County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Water Plant

Leland, NC
Samples Received: 03/31/22

Analytical Report
0322-833

Isotope Dilution Method

PFAS

Enthalpy Analytical, LLC – Ultratrace

Mark Hager
O: 910-876-6894/ F: 910-212-6886
mark.hager@enthalpy.com / www.enthalpy.com
2714 Exchange Drive, Wilmington, NC 28405

I certify that to the best of my knowledge all analytical data presented in this report:

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)

This analytical report was prepared in Portable Document Format (.PDF) and contains __21__ pages.

QA Review Performed by: Laura K. Boivin

Report Issued Date: 5/2/2022

ENTHALPY ANALYTICAL

Summary of Results

Enthalpy Analytical

Job No.: 0322-833-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County PUlic Utilites - NC Site: Northwest Water Plant, Leland, NC

Summary

	Compound	CAS	033122-SO1 ng/L	033122-EO1 ng/L
Acids	PFBA	375-22-4	3.77	3.44
	PFPeA	2706-90-3	5.05	5.14
	PFHxA	307-24-4	5.17	5.48
	PFHpA	375-85-9	2.51	2.95
	PFOA	335-67-1	6.29	6.42
	PFNA	375-95-1	0.882	0.929
	PFDA	335-76-2	0.458	0.471
	PFUnDA	2058-94-8	0.0707 L	0.201 J
	PFDoDA	307-55-1	0.0210 LB	0.145 LB
	PFTrDA	72629-94-8	ND U	0.106 LB
	PFTeDA	376-06-7	ND U	0.0386 L
Sulfonates	PFBS	375-73-5	3.57	3.93
	PFPeS	2706-91-4	0.837	0.856
	PFHxS	355-46-4	4.07	3.50
	PFHpS	375-92-8	0.446	0.444
	PFOS	1763-23-1	12.5	11.3
	PFNS	68259-12-1	ND U	0.000981 L
	PFDS	335-77-3	ND U	0.00388 L
	4:2 FTS	757124-72-4	ND U	ND U
	6:2 FTS	27619-97-2	0.0988 J	0.159 J
	8:2 FTS	39108-34-4	0.0255 L	0.0877 L
Other	PFOSA	754-91-6	ND U	0.0510 L
	N-MeFOSAA	2355-31-9	0.0503 LB	0.0941 L
	N-EtFOSAA	2991-50-6	ND U	0.0592 LB
	HFPO-DA	13252-13-6	1.28	1.37
	PFMOAA	674-13-5	19.9	13.5
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	1.82	1.98
	PFO3OA	39492-89-2	0.730 L	0.859 L
	PFO4DA	39492-90-5	ND U	0.767 L
	Nafion Byproduct 1	29311-67-9	ND U	ND U
	ADONA	919005-14-4	ND U	0.0274 L
	9Cl-PF3ONS	756426-58-1	ND U	0.0675 L
	11Cl-PF3OUdS	763051-92-9	ND U	0.0810 LB
	10:2 FTS	120226-60-0	ND U	0.188 L
	EVE Acid	69087-46-3	ND U	ND U
	FBSA	30334-69-1	0.408	0.516
	Hydro-EVE Acid	773804-62-9	0.128 LB	0.113 LB
	Hydrolyzed PSDA	2416366-19-1	1.03 LB	1.60
	Nafion Byproduct 2	749836-20-2	0.102 L	0.308
	N-EtFOSA	4151-50-2	ND U	ND U
	N-EtFOSE	1691-99-2	ND U	ND U
	NFDHA	151772-58-6	ND U	ND U
	N-MeFOSA	31506-32-8	ND U	0.0187 LB
	N-MeFOSE	24448-09-7	ND U	ND U
	NVHOS	1132933-86-8	1.10 L	1.08 L
	PEPA	267239-61-2	ND U	ND U
	PFECA-G	801212-59-9	ND U	0.0662 L
	PFEESA	113507-82-7	ND U	ND U
	PFHxDA	67905-19-5	0.0416 L	ND U
	PFMOBA	863090-89-5	ND U	ND U
	PFO5DA	39492-91-6	ND U	0.437 L
	PMPA	13140-29-9	ND U	ND U
	R-EVE	2416366-22-6	4.30	3.48
	R-PSDA	2416366-18-0	ND U	ND U
	R-PSDCA	2416366-21-5	ND U	ND U

Detailed Results

Enthalpy Analytical

Job No.: 0322-833-1 PFAS by Isotope Dilution (non-potable water)
Brunswick County PUlic Utilites - NC Site: Northwest Water Plant, Leland, NC

Enthalpy ID	0322-833-001-1	Prep Batch	EU13216	Sample Vol (mL)	293.77
Sample Name	033122-SO1	Prep Date	2022-03-31 14:50	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-04-03 02:06	Split Factor	N/A
Sampling Date	20220331 00:00	Analyst	avheadrick	Method Code	WM-026
Received Date	2022-03-31 14:00	Instrument	Kili	Sample Type	Sample

