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

OFFICE OF
RESEARCH AND DEVELOPMENT

April 23, 2020

Ken Kloo, Director
NJ Department of Environmental Protection
Division of Remediation Management
Mail Code 401-05M
401 East State Street
P.O. Box 420
Trenton, NJ 08625-0420

Subject: NJ DEP Data Report #7: Non-targeted Analysis of PFAS in Water Samples Collected from Wells with Point of Entry Treatment

Dear Mr. Kloo:

I am pleased to provide you with the attached laboratory report that includes non-targeted analysis (NTA) results for per- and polyfluoroalkyl substance (PFAS) in water samples collected from wells to evaluate the effectiveness of Granular Activated Carbon (GAC) or Ion Exchange Resin (at one location) Point of Entry Treatment Systems (POETs). This is the seventh in a series of reports prepared as a part of EPA Office of Research and Development's (ORD) collaboration with the New Jersey Department of Environmental Protection (NJ DEP) and EPA Region 2 on the study, "Detection, Evaluation, and Assignment of Multiple Poly- and Perfluoroalkyl Substances (PFAS) in Environmental Media from an Industrialized Area of New Jersey."

It is our understanding that this study was designed to help NJ DEP in their ongoing investigation into the presence of PFAS in the environment near manufacturing facilities of interest. This study 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 and semi-quantitative analytical results for 24 PFAS. We do not interpret exposure or risk from any reported values. EPA does not currently have health-based standards, toxicity factors, or associated risk levels for PFAS, other than perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorobutanesulfonic acid (PFBS). While the data provided in the attached report indicate the presence of PFAS in the water 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 New Jersey'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. I look forward to our continued work together.

Sincerely,

Timothy H Watkins

Timothy H. Watkins

Director

Enclosure

CC:

Erica Bergman, NJDEP
Peter Lopez, USEPA Region 2
Matt Laurita, USEPA, Region 2
Nidal Azzam, USEPA, Region 2
Ariel Iglesias, USEPA, Region 2
Daniel D'Agostino, USEPA, Region 2
Kathleen Salyer, USEPA, OLEM
Jim Woolford, USEPA, OLEM
Tala Henry, USEPA, OCSPP
Mike Koerber, USEPA, OAR
Charlotte Bertrand, USEPA, OW
Jennifer Mclain, USEPA, OW
Jennifer Orme-Zavaleta, USEPA, ORD
Alice Gilliland, USEPA, ORD
Andy Gillespie, USEPA, ORD
Kevin Oshima, USEPA, ORD
Brian Schumacher, USEPA, ORD

Detection, Evaluation, and Assignment of PFAS in Environmental Media from an Industrialized Area of New Jersey

Laboratory Data Report #7: Non-targeted Analysis of PFAS in Water Samples Collected from Wells with Point of Entry Treatment

Background. This report stems from a collaborative study with EPA ORD, EPA Region 2, and NJ DEP entitled "Detection, Evaluation, and Assignment of Multiple Poly- and Perfluoroalkyl Substances (PFAS) in Environmental Media from an Industrialized Area of New Jersey." NJ DEP assumed responsibility for the collection of samples and their shipment to the ORD laboratory. ORD was responsible for sample extraction and analysis of PFAS. Preparation of this report involved many from ORD assuming various roles and responsibilities (Table 1).

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

Responsibility	Personnel
ORD Principal Investigators	Andy Lindstrom, Mark Strynar, John Washington
Laboratory chemistry	James McCord
Quality Assurance Review	Libby Nessley, Sania Tong Argao
Management coordination and review	Kate Sullivan, Myriam Medina-Vera, Tim Buckley
Report preparation	Kate Sullivan

This 7th report includes non-targeted analysis (NTA) results for 24 water samples collected at three points across the treatment process of 6 wells installed with Granular Activated Carbon (GAC) or Ion Exchange Resin (IER; at one location) Point of Entry Treatment Systems (POETs). Sample collection was the responsibility of NJ DEP and occurred September 5, 2019. Samples were shipped to and received by ORD on September 6, 2019. The samples were analyzed for PFAS under the direction of Dr. James McCord at ORD's laboratory in Research Triangle Park, NC.

