UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CENTER FOR ENVIRONMENTAL MEASUREMENT AND MODELING
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
RESEARCH AND DEVELOPMENT

May 12, 2020

Ms. Cristina Fernandez, Director
Air Protection Division
U.S. Environmental Protection Agency Region 3
1650 Arch Street
Mail Code: 3AP00
Philadelphia, PA 19103-2029

Subject: WV DAQ Data Report #2: Non-targeted Analysis of PFAS in EPA Method 0010 Sampling Trains Collected at the Chemours Washington Works Facility

Dear Director Fernandez:

I am pleased to provide the enclosed second report from our ongoing collaborative technical support to the West Virginia Department of Air Quality (WV DAQ) assisting with concerns about environmental contamination associated with per- and polyfluoroalkyl substances (PFAS) that may have occurred in air emissions from the Chemours Washington Works facility near Parkersburg, West Virginia.

This report is in response to an August 2018 request from WV DAQ asking for laboratory assistance analyzing PFAS in samples collected during air emission testing at the Chemours facility. The enclosed Report #2 provides non-targeted analysis laboratory results that characterized various PFAS found in air emission samples collected by Chemours contractors using EPA Method 0010 (also referred to as Modified Method 5 or MM5) sampling train protocols and provided as splits by TestAmerica to the US EPA.

It is our understanding that this information was requested by WV DAQ to help in their ongoing investigation into the presence of PFAS in the environment near manufacturing facilities of interest. This request relates to our research capabilities and interests applying targeted and non-targeted analysis methods for discovery of the nature and extent of PFAS environmental occurrence that may be potentially associated with industrial releases. EPA continues to develop analytical methods for many PFAS compounds in various media including some of those included in this report. We are providing the results of our analysis as they become available.

In this report, we provide tentative identification of 24 PFAS compounds and their relative sample abundance from non-targeted analysis (NTA) of 116 MM5 samples. We do not interpret exposure or risk from these values. EPA does not currently have final health-based standards, toxicity factors, or associated risk levels for PFAS, other than perfluorooctanoic acid (PFOA),

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perfluorooctane sulfonate (PFOS), and perfluorobutanesulfonic acid (PFBS). While the data provided in the attached report indicates the presence (or lack) of PFAS in the samples, we do not have sufficient information to offer interpretations related to human or environmental exposure and risk.

Thank you for inviting us to be part of this effort that helps to further both EPA's and West Virginia's understanding of an important issue in the state. This is just one of many Agency efforts that demonstrates EPA's commitment to cooperative federalism.

If you have any questions or concerns, do not hesitate to contact me at (919) 541-2107 or via email at Watkins.tim@epa.gov or Brian Schumacher at (702) 798-2242 or via email at Schumacher.brian@epa.gov. I look forward to our continued work together.

Sincerely,

Timothy H Watkins

Timothy H. Watkins
Director

Enclosure

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PFAS Associated with Air Emission Control Devices in West Virginia

Laboratory Data Report #2: Non-targeted Analysis of PFAS in EPA Method 0010 Sampling Trains

Background. The West Virginia Department of Air Quality (WV DAQ), in coordination with EPA Region 3, requested the Office of Research and Development's (ORD's) technical support in analyzing per- and polyfluoroalkyl substances (PFAS) that may be generated from the Chemours Washington Works facility near Parkersburg, West Virginia, and emitted into surrounding environmental media through air.

Contractors for Chemours conducted stack emissions testing at several locations within the fluoropolymers manufacturing area of the facility in August and November 2018 using standard EPA Method 0010 (also referred to as Modified Method 5 or MM5) sampling trains to identify the specific PFAS compounds and their degradation products that may be emitted to the atmosphere. TestAmerica laboratories extracted samples from the MM-0010 samples using methanol and analyzed them in their laboratories in September 2018. At WV DAQ's request, TestAmerica also prepared splits of the extracted samples from three of the emission control points and provided them to ORD[1]. WV DAQ is particularly interested in having ORD quantify the specific PFAS compounds, C3 dimer acid (HFPO-DA; also known as "GenX"), perfluorinated octanoic acid (PFOA; also known as C8), and heptafluoropropyl 1,2,2,2-tetrafluoroethyl ether, hereafter referred to as fluoroether (E-1), as well as to identify other PFAS that may occur within the samples. The ORD laboratory does not currently have the capability to analyze E-1, as discussed with WV DAQ, and analytical results for this compound are not presented in this report.

This 2nd report includes non-targeted analysis (NTA) results for the methanol extracted samples that include 84 stack samples and 32 field quality control (QC) samples. Sample extracts were sent by TestAmerica and received at ORD's laboratories in Research Triangle Park, N.C. on April 3, 2019. Samples were analyzed under the direction of Dr. James McCord following NTA procedures. ORD's analysis and report team that contributed to this effort are listed in Table 1.

Table 1. EPA Office of Research and Development Lab Analysis and Report Team.

Responsibility	Personnel
ORD Principal Investigators	James McCord, Mark Strynar, Jeff Ryan
Laboratory chemistry	James McCord
Quality Assurance Review	Libby Nessley, Sania Tong-Argao
Management coordination and review	Myriam Medina-Vera, Brian Schumacher, Kate Sullivan

[1] U.S. EPA National Exposure Research Laboratory, Project Study Plan: Targeted and Non-targeted Analyses of Per- and Polyfluoroalkyl Substances (PFAS) In Air Emission Control Devices for the West Virginia Department of Air Quality (WVDAQ) D-IO-0031870-QP-1-0, 19Feb2019.

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Report preparation	Kate Sullivan

The current data report provides a simple representation and summary of non-targeted analysis results. Therefore, the description of methods and quality assurance are brief and high-level. Additional reports and/or publications may be developed that will include a more detailed description of methods, quality assurance procedures, and statistical interpretation of the data. As study partners/collaborators, we anticipate that WV DAQ and Region 3 will assist in these reports and publications.

