

# County of Brunswick

3954 Clearwell Dr NE  
Leland, NC 28451

## Northwest Water Plant

Leland, NC  
Samples Received: 07/22/22

### Analytical Report 0722-785

#### *Isotope Dilution Method* Brunswick PFAS List



#### **Enthalpy Analytical, LLC – Ultratrace**

Mark Hager

O: 910-876-6894/ F: 910-212-6886

[mark.hager@enthalpy.com](mailto:mark.hager@enthalpy.com) / [www.enthalpy.com](http://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.

....."Report Issued Date: 08/12/2022



# Summary of Results



## Enthalpy Analytical

Job No.: 0722-785-1 PFAS by Isotope Dilution (non-potable water)

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

### Summary

	Compound	CAS	072222-SO1 ng/L	072222-EO1 ng/L
Acids	PFBA	375-22-4	6.89	5.76
	PFPeA	2706-90-3	13.9	12.2
	PFHxA	307-24-4	10.0	9.04
	PFHpA	375-85-9	4.44	4.25
	PFOA	335-67-1	5.86	6.51
	PFNA	375-95-1	0.949	0.807
	PFDA	335-76-2	0.627	0.564
	PFUnDA	2058-94-8	0.177 J	0.190 J
	PFDoDA	307-55-1	<LOD (0.172) U	<LOD (0.173) U
	PFTriDA	72629-94-8	<LOD (0.129) U	<LOD (0.129) U
PFTeDA	376-06-7	<LOD (0.186) U	<LOD (0.187) U	
Sulfonates	PFBS	375-73-5	6.16	5.76
	PFPeS	2706-91-4	1.32	1.14
	PFHxS	355-46-4	6.41	5.70
	PFHpS	375-92-8	0.315 J	0.322 J
	PFOS	1763-23-1	14.5	12.2
	PFNS	68259-12-1	<LOD (0.0736) U	<LOD (0.0740) U
	PFDS	335-77-3	<LOD (0.164) U	<LOD (0.164) U
	4:2 FTS	757124-72-4	<LOD (0.101) U	<LOD (0.101) U
	6:2 FTS	27619-97-2	1.55	3.90
	8:2 FTS	39108-34-4	<LOD (0.146) U	<LOD (0.146) U
Other	PFOSA	754-91-6	<LOD (0.111) U	<LOD (0.111) U
	N-MeFOSAA	2355-31-9	<LOD (0.123) U	<LOD (0.123) U
	N-EtFOSAA	2991-50-6	<LOD (0.0929) U	<LOD (0.0933) U
	HFPO-DA	13252-13-6	5.48	5.43
	PFMOAA	674-13-5	40.0	31.2
	PFMOPrA	377-73-1	<LOD (0.204) U	<LOD (0.205) U
	PFO2HxA	39492-88-1	6.98	7.27
	PFO3OA	39492-89-2	1.57	<LOD (1.23) U
	PFO4DA	39492-90-5	<LOD (1.29) U	<LOD (1.30) U
	Nafion Byproduct 1	29311-67-9	<LOD (0.259) U	<LOD (0.260) U
	ADONA	919005-14-4	<LOD (0.102) U	<LOD (0.103) U
	9Cl-PF3ONS	756426-58-1	<LOD (0.102) U	<LOD (0.103) U
	11Cl-PF3OUdS	763051-92-9	<LOD (0.102) U	<LOD (0.103) U
	10:2 FTS	120226-60-0	<LOD (0.204) U	<LOD (0.205) U
	EVE Acid	69087-46-3	<LOD (1.23) U	<LOD (1.23) U
	FBSA	30334-69-1	1.29	0.940
	Hydro-EVE Acid	773804-62-9	<LOD (1.23) U	<LOD (1.23) U
	Hydrolyzed PSDA	2416366-19-1	7.74	13.4
	Nafion Byproduct 2	749836-20-2	0.324 J	0.309 J
	N-EtFOSA	4151-50-2	<LOD (0.204) U	<LOD (0.205) U
	N-EtFOSE	1691-99-2	<LOD (6.13) U	<LOD (6.16) U
	NFDHA	151772-58-6	<LOD (0.204) U	<LOD (0.205) U
	N-MeFOSA	31506-32-8	<LOD (0.204) U	<LOD (0.205) U
	N-MeFOSE	24448-09-7	<LOD (6.13) U	<LOD (6.16) U
	NVHOS	1132933-86-8	1.89	2.15
	PEPA	267239-61-2	3.52	3.01
	PFECA-G	801212-59-9	<LOD (0.259) U	<LOD (0.260) U
	PFEEESA	113507-82-7	<LOD (0.204) U	<LOD (0.205) U
	PFHxDA	67905-19-5	<LOD (1.23) U	<LOD (1.23) U
	PFMOBA	863090-89-5	<LOD (1.23) U	<LOD (1.23) U
PFO5DA	39492-91-6	<LOD (1.29) U	<LOD (1.30) U	
PMPA	13140-29-9	8.47	9.70	
R-EVE	2416366-22-6	11.2	13.8	
R-PSDA	2416366-18-0	<LOD (1.23) U	<LOD (1.23) U	
R-PSDCA	241636-21-5	<LOD (1.23) U	<LOD (1.23) U	

