

County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Water Plant

Leland, NC
Samples Received: 09/02/21

Analytical Report 0921-717

Isotope Dilution Method PFAS



Enthalpy Analytical, LLC – Ultratrace

Laura Boivin

M: 910-520-2526 / F: 910-212-5866

laura.boivin@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 _____ pages.

Report Issued Date: _____



Summary of Results

Enthalpy Analytical

Job No.: 0921-717-1 PFAS by Isotope Dilution (non-potable water)

County of Brunswick Site: Northwest Water Plant

Summary

	Compound	CAS	090221-SO1 ng/L	090221-EO1 ng/L
Acids	PFBA	375-22-4	5.40	5.69
	PFPeA	2706-90-3	11.5	10.3
	PFHxA	307-24-4	8.49	8.10
	PFHpA	375-85-9	4.26	3.99
	PFOA	335-67-1	6.72	6.22
	PFNA	375-95-1	0.941	0.937
	PFDA	335-76-2	0.641	0.594
	PFUnDA	2058-94-8	0.0871 L	0.104 L
	PFDoDA	307-55-1	0.0263 LB	0.0275 LB
	PFTTrDA	72629-94-8	0.0205 LB	ND U
Sulfonates	PFTeDA	376-06-7	0.0452 L	ND U
	PFBS	375-73-5	5.17	5.52
	PFPeS	2706-91-4	0.613	0.605
	PFHxS	355-46-4	3.92	4.07
	PFHpS	375-92-8	0.242 J	0.315
	PFOS	1763-23-1	10.1	9.82
	PFNS	68259-12-1	ND U	ND U
	PFDS	335-77-3	ND U	ND U
	4:2 FTS	757124-72-4	ND U	ND U
	6:2 FTS	27619-97-2	0.0825 L	0.186 J
other	8:2 FTS	39108-34-4	ND U	ND U
	PFOSA	754-91-6	ND U	ND U
	N-MeFOSAA	2355-31-9	0.0317 LB	0.000176 LB
	N-EtFOSAA	2991-50-6	ND U	ND U
	HFPO-DA	13252-13-6	4.76	5.25
	PFMOAA	674-13-5	71.3	52.3
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	4.79	6.04
	PFO3OA	39492-89-2	3.75	2.62
	PFO4DA	39492-90-5	ND U	ND U
	Nafion Byproduct 1	29311-67-9	ND U	ND U
	ADONA	919005-14-4	ND U	ND U
	9Cl-PF3ONS	756426-58-1	ND U	ND U
	11Cl-PF3OUdS	763051-92-9	0.0135 LB	ND U
	10:2 FTS	120226-60-0	ND U	ND U
	EVE Acid	69087-46-3	ND U	ND U
	FBSA	30334-69-1	0.762	0.710
	Hydro-EVE Acid	773804-62-9	0.333 L	0.304 L
	Hydrolyzed PSDA	2416366-19-1	12.1	16.2
	Nafion Byproduct 2	749836-20-2	ND U	ND U
	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	ND U
	N-MeFOSE	24448-09-7	ND U	ND U
	NVHOS	1132933-86-8	2.91	3.13
	PEPA	267239-61-2	ND U	5.54
	PFECA-G	801212-59-9	ND U	ND U
	PFEESA	113507-82-7	ND U	ND U
	PFHxDA	67905-19-5	ND U	ND U
	PFMOBA	863090-89-5	ND U	ND U
	PFO5DA	39492-91-6	ND U	ND U
	PMPA	13140-29-9	5.06	5.68
	R-EVE	2416366-22-6	11.0	14.4
	R-PSDA	2416366-18-0	33.7	36.5
	R-PSDCA	2416366-21-5	0.0400 L	0.0311 L

Detailed Results

Enthalpy Analytical

Job No.: 0921-717-1 PFAS by Isotope Dilution (non-potable water)

