Madison Metropolitan Sewerage District
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October 17, 2019

Mr. Jason Knutson
Chief, Wastewater Section
Bureau of Water Quality

Mr. Wade Strickland
Chief, Water Permits Section
Bureau of Water Quality
Wisconsin Department of Natural Resources
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707

Dear Mr. Knutson and Mr. Strickland:

On July 22, 2019, I received a letter from the DNR (the "department") requesting that the district consider three voluntary actions related to per- and polyfluoroalkyl substances (PFAS). Thank you for including us in the effort to contribute information on this important topic. We are dedicated to our mission to protect public health and the environment. As a public utility, we are also committed to providing accurate, science based information to our customers and residents in our service area.

We prepared a white paper in May of 2019 (enclosed) which outlines a path forward that reflects the current, unresolved state of a variety of scientific and regulatory questions regarding PFAS concerns. We have also retained a consultant to assist us with obtaining answers to critical questions in the paper.

Below is our response to your three requests:

1. **Monitor influent and effluent for PFAS**: We are pleased to work with the department towards voluntary testing of wastewater influent and effluent. For this effort to benefit public health and improve our industry's response, we believe the following steps are necessary prior to testing:

    - Development of a public outreach plan with the department that outlines accurate information around fate, transport and risk of PFAS compounds in wastewater and biosolids. We have a responsibility to let the public know what the test results mean.
    - Establishment of standard state and federal analytical methods and certified laboratories for monitoring PFAS in wastewater influent and effluent to assure meaningful results. We have a responsibility to obtain reliable data on which to base decisions.

2. **Investigate/reduce sources**: The district service area contains no known original industrial manufacturers or users of PFAS that would have the potential to discharge high concentrations to the treatment plant. That being said, we will continue to do the following:

    - Expand the scope of pollution prevention initiatives to identify and reach commercial entities that may have PFAS in their products or receive PFAS through their process, and work with these facilities to reduce sources through product substitution or other pollution minimization plan alternatives.
    - Review sewer use ordinance language; consider additional protective requirements when industrial permit users reach renewal dates.

3. **Fate and transport study participation**: We have contacted the UW study group and agreed to monitor their progress and participate at a future time pending completion of our own study, which is currently underway.

In closing, we understand there is significant public pressure for answers. It is at times like these that public servants must "go slow to go fast" to seek the truth through good science and process. The department has always taken a pragmatic, deliberative approach when tackling tough environmental issues, and we should apply those same practices to this high profile issue.

Sincerely,

D. Michael Mucha, P.E., ENV-SP
Chief Engineer and Director

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Enclosure

Madison Metropolitan Sewerage District

Background and actions to address per- and polyfluoroalkyl substances (PFAS)

May 13, 2019

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Executive summary

Madison Metropolitan Sewerage District has been safely cleaning water and reclaiming natural resources since 1930. This work brings with it responsibility for managing wastewater that reflects the daily lives of the people and businesses in 26 customer communities. It requires the district to manage a wide range of water chemistry concerns from minute amounts of toxic substances such as mercury and arsenic to an overabundance of more common chemicals such as phosphorus and chloride. To do so, the district employs strategies including source control, industrial pretreatment permits and pollution prevention programs to protect public health and the environment. In developing its control and prevention strategies, the district pursues solutions that optimize environmental, economic and social sustainability.

The district takes customer and community issues very seriously, including recent public concerns regarding the transport, fate and effects of per- and polyfluoroalkyl substances (PFAS). Wastewater treatment plants are not original sources of PFAS and do not add or have the capability to remove these chemicals during the treatment processes. However, wastewater arriving at the plant contains traces of these chemicals from all of us – from our bodies, our cookware, the dust in our homes, the clothing we wash and even the cosmetics, conditioners and sunscreens we use.

