

Report of Annual PFAS Analysis

2023 Update -

Please see the table at the end of this report for our 2023 results. Levels of all regulated PFAS are down, most all below even the detection limit. Levels of unregulated PFAS are also down. We are happy to see our levels are both consistent and remain in the low range. We are even happier to see levels going down which we attribute to more audits of our feedstocks that check products are certified compostable.

Original Report -

Black Earth Compost is taking a proactive approach to investigating the issue of PFAS in our world and as it relates to our composts and soils. We have been voluntarily analyzing and reporting our results and have worked with a consultant to put together this document. In it we provide data from our latest round of PFAS testing from our 3 compost sites (see Table 2) and compare it to Massachusetts limits for human safety defined by the state as: children inhaling and playing in the soil (see Table 1). The good news is our compost and soil blends are safe by these strict standards.

Additional research with our consultant found studies describing background levels of PFAS in the environment (see Table 3). Some PFAS can be detected in most soils and homes because they have been heavily used by society since the 1950's. For comparison, we then collected publicly available data from high-profile PFAS contamination that occurred on Maine farms and in central Massachusetts at a compost facility which made news this summer (see Table 4).

Finally, we show data that the levels of PFAS, taken by the US Center for Disease Control, in blood serum has dropped significantly since 2001 (see Table 5). This may indicate that we may be past peak exposure to the PFAS that are of most concern and are highly regulated.

There is much fear associated with PFAS, but it is important to remember that we have been living with them for over 70 years. More importantly we have been depending on them every minute of every day to create the modern lifestyle we enjoy and depend on. Any transition away needs to be orderly and phased and not have impossible expectations of getting back to a zero PFAS world.

Background Information

PFAS, or per- and poly-fluoroalkyl substances have been widely used since the 1950s and are now ubiquitous in the environment. The reason for their popularity and utility is the molecules are able to provide simultaneous grease and water resistance while also being resistant to degradation by life and heat. Due to their use in Teflon cooking ware, Gore-Tex containing outdoor gear, stain-resistant furniture, stain-resistant carpeting, food packaging, mascara, school floor waxes, firefighting foam, and scores of other widely used products, we are all exposed to PFAS daily. Fortunately, due to the apparent toxicity of some PFAS compounds, many of the compounds are already being phased out of production, and our exposure to these have been decreasing (see Table 5 for the reduction in the US population's blood serum level of PFAS compounds in the last two decades). PFAS compounds last a very long time in the world, so that even with this reduction, background levels still persist and in some media, such as household dust, levels are quite high (see Table 4). Due to this we still see them in our daily lives for many years to come.

It is important to realize that PFAS exists in our world in a range from high concentrations to low concentrations. On the high end of the spectrum, there has been extensive media coverage recently related to Towns that have high levels of PFAS that are a concern (see Table 4). These sites have been taking ingredients that are high in PFAS such as paper mill waste. On the other end of the spectrum, studies have found low levels of PFAS in rain water which means that all environmental media (soils, plants, animals, fresh water, salt water, etc.) will show detectable amounts. This is shown to be true in studies that analyze for PFAS across forest, rural and urban soils in Maine and Vermont (see Table 3). It's important to realize

that low levels exist in most environmental media, including composts, and generally are not a concern to human health.

2022 Results

Black Earth Compost tests well below the limits set for human safety by the state of Massachusetts, the US EPA and the Canadian government. For the 6 PFAS compounds that are common and considered harmful, they are either **not detected** or are at least **180 fold below** the human safety limits set by the state. For example, the threshold for PFOA is 300 ug/kg (300 parts per billion); the PFOA level in our compost tests 1.6 ug/kg on average (see Table 2).

Massachusetts bases its human safety thresholds around a worst case scenario of soil being used at a daycare where children will be exposed to it through play and inhalation. The state then adds safety factors on top of that threshold to account for persons who may react differently or are particularly frail.