County of Brunswick Site: Northwest Water Plant

Enthalpy ID	0921-717-001-1	Prep Batch	EU12257	Sample Vol (mL)	293.74
Sample Name	090221-SO1	Prep Date	2021-09-07 16:16	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2021-09-09 10:16	Dilution Factor	1
Sampling Date	20210902 00:00	Analyst	wicleve	Method Code	WM-026
Received Date	2021-09-02 02:50	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	3966.14	5.40	5.40	0.130	0.259			
	PFPeA	2706-90-3	8428.26	11.5	11.5	0.145	0.259			
	PFHxA	307-24-4	6237.87	8.49	8.49	0.164	0.259			
	PFHpA	375-85-9	3126.75	4.26	4.26	0.104	0.259			
	PFOA	335-67-1	4936.51	6.72	6.72	0.151	0.259			
	PFNA	375-95-1	690.89	0.941	0.941	0.0648	0.259			
	PFDA	335-76-2	471.05	0.641	0.641	0.0719	0.259			
	PFUnDA	2058-94-8	63.93	0.0871	0.0871	0.157	0.259			L
	PFDoDA	307-55-1	19.31	0.0263	0.0263	0.172	0.259			LB
	PFTTrDA	72629-94-8	15.05	0.0205	0.0205	0.129	0.259			LB
Sulfonates	PFTeDA	376-06-7	33.20	0.0452	0.0452	0.186	0.259			L
	PFBS	375-73-5	3798.34	5.17	5.17	0.302	0.302			
	PFPeS	2706-91-4	450.21	0.613	0.613	0.175	0.244			
	PFHxS	355-46-4	2876.13	3.92	3.92	0.163	0.237			
	PFHpS	375-92-8	178.07	0.242	0.242	0.115	0.246			J
	PFOS	1763-23-1	7383.17	10.1	10.1	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	60.56	0.0825	0.0825	0.0987	0.246			L
other	8:2 FTS	39108-34-4	ND	ND	ND	0.146	0.248			U
	PFOSA	754-91-6	ND	ND	ND	0.111	0.259			U
	N-MeFOSAA	2355-31-9	23.27	0.0317	0.0317	0.123	0.259			LB
	N-EiFOSAA	2991-50-6	ND	ND	ND	0.0928	0.259			U
	HFPO-DA	13252-13-6	3493.41	4.76	4.76	0.194	0.259			
	PFMOAA	674-13-5	52334.37	71.3	71.3	1.23	1.23			
	PFMOPrA	377-73-1	ND	ND	ND	0.204	0.259			U
	PFO2HxA	39492-88-1	3518.41	4.79	4.79	1.23	1.23			
	PFO3OA	39492-89-2	2751.52	3.75	3.75	1.23	1.23			
	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	9.89	0.0135	0.0135	0.102	0.244			LB
	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	559.43	0.762	0.762	0.204	0.259			
	Hydro-EVE Acid	773804-62-9	244.34	0.333	0.333	1.23	1.23			L
	Hydrolyzed PSDA	2416366-19-1	8865.85	12.1	12.1	1.23	1.23			
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.259	0.259			U
	N-EiFOSA	4151-50-2	ND	ND	ND	0.204	0.259			U
	N-EiFOSE	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	2134.17	2.91	2.91	1.23	1.23			
	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	ND	ND	ND	1.23	1.23			U
	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	3718.27	5.06	5.06	1.23	1.23			
	R-EVE	2416366-22-6	8072.90	11.0	11.0	1.23	1.23			
	R-PSDA	2416366-18-0	24773.42	33.7	33.7	1.23	1.23			
	R-PSDCA	2416366-21-5	29.41	0.0400	0.0400	1.23	1.23			L
ES	MPFBA		4344.81	5.92				20-150%	86.9%	
	M5PFPeA		10958.02	14.9				20-150%	219.2%	Q
	M3PFBS		27591.78	37.6				20-150%	551.8%	Q
	M2-4:2 FTS		10758.15	14.6				20-150%	215.2%	Q
	M5PFHxA		3589.72	4.89				20-150%	71.8%	
	M3HFPO-DA		3822.81	5.21				20-150%	76.5%	
	M4PFHpA		4308.55	5.87				20-150%	86.2%	
	M3PFHxS		4783.61	6.51				20-150%	95.7%	
	M2-6:2 FTS		6424.96	8.75				20-150%	128.5%	
	M8PFOA		4233.80	5.77				20-150%	84.7%	
	M9PFNA		4550.84	6.20				20-150%	91.0%	
	M8PFOS		4205.00	5.73				20-150%	84.1%	
	M2-8:2 FTS		4579.02	6.24				20-150%	91.6%	
	M8FOSA-I		2191.82	2.98				20-150%	43.8%	
	M6PFDA		4139.19	5.64				20-150%	82.8%	
	d3-N-MeFOSAA		4103.95	5.59				20-150%	82.1%	
	d5-N-EiFOSAA		3760.11	5.12				20-150%	75.2%	
	M7PFUdA		3893.58	5.30				20-150%	77.9%	
	MPFDoA		2689.65	3.66				20-150%	53.8%	
	M2PFTeDA		879.98	1.20				20-150%	17.6%	Q