As explained in the pages that follow, while current wastewater treatment processes are not designed to remove these chemicals, potential technologies to accomplish the task create their own problems with respect to human health, the environment and affordability. As with other chemicals that cannot be effectively treated, the district already has worked in partnership with its industrial permittees to protect the system from concentrated PFAS discharges. However, the district is continuing to refine its prevention strategy to increase its focus on potential diffuse sources. The following plan integrates work that is already underway with new actions informed by dialogue involving the district, the Madison Metropolitan Sewerage District Commission, state and federal regulators, elected officials, customers and community members.

In outlining a path forward, the plan reflects the current, unresolved state of a variety of scientific and regulatory questions regarding PFAS while building on successful approaches the district has historically used to address chemicals for which treatment is not feasible. The plan focuses on:

- further advocacy for the development of federal standards;
- additional research including a deeper review of published scientific literature;
- engagement with technical working groups developing common approaches;
- continued independent evaluation of sampling protocols, laboratory methodologies and accreditations related to PFAS;
- sewer use ordinance and industrial permit review;
- pollution prevention efforts involving an expanded number of commercial entities; and
- community engagement work to better understand customer and community concerns, to identify ways in which area residents and businesses may aid in the search for solutions and to share information regarding the district's efforts.

Taken together, these critical steps support national efforts already underway to hold major sources of PFAS accountable, establish consistent, science-based standards and minimize the potential for low concentration contributions from diffuse sources. This approach includes gathering additional information and taking action to minimize the potential for PFAS discharges by using proven adaptive strategies that will protect human health and the environment while maintaining affordability.

PFAS found throughout the environment; levels in people declining

PFAS chemicals can be found ubiquitously in the environment and have been detected in water and soil near some industrial and military installations nationwide, including near Madison's Truax Air National Guard Base. This family of chemicals has been in use since the 1940s with more than 3,000 variations developed for products including food packaging, stain resistant and waterproof fabrics, nonstick cookware and aqueous film forming foam, which is required for some firefighting applications.[i]

A December 2018 white paper developed by a State of Michigan PFAS science advisory panel identifies numerous routes of direct human exposure to PFAS ranging from household dust to seafood, while making clear that more research is needed to understand the relative contributions of each route of transport to human blood serum concentrations. The report focused on specific evaluation of perfluorooctane acid (PFOS) and perfluorooctanioic acid (PFOA).[ii] The Danish Environmental Protection Agency further documents the presence of PFAS in numerous personal care products including cosmetics, lotions, shampoos, conditioners and shaving creams.[iii]

The good news is that human blood serum levels of PFOS and PFOA have declined dramatically in recent years. This trend is consistent with a voluntary phase-out of key PFAS substances, including PFOA and its precursors, by leading manufacturers starting in 2000 and continuing with a U.S. Environmental Protection Agency stewardship program launched in 2006.[iv] Data released in January 2019 by the Centers for Disease Control show 2013-14 median blood serum concentrations of PFOS at 5.2 parts per billion, down some 80 percent from 1999-2000 concentrations of 30.2 parts per billion. Median concentrations of PFOA in 2013-14 were 2.1 parts per billion, down some 60 percent from 5.2 parts per billion in 1999-2000.[v] By comparison, a 2008 study showed samples of household dust averaging PFOS concentrations of 201 parts per billion and PFOA concentrations of 142 parts per billion.[vi]

Federal efforts underway, more work needed

EPA has classified certain chemicals in the PFAS family as emerging contaminants[vii] and has started the process to list some of the chemicals as hazardous substances under the Comprehensive Environmental Response, Compensation and Liability Act, also known also as Superfund.[viii] This listing will provide EPA with additional authority to require response actions by responsible parties. As part of its recently released PFAS Action Plan, the agency also is working to provide guidance for groundwater cleanup actions at contaminated sites and coordinate with other agencies working to better understand PFAS toxicity.[ix]

Under its newly issued draft interim recommendations to address groundwater contamination, EPA has established a screening level of 40 parts per trillion at which no adverse effects are expected based on potential exposure. The draft recommendations, which have been posted for public comment until June 10, 2019, also establish preliminary remediation goals of 70 parts per trillion for groundwater based on the agency's lifetime health advisory for PFAS.[x]