Methods in Brief. EPA Method 0010 (also referred to as Modified Method 5 or MM5) sample train extracts were analyzed by ultra-performance liquid chromatography mass spectrometry (UPLC-MS) using non-targeted workflow methods described within our Laboratory Quality Assurance Project Plan[2] and McCord *et al.* 2019[3]. Methanol extracts were provided to ORD in vials containing approximately 5 or 50 mL of sample. Samples were subsampled as received, diluted if necessary, and analyzed by UPLC-MS. An aliquot of the 1 mL concentrated extract sample was injected into a Thermo Vanquish ultra performance liquid chromatograph coupled to a Thermo Orbitrap Fusion mass spectrometer.

Non-targeted analysis (NTA) provides two important measurements. The first is a tentative identification of PFAS compounds detected in the sample. PFAS are tentatively identified based on a combination of mass spectral data along with patterns of fragmentation compared to on-line and in-house mass-spectral libraries. Analytes in each sample and process blank were identified to various levels of confidence depending on how much combined evidence was identified during manual examination of MS/MS fragmentation spectra and/or comparison with mass spectral libraries.

The second measurement is an indication of the relative abundance of the PFAS present in the sample. The mass spectrometer provides integrated peak areas for the chromatogram of the compound mass (+/- 5ppm) at the specified retention time. Abundance is indicated as the peak area counts which is a measure of ions detected in the mass spectrometer. The peak area counts are proportional to the mass of PFAS in the sample, although the relationship varies based on compound. Since the sample and injection volume are held constant, the peak area counts are also proportional to concentration, although the relationship varies based on compound.

It is important to understand how results of non-targeted analysis differ from those produced during routine laboratory analysis. Without a standard curve to calibrate the relationship between peak area and a mass or concentration value, the peak area counts alone should be considered a semi-quantitative indicator of relative abundance. Analyte peak areas can be compared between samples in a sample set to obtain relative concentrations but cannot be directly compared between analytes. Our experience indicates that measured abundances for PFAS are typically

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[2] National Exposure Research Laboratory, Quality Assurance Project Plan: Non-targeted Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Liquid Samples. J-WECD-0031918-QP-1-0. Aug 30, 2019.

[3] McCord, J., Strynar, M. Identifying Per- and Polyfluorinated Chemical Species with a Combined Targeted and Non-Targeted-Screening High-Resolution Mass Spectrometry Workflow. *J. Vis. Exp.* (146), e59142, doi:10.3791/59142 (2019). https://www.jove.com/video/59142/identifying-per-polyfluorinated-chemical-species-with-combined

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four to six orders of magnitude higher than the ppt concentration (e.g. 1e7 ~ 100 ppt) not accounting for dilutions during sample preparation. Peak area counts are expected to have much greater inherent sampling and analytical variability, which may become evident in reproducibility assessments. For example, it is possible for field duplicates to differ by two or three-fold or more, and laboratory replicates to have greater variability than typically observed in routine laboratory analysis. Any application of NTA results should consider this inherently greater uncertainty.

We determined PFAS presence and relative abundance based on acceptable chromatographic peaks and spectral data. Samples with no identifiable peak are labeled Non-Detect ("ND"). Samples with detected analytes were further screened to determine the reporting limit (RL) that accounts for contamination that may have occurred during sampling and analysis including field, laboratory, and instrument blanks. The RL was established for each compound by statistical analysis of the combined laboratory and field blanks, where RL =AVE [blanks] + 3x STD [blanks]. Sample values less than this statistically defined threshold are reported as "<RL".

Summary of Results

Compound Identification. Across all the MM5 extract samples, the 24 PFAS compounds listed in Table 2 were detected with NTA and tentatively identified by chemical formula, name, monoisotopic mass and retention time, CAS registry number (CASRN), and CompTox Identification Number (DTXSID), when available. PFAS compounds with a DTXSID are registered in EPA's Comptox Chemistry Dashboard where additional information can be found (U.S. EPA CompTox Chemistry Dashboard, 2019)[4]. The analyst's confidence in PFAS compound identification is also provided as defined in the Table 2 footnote.

The compounds identified with NTA included HPFO-DA and PFOA as well as eight additional "legacy" perfluoro carboxylic acids (Table 2 Chem Ref. # 1-10). There were also 3 closely related analogs to the perfluoro carboxylic acids that have one hydrogen subsituted for a fluorine on the carbon chain (i.e., 7-H-perfluoroheptanoic acid, 9-H-perfluorononanoic acid, and 11-H-perfluoroundecanoic acid). These are likely breakdown products of the larger PFAS species and have been commonly observed as PFAS replacements and polymer degradants in other studies.

NTA also documented a series of related polymer compounds that differ by the molecular weight of the monomer C_3F_6O (Figure 1). This series of compounds have larger molecular weights and derive from the same repeating chemical unit as HFPO-DA. Compounds of 5 to 9 monomers were reliably detected at significant abundances in numerous samples. These compounds are not fully structurally resolved but are listed in Table 2 by the indicated number of HFPO monomer units.

[4] U.S. EPA CompTox Chemistry Dashboard https://comptox.epa.gov/dashboard

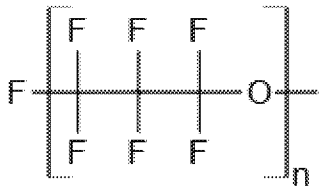

Figure 1. C_3F_6O polymer series identified in MM5 samples identified in Table 2 by n= number of monomer units.

The automated library search identified 199 additional compounds to the formula level that were tentative candidates for PFAS (Confidence = 3 in Table 2). However, LC-MS data were insufficient for unequivocal identification beyond class; thus, discussion of these compounds is not included in this report. None of these suspect PFAS compounds had characteristics similar to fluoroether (E-1) which was of interest to WV DAQ.