Enthalpy Analytical

Job No.: 0921-717-1 PFAS by Isotope Dilution (non-potable water)

County of Brunswick Site: Northwest Water Plant

Enthalpy ID	0921-717-002-1	Prep Batch	EU12257	Sample Vol (mL)	291.92
Sample Name	090221-EO1	Prep Date	2021-09-07 16:16	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2021-09-09 10:39	Dilution Factor	1
Sampling Date	20210902 00:00	Analyst	wicleve	Method Code	WM-026
Received Date	2021-09-02 02:50	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	4150.28	5.69	5.69	0.131	0.260			
	PFPeA	2706-90-3	7542.76	10.3	10.3	0.146	0.260			
	PFHxA	307-24-4	5911.48	8.10	8.10	0.165	0.260			
	PFHpA	375-85-9	2913.45	3.99	3.99	0.104	0.260			
	PFOA	335-67-1	4539.20	6.22	6.22	0.152	0.260			
	PFNA	375-95-1	683.99	0.937	0.937	0.0652	0.260			
	PFDA	335-76-2	433.55	0.594	0.594	0.0724	0.260			
	PFUnDA	2058-94-8	76.03	0.104	0.104	0.158	0.260			
	PFDoDA	307-55-1	20.05	0.0275	0.0275	0.173	0.260			
	PFTTrDA	72629-94-8	ND	ND	ND	0.129	0.260			
Sulfonates	PFTeDA	376-06-7	ND	ND	ND	0.187	0.260			
	PFBS	375-73-5	4030.18	5.52	5.52	0.304	0.304			
	PFPeS	2706-91-4	441.60	0.605	0.605	0.176	0.245			
	PFHxS	355-46-4	2969.81	4.07	4.07	0.164	0.238			
	PFHpS	375-92-8	229.99	0.315	0.315	0.116	0.248			
	PFOS	1763-23-1	7170.26	9.82	9.82	0.137	0.241			
	PFNS	68259-12-1	ND	ND	ND	0.0740	0.251			
	PFDS	335-77-3	ND	ND	ND	0.164	0.251			
	4:2 FTS	757124-72-4	ND	ND	ND	0.101	0.244			
	6:2 FTS	27619-97-2	135.67	0.186	0.186	0.0993	0.248			
other	8:2 FTS	39108-34-4	ND	ND	ND	0.146	0.249			
	PFOSA	754-91-6	ND	ND	ND	0.111	0.260			
	N-MeFOSAA	2355-31-9	0.13	0.000176	0.000176	0.123	0.260			
	N-EiFOSAA	2991-50-6	ND	ND	ND	0.0934	0.260			
	HFPO-DA	13252-13-6	3830.19	5.25	5.25	0.195	0.260			
	PFMOAA	674-13-5	38145.68	52.3	52.3	1.23	1.23			
	PFMOPrA	377-73-1	ND	ND	ND	0.206	0.260			
	PFO2HxA	39492-88-1	4405.21	6.04	6.04	1.23	1.23			
	PFO3OA	39492-89-2	1910.38	2.62	2.62	1.23	1.23			
	PFO4DA	39492-90-5	ND	ND	ND	1.30	1.30			
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.260	0.260			
	ADONA	919005-14-4	ND	ND	ND	0.103	0.247			