To date, the EPA has not issued a drinking water standard for PFAS compounds. The health advisory for drinking water covers two of the more prominently found PFAS constituents – PFOA and PFOS – at 70 parts per trillion or 70 ng/L, individually or combined when both compounds are present. The agency's health advisories are not enforceable. While numerous studies have documented negative health impacts associated with high levels of PFAS exposure,[xi] human health effects from low PFAS environmental exposures are not well understood. According to the U.S. Centers for Disease Control, finding a measurable amount of perfluorochemicals in serum does not imply that the levels cause an adverse health effect.[xii]

Absent federal standards, several states have established or are developing their own standards for PFAS at levels in drinking water as low as 10 parts per trillion. While many of these state efforts focus on drinking water, Maine has moved to require testing for PFAS in biosolids[xiii] and Michigan now requires testing of wastewater.[xiv] Wisconsin currently has not developed its own PFAS standards and is not requiring testing.

Inconsistent methods, measurements create challenges

There are two critical considerations in measuring compounds such as PFAS. First, while advances in analytical monitoring techniques now allow PFAS compounds to be detected at a parts per trillion level, the mere detection of the compound does not necessarily equate to a human health risk. To provide a sense of scale, one part per trillion is the equivalent of one drop of water in 20 Olympic sized swimming pools,[xv] and 1,000 parts per trillion equals one part per billion. As noted above, recent human blood samples now show PFOS to be present at 5.2 parts per billion, PFOA at 2.1 parts per billion and household dust at 201 parts per billion compared with the drinking water health advisory of 70 parts per trillion.

Second, the applicability and reliability of analytical test methods may vary with the substances being tested. There is no single methodology for isolating, identifying and quantifying all PFAS in environmental media. Sampling and analyzing complex media such as wastewater and biosolids present a variety of challenges not seen in testing drinking water and currently, no federal standards exist.

In developing the 2016 federal health advisory for drinking water, EPA reviewed the performance of multiple laboratories and provided opportunities for public comment before establishing minimum reporting levels of PFOA at 20 parts per trillion and PFOS at 40 parts per trillion. EPA established these parameters to reflect the lowest levels at which the agency had high confidence that capable analysts and laboratories would be able to reliably meet the standards, although it acknowledged that some laboratories may be able to measure PFAS in drinking water at lower levels.[xvi]

Accompanying this work was development of Method 537[xvii], which was approved only for drinking water testing and implemented as part of the agency's unregulated contaminant monitoring rule to sample for PFOA, PFOS and four other PFAS through the end of 2016. The monitoring project and minimum reporting effort have since concluded. EPA's drinking water program does not currently specify a method for monitoring since PFOA, PFOS and the other target chemicals are not regulated under the Safe Drinking Water Act.[xviii]

Method 537 was never intended for use in analyzing wastewater influent, effluent or biosolids. Currently, some laboratories promote the use of various modifications of the 537 method to test environmental media including soils and surface waters as well as other PFAS chemicals. However, EPA has not identified standard descriptions for the modified methods and is not aware of studies validating the performance of the modified methods across multiple laboratories.[xix] EPA does not accredit laboratories, although some individual states have established preferred provider lists and the U.S. Department of Defense has established its own accreditation program for PFAS.[xx, xxi] The Wisconsin Department of Natural Resources is currently working on developing methods and required certification processes for labs in the state.[xxii]

Among the states conducting sampling of drinking water, wastewater and material such as biosolids, sampling protocols and targets vary greatly. For example, the State of Maine Department of Environmental Protection issued a memo on March 22, 2019 requiring all licensed facilities that land apply, compost or process sludge in Maine to update sampling and analytical work plans to include PFOA, PFAS and PFBS by April 12, 2019, complete initial sampling in accordance with the

state's guidance by May 7, 2019 and submit the samples to seven Maine-approved lab companies that use a Modified Method 537 method.[xxiii]

By comparison, Michigan has established the ASTM D7979 (ASTM, 2017) test method for wastewater and sludge by liquid chromatography – tandem mass spectrometry to scan for a total of 24 substances. These include 14 analytes consistent with Method 537 Revision 1.1 as well as 10 other substances.[xxiv]

