partially funded in 2023, has started with initial study design development and exploration of potential sampling sites, which will be discussed later during the proposal discussion.

An SFEI-led study funded by the USEPA Water Quality Improvement Fund includes a component to evaluate the efficacy of microplastics (and other chemical contaminants) removal in bioretention rain gardens; the project finished sample collection this year with analysis by CDPH in progress. Diana also shared that a study to evaluate whether dryer emissions are a major source of microplastics in urban stormwater runoff, funded by California Sea Grant and California Ocean Protection Council (OPC), recently completed pilot sampling and she is now looking for volunteer participants to join the study. Diana shared that SFEI is launching another study to evaluate trash capture devices to see if these devices generate, capture, or allow microplastics in urban stormwater flows to pass through.

Diana shared brief updates on microplastic developments from state agencies. The State Water Board (SWB) has established a CEC Program that will serve as a central coordination point and technical resource for other SWB programs regarding CECs, which will also include microplastics. The California Department of Toxic Substances Control Safer Consumer Products Program (DTSC SCP) has proposed adding microplastics to their Candidate Chemical List, which would give the program future authority to potentially regulate products that contain or have the potential to release microplastics.

Diana reminded the group that last year Leah Thornton Hampton from the Southern California Coastal Water Research Project (SCCWRP) shared a project funded by OPC to support the development of standardized field sample collection methods for different matrices. Chelsea Rochman is leading efforts to develop guidelines for sampling ambient water. The Toxicity of Microplastics Explorer (ToMEx) database has recently been updated with significantly more aquatic ecotoxicology and human health studies.

Tom Mumley asked about efforts to standardize microplastic sampling and laboratory analysis and how this affects ongoing monitoring projects. Diana Lin answered that there are still significant challenges in analysis and figuring out how to sub-sample and quantify samples. Tom asked if SFEI is comfortable with the laboratory procedures for microplastic analysis even though stormwater is much more complex than drinking water. Ezra Miller and Diana responded that there are still challenges, but we are moving forward with the best available information and learning as we go.

4. Information: Developing a Statewide Plastics Monitoring Strategy

Christine Sur gave an update on the ongoing efforts led by SFEI and OPC to develop a Statewide Plastic Monitoring Strategy, which follows up on the priorities outlined in the Statewide Microplastic Strategy published by OPC in 2022. The Statewide Plastics Monitoring Strategy is envisioned to include a phased, multi-year monitoring plan for both macro- and microplastics. OPC plans to initiate a pilot monitoring program towards the end of 2025, which will inform future investments in monitoring. The high-level long-term goals are for the monitoring efforts to establish a baseline of macro- and microplastic levels in ambient waters, evaluate trends and impacts, and inform future management actions to reduce the impacts of plastics on aquatic ecosystems and human health.

The Statewide Plastics Monitoring Strategy effort is informed by a State Advisory Group (SAG), which includes representatives from relevant state agencies; the SAG group is currently reviewing and finalizing the priority management questions that will guide the development of the monitoring strategy. A technical advisory committee (TAC) will be assembled soon to help develop and draft the monitoring strategy. The project team has also led a public and community engagement process to gather feedback about monitoring and plastic pollution concerns. The project timeline is to have a draft Monitoring Strategy and Plan ready to share for stakeholder review in 2025. Christine showed the current draft of the management questions.

Tom Mumley wanted to know how OPC would address this monitoring strategy's scope, funding, and governance needs. Would financing be built into the next steps, and would it be from the state or a regulated entity? Christine Sur responded that the initial stages of monitoring would be based on current resources and the pilot phase would be a proof of concept that can be used to expand the program and explore other funding sources at a later stage of the monitoring program. Tom thinks the RMP will be part of this effort; what would that translate to monitoring on our end, and what would we decide to do with near-term and long-term funding? Chelsea Rochman asked if agricultural runoff is a big concern as an upstream source and pathway of microplastics. Christine clarified that while agriculture runoff is under consideration, it will not be included in the initial phase but may be included in future phases of monitoring. Chris Sommers asked what the community engagement was like and who were the community members attending the outreach meetings. Christine responded that community engagement was mostly from interested non-profit organizations or community members active in microplastic or trash issues, and there was a good turnout in most of the regions. Tony Hale added that the team will do more target outreach with experts in different regions during the convening of the technical advisory committee.

