Minnesota 3M PFC Settlement

Notes for Technical Subgroup 1 Meeting

Wednesday, June 15, 2022
1 – 4 p.m.

Hybrid WebEx and In-Person Meeting

Group members in attendance

- Brian Bachmeier
- Brian Davis
- Gary Krueger
- Jamie Wallerstedt
- Jim Kotsmith
- John Hanson
- John Seaberg (substitute for Jason Moeckel)
- Jon Herdegen
- Karla Peterson
- Kristina Handt
- Marian Appelt
- Matt Moore
- Mike Kothe
- Ryan Burfeind
- Steve Love

Presenters

- Gary Krueger, Minnesota Pollution Control Agency (MPCA)
- John Seaberg, Minnesota Department of Natural Resources (DNR)
- Heather Hosterman, Abt Associates
- Jim Kelly, Minnesota Department of Health (MDH)
- Shalene Thomas, Wood
- Dora Chiang, Wood
- Hanna Temme, AECOM
- Amanda Lanning, AECOM

Welcome and Updates

Heather Hosterman (Abt Associates) welcomed Subgroup 1 to the meeting. Gary Krueger (MPCA) also welcomed the Subgroup and announced that in the morning, the U.S. Environmental Protection Agency (EPA) had released new health guidance for some PFAS.

EPA PFOA/PFOS Update

Jim Kelly (MDH) provided an update on the new interim health guidance released by EPA. On June 15, 2022, EPA released new interim drinking water health advisories for PFOS and PFOA, and final health advisories for PFBS and GenX. EPA's interim values for PFOS and PFOA are 0.02 parts per trillion (ppt) and 0.004 ppt, respectively. EPA's final health advisories for PFBS and GenX are 2,000 ppt and 10 ppt respectively. The PFOS and PFOA interim health advisories are much lower than current MDH guidance values; the PFBS value is higher. For more information, refer to MDH's website (under "PFAS Activities In Minnesota", and "EPA PFAS Health-based Guidance Released – June 15, 2022): Per- and Polyfluoroalkyl Substances (PFAS) - EH: Minnesota Department of Health (state.mn.us).

These new PFOS and PFOA values are based on human exposure data that has been generated over the last few years, however, MDH has asked the EPA to make their data and methodology more transparent. MDH has been

in contact with EPA and will continue to review EPA's methods and analysis for these new values and will be conducting their own analyses of all relevant data. Jim explained that the EPA is not currently recommending alternative water supplies, such as bottled water, or new treatment technology as these values are based on a lifetime of PFAS exposure.

Gary Krueger (MPCA) reminded the Subgroup that changing health values was one reason the Co-Trustees built contingency into the Conceptual Drinking Water Supply Plan. The Co-Trustees will examine how these new health values impact the Plan implementation.

Feedback

A subgroup member asked about EPA's timeline to publish final guidance values. Jim explained that EPA intends to release draft Maximum Contaminant Levels (MCLs) in Fall of 2022 and final MCLs by Fall of 2023.

One member of the public asked how EPA was planning to measure parts per quadrillion. Jim explained that he is not sure, as he doesn't know of any labs that can currently measure PFAS detections that low. This has been a point of confusion for states because they do not know how to apply a value that cannot be detected.

One member of the public asked if the EPA criteria would be applied differently to potable water and water for irrigation. Jim said that these standards are for drinking water only, and MDH has not yet evaluated how these levels would be applied to different water uses. He also explained that there are other media (e.g., soil) through which people can be exposed to PFAS.

Another member of the public asked if there were indications of health impacts that justified the lower guidance values. Jim explained that the interim EPA guidance values are based on a slight decrease in serum antibody concentrations following immunization in children ages 0-5. However, there is no evidence of increased infectious disease in the population studied.

Two members of the public explained that they represent Hastings, a community close to the East Metro on the other side of the Mississippi River. Hastings was not included in Priority 1 of the Settlement. However, their testing has shown signs of increased PFAS concentrations. They are especially concerned given EPA's new health guidance values and would like to be considered for future involvement in the Settlement. Kirk Koudelka (MPCA) explained that the State is considering many ways that they can help communities, both within the Settlement and outside of the Settlement. Communities under the Settlement have to prove their contamination is connected to releases from 3M facilities, which Hastings may or may not. Kirk explained that the new Bipartisan Infrastructure Bill includes funding for States for emerging contaminants, which could be used to help communities impacted by PFAS. The State is also looking into other funding sources and is having conversations with legislators. The Co-Trustees will continue to keep communities like Hastings updated.