The current data report provides a simple representation and summary of the NTA results. Therefore, the description of methods and quality assurance are brief and high-level. Additional reports and/or publications are being developed that will include a more detailed description of methods, quality assurance analyses, and statistical/geospatial interpretation of the project data. As study partners/collaborators, we anticipate that NJ DEP and EPA Region 2 scientists will assist in these additional reports and publications.

Methods in Brief. Water samples were analyzed by ultra-performance liquid chromatography mass spectrometry (UPLC-MS) using methods described within our Laboratory Quality

Assurance Project Plan[1,2] and McCord *et al*. 2019[3]. In brief, water samples (500 mL) were filtered and then extracted using a WAX solid phase extraction cartridge. PFAS was removed from the cartridge in methanol and the volume reduced to 1 mL under a gentle stream of dry nitrogen. An aliquot of the 1 mL concentrated sample was injected into a Thermo Fisher Scientific™ Vanquish™ ultra-performance liquid chromatograph (UPLC) coupled to a Thermo Fisher Scientific™ Orbitrap Fusion™ MS. Samples were not diluted.

PFAS were analyzed using NTA methods. NTA provides two important measurements. The first is a tentative identification of PFAS compounds detected in the sample 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 the combined evidence from 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 MS detector provides integrated peak areas for the chromatogram of the compound mass (+/- 5 ppm) at the specified retention time. The peak area counts are proportional to the mass of PFAS in the sample. 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 NTA results differ from those produced during routine laboratory targeted 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 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.

The NTA data generated by UPLC/MS were considered as a "detect" when acceptable chromatographic peaks and spectra were evident. Samples without a detectable peak are reported as "ND" or not detected. Samples with detected analytes were further screened to determine the

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[1]National Exposure Research Laboratory, Quality Assurance Project Plan: Detection, Evaluation and Assignment of Multiple Poly and Per-fluoroalkyl Substances (PFAS) in environmental media from an industrialized area of New Jersey. Prepared for New Jersey Department of Environmental Protection (NJ DEP), D-EMMD-IEIB-010-QAPP-01, September 14, 2017.

[2]National Exposure Research Laboratory, Quality Assurance Project Plan: Detection, Evaluation and Assignment of Multiple Poly and Per-fluoroalkyl Substances (PFAS) in environmental media from an industrialized area of New Jersey. Prepared for New Jersey Department of Environmental Protection (NJ DEP) Amendment 2, D-EMMD-0031345-QO-1-2, September 3, 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

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 according to Equation 1. Sample values less than this threshold are reported as "<RL".

Equation 1. Reporting Limit (RL) =Average [Field and Laboratory blanks] + 3x STD [blanks].

Because of the particular interest in the chloro-perfluoro-polyether-carboxylate congeners (ClPFPECA) identified in soil and vegetation samples (Report #2 dated March 8, 2019), we reanalyzed the samples to provide an additional semiquantitative estimate of their concentration (ng/L). Since there are no standards for ClPFPECA congeners, an estimate of their concentration is derived from the MS response for two stable isotope-labeled compounds ($^{13}C_4$-labeled perfluorooctane sulfonate (M4PFOS) and $^{13}C_4$-labeled perfluorononononoic acid (M5PFNA) of known concentration to serve as an internal standard. The concentration of ClPFPECA was estimated proportional to its peak area assuming the same instrument response as the labeled PFAS as shown in Equation 2.

Equation 2. $$ClPFPECA_{Conc} = \frac{\mathrm{ClPFPECA}_{PA} \times C^{13}PFOS_OA_{Conc}}{C^{13}PFOS_OA_{PA}}$$

Where:

$ClPFPECA_{Conc}$ is the semi-quantified ClPFPECA concentration (ng/L)

$ClPFPECA_{PA}$ is the ClPFPECA peak area

C^{13}-$PFOS_OA_{Conc}$ is the known concentration of labeled PFOS (or PFNA) after spiking into the sample (ng/L)

C^{13}-$PFOS_OA_{PA}$ is the peak area of the labeled PFOS or PFOA

ClPFPECA results are expressed as PFOS IS-based or PFNA IS-based concentration (ng/L). Our experience with PFAS suggests that this means of estimation is within an order of magnitude of the actual concentration.