Sampling is also an area that requires standardization. While both states ban a wide list of products from field sampling sites including certain types of collection bottles, tubing, cosmetics and clothing containing Gore-Tex, Maine bans Post-It notes and all blue chemical ice packs while Michigan bans carry-out food and regular or thick sized Sharpie markers.[xxv] Michigan also specifies that new clothes be washed six times with no fabric softener before being worn for sampling work.[xxvi, xxvii] While these and other sampling protocols incorporate a variety of scientific methods as part of efforts to aid precision, the reality is that PFAS chemicals are all around and in fact already inside of us.

Beyond the need for additional work to standardize sampling methods, analytical techniques and laboratory qualifications, further research is needed regarding PFAS in soil. As shown in a 2010 study, biosolids affected by direct industrial discharges of PFAS to wastewater treatment plants may elevate levels of the chemicals in soils.[xxviii]

However, a more recent compilation of research by the North East Biosolids and Residuals Association indicates that, in modern biosolids with no direct industrial discharges, PFOA levels average about 5 parts per billion and PFOS levels average about 11 parts per billion. These values are reduced approximately 200 times when biosolids are properly applied. To date, testing has not found levels of PFOA and PFOS above 70 parts per trillion in groundwater monitoring wells under and around land application sites, as long as the biosolids have not been affected by direct industrial discharges.[xxix]

Treatment options problematic

Systems for removing PFAS from drinking water including use of granular activated carbon are well developed, albeit costly. Treatments for dirtier water, such as wastewater, and biosolids are not well developed, carry significant implications for human health and the environment and are also extremely costly.

The State of Michigan's science advisory panel notes that reverse osmosis technology may be one way to remove PFAS from the wastewater stream but recommends laboratory-scale and pilot-scale studies before implementation since efficacy varies significantly with the type of PFAS and the pH, temperature, organic matter content and other properties of the water.[xxx]

Anion exchange, granular activated carbon and reverse osmosis treatments for water with higher solids content such as wastewater, and biosolids, are not well developed, are extremely costly and have been shown to have reduced removal efficacy of PFAS compared to use of these technologies in most drinking waters.

These treatments also hold potential implications for human health and the environment. In the case of anion exchange and reverse osmosis, there are concentrated liquid waste streams that must be further treated prior to discharge. With granular activated carbon, carbon regeneration has the potential to release PFAS to the atmosphere.

The State of Michigan's science advisory panel also identifies high temperature incineration as one of the few means available to break down PFAS in solid material (including destruction of used granular activated carbon filters from drinking water treatments) and convert the contaminants into chemicals no longer considered to be PFAS.[xxxi] Beyond the energy used to operate a high temperature incinerator, this solution would carry serious air quality concerns, require a significant air permitting effort and involve contracting for landfill acceptance of the resulting ash. Any solution involving landfilling would not effectively address concerns about the fate of PFAS in the environment; the district currently accepts leachate from area landfills for treatment.

Taken together, these alternatives related to the treatment of solid material also ignore the fact that biosolids represent an important local and sustainable source of nutrients needed by the local farming community. The 37 million gallons of biosolids the district reclaims each year are injected into the soil to fertilize some 5,000 acres, reducing the need for incoming shipments and application of synthetic fertilizers.

Despite these challenges, the district remains committed to addressing PFAS concerns and has effective tools to do so. As demonstrated by the success of long-standing mercury and chloride source control efforts, minimizing any PFAS coming into the plant represents the best way to reduce any PFAS leaving the plant.

The following table provides a synopsis of key PFAS related challenges, anticipated district actions to address those concerns, the intended results from these actions and a timeframe for doing so.