Black Earth Compost used in a soil directly on top of a drinking water supply does not contain enough concerning PFAS to accumulate to threatening levels. It is important to remember that compost is only applied to soil as an amendment, making up a fraction of the overall soil mass. To test this theory, we analyzed a farm soil that had used our compost about 10 times over 8 years (see Table 2). Levels of PFAS in this soil are still below the strict state thresholds to protect drinking water. On top of that, the levels found are lower than or in the range of background soil levels found at uncontaminated sites in Maine and Vermont (see Table 3).

There are 28 other PFAS molecules that EPA regularly advises testing for. 25 out of 28 of those are not detectable in Black Earth Compost or soil blends. The 3 that we do find are in low concentrations and are generally used on food and food packaging and thus people are already regularly exposed to them at higher concentrations on their food. These compounds are typically not regulated by states or countries because their toxicity is lower than those 6 PFAS that are near-universally regulated. Where safety standards do exist, Black Earth Compost is well below those thresholds as well. For example, the threshold for PFHxA is 800 ug/kg in Canada (one of the few countries to even regulate it) and our compost tests at 25 ug/kg; Threshold for PFBA in Canada is 114,000 ug/kg and our compost tests at 2.9 ug/kg.

Reducing PFAS impact - Getting to zero PFAS

Society will never get to zero PFAS. They have been heavily used in modern society in suburbs, cities, processed food supply chain and the single-use packaging culture. As we wean ourselves off of them and lower demand, manufacturers will respond and slowly start to produce less each day. When those production levels drop, PFAS will slowly disperse into the environment adding to the background 'chemical noise' found all over the Earth. Over 100's or 1000's of years that background amount will continue to decrease until it is only found in sedimentary rocks from our era. This is how persistent pollutants work.

Some people are demanding that all traces of PFAS be cleaned up and our world be set back to zero PFAS. That is impossible because PFAS is already in rain water from the Northern Hemisphere's continents down to Antarctica (Cousins et al.)¹. Reducing the manufacturing of PFAS is a smart first step. This stops new PFAS from entering into the environment and allows what is here to slowly disperse. Realistically though, a wind down of these PFAS containing products is going to take 10 to 20 years. On top of that, there may not be a replacement for many uses of PFAS. The reason they harm living beings and that they persist in the environment may be the same reason they provide the beneficial properties we want. Therefore, part of the solution is to lower our expectations of what we ask from consumer products.

Compostable Packaging

Black Earth Compost requires that any food packaging that you place in our bins is certified compostable. We only allow the following certifications because they have PFAS standards.

- Biodegradable Product Institute (BPI)
- Compost Manufacturer's Alliance (CMA)
- TÜV Austria/OK Compost



- EN 13432 or EN 14995

Legislative and Personal Actions

Black Earth Compost supports the following actions in government, schools, businesses and people...

- Legislative and Executive branch of government
 - The question of how to handle PFAS needs to be dealt with at the Executive level rather than legislative, judicial or with regulators. These later groups often have strict mandates that may prevent decision making where there are difficult tradeoffs for all decision pathways. There are too many complexities, PFAS is too pervasive and deeply integrated into modern living; Therefore Executive level thought, research and decision is required.
 - Scenario 1 – Mandate phase out of all PFAS from consumer food products and food packaging.
 - Scenario 2 – Require that if PFAS are to be used on consumer food and food packaging that they are first approved by FDA.
 - Either scenario should likely be phased in on a 5 year time frame in order to prevent shock to the supply chains. Going zero tolerance does not work for something that is used every minute of every day by people.
 - Regulate the term ‘compostable’ and ‘biodegradable’. These terms are used very loosely on consumer single use items. Two side by side products at a supermarket can say ‘compostable’, but one likely has PFAS and the other does not because it is certified compostable.
- Restaurants and Cafeterias
 - For single use plastic to-go items, first try to utilize PLA (polylactic acid) based items that are certified compostable (BPI, CMA, TUV, or the European compostable standards, see above). PLA doesn’t need a PFAS coating and can be cheaper. If you do use paper or fiber-based containers (trays, plates, wrappers, etc.), ensure that they are certified compostable by our standards in order to avoid PFAS (see above)
- Schools
 - Consider whether daily or weekly waxing of your hallways and floors is necessary. Determine if there are non-PFAS containing alternatives to the wax and wax strippers.
 - If you choose to use single use trays to serve lunches, ensure they are certified compostable. If you find an affordable certified 5-compartment trays, contact Black Earth so we can share it. We have a New England distributor who wants to carry affordable trays and can buy in bulk.
- Consumers
 - Ask that single-use food packaging that you consume be certified compostable by BPI, CMA, TUV or European standards (the ASTM 6400, developed by the American Society for Testing and Materials, does not consider anything regarding PFAS; nor does Forest Stewardship Council certification have anything to do with PFAS). So whether you are into composting or not, if you are against PFAS then you should be buying single use products that are certified by BPI, CMA, TUV or the European standards. <https://blackearthcompost.com/compostables/>
 - Consider consuming less greasy food. Not only is the greasy food likely bad for your health, but the PFAS needed to contain it in its bag or box is likely bad for you too.
 - Consume less total number of products.
 - Consume more simply. Do you need that stylish waterproof jacket? Or will a poncho and boiled-wool tunic work?