Summary of Results

Compound Identification: Across all the water samples, we detected and tentatively identified 24 different PFAS listed in Table 2 by chemical formula, name, CAS registry number (CASRN), monoisotopic mass, and retention time, where available. Note that there are only 16 unique PFAS compounds in Table 2. Several of the primary compounds have one or more isomers that have the same intrinsic properties but are distinguished primarily by retention time. In many cases, isomer branching could be identified. PFAS compounds with CASRN registered in EPA's Comptox Chemistry Dashboard (https://comptox.epa.gov/dashboard) where additional information about these chemicals can be found (U.S. EPA CompTox, 2019)[4].

Abundance of Compounds: Table 3 provides peak area counts for well samples and various field blanks. The peak areas are superimposed on a heat map where gradations in color reflect seven classifications of peak area from low (non-detect and less than the reporting limit) to high

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

(>1,000,000). The heat map is useful in showing where PFAS "light-up" in terms of detection and high peak areas.

None of the PFAS compounds were detected at levels greater than the reporting limit in the field blanks, although a number of the blanks had detectable peak areas for many of the analytes. We report the relative percent difference (RPD) of the field duplicate pairs as a measure of reproducibility in the samples. The RPD of the sample pair PFPW007_INF and was 75% averaged for analytes greater than RL. The peak areas for this sample were consistently biased low relative to its duplicate, which may indicate a variation in the concentration factor between preparations. This affects non-targeted abundances, but not estimated concentrations based on internal standard correction. The RPD of the sample pair collected at PFPW017_INF averaged 16% and all analytes met the reproducibility goal of 50%.

A number of the analytes were found in the influent of many of the wells at various levels of abundance. After GAC or IER treatment, analyte abundance in effluents was considerably reduced or not detected. An exception to this trend was the effluent sample for PFPW010 where effluent levels exceeded the influent or mid-point levels for a few analytes. It is unclear whether detections associated with this sample are reflective of conditions at the POET effluent, the result of typical NTA abundance variation, or from contamination during sample collection/handling/processing. We could conduct targeted analysis on this sample if it would help to clarify this result, but additional analysis is not included in this report.

NTA analysis of the well water samples identified the presence of the congener series named Chloro-Perfluoro-Polyether-Carboxalate that were previously found in soils[5] (ClPFPECA, Chem. Ref. #21 in Table 3). Results of the semiquantitative analysis of ClPFPECA congeners conducted with internal standards are provided in Table 4. The generic structure of the ClPFPECA congeners is shown in Figure 1. Analysis of soils previously identified nine congeners with m and n varying from 0 to 3. This analysis of well samples analyzed for 6 congeners with m and n varying from 0 to 2.

Figure 1. Generic Structure of Chloro-Perfluoro-Polyether-Carboxylate (ClPFPECA).

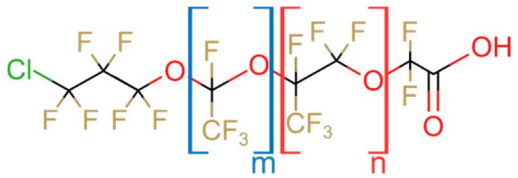

Table 4 provides the Peak areas of 6 ClFPECA congeners and the estimated concentration of the 0,1 (ethyl, propyl) congener which accounted for 99% of the ClPFPECA quantified. Two of the congeners were not detected in samples. Since this was a separate analysis, the peak areas of ClPFPECA (Chem. Ref. #21) reported in Table 3 are not directly comparable to the peak areas reported in Table 4.

[5] NJ DEP Report #2. Detection, Evaluation, and Assignment of PFAS in Environmental Media from an Industrialized Area of New Jersey. Laboratory Data Report #2: Non-targeted Analysis of PFAS in Soil and Vegetation. U.S.EPA/ORD, March 8, 2019.

Table 2. PFAS Tentatively Identified in Well Water Samples by UPCL-MS Non-targeted Analysis.

