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October 14, 2021

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Environmental Protection Agency
1200 Pennsylvania Ave. NW
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Re: EPA's Preliminary Effluent Guidelines Program Plan 15
Docket No. EPA-HQ-OW-2021-0547

The National Waste & Recycling Association (NWRA) submits these comments in response to the Environmental Protection Agency's (EPA) September 14, 2021, Notice on Preliminary Effluent Guidelines Program Plan 15. NWRA is a national trade association representing private-sector U.S. waste and recycling companies, as well as the manufacturers and service providers that do business with those companies. Some NWRA members operate landfills which are discussed in the Multi-Industry PFAS study.

EPA prepares bi-annual Preliminary Effluent Guidelines Program Plans that identify categories selected for effluent limitations guidelines or pretreatment standards rulemakings as well as categories for further review and analysis. EPA indicated it initiated a preliminary review of landfills based on comments received on Plan 14. EPA's most recent plan, Preliminary Plan 15, discusses the initial results from EPA's review for the landfill point source category and plans for additional data gathering to further evaluate the landfill category for possible development of guidelines or standards.

Landfills are PFAS receivers

Landfills are receivers of PFAS. They do not use PFAS. Instead, landfills, like publicly owned treatment works (POTW), manage materials containing PFAS from their incoming waste streams. Given that, the relative mass of PFOA and PFOS in leachate discharges to POTWs has been shown to be a relative minor contribution to POTWs overall PFOA and PFOS concentrations.[1] Because PFAS are ubiquitous in our environment, found in everything from textiles to food packaging; at end of life, these materials will reach landfills. Most of the PFAS remain sequestered within the landfill rather than making their way into leachate. Nonetheless, small amounts of PFAS do migrate into the leachate. For example, studies show that disposal of food packaging containing PFAS is a primary contributor to loading in landfill leachate.[2] Landfill leachate is managed for proper treatment/disposal mostly through direct or indirect discharge to POTWs.

Completely eliminating PFAS from entering landfills is impossible. At best, landfills and POTWs can minimize their PFAS effluent loadings or concentrations. One of the best ways to reduce effluent loading it to reduce influent loading. As Minnesota has recognized, a key long-term course of action to reduce PFAS in leachate is to continue and promote practices that reduce PFAS in the first place.[3] This has already been done with PFOS through EPA's 2002 SNUR that resulted in a voluntary phase out[4] and with PFOA through EPA's PFOA Stewardship Program.[5] There is a growing body of data that show these programs have been effective in reducing PFOA and PFOS in landfill leachate generated from older waste versus recent waste. Similar measures for other PFAS compounds should be similarly effective.

Future strategies to reduce use of PFAS in the marketplace need to be continued to be pursued nationally and could include additional voluntary phase outs, replacement products/chemicals, and increased disclosure of PFAS in consumer products. We encourage EPA to consider further assessment of preventative

[1] National Waste & Recycling Association – Carolina Chapters. *North Carolina Collective Study Report. Collective Study of PFAS and 1,4-Dioxane in Landfill Leachate and Estimated Influence on Wastewater Treatment Plant Facility Influent.* (March 10, 2020), available at: https://files.nc.gov/ncdeq/Waste%20Management/DWM/NC-Collective-Study-Rpt-03-10-2020.pdf; Michigan Waste & Recycling Association. *Statewide Study on Landfill Leachate PFOA and PFOS Impact on Water Resource Recovery Facility Influent. Technical Report* (March 1, 2019), available at: https://www.bridgemi.com/sites/default/files/mwra-technical-report.pdf

[2] Sanborn Head. *PFAS Waste Source Testing Report New England Waste Services of Vermont, Inc*. (October 2019), available at: https://anrweb.vt.gov/PubDocs/DEC/SolidWaste/OL510/OL510%202019.10.15%20NEWSVT%20PFAS%20Source%20Testing%20Rpt%20-%20Final.pdf

[3] Minnesota Pollution Control Agency, *Minnesota's PFAS Blueprint,* pg. 17 (February 2021), available at: https://www.pca.state.mn.us/sites/default/files/p-gen1-22.pdf

[4] Risk Management for Per- and Polyfluoroalkyl Substances (PFAS) under TSCA, EPA, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfas

[5] Fact Sheet: 2010/2015 PFOA Stewardship Program, EPA, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program

measures designed to address primary sources of PFAS in waste streams. As their use is phased out, leachate concentrations will also decline.