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.103	0.243			
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.103	0.245			
	10:2 FTS	120226-60-0	ND	ND	ND	0.206	0.260			
	EVE Acid	69087-46-3	ND	ND	ND	1.23	1.23			
	FBSA	30334-69-1	518.11	0.710	0.710	0.206	0.260			
	Hydro-EVE Acid	773804-62-9	221.68	0.304	0.304	1.23	1.23			
	Hydrolyzed PSDA	2416366-19-1	11807.99	16.2	16.2	1.23	1.23			
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.260	0.260			
	N-EiFOSA	4151-50-2	ND	ND	ND	0.206	0.260			
	N-EiFOSE	1691-99-2	ND	ND	ND	6.17	6.17			
	NFDHA	151772-58-6	ND	ND	ND	0.206	0.260			
	N-MeFOSA	31506-32-8	ND	ND	ND	0.206	0.260			
	N-MeFOSE	24448-09-7	ND	ND	ND	6.17	6.17			
	NVHOS	1132933-86-8	2284.79	3.13	3.13	1.23	1.23			
	PEPA	267239-61-2	4041.31	5.54	5.54	1.23	1.23			
	PFECA-G	801212-59-9	ND	ND	ND	0.260	1.23			
	PFEESA	113507-82-7	ND	ND	ND	0.206	0.260			
	PFHxDA	67905-19-5	ND	ND	ND	1.23	1.23			
	PFMOBA	863090-89-5	ND	ND	ND	1.23	1.23			
	PFO5DA	39492-91-6	ND	ND	ND	1.30	1.30			
	PMPA	13140-29-9	4147.18	5.68	5.68	1.23	1.23			
	R-EVE	2416366-22-6	10507.11	14.4	14.4	1.23	1.23			
	R-PSDA	2416366-18-0	26668.34	36.5	36.5	1.23	1.23			
	R-PSDCA	2416366-21-5	22.73	0.0311	0.0311	1.23	1.23			
ES	MPFBA		4952.81	6.79				20-150%	99.1%	
	M5PFPeA		12529.64	17.2				20-150%	250.6%	Q
	M3PFBS		21346.73	29.3				20-150%	426.9%	Q
	M2-4:2 FTS		9789.12	13.4				20-150%	195.8%	Q
	M5PFHxA		3866.37	5.30				20-150%	77.3%	
	M3HFPO-DA		3845.11	5.27				20-150%	76.9%	
	M4PFHpA		4581.74	6.28				20-150%	91.6%	
	M3PFHxS		4845.51	6.64				20-150%	96.9%	
	M2-6:2 FTS		6241.80	8.55				20-150%	124.8%	
	M8PFOA		4749.71	6.51				20-150%	95.0%	
	M9PFNA		4953.92	6.79				20-150%	99.1%	
	M8PFOS		4428.76	6.07				20-150%	88.6%	
	M2-8:2 FTS		4978.42	6.82				20-150%	99.6%	
	M8FOSA-I		3620.97	4.96				20-150%	72.4%	
	M6PFDA		4455.72	6.11				20-150%	89.1%	
	d3-N-MeFOSAA		4115.73	5.64				20-150%	82.3%	
	d5-N-EiFOSAA		4467.64	6.12				20-150%	89.4%	
	M7PFUdA		4270.68	5.85				20-150%	85.4%	
	MPFDoA		3815.73	5.23				20-150%	76.3%	
	M2PFTeDA		2995.41	4.10				20-150%	59.9%	