Abundance of Compounds. MM5 sampling trains (3 runs) were conducted at the inlet and outlets of emission control devices at 3 locations in the facility for a total of 7 sample trains (see the project study plan[1] appendices for details of sample testing provided by Chemours). Sample identifiers are as provided by TestAmerica on chain of custody (CoC) forms. Four extracted samples were produced from each MM5 sample train as follows:

- Front-Half Composite—consisting of a particulate filter, and a probe, nozzle and front portion of the filter holder bell housing glassware solvent rinses,
- Back-Half Composite—consisting of an XAD-2 resin module, and the back portion of the filter holder bell housing with connecting glassware solvent rinses,
- Condensate and Impinger Contents—consisting of the DI water content used to initially charge the impingers and Condensate collected during the sampling run, and
- Breakthrough XAD-2 Resin Tube—consisting of a standard XAD-2 module placed behind the condensate impingers as a final quality assurance indicator of the lack of breakthrough of the HFPO-DA through the sampling train.

The tabular presentation of sample analysis results is organized to facilitate comparison of inlet and outlet compound abundance at each of the three sampling locations. Table 3 provides results for the inlet and outlet samples collected at the PTFE location on August 24, 2018. Table 4 provides results for the scrubber inlet and outlet samples collected at the PFA location on November 6, 2018. Table 5 provides results for the inlet lines 2 and 3 and scrubber outlet collected at the FEP locations on November 7, 2018.

Peak area counts have been adjusted for the level of dilution by a constant multiplier applied to each sample. The peak areas are superimposed on a heat map (Figure 2) where gradations in color reflect seven classifications of peak area from low (non-detect and less than reporting limit, RL) to high (>1,000,000). The heat map is useful in showing where PFAS "light-up" in terms of detection and high peak areas. Heatmap values >100,000 (yellow, orange and red tones) have the highest confidence that a compound is present in relatively higher abundance.

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LEGEND	
Color	Peak Area Category
<RL	Less than the Reporting Limit (RL)
	>RL - 50,000
	50,000 - 100,000
	100,000 - 200,000
	200,000 - 500,000
	500,000 - 1,000,000
	>1,000,000

Figure 2. Peak area count categories and associated color designation for Tables 3-6.

The NTA results for PFOA and HFPO-DA are generally consistent with those reported with targeted analysis in WV DAQ Report #1[5]. HFPO-DA was present at high abundance, especially in the inlet samples (Tables 3-5). PFOA abundance was generally much lower relative to HFPO-DA and many samples had PFOA abundances below our reporting limit. The general pattern of abundance of these two compounds were also relatively consistent between targeted and NTA results by analyte and sample, but the NTA results vary more widely. Quantitative results from targeted analysis should be considered more reliable when both results are available.

Legacy PFCAs were also present in high abundance, especially in the inlet samples. The C_3F_6O polymers tended to occur concurrently with HFPO-DA with equal or greater combined abundance. The C_3F_6O polymers were prevalent in scrubber inlets but were observed in only a few outlet samples.

Field QC Summary. Table 6 provides results for field quality control samples collected during the two field sampling campaigns. The field QC samples included blank sampling trains collected during each sampling campaign and samples labeled MB. PFAS compounds were not detected at levels greater than the reporting limit (RL) in the blanks except in two blank sampling train samples collected in August 2018. Potential laboratory cross contamination was investigated by analyzing 24 laboratory blanks (not included in Table 6). None of the 24 laboratory blanks had abundances of any compound greater than the RL.

[5] WV DAQ/EPA Region 3 Report #1. PFAS Associated with Air Emission Control Devices in West Virginia. Laboratory Data Report #1: Targeted Analysis of PFAS in Modified Method 0010 (MM-0010) Sampling Trains. U.S. EPA/ORD, March 2020.

Table 2. PFAS Tentatively Identified in EPA Method 0010 MM5 Train Samples Collected at the Chemours Washington Works Facility by UPLC-MS.

Chem Ref. #	Tentatively Identified Compound Name	CAS Number	DTXSID	Formula	Monoisotopic Mass (g/mol)	Retention Time	Confidence
1	Perfluoroctanoic acid (PFOA)	335-67-1	DTXSID8031865	C8 H F15 O2	413.9737	3.20	1
2	Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA)	13252-13-6	DTXSID70880215	C6 H F11 O3	329.9753	1.47	1
3	Perfluorohexanoic acid (PFHxA)	307-24-4	DTXSID3031862	C6 H F11 O2	313.9801	1.39	1
4	Perfluoroheptanoic acid (PFHpA)	375-85-9	DTXSID1037303	C7 H F13 O2	363.9769	2.38	1
5	Perfluorononanoic acid (PFNA)	375-95-1	DTXSID8031863	C9 H F17 O2	463.9705	3.86	1
6	Perfluorodecanoic acid (PFDA)	335-76-2	DTXSID3031860	C10 H F19 O2	513.9674	4.02	1
7	Perfluoroundecanoic acid (PFUnDA)	2058-94-8	DTXSID8047553	C11 H F21 O2	563.9642	4.83	1
8	Perfluorododecanoic acid (PFDoDA)	307-55-1	DTXSID8031861	C12 H F23 O2	613.9613	5.34	1
9	Perfluorotridecanoic acid (PFTrDA)	72629-94-8	DTXSID90868151	C13 H F25 O2	663.9583	5.78	1
10	Perfluorotetradecanoic acid (PFTeDA)	376-06-7	DTXSID3059921	C14 H F27 O2	713.9553	6.23	1
11	Perfluoro-1,10-decanedicarboxylic acid	865-85-0	DTXSID60379789	C12 H2 F20 O4	589.9636	1.00	2a
12	Hexacosafluoro-13-(trifluoromethyl)myristic acid	18024-09-4	DTXSID7066300	C15 H F29 O2	763.9518	6.62	2a
13	Fluoro(heptafluoropropoxy)acetic acid	919005-00-8	DTXSID60844624	C5 H2 F8 O3	261.9876	1.01	2a
14	CAS 919005-26-8			C7 H2 F12 O3	361.9813	2.06	2b
15	C3F6O Polymer (n=5)			C15 H F31 O5	849.9331	7.93	2b
16	C3F6O Polymer (n=6)			C18 H F37 O6	1015.9180	8.44	2b
17	C3F6O Polymer (n=7)			C21 H F43 O7	1181.9027	8.86	2b
18	C3F6O Polymer (n=8)			C24 H F49 O8	1347.8880	9.20	2b
19	C3F6O Polymer (n=9)			C26 H3 F49 N2 O15	1513.8731	9.51	2b
20	9-H-Perfluorononanoic acid	76-21-1	DTXSID50226894	C9 H2 F16 O2	445.9801	2.75	2a
21	7-H-Perfluoroheptanoic acid	1546-95-8	DTXSID70165670	C7 H2 F12 O2	689.9574	1.23	2a
22	2,3,3,3-Tetrafluoro-2-(pentafluoroethoxy)propanoic acid	267239-61-2	DTXSID60896486	C5 H F9 O3	279.9784	1.11	2a
23	11-H-Perfluoroundecanoic acid	1765-48-6	DTXSID5061954	C11 H2 F20 O2	545.9737	3.93	2a
24	1,1,2,2-Tetrahydroperfluorotetradecyl acrylate	34395-24-9	DTXSID5067841	C17 H7 F25 O2	718.0037	1.70	2a