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	2769.42	3.77	3.77	0.130	0.259			
	PFPeA	2706-90-3	3707.46	5.05	5.05	0.145	0.259			
	PFHxA	307-24-4	3794.03	5.17	5.17	0.164	0.259			
	PFHpA	375-85-9	1846.84	2.51	2.51	0.104	0.259			
	PFOA	335-67-1	4617.87	6.29	6.29	0.151	0.259			
	PFNA	375-95-1	647.73	0.882	0.882	0.0648	0.259			
	PFDA	335-76-2	336.30	0.458	0.458	0.0719	0.259			
	PFUnDA	2058-94-8	51.93	0.0707	0.0707	0.157	0.259			L
	PFDoDA	307-55-1	15.44	0.0210	0.0210	0.172	0.259			LB
	PFTrDA	72629-94-8	ND	ND	ND	0.129	0.259			U
	PFTeDA	376-06-7	ND	ND	ND	0.186	0.259			U
Sulfonates	PFBS	375-73-5	2623.78	3.57	3.57	0.302	0.302			
	PFPeS	2706-91-4	614.79	0.837	0.837	0.175	0.244			
	PFHxS	355-46-4	2987.35	4.07	4.07	0.163	0.237			
	PFHpS	375-92-8	327.28	0.446	0.446	0.115	0.246			
	PFOS	1763-23-1	9203.32	12.5	12.5	0.136	0.240			
	PFNS	68259-12-1	ND	ND	ND	0.0735	0.249			U
	PFDS	335-77-3	ND	ND	ND	0.163	0.249			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.100	0.242			U
	6:2 FTS	27619-97-2	72.56	0.0988	0.0988	0.0987	0.246			J
	8:2 FTS	39108-34-4	18.71	0.0255	0.0255	0.146	0.248			L
Other	PFOSA	754-91-6	ND	ND	ND	0.111	0.259			U
	N-MeFOSAA	2355-31-9	36.93	0.0503	0.0503	0.123	0.259			LB
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.0928	0.259			U
	HFPO-DA	13252-13-6	937.66	1.28	1.28	0.194	0.259			
	PFMOAA	674-13-5	14582.18	19.9	19.9	1.23	1.23			
	PFMOPrA	377-73-1	ND	ND	ND	0.204	0.259			U
	PFO2HxA	39492-88-1	1339.37	1.82	1.82	1.23	1.23			
	PFO3OA	39492-89-2	536.44	0.730	0.730	1.23	1.23			L
	PFO4DA	39492-90-5	ND	ND	ND	1.29	1.29			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.259	0.259			U
	ADONA	919005-14-4	ND	ND	ND	0.102	0.245			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.102	0.241			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.102	0.244			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.204	0.259			U
	EVE Acid	69087-46-3	ND	ND	ND	1.23	1.23			U
	FBSA	30334-69-1	299.53	0.408	0.408	0.204	0.259			
	Hydro-EVE Acid	773804-62-9	94.37	0.128	0.128	1.23	1.23			LB
	Hydrolyzed PSDA	2416366-19-1	754.27	1.03	1.03	1.23	1.23			LB
	Nafion Byproduct 2	749836-20-2	74.55	0.102	0.102	0.259	0.259			L
	N-EtFOSA	4151-50-2	ND	ND	ND	0.204	0.259			U
	N-EtFOSE	1691-99-2	ND	ND	ND	6.13	6.13			U
	NFDHA	151772-58-6	ND	ND	ND	0.204	0.259			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.204	0.259			U
	N-MeFOSE	24448-09-7	ND	ND	ND	6.13	6.13			U
	NVHOS	1132933-86-8	806.34	1.10	1.10	1.23	1.23			L
	PEPA	267239-61-2	ND	ND	ND	1.23	1.23			U
	PFECA-G	801212-59-9	ND	ND	ND	0.259	1.23			U
	PFEESA	113507-82-7	ND	ND	ND	0.204	0.259			U
	PFHxDA	67905-19-5	30.57	0.0416	0.0416	1.23	1.23			L
	PFMOBA	863090-89-5	ND	ND	ND	1.23	1.23			U
	PFO5DA	39492-91-6	ND	ND	ND	1.29	1.29			U
	PMPA	13140-29-9	ND	ND	ND	1.23	1.23			U
	R-EVE	2416366-22-6	3159.27	4.30	4.30	1.23	1.23			
	R-PSDA	2416366-18-0	ND	ND	ND	1.23	1.23			U
	R-PSDCA	2416366-21-5	ND	ND	ND	1.23	1.23			U
ES	MPFBA		4793.77	6.53				20-150%	95.9%	
	M5PFPeA		9673.95	13.2				20-150%	193.5%	Q
	M3PFBS		13113.35	17.9				20-150%	262.3%	Q
	M2-4:2 FTS		12180.69	16.6				20-150%	243.6%	Q
	M5PFHxA		4471.21	6.09				20-150%	89.4%	
	M3HFPO-DA		3930.19	5.35				20-150%	78.6%	
	M4PFHpA		5174.35	7.05				20-150%	103.5%	
	M3PFHxS		5228.18	7.12				20-150%	104.6%	
	M2-6:2 FTS		6549.82	8.92				20-150%	131.0%	
	M8PFOA		4965.38	6.76				20-150%	99.3%	
	M9PFNA		4428.45	6.03				20-150%	88.6%	
	M8PFOS		5254.20	7.15				20-150%	105.1%	
	M2-8:2 FTS		7121.79	9.70				20-150%	142.4%	
	M8FOSA-I		4351.75	5.93				20-150%	87.0%	
	M6PFDA		5145.58	7.01				20-150%	102.9%	
	d3-N-MeFOSAA		6224.23	8.47				20-150%	124.5%	
	d5-N-EtFOSAA		6151.95	8.38				20-150%	123.0%	
	M7PFUdA		4983.99	6.79				20-150%	99.7%	
	MPFDoA		4626.92	6.30				20-150%	92.5%	
	M2PFTeDA		3080.29	4.19				20-150%	61.6%	

Enthalpy Analytical

Job No.: 0322-833-1 PFAS by Isotope Dilution (non-potable water)
Brunswick County PUlic Utilites - NC Site: Northwest Water Plant, Leland, NC

Enthalpy ID	0322-833-002-1	Prep Batch	EU13216	Sample Vol (mL)	286.17
Sample Name	033122-EO1	Prep Date	2022-03-31 14:50	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-04-03 02:29	Split Factor	N/A
Sampling Date	20220331 00:00	Analyst	avheadrick	Method Code	WM-026
Received Date	2022-03-31 14:00	Instrument	Kili	Sample Type	Sample