QC Data

Enthalpy Analytical

Job No.: 0921-717-1 PFAS by Isotope Dilution (non-potable water)

County of Brunswick Site: Northwest Water Plant

Enthalpy ID	MB-12257-PFAS	Prep Batch	EU12257	Sample Vol (mL)	250
Sample Name	MB-12257-PFAS	Prep Date	2021-09-07 16:16	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2021-09-09 09:30	Dilution Factor	1
Sampling Date		Analyst	wicleve	Method Code	WM-026
Received Date	2021-09-07 16:16	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	116.59	0.187	0.187	0.193	0.304			L
	PFHpA	375-85-9	ND	ND	ND	0.122	0.304			U
	PFOA	335-67-1	142.68	0.228	0.228	0.177	0.304			J
	PFNA	375-95-1	ND	ND	ND	0.0761	0.304			U
	PFDA	335-76-2	8.96	0.0143	0.0143	0.0845	0.304			L
	PFUnDA	2058-94-8	ND	ND	ND	0.185	0.304			U
	PFDoDA	307-55-1	4.49	0.00719	0.00719	0.202	0.304			L
	PFTeDA	72629-94-8	1.59	0.00255	0.00255	0.151	0.304			L
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	90.58	0.145	0.145	0.191	0.278			L
	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	48.35	0.0774	0.0774	0.0864	0.293			L
	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	32.31	0.0517	0.0517	0.144	0.304			L
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.109	0.304			U
	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	14.22	0.0228	0.0228	0.240	0.304			L
	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	45.91	0.0735	0.0735	0.304	0.304			L
	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	4.81	0.00770	0.00770	0.120	0.286			L
	10:2 FTS	120226-60-0	ND	ND	ND	0.240	0.304			U
	EVE Acid	69087-46-3	8.53	0.0137	0.0137	1.44	1.44			L
	FBSA	30334-69-1	ND	ND	ND	0.240	0.304			U
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	1.44	1.44			U
	Hydrolyzed PSDA	2416366-19-1	ND	ND	ND	1.44	1.44			U
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.304	0.304			U
	N-EtFOA	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-MeFOA	31506-32-8	ND	ND	ND	0.240	0.304			U
	N-MeFOSE	24448-09-7	ND	ND	ND	7.20	7.20			U
	NVHOS	1132933-86-8	ND	ND	ND	1.44	1.44			U
	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	11.52	0.0184	0.0184	0.240	0.304			L
	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	ND	ND	ND	1.44	1.44			U
	R-PSDA	2416366-18-0	ND	ND	ND	1.44	1.44			U
	R-PSDCA	2416366-21-5	ND	ND	ND	1.44	1.44			U
ES	MPFBA		4600.00	7.36				20-150%	92.0%	
	M5PFPeA		4932.75	7.89				20-150%	98.7%	
	M3PFBS		5213.81	8.34				20-150%	104.3%	
	M2-4:2 FTS		4359.94	6.98				20-150%	87.2%	
	M5PFHxA		4537.26	7.26				20-150%	90.7%	
	M3HFPO-DA		4561.58	7.30				20-150%	91.2%	
	M4PFHpA		4813.33	7.70				20-150%	96.3%	
	M3PFHxS		4515.01	7.22				20-150%	90.3%	
	M2-6:2 FTS		4442.69	7.11				20-150%	88.9%	
	M8PFOA		4814.25	7.70				20-150%	96.3%	
	M9PFNA		5113.66	8.18				20-150%	102.3%	
	M8PFOS		4286.65	6.86				20-150%	85.7%	
	M2-8:2 FTS		4564.02	7.30				20-150%	91.3%	
	M8FOSA-I		3564.83	5.70				20-150%	71.3%	
	M6PFDA		4484.59	7.18				20-150%	89.7%	
	d3-N-MeFOSAA		3595.92	5.75				20-150%	71.9%	
	d5-N-EtFOSAA		3794.75	6.07				20-150%	75.9%	
	M7PFUdA		3912.90	6.26				20-150%	78.3%	
	MPFDoA		3032.90	4.85				20-150%	60.7%	
	M2PFTeDA		2123.01	3.40				20-150%	42.5%	

Enthalpy Analytical

Job No.: 0921-717-1 PFAS by Isotope Dilution (non-potable water)