5. Information: Fate and Effects of Microplastics in Fish

Chelsea Rochman presented her research on the fate and effects of microplastics in fish. She explained that we don’t know much about the toxicokinetics of microplastics in fish or whether/how microplastics bioaccumulate. Chelsea talked about two studies: one study involved looking for microplastics in the muscle and gut of Great Lakes sport fish to inform whether

microplastics should be part of future fish consumption advisories. The other study examined microplastic fate in a controlled system in Canada's experimental lakes.

For the Experimental Lakes Area (ELA) study, there are a lot of collaborators due to the size and amount of testing involved in any ELA work. This study examines microplastics' physical, biological, and chemical fate in lakes. They are using a series of three types of brightly colored microplastic fragments (polyethylene terephthalate [PET], naturally buoyant polystyrene [PS], and low-density polyethylene [LDPE]) that have a wide range of sizes and shapes. They added plastics with additives and plastics without additives to mesocosms with yellow perch; Chelsea's presentation focused on the results of the additive-free plastics. They are seeing microplastics widespread across different parts of the fish, including those used for human consumption, such as the filet. Chelsea is interested in why microplastics are migrating to different tissues within the fish and what might constrain the movement of microplastics through the different tissues. The fate of particles varies by size and shape, and small fiber-like fragments appear more likely to make it through into muscle tissues. Higher microplastic exposure also seems to correlate with more inflammation of the gut. This is an ongoing investigation, but they currently do not see evidence of bioaccumulation occurring in fish; they also don't see evidence suggesting biomagnification. Future research will look into the mechanism of translocation and the retention time of microplastics in fish. They are also in the process of a whole lake experiment in which they are simulating stormwater inputs of microplastics.

Chris Sommers asked why they see polyethylene more in fish tissues and whether this is related to translocation or the levels of polyethylene in the environment. Chelsea said it has more to do with particle dynamics; PET and PS sank quickly while LDPE tended to float and stick to surfaces where the fish tended to eat. Sutapa Ghosal asked if Chelsea has observed patterns of microplastic accumulation in which larger fish may have fewer microplastics due to their feeding patterns of eating other fish, while smaller fish might engage in more passive indiscriminate feeding. Chelsea said the literature is not consistent on what may cause more or less microplastic accumulation in fish, but there is some evidence that indiscriminate eaters such as bottom feeders and filter feeders may have more microplastics. Although there is some evidence showing that larger fish that eat more will have more microplastics, the most consistent result has been where there is a higher exposure to microplastics there is a higher amount of microplastic accumulation in the fish, but there is still a large amount of variation across studies.

6. Discussion: Multi-Year Planning

Diana Lin presented the multi-year plan for microplastic funding for 2026 and beyond. Because the RMP funding is anticipated to grow with additional USEPA funding in the next few years, there is an opportunity to grow the RMP microplastics work. Diana presented several suggested projects for future microplastic monitoring. Diana asked for feedback on these priorities and if anything was missing. Tom Mumley pointed out that wet season water was missing from the list of priorities and asked if there were differences between wet and dry weather events. He continued that sport fish are only a Tier 2 proposal, but this could be something to consider in the future when we do the next sport fish monitoring in 5 years. Jay Davis mentioned that prey-fish monitoring collected in the near-field could also be added to this microplastic

monitoring effort. Chris Sommers asked about monitoring dry weather flows from stormwater pathways to get an idea of baseline concentrations. He also asked how the MPWG might connect with the integrated modeling and monitoring approach being developed for stormwater CECs, leveraging tools and approaches developed by ECWG and SPLWG. Diana and Kelly Moran responded that they will work with the SPLWG team on this and that the proposed fixed station monitoring might be leveraged for microplastic monitoring.