Chem Ref. #	Tentatively Identified Compound Name	CAS Number	Formula	Monoisotopic Mass (Daltons)	Retention Time
1	Perfluoropentanoic acid (PFPeA)	2706-90-3	C5 H F9 O2	263.9834	2.20
2	Perfluorohexanoic acid (PFHxA) - Linear Isomer	307-24-4	C6 H F11 O2	313.9802	4.22
3	Perfluorohexanoic acid (PFHxA) - Branched Isomer		C6 H F11 O2	313.9801	3.82
4	Perfluoroheptanoic acid (PFHpA) - Linear Isomer	375-85-9	C7 H F13 O2	363.9770	5.61
5	Perfluoroheptanoic acid (PFHpA) - Branched Isomer		C7 H F13 O2	363.9771	5.36
6	7-H-Perfluoroheptanoic acid	1546-95-8	C7 H2 F12 O2	345.9864	3.75
7	Perfluoroctanoic acid (PFOA) - Linear Isomer	335-67-1	C8 H F15 O2	413.9741	6.43
8	Perfluoroctanoic acid (PFOA) - Branched Isomer		C8 H F15 O2	413.9741	6.25
9	Perfluorononanoic acid (PFNA) - Linear Isomer	375-95-1	C9 H F17 O2	463.9714	7.01
10	Perfluorononanoic acid (PFNA) -Branched Isomer		C9 H F17 O2	463.9714	6.87
11	Perfluorodecanoic acid (PFDA) - Linear Isomer	335-76-2	C10 H F19 O2	513.9683	7.51
12	Perfluoroundecanoic acid (PFUDA) - Linear Isomer	2058-94-8	C11 H F21 O2	563.9649	7.91
13	Perfluorobutanesulfonic acid (PFBS)	375-73-5	C4 H F9 O3 S	299.9503	2.72
14	Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	C5 H F11 O3 S	349.9471	4.60
15	Perfluoro-1-hexanesulfonic acid (PFHxS) - Linear Isomer	355-46-4	C6 H F13 O3 S	399.9442	5.77
16	Perfluoroheptanesulfonic acid (PFHpS) - Linear Isomer	375-92-8	C7 H F15 O3 S	449.9410	6.49
17	Perfluoro-1-octanesulfonic acid (PFOS) - Linear Isomer	1763-23-1	C8 H F17 O3 S	499.9403	7.05
18	Perfluoro-1-octanesulfonic acid (PFOS) - Branched Isomer		C8 H F17 O3 S	499.9402	6.90
19	Perfluoro-1-octanesulfonic acid (PFOS) -Branched Isomer		C8 H F17 O3 S	499.9394	6.86
20	Perfluorooctanesulfonic acid (PFOS) - Branched Isomers		C8 H F17 O3 S	499.9382	6.71
21	Chloro-perfluoro-polyether-carboxylate congeners (ClPFPECA)(0,1)		C8 H Cl F14 O4	461.9349	6.88
22	Perfluoro-4-(perfluoroethyl)cyclohexylsulfonic acid	335-24-0	C8 H F15 O3 S	461.9414	6.36
23	Perfluoro-4-(perfluoroethyl)cyclohexylsulfonic acid	335-24-0	C8 H F15 O3 S	461.9414	6.18
24	2,2,3,3-Tetrafluoro-3-{[1,1,1,2,3,3-hexafluoro-3-(1,2,2,2-tetrafluoroethoxy)propan-2-yl]oxy}propanoic acid	773804-62-9	C8 H2 F14 O4	427.9731	6.13

Table 3. PFAS Peak Area Count Determined with Non-targeted Analysis.

