Chesapeake Bay Program
Toxic Contaminants Workgroup
Meeting Agenda
Date: Wednesday, May 14th
Time: 1:00 – 3:00 PM
Location: Conference Call
Calendar Page: May Meeting Materials

Agenda Item and Desired Outcome	Time	Background Docs, Notes, and Action Items
1. **Introductions and Announcements** – Keith Bollt, EPA and Emily Majcher, USGS; WG Members • Intro from TCW coordinator, Keith Bollt • Welcome new WQGIT staffer, Petra Baldwin • Beyond 2025 update • Meeting goals and background on passive sampling for PFAS	1:00	• Meeting materials are posted on the Calendar Page. • Petra Baldwin, TCW Staffer, introduced herself to the workgroup. • Keith Bollt, TCW Coordinator, shared that the Management Board met last week to review proposed updated Outcomes. Revised versions will be submitted to the Principals' Staff Committee for review before they are released for public feedback on July 1. The updated Toxic Contaminants Mitigation Outcome combines the two previous outcomes, and sets the focus on convening and information sharing to help partners reduce the impacts and effects of toxic contaminants. • Emily Majcher, USGS, gave an overview of the development of passive sampling methods. Passive sampling allows for time-integrated sampling, provides improved detection limits, limits investigation-derived waste, mimics exposure conditions, and is often cost-effective. These advantages have led to recent developments of passive sampling methods for monitoring PFAS. **ACTION:** If you have any topic suggestions for future PFAS Quarterlies, please contact Emily Majcher, USGS (emajcher@usgs.gov), Keith Bollt, EPA (Bollt.Keith@epa.gov), or Petra Baldwin, CRC (Baldwin.Petra@epa.gov).
2. **Technical Presentations: Advances in the use of passive samplers for PFAS monitoring in environmental waters** • *The Sentinel™ Sampler for measurement of PFAS in environmental waters,* Erika Carter, Ph.D., Arcadis U.S., Inc. • *PFASsive™: A passive sampler for accurate monitoring and quantification of PFAS in*	1:10	• All presentations are posted to the Calendar Page. • Erika Carter, Arcadis presented on the Sentinel™ Sampler, an integrative sampler that can be used for measuring PFAS in environmental waters. Erika highlighted the factors to consider when designing (and selecting) a passive sampler, including size of the sampler, ease of use and analysis, sensitivity to environmental conditions, detection limit, deployment time, degree of field testing, and commercial availability/cost. The Sentinel Sampler is small with a plastic or metal housing and a sorbent material made of Cu(II)-polyethyleneimine-Osorb® that sits behind a mesh window, which was optimized for PFAS sorption. The Sentinel™ is an integrative sampler which provides a time-averaged concentration. It has consistent and fast uptake rates, can be used in a wide range of environmental water types (and in sediment), uses an analysis compatible with EPA-approved LC-MS methods, allows for flexible deployment options, and has a membrane-less design that inhibits biofouling. The Sentinel™ has been calibrated for 49

sediment porewater, surface water and groundwater, Brent Pautler, Ph.D., SiREM • *Developing bivalves as biomonitors for PFAS in coastal environments,* Mi-Ling Li, Ph.D., University of Delaware *[Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.]*		analytes so far. The sampling rate (R_s) is sensitive to environmental conditions, especially flow rate and temperature, so the R_s is put into two "buckets" to capture high and low conditions or, for temperature, can be corrected with a curve fitting. Pilot demonstrations in groundwater showed good correlation with grab samples, 14% relative standard deviation (RSD) between passive sampler replicates, and similar performance for short and long chain PFAS analytes. In surface water, passive sampler replicates were slightly more variable (30% RSD) but also showed good correlation with grab samples. It worked well at high and low concentrations and has a detection limit of about 1 ng/L (depending on deployment time). The Sentinel™ is commercially available for $100, and analysis can be done at several labs across North America, including Enthalpy Analytical in Wilmington, NC. More research and testing is being done to develop applications in pore water at contaminated sediment sites. Questions for Erika included whether a performance reference compound (PRC) has been used to correct for temperature fluctuations (it had been tried but stuck to the sampler too strongly so they are looking into other possibilities) and concerns about co-contaminants (limited concern since the selection is pretty specific to PFAS). • Brent Pautler, SiREM presented on the PFASsive™ Sampler, an equilibrium-based sampler. Brent highlighted some advantages of passive sampling including its measurement of freely dissolved concentrations (C_{free}) of PFAS as opposed to total mass, which correlates to actual toxicity and bioaccumulation for environmental receptors to better apply to risk assessment work. The PFASsive™ Sampler utilizes a dialysis sampler with a small container of PFAS-free, pure water capped with a semi-permeable membrane that allows for movement of the analyte from high to low concentrations. When deployed, PFAS from the environmental water will accumulate by diffusion across the permeable membrane and into the ultrapure water and that water sample can be analyzed by existing EPA-approved methods. It can be utilized across a variety of water types like sediment pore water, groundwater, and wastewater, including for very turbid samples. In the development, materials were tested and chosen for the vial (high density polyethelyne) and membrane (polycarbonate) to not be sinks or sources of PFAS. A reverse tracer PRC was used as a reference in the sample to show the mirror image diffusion of the PFAS analyte to ensure equilibrium is reached. Since this passive sampler is equilibrium based, they needed to measure the diffusivity constant for all PFAS analytes of interest. Initial field validation of the PFASsive™ Sampler compared to multiple metrics showed good results. Now, they are working on further validation in groundwater and marine environments, and are conducting in-situ bioaccumulation testing of organisms. They are also developing a stainless-steel sampler with a silver membrane that can simultaneously sample for PFAS, VOCs, petroleum hydrocarbons, and other analytes. Questions for Brent included clarification on use in wastewater (the silver membrane version works particularly well with no fouling), typical deployment time (7-14 days in surface water, one month in sediment pore water, and 45 days-3 months in groundwater depending on flow), and issues with tracer adsorbing to HDPE components of the samplers (no issues). • Mi-Ling Li, University of Delaware presented her lab's research on utilizing bivalves as biomonitors for PFAS in coastal environments. Bivalves have been used previously for biomonitoring other contaminants like heavy metals successfully since they have simple

