Investigation of Per- and Polyfluoroalkyl Substances (PFAS) in Fort Gratiot and Clyde Townships and North Street / St. Clair County Surface Water Sampling Update December 2019

Perfluorinated and polyfluorinated alkyl substances (PFAS) are a very large class of man-made organic chemicals that have been used in numerous industrial processes and consumer products for over 60 years. Validated analytical methods are available for relatively few of the thousands of compounds. Much of the environmental monitoring of PFAS in Michigan has focused on measuring only perfluorinated chemicals.

Many PFAS are persistent, some bioaccumulate in the environment, and several are toxic to mammals and/or birds in laboratory tests. The toxicities of most PFAS have not been evaluated. Two perfluorinated compounds; perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), have been the subject of the most toxicological work and environmental monitoring. Both compounds were manufactured intentionally, but they can also be generated as byproducts when other fluorinated compounds break down. In addition, several PFAS are key ingredients in firefighting foams. These foams have been used extensively in fire training exercises at military bases nationwide; in recent years, PFAS have been detected in surface and groundwater near many military facilities. Many products containing PFAS are used in numerous industrial processes, including metal plating, textile production and treatment, and specialty paper production. Industrial and domestic waste containing these compounds can enter the environment through municipal or private waste treatment systems, storm water runoff, venting groundwater, or as deposits after emissions into the atmosphere. Both PFOS and PFOA have been measured in surface waters across the state, and PFOS has been detected in most fish tissue samples from Michigan waters that have been analyzed for PFAS.

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has generated Rule 57 surface water quality values for the protection of human health and aquatic life for PFOS and PFOA. The Rule 57 Human Non-Cancer Value (HNV) for PFOS is 12 nanograms per liter (ng/L; parts per trillion) in surface waters not used as a source of drinking water, and 11 ng/L for those surface waters used as a drinking water source. The HNVs for PFOA are 420 ng/L and 12,000 ng/L for drinking and non-drinking water sources, respectively. The Aquatic Maximum Value (AMV) is the highest concentration of a substance to which an aquatic community can be exposed briefly without resulting in adverse effects; whereas the Final Chronic Value (FCV) is the highest concentration of a substance to which an aquatic community can be exposed for a long period of time without experiencing adverse effects. The Rule 57 AMV and FCV for PFOS is 880,000 and 7,700 ng/L, respectively. The Rule 57 AMV and FCV for PFOA is 780,000 and 140,000 ng/L, respectively.

EGLE, Water Resources Division (WRD), Emerging Pollutant Section (EPS), conducted surface water sampling in the Black River, Birch Creek, and Lake Huron coastal watersheds in December 2019. This sampling is a continuation of the effort the WRD, Surface Water Assessment Section (SWAS), initiated in September and November 2019. This sampling effort was initiated in part because the Fort Gratiot Landfill in Fort Gratiot Township, St. Clair County, was listed as a <u>PFAS site</u> after elevated levels of PFOS and PFOA were measured in landfill leachate/groundwater and surface water samples collected near the landfill in 2018. The Fort Gratiot Landfill in Fort Gratiot Township, St. Clair Ounty, was in operation from 1969 to 1994 and accepted industrial waste, including paper pulp waste, paint sludge, and contaminated soil from environmental cleanup projects. Additional surface water samples collected by contractors

for EGLE in July 2019 indicated that there may be significant PFAS sources upgradient of the landfill. A summary of the September and November 2019 surface water sampling can be found <u>here</u>.

EGLE, WRD, EPS, collected surface water samples in the Howe-Brandymore Drain, Doe Creek, Galbraith Drain, and Burtch Creek drainages (Table 1; Figure 1 and Figure 2). These sample locations are upstream of previously-measured locations to aid in our investigation of identifying the source(s) of PFAS in these drainages. Additionally, EGLE, WRD, coordinated with our contractor, AECOM, Inc. to collect soil and water samples from an agricultural field with Parcel ID 74-20-019-1007-01 (Parcel 1007-01), which received historic biosolids applications, stockpiles believed to be composed of dredge spoils/soils from a culvert replacement, tile drain outlets, and surface waters within multiple drainages. Lastly, three residential wells were sampled along Keewahdin Road north of Parcel 1007-01. The report summarizing the sampling conducted at Parcel 1007-01, along with the residential well sampling, can be found <u>here</u>.

Surface water samples were collected in accordance with the Michigan General PFAS Sampling Guidance (MDEQ 2018a) and Surface Water PFAS Sampling Guidance (MDEQ 2018b). The soil samples were collected following the Michigan Soil PFAS Sampling Guidance (MDEQ 2018c). The residential well sample was collected in accordance with the Michigan Residential Well PFAS Sampling Guidance (MDEQ 2018d). Quality Assurance/Quality Control (QA/QC) procedures followed the Fort Gratiot Area PFAS Investigation December 2019 Quality Assurance Project Plan (QAPP). The analysis of aqueous (surface water and residential wells) and solid (soil and dredge spoils) were delivered to Vista Analytical Laboratories in El Dorado Hills, California. Surface water samples collected outside of Parcel 1007-01 were delivered to the Eurofins Test America office in Brighton for shipment to the analytical laboratory by their staff. Surface water samples were analyzed for the PFAS listed in Table 2.