PFAS sampling and analysis in leachate

On September 2, 2021, EPA released Draft EPA Method 1633, its first validated method designed to test 40 PFAS in leachate. Currently, most laboratories analyze leachate samples using their own modified version of EPA Method 537.1, a method originally designed for drinking water. It is unclear how closely results from these two methods compare. Recommended sampling techniques also need to be developed. When dealing with smaller and smaller concentrations, minor sampling variations could potentially introduce considerable variations in results. Therefore, EPA should expedite finalizing EPA Method 1633 and developing sampling guidance to eliminate these doubts.

EPA Data needs

We understand that it has been 20 years since the landfill point source category was considered. As such, we appreciate the need for updated data that can be used to consider efforts to improve protection of human health and the environment. NWRA understands that EPA's preliminary review results show that further research is needed to address limited data availability including the following:

- Current size and scope of the landfills industry that generates and collects landfill wastewater.
- Analytical data for PFAS discharges from landfills nationwide, particularly direct discharge data on PFAS concentrations other than perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS).
- Profile of indirect discharging landfills including the amount of wastewater they discharge and their impact on POTW influent and effluent PFAS concentrations.
- Current wastewater control practices and treatment technologies in place at landfills and whether there are landfills currently implementing PFAS treatment for leachate.

NWRA members would be pleased to work with EPA on providing and/or establishing this information. A large volume of this information exists in various forms and our members are best suited to provide the most complete and accurate information for EPA's efficiency. Further, a literature review summary representing available publications and reports related to landfill leachate discharged to POTWs is included at the end of this letter to provide additional information.

EPA Preliminary Review

Currently, removal of PFAS from leachate have not been shown to be viable for full-scale implementation. This is because of significant interference from competing contaminants. As part of its analysis, EPA should evaluate whether a proposed treatment technology has been scaled for a full-sized landfill. Our members would welcome a meeting with EPA to review the current state of PFAS treatment in leachate.

Regarding treatment technologies, as long-chain PFAS are phased out and new short-chain PFAS replace them, the landfill leachate profile will also change. Older landfills will have higher concentrations of long-chain PFAS, while newer landfills will have higher levels of short-chain replacement compounds. Literature shows that some of the more common PFAS treatment methods (e.g., granular activated carbon and ion exchange technologies) are more effective with long-chain PFAS. Thus, EPA should consider the history of disposal in its analysis.

Conclusion

NWRA appreciates your consideration of these comments. Given the significant comments we have provided, we would appreciate the opportunity to review them with you as EPA conducts its review. Should you have any questions, please call Anne Germain at 202-364-3724 or e-mail at agermain@wasterecycling.org.

Very truly yours,

Darrell K. Smith

Darrell K. Smith, PhD
President & CEO

LITERATURE REVIEW SUMMARY

Summary of Leachate and Wastewater Co-Treatment Paper and Reports
This summary represents the available publications and reports related to leachate discharged to publicly owned treatment works (POTWs). To date, there are # studies that focused on the evaluation of leachate PFAS impacts of influent and effluent concentrations at POTWs. The literature does suggest that although leachate has a relatively higher concentration of PFAS when compared to domestic wastewater influent or other industrial sources, leachate does not make up a significant portion of the influent flow at POTWs and have not be shown to cause a significant impact on influent and effluent quality. Some studies have reported no statistically significant differences in effluent PFAS concentration from POTWs with and without leachate (Masoner et al., 2020).

Title: Disposal of products and materials containing per- and polyfluoroalkyl substances (PFAS): A cyclical problem
Author: Stoiber, Evans, and Naidenko, 2020
Link:
https://www.sciencedirect.com/science/article/abs/pii/S0045653520318543

This paper summarizes the available literature related to the disposal of products and materials that contain PFAS. Landfill leachate discharged to WWTPs is specifically mentioned in this article. Leachate can contain higher concentrations of PFAS relative to domestic influent but when considering the differences in volumes being treated, wastewater can contribute a higher mass of PFAS being released to the environment. A study of five wastewater treatment facilities in the U.S. reported that PFAS levels in effluent from wastewater treatment facilities receiving landfill leachate were similar to those that did not receive landfill leachate (Masoner et al., 2020). Landfill leachate transferred to the wastewater treatment plants in the study only represented around 18% of daily mass of measured PFAS in those plants (Masoner et al., 2020). Gallen et al., 2017 also found similar trends in leachate contributions to domestic wastewater. Busch et al., 2010 stated that approximately1% of the mass flow of PFAS to WWTPs was from landfill leachate. On occasion PFAS concentrations from landfill can be a potential source PFAS discharge to WWTPs but this would need to be better understood on a national level with a well-developed study.