Erica Kalve said SWB is looking into decisions that can benefit water quality control measures, and they are very interested in monitoring microplastics in fish. She wondered if this monitoring effort could be used to evaluate the risk for fish consumption and allow us to develop an appropriate microplastic limit for fish consumption. Ezra Miller responded to Erica's comment that the ToMEx database has been updated with more studies, and thresholds are being updated, but there is still not enough high-quality toxicity data available to implement a comprehensive risk assessment or develop a threshold number. Tom responded to Erica by questioning the extent to which we need a threshold to inform management actions when monitoring data on its own will get people's attention to pursue actions. Erica mentioned that many regulatory processes and procedures are tied to a threshold limit. Chris Sommers provided the perspective that effective management of microplastics will need to be addressed through source control, manufacturing changes, and regulatory actions, and although a lot hasn't been accomplished yet, these things take time. Ambient limits are used to require treatment, but treatment will not be an effective solution and does not address the root sources and pathways of plastic pollution. He doesn't know if water quality criteria will do anything to address source issues, and they will take a lot of effort to develop, and current microplastic methods and data gaps add even more challenges. Ezra asked if there are any specific data needs that future RMP monitoring studies could generate to inform DTSC SCP work plan evaluations on microplastics. Dicle Yardimci said that monitoring work would be helpful and that they are really interested in monitoring data that can be traced to upstream sources and typically are looking for product/chemical combinations for rulemaking. They need to be able to make the case that microplastics come from a specific product type. Sutapa mentioned that in the current rain garden studies, she is finding many tire particles and was wondering how many particles need to be found to make any changes. Dicle said microplastics are in the process of being added to the Candidate Chemicals List, but this is still going through rulemaking and needs to pass before they can move forward. They have lots of data pointing to tire particles coming from urban stormwater runoff.

7. Summary of Proposed MPWG Studies for 2025

Diana Lin presented the three proposed MPWG studies for 2025. Diana asked if anyone had any questions or feedback on the three MPWG study proposals. Tom Mumley started off the round of questions with feedback on the Microplastics in Urban Stormwater Runoff Pilot Year 2 proposal. He noted a substantial increase in the proposal budget compared to what was presented last year without justifying the scope or details of the project. He noted a significant increase in laboratory costs with an increase in the number of samples. He wanted to clarify that five samples would be collected during a storm instead of a single sample. Diana clarified that the budget was shifted from modeling to sample analysis and storm deployment. Laboratory analysis did increase significantly with additional sample collection, which increased the

individual sample analysis costs due to the challenges with microplastics analysis and the addition of separate tire particle analysis by NIVA. Tom asked why tire particle analysis changed from last year's proposal, which had tire particle analysis included in the analytical costs. Diana clarified that the previous version of the proposal only included a budget for one type of microplastic analysis via FTIR or Raman spectroscopy, and only sending a subset of samples for pyrolysis GC-MS for confirmation; the current updated proposal includes a dedicated budget for using pyrolysis GC-MS on all samples.