County of Brunswick Site: Northwest Water Plant

Enthalpy ID	OPR-12257-PFAS	Prep Batch	EU12257	Sample Vol (mL)	250
Sample Name	OPR-12257-PFAS	Prep Date	2021-09-07 16:16	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2021-09-09 09:53	Dilution Factor	1
Sampling Date		Analyst	wicleve	Method Code	WM-026
Received Date	2021-09-07 16:16	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	11639.82	18.6	18.6	0.153	0.304	73-129%	93.1%	
	PFPeA	2706-90-3	10937.14	17.5	17.5	0.170	0.304	72-129%	87.5%	
	PFHxA	307-24-4	11451.11	18.3	18.3	0.193	0.304	72-129%	91.6%	
	PFHpA	375-85-9	11654.64	18.6	18.6	0.122	0.304	72-130%	93.2%	
	PFOA	335-67-1	10848.45	17.4	17.4	0.177	0.304	71-133%	86.8%	
	PFNA	375-95-1	11095.89	17.8	17.8	0.0761	0.304	69-130%	88.8%	
	PFDA	335-76-2	11363.29	18.2	18.2	0.0845	0.304	71-129%	90.9%	
	PFUnDA	2058-94-8	11617.18	18.6	18.6	0.185	0.304	69-133%	92.9%	
	PFDoDA	307-55-1	12147.37	19.4	19.4	0.202	0.304	72-134%	97.2%	
	PFTTrDA	72629-94-8	12917.12	20.7	20.7	0.151	0.304	65-144%	103.3%	
	PFTeDA	376-06-7	12756.10	20.4	20.4	0.218	0.304	71-132%	102.0%	
Sulfonates	PFBS	375-73-5	9296.76	14.9	14.9	0.355	0.355	72-134%	83.8%	
	PFPeS	2706-91-4	9845.29	15.8	15.8	0.206	0.286	71-127%	83.7%	
	PFHxS	355-46-4	9965.60	15.9	15.9	0.191	0.278	68-131%	87.2%	
	PFHpS	375-92-8	12329.25	19.7	19.7	0.135	0.290	69-134%	103.5%	
	PFOS	1763-23-1	9956.78	15.9	15.9	0.160	0.282	65-140%	85.8%	
	PFNS	68259-12-1	10725.59	17.2	17.2	0.0864	0.293	69-127%	89.2%	
	PFDS	335-77-3	9840.64	15.7	15.7	0.192	0.293	53-142%	81.6%	
	4:2 FTS	757124-72-4	14457.84	23.1	23.1	0.118	0.285	63-143%	123.4%	
	6:2 FTS	27619-97-2	10840.50	17.3	17.3	0.116	0.290	64-140%	91.2%	
	8:2 FTS	39108-34-4	16753.28	26.8	26.8	0.171	0.291	67-138%	139.6%	Q
Other	PFOSA	754-91-6	12446.12	19.9	19.9	0.130	0.304	67-137%	99.6%	
	N-MeFOSAA	2355-31-9	10629.15	17.0	17.0	0.144	0.304	65-136%	85.0%	
	N-EtFOSAA	2991-50-6	10403.41	16.6	16.6	0.109	0.304	61-135%	83.2%	
	HFPO-DA	13252-13-6	10487.06	16.8	16.8	0.228	0.304	70-130%	83.9%	
ES	MPFBA		4671.77	7.47				20-150%	93.4%	
	M5PFPeA		4832.21	7.73				20-150%	96.6%	
	M3PFBS		5305.73	8.49				20-150%	106.1%	
	M2-4:2 FTS		2979.86	4.77				20-150%	59.6%	
	M5PFHxA		4567.64	7.31				20-150%	91.4%	
	M3HFPO-DA		4507.55	7.21				20-150%	90.2%	
	M4PFHpA		4745.70	7.59				20-150%	94.9%	
	M3PFHxS		4321.48	6.91				20-150%	86.4%	
	M2-6:2 FTS		4251.76	6.80				20-150%	85.0%	
	M8PFOA		4686.78	7.50				20-150%	93.7%	
	M9PFNA		4480.76	7.17				20-150%	89.6%	
	M8PFOS		3797.30	6.08				20-150%	75.9%	
	M2-8:2 FTS		3775.43	6.04				20-150%	75.5%	
	M8FOSA-I		2530.02	4.05				20-150%	50.6%	
	M6PFDA		3971.76	6.35				20-150%	79.4%	
	d3-N-MeFOSAA		3951.09	6.32				20-150%	79.0%	
	d5-N-EtFOSAA		3908.66	6.25				20-150%	78.2%	
	M7PFUdA		3882.15	6.21				20-150%	77.6%	
	MPFD0A		3006.83	4.81				20-150%	60.1%	
	M2PFTeDA		2964.49	4.74				20-150%	59.3%	

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	County of Brunswick
Job No.	0921-717-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	Site: Northwest Water Plant

1. Custody

Avery Headrick received the samples on September 02, 2021 at 7.7 °C after being relinquished by County of Brunswick. 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
0921-717-001-1	090221-SO1	Aqueous
0921-717-002-1	090221-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	Brunswick PFAS List	ENVI-Carb

3. Analysis

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

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.

Samples that were run in more than one sequence and their comments are as follows:

090221-SO1, 090221-EO1 - Due to acquisition requirements for analytes requested, the samples were 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 with the following exception: 8:2 FTS and N-EtFOSE fell outside method criteria. However, there is no adverse impact as these analytes were not detected in the samples.