Pertinent Information not Provided:

- The relative volumetric contributions of leachate to wastewater influent were not reported.
- The PFAS compounds studied were not mentioned in the tables presented. Only totals were reported.

Title: Occurrence and distribution of brominated flame retardants and perfluoroalkyl substances in Australian landfill leachate and biosolids
Author: Gallen et al., 2016
Link:
https://www.sciencedirect.com/science/article/abs/pii/S0304389416302539

Brominated flame retardants and perfluoroalkyl substances in Australian landfill leachate and biosolids were evaluated. This study highlights leachate quality trends that have been cited in the literature. Perfluorohexanoate (PFHxA) (12–5700 ng/L) was the most abundant investigated persistent, bioaccumulative and toxic (PBT) chemical in leachate. With one exception, mean concentrations of PFASs were higher in leachate of operating landfills compared to closed land- fills. Polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecane isomers (HBCDDs) were detected typically at operating landfills in comparatively lower concentrations than the PFASs. <u>Note, the volume of leachate discharged to WWTPs for treatment was small at <1% total inflow.</u>

Pertinent Information not Provided:

- This study did not evaluate the impact of leachate on POTW influent or effluent quality. But supports the general trends in the fraction of leachate discharged to POTWs.

Title: Australia-wide assessment of perfluoroalkyl substances (PFASs) in landfill leachates
Author: Gallen et al., 2017
Link:
https://www.sciencedirect.com/science/article/abs/pii/S0304389417300870

Mean concentrations of eight PFASs were higher in operating landfills (or landfill cells) accepting primarily municipal waste, compared to closed municipal landfills. Landfills accepting primarily construction and demolition wastes produced leachate that had higher mean PFAS concentrations than municipal landfills. Younger landfills appeared to have a higher burden of waste containing PFASs (or their precursors), as significant relationships ($p < 0.05$) were observed between selected PFAS concentrations and landfill age. Increasing pH and total organic carbon (TOC) in leachate were associated with increased concentrations of several PFASs. WWTPs are considered major point sources of PFASs release into the aquatic environment. Previous Australian estimates of the masses of PFASs discharged in wastewater effluent reached up to 186 kg per annum for PFOA, and so it appears that the contribution of leachate to the overall burden of PFASs entering WWTPs and being released in effluent is minor. The practice of treating leachate at WWTPs allows redistribution of PFASs between the solid and liquid waste streams, although the contribution of leachate to the total load of PFASs entering WWTPs is minor compared to domestic wastewater sources.

Site	Annual Volume Discharged (ML)	Mass of PFAS (g) Discharged to WWTPs Annually									
		PFOA	PFOS	PFHxA	PFHpA	PFNA	PFDA	PFUdA	PFDoDa	PFHxS	Total
2	1.53	1.3	0.76	3.4	0.92	0.13	0.1	0.03	0.03	3.3	9.9
6(SLC1)	17.44	7.8	3.6	19	6.1	0.26	0.12	0.03	n.d.	20	57
6(SLC9)	8.75	6.3	4.5	8.2	3.2	0.23	0.09	0.01	n.d.	22	44
8	7.39	2.8	0.45	4.3	2.1	0.29	0.16	0.02	n.d.	0.81	11
9	16.84	4.5	1.2	13	3.7	0.27	0.14	0.02	0.02	1.7	24
11	36.5	3.5	1.3	62	9.7	0.07	0.07	0	n.d.	8.9	85
15	36.5	17	7.5	28	10	0.75	0.34	0.06	0.02	37	100
25	39.576	7	1.7	18	5.3	2.6	0.1	0.19	n.d.	7.6	42
26	18.25	0.63	0.65	2.3	0.46	n.d.	n.d.	0.01	n.d.	1	5.1
	Min	0.63	0.45	2.33	0.46	0.07	0.07	0	0.02	0.81	5.11
	Mean	5.7	2.4	17	4.6	0.58	0.14	0.04	0.02	11	42
	Max	17	7.5	62	10	2.6	0.34	0.19	0.03	37	100

Pertinent Information not Provided:

- This study did not quantify the mass loading of PFAS coming from domestic wastewater to compare.

Title: Landfill leachate contributes per-/poly-fluoroalkyl substances (PFAS) and pharmaceuticals to municipal wastewater
Author: Masoner et al., 2020
Link: https://pubs.rsc.org/en/content/articlehtml/2020/ew/d0ew00045k

This study evaluated the impact of leachate on wastewater influent and effluent. Two WWTPs that did not accept leachate were used for comparison purposes. It is important to note that all of the WWTPs evaluated did have additional industrial sources.