Chem Ref. #	PFPW007_ INF	PFPW007_ INF_DUP	PFPW007_ MID	PFPW007_ EFF	PFPW008_ INF	PFPW008_ MID	PFPW008_ EFF	PFPW010_ INF	PFPW010_ MID	PFPW010_ EFF	PFPW011_ INF	PFPW011_ MID	PFPW011_ EFF
1	155,000	338,000	<RL	<RL	171,000	65,800	<RL	<RL	<RL	<RL	90,200	<RL	<RL
2	293,000	680,000	<RL	<RL	351,000	31,700	<RL	41,800	<RL	<RL	55,100	<RL	<RL
3	<RL	<RL	<RL	<RL	2,230	<RL	<RL	1,610	<RL	<RL	1,670	<RL	<RL
4	266,000	635,000	<RL	<RL	233,000	<RL	<RL	227,000	<RL	<RL	140,000	<RL	<RL
5	3,370	9,310	<RL	<RL	9,650	882	<RL	14,800	<RL	<RL	7,290	<RL	<RL
6	<RL	<RL	<RL	<RL	<RL	<RL	<RL	6,950	<RL	<RL	<RL	<RL	3,650
7	1,080,000	2,250,000	24,900	<RL	929,000	<RL	<RL	266,000	<RL	55,000	682,000	<RL	<RL
8	73,000	154,000	1,850	<RL	148,000	2,890	1,470	17,900	<RL	<RL	154,000	1,990	<RL
9	257,000	457,000	<RL	<RL	1,640,000	<RL	<RL	894,000	<RL	77,900	3,240,000	<RL	<RL
10	8,640	18,300	<RL	<RL	24,700	<RL	<RL	37,000	<RL	<RL	45,900	<RL	<RL
11	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	166,000	<RL	37,900	<RL
12	<RL	<RL	<RL	<RL	9,070	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
13	51,700	93,200	<RL	<RL	134,000	<RL	<RL	10,900	<RL	<RL	28,400	<RL	<RL
14	<RL	<RL	<RL	12,300	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
15	69,700	148,000	<RL	<RL	222,000	24,800	<RL	61,800	<RL	269,000	318,000	26,200	<RL
16	53,600	136,000	875	<RL	11,000	<RL	<RL	2,390	<RL	772	13,600	1,080	<RL
17	164,000	300,000	<RL	<RL	214,000	<RL	<RL	<RL	<RL	480,000	237,000	<RL	<RL
18	207,000	486,000	<RL	<RL	83,300	21,900	<RL	<RL	<RL	<RL	117,000	<RL	<RL
19	139,000	345,000	<RL	<RL	38,400	13,000	<RL	<RL	<RL	<RL	48,600	<RL	<RL
20	30,800	71,400	<RL	<RL	6,600	2,140	<RL	1,810	<RL	<RL	9,280	848	825
21	3,290	7,360	<RL	<RL	65,900	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
22	6,900	14,200	<RL	<RL	17,900	41,400	<RL	18,600	<RL	<RL	36,500	<RL	2,790
23	<RL	851	<RL	<RL	5,780	11,600	<RL	6,620	<RL	<RL	11,600	<RL	<RL
24	7,160	15,200	<RL	<RL	224,000	910	529	<RL	<RL	<RL	1,020	<RL	<RL

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

Table 3 (continued). PFAS Peak Area Count Determined with Non-targeted Analysis.

Chem Ref. #	PFPW012_ INF	PFPW012_ MID	PFPW012_ EFF	PFPW017_ INF	PFPW017_ INF_DUP	PFPW017_ MID	PFPW017_ EFF	FB1	FB2	TB1	TB2
1	78,100	<RL	<RL	171,000	123,000	<RL	<RL	<RL	<RL	<RL	<RL
2	130,000	<RL	<RL	242,000	216,000	<RL	<RL	<RL	<RL	<RL	<RL
3	<RL	<RL	<RL	182,000	168,000	<RL	<RL	<RL	<RL	<RL	<RL
4	102,000	<RL	<RL	304,000	254,000	<RL	<RL	<RL	<RL	<RL	<RL
5	3,710	<RL	1,150	225,000	194,000	<RL	<RL	<RL	<RL	<RL	<RL
6	<RL	<RL	<RL	95,800	82,100	<RL	3,790	<RL	<RL	<RL	<RL
7	342,000	<RL	<RL	1,560,000	1,430,000	<RL	<RL	<RL	<RL	<RL	<RL
8	85,200	1,270	2,390	755,000	681,000	1,200	<RL	<RL	<RL	<RL	<RL
9	222,000	<RL	81,200	7,160,000	6,580,000	<RL	<RL	<RL	<RL	<RL	<RL
10	5,480	<RL	1,030	377,000	353,000	729	<RL	<RL	<RL	<RL	<RL
11	50,100	<RL	<RL	60,000	55,600	<RL	<RL	<RL	<RL	<RL	<RL
12	<RL	<RL	<RL	86,100	78,900	<RL	<RL	<RL	<RL	<RL	<RL
13	17,200	<RL	<RL	144,000	113,000	13,000	<RL	<RL	<RL	<RL	<RL
14	<RL	<RL	<RL	138,000	115,000	<RL	<RL	<RL	<RL	<RL	<RL
15	90,700	<RL	<RL	1,020,000	895,000	<RL	<RL	<RL	<RL	<RL	<RL
16	5,160	<RL	<RL	119,000	101,000	<RL	<RL	<RL	<RL	<RL	<RL
17	210,000	<RL	<RL	2,300,000	2,140,000	<RL	<RL	<RL	<RL	<RL	<RL
18	75,800	<RL	<RL	1,140,000	1,790,000	<RL	<RL	<RL	<RL	<RL	<RL
19	33,900	<RL	<RL	633,000	451,000	<RL	<RL	<RL	<RL	<RL	<RL
20	4,820	<RL	<RL	105,000	89,600	<RL	<RL	<RL	<RL	<RL	<RL
21	2,250	<RL	<RL	1,270,000	1,110,000	593	<RL	<RL	<RL	<RL	<RL
22	2,200	<RL	816	234,000	199,000	<RL	<RL	<RL	<RL	<RL	<RL
23	<RL	<RL	<RL	55,500	46,900	<RL	<RL	<RL	<RL	<RL	<RL
24	8,980	<RL	<RL	2,090,000	1,870,000	2,400	<RL	<RL	<RL	<RL	<RL