# Detailed Results



### Enthalpy Analytical

Job No.: 0722-785-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant

Enthalpy ID	0722-785-001-1	Prep Batch	EU13746	Sample Vol (mL)	293.46
Sample Name	072222-SO1	Prep Date	2022-07-25 13:43	Extract Vol (mL)	0.4
Matrix	AQUEOUS	Analysis Date	2022-07-26 20:01	Split Factor	N/A
Sampling Date	20220722 00:00	Analyst	wicve	Method Code	WM-026
Received Date	2022-07-22 13:00	Instrument	Sauron	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	5052.80	6.89	6.89	0.130	0.545			
	PFFPeA	2706-90-3	10187.65	13.9	13.9	0.145	0.545			
	PFFHxA	307-24-4	7354.65	10.0	10.0	0.164	0.545			
	PFFHpA	375-85-9	3261.00	4.44	4.44	0.104	0.545			
	PFOA	335-67-1	4296.57	5.86	5.86	0.151	0.545			
	PFNA	375-95-1	695.90	0.949	0.949	0.0648	0.545			
	PFDA	335-76-2	460.35	0.627	0.627	0.0720	0.545			
	PFUnDA	2058-94-8	130.11	0.177	0.177	0.158	0.545			J
	PFDoDA	307-55-1	34.72	0.0473	<LOD	0.172	0.545			U
	PFTrDA	72629-94-8	ND	ND	<LOD	0.129	0.545			U
PFTeDA	376-06-7	ND	ND	<LOD	0.186	0.545			U	
Sulfonates	PFBS	375-73-5	4521.79	6.16	6.16	0.302	0.637			
	PFFPeS	2706-91-4	971.92	1.32	1.32	0.175	0.514			
	PFFHxS	355-46-4	4701.91	6.41	6.41	0.163	0.499			
	PFFHpS	375-92-8	231.29	0.315	0.315	0.115	0.519			J
	PFOS	1763-23-1	10609.89	14.5	14.5	0.136	0.505			
	PFNS	68259-12-1	ND	ND	<LOD	0.0736	0.525			U
	PFDS	335-77-3	ND	ND	<LOD	0.164	0.525			U
	4:2 FTS	757124-72-4	ND	ND	<LOD	0.101	0.511			U
	6:2 FTS	27619-67-2	1136.79	1.55	1.55	0.0988	0.519			U
	8:2 FTS	39108-34-4	74.26	0.101	<LOD	0.146	0.522			U
Other	PFOSA	754-91-6	38.87	0.0530	<LOD	0.111	0.545			U
	N-MeFOSAA	2355-31-9	21.85	0.0298	<LOD	0.123	0.545			U
	N-EiFOSAA	2991-50-6	ND	ND	<LOD	0.0929	0.545			U
	HFPO-DA	13252-13-6	4017.56	5.48	5.48	0.194	0.545			U
	PFMOAA	674-13-5	29334.87	40.0	40.0	1.23	1.23			U
	PFMOPrA	377-73-1	ND	ND	<LOD	0.204	0.545			U
	PF02HxA	39492-88-1	5118.98	6.98	6.98	1.23	1.23			U
	PF03OA	39492-89-2	1154.51	1.57	1.57	1.23	1.23			U
	PF04DA	39492-90-5	ND	ND	<LOD	1.29	1.29			U
	Nafion Byproduct 1	29311-67-9	ND	ND	<LOD	0.259	0.545			U
	ADONA	919005-14-4	ND	ND	<LOD	0.102	0.517			U
	9Cl-PF3ONS	756426-58-1	ND	ND	<LOD	0.102	0.508			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	<LOD	0.102	0.514			U
	10:2 FTS	120226-60-0	9.49	0.0129	<LOD	0.204	0.545			U
	EVE Acid	69087-46-3	ND	ND	<LOD	1.23	1.23			U
	FBSA	30334-69-1	948.86	1.29	1.29	0.204	0.545			U
	Hydro-EVE Acid	773804-62-9	153.05	0.209	<LOD	1.23	1.23			U
	Hydrolyzed PSDA	2416366-19-1	5681.11	7.74	7.74	1.23	1.23			U
	Nafion Byproduct 2	749836-20-2	237.71	0.324	0.324	0.259	0.545			J
	ES	N-EiFOSA	4151-50-2	ND	ND	<LOD	0.204	0.545		
N-EiFOSE		1691-99-2	ND	ND	<LOD	6.13	6.13			U
NFDHA		151772-58-6	ND	ND	<LOD	0.204	0.545			U
N-MeFOSA		31506-32-8	ND	ND	<LOD	0.204	0.545			U
N-MeFOSE		24448-09-7	ND	ND	<LOD	6.13	6.13			U
NvHOS		1132933-86-8	1388.83	1.89	1.89	1.23	1.23			U
PEPA		267239-61-2	2581.41	3.52	3.52	1.23	1.23			U
PFECA-G		801212-59-9	ND	ND	<LOD	0.259	1.23			U
PFEESA		113507-82-7	ND	ND	<LOD	0.204	0.545			U
PFFHxDA		67905-19-5	11.41	0.0156	<LOD	1.23	1.23			U
PFMOBA		863090-89-5	ND	ND	<LOD	1.23	1.23			U
PFOSDA		39492-91-6	ND	ND	<LOD	1.29	1.29			U
PMPA		13140-29-9	6211.06	8.47	8.47	1.23	1.23			U
R-EVE		2416366-22-6	8188.79	11.2	11.2	1.23	1.23			U
R-PSDA		2416366-18-0	ND	ND	<LOD	1.23	1.23			U
R-PSDCA		241636-21-5	8.26	0.0113	<LOD	1.23	1.23			U
MPFBA			4352.02	5.93				20-150%	87.0%	
M5PFFPeA			7032.63	9.59				20-150%	140.7%	
M3PFBS			9074.20	12.4				20-150%	181.5%	Q
M2-4:2 FTS			13448.85	18.3				20-150%	269.0%	Q
M5PFFHxA		3536.27	4.82				20-150%	70.7%		
M3HFPO-DA		3894.15	5.31				20-150%	77.9%		
M4PFFHpA		4306.29	5.87				20-150%	86.1%		
M3PFFHxS		4363.70	5.95				20-150%	87.3%		
M2-6:2 FTS		9557.95	13.0				20-150%	191.2%	Q	
M8PFOA		4537.96	6.19				20-150%	90.8%		
M9PFNA		4049.36	5.52				20-150%	81.0%		
M8PFOS		4281.68	5.84				20-150%	85.6%		
M2-8:2 FTS		5897.75	8.04				20-150%	118.0%		
M8FOSA-I		4043.96	5.51				20-150%	80.9%		
M6PFDA		4608.48	6.28				20-150%	92.2%		
d3-N-MeFOSAA		4137.47	5.64				20-150%	82.7%		
d5-N-EiFOSAA		3908.16	5.33				20-150%	78.2%		
M7PFUdA		4497.73	6.13				20-150%	90.0%		
MPPDoA		3241.68	4.42				20-150%	64.8%		
M2PFTeDA		1184.81	1.61				20-150%	23.7%		
d3-N-MeFOSA		1067.84	1.46				10-200%	10.7%		
d5-N-EiFOSA		661.57	0.902				10-200%	6.6%	Q	
d7-N-MeFOSE		3103.29	4.23				10-200%	31.0%		
d9-N-EiFOSE		2286.62	3.12				10-200%	22.9%		