Enthalpy Analytical Narrative Summary

Company	County of Brunswick
Job No.	0921-717-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	Site: Northwest Water Plant

5. QC Notes

Except where noted below, the QC sample analyses passed all method criteria.

QC samples that did not meet method acceptance criteria were:

OPR-12257-PFAS 8:2 FTS - % Recovery fell outside the upper/lower limit but met marginal exceedance limits. Therefore, data is accepted with no adverse impact.

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.

6. Reporting Notes

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 concentration 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. Specific to Dioxin/Furan tests and equivalent to MDL
- EMPC – Estimated Maximum Possible Concentration Specific to Dioxin/Furan tests to indicate the signal/noise ratio was not sufficient for peak identification (the determined ion-abundance ratio was outside the allowed theoretical range), or where there was a co-eluting interference. Indicates that a peak was identified but did not meet the method specified ion-abundance ratio.
- IR – The ion ratio between the primary and secondary ions was observed to be outside the method criteria therefore the actual analyte concentration cannot be accurately determined as defined by DoD QSM Table B-15.
- 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 LOD is adjusted for sample weight or volume.
- <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.

General Reporting Notes – Data Qualifiers

- 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 – The labeled standard recovery is not within method control limits.
- X – Results 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.
- RJ – Indicates a reinjection of the sample extract.
- S – Indicates a sample split. The number that follows the “S” indicates the split factor.
- R – Indicates a re-extraction of the sample.

PFAS Compound Acronym List		
Acronym	Compound Name	CAS #
Target Analytes		
PFBA	Perfluorobutanoic Acid	375-22-4
PFPeA	Perfluoropentanoic Acid	2706-90-3
PFHxA	Perfluorohexanoic Acid	307-24-4
PFHpA	Perfluoroheptanoic Acid	375-85-9
PFOA	Perfluorooctanoic Acid	335-67-1
PFNA	Perfluorononanoic Acid	375-95-1
PFDA	Perfluorodecanoic acid	335-76-2
PFUnA (PFUnDA)	Perfluoroundecanoic acid	2058-94-8
PFDoA (PFDoDA)	Perfluorododecanoic acid	307-55-1
PFTriDA (PFTriA)	Perfluorotridecanoic acid	72629-94-8
PFTeDA (PFTA)	Perfluorotetradecanoic acid	376-06-7
PFBS	Perfluorobutane sulfonic acid	375-73-5
PFPeS	Perfluoropentane sulfonic acid	2706-91-4
PFHxS	Perfluorohexane sulfonic acid	355-46-4
PFHpS	Perfluoroheptane sulfonic acid	375-92-8
PFOS	Perfluorooctane sulfonic acid	1763-23-1
PFNS	Perfluorononane sulfonic acid	68259-12-1
PFDS	Perfluorodecane sulfonic acid	335-77-3
4:2 FTS	4:2 fluorotelomer sulfonic acid	757124-72-4
6:2 FTS	6:2 fluorotelomer sulfonic acid	27619-97-2
8:2 FTS	8:2 fluorotelomer sulfonic acid	39108-34-4
PFOSA (FOSA)	Perfluorooctane sulfonamide	754-91-6
N-MeFOSAA	N-methyl perfluorooctane sulfonamido acetic acid	2355-31-9
N-EtFOSAA	N-ethyl perfluorooctane sulfonamido acetic acid	2991-50-6
HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (Gen-X)	13252-13-6
11Cl-PF3OUdS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	763051-92-9
9Cl-PF3ONS	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	756426-58-1
ADONA	4,8-dioxa-3H-perfluorononanoic acid	919005-14-4
* PFMOAA	Perfluoro-2-methoxyacetic acid	674-13-5
PFMOPrA (PFMPA)	Perfluoro-3-methoxypropanoic acid	377-73-1
* PFO2HxA	Perfluoro (3,5-dioxahexanoic) acid	39492-88-1
* PFO3OA	Perfluoro (3,5,7-trioxaoctanoic) acid	39492-89-2
* PFO4DA	Perfluoro (3,5,7,9-tetraoxadecanoic) acid	39492-90-5
* PFO5DA	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	39492-91-6
* Nafion Byproduct 1	Nafion Byproduct 1	29311-67-9
* Nafion Byproduct 2	Nafion Byproduct 2	749836-20-2
PFEESA	Perfluoro(2-ethoxyethane)sulphonic acid	113507-82-7
PFMOBA (PFMBA)	Perfluoro-4-methoxybutanic acid	863090-89-5
NFDHA	Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6
* PEPA	Perfluoro-2-ethoxypropanoic acid	267239-61-2
* PMPA	Perfluoro-2-methoxypropanoic acid	13140-29-9
* 10:2 FTS	Fluorotelomer sulfonate 10:2	120226-60-0
* N-EtFOSA	N-ethylperfluoro-1-octanesulfonamide	4151-50-2
* N-EtFOSE	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	1691-99-2
* N-MeFOSA	N-methylperfluoro-1-octanesulfonamide	31506-32-8
* N-MeFOSE	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	24448-09-7
* PFECA-G	4-(Heptafluoroisopropoxy)hexafluorobutanoic acid	801212-59-9
* PFHxDA	Perfluorohexadecanoic acid	67905-19-5
* R-PSDA	Perfluoro-4-(2-sulfoethoxy)pentanoic acid	2416366-18-0