-Andrew Brousseau
Compost Operations/Managing Partner
Black Earth Compost

Table 1	PFAS Regulated by MA						PFAS Monitored by EPA			
	PFHpA	PFHxS	PFOA	PFNA	PFOS	PFDA	25 other PFAS*	PFBA	PFPeA	PFHxA
	STATE AND INTERNATIONAL REGULATIONS									
	no std = no regulation/standard, measured in ng/g, dry weight basis (parts per billion)									
Massachusetts Soil Standard - Skin Contact and Inhalation	Soil	300	300	300	300	300	no std	no std	no std	no std
Federal - EPA - Skin Contact	Soil	no std	1,300	190	190	190	no std	no std	no std	no std
Canada - Human Contact Safety	Soil	800	2,300	700	80	2,000	no std	no std	114,000	800
Massachusetts Soil Standard - Over drinking water source	Soil	0.50	0.30	0.72	0.32	2.00	0.30	no std	no std	no std
Federal - EPA - Over drinking water source	Soil	no std	0.17	0.92	0.25	0.04	no std	no std	no std	no std

Table 2	BLACK EARTH COMPOST - 2022 + 2023 RESULTS										
	no detc = not detected in this soil by analysis, measured in ng/g, dry weight basis (parts per billion)										
Manchester site 2022	Compost	no detc	no detc	1	no detc	no detc	no detc	no detc	4	7	26
Manchester Site 2023	Compost	no detc	no detc	no detc	no detc	no detc	no detc	no detc	3	1	2
Manchester site 2022	Soil Blend	no detc	no detc	1	no detc	no detc	no detc	no detc	2	4	15
Manchester site 2023	Raw Loam	no detc	no detc	no detc	no detc	no detc	no detc	no detc	no detc	no detc	1
Groton site 2022	Compost	no detc	no detc	no detc	no detc	1	no detc	no detc	3	7	34
Groton site 2023	Compost	no detc	no detc	no detc	no detc	no detc	no detc	no detc	no detc	1	6
Framingham 2022	Compost	no detc	no detc	3	no detc	no detc	2	no detc	3	9	11
Framingham 2023	Compost	no detc	no detc	2	no detc	no detc	no detc	2	2	2	15
Farm 1 soil with long term Black Earth Compost use 2022	Soil	no detc	no detc	0.5	no detc	no detc	no detc	no detc	no detc	1	1
Farm 2 soil with long term Black Earth Compost use 2023	Soil	no detc	no detc	no detc	no detc	no detc	no detc	no detc	no detc	no detc	no detc

Table 3	BACKGROUND LEVELS										
	no data = not analyzed for this PFAS, measured in ng/g, dry weight basis (parts per billion)										
Vermont State Soil Background	Soil	0.19	0.12	0.39	0.16	0.68	0.095	no data	no data	no data	0.23
Maine State Soil Background	Soil	0.085	min	0.394	0.145	0.275	0.078	no data	0.137	0.098	0.219
Maine State Soil Background (urban)	Soil	no data	no data	no data	min	1.17	0.094	no data	no data	no data	no data
US Household Dust (2001)	Dust	50	46	142	8	201	7	no data	no data	no data	54