Update on Treatment Technology

Shalene Thomas and Dora Chiang (Wood) provided an update on technologies for treating PFAS. They explained that PFAS treatment is not only about removing PFAS from drinking water, but it also encompasses treating the sources of PFAS. They also explained that we need to consider more than just removing PFAS from surface water (or other media), PFAS should also be destroyed. However, there are few technologies that have been scaled up to actually destroy PFAS in water. Current PFAS treatment technologies focus on removing PFAS from water to

non-detect levels. Granulated activated carbon (GAC) is the most commonly used treatment technology since cities and states know how to design and operate GAC systems.

Dora compared four different treatment technologies commercially available for PFAS removal. They include GAC, ion exchange (IX), reverse osmosis, and foam fractionation. IX is just beginning to be used for full-scale drinking water treatment. Reverse osmosis has not gone through long-term operation for PFAS removal for large-scale drinking water applications, and foam fractionation has not yet been used for large-scale drinking water applications either. Based on pilot studies, reverse osmosis is very promising because it has performed well in getting short chain- and long-chain PFAS below non-detect levels, including PFBA which is the one most difficult to be removed using GAC or IX. However, there are high costs associated with this technology. All four technologies create some type of PFAS-containing waste.

Dora explained that adaptive design is crucial for the future of PFAS treatment. This means that a system is flexible for different media uses when needed for large-scale treatment. She also explained that there have been advancements with sorbents that are added to the treatment technology that help remove shorter chain PFAS (e.g., Fluoro-Sorb, Biochar). Dora also mentioned that there are important considerations about precursor treatment and PFAS transformation. It is important to note that in communities that already have reuse programs for drinking water, there are sometimes concerns about converting precursors into regulated PFAS when advanced oxidation is part of the treatment process.

Dora then went into further detail on different PFAS remediation technologies including reverse osmosis. While this system is effective for removing PFAS, there are expensive capital and operating costs. In addition, the overall PFAS mass is not reduced but concentrated in the RO reject which needs to be discharged and managed after treatment. This technology has not been previously implemented in Minnesota for PFAS and would require additional testing to be approved. Dora also detailed the foam fractionation process. This technology has recent applications for landfill leachate, wastewater, groundwater, and surface water. This process adds air to water causing bubbles to form due to the surfactant properties of PFAS. PFAS get concentrated at the bubble-water interface and float to the surface of the water. A PFAS-containing foam layer is formed and can then be removed from the water surface. This technology is especially effective for long-chain PFAS. This technology is also not yet approved for large-scale drinking water treatment projects in Minnesota. Lastly, Dora discussed coagulation. This is an additive (e.g., a plant-based coagulant such as PerfluorAd) which interacts with PFAS only. The PFAS coagulates with a simple mixing process. This process is relatively low-cost and is commercially available in the U.S.

Dora then discussed PFAS destruction technologies. One technology is electrochemical oxidation, a process where voltage is applied to an electrochemical cell containing anodes and cathodes, destroying PFAS through electrochemical oxidation reactions. This technology is especially helpful for low-volume liquids that contain high concentrations of PFAS. Limitations of this process include slow reaction that requires liquids to be recirculated in the cell for many hours before complete destruction, co-contaminants, shorter chain PFAS generation from longer chain PFAS destruction, and it is less effective for shorter chain PFAS. Dora also explained the process of plasma treatment where argon gas concentrates PFAS at the gas-water interface and plasma is generated at that interface, which then destroys PFAS. Dora also reviewed the process of supercritical water oxidation, which is one of the few technologies with the potential to destroy PFAS in solid wastes. In this technology, water is heated, and pressure is increased to reach a supercritical point where certain chemical

oxidation processes are accelerated. Lastly, Dora explained the possibility of coupling regenerable IX treatment with on-site PFAS destruction.

Dora explained that the top considerations for selecting a PFAS treatment are cost, reliability, flexibility, and waste generation and management. The best practice for PFAS mitigation when treatment is needed is "separate, concentrate, and destroy."

Feedback

One Subgroup member asked if any of the new technologies were available for private water systems, or if GAC was still recommended and most affordable. Dora explained that GAC is still the most common treatment for private water systems. She explained that the cost of a new treatment system for comparison would depend on operation and reliability.

Public Comments and Questions

There were no comments or questions from the public at this time.

Update on Project 1007

Hanna Temme and Amanda Lanning (AECOM) provided an update on Project 1007. The end goal of Project 1007 is to develop a feasibility study to address PFAS impacts in the groundwater, surface water, and sediment. AECOM is still doing a lot of sampling and beta site drilling investigation. They expect to complete drilling by the end of 2022 and will continue sampling through 2023. AECOM is continuing to refine the conceptual site model that they are creating by focusing on secondary source areas resulting from primary source areas and migration pathways from both the primary source areas and these secondary sources. This will help determine how PFAS is moving both laterally and vertically in groundwater and will allow for more effective surface water treatment and long-term drinking water protection. The conceptual site model is being further developed from the original understanding of PFAS movement in the Project 1007 area by explaining how and where PFAS contamination enters aquifers. The beta site drilling of multi-aquifer well nests has allowed for a more targeted approach to mapping contamination within each aquifer and has led to gaining a better understanding of aquifer-specific groundwater divides and groundwater flow pathways. However, there are still areas where contamination has not been mapped. These unmapped areas show where there is no aquifer data within a ½ mile radius of the plume. Additional testing and information are needed to fill in these gaps and confirm suspected PFAS pathways to ensure the implementation of an effective remedial strategy.