Key concerns and actions related to (PFAS)

Concerns/challenges	District actions	Intended results	Timeframe
Lack of regulatory clarity	Advocate for federal standards; support efforts that focus on upstream sources of PFAS; monitor state and local regulatory initiatives; provide information to stakeholders and supporters to advance these efforts	Achieve regulatory clarity; invoke ultimate authority and hold upstream parties accountable; achieve consistent, science-based standards that support industry responsiveness	Ongoing
Incomplete, inconclusive and conflicting sources of information	Support further research regarding the toxicity and transport of PFAS; explore options related to a review of scientific literature to better understand current findings and address existing knowledge gaps	To aid in understanding key health and environmental implications of PFAS management methods and develop information that may be necessary to implement next steps	Ongoing
Interests of the district's customer communities may be subordinated to ill-advised policy decisions	Engage with technical working groups at state and federal levels	To ensure sound science and operational realities are accounted for	Ongoing

Attachment 1

Concerns/challenges	District actions	Intended results	Timeframe
There is no standard approach for PFAS sampling in wastewater, effluent or biosolids; there is no approved analytical protocol or agreed upon panel of substances to test for; states are pursuing inconsistent approaches with respect to lab accreditations	Advocate for a federal approach to sampling, laboratory testing methodologies and accreditation; review existing state and federal approaches for wastewater and biosolids sampling; work through stakeholder groups to develop comparisons of current laboratory methods and key substances to sample for; identify various accrediting entities and laboratories with appropriate credentials	To determine whether sampling and laboratory analysis can be used with confidence to develop a reliable and applicable data set absent federal or state regulatory guidance	Ongoing
Existing industrial permittees may not be fully aware of potential aspects of their operations that may contribute PFAS	Review sewer use ordinance language; consider additional protective requirements when existing industrial permits reach renewal dates (pending identification of suitable sampling and analytical methods); conduct outreach to ensure industrial permittees are aware of district, customer and community PFAS concerns	To expand the suite of tools and practices in place to provide assurance that PFAS loading is being minimized from industrial sources and establish the potential for more robust data collection in the future	Six months to begin planning and implementing
The extent of district authority to compel potential diffuse sources of PFAS to reduce loading needs to be reviewed	Expand scope of pollution prevention initiatives to reach commercial entities that may have PFAS in their products or receive PFAS through their processes	To encourage more diffuse sources of PFAS to recognize and act on public concerns to the extent practicable	Six months to begin planning and implementing
Customers and community members may not be aware of the district's efforts or may have fears about PFAS	Increase community engagement to better understand customer and community concerns; identify ways in which area residents and businesses may aid in the search for solutions; share information regarding the district's efforts	To bring new insights to bear in the search for solutions; to provide information from credible sources regarding PFAS and wastewater treatment processes to address concerns; to build broad-based support for potential voluntary compliance initiatives	Ongoing
District staff may not be aware of district efforts or may have fears about PFAS	Increase staff awareness to better understand the issues and the district's actions	To be transparent to staff and help connect concerns from their networks with district expertise	Ongoing

[i] Interstate Technology Regulatory Council, History and Use of Per- and Polyfluoroalkyl Substances (PFAS). Nov. 13, 2017. https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use__11_13_17.pdf

[ii] Scientific evidence and recommendations for managing PFAS contamination in Michigan. Michigan Science Advisory Panel. Dec. 7, 2018. https://www.michigan.gov/documents/pfasresponse/Science_Advisory_Board_Report_641294_7.pdf

[iii] Risk assessment of fluorinated substances in cosmetic products, Survey of chemical substances in consumer products No. 169. Danish Environmental Protection Agency. October 2018, https://www2.mst.dk/Udgiv/publications/2018/10/978-87-93710-94-8.pdf

[iv] PFOA Stewardship Program. U.S. EPA website. https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfass#tab-3

[v] Agency for Toxic Substances and Disease Registry. Per- and Polyfluoroalkyl Substances (PFAS) and Your Health. PFAS Blood Testing. U.S. Department of Health and Human Services website. https://www.atsdr.cdc.gov/pfas/pfas-blood-testing.html

[vi] Strynar MJ, Lindstrom AB. "Perfluorinated compounds in house dust from Ohio and North Carolina, USA." Environmental Science and Technology. May 15, 2008. 15;42(10):3751-6. https://www.ncbi.nlm.nih.gov/pubmed/18546718

[vii] Technical Fact Sheet – Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), U.S. Environmental Protection Agency, November 2017. https://www.epa.gov/sites/production/files/2017-12/documents/ffrrofactsheet_contaminants_pfos_pfoa_11-20-17_508_0.pdf

[viii] EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan, U.S. Environmental Protection Agency, February 2019. https://www.epa.gov/sites/production/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf

[ix] Ibid.