- Total PFAS concentrations in leachate (93 100 ng L^{-1}) were more than 10 times higher than in influent (6950 ng L^{-1}) and effluent samples (3730 ng L^{-1}).
- Leachate load contributions for PFAS (0.78 to 31 g d^{-1})
- No clear differences in concentrations were apparent between effluents from WWTPs receiving landfill leachate and those that did not receive landfill leachate.
- The volumetric contribution of the landfills to the studied WWTPs was 0.09%, 0.24%, and 11.7%.

Pertinent Information not Provided:

- The authors present PFAS concentrations as "totals". It will be important to breakout these data to compare individual PFAS concentrations to make sure direct comparisons can be made. Total PFAS concentrations should never be compared study to study unless these totals reflect the same compounds.
- The breakdown of industrial source contributions will be important to note.

Title: National Estimate of Per- and Polyfluoroalkyl Substance (PFAS) Release to U.S. Municipal Landfill Leachate
Author: Lang et al., 2017
Link: https://pubs.acs.org/doi/10.1021/acs.est.6b05005

This study evaluated 95 leachate samples from across the U.S. for 70 PFAS compounds.

- For 2013, the total volume of leachate generated in the U.S. was estimated to be 61.1 million m^3, with 79% of this volume coming from landfills in wet climates (>75 cm/yr precipitation) that contain 47% of U.S. solid waste.
- The mass of measured PFASs from U.S. landfill leachate to wastewater treatment plants was estimated to be between 563 and 638 kg for 2013.

Pertinent Information not Provided:

- Note that leachate generation was "estimated" in this study.

Title: Michigan Waste & Recycling Association Statewide Study on Landfill Leachate PFOA and PFOS Impact on Water Resource Recovery Facility Influent
Author: NTH Consultants on Behalf of MWNA
Link:
https://docs.wixstatic.com/ugd/6f7f77_5be8751a1f754474ac6e27fc8247eba2.pdf

This report summarizes the results of a statewide study completed on behalf of the Michigan Waste & Recycling Association (MWRA) to determine levels of PFOA and PFOS in the leachate of those landfills participating in the study, and to estimate the leachate's relative contribution to the total amount found in wastewater influent at water resource recovery facilities (WRRFs) (aka POTWs or publicly owned treatment works, or sewage or wastewater treatment plants). On a statewide basis, available data indicates that the 35 landfills contribute approximately one million gallons of leachate to WRRF influent, with approximately 0.01 lbs / day of PFOA and 0.003 lbs / day of PFOS. On a statewide basis, available data indicates that the 34 WRRFs that have influent data receive approximately 1.4 billion gallons of influent daily (based on design capacity), with approximately 0.09 lbs / day of PFOA and 0.15 lbs / day of PFOS. The data collected during this study indicate that leachate provides a relatively minor contribution to the overall PFOA and PFOS concentration in most WRRF influent; non-leachate sources of PFOA and PFOS contribute greater mass to WRRF influent than leachate.

Pertinent Information not Provided:

- This study only focused on PFOA and PFOS.

Title: Collective Study of PFAS and 1,4-Dioxane in Landfill Leachate and Estimated Influence on Wastewater Treatment Plant Facility Influent
Author: Hart Hickman for NWRA – Carolina Chapter
Link: https://files.nc.gov/ncdeq/Waste%20Management/DWM/NC-Collective-Study-Rpt-03-10-2020.pdf

This study focused on perfluoroalkyl and polyfluoroalkyl substances (PFAS) and 1,4-dioxane in municipal solid waste landfill (MSWLF) leachate and its possible influence on wastewater treatment plant (WWTP) facility influent. The volumetric contribution of leachate to POTWs in NC was 0.88%-2.64%. The results of the North Carolina Collective Study clearly show that landfill leachate represents a minor contribution of PFOS, PFOA, and 1,4-dioxane mass to overall WWTP influent mass for these compounds. Non-leachate sources contribute significantly more mass to WWTP influent than leachate. Landfills and WWTPs are not producers of the original sources of PFAS and 1,4-dioxane. Rather, they both receive and manage PFAS contaminated waste and wastewater from households, business, and industry.

Percent Contribution to WWTP Influent Daily Mass		
Constituent	Leachate Sources	Non-Leachate Sources
PFOS	0.7 to 2.9%	97.1 to 99.3%
PFOA	0.6 to 10.2%	89.8 to 99.4%
1,4-Dioxane	0.3 to 3.6%	96.4 to 99.7%