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	2463.40	3.44	3.44	0.134	0.266			
	PFPeA	2706-90-3	3679.18	5.14	5.14	0.149	0.266			
	PFHxA	307-24-4	3920.21	5.48	5.48	0.169	0.266			
	PFHpA	375-85-9	2108.32	2.95	2.95	0.107	0.266			
	PFOA	335-67-1	4590.85	6.42	6.42	0.155	0.266			
	PFNA	375-95-1	664.85	0.929	0.929	0.0665	0.266			
	PFDA	335-76-2	337.03	0.471	0.471	0.0738	0.266			
	PFUnDA	2058-94-8	143.56	0.201	0.201	0.162	0.266			J
	PFDoDA	307-55-1	103.61	0.145	0.145	0.176	0.266			LB
	PFTrDA	72629-94-8	76.12	0.106	0.106	0.132	0.266			LB
	PFTeDA	376-06-7	27.62	0.0386	0.0386	0.190	0.266			L
Sulfonates	PFBS	375-73-5	2809.14	3.93	3.93	0.310	0.310			
	PFPeS	2706-91-4	612.20	0.856	0.856	0.180	0.250			
	PFHxS	355-46-4	2506.30	3.50	3.50	0.167	0.243			
	PFHpS	375-92-8	317.96	0.444	0.444	0.118	0.253			
	PFOS	1763-23-1	8063.18	11.3	11.3	0.140	0.246			
	PFNS	68259-12-1	0.70	0.000981	0.000981	0.0755	0.256			L
	PFDS	335-77-3	2.78	0.00388	0.00388	0.168	0.256			L
	4:2 FTS	757124-72-4	ND	ND	ND	0.103	0.249			U
	6:2 FTS	27619-97-2	114.02	0.159	0.159	0.101	0.253			J
	8:2 FTS	39108-34-4	62.77	0.0877	0.0877	0.149	0.254			L
Other	PFOSA	754-91-6	36.45	0.0510	0.0510	0.114	0.266			L
	N-MeFOSAA	2355-31-9	67.35	0.0941	0.0941	0.126	0.266			L
	N-EtFOSAA	2991-50-6	42.35	0.0592	0.0592	0.0952	0.266			LB
	HFPO-DA	13252-13-6	978.98	1.37	1.37	0.199	0.266			
	PFMOAA	674-13-5	9664.65	13.5	13.5	1.26	1.26			
	PFMOPrA	377-73-1	ND	ND	ND	0.210	0.266			U
	PFO2HxA	39492-88-1	1416.48	1.98	1.98	1.26	1.26			
	PFO3OA	39492-89-2	614.88	0.859	0.859	1.26	1.26			L
	PFO4DA	39492-90-5	548.73	0.767	0.767	1.33	1.33			L
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.266	0.266			U
	ADONA	919005-14-4	19.58	0.0274	0.0274	0.105	0.252			L
	9Cl-PF3ONS	756426-58-1	48.30	0.0675	0.0675	0.105	0.247			L
	11Cl-PF3OUdS	763051-92-9	57.93	0.0810	0.0810	0.105	0.250			LB
	10:2 FTS	120226-60-0	134.15	0.188	0.188	0.210	0.266			L
	EVE Acid	69087-46-3	ND	ND	ND	1.26	1.26			U
	FBSA	30334-69-1	369.01	0.516	0.516	0.210	0.266			
	Hydro-EVE Acid	773804-62-9	80.68	0.113	0.113	1.26	1.26			LB
	Hydrolyzed PSDA	2416366-19-1	1144.53	1.60	1.60	1.26	1.26			
	Nafion Byproduct 2	749836-20-2	220.22	0.308	0.308	0.266	0.266			
	N-EtFOSA	4151-50-2	ND	ND	ND	0.210	0.266			U
	N-EtFOSE	1691-99-2	ND	ND	ND	6.29	6.29			U
	NFDHA	151772-58-6	ND	ND	ND	0.210	0.266			U
	N-MeFOSA	31506-32-8	13.39	0.0187	0.0187	0.210	0.266			LB
	N-MeFOSE	24448-09-7	ND	ND	ND	6.29	6.29			U
	NVHOS	1132933-86-8	775.48	1.08	1.08	1.26	1.26			L
	PEPA	267239-61-2	ND	ND	ND	1.26	1.26			U
	PFECA-G	801212-59-9	47.34	0.0662	0.0662	0.266	1.26			L
	PFEESA	113507-82-7	ND	ND	ND	0.210	0.266			U
	PFHxDA	67905-19-5	ND	ND	ND	1.26	1.26			U
	PFMOBA	863090-89-5	ND	ND	ND	1.26	1.26			U
	PFO5DA	39492-91-6	312.99	0.437	0.437	1.33	1.33			L
	PMPA	13140-29-9	ND	ND	ND	1.26	1.26			U
	R-EVE	2416366-22-6	2490.56	3.48	3.48	1.26	1.26			
	R-PSDA	2416366-18-0	ND	ND	ND	1.26	1.26			U
	R-PSDCA	2416366-21-5	ND	ND	ND	1.26	1.26			U
ES	MPFBA		4363.39	6.10				20-150%	87.3%	
	M5PFPeA		8618.26	12.0				20-150%	172.4%	Q
	M3PFBS		10987.12	15.4				20-150%	219.7%	Q
	M2-4:2 FTS		9424.73	13.2				20-150%	188.5%	Q
	M5PFHxA		4253.99	5.95				20-150%	85.1%	
	M3HFPO-DA		3652.21	5.10				20-150%	73.0%	
	M4PFHpA		4500.83	6.29				20-150%	90.0%	
	M3PFHxS		4837.67	6.76				20-150%	96.8%	
	M2-6:2 FTS		5793.37	8.10				20-150%	115.9%	
	M8PFOA		4530.52	6.33				20-150%	90.6%	
	M9PFNA		3952.13	5.52				20-150%	79.0%	
	M8PFOS		4414.23	6.17				20-150%	88.3%	
	M2-8:2 FTS		4748.72	6.64				20-150%	95.0%	
	M8FOSA-I		3304.09	4.62				20-150%	66.1%	
	M6PFDA		4918.52	6.87				20-150%	98.4%	
	d3-N-MeFOSAA		5633.51	7.87				20-150%	112.7%	
	d5-N-EtFOSAA		5419.40	7.58				20-150%	108.4%	
	M7PFUdA		4698.89	6.57				20-150%	94.0%	
	MPFDoA		4018.06	5.62				20-150%	80.4%	
	M2PFTeDA		2816.59	3.94				20-150%	56.3%	