Confidence:

1= Confirmed by comparison with reference chemical.

2a= Likely structure based on computerized spectrum match.

2b= Likely structure based on manual interpretation of MS/MS spectrum.

3= Tentative candidate or MS data insufficient for unequivocal identification beyond class (i.e. PFAS chemical).

Table 3. PFAS Peak Area Counts in Samples from the PTFE Facility Location Determined by Non-targeted Analysis.

Sampling Location			Sample ID	PFOA	HFPO-DA	PFHxA	PFHpA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	Perfluoro-1,10-decanedicarboxylic acid	Hexacosafluoro-13-(trifluoromethyl)myristic acid
				1	2	3	4	5	6	7	8	9	10	11	12
PTFE Inlet	FH filter fraction composite	Run 1	12505-1	<RL	2,600,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	54,600	<RL
		Run2	12505-5	<RL	4,480,000	<RL	14,700	<RL	<RL	<RL	<RL	<RL	<RL	67,100	<RL
		Run3	12505-9	<RL	4,570,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	43,500	<RL
	BH filter fraction composite	Run 1	12505-2	<RL	121,000,000	2,160	49,400	<RL	<RL	<RL	<RL	<RL	<RL	5,100	<RL
		Run2	12505-6	<RL	97,200,000	2,180	45,700	<RL	<RL	<RL	<RL	<RL	<RL	9,150	<RL
		Run3	12505-10	<RL	203,000,000	2,620	79,600	<RL	<RL	<RL	<RL	<RL	<RL	4,480	<RL
	Impinger condensate	Run 1	12505-3	<RL	99,500,000	705	38,000	<RL	<RL	<RL	<RL	<RL	<RL	439	<RL
		Run2	12505-7	<RL	62,000,000	624	33,800	<RL	<RL	<RL	<RL	<RL	<RL	929	<RL
		Run3	12505-11	<RL	94,500,000	609	35,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	XAD-2 Resin Tube	Run 1	12505-4	<RL	51,700,000	474	14,400	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12505-8	<RL	36,700,000	390	13,600	<RL	<RL	<RL	<RL	<RL	<RL	539	<RL
		Run3	12505-12	<RL	38,100,000	448	18,900	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
PTFE Outlet	FH filter fraction composite	Run 1	12503-1	<RL	1,500,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	9,420	<RL
		Run2	12503-5	216,000	3,440,000	3,110	9,610	<RL	<RL	<RL	<RL	<RL	<RL	2,120	<RL
		Run3	12503-9	209,000	2,830,000	2,320	<RL	<RL	<RL	<RL	<RL	<RL	<RL	1,340	<RL
	BH filter fraction composite	Run 1	12503-2	<RL	<RL	853	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12503-6	<RL	<RL	1,040	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	12503-10	<RL	<RL	1,010	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	Impinger condensate	Run 1	12503-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12503-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	12503-11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	XAD-2 Resin Tube	Run 1	12503-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12503-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	12503-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 3 PFAS Peak Area Counts in Samples from the PTFE Facility Location Determined by Non-targeted Analysis (continued).

Sampling Location			Sample ID	Fluoro(heptafluoropropoxy) acetic acid	CAS 919005-26-8	C3F6O Polymer (n=9)	C3F6O Polymer (n=8)	C3F6O Polymer (n=7)	C3F6O Polymer (n=6)	C3F6O Polymer (n=5)	9-H-Perfluorononanoic acid	7-H-Perfluoroheptanoic acid	2,3,3,3-Tetrafluoro-2-(pentafluoroethoxy)propanoic acid	11-H-Perfluoroundecanoic acid	1,1,2,2-Tetrahydroperfluorotetradecyl acrylate
				13	14	15	16	17	18	19	20	21	22	23	24
PTFE Inlet	FH filter fraction composite	Run 1	12505-1	<RL	<RL	45,600,000	54,800,000	34,200,000	7,540,000	481,000	2,030	22,500	<RL	<RL	243,000
		Run2	12505-5	<RL	<RL	20,100,000	27,200,000	14,900,000	2,470,000	123,000	<RL	26,500	<RL	<RL	154,000
		Run3	12505-9	<RL	<RL	33,800,000	54,900,000	25,000,000	8,070,000	680,000	<RL	15,800	<RL	<RL	220,000
	BH filter fraction composite	Run 1	12505-2	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	11,800	522	<RL	545,000
		Run2	12505-6	<RL	226	<RL	<RL	<RL	<RL	<RL	<RL	26,500	402	<RL	362,000
		Run3	12505-10	<RL	287	<RL	<RL	<RL	<RL	<RL	<RL	18,500	852	<RL	1,630,000
	Impinger condensate	Run 1	12505-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	27,400	<RL	<RL	1,190,000
		Run2	12505-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	28,500	<RL	<RL	1,380,000
		Run3	12505-11	<RL	<RL	<RL	<RL	224,000	171,000	28,500	<RL	33,200	<RL	<RL	851,000
	XAD-2 Resin Tube	Run 1	12505-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	21,200	<RL	<RL	1,290,000
		Run2	12505-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	21,800	<RL	<RL	1,920,000
		Run3	12505-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	33,300	<RL	<RL	530,000
PTFE Outlet	FH filter fraction composite	Run 1	12503-1	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	6,110	<RL	<RL	235,000
		Run2	12503-5	<RL	429	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	1,080,000
		Run3	12503-9	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	611,000
	BH filter fraction composite	Run 1	12503-2	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12503-6	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	195	<RL	<RL
		Run3	12503-10	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	Impinger condensate	Run 1	12503-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12503-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	12503-11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	XAD-2 Resin Tube	Run 1	12503-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	12503-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	12503-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 4. PFAS Peak Area Counts in Samples from the PFA Facility Location Determined by Non-targeted Analysis.