Tom Mumley stated that it is well documented that stream flow is well mixed, as shown by suspended sediment analysis. He wondered if some property of microplastics may cause them to be distributed differently in turbulent flows that would call for discrete depth-specific sampling. Also, doing five discrete samples may be overkill, especially since we are only doing two sites; he would like to see us do more sites. He wondered aloud about the tradeoff of investigating microplastics at different depths versus more sites since we still have such a limited dataset. Rebecca Sutton responded that SFEI's previous studies did do depth-integrated samples, and SFEI observed a lot more tire particles than what had been reported by others, and that this may be because SFEI's approach captured water column samples at different levels compared to other studies which sampled at a single depth. Those depth-integrated samples raised the question of equal distribution of microplastics within the water column and whether a single depth sample fully captures microplastic concentrations in streams. Chris said the hydrology will inform the flow and help determine the critical mixing within the stream and if a sample can be considered well-mixed. He was interested in how the multi-depth information from this study would be used from a modeling or monitoring standpoint to help us set up unmanned samplers at a fixed depth in future monitoring efforts. Don Yee responded to Chris that this multi-depth study would help to inform unmanned sampler fixed depth placement and how the data at that fixed depth might be biased. Lester McKee added that previous sampling at the Guadeloupe channel and Zone 4 line A, had shown that the suspended sediment in the water column was sufficiently well-mixed during storm events such that single-depth sampling was sufficiently representative of the water column. However, for microplastics, we still need to do our due diligence to show that depth integration (or lack thereof) does not impact our sample representativeness. Although this study has a high cost, Lester believes that this pilot study would inform future sampling for the next 5-10 years, and the data would be of sufficient quality to inform monitoring methods. Alicia Gilbreath responded to Chris Sommer's earlier comment about changing stream depth and how that would affect the sampling at a fixed depth; she said that the depth of the mid-depth and top-depth tubing would be readjusted based on stream height measurements throughout the storm to stay within the target range of the sampled depths. Lester agreed with Chris that there will be variability in the sample collection, but we are trying to test the hypothesis that the water column is well-mixed. Diana added that they chose five sampling points at a single site/event to be more cost-effective since deploying teams to collect samples is very expensive. Tom Mumley commented on the study's low *n* and the logistical challenges that come with stormwater sampling that make getting a good collection event very challenging. The issue that this study proposes to address is a problem, but it might not need to be addressed now. Chris Sommers responded to Tom's comment that this project is being proposed now because this issue may impact future monitoring and modeling efforts where a lot of money has been dedicated, and this fills a critical data gap. Kelly Moran added to Chris's comment that this study could really inform the automated sampler's use for future

monitoring efforts and determine if there are going to be distinct differences between samples collected manually or with the automated sampler. Luisa Valiela asked if other groups, such as Chelsea Rochman's group, have done automated monitoring or if they will do so in the future. Andy Gray responded to Luisa's question; he said the hypothesis is that microplastics are expected to be transported in a fully mixed fashion across washflows. However, this is still under debate, and there isn't a lot of data to support this. His group will do some tests in a flume to evaluate different sampling methods and also inform data gaps in stormwater monitoring.

Chris Sommers mentioned that only sampling one storm event puts a lot of pressure on the one storm event to be representative of all storms. He wondered how we would select the single storm event that would be sampled to be representative of all storm events. Lester McKee responded that the proposed collection would not be perfect, but they would see the energy variability with the channels rising and falling between the two locations sampled; this would be enough to reject/confirm the hypothesis. Tom Mumley said that successfully picking a storm is challenging. Lester agreed that picking a representative storm is challenging. Still, there are ways, such as choosing more urban streams, that can reduce the chances of failure because these streams get significant flows even with small events. Still, he understands that with competing resources and how variable storm seasons are, we would have to come back to the committees to clarify where the resources should go if there is a bad year. Tom asked what other ancillary data would be collected to characterize variability during the storm. Diana Lin answered that what would be collected for the ancillary data has yet to be chosen, and this will be discussed with Lester McKee and Alicia Gilbreath in the future. Tom proposed that five samples could be collected, but three might be analyzed to save some money; if more need to be analyzed to get a full dataset, that can be done later. Diana agreed that we could collect five samples but possibly prioritize the analysis of half the samples and hold the other half for analysis after data interpretation. Lester brought up that without a strong conceptual model of microplastics in stormwater flows, it could be difficult to prioritize which samples would be useful for analysis. Alicia proposed that SSC and turbidity information could inform which microplastic samples to analyze. Sutapa Ghosal asked if the samples need to be sieved before being sent to the lab, as this adds a layer of variability to the samples that could impact analysis. Diana clarified that the samples would be collected on the sieves, but they would be composited into a single jar, as it would be a separate analytical cost for each of the sieves; also, the method would only go down to the 53 µm size, which is the FTIR size detection limit. The LDIR analytical methods could detect smaller particles.