QC Data

ENTHALPY
ANALYTICAL

Enthalpy Analytical

Job No.: 0322-833-1 PFAS by Isotope Dilution (non-potable water)
Brunswick County Public Utilites - NC Site: Northwest Water Plant, Leland, NC

Enthalpy ID	MB-13216-PFAS	Prep Batch	EU13216	Sample Vol (mL)	250
Sample Name	MB-13216-PFAS	Prep Date	2022-03-31 14:50	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-04-03 01:19	Split Factor	N/A
Sampling Date		Analyst	avheadrick	Method Code	WM-026
Received Date		Instrument	Kili	Sample Type	Blank

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	ND	ND	ND	0.153	0.304			U
	PFPeA	2706-90-3	ND	ND	ND	0.170	0.304			U
	PFHxA	307-24-4	ND	ND	ND	0.193	0.304			U
	PFHpA	375-85-9	ND	ND	ND	0.122	0.304			U
	PFOA	335-67-1	ND	ND	ND	0.177	0.304			U
	PFNA	375-95-1	ND	ND	ND	0.0761	0.304			U
	PFDA	335-76-2	ND	ND	ND	0.0845	0.304			U
	PFUnDA	2058-94-8	ND	ND	ND	0.185	0.304			U
	PFDoDA	307-55-1	15.92	0.0255	0.0255	0.202	0.304			L
	PFTrDA	72629-94-8	16.99	0.0272	0.0272	0.151	0.304			L
	PFTeDA	376-06-7	ND	ND	ND	0.218	0.304			U
Sulfonates	PFBS	375-73-5	ND	ND	ND	0.355	0.355			U
	PFPeS	2706-91-4	ND	ND	ND	0.206	0.286			U
	PFHxS	355-46-4	ND	ND	ND	0.191	0.278			U
	PFHpS	375-92-8	ND	ND	ND	0.135	0.290			U
	PFOS	1763-23-1	ND	ND	ND	0.160	0.282			U
	PFNS	68259-12-1	ND	ND	ND	0.0864	0.293			U
	PFDS	335-77-3	ND	ND	ND	0.192	0.293			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.118	0.285			U
	6:2 FTS	27619-97-2	ND	ND	ND	0.116	0.290			U
	8:2 FTS	39108-34-4	ND	ND	ND	0.171	0.291			U
Other	PFOSA	754-91-6	ND	ND	ND	0.130	0.304			U
	N-MeFOSAA	2355-31-9	4.86	0.00778	0.00778	0.144	0.304			L
	N-EtFOSAA	2991-50-6	25.39	0.0406	0.0406	0.109	0.304			L
	HFPO-DA	13252-13-6	ND	ND	ND	0.228	0.304			U
	PFMOAA	674-13-5	ND	ND	ND	1.44	1.44			U
	PFMOPrA	377-73-1	ND	ND	ND	0.240	0.304			U
	PFO2HxA	39492-88-1	ND	ND	ND	1.44	1.44			U
	PFO3OA	39492-89-2	ND	ND	ND	1.44	1.44			U
	PFO4DA	39492-90-5	ND	ND	ND	1.52	1.52			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.304	0.304			U
	ADONA	919005-14-4	ND	ND	ND	0.120	0.288			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.120	0.283			U
	11Cl-PF3OUdS	763051-92-9	25.62	0.0410	0.0410	0.120	0.286			L
	10:2 FTS	120226-60-0	ND	ND	ND	0.240	0.304			U
	EVE Acid	69087-46-3	61.90	0.0990	0.0990	1.44	1.44			L
	FBSA	30334-69-1	ND	ND	ND	0.240	0.304			U
	Hydro-EVE Acid	773804-62-9	50.28	0.0804	0.0804	1.44	1.44			L
	Hydrolyzed PSDA	2416366-19-1	86.65	0.139	0.139	1.44	1.44			L
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.304	0.304			U
	N-EtFOSA	4151-50-2	ND	ND	ND	0.240	0.304			U
	N-EtFOSE	1691-99-2	ND	ND	ND	7.20	7.20			U
	NFDHA	151772-58-6	ND	ND	ND	0.240	0.304			U
	N-MeFOSA	31506-32-8	2.04	0.00326	0.00326	0.240	0.304			L
	N-MeFOSE	24448-09-7	ND	ND	ND	7.20	7.20			U
	NVHOS	1132933-86-8	77.20	0.124	0.124	1.44	1.44			L
	PEPA	267239-61-2	ND	ND	ND	1.44	1.44			U
	PFECA-G	801212-59-9	ND	ND	ND	0.304	1.44			U
	PFEESA	113507-82-7	ND	ND	ND	0.240	0.304			U
	PFHxDA	67905-19-5	ND	ND	ND	1.44	1.44			U
	PFMOBA	863090-89-5	ND	ND	ND	1.44	1.44			U
	PFO5DA	39492-91-6	ND	ND	ND	1.52	1.52			U
	PMPA	13140-29-9	ND	ND	ND	1.44	1.44			U
	R-EVE	2416366-22-6	64.51	0.103	0.103	1.44	1.44			L
	R-PSDA	2416366-18-0	ND	ND	ND	1.44	1.44			U
	R-PSDCA	2416366-21-5	64.52	0.103	0.103	1.44	1.44			L
ES	MPFBA		4442.15	7.11				20-150%	88.8%	
	M5PFPeA		4684.64	7.50				20-150%	93.7%	
	M3PFBS		4734.59	7.58				20-150%	94.7%	
	M2-4:2 FTS		4469.57	7.15				20-150%	89.4%	
	M5PFHxA		4416.64	7.07				20-150%	88.3%	
	M3HFPO-DA		4380.60	7.01				20-150%	87.6%	
	M4PFHpA		4581.16	7.33				20-150%	91.6%	
	M3PFHxS		4280.09	6.85				20-150%	85.6%	
	M2-6:2 FTS		5261.09	8.42				20-150%	105.2%	
	M8PFOA		4649.32	7.44				20-150%	93.0%	
	M9PFNA		4114.44	6.58				20-150%	82.3%	
	M8PFOS		4510.29	7.22				20-150%	90.2%	
	M2-8:2 FTS		4908.10	7.85				20-150%	98.2%	
	M8FOSA-I		3880.23	6.21				20-150%	77.6%	
	M6PFDA		4853.18	7.77				20-150%	97.1%	
	d3-N-MeFOSAA		4937.82	7.90				20-150%	98.8%	
	d5-N-EtFOSAA		4848.29	7.76				20-150%	97.0%	
	M7PFUdA		4570.83	7.31				20-150%	91.4%	
	MPFDoA		4165.33	6.66				20-150%	83.3%	
	M2PFTeDA		3169.63	5.07				20-150%	63.4%	