Sampling Location			Sample ID	PFOA	HFPO-DA	PFHxA	PFHpA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	Perfluoro-1,10-decanedicarboxylic acid	Hexacosafluoro-13-(trifluoromethyl)myristic acid
				1	2	3	4	5	6	7	8	9	10	11	12
PFA Scrubber Inlet	FH filter fraction composite	Run 1	13273-1	244,000	299,000	1,360	82,200	581,000	14,500	692,000	<RL	378,000	<RL	1,120,000	226,000
		Run2	13273-5	<RL	869,000	2,540	52,700	685,000	19,500	973,000	15,000	616,000	11,000	1,980,000	502,000
		Run3	13273-9	<RL	316,000	1,850	37,500	417,000	13,600	738,000	<RL	<RL	<RL	1,320,000	160,000
	BH filter fraction composite	Run 1	13273-2	1,260,000	103,000,000	998,000	9,270,000	21,200,000	403,000	2,020,000	<RL	<RL	<RL	279,000	<RL
		Run2	13273-6	2,550,000	96,300,000	1,180,000	5,790,000	63,300,000	8,620,000	68,800,000	592,000	5,210,000	45,800	998,000	2,310,000
		Run3	13273-10	925,000	62,300,000	758,000	3,320,000	16,400,000	689,000	5,100,000	13,700	<RL	<RL	622,000	375,000
	Impinger condensate	Run 1	13273-3	2,900,000	427,000,000	139,000	28,900,000	51,600,000	1,760,000	17,200,000	197,000	4,820,000	40,100	1,010,000	1,050,000
		Run2	13273-7	2,660,000	403,000,000	187,000	20,300,000	71,700,000	1,810,000	15,900,000	105,000	2,030,000	<RL	940,000	125,000
		Run3	13273-11	3,240,000	296,000,000	167,000	30,500,000	54,300,000	2,530,000	24,500,000	181,000	4,910,000	36,400	1,240,000	988,000
	XAD-2 Resin Tube	Run 1	13273-4	<RL	1,230,000	5,560	39,400	1,050,000	29,600	<RL	<RL	<RL	<RL	2,420	<RL
		Run2	13273-8	<RL	3,510,000	2,540	48,800	1,080,000	30,400	1,040,000	<RL	<RL	<RL	1,360	<RL
		Run3	13273-12	<RL	638,000	12,000	26,000	763,000	26,300	<RL	<RL	<RL	<RL	1,390	<RL
PFA Scrubber Outlet	FH filter fraction composite	Run 1	13274-1	<RL	1,380,000	14,200	321,000	464,000	111,000	648,000	53,200	<RL	<RL	655	<RL
		Run2	13274-5	<RL	2,330,000	14,200	226,000	364,000	83,400	<RL	38,600	<RL	<RL	<RL	<RL
		Run3	13274-9	<RL	1,470,000	10,800	189,000	<RL	68,100	<RL	21,800	<RL	<RL	725	<RL
	BH filter fraction composite	Run 1	13274-2	<RL	25,900,000	63,600	80,800	<RL	<RL	<RL	<RL	<RL	<RL	841	<RL
		Run2	13274-6	<RL	28,300,000	81,100	73,300	<RL	<RL	<RL	<RL	<RL	<RL	2,520	<RL
		Run3	13274-10	<RL	21,500,000	79,600	65,700	<RL	<RL	<RL	<RL	<RL	<RL	443	<RL
	Impinger condensate	Run 1	13274-3	<RL	<RL	375	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13274-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13274-11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	XAD-2 Resin Tube	Run 1	13274-4	<RL	<RL	2,750	<RL	<RL	<RL	<RL	<RL	<RL	<RL	799	<RL
		Run2	13274-8	<RL	<RL	2,930	<RL	<RL	<RL	<RL	<RL	<RL	<RL	789	<RL
		Run3	13274-12	<RL	<RL	6,080	<RL	<RL	<RL	<RL	<RL	<RL	<RL	804	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 4. PFAS Peak Area Counts in Samples from the PFA Facility Location Determined by Non-targeted Analysis (continued).