Table 4	PFAS IN THE NEWS										
	no data = not analyzed for this PFAS, measured in ng/g, dry weight basis (parts per billion)										
(Max concentration) Contaminated Soils - Fairfield Ctr, ME	Soil	no data	no data	64	62	1,020	134	no data	no data	no data	no data
Mass Natural Compost - Westminster, MA	Compost	5	0.3	13	4	26	9	no data	no data	no data	12
(Max concentration) Mass Natural Compost - Westminster, MA	Compost	7	0.5	26	9	62	18	no data	no data	no data	33

Table 5	PFAS IN HUMANS										
	no data = not analyzed for this PFAS, measured in ug/L (parts per billion)										
US population 1999-2000	Blood	no data	2.13	5.21	0.551	30.40	no data	no data	no data	no data	no data
US population 2017-2018	Blood	no data	1.08	1.42	0.411	4.25	0.193	no data	no data	no data	no data

Notes:

all data based on median levels unless otherwise noted

NS = no standard

ND = below limit of detection (not detected)

NT = Not Tested

min = detected on less than 10% of samples (only applicable in background level testing)

* Black Earth Compost was analyzed for 25 other PFAS and does not contain the following: PFBS, F53B Major, F53B Minor, ADONA,

HFPO-DA, 8:2FTS A, PFDA, PFDoA, PFEEsA, PFHpS, N-EtFOSAA, N-MeFOSAA, PFTA, PFTrDA, 4:2FTS A, PFDS, FOSA, PFNS, FHxSA,

FBsA, PFMPA, 6:2 FTS A, PFPeS, PFUnA, nor NFDHA.

VT soil background levels from Zhu et al. 2019. *PFAS Background in Vermont Shallow Soils*

ME soil background levels from Sanborn Head. 2022. *Background levels of PFAS and PAHs in Maine Shallow Soils; study report.*

US household dust levels from Strynar and Lindstrom. 2008. *Perfluorinated compounds in house dust from Ohio and North Carolina, USA.*

Contaminated soils in Maine from Maine Department of Environmental Protection testing results summary

Mass Natural compost results from Tighe&Bond report to Massachusetts Department of Environmental Protection, September 16, 2002

Black Earth testing results from BE sampling utilized Pace Analytical labs

Blood serum levels from US Center for Disease Control (CDC). *National Report on Human Exposure to Environmental Chemicals*

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: MA

Sample Description:

Work Order: 23F0447

Date Received: 6/5/2023

Field Sample #: Manch Compost

Sampled: 6/1/2023 14:00

Sample ID: 23F0447-01

Sample Matrix: Product/Solid

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	1.4	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorobutanesulfonic acid (PFBS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoropentanoic acid (PFPeA)	1.9	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorohexanoic acid (PFHxA)	9.6	0.85	µg/kg dry	1	MS-07A	SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
11Cl-PF3OUdS (F53B Major)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
9Cl-PF3ONS (F53B Minor)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorodecanoic acid (PFDA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorododecanoic acid (PFDoA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoro(2-ethoxyethane)sulfonic acid (PFEEA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoroheptanesulfonic acid (PFHpS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
N-EtFOSAA (NEtFOSAA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
N-MeFOSAA (NMeFOSAA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorotetradecanoic acid (PFTA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorotridecanoic acid (PFTrDA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
4:2 Fluorotelomersulfonic acid (4:2FTS A)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorodecanesulfonic acid (PFDS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorooctanesulfonamide (FOSA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorononanesulfonic acid (PFNS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoro-1-hexanesulfonamide (FHxSA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoro-1-butanefulfonamide (FBFA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorohexanesulfonic acid (PFHxS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoro-4-oxapentanoic acid (PFMPA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoro-5-oxahexanoic acid (PFMBA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
6:2 Fluorotelomersulfonic acid (6:2FTS A)	2.5	0.85	µg/kg dry	1	MS-07A	SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoropentanesulfonic acid (PFPeS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoroundecanoic acid (PFUnA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluoroheptanoic acid (PFHpA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorooctanoic acid (PFOA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorooctanesulfonic acid (PFOS)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW
Perfluorononanoic acid (PFNA)	ND	0.85	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:06	QNW