Enthalpy Analytical

Job No.: 0322-833-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilites - NC Site: Northwest Water Plant, Leland, NC

Enthalpy ID	OPR-13216-PFAS	Prep Batch	EU13216	Sample Vol (mL)	250
Sample Name	OPR-13216-PFAS	Prep Date	2022-03-31 14:50	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-04-03 01:42	Split Factor	N/A
Sampling Date		Analyst	avheadrick	Method Code	WM-026
Received Date		Instrument	Kili	Sample Type	Control

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	11957.97	19.1	19.1	0.153	0.304	73-129%	95.7%	
	PFPeA	2706-90-3	11504.91	18.4	18.4	0.170	0.304	72-129%	92.0%	
	PFHxA	307-24-4	11788.79	18.9	18.9	0.193	0.304	72-129%	94.3%	
	PFHpA	375-85-9	11212.25	17.9	17.9	0.122	0.304	72-130%	89.7%	
	PFOA	335-67-1	12223.33	19.6	19.6	0.177	0.304	71-133%	97.8%	
	PFNA	375-95-1	12195.61	19.5	19.5	0.0761	0.304	69-130%	97.6%	
	PFDA	335-76-2	11145.93	17.8	17.8	0.0845	0.304	71-129%	89.2%	
	PFUnDA	2058-94-8	11523.52	18.4	18.4	0.185	0.304	69-133%	92.2%	
	PFDoDA	307-55-1	12655.69	20.2	20.2	0.202	0.304	72-134%	101.2%	
	PFTrDA	72629-94-8	13614.16	21.8	21.8	0.151	0.304	65-144%	108.9%	
	PFTeDA	376-06-7	11623.29	18.6	18.6	0.218	0.304	71-132%	93.0%	
Sulfonates	PFBS	375-73-5	9846.84	15.8	15.8	0.355	0.355	72-134%	88.8%	
	PFPeS	2706-91-4	10910.73	17.5	17.5	0.206	0.286	71-127%	92.8%	
	PFHxS	355-46-4	10829.82	17.3	17.3	0.191	0.278	68-131%	94.8%	
	PFHpS	375-92-8	13220.92	21.2	21.2	0.135	0.290	69-134%	111.0%	
	PFOS	1763-23-1	11427.21	18.3	18.3	0.160	0.282	65-140%	98.5%	
	PFNS	68259-12-1	12293.62	19.7	19.7	0.0864	0.293	69-127%	102.2%	
	PFDS	335-77-3	12307.74	19.7	19.7	0.192	0.293	53-142%	102.0%	
	4:2 FTS	757124-72-4	10906.89	17.5	17.5	0.118	0.285	63-143%	93.1%	
	6:2 FTS	27619-97-2	11917.37	19.1	19.1	0.116	0.290	64-140%	100.3%	
	8:2 FTS	39108-34-4	9852.51	15.8	15.8	0.171	0.291	67-138%	82.1%	
Other	PFOSA	754-91-6	11449.34	18.3	18.3	0.130	0.304	67-137%	91.6%	
	N-MeFOSAA	2355-31-9	12072.05	19.3	19.3	0.144	0.304	65-136%	96.6%	
	N-EtFOSAA	2991-50-6	12398.72	19.8	19.8	0.109	0.304	61-135%	99.2%	
	HFPO-DA	13252-13-6	11152.74	17.8	17.8	0.228	0.304	70-130%	89.2%	
ES	MPFBA		4542.83	7.27				20-150%	90.9%	
	M5PFPeA		4724.31	7.56				20-150%	94.5%	
	M3PFBS		4569.61	7.31				20-150%	91.4%	
	M2-4:2 FTS		4624.24	7.40				20-150%	92.5%	
	M5PFHxA		4452.88	7.12				20-150%	89.1%	
	M3HFPO-DA		4605.05	7.37				20-150%	92.1%	
	M4PFHpA		4651.54	7.44				20-150%	93.0%	
	M3PFHxS		4671.06	7.47				20-150%	93.4%	
	M2-6:2 FTS		4727.21	7.56				20-150%	94.5%	
	M8PFOA		4595.97	7.35				20-150%	91.9%	
	M9PFNA		4104.70	6.57				20-150%	82.1%	
	M8PFOS		4560.12	7.30				20-150%	91.2%	
	M2-8:2 FTS		5426.89	8.68				20-150%	108.5%	
	M8FOSA-I		3764.94	6.02				20-150%	75.3%	
	M6PFDA		4827.00	7.72				20-150%	96.5%	
	d3-N-MeFOSAA		5568.25	8.91				20-150%	111.4%	
	d5-N-EtFOSAA		5159.21	8.25				20-150%	103.2%	
	M7PFUdA		4686.63	7.50				20-150%	93.7%	
	MPFDoA		4455.22	7.13				20-150%	89.1%	
	M2PFTeDA		3420.17	5.47				20-150%	68.4%	