Sampling Location			Sample ID	Fluoro(heptafluoropropoxy) acetic acid	CAS 919005-26-8	C3F6O Polymer (n=9)	C3F6O Polymer (n=8)	C3F6O Polymer (n=7)	C3F6O Polymer (n=6)	C3F6O Polymer (n=5)	9-H-Perfluorononanoic acid	7-H-Perfluoroheptanoic acid	2,3,3,3-Tetrafluoro-2-(pentafluoroethoxy)propanoic acid	11-H-Perfluoroundecanoic acid	1,1,2,2-Tetrahydroperfluorotetradecyl acrylate
				13	14	15	16	17	18	19	20	21	22	23	24
PFA Scrubber Inlet	FH filter fraction composite	Run 1	13273-1	<RL	1,160	10,100,000	16,000,000	8,390,000	2,890,000	149,000	<RL	940,000	<RL	<RL	<RL
		Run2	13273-5	<RL	1,950	13,300,000	20,900,000	15,400,000	3,940,000	273,000	<RL	657,000	<RL	<RL	47,800
		Run3	13273-9	<RL	1,470	9,410,000	11,700,000	6,760,000	1,410,000	81,500	<RL	608,000	<RL	<RL	22,300
	BH filter fraction composite	Run 1	13273-2	675,000	46,800	204,000	2,690,000	4,980,000	1,520,000	143,000	3,320	71,100	793,000	<RL	516,000
		Run2	13273-6	3,350,000	103,000	2,760,000	17,900,000	34,300,000	21,500,000	4,420,000	6,680	198,000	591,000	<RL	1,160,000
		Run3	13273-10	2,860,000	36,000	5,600,000	21,900,000	23,600,000	10,700,000	1,860,000	2,640	116,000	410,000	<RL	970,000
	Impinger condensate	Run 1	13273-3	<RL	250,000	9,850,000	21,600,000	24,100,000	12,200,000	1,150,000	6,160	379,000	44,500	<RL	3,880,000
		Run2	13273-7	<RL	232,000	1,640,000	2,860,000	2,850,000	1,110,000	121,000	3,950	364,000	38,600	<RL	4,080,000
		Run3	13273-11	<RL	213,000	10,300,000	19,100,000	21,100,000	8,870,000	1,110,000	7,490	684,000	56,000	20,300	5,820,000
	XAD-2 Resin Tube	Run 1	13273-4	4,250,000	672	122,000	307,000	306,000	149,000	11,800	<RL	13,400	1,830,000	<RL	127,000
		Run2	13273-8	4,450,000	715	73,500	160,000	155,000	68,700	<RL	<RL	13,200	1,930,000	<RL	250,000
		Run3	13273-12	3,270,000	371	126,000	287,000	298,000	143,000	13,500	<RL	12,900	3,350,000	<RL	106,000
PFA Scrubber Outlet	FH filter fraction composite	Run 1	13274-1	<RL	2,430	<RL	<RL	<RL	<RL	<RL	<RL	<RL	1,070	<RL	63,800
		Run2	13274-5	467,000	2,050	<RL	<RL	<RL	<RL	<RL	<RL	<RL	1,260	<RL	176,000
		Run3	13274-9	487,000	1,530	<RL	<RL	<RL	<RL	<RL	<RL	<RL	1,280	<RL	172,000
	BH filter fraction composite	Run 1	13274-2	3,200,000	4,190	<RL	<RL	<RL	<RL	<RL	<RL	11,300	1,050,000	<RL	550,000
		Run2	13274-6	12,200,000	3,630	<RL	<RL	<RL	<RL	<RL	<RL	16,500	2,020,000	<RL	35,200
		Run3	13274-10	1,340,000	3,110	<RL	<RL	<RL	<RL	<RL	<RL	17,700	1,260,000	<RL	1,690,000
	Impinger condensate	Run 1	13274-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13274-7	397,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	231	<RL	<RL
		Run3	13274-11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	232	<RL	<RL
	XAD-2 Resin Tube	Run 1	13274-4	3,800,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	256,000	<RL	17,800
		Run2	13274-8	9,810,000	240	<RL	<RL	<RL	<RL	<RL	<RL	<RL	437,000	<RL	<RL
		Run3	13274-12	3,150,000	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	369,000	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 5. PFAS Peak Area Counts in Samples from the FEP Facility Location Determined by Non-targeted Analysis.

Sampling Location			Sample ID	PFOA	HFPO-DA	PFHxA	PFHpA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	Perfluoro-1,10-decanedicarboxylic acid	Hexacosafluoro-13-(trifluoromethyl)myristic acid
				1	2	3	4	5	6	7	8	9	10	11	12
FEP Line 2 Inlet	FH filter fraction composite	Run 1	13312-1	<RL	17,500,000	4,750	14,700	<RL	522,000	<RL	1,020,000	<RL	1,220,000	5,470,000	295,000
		Run2	13312-5	<RL	11,800,000	2,800	11,400	<RL	244,000	<RL	454,000	<RL	904,000	6,250,000	220,000
		Run3	13312-9	<RL	6,870,000	63,800	11,800	<RL	363,000	<RL	612,000	<RL	1,030,000	9,010,000	192,000
	BH filter fraction composite	Run 1	13312-2	273,000	22,700,000	68,300	68,600	791,000	1,040,000	<RL	41,200	<RL	<RL	185,000	<RL
		Run2	13312-6	<RL	12,600,000	20,400	36,500	<RL	156,000	<RL	<RL	<RL	<RL	207,000	<RL
		Run3	13312-10	<RL	20,900,000	29,000	37,600	<RL	373,000	<RL	16,300	<RL	16,400	321,000	<RL
	Impinger condensate	Run 1	13312-3	1,940,000	168,000,000	29,000	333,000	3,190,000	1,700,000	1,100,000	109,000	<RL	<RL	1,640,000	<RL
		Run2	13312-7	2,120,000	344,000,000	12,800	324,000	3,390,000	4,320,000	855,000	423,000	<RL	93,500	2,300,000	<RL
		Run3	13312-11	2,070,000	338,000,000	24,800	152,000	3,370,000	4,410,000	<RL	579,000	<RL	344,000	2,660,000	<RL
	XAD-2 Resin Tube	Run 1	13312-4	<RL	200,000	424	<RL	<RL	24,500	<RL	<RL	<RL	<RL	6,960	<RL
		Run2	13312-8	<RL	240,000	442	<RL	<RL	16,300	<RL	<RL	<RL	<RL	3,770	<RL
		Run3	13312-12	<RL	524,000	331	<RL	<RL	<RL	<RL	<RL	<RL	<RL	3,360	<RL
FEP Line 3 Inlet	FH filter fraction composite	Run 1	13315-1	<RL	48,600,000	54,600	<RL	<RL	53,500	536,000	1,240,000	<RL	2,520,000	10,200,000	499,000
		Run2	13315-5	<RL	7,350,000	1,890	<RL	<RL	238,000	<RL	246,000	<RL	673,000	18,500	146,000
		Run3	13315-9	<RL	25,800,000	5,690	<RL	<RL	521,000	<RL	725,000	<RL	940,000	35,800	186,000
	BH filter fraction composite	Run 1	13315-2	302,000	22,400,000	143,000	53,700	<RL	665,000	<RL	55,100	<RL	54,600	1,190	<RL
		Run2	13315-6	<RL	10,400,000	17,000	16,800	<RL	775,000	<RL	193,000	<RL	288,000	381	<RL
		Run3	13315-10	460,000	29,800,000	151,000	<RL	399,000	1,490,000	<RL	236,000	<RL	84,500	1,180	<RL
	Impinger condensate	Run 1	13315-3	774,000	144,000,000	14,700	169,000	967,000	350,000	<RL	<RL	<RL	13,600	594,000	<RL
		Run2	13315-7	619,000	77,100,000	13,100	134,000	659,000	977,000	<RL	114,000	<RL	65,500	198,000	<RL
		Run3	13315-11	943,000	206,000,000	6,620	194,000	683,000	15,900	<RL	39,500	<RL	12,600	33,900	<RL
	XAD-2 Resin Tube	Run 1	13315-4	<RL	264,000	690	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13315-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13315-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
FEP Scrubber Outlet	FH filter fraction composite	Run 1	13316-1	<RL	<RL	<RL	<RL	<RL	44,900	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13316-5	<RL	<RL	3,620	<RL	<RL	56,100	<RL	61,400	<RL	<RL	348	<RL
		Run3	13316-9	<RL	160,000	4,020	<RL	<RL	142,000	<RL	81,100	<RL	<RL	<RL	<RL
	BH filter fraction composite	Run 1	13316-2	<RL	544,000	50,000	39,700	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13316-6	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13316-10	<RL	<RL	21,200	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	Impinger condensate	Run 1	13316-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13316-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13316-11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	XAD-2 Resin Tube	Run 1	13316-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13316-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13316-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 5. PFAS Peak Area Counts in Samples from the FEP Facility Location Determined by Non-targeted Analysis (continued).