AECOM is planning additional beta drilling sites around areas of concentrated PFAS impacts where further delineation is needed to understand where the PFAS is coming from and where it is going. Another key component is aquifer pumping tests. AECOM has completed two pumping tests to date in the Jordan Aquifer and is planning two additional tests in the Shakopee Aquifer. In the meantime, AECOM is also working on completing an integrated surface water and groundwater model. Currently, they are refining the hydrogeologic model layers as well as improving the model's data inputs by incorporating all of AECOM's field data from analytical data, drilling, pumping, and field observations. AECOM expects the completion of the integrated surface water and groundwater model by the end of 2022. AECOM is also incorporating a PFAS fate and transport model into the site conceptual model. This will predict how PFAS moves in surface and groundwater

and incorporates a comprehensive understanding of historical source areas, all available PFAS analytical data, and an assessment of the specific transport properties of PFAS in surface water and groundwater. Most importantly, this model will help create the most effective, targeted remediation plan for surface water and groundwater concerns.

AECOM also discussed the potential use and placement of a multi-benefit well array as they begin to consider the remedial phase recommendations for the Project 1007 area. They are currently reevaluating the best placement for multi-benefit wells based on new information about the hydrogeologic system, surface water infiltration pathways, and identified secondary source areas. The goal of the new multi-benefit well placement is to capture PFAS effectively and efficiently from impacted aquifers while also serving other supply needs. AECOM expects to finalize the location of the wells by the end of 2022 and will include this information in the feasibility study along with other potential remedial options.

Another component of Project 1007 is a surface water treatment pilot study. The goal is to evaluate the effectiveness of surface activate foam fractionation (SAFF) to concentrate PFAS followed by an electrochemical oxidation technology to destroy PFAS as options for full-scale surface water treatment. The first proposed pilot study location is at Eagle Point Lake. The surface water will enter the SAFF system, foam into a concentrate, capture the concentrate, and the treated water will then be returned to the Project 1007 waterbody. The captured concentrate will be destroyed. Testing will begin as soon as the SAFF system is in place at the first of four locations, potentially later this year.

AECOM also discussed how this information would feed into the overall feasibility study. The goals of the feasibility study are to identify areas where treatment is required to reduce human or ecological exposures, evaluate applicable treatment options, and recommend remedial options to address PFAS impacts.

Updates were also provided on the baseline ecological risk assessment, which identified risks in animals and plants in the Project 1007 area. An addendum was completed to include PFAS risks to muskrats by sampling vegetation. The results showed a low risk to muskrats but PFAS concentrations in floating vegetation were highest, which was an unexpected result, and could have implications to the risks to ducks. More ecological risk assessment work is being done by the Department of Natural Resources on deer, ducks, and geese that will be incorporated into future addendums. The baseline ecological risk assessment report can be found on the Project 1007 website: Project 1007 | Minnesota 3M PFAS Settlement (state.mn.us).

Feedback:

One Subgroup member asked if shorter chain PFAS were found in floating vegetation. Hanna explained that they saw more of the longer chain PFAS in floating vegetation.

Another Subgroup member asked how AECOM would determine where to discharge treated water. Hanna explained that they were still determining the final location, but it would be easiest in a stream where it would be easy to separate intake and discharge.

A member of the public asked if AECOM had studied PFAS impacts on Canadian geese. A representative from DNR explained that they are working on geese studies right now and expect that to be done in the next year.

Subgroup 1 wrap up and next steps

Gary Krueger provided an overview on next steps for Subgroup 1. He explained that this is the last formal Subgroup 1 meeting and Co-Trustees will plan to roll technical items into work group meetings moving forward. One-on-one meetings will be held on an as-needed basis. He also explained that capacity grants will be closing on June 30th, so all reimbursement requests should be submitted by July 31, 2022.

Gary thanked the Subgroup members for all their work over 30 Subgroup meetings and over 100 one-on-one community meetings. The technical input from Subgroup 1 was critical in developing the Conceptual Drinking Water Supply Plan. He concluded with a few additional updates including that MPCA will be taking a lead on scheduling well testing but would continue working with MDH.

Public Comments and Questions

There were no public comments or questions at this time.