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Date Received: 6/5/2023

Field Sample #: Manch Compost

Sampled: 6/1/2023 14:00

Sample ID: 23F0447-01

Sample Matrix: Product/Solid

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	51.9		% Wt	1		SM 2540G	6/6/23	6/6/23 8:30	DRL

Project Location: MA

Sample Description:

Work Order: 23F0447

Date Received: 6/5/2023

Field Sample #: Groton Compost

Sampled: 5/20/2023 14:00

Sample ID: 23F0447-02

Sample Matrix: Product/Solid

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluorobutanesulfonic acid (PFBS)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluoropentanoic acid (PFPeA)	1.4	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluorohexanoic acid (PFHxA)	6.3	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
11Cl-PF3OUdS (F53B Major)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
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Perfluoropentanesulfonic acid (PFPeS)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluoroundecanoic acid (PFUnA)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluoroheptanoic acid (PFHpA)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluorooctanoic acid (PFOA)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluorooctanesulfonic acid (PFOS)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW
Perfluorononanoic acid (PFNA)	ND	0.78	µg/kg dry	1		SOP-466 PFAS	6/8/23	6/16/23 13:14	QNW

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: MA

Sample Description:

Work Order: 23F0447

Date Received: 6/5/2023

Field Sample #: Groton Compost

Sampled: 5/20/2023 14:00

Sample ID: 23F0447-02Sample Matrix: Product/Solid**Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	53.3		% Wt	1	H-06	SM 2540G	6/6/23	6/6/23 8:30	DRL

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Various

Sample Description:

Work Order: 23G0694

Date Received: 7/6/2023

Field Sample #: Farm GH

Sampled: 6/20/2023 14:00

Sample ID: 23G0694-03

Sample Matrix: Soil

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorobutanesulfonic acid (PFBS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoropentanoic acid (PFPeA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorohexanoic acid (PFHxA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
11Cl-PF3OUdS (F53B Major)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
9Cl-PF3ONS (F53B Minor)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorodecanoic acid (PFDA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorododecanoic acid (PFDoA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoro(2-ethoxyethane)sulfonic acid (PFEEESA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoroheptanesulfonic acid (PFHpS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
N-EtFOSAA (NEtFOSAA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
N-MeFOSAA (NMeFOSAA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorotetradecanoic acid (PFTA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorotridecanoic acid (PFTrDA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
4:2 Fluorotelomersulfonic acid (4:2FTS A)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorodecanesulfonic acid (PFDS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorooctanesulfonamide (FOSA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorononanesulfonic acid (PFNS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoro-1-hexanesulfonamide (FHxSA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoro-1-butanefulfonamide (FBFA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorohexanesulfonic acid (PFHxS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoro-4-oxapentanoic acid (PFMPA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoro-5-oxahexanoic acid (PFMBA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoropentanesulfonic acid (PFPeS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoroundecanoic acid (PFUnA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluoroheptanoic acid (PFHpA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorooctanoic acid (PFOA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorooctanesulfonic acid (PFOS)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW
Perfluorononanoic acid (PFNA)	ND	0.58	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:07	QNW

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Various

Sample Description:

Work Order: 23G0694

Date Received: 7/6/2023

Field Sample #: Farm GH

Sampled: 6/20/2023 14:00

Sample ID: 23G0694-03

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	73.0		% Wt	1	H-03	SM 2540G	7/10/23	7/10/23 8:55	JLC

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Various

Sample Description:

Work Order: 23G0694

Date Received: 7/6/2023

Field Sample #: Raw Loam

Sampled: 6/20/2023 14:00

Sample ID: 23G0694-04

Sample Matrix: Soil

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorobutanesulfonic acid (PFBS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoropentanoic acid (PFPeA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorohexanoic acid (PFHxA)	0.97	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
11Cl-PF3OUdS (F53B Major)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
9Cl-PF3ONS (F53B Minor)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorodecanoic acid (PFDA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorododecanoic acid (PFDoA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoro(2-ethoxyethane)sulfonic acid (PFEEA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoroheptanesulfonic acid (PFHpS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
N-EtFOSAA (NEtFOSAA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
N-MeFOSAA (NMeFOSAA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorotetradecanoic acid (PFTA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorotridecanoic acid (PFTrDA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
4:2 Fluorotelomersulfonic acid (4:2FTS A)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorodecanesulfonic acid (PFDS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorooctanesulfonamide (FOSA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorononanesulfonic acid (PFNS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoro-1-hexanesulfonamide (FHxSA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoro-1-butanedisulfonamide (FBSA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorohexanesulfonic acid (PFHxS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoro-4-oxapentanoic acid (PFMPA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoro-5-oxahexanoic acid (PFMBA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoropentanesulfonic acid (PFPeS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoroundecanoic acid (PFUnA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluoroheptanoic acid (PFHpA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorooctanoic acid (PFOA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorooctanesulfonic acid (PFOS)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW
Perfluorononanoic acid (PFNA)	ND	0.60	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:14	QNW

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Various

Sample Description:

Work Order: 23G0694

Date Received: 7/6/2023

Field Sample #: Raw Loam

Sampled: 6/20/2023 14:00

Sample ID: 23G0694-04

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	71.6		% Wt	1	H-03	SM 2540G	7/10/23	7/10/23 8:55	JLC

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Various

Sample Description:

Work Order: 23G0694

Date Received: 7/6/2023

Field Sample #: Fram Compost

Sampled: 6/20/2023 14:00

Sample ID: 23G0694-05

Sample Matrix: Soil

Semivolatile Organic Compounds by - LC/MS-MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Perfluorobutanoic acid (PFBA)	1.6	0.95	µg/kg dry	1	PF-20	SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorobutanesulfonic acid (PFBS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoropentanoic acid (PFPeA)	1.9	0.95	µg/kg dry	1	PF-20	SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorohexanoic acid (PFHxA)	15	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
11Cl-PF3OUdS (F53B Major)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
9Cl-PF3ONS (F53B Minor)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
8:2 Fluorotelomersulfonic acid (8:2FTS A)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorodecanoic acid (PFDA)	1.8	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorododecanoic acid (PFDoA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoro(2-ethoxyethane)sulfonic acid (PFEEA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoroheptanesulfonic acid (PFHpS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
N-EtFOSAA (NEtFOSAA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
N-MeFOSAA (NMeFOSAA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorotetradecanoic acid (PFTA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorotridecanoic acid (PFTrDA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
4:2 Fluorotelomersulfonic acid (4:2FTS A)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorodecanesulfonic acid (PFDS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorooctanesulfonamide (FOSA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorononanesulfonic acid (PFNS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoro-1-hexanesulfonamide (FHxSA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoro-1-butanedisulfonamide (FBSA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorohexanesulfonic acid (PFHxS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoro-4-oxapentanoic acid (PFMPA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoro-5-oxahexanoic acid (PFMBA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
6:2 Fluorotelomersulfonic acid (6:2FTS A)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoropentanesulfonic acid (PFPeS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoroundecanoic acid (PFUnA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluoroheptanoic acid (PFHpA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorooctanoic acid (PFOA)	2.1	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorooctanesulfonic acid (PFOS)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW
Perfluorononanoic acid (PFNA)	ND	0.95	µg/kg dry	1		SOP-466 PFAS	7/12/23	7/14/23 12:22	QNW

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Various

Sample Description:

Work Order: 23G0694

Date Received: 7/6/2023

Field Sample #: Fram Compost

Sampled: 6/20/2023 14:00

Sample ID: 23G0694-05

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	44.7		% Wt	1	H-03	SM 2540G	7/10/23	7/10/23 8:55	JLC