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilites - NC
Job No.	0322-833-1 PFAS by Isotope Dilution
Client ID.	N/A Site: Northwest Water Plant, Leland, NC

1. Custody

Megan Holden received the samples on March 31, 2022 at 7.2 °C after being relinquished by Brunswick County Public Utilites - NC. The samples were received in good condition.

Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, LLC

Table 1 - Sample Inventory

EU Lab Sample ID	Client Sample ID	Matrix
0322-833-001-1	033122-SO1	Aqueous
0322-833-002-1	033122-EO1	Aqueous

2. Methods and Analytes

A list of analytes of interest and corresponding methods of analysis is shown in Table 3. Abbreviations are defined in the listed Appendices.

Table 3 - Methods and Analytes

EU Method	Analytes	Cleanup Method
EU-047	Brusnwick PFAS List	ENVI-Carb

3. Analysis

The samples were analyzed using Waters Acquity UPLC equipped with Xevo TQ MS (LC/MS/MS "Kili").

For aqueous samples, the sample volume was measured gravimetrically by the laboratory, and spiked with Extraction Standard (ES). The sample was then mixed well and centrifuged, if needed. The samples were then extracted via SPE, and the extracts were cleaned up using ENVI-Carb.

Each final sample extract was transferred to an autosampler vial, spiked with Injection Standard (IS), and brought to a final volume of 400µL prior to analysis.

Due to acquisition requirements for analytes requested, the sample was analyzed in more than one sequence

4. Calibration

In the initial calibration, the reported analytes exhibited R^2 of ≥ 0.99. The reported analytes in the calibration standards, continuing calibration (concal) and Initial Calibration Verification (ICV) met the 30% accuracy criterion for native analytes.

Supplemental compounds were run using a single point calibration forced through zero.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilites - NC
Job No.	0322-833-1 PFAS by Isotope Dilution
Client ID.	N/A Site: Northwest Water Plant, Leland, NC

4. Calibration, continued

The Technical Director extended the method criteria for certain non-legacy analytes that do not have their own internal standard and exhibit observed variability during calibration.

5. QC Notes

The QC sample analyses passed all method criteria.

The samples were extracted within the 28-day from collection holding time and analyzed within the 28-day from extraction to analysis holding time required by the method.

Samples received above 6 °C, client notified in order acknowledgement documentation.

6. Reporting Notes

This report provides all results including detections below LOD following client instruction.

Analyte(s) were detected in the method blank (MB) at less than 1/2 LOQ that may also be less than LOD. Any analyte(s) detected in the samples with less than 10 times the amount detected in MB were notated with a B qualifier and are reported with no adverse impact.

Some labeled extraction standards in the sample analyses fell outside the control limits for ES recovery, as denoted by the "Q" qualifier. The target analytes are quantified based on their ratio to their labeled standard analogs. As a result, low or high labeled standard recovery do not cause any change to ratios or contribute any additional error in the measurement of the target analytes. The data have been accepted and reported with no further actions.

The results presented in this report are representative of the samples as provided to the laboratory.

These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.

Enthalpy Analytical, LLC in Wilmington NC is accredited by the Louisiana Department of Environmental Quality to the 2009 TNI Standard under certificate number 05075.

General Reporting Notes – Data Qualifiers

The following are general reporting notes that are applicable to all Enthalpy Analytical, LLC - Wilmington, NC data reports, unless specifically noted otherwise.