### Enthalpy Analytical

Job No.: 0722-785-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant

Enthalpy ID	0722-785-002-1	Prep Batch	EU13746	Sample Vol (mL)	292.08
Sample Name	072222-EO1	Prep Date	2022-07-25 13:43	Extract Vol (mL)	0.4
Matrix	AQUEOUS	Analysis Date	2022-07-26 20:23	Split Factor	N/A
Sampling Date	20220722 00:00	Analyst	wicive	Method Code	WM-026
Received Date	2022-07-22 13:00	Instrument	Sauron	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	4204.89	5.76	5.76	0.131	0.548			
	PFPeA	2706-90-3	8897.05	12.2	12.2	0.146	0.548			
	PFHxA	307-24-4	6602.69	9.04	9.04	0.165	0.548			
	PFHpA	375-85-9	3099.72	4.25	4.25	0.104	0.548			
	PFOA	335-67-1	4753.39	6.51	6.51	0.152	0.548			
	PFNA	375-95-1	589.18	0.807	0.807	0.0651	0.548			
	PFDA	335-76-2	412.12	0.564	0.564	0.0723	0.548			
	PFUnDA	2058-94-8	139.08	0.190	0.190	0.158	0.548			J
	PFDoDA	307-55-1	16.90	0.0231	<LOD	0.173	0.548			U
	PFTrDA	72629-94-8	ND	ND	<LOD	0.129	0.548			U
PFTeDA	376-06-7	5.47	0.00749	<LOD	0.187	0.548			U	
Sulfonates	PFBS	375-73-5	4206.84	5.76	5.76	0.304	0.640			
	PFPeS	2706-91-4	832.98	1.14	1.14	0.176	0.516			
	PFHxS	355-46-4	4159.13	5.70	5.70	0.163	0.502			
	PFHpS	375-92-8	234.78	0.322	0.322	0.116	0.522			J
	PFOS	1763-23-1	8876.05	12.2	12.2	0.137	0.507			
	PFNS	68259-12-1	ND	ND	<LOD	0.0740	0.528			U
	PFDS	335-77-3	ND	ND	<LOD	0.164	0.528			U
	4:2 FTS	757124-72-4	ND	ND	<LOD	0.101	0.513			U
	6:2 FTS	27619-97-2	2845.77	3.90	3.90	0.0993	0.522			U
	8:2 FTS	39108-34-4	ND	ND	<LOD	0.146	0.525			U
Other	PFOSA	754-91-6	51.12	0.0700	<LOD	0.111	0.548			U
	N-MeFOSAA	2355-31-9	48.36	0.0662	<LOD	0.123	0.548			U
	N-EiFOSAA	2991-50-6	ND	ND	<LOD	0.0933	0.548			U
	HFPO-DA	13252-13-6	3962.44	5.43	5.43	0.195	0.548			U
	PFMOAA	674-13-5	22767.99	31.2	31.2	1.23	1.23			U
	PFMOPrA	377-73-1	ND	ND	<LOD	0.205	0.548			U
	PF02HxA	39492-88-1	5306.21	7.27	7.27	1.23	1.23			U
	PF03OA	39492-89-2	ND	ND	<LOD	1.23	1.23			U
	PF04DA	39492-90-5	ND	ND	<LOD	1.30	1.30			U
	Nafion Byproduct 1	29311-67-9	ND	ND	<LOD	0.260	0.548			U
	ADONA	919005-14-4	ND	ND	<LOD	0.103	0.519			U
	9Cl-PF3ONS	756426-58-1	ND	ND	<LOD	0.103	0.510			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	<LOD	0.103	0.516			U
	10:2 FTS	120226-60-0	ND	ND	<LOD	0.205	0.548			U
	EVE Acid	69087-46-3	ND	ND	<LOD	1.23	1.23			U
	FBSA	30334-69-1	686.21	0.940	0.940	0.205	0.548			U
	Hydro-EVE Acid	773804-62-9	154.04	0.211	<LOD	1.23	1.23			U
	Hydrolyzed PSDA	2416366-19-1	9808.63	13.4	13.4	1.23	1.23			U
	Nafion Byproduct 2	749836-20-2	225.48	0.309	0.309	0.260	0.548			J
	N-EiFOSE	4151-50-2	ND	ND	<LOD	0.205	0.548			U
	N-EiFOSE	1691-99-2	ND	ND	<LOD	6.16	6.16			U
	NFDHA	151772-58-6	ND	ND	<LOD	0.205	0.548			U
	N-MeFOSE	31506-32-8	ND	ND	<LOD	0.205	0.548			U
	N-MeFOSE	24448-09-7	ND	ND	<LOD	6.16	6.16			U
	NVHOS	1132933-86-8	1570.19	2.15	2.15	1.23	1.23			U
	PEPA	267239-61-2	2200.68	3.01	3.01	1.23	1.23			U
	PFECA-G	801212-59-9	ND	ND	<LOD	0.260	1.23			U
	PFEEESA	113507-82-7	ND	ND	<LOD	0.205	0.548			U
	PFHxDa	67905-19-5	50.06	0.0686	<LOD	1.23	1.23			U
	PFMOBA	863090-89-5	ND	ND	<LOD	1.23	1.23			U
PFOSDA	39492-91-6	ND	ND	<LOD	1.30	1.30			U	
PMPA	13140-29-9	7083.04	9.70	9.70	1.23	1.23			U	
R-EVE	2416366-22-6	10047.31	13.8	13.8	1.23	1.23			U	
R-PSDA	2416366-18-0	ND	ND	<LOD	1.23	1.23			U	
R-PSDCA	241636-21-5	9.20	0.0126	<LOD	1.23	1.23			U	
ES	MPPFA		4568.49	6.26				20-150%	91.4%	
	M5PFPeA		7001.72	9.59				20-150%	140.0%	
	M3PFBS		8412.35	11.5				20-150%	168.2%	Q
	M2-4:2 FTS		15201.36	20.8				20-150%	304.0%	Q
	M5PFHxA		3989.18	5.46				20-150%	79.8%	
	M3HFPO-DA		4056.07	5.55				20-150%	81.1%	
	M4PFHpA		4186.63	5.73				20-150%	83.7%	
	M3PFHxS		4966.95	6.80				20-150%	99.3%	
	M2-6:2 FTS		10325.40	14.1				20-150%	206.5%	Q
	M8PFOA		4169.17	5.71				20-150%	83.4%	
	M9PFNA		3924.42	5.37				20-150%	78.5%	
	M8PFOS		4575.55	6.27				20-150%	91.5%	
	M2-8:2 FTS		6492.64	8.89				20-150%	129.9%	
	M8FOSA-I		4533.68	6.21				20-150%	90.7%	
	M6PFDA		4366.15	5.98				20-150%	87.3%	
	d3-N-MeFOSAA		5082.82	6.96				20-150%	101.7%	
	d5-N-EiFOSAA		4727.95	6.47				20-150%	94.6%	
	M7PFUDa		4241.06	5.81				20-150%	84.8%	
	MPPDoA		4006.62	5.49				20-150%	80.1%	
	M2PFTeDA		2891.27	3.96				20-150%	57.8%	
	d3-N-MeFOSE		1664.86	2.28				10-200%	16.6%	
	d5-N-EiFOSE		1394.70	1.91				10-200%	13.9%	
	d7-N-MeFOSE		5704.13	7.81				10-200%	57.0%	
	d9-N-EiFOSE		5302.47	7.26				10-200%	53.0%	

# QC Data



### Enthalpy Analytical

Job No.: 0722-785-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant

Enthalpy ID	MB-13746-PFAS	Prep Batch	EU13746	Sample Vol (mL)	250
Sample Name	MB-13746-PFAS	Prep Date	2022-07-25 13:43	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-07-26 16:57	Split Factor	N/A
Sampling Date		Analyst	wicleve	Method Code	WM-026
Received Date		Instrument	Sauron	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	<LOD	0.153	0.640			U
	PFPeA	2706-90-3	ND	ND	<LOD	0.170	0.640			U
	PFHxA	307-24-4	23.68	0.0379	<LOD	0.193	0.640			U
	PFHpA	375-85-9	ND	ND	<LOD	0.122	0.640			U
	PFOA	335-67-1	ND	ND	<LOD	0.177	0.640			U
	PFNA	375-95-1	ND	ND	<LOD	0.0761	0.640			U
	PFDA	335-76-2	ND	ND	<LOD	0.0845	0.640			U
	PFUnDA	2058-94-8	ND	ND	<LOD	0.185	0.640			U
	PFDoDA	307-55-1	ND	ND	<LOD	0.202	0.640			U
	PFTrDA	72629-94-8	30.24	0.0484	<LOD	0.151	0.640			U
PFTeDA	376-06-7	ND	ND	<LOD	0.218	0.640			U	
Sulfonates	PFBS	375-73-5	27.09	0.0433	<LOD	0.355	0.747			U
	PFPeS	2706-91-4	ND	ND	<LOD	0.206	0.603			U
	PFHxS	355-46-4	ND	ND	<LOD	0.191	0.586			U
	PFHpS	375-92-8	ND	ND	<LOD	0.135	0.610			U
	PFOS	1763-23-1	14.23	0.0228	<LOD	0.160	0.593