Tom Mumley moved the topic to the next proposed study: the size distribution of microplastics in San Francisco Bay. He supported the improved understanding of microplastics related to particle size in Bay water but did not think this needs to be framed as just tied to comparison with risk thresholds. However, the proposed water sampling will only collect surface grabs, and we know the presence of particles varies in the Bay based on depth, which puts into question how representative the surface samples would be. The project scope increased from the last time it was proposed, with more sites and higher analytical costs. Diana replied that the increased costs are due to more sampling sites being added to the previous version of the proposal, higher analytical costs, and also adding building and piloting an in-line filtration device. Tom thought this proposal might be too limited with too few samples and a single depth, and Jay Davis agreed that we may want to expand this study as a Tier 2 study and go up to 20 stations

sampled to be more representative of the Bay. Ezra Miller added that a similar proposal could be added for the next sediment cruise in five years to understand microplastic levels in Bay sediments.

Tom Mumley moved the discussion forward with the microplastic Bay sportfish proposal and asked why the sportfish study was in Tier 2. Diana answered it was due to budget reasons. Tom said this was an important project but asked why only two types of fish were being studied. Jay Davis said that these two kinds of fish are already built into the collection plan for the 2024 Status and Trends Sport Fish monitoring effort, and the permits to collect these fish have already been issued, so it is not possible to add additional fish. Jay elaborated that the shiner surfperch size, site fidelity, and dietary preferences make them ideal for characterizing microplastic levels in fish. Tom said that the opportunity for additional funding may allow us to do more. Luisa Valiela wondered if microplastic toxicity data is still not at the level we'd like it to be at and if there is work in the pipeline from our partners that may influence our tox-related work in the future. Ezra Miller responded that there is a lot of toxicity work happening, and the ToMEx database was recently updated with significantly more published studies; however, the database isn't complete, and SCCWRP is working towards a more complete understanding of microplastic toxicity. Leah Thornton Hampton added that the ToMEx database does not encompass all toxicity studies happening; the most recent database update included studies up to 2022, and it was a considerable effort to manually mine the data. Also, the data quality of many of the studies, such as the inclusion of full dose-response curves rather than just a single microplastic exposure concentration, was not at the quality needed for risk assessment purposes. Chris Sommers asked if this should be a priority study because of its ecological importance and relevance to toxicological studies and human exposure. It may also lead to more regulatory or source control actions. Chris asked Leah how close SCCWRP was at creating a fish tissue standard for microplastics and where the toxicological data was at this time. Leah replied that she is not aware of any development of state standards for microplastics in fish tissue at this time. She emphasized that even though there is a lot of toxicity data related to setting standards for fish and ambient water, a lot of it is not fit-for-purpose to establish thresholds; however, the path for creating microplastic thresholds in these matrices will be made easier with the development of a drinking water threshold. Chris believes that since this study can link concentrations of microplastics in sport fish to human consumption, it will get more attention on microplastics, which may lead to source control or regulatory action, and it should therefore be a higher priority.

Returning from the lunch break, Diana asked the science advisors if having five samples at a single site would be too many for the stormwater proposal. Barbara Beckingham asked if the samples would be spread over the hydrograph and have a large variation in time and if we would expect the channels to be well mixed at different time points in the storm. Barbara thought there was a possibility that over the different stream energies, we might expect different microplastics to be well-mixed while others are not, and mixing could be based on shape or density, such as fibers or tire particles. Also, having an idea about baseflow mixing could inform how the stormwater mixing might behave. She also mentioned that measuring velocity and co-locating sites with USGS gauges would be useful to get more information for loading estimates. Barbara also brought up how the budget for the stormwater proposal should be allocated and wondered if having duplicates at each depth versus two sites would be more

beneficial to answer the question of depth variation. She thought the stormwater study was well outlined and important for future monitoring and modeling. Diana asked Barbara to explain LDIR analysis and how it might complement other microplastic analysis techniques. Barbara is working with a collaborator at Clemson University who would perform the LDIR analysis for particle enumeration and size information. It would complement the mass-based analysis given by Py-GC/MS but provide more information about the material embedded in tire particles. The minimum particle size detectable by LDIR is 10 µm.