General Data Qualifiers

- B – The analyte was found in the method blank, at a concentration that was at least 10% of the amount in the sample.
- Cxx – Two or more congeners co-elute. In EDDs, C denotes the lowest IUPAC congener in a co-elution group and additional co-eluters for the group ('xx') are shown with the number of the lowest IUPAC co-eluter**.**
- E – The reported concentration exceeds the calibration range (upper point of the calibration curve). For HRMS data, this condition does not imply additional measurement uncertainty. For LC-MS/MS data, these values should be considered as having measurement uncertainty higher than values within the calibration range.
- EDL – Estimated Detection Level: The EDL is unique to isotope dilution methods and reflects the conditions of analysis at the time of analysis, including the equipment used. Where the MDL is a static value, the EDL is a dynamic value.
- EMPC – Estimated Maximum Possible Concentration: EMPC is specific to Dioxin/Furan tests to indicate the determined ion-abundance ratio was outside the allowed theoretical range (usually due to being near the detection limit, although it can very rarely be caused by a co-eluting interference). The EMPC concentration is adjusted to reflect the value at the theoretical ion-abundance ratio.
- IR – The ion ratio between the primary and secondary ions was observed to be outside the method criteria. The analyte concentration may be inaccurate due to interference.
- J – The analyte has a concentration below the minimum calibration level (LOQ value) but greater than the LOD. These values should be considered as having measurement uncertainty higher than values within the calibration range
- L - Indicates that an analyte has a concentration below the Minimum Detection Limit (MDL). The reported concentration is not recommended for regulatory use as the analyte signal may have a signal-to-noise ratio less than the criteria deemed necessary to be considered a detected analyte.
- LOD – Limit of Detection: For reports conforming to the DOD ELAP QSM, this is the QSM-defined LOD. For reports conforming to TNI requirements (but not DOD ELAP QSM requirements), this value is the minimum detection limit (MDL). The LOD is adjusted for sample weight or volume.
- LOQ – Limit of Quantitation: For reports conforming to the DOD ELAP QSM, this is the QSM-defined LOQ. For reports conforming to TNI requirements (but not DOD ELAP QSM requirements), this value is the reporting limit (RL). The LOQ is adjusted for sample weight or volume.

General Reporting Notes – Data Qualifiers

- <LOD() – Analyte was not found at a concentration high enough to be reported as detected. It is reported as less than the LOD, and the LOD is given in the parentheses.
- <LOQ() – Analyte was not found at a concentration high enough to be reported as above the QSM-defined LOQ or TNI defined Reporting Limit. It is reported as less than the LOQ, and the LOQ is given in the parentheses.
- ND – Indicates a non-detect.
- NR – Indicates a value that is not reportable due to issues observed in sample preparation or analysis.
- PR – The associated congener(s) is(are) poorly resolved.
- QI – Indicates the presence of a quantitative interference.
- RL – Reporting Limit. Lowest reportable value. The level is higher than the MDL.
- SI – Denotes "Single Ion Mode" and is utilized for PCBs where the secondary ion trace has a significantly elevated noise level due to background PFK. Responses for such peaks are calculated using an EMPC approach based solely on the primary ion area(s) and may be considered estimates.
- U – The analyte was not detected.
- V / Q – The labeled standard recovery is not within method control limits.
- X – Indicates the result is from re-injection/repeat/second-column analysis.

Lab Identifiers/ Data Attributes

- AR – Indicates use of the archived portion of the sample extract.
- CU – Indicates a sample that required additional clean-up prior to HRMS injection/processing.
- D – Dilution Data. Result was obtained from the analysis of a dilution. The number that follows the "D" indicates the dilution factor.
- DE – Indicates a dilution performed with the addition of ES (Extraction Standard) solution.
- DUP – Designation for a duplicate sample.
- MS – Designation for a matrix spike.
- MSD – Designation for a matrix spike duplicate.
- R – Indicates a re-extraction of the sample.
- RJ – Indicates a reinjection of the sample extract.

- S – Indicates a sample split. The number that follows the "S" indicates the split factor.
- SAT – Indicates an analyte saturated the detector.

PFAS Compound Acronym List		
Acronym	CAS #	Compound Name
Target Analytes		
* Analyte is not accredited		
PFBA	375-22-4	Perfluorobutanoic Acid
PFPeA	2706-90-3	Perfluoropentanoic Acid
PFHxA	307-24-4	Perfluorohexanoic Acid
PFHpA	375-85-9	Perfluoroheptanoic Acid
PFOA	335-67-1	Perfluorooctanoic Acid
PFNA	375-95-1	Perfluorononanoic Acid
PFDA	335-76-2	Perfluorodecanoic acid
PFUnA (PFUnDA)	2058-94-8	Perfluoroundecanoic acid
PFDoA (PFDoDA)	307-55-1	Perfluorododecanoic acid
PFTrDA (PFTriA)	72629-94-8	Perfluorotridecanoic acid
PFTeDA (PFTA)	376-06-7	Perfluorotetradecanoic acid
PFBS	375-73-5	Perfluorobutane sulfonic acid
PFPeS	2706-91-4	Perfluoropentane sulfonic acid
PFHxS	355-46-4	Perfluorohexane sulfonic acid
PFHpS	375-92-8	Perfluoroheptane sulfonic acid
PFOS	1763-23-1	Perfluorooctane sulfonic acid
PFNS	68259-12-1	Perfluorononane sulfonic acid
PFDS	335-77-3	Perfluorodecane sulfonic acid
4:2 FTS	757124-72-4	4:2 fluorotelomer sulfonic acid
6:2 FTS	27619-97-2	6:2 fluorotelomer sulfonic acid
8:2 FTS	39108-34-4	8:2 fluorotelomer sulfonic acid
PFOSA (FOSA)	754-91-6	Perfluorooctane sulfonamide
N-MeFOSAA	2355-31-9	N-methyl perfluorooctane sulfonamido acetic acid
N-EtFOSAA	2991-50-6	N-ethyl perfluorooctane sulfonamido acetic acid
HFPO-DA	13252-13-6	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (Gen-X)
11Cl-PF3OUdS	763051-92-9	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
9Cl-PF3ONS	756426-58-1	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
ADONA	919005-14-4	4,8-dioxa-3H-perfluorononanoic acid
PFEESA	113507-82-7	Perfluoro(2-ethoxyethane)sulphonic acid
PFMOBA (PFMBA)	863090-89-5	Perfluoro-4-methoxybutanic acid
NFDHA	151772-58-6	Nonafluoro-3,6-dioxaheptanoic acid
PFMOPrA (PFMPA)	377-73-1	Perfluoro-3-methoxypropanoic acid
* PFMOAA	674-13-5	Perfluoro-2-methoxyacetic acid
* PFO2HxA	39492-88-1	Perfluoro (3,5-dioxahexanoic) acid
* PFO3OA	39492-89-2	Perfluoro (3,5,7-trioxaoctanoic) acid
* PFO4DA	39492-90-5	Perfluoro (3,5,7,9-tetraoxadecanoic) acid
* PFO5DA	39492-91-6	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid
* Nafion Byproduct 1	29311-67-9	Nafion Byproduct 1
* Nafion Byproduct 2	749836-20-2	Nafion Byproduct 2
* PEPA	267239-61-2	Perfluoro-2-ethoxypropanoic acid
* PMPA	13140-29-9	Perfluoro-2-methoxypropanoic acid
* 10:2 FTS	120226-60-0	Fluorotelomer sulfonate 10:2
* N-EtFOSA	4151-50-2	N-ethylperfluoro-1-octanesulfonamide
* N-EtFOSE	1691-99-2	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
* N-MeFOSA	31506-32-8	N-methylperfluoro-1-octanesulfonamide
* N-MeFOSE	24448-09-7	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
* PFECA-G	801212-59-9	4-(Heptafluoroisopropoxy)hexafluorobutanoic acid
* PFHxDA	67905-19-5	Perfluorohexadecanoic acid
* R-PSDA (Nafion Byproduct 4)	2416366-18-0	Perfluoro-4-(2-sulfoethoxy)pentanoic acid