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

Table 4. Semi-Quantitation of Chloro-Perfluoro-Polyether-Carboxylate Congeners (ClPFPECA) in Water Samples. Concentration Values (ng/L) are Estimated Based on Labeled PFOS and PFNA Using Equation 2 Above.

	Fully Integrated Peak Area						Estimated ClPFPECA(0,1) Concentration (ng/L)		
Ethyl/Propyl Sample ID	Cl-PFPECA 1,0	Cl-PFPECA 2,0	Cl-PFPECA 0,1	Cl-PFPECA 1,1	Cl-PFPECA 2,1	Cl-PFPECA 0,2	as M4PFOS	as M5PFNA	Average
PFPW007_INF	ND	ND	945,000	ND	ND	ND	<5	<5	<5
PFPW007_INF_DUP	ND	ND	1,710,000	33,400	ND	ND	<5	<5	<5
PFPW007_MID	ND	ND	9,390	ND	ND	ND	ND	ND	ND
PFPW007_EFF	ND	ND	<RL	ND	ND	ND	ND	ND	ND
PFPW008_INF	ND	224,000	17,100,000	34,500	ND	ND	20	48	34
PFPW008_MID	ND	ND	91,100	ND	ND	ND	<5	<5	<5
PFPW008_EFF	ND	ND	25,300	ND	ND	ND	ND	<5	ND
PFPW010_INF	ND	ND	18,800	ND	ND	ND	ND	ND	ND
PFPW010_MID	ND	ND	<RL	ND	ND	ND	ND	ND	ND
PFPW010_EFF	ND	ND	12,700	ND	ND	ND	ND	ND	ND
PFPW011_INF	ND	ND	44,900	ND	ND	ND	<5	<5	<5
PFPW011_MID	ND	ND	40,400	ND	ND	ND	ND	<5	ND
PFPW011_EFF	ND	ND	<RL	ND	ND	ND	ND	ND	ND
PFPW012_INF	ND	24,600	740,000	73,100	ND	ND	<5	<5	<5
PFPW012_MID	ND	ND	82,900	ND	ND	ND	ND	<5	ND
PFPW012_EFF	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFPW017_INF	ND	2,950,000	155,000,000	43,000	ND	28,000	99	313	206
PFPW017_INF_DUP	ND	2,440,000	139,000,000	53,300	ND	19,700	82	294	188
PFPW017_MID	ND	ND	188,000	ND	ND	ND	<5	<5	<5
PFPW017_EFF	ND	ND	17,300	ND	ND	ND	ND	ND	ND
FB1	ND	ND	ND	ND	ND	ND	ND	ND	ND
FB2	ND	ND	<RL	ND	ND	ND	ND	ND	ND
SB1	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB1	ND	ND	ND	ND	ND	ND	ND	ND	ND
TB1	ND	ND	ND	ND	ND	ND	ND	ND	ND
TB2	ND	ND	<RL	ND	ND	ND	ND	ND	ND