INSERT SUMMARY

References:

Michigan Department of Environmental Quality. (2018a). General PFAS Sampling Guidance. Michigan Department of Environmental Quality. (2018b). Surface Water PFAS Sampling

Guidance.

Michigan Department of Environmental Quality. (2018c). Soil PFAS Sampling Guidance.

Michigan Department of Environmental Quality. (2018d). Residential Well PFAS Sampling Guidance.

- Michigan Department of Environment, Great Lakes, and Energy Fort Gratiot Area Perfluoroalkyl and Polyfluoroalkyl Compound (PFAS) Investigation December 2019 Quality Assurance Project Plan (QAPP).
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Table 1: PFOS and PFOA concentrations measured above their detection limit in surface water samples collected from locations on the Black River, Birch Creek, and Lake Huron coastal watersheds in December 2019. Concentrations exceeding the Rule 57 HNV are in bold and italicized.

SAMPLE ID	SAMPLE LOCATION DESCRIPTION	LAT	LONG	PFOS (NG/L)	PFOA (NG/L)
1	Unnamed Ditch on west side of Wadhams Road	43.0533	-82.5565	35	5.4
2	Unnamed Ditch on east side of North Road	43.0603	-82.5570	62	11
3	Culvert on south side of Beard Road & North Road	43.0558	-82.5368	270	31
5	Pond east of driveway on Beard Road	43.0440	-82.5575	720	140
6	Unnamed Ditch on west side of Vincent Road; south of Beard Road	43.0443	-82.5322	0.98	2.3
7	Unnamed Ditch on east side of Vincent Road	43.0443	-82.5266	8.7	3.3
8	Unnamed Ditch on west side of Vincent Road	43.0661	-82.5266	ND	ND
9	Unnamed Ditched on south side of Carrigan Road	43.0583	-82.5504	100	21
10	Unnamed Ditch on east side of North Road	43.0550	-82.5269	3.9	1.2
11	Unnamed Ditch on west side of North Road	43.0687	-82.4818	4.1	1.1
12	Unnamed Ditch on south side of Cole Road	43.0819	-82.5063	ND	ND
13	Unnamed Ditch on south side of Cole Road	43.1551	-82.5058	0.71	ND
14	Unnamed Ditch on north side of Brace Road	43.1520	-82.5238	ND	ND
15	Unnamed Ditch south of Metcalf Road & Old Country Lane	43.0261	-82.5400	46	13
16	Unnamed Ditch on west side of State Road	43.0239	-82.5251	3.0	ND
17	Unnamed Ditch on west side of State Road	43.1404	-82.5025	410	10
18	Burtch Creek @ State Road	43.1467	-82.5232	35	16
19	Burtch Creek @ Jeddo Road	43.1429	-82.5230	52	20
20	Wixom Drain @ Harris Road	43.1404	-82.5025	2.5	1.1
21	Culvert south of GLWA Lake Huron Water Plant @ State Road	43.0760	-82.4986	ND	0.89
FB	Unnamed Ditch on south side of Cole Road	43.1551	-82.5058	ND	ND

FB denotes a Field Blank

Table 2: Perfluoroalkyl and polyfluoroalkyl substances analyzed.

Compound	Abbreviation	CAS #
Perfluorotetradecanoic acid	PFTeA	376-06-7
Perfluorotridecanoic acid	PFTriA	72629-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorobutanoic acid	PFBA	375-22-4
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorooctanesulfonamide	PFOSA	754-91-6
Fluorotelomer sulphonic acid 8:2	FtS 8:2	39108-34-4
Fluorotelomer sulphonic acid 6:2	FtS 6:2	27619-97-2
Fluorotelomer sulphonic acid 4:2	FtS 4:2	757124-72-4
2-(N-Ethylperfluorooctanesulfonamido) acetic acid	N-EtFOSAA	2991-50-6
2-(N-Methylperfluorooctanesulfonamido) acetic acid	N-MeFOSAA	2355-31-9
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11CI-PF3OUdS	763051-92-9
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9CI-PF3ONS	756426-58-1
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4

Figure 1: Overview map of surface water PFOS concentrations (ng/L) at locations in the Birch Creek watershed sampled in December 2019. The blue area is the Mill Creek-Frontal Lake Huron Watershed, whereas the red area is the Black River (St. Clair) Watershed. Concentrations exceeding the Rule 57 HNV are displayed as red circles.



Figure 2: Overview map of surface water PFOS concentrations (ng/L) at locations in the Lake Huron and Black River watersheds sampled in December 2019. The blue area is the Mill Creek-Frontal Lake Huron Watershed, whereas the red area is the Black River (St. Clair) Watershed. Concentrations exceeding the Rule 57 HNV are displayed as red circles.