Chelsea Rochman saw all three studies as working toward assessing risk and building a good monitoring plan. She thought the particle distribution in the Bay waters study was important, but how the water is pumped/sampled should match how we would want to monitor. The stormwater study is also important, as Chelsea has observed different particle distribution patterns based on base and peak flow. One of her studies showed particle variation in stormflow based on density. She agreed taking the sample next to a gauge would be valuable. Chelsea thought we could reduce the amount of fish used for analysis for the sport fish study if needed. She also saw less value in the mass-based information from Pry-GC/MS. Barbara said they had done a preliminary analysis of surface waters with the EPA in Cincinnati using LDIR and were able to analyze tire particles using the method they developed. Sutapa thinks having more analysis would cover a lot of bases as they could complement each other and fill in the gaps that other methods might not be able to cover.

Susanne Brander was interested in the possibility of doing some quantification of the samples for emerging contaminants such as 6PPD, 7PPD, etc., which may leach differently depending on particle size, and some Py-GC/MS may be beneficial to quantify CECs. Diana clarified that the current proposal is only for tire particle analysis, and an additional budget would be needed to add analysis of other CEC analytes. Kelly Moran expanded on this thread that emerging contaminants are being quantified in other stormwater studies; if we were to add to this proposal to include the CECs, there would be tire particle mass concentrations parallel to CEC concentrations. Tom Mumley asked if it would be possible to co-locate sampling events with other studies. Diana replied that the stormwater study has a lot of constraints for choosing a sampling location, which is the biggest factor in informing which site we should select. Chelsea thought that if the big idea of the study was to check the variability in particle distribution at different depths, then it would be more relevant to do peak and base flows. Diana stated the focus is more on looking at storm conditions over the course of the storm. Diana circled back to Barbara's earlier comment about duplicates and replicates and commented that it is extremely difficult to collect a true replicate (i.e., same time and location). Don Yee agreed that sample replicates are difficult to do with such variability in stormwater flows. They could be useful to tell us information about variability in the stormwater flow and what factors might affect particle distribution, but replicating every sample is not worth the money or effort. Shelly Walther asked if it was possible to set up one of the automated samplers to split the stream and take two samples simultaneously. Chelsea asked if just doing base flow and peak flow three times at the same site would give enough data to develop an idea of the flow pattern and particle distribution. Tom Mumley pointed out that base flow in the Bay Area is very different from other places, and the flows here are much smaller than in other places, as we don't have a steady water supply in the rivers or creeks we sample. He said that from early studies that looked at contaminant flow during the dry season, there was very little in comparison to stormwater flows,

but there should be some consideration for base flows. Barbara Beckingham thought there should be a time point after base flow, such as the first flush, that could be sampled to amend Chelsea's argument for base and peak flows. Chris Sommers pointed out that there is base flow during the wet weather season, and it might behoove us to get a few base flow data points to clarify the data. Kelly Moran added that there is interest in looking at base flows for other studies, and it may be appropriate to add microplastics to one of the other stormwater studies sampling base flows.

8. Closed Session: Decision Recommendations for 2025 Special Study Funding

Amanda Roa led the closed session that provided recommendations for 2025 special study funding.

9. Report Out on Recommendations

Amanda Roa gave out the ranking recommendations to the workgroup. The stormwater monitoring project for year 2 was recommended for funding with the addition of LDIR. The sport fish study was ranked second, with the possibility of archiving samples for later analysis. For the size distribution study, the group had a broad consensus for waiting for costs to come down and methods to be more in place before funding.

Adjourn