[x] USEPA Draft Interim Recommendations to Address Groundwater Contaminated with Perfluorooctanoic Acid and Perfluorooctane Sulfonate. U.S. EPA. April 25, 2019. https://www.epa.gov/sites/production/files/2019-04/documents/draft_interim_recommendations_for_addressing_groundwater_contaminated_with_pfoa_and_pfos_public_comment_draft_4-24-19.508post.pdf

[xi] Scientific evidence and recommendations for managing PFAS contamination in Michigan. Michigan Science Advisory Panel. Dec. 7, 2018 https://www.michigan.gov/documents/pfasresponse/Science_Advisory_Board_Report_641294_7.pdf

[xii] Biomonitoring Summary: Perflurochemicals. National Biomonitoring Program website. U.S. Centers for Disease Control. https://www.cdc.gov/biomonitoring/PFAS_BiomonitoringSummary.html

[xiii] Memorandum to licensed facilities that land apply, compost or process sludge in Maine. State of Maine Department of Environmental Protection, March 22, 2019. https://www1.maine.gov/dep/spills/topics/pfas/03222019_Sludge_Memorandum.pdf

[xiv] Wastewater Treatments Plants/Industrial Pretreatment Program. PFAS Response: Taking Action, Protecting Michigan. Michigan Department of Environmental Quality. Michigan.gov website, https://www.michigan.gov/pfasresponse/0,9038,7-365-86510_88079-476131--,00.html

[xv] Dolehanty, Mary Ann, Air Quality Division Director, Michigan Department of Environmental Quality. "Michigan: Taking Action on PFAS," NACAA Fall 2018 Meeting, PowerPoint Presentation. http://www.4cleanair.org/sites/default/files/Documents/Fall_2018_Dolehanty.pdf

[xvi] EPA Drinking Water Laboratory Method 537 Q&A. U.S. EPA website. https://www.epa.gov/pfas/epa-drinking-water-laboratory-method-537-qa

[xvii] EPA Document #: EPA/600/R-08/092. Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry. https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=525468

[xviii] EPA Drinking Water Laboratory Method 537 Q&A. U.S. EPA website. https://www.epa.gov/pfas/epa-drinking-water-laboratory-method-537-qa

[xix] Ibid.

[xx] U.S. Department of Defense Environment Safety and Occupational Health Network and Information Exchange. Website. https://www.denix.osd.mil/edqw/documents/

[xxi] Perry Johnson Laboratory Accreditation Inc. United States Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP). Website. http://www.pjlabs.com/accreditation-programs/department-of-defense-elap

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[xxv] Memorandum to licensed facilities that land apply, compost or process Sludge in Maine. David Burns, P.E., Acting Director, Bureau of Remediation and Waste Management, State of Maine Department of Environmental Protection, March 22, 2019. https://www1.maine.gov/dep/spills/topics/pfas/03222019_Sludge_Memorandum.pdf

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[xxix] Interim Best Practices- PFAS & Biosolids / Residuals. Jan. 10 2019. North East Biosolids and Residuals Association. Website. https://static1.squarespace.com/static/54806478e4b0dc44e1698e88/t/5c38a1cf4fa51a28ba9e2555/1547215312689/PFAS%26Biosolids-InterimBestPractices-10Jan2019-V1.2.pdf

[xxx] Scientific evidence and recommendations for managing PFAS contamination in Michigan. Michigan Science Advisory Panel. Dec. 7, 2018 https://www.michigan.gov/documents/pfasresponse/Science_Advisory_Board_Report_641294_7.pdf

[xxxi] Ibid.