

County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Water Plant

Leland, NC
Samples Received: 09/08/22

Analytical Report 0922-725

Isotope Dilution Method Brunswick PFAS List



Enthalpy Analytical, LLC – Ultratrace

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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.: 0922-725-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant Leland, N.C.

Summary

	Compound	CAS	090822S01 ng/L	090822E01 ng/L
Acids	PFBA	375-22-4	6.29	7.04
	PFPeA	2706-90-3	13.5	14.3
	PFHxA	307-24-4	9.55	8.93
	PFHpA	375-85-9	4.28	4.63
	PFOA	335-67-1	5.90	5.53
	PFNA	375-95-1	0.828	0.902
	PFDA	335-76-2	0.646	0.808
	PFUnDA	2058-94-8	0.146 L	0.211 J
	PFDoDA	307-55-1	0.0162 L	0.0629 L
	PFTrDA	72629-94-8	ND U	ND U
	PFTeDA	376-06-7	0.0303 LB	ND U
Sulfonates	PFBS	375-73-5	6.79	6.82
	PFPeS	2706-91-4	1.02	0.968
	PFHxS	355-46-4	5.22	5.47
	PFHpS	375-92-8	0.195 J	0.271 J
	PFOS	1763-23-1	11.3	12.1
	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	0.920	0.501 J
	8:2 FTS	39108-34-4	ND U	ND U
	Other	PFOSA	754-91-6	ND U
N-MeFOSAA		2355-31-9	ND U	ND U
N-EtFOSAA		2991-50-6	ND U	ND U
HFPO-DA		13252-13-6	5.62	5.05
PFMOAA		674-13-5	51.1	47.0
PFMOPrA		377-73-1	0.0528 L	0.0629 L
PFO2HxA		39492-88-1	6.90	6.93
PFO3OA		39492-89-2	1.35	1.95
PFO4DA		39492-90-5	0.227 L	0.409 L
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	ND U	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	0.877	0.895
Hydro-EVE Acid		773804-62-9	0.255 L	0.217 L
Hydrolyzed PSDA		2416366-19-1	2.76	1.99
Nafion Byproduct 2		749836-20-2	0.338 J	0.383 J
N-EtFOSA		4151-50-2	ND U	0.0507 L
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	3.72	3.95
PEPA		267239-61-2	2.98	2.69
PFECA-G		801212-59-9	ND U	ND U
PFEESA		113507-82-7	0.0161 L	0.0175 L
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	8.56	7.90
R-EVE		2416366-22-6	9.67	8.78
R-PSDA	2416366-18-0	18.2	13.4	
R-PSDCA	241636-21-5	0.0553 L	0.0517 L	

Detailed Results



Enthalpy Analytical

Job No.: 0922-725-1 PFAS by Isotope Dilution (non-potable water)
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant Leland, N.C.

Enthalpy ID	0922-725-001-1	Prep Batch	EU13968	Sample Vol (mL)	287.65
Sample Name	090822S01	Prep Date	2022-09-09 10:07	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	9/24/2022 1:43:26 PM	Split Factor	N/A
Sampling Date	20220908 00:00	Analyst	aybaker/itbrooker	Method Code	WM-026
Received Date	2022-09-08 01:48	Instrument	Pippin	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	4526.67	6.29	6.29	0.133	0.556			
	PFPeA	2706-90-3	9693.77	13.5	13.5	0.148	0.556			
	PFHxA	307-24-4	6866.46	9.55	9.55	0.168	0.556			
	PFHpA	375-85-9	3079.98	4.28	4.28	0.106	0.556			
	PFOA	335-67-1	4243.99	5.90	5.90	0.154	0.556			
	PFNA	375-95-1	595.35	0.828	0.828	0.0661	0.556			
	PFDA	335-76-2	464.52	0.646	0.646	0.0734	0.556			
	PFUnDA	2058-94-8	105.01	0.146	0.146	0.161	0.556			L
	PFDoDA	307-55-1	11.67	0.0162	0.0162	0.176	0.556			L
	PFTrDA	72629-94-8	ND	ND	ND	0.131	0.556			U
PFTeDA	376-06-7	21.82	0.0303	0.0303	0.189	0.556			LB	
Sulfonates	PFBS	375-73-5	4879.35	6.79	6.79	0.309	0.650			
	PFPeS	2706-91-4	730.92	1.02	1.02	0.179	0.524			
	PFHxS	355-46-4	3751.54	5.22	5.22	0.166	0.509			
	PFHpS	375-92-8	140.58	0.195	0.195	0.117	0.530			J
	PFOS	1783-23-1	8136.05	11.3	11.3	0.139	0.515			
	PFNS	68259-12-1	ND	ND	ND	0.0751	0.536			U
	PFDS	335-77-3	ND	ND	ND	0.167	0.536			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.103	0.521			U
	6:2 FTS	27619-97-2	661.26	0.920	0.920	0.101	0.530			
	8:2 FTS	39108-34-4	ND	ND	ND	0.149	0.533			U
Other	PFOSA	754-91-6	ND	ND	ND	0.113	0.556			U
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.125	0.556			U
	N-EiFOSAA	2991-50-6	ND	ND	ND	0.0947	0.556			U
	HFPO-DA	13252-13-6	4044.58	5.62	5.62	0.198	0.556			
	PFMOAA	674-13-5	36783.23	51.1	51.1	1.25	1.25			
	PFMOPrA	377-73-1	37.99	0.0528	0.0528	0.209	0.556			L
	PFO2HxA	39492-88-1	4964.71	6.90	6.90	1.25	1.25			
	PFO3OA	39492-89-2	967.96	1.35	1.35	1.25	1.25			
	PFO4DA	39492-90-5	163.39	0.227	0.227	1.32	1.32			L
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.264	0.556			U
	ADONA	919005-14-4	ND	ND	ND	0.104	0.527			U
	9CI-PF3ONS	756426-58-1	ND	ND	ND	0.104	0.518			U
	11CI-PF3OUds	763051-92-9	ND	ND	ND	0.104	0.524			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.209	0.556			U
	EVE Acid	69087-46-3	ND	ND	ND	1.25	1.25			U
	FBSA	30334-69-1	630.69	0.877	0.877	0.209	0.556			
	Hydro-EVE Acid	773804-62-9	183.02	0.255	0.255	1.25	1.25			L
	Hydrolyzed PSDA	2416366-19-1	1987.85	2.76	2.76	1.25	1.25			
	Nafion Byproduct 2	749836-20-2	242.85	0.338	0.338	0.264	0.556			J
	N-EiFOSA	4151-50-2	ND	ND	ND	0.209	0.556			U
	N-EiFOSE	1691-99-2	ND	ND	ND	6.26	6.26			U
	NFDHA	151772-58-6	ND	ND	ND	0.209	0.556			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.209	0.556			U
	N-MeFOSE	24448-09-7	ND	ND	ND	6.26	6.26			U
	NVHOS	1132933-86-8	2676.57	3.72	3.72	1.25	1.25			
	PEPA	267239-61-2	2143.52	2.98	2.98	1.25	1.25			
	PFECA-G	801212-59-9	ND	ND	ND	0.264	1.25			U
	PFEEESA	113507-82-7	11.60	0.0161	0.0161	0.209	0.556			L
	PFHxDA	67905-19-5	ND	ND	ND	1.25	1.25			U
	PFMOBA	863090-89-5	ND	ND	ND	1.25	1.25			U
PFOSDA	39492-91-6	ND	ND	ND	1.32	1.32			U	
PMPA	13140-29-9	6158.40	8.56	8.56	1.25	1.25				
R-EVE	2416366-22-6	6952.92	9.67	9.67	1.25	1.25				
R-PSDA	2416366-18-0	13092.62	18.2	18.2	1.25	1.25				
R-PSDCA	241636-21-5	39.77	0.0553	0.0553	1.25	1.25			L	
ES	MPFBA		4643.93	6.46				20-150%	92.9%	
	M5PFPeA		7003.26	9.74				20-150%	140.1%	
	M3PFBS		9722.20	13.5				20-150%	194.4%	Q
	M2-4:2 FTS		9461.00	13.2				20-150%	189.2%	Q
	M5PFHxA		3773.17	5.25				20-150%	75.5%	
	M3HFPO-DA		4064.25	5.65				20-150%	81.3%	
	M4PFHpA		4479.98	6.23				20-150%	89.6%	
	M3PFHxS		5868.23	8.16				20-150%	117.4%	
	M2-6:2 FTS		5791.73	8.05				20-150%	115.8%	
	M8PFOA		4707.90	6.55				20-150%	94.2%	
	M9PFNA		4514.06	6.28				20-150%	90.3%	
	M8PFOS		4956.88	6.89				20-150%	99.1%	
	M2-8:2 FTS		5243.85	7.29				20-150%	104.9%	
	M8FOSA-I		2646.23	3.68				20-150%	52.9%	
	M6PFDA		4489.01	6.24				20-150%	89.8%	
	d3-N-MeFOSAA		2917.77	4.06				20-150%	58.4%	
	d5-N-EiFOSAA		2913.91	4.05				20-150%	58.3%	
	M7PFUDa		3861.64	5.37				20-150%	77.2%	
	MPFDa		5457.33	7.59				20-150%	109.1%	
	M2PFTeDA		2613.85	3.63				20-150%	52.3%	
	d3-N-MeFOSA		2569.19	3.57				10-200%	25.7%	
	d5-N-EiFOSA		2089.14	2.91				10-200%	20.9%	
	d7-N-MeFOSE		1656.77	2.30				10-200%	16.6%	
	d9-N-EiFOSE		1295.93	1.80				10-200%	13.0%	
	M2PFHxDA		1163.15	1.62				10-200%	23.3%	

Enthalpy Analytical

Job No.: 0922-725-1 PFAS by Isotope Dilution (non-potable water)
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant Leland, N.C.

Enthalpy ID	0922-725-002-1	Prep Batch	EU13968	Sample Vol (mL)	289.85
Sample Name	090822E01	Prep Date	2022-09-09 10:07	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	9/24/2022 2:06:14 PM	Split Factor	N/A
Sampling Date	20220908 00:00	Analyst	aybaker/itbrooker	Method Code	WM-026
Received Date	2022-09-08 01:48	Instrument	Pippin	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	5104.10	7.04	7.04	0.132	0.552			
	PFPeA	2706-90-3	10360.26	14.3	14.3	0.147	0.552			
	PFHxA	307-24-4	6473.73	8.93	8.93	0.166	0.552			
	PFHpA	375-85-9	3353.79	4.63	4.63	0.105	0.552			
	PFOA	335-67-1	4005.62	5.53	5.53	0.153	0.552			
	PFNA	375-95-1	653.78	0.902	0.902	0.0656	0.552			
	PFDA	335-76-2	585.49	0.808	0.808	0.0729	0.552			
	PFUnDA	2058-94-8	153.23	0.211	0.211	0.160	0.552			J
	PFDoDA	307-55-1	45.58	0.0629	0.0629	0.174	0.552			L
	PFTrDA	72629-94-8	ND	ND	ND	0.130	0.552			U
PFTEdA	376-06-7	ND	ND	ND	0.188	0.552			U	
Sulfonates	PFBS	375-73-5	4943.96	6.82	6.82	0.306	0.645			
	PFPeS	2706-91-4	701.60	0.968	0.968	0.178	0.520			
	PFHxS	355-46-4	3963.68	5.47	5.47	0.165	0.506			
	PFHpS	375-92-8	196.04	0.271	0.271	0.116	0.526			J
	PFOS	1783-23-1	8775.87	12.1	12.1	0.138	0.511			
	PFNS	68259-12-1	ND	ND	ND	0.0745	0.532			U
	PFDS	335-77-3	ND	ND	ND	0.166	0.532			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.102	0.517			U
	6:2 FTS	27619-97-2	363.37	0.501	0.501	0.100	0.526			J
	8:2 FTS	39108-34-4	ND	ND	ND	0.147	0.529			U
Other	PFOSA	754-91-6	94.69	0.131	0.131	0.112	0.552			J
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.124	0.552			U
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.0940	0.552			U
	HFPO-DA	13252-13-6	3658.43	5.05	5.05	0.197	0.552			
	PFMOAA	674-13-5	34035.33	47.0	47.0	1.24	1.24			
	PFMOPrA	377-73-1	45.55	0.0629	0.0629	0.207	0.552			L
	PFO2HxA	39492-88-1	5022.91	6.93	6.93	1.24	1.24			
	PFO3OA	39492-89-2	1409.69	1.95	1.95	1.24	1.24			
	PFO4DA	39492-90-5	296.70	0.409	0.409	1.31	1.31			L
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.262	0.552			U
	ADONA	919005-14-4	ND	ND	ND	0.104	0.523			U
	9CI-PF3ONS	756426-58-1	ND	ND	ND	0.104	0.514			U
	11CI-PF3OUds	763051-92-9	ND	ND	ND	0.104	0.520			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.207	0.552			U
	EVE Acid	69087-46-3	ND	ND	ND	1.24	1.24			U
	FBSA	30334-69-1	648.86	0.895	0.895	0.207	0.552			
	Hydro-EVE Acid	773804-62-9	157.52	0.217	0.217	1.24	1.24			L
	Hydrolyzed PSDA	2416366-19-1	1441.78	1.99	1.99	1.24	1.24			
	Nafion Byproduct 2	749836-20-2	277.53	0.383	0.383	0.262	0.552			J
	N-EtFOA	4151-50-2	36.71	0.0507	0.0507	0.207	0.552			L
	N-EtFOSE	1691-99-2	ND	ND	ND	6.21	6.21			U
	NFDHA	151772-58-6	ND	ND	ND	0.207	0.552			U
	N-MeFOA	31506-32-8	ND	ND	ND	0.207	0.552			U
	N-MeFOSE	24448-09-7	ND	ND	ND	6.21	6.21			U
	NVHOS	1132933-86-8	2862.47	3.95	3.95	1.24	1.24			
	PEPA	267239-61-2	1951.98	2.69	2.69	1.24	1.24			
	PFECA-G	801212-59-9	ND	ND	ND	0.262	1.24			U
	PFEEA	113507-82-7	12.66	0.0175	0.0175	0.207	0.552			L
	PFHxDA	67905-19-5	ND	ND	ND	1.24	1.24			U
	PFMOBA	863090-89-5	ND	ND	ND	1.24	1.24			U
PFOSDA	39492-91-6	ND	ND	ND	1.31	1.31			U	
PMPA	13140-29-9	5727.99	7.90	7.90	1.24	1.24				
R-EVE	2416366-22-6	6361.48	8.78	8.78	1.24	1.24				
R-PSDA	2416366-18-0	9675.69	13.4	13.4	1.24	1.24				
R-PSDCA	241636-21-5	37.45	0.0517	0.0517	1.24	1.24			L	
ES	MPFBA		4574.70	6.31				20-150%	91.5%	
	M5PFPeA		7171.24	9.90				20-150%	143.4%	
	M3PFBS		8798.32	12.1				20-150%	176.0%	Q
	M2-4:2 FTS		6486.93	8.95				20-150%	129.7%	
	M5PFHxA		4372.15	6.03				20-150%	87.4%	
	M3HFPO-DA		4700.79	6.49				20-150%	94.0%	
	M4PFHpA		4546.99	6.27				20-150%	90.9%	
	M3PFHxS		5134.33	7.09				20-150%	102.7%	
	M2-6:2 FTS		4161.25	5.74				20-150%	83.2%	
	M8PFOA		4713.10	6.50				20-150%	94.3%	
	M9PFNA		4569.33	6.31				20-150%	91.4%	
	M8PFOS		4616.26	6.37				20-150%	92.3%	
	M2-8:2 FTS		4774.30	6.59				20-150%	95.5%	
	M8FOSA-I		2654.97	3.66				20-150%	53.1%	
	M6PFDA		4118.58	5.68				20-150%	82.4%	
	d3-N-MeFOSAA		2639.54	3.64				20-150%	52.8%	
	d5-N-EtFOSAA		2868.90	3.96				20-150%	57.4%	
	M7PFUDa		3801.74	5.25				20-150%	76.0%	
	MPFDaA		5052.91	6.97				20-150%	101.1%	
	M2PFTeDA		2109.75	2.91				20-150%	42.2%	
d3-N-MeFOSA		2783.54	3.84				10-200%	27.8%		
d5-N-EtFOA		2057.49	2.84				10-200%	20.6%		
d7-N-MeFOSE		1532.08	2.11				10-200%	15.3%		
d9-N-EtFOSE		1185.32	1.64				10-200%	11.9%		
M2PFHxDA		482.98	0.667				10-200%	9.7%	Q	

QC Data



Enthalpy Analytical

Job No.: 0922-725-1 PFAS by Isotope Dilution (non-potable water)
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant Leland, N.C.

Enthalpy ID	MB-13968-PFAS	Prep Batch	EU13968	Sample Vol (mL)	250
Sample Name	MB-13968-PFAS	Prep Date	2022-09-09 10:07	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	9/24/2022 12:57:50 PM	Split Factor	N/A
Sampling Date		Analyst	aybaker/itbrooker	Method Code	WM-026
Received Date		Instrument	Pippin	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	119.05	0.190	0.190	0.153	0.640			J
	PFPeA	2706-90-3	ND	ND	ND	0.170	0.640			U
	PFHxA	307-24-4	ND	ND	ND	0.193	0.640			U
	PFHpA	375-85-9	ND	ND	ND	0.122	0.640			U
	PFOA	335-67-1	ND	ND	ND	0.177	0.640			U
	PFNA	375-95-1	ND	ND	ND	0.0761	0.640			U
	PFDA	335-76-2	ND	ND	ND	0.0845	0.640			U
	PFUnDA	2058-94-8	ND	ND	ND	0.185	0.640			U
	PFDoDA	307-55-1	ND	ND	ND	0.202	0.640			U
	PFTrDA	72629-94-8	20.25	0.0324	0.0324	0.151	0.640			L
PFTeDA	376-06-7	33.02	0.0528	0.0528	0.218	0.640			L	
Sulfonates	PFBS	375-73-5	ND	ND	ND	0.355	0.747			U
	PFPeS	2706-91-4	ND	ND	ND	0.206	0.603			U
	PFHxS	355-46-4	ND	ND	ND	0.191	0.586			U
	PFHpS	375-92-8	ND	ND	ND	0.135	0.610			U
	PFOS	1783-23-1	ND	ND	ND	0.160	0.593			U
	PFNS	68259-12-1	ND	ND	ND	0.0864	0.616			U
	PFDS	335-77-3	ND	ND	ND	0.192	0.616			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.118	0.600			U
	6:2 FTS	27619-97-2	29.90	0.0478	0.0478	0.116	0.610			L
	8:2 FTS	39108-34-4	ND	ND	ND	0.171	0.613			U
Other	PFOSA	754-91-6	ND	ND	ND	0.130	0.640			U
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.144	0.640			U
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.109	0.640			U
	HFPO-DA	13252-13-6	ND	ND	ND	0.228	0.640			U
	PFMOAA	674-13-5	ND	ND	ND	1.44	1.44			U
	PFMOPrA	377-73-1	ND	ND	ND	0.240	0.640			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	0.640			U
	ADONA	919005-14-4	ND	ND	ND	0.120	0.606			U
	9CI-PF3ONS	756426-58-1	ND	ND	ND	0.120	0.596			U
	11CI-PF3OUds	763051-92-9	ND	ND	ND	0.120	0.603			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.240	0.640			U
	EVE Acid	69087-46-3	ND	ND	ND	1.44	1.44			U
	FBSA	30334-69-1	ND	ND	ND	0.240	0.640			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	0.640			U
	N-EtFOA	4151-50-2	ND	ND	ND	0.240	0.640			U
	N-EtFOSE	1691-99-2	ND	ND	ND	7.20	7.20			U
	NFDHA	151772-58-6	ND	ND	ND	0.240	0.640			U
	N-MeFOA	31506-32-8	ND	ND	ND	0.240	0.640			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
	PFEEA	113507-82-7	ND	ND	ND	0.240	0.640			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
PFOSDA	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	241636-21-5	ND	ND	ND	1.44	1.44			U	
ES	MPFBA		4672.89	7.48				20-150%	93.5%	
	M5PFPeA		4865.15	7.78				20-150%	97.3%	
	M3PFBS		4863.33	7.78				20-150%	97.3%	
	M2-4:2 FTS		3864.95	6.18				20-150%	77.3%	
	M5PFHxA		4222.92	6.76				20-150%	84.5%	
	M3HFPO-DA		5330.71	8.53				20-150%	106.6%	
	M4PFHpA		4523.59	7.24				20-150%	90.5%	
	M3PFHxS		6357.21	10.2				20-150%	127.1%	
	M2-6:2 FTS		3947.17	6.32				20-150%	78.9%	
	M8PFOA		5161.87	8.26				20-150%	103.2%	
	M9PFNA		4482.26	7.17				20-150%	89.6%	
	M8PFOS		4855.72	7.77				20-150%	97.1%	
	M2-8:2 FTS		5780.59	9.25				20-150%	115.6%	
	M8FOSA-I		3019.18	4.83				20-150%	60.4%	
	M6PFDA		4660.65	7.46				20-150%	93.2%	
	d3-N-MeFOSAA		3208.75	5.13				20-150%	64.2%	
	d5-N-EtFOSAA		2883.06	4.61				20-150%	57.7%	
	M7PFUDa		4279.82	6.85				20-150%	85.6%	
	MPFDaA		6279.71	10.0				20-150%	125.6%	
	M2PFTeDA		2583.34	4.13				20-150%	51.7%	
d3-N-MeFOSA		3702.11	5.92				10-200%	37.0%		
d5-N-EtFOSA		3051.40	4.88				10-200%	30.5%		
d7-N-MeFOSE		1871.51	2.99				10-200%	18.7%		
d9-N-EtFOSE		1354.41	2.17				10-200%	13.5%		
M2PFHxDA		245.29	0.392				10-200%	4.9%	Q	

Enthalpy Analytical

Job No.: 0922-725-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant Leland, N.C.

Enthalpy ID	OPR-13968-PFAS	Prep Batch	EU13968	Sample Vol (mL)	250
Sample Name	OPR-13968-PFAS	Prep Date	2022-09-09 10:07	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	9/24/2022 1:20:38 PM	Split Factor	N/A
Sampling Date		Analyst	aybaker/itbrooker	Method Code	WM-026
Received Date		Instrument	Pippin	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	13790.38	22.1	22.1	0.153	0.640	73-129%	110.3%	
	PFPeA	2706-90-3	13542.55	21.7	21.7	0.170	0.640	72-129%	108.3%	
	PFHxA	307-24-4	13904.56	22.2	22.2	0.193	0.640	72-129%	111.2%	
	PFHpA	375-85-9	13938.95	22.3	22.3	0.122	0.640	72-130%	111.5%	
	PFOA	335-67-1	13173.38	21.1	21.1	0.177	0.640	71-133%	105.4%	
	PFNA	375-95-1	13301.92	21.3	21.3	0.0761	0.640	69-130%	106.4%	
	PFDA	335-76-2	16110.59	25.8	25.8	0.0845	0.640	71-129%	128.9%	
	PFUnDA	2058-94-8	13629.80	21.8	21.8	0.185	0.640	69-133%	109.0%	
	PFDODA	307-55-1	12282.12	19.7	19.7	0.202	0.640	72-134%	98.3%	
Sulfonates	PFTTrDA	72629-94-8	21331.91	34.1	34.1	0.151	0.640	65-144%	170.7%	Q
	PFTeDA	376-06-7	14761.17	23.6	23.6	0.218	0.640	71-132%	118.1%	
	PFBS	375-73-5	12111.57	19.4	19.4	0.355	0.747	72-134%	109.2%	
	PFPeS	2706-91-4	12909.41	20.7	20.7	0.206	0.603	71-127%	109.8%	
	PFHxS	355-46-4	11480.82	18.4	18.4	0.191	0.586	68-131%	100.5%	
	PFHpS	375-92-8	13813.14	22.1	22.1	0.135	0.610	69-134%	116.0%	
	PFOS	1763-23-1	11860.01	19.0	19.0	0.160	0.593	65-140%	102.2%	
	PFNS	68259-12-1	11675.33	18.7	18.7	0.0864	0.616	69-127%	97.1%	
	PFDS	335-77-3	9827.76	15.7	15.7	0.192	0.616	53-142%	81.5%	
Other	4:2 FTS	757124-72-4	11961.54	19.1	19.1	0.118	0.600	63-143%	102.1%	
	6:2 FTS	27619-97-2	12436.61	19.9	19.9	0.116	0.610	64-140%	104.6%	
	8:2 FTS	39108-34-4	18614.64	29.8	29.8	0.171	0.613	67-138%	155.1%	Q
	PFOSA	754-91-6	15463.02	24.7	24.7	0.130	0.640	67-137%	123.7%	
	N-MeFOSAA	2355-31-9	12665.51	20.3	20.3	0.144	0.640	65-136%	101.3%	
	N-EtFOSAA	2991-50-6	13684.23	21.9	21.9	0.109	0.640	61-135%	109.5%	
	HFPO-DA	13252-13-6	13285.30	21.3	21.3	0.228	0.640	70-130%	106.3%	
	MPFBA		4307.34	6.89				20-150%	86.1%	
	M5PFPeA		4601.36	7.36				20-150%	92.0%	
	M3PFBS		4321.13	6.91				20-150%	86.4%	
	M2-4:2 FTS		2964.29	4.74				20-150%	59.3%	
	M5PFHxA		3896.42	6.23				20-150%	77.9%	
	M3HFPO-DA		5009.14	8.01				20-150%	100.2%	
	M4PFHpA		4410.49	7.06				20-150%	88.2%	
	M3PFHxS		4963.96	7.94				20-150%	99.3%	
ES	M2-6:2 FTS		3668.84	5.87				20-150%	73.4%	
	M8PFOA		4551.49	7.28				20-150%	91.0%	
	M9PFNA		4255.48	6.81				20-150%	85.1%	
	M8PFOS		4533.50	7.25				20-150%	90.7%	
	M2-8:2 FTS		4494.78	7.19				20-150%	89.9%	
	M8FOSA-I		2550.77	4.08				20-150%	51.0%	
	M6PFDA		3881.02	6.21				20-150%	77.6%	
	d3-N-MeFOSAA		2591.12	4.15				20-150%	51.8%	
	d5-N-EtFOSAA		2618.39	4.19				20-150%	52.4%	
	M7PFUDa		3771.77	6.03				20-150%	75.4%	
MPFDoA		5760.73	9.22				20-150%	115.2%		
M2PFTeDA		2787.71	4.46				20-150%	55.8%		

Narrative Summary



Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0922-725-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant - Leland, N.C.

1. Custody

Josie Morton received the samples on September 08, 2022 at 10.0 °C after being relinquished by Brunswick County Public Utilities - 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
0922-725-001-1	090822S01	AQ
0922-725-002-1	090822E01	AQ

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 "Pippin").

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.

The samples were analyzed on more than one instrument sequence in order to include all of the analytes of interest and to meet method acceptance criteria.

4. Calibration

In the initial calibration, the reported analytes exhibited R^2 of ≥ 0.99 .

Except where noted below, the reported analytes in the calibration standards, continuing calibration (concal) and Initial Calibration Verification (ICV) met the 30% accuracy criterion for native analytes.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0922-725-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant - Leland, N.C.

4. Calibration, continued

PFTrDA, PFO4DA, PFO5DA, 10:2 FTS, and PFHxDA fell outside method control limits in one or more concals. These analytes were not detected above LOD; therefore, are reportable without adverse impact.

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

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

QC samples that did not meet method acceptance criteria were:

OPR-13968-PFAS PFTrDA fell above method recovery criteria. This analyte is not detected in the samples above LOD and the data is reported 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

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 of these 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 QA/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. When detected at a signal-to-noise above 10:1 the ES peak area is used to quantify its respective target analyte using accepted isotope dilution principles. The data is reported without adverse impact.

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.



General Reporting Notes – Data Qualifiers

- 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
PFTriA (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-dioxaheptanoic) 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-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
* PFOA	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





Chain of Custody Record

0922-725 Enthalpy Ultratrace Job#: _____ COC Page 1 of 1

Special Handling:

- 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: <u>BRUNSWICK COUNTY UTILITIES</u>	Project Number: _____	PO#: _____	This Chain of Custody is applicable to Non-Air samples. Standard TAT differ per analysis and are provided by request.
Project Manager: <u>GLENN WALKER</u>	Site Name: <u>NORTHWEST WATER PLANT</u>	Telephone#: _____	
Report To: <u>SAME</u>	Location: <u>LELAND N.C.</u>	Email: _____	

Client Special Instructions:						Sample Containers				Analyses:							Notes:	
Sample ID	Date	Time	Sample Volume	Type	Matrix	# of Bottles	# of Jars	# of Bags	# Other	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
090822S01	9/8/2022	1145	250 ml	G	NW	2												X
090822E01	9/8/2022	1145	250 ml	G	DW	2												X
<p>Courier, cooler, on ice, no seals, good condition pm 9-8-22</p>																		

Relinquished By:	Date:	Received By:	Date:	Time:	Sample Temperature Upon Receipt:
Phil McCulloch	9/8/2022	<i>Jessie Matan</i>	9-8-22	1:48	<input checked="" type="checkbox"/> Iced <input type="checkbox"/> Ambient °C <u>10.0 T10</u> <input type="checkbox"/> Iced <input type="checkbox"/> Ambient °C _____ <input type="checkbox"/> Iced <input type="checkbox"/> Ambient °C _____

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