		exposure routes, provide site-specific information since they are stationary, and can survive in tough conditions. They also give time- and ecosystem-integrated bioavailable fraction of a contaminant, which tells us what is actually being taken up and potentially passed on to higher trophic levels. This study looked at the bioaccumulation of 30 PFAS compounds in eastern oysters and ribbed mussels at 8 study sites along the Delaware Bay. They found a decreasing trend in PFAS from the mouth of the Delaware River down to the mouth of the Delaware Bay, with a good correlation between overall PFAS in water samples and bivalves from each study site. They generally found higher concentrations of PFAS in the oysters than mussels and found different profiles of individual PFAS in the two species, potentially due to the faster growth rate and longer lifespan of oysters. Mi-Ling highlighted that different bivalves may bioaccumulate more precursor compounds or terminal compounds, depending on their capacity for biotransformation. Oysters had a much higher ratio of precursors to terminal compounds than mussels, and the lab is undergoing a project to examine the factors that might cause this, such as their lipid and protein content or their metabolic process. Questions for Mi-Ling included whether total oxidizable precursor (TOP) assays were used (no, since the matrix tends to interfere with the TOP assay) and how to tell the age of a bivalve (size and counting rings on the shell).
3. Discussion: Use of PFAS passive samplers in the Chesapeake Bay watershed– Emily Majcher, USGS and Keith Bollt, EPA	2:25	• Emily and Keith led a discussion on how these passive sampling methods could be utilized by jurisdictions across the Bay for PFAS monitoring and collected responses from participants through a Menti interactive poll. Three participants shared that they were currently using passive sampling for PFAS monitoring. • John Cargill, DNREC shared that one of their PFAS experts in the remediation section has been utilizing ITRC passive sampling in groundwater and surface water for some regional studies in Delaware. John also shared some of the challenges with utilizing passive sampling for PFAS are the lack of commercial availability and the barrier from regulatory agencies to accept results since it is still a relatively new method. • Erika Carter, Arcadis suggested that the best way to encourage adoption is to first utilize passive sampling for routine monitoring to make people more comfortable with the data, and then perhaps it can be used for compliance. • Brent Pautler, SiREM shared they have seen some regulatory acceptance for the PFASsive™ in Canada at the federal level and in some states in the US. • Len Schugam, MDE shared they have very limited results from shellfish sampling in the Bay but from a small sample of blue crab they didn't see much of any PFAS in tissue samples. • Written responses in the Menti about potential applications for use included source tracking, long-term monitoring, remedial monitoring, routine monitoring focused on trends, more realistic exposure assessments due to measurement of freely dissolved concentrations, and use in karst landscapes. • Emily suggested having a potential follow-up PFAS Quarterly on passive sampling to continue this discussion once more studies currently underway have data and lessons learned to share.

Wrap Up and Adjourn	2:55	**ACTION:** Keith reminded TCW members that the workgroup is seeking to clarify voting membership and receive nominations for workgroup co-chairs and at-large voting members. Please look out for and respond to an email from Keith Bollt, TCW Coordinator (Bollt.Keith@epa.gov) on this. **Next meeting: June 11, 2025**
Attendance: Sakinat Ahmad, Kofi Asante, Douglas Austin, Lorie Baker, Petra Baldwin, Zachary Basile, Nicki Bellezza, Steven Bieber, Lakisa Blocker, Keith Bollt, Charles Brown, John Cargill, Erika Carter, Ruth Cassily, Christina Davis, Om Devkota, Mark Dubin, Kevin Du Bois, Ellen Egen, Nazmul Haque, John Healey, Ke He, Paul Hlanika, Faith Kibuye, Marel King, Bill Kramer, Lisa Larimer, Mi-Ling Li, Emily Majcher, Raffaela Marano, Anna McClain, Sabine Miller, Rick Mittler, Nick Murray, Hlengilizwe Nyoni, Connor O'Loughlin, Brent Pautler, Andrew Psoras, Lisa Regain, Maria Russo, Len Schugam, Jamie Shallenberger, Nicoline Shulterbrandt, Blain Snyder, Elise Stabile, Shana Stephens, Renee Thompson, Anthony Timpano, David Tobias, Suzanne Trevena, Lisa Weber, Kelly Yachera		