Sampling Location			Sample ID	Fluoro(heptafluoropropoxy)acetic acid	CAS 919005-26-8	C3F6O Polymer (n=9)	C3F6O Polymer (n=8)	C3F6O Polymer (n=7)	C3F6O Polymer (n=6)	C3F6O Polymer (n=5)	9-H-Perfluorononanoic acid	7-H-Perfluoroheptanoic acid	2,3,3,3-Tetrafluoro-2-(pentafluoroethoxy)propanoic acid	11-H-Perfluoroundecanoic acid	1,1,2,2-Tetrahydroperfluorotetradecyl acrylate
				13	14	15	16	17	18	19	20	21	22	23	24
FEP Line 2 Inlet	FH filter fraction composite	Run 1	13312-1	<RL	<RL	55,600,000	164,000,000	213,000,000	150,000,000	38,000,000	740,000	9,670,000	241	4,260,000	859,000
		Run2	13312-5	<RL	651	93,200,000	74,500,000	243,000,000	144,000,000	30,800,000	390,000	12,700,000	<RL	2,540,000	272,000
		Run3	13312-9	<RL	1,090	63,200,000	75,000,000	312,000	186,000,000	34,200,000	436,000	13,360,000	<RL	2,370,000	260,000
	BH filter fraction composite	Run 1	13312-2	<RL	<RL	1,490,000	16,400,000	45,300,000	42,900,000	10,100,000	360,000	236,000	1,850	3,240,000	1,410,000
		Run2	13312-6	<RL	<RL	1,640,000	14,000,000	28,500,000	18,700,000	2,640,000	139,000	131,000	1,480	426,000	582,000
		Run3	13312-10	<RL	244	1,360,000	17,600,000	50,400,000	43,200,000	10,700,000	319,000	263,000	2,020	1,140,000	2,690,000
	Impinger condensate	Run 1	13312-3	<RL	391	1,110,000	3,110,000	3,930,000	2,920,000	431,000	3,820,000	2,180,000	901	30,400,000	1,240,000
		Run2	13312-7	<RL	402	9,510,000	27,900,000	31,400,000	16,600,000	3,270,000	4,010,000	2,750,000	2,780	21,100,000	2,320,000
		Run3	13312-11	<RL	250	7,080,000	28,200,000	49,100,000	37,300,000	8,600,000	5,800,000	4,000,000	2,320	25,600,000	4,390,000
	XAD-2 Resin Tube	Run 1	13312-4	<RL	<RL	<RL	116,000	188,000	107,000	15,900	5,480	9,520	<RL	130,000	<RL
		Run2	13312-8	<RL	<RL	70,100	246,000	312,000	155,000	16,800	8,680	8,080	<RL	58,800	24,100
		Run3	13312-12	<RL	<RL	<RL	<RL	<RL	<RL	14,000	6,420	6,200	<RL	44,000	46,600
FEP Line 3 Inlet	FH filter fraction composite	Run 1	13315-1	<RL	<RL	62,900,000	166,000,000	187,000,000	119,000,000	23,800,000	1,020,000	21,000,000	656	2,410,000	<RL
		Run2	13315-5	<RL	<RL	16,400,000	44,400,000	67,600,000	42,900,000	7,990,000	190,000	5,190,000	<RL	652,000	<RL
		Run3	13315-9	<RL	209	24,600,000	68,900,000	97,800,000	63,900,000	13,500,000	593,000	11,900,000	269	2,050,000	<RL
	BH filter fraction composite	Run 1	13315-2	<RL	2,270	<RL	19,000,000	34,100,000	33,600,000	7,820,000	167,000	166,000	2,460	212,000	<RL
		Run2	13315-6	<RL	366	1,100,000	9,910,000	33,600,000	26,500,000	6,030,000	82,900	124,000	782	656,000	<RL
		Run3	13315-10	<RL	1,890	3,370,000	23,400,000	49,500,000	48,600,000	11,700,000	311,000	382,000	3,700	2,520,000	<RL
	Impinger condensate	Run 1	13315-3	<RL	209	833,000	3,830,000	9,160,000	3,860,000	512,000	2,150,000	293,000	2,160	5,790,000	15,700
		Run2	13315-7	<RL	<RL	4,000,000	13,300,000	16,000,000	13,900,000	2,620,000	947,000	171,000	889	4,440,000	14,800
		Run3	13315-11	<RL	305	1,000,000	5,240,000	12,500,000	5,310,000	619,000	1,750,000	173,000	<RL	3,110,000	21,800
	XAD-2 Resin Tube	Run 1	13315-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	5,330	<RL	<RL	<RL	<RL
		Run2	13315-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13315-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	2,190	<RL	<RL	<RL	<RL
FEP Scrubber Outlet	FH filter fraction composite	Run 1	13316-1	<RL	<RL	<RL	<RL	<RL	<RL	<RL	7,570	26,200	<RL	14,200	<RL
		Run2	13316-5	<RL	1,070	<RL	291,000	279,000	87,600	<RL	16,600	49,900	498	<RL	<RL
		Run3	13316-9	<RL	634	220,000	1,400,000	1,400,000	874,000	86,500	21,200	31,300	541	29,500	<RL
	BH filter fraction composite	Run 1	13316-2	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	5,520	<RL	<RL	<RL
		Run2	13316-6	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13316-10	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	Impinger condensate	Run 1	13316-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13316-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13316-11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	XAD-2 Resin Tube	Run 1	13316-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run2	13316-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
		Run3	13316-12	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 6. Peak Area Counts in Field Quality Control Samples Determined by Non-targeted Analysis.