	PFAS Compound Acronym List		
	Acronym	**CAS #**	**Compound Name**
	Target Analytes		
	*** Analyte is not accredited**		
*	Hydrolyzed PSDA (Nafion Byproduct 5)	2416366-19-1	2-fluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2-tetrafluoro-2-sulfoethoxy)propoxy]-acetic acid
*	R-PSDCA (Nafion Byproduct 6)	2416366-21-5	1,1,2,2-tetrafluoro-2-[1,2,2,3,3-pentafluoro-1-(trifluoromethyl)propoxy] ethanesulfonic acid
*	EVE Acid	69087-46-3	2,2,3,3-tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-[(1,2,2-trifluoroethenyl)oxy]propan-2-yl}oxy)propionic acid
*	FBSA	30334-69-1	Perfluorobutylsulfonamide
*	Hydro-EVE Acid	773804-62-9	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
*	R-EVE Acid	2416366-22-6	4-(2-carboxy-1,1,2,2-tetrafluoroethoxy)-2,2,3,3,4,5,5,5-octafluoro-pentanoic acid
*	NVHOS	1132933-86-8	Perfluoroethoxysulfonic acid
*	PFDoS	79780-39-5	Perfluorododecane sulfonic acid
*	PFODA	16517-11-6	Perfluorooctadecanoic acid
*	3:3 FTCA	356-02-5	2H,2H,3H,3H-Perfluorohexanoic acid
*	5:3 FTCA	914637-49-3	2H,2H,3H,3H-Perfluorooctanoic acid
*	7:3 FTCA	812-70-4	2H,2H,3H,3H-Perfluorodecanoic acid
*	N-AP-FHxSA	50598-28-2	N-(3-(Dimethylamino)propyl)tridecafluoro-1-hexanesulfonamide
*	N-CMAmP-6:2 FOSA	34455-29-3	N-(Carboxymethyl)-N,N-dimethyl-3-(((3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl)sulfonyl)amino)1-propanaminium

Sample Custody

0322-833 *ee LM 5.2.22

~~0322-833~~

Chain of Custody Record

ENTHALPY analytical

Enthalpy Ultratrace Job#: _____ COC Page 1 of 1

Special Handling:
X Standard Turn Around Time
☐ Rush Turn Around Time -- Date Needed_____
• All Fast TATs Subject to Approval by Enthalpy Analytical, Inc.
• All Samples Disposed of After 6 months Unless Otherwise Instructed.
Enthalpy Analytical-Wilmington, NC has added enhancements to standard methods to improve accuracy, precision and permit an assessment of laboratory performance in the context of your specific data needs. For more information email Cindy.James@enthalpy.com.

Client Name: BRUNSWICK COUNTY UTILITIES
Project Manager: GLENN WALKER
Report To: SAME
Project Number:
Site Name: NORTHWEST WATER PLANT
Location: LELAND N.C.
PO#:
Telephone#:
Email:

This Chain of Custody is applicable to Non-Air samples. Standard TAT differ per analysis and are provided by request.

Client Special Instructions:

Matrix: GW-Groundwater, WW-Wastewater, NW-Non-Potable Water, DW-Drinking Water, S-Soil, SL-Sludge, BT-Biological Tissue, O-Other

Type: G=Grab C=Composite Q=Quality Control

Sample ID	Date	Time	Sample Volume	Type	Matrix	Sample Containers: # of Bottles	# of Jars	# of Bags	# Other	Analyses: Method 1613	Method 8290	Method 1668A/B/C PCB	PFAS by LC/MS/MS	PAHs by HRGC/HRMS	Sample on Hold	Method 23	ALL PFAS	Notes:
033122-SO1	3/31/2022	12:50PM	250 ml	G	NW	2											X	
033122-EO1	3/31/2022	12:50PM	250 ml	G	DW	2											X	

courier, cooler, on ice, no seals, good condition LM 3.31.22

Relinquished By:	Date:	Received By:	Date:	Time:	Sample Temperature Upon Receipt:
	3/31/2022		3.31.22	2:00	X Iced ☐ Ambient °C 7.2°C TG
					☐ Iced ☐ Ambient °C_____
					☐ Iced ☐ Ambient °C_____

2714 Exchange Drive • Wilmington, NC 28405 • (910) 212-5858 • www.enthalpy.com

This Is The Last Page Of This Report.