* Hydrolyzed PSDA	2-fluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2-tetrafluoro-2-sulfoethoxy)propoxy]-acetic acid	2416366-19-1
* R-PSDCA	1,1,2,2-tetrafluoro-2-[1,2,2,3,3-pentafluoro-1-(trifluoromethyl)propoxy] ethanesulfonic acid	2416366-21-5
* EVE Acid	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	69087-46-3
* FBSA	Perfluorobutylsulfonamide	30334-69-1
* Hydro-EVE Acid	2,2,3,3-Tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-(1,2,2-tetrafluoroethoxy)propan-2-yl)oxy}propanoic acid	773804-62-9
* R-EVE Acid	4-(2-carboxy-1,1,2,2-tetrafluoroethoxy)-2,2,3,3,4,5,5,5-octafluoro-pentanoic acid	2416366-22-6
NVHOS	Perfluoroethoxysulfonic acid	1132933-86-8
Extraction Standards		
MPFBA	Perfluoro-n-[13C4]butanoic acid	
M5PFPeA	Perfluoro-n-[13C5]pentanoic acid	
M3PFBS	Sodium perfluoro-1-[2,3,4-13C3]-butanesulfonic acid	
M2-4:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid	
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid	
M3HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-13C3-propanoic acid	
M4PFHpA	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid	
M3PFHxS	Sodium perfluoro-1-[1,2,3-13C3]-hexanesulfonic acid	
M2-6:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid	
M8PFOA	Perfluoro-n-[13C8]octanoic acid	
M9PFNA	Perfluoro-n-[13C9]nonanoic acid	
M8PFOS	Sodium perfluoro-1-[13C8]-octanesulfonic acid	
M2-8:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid	
M8FOSA	Perfluoro-1-[13C8]octanesulfonamide	
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid	
d3-N-MeFOSAA	N-methyl-d3-perfluoro-1-octanesulfonamide	
d5-N-EtFOSAA	N-ethyl-d5-perfluoro-1-octanesulfonamide	
M7PFUnDA (M7PFUdA)	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid	
MPFDoA	Perfluoro-n-[1,2-13C2]dodecanoic acid	
M2PFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid	
Injection Standards		
M3PFBA	Perfluoro-n-[2,3,4-13C3]butanoic acid	
M2PFOA	Perfluoro-n-[1,2-13C2]octanoic acid	
MPFDA	Perfluoro-n-[1,2-13C2]decanoic acid	
MPFOS	Sodium perfluoro-1-[1,2,3,4-13C4]-octanesulfonic acid	

* Analytes are currently not accredited under TNI Scope - Accreditation pending.

Sample Custody



ENTHALPY
analytical

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.

Enthalpy Ultratrace Job#: _____ COC Page 1 of 1

Client Name: **BRUNSWICK COUNTY UTILITIES**

Project Number: _____

PO#: _____

Project Manager: GLENN WALKER

Site Name: NORTHWEST WATER PLANT.

Telephone#: _____

Report To: **SAME**

Location: **LELAND N.C.**

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

[illegible]

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

Courier, Cooler, on ice, no seals, good condition 9-2-21 ah

**This Is The Last Page
Of This Report.**