	Sample Type		Sample ID	PFOA	HFPO-DA	PFHxA	PFHpA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	Perfluoro-1,10-decanedicarboxylic acid	Hexacosafluoro-13-(trifluoromethyl)myristic acid
				1	2	3	4	5	6	7	8	9	10	11	12
Field QC: Blank Train Samples 8/20/2018	QC M0010 FH BT		12459-13	208,000	<RL	1,410	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 BH BT		12459-14	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 Impingers 1,2&3 Condensate TB		12459-15	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 Breakthrough XAD-2 Resin Tube		12459-16	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC N0010 DI Water RB		12459-17	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 MEOH with 5% NH4OH RB		12459-18	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 XAD-2 Resin Tube RB		12459-19	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 MEOH with 5% NH4OH TB		12459-20	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 XAD-2 Resin Tube TB		12459-21	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 Combined glassware rinses PB		12459-22	<RL	155,000	853	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Field QC: Blank Train Samples 11/8/2018	FEP QC M0010 FH BT		13314-1	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 BH BT		13314-2	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 Impingers 1,2&3 Condensate		13314-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 Breakthrough XAD-2 BT		13314-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 Combined glassware rinses PB		13314-5	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 MEOH with 5% HN4OH RB		13314-6	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 XAD-2 Resin Tube RB		13314-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 DI Water RB		13314-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 XAD-2 Resin Tube TB?		13314-9	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Field QC: MB Samples	QC Field MB	QC	427249	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	QC	427579	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE out	427721	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE out	428539	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE in	428541	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE in	428730	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PFA Scrub out	436766	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PFA Scrub in	437214	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PFA Scrub out	437217	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	FEP 2 in	437337	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	FEP 2 in	437700	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.

Table 6. Peak Area Counts in Field Quality Control Samples Determined by Non-targeted Analysis (continued).

	Sample Type		Sample ID	Fluoro(heptafluoropropoxy)acetic acid	CAS 919005-26-8	C3F6O Polymer (n=9)	C3F6O Polymer (n=8)	C3F6O Polymer (n=7)	C3F6O Polymer (n=6)	C3F6O Polymer (n=5)	9-H-Perfluorononanoic acid	7-H-Perfluoroheptanoic acid	2,3,3,3-Tetrafluoro-2-(pentafluoroethoxy)propanoic acid	11-H-Perfluoroundecanoic acid	1,1,2,2-Tetrahydroperfluorotetradecyl acrylate
				13	14	15	16	17	18	19	20	21	22	23	24
Field QC: Blank Train Samples 8/20/2018	QC M0010 FH BT		12459-13	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 BH BT		12459-14	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 Impingers 1,2&3 Condensate		12459-15	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 Breakthrough XAD-2 Resin		12459-16	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC N0010 DI Water RB		12459-17	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 MEOH with 5% NH4OH RB		12459-18	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 XAD-2 Resin Tube RB		12459-19	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 MEOH with 5% NH4OH TB		12459-20	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 XAD-2 Resin Tube TB		12459-21	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC M0010 Combined glassware rinses PB		12459-22	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Field QC: Blank Train Samples 11/8/2018	FEP QC M0010 FH BT		13314-1	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	15,500	<RL	<RL	<RL
	FEP QC M0010 BH BT		13314-2	<RL	<RL	<RL	<RL	<RL	<RL	<RL	1,570	<RL	<RL	<RL	<RL
	FEP QC M0010 Impingers 1,2&3		13314-3	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 Breakthrough XAD-2 BT		13314-4	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 Combined glassware		13314-5	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 MEOH with 5% HN4OH RB		13314-6	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 XAD-2 Resin Tube RB		13314-7	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 DI Water RB		13314-8	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	FEP QC M0010 XAD-2 Resin Tube TB?		13314-9	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Field QC: MB Samples	QC Field MB	QC	427249	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	QC	427579	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE out	427721	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE out	428539	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE in	428541	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PTFE in	428730	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PFA Scrub out	436766	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PFA Scrub in	437214	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	PFA Scrub out	437217	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	FEP 2 in	437337	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
	QC Field MB	FEP 2 in	437700	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL

ND: Non-detect based on criteria of signal-to-noise contrast and temporal continuity of signal. <RL: Sample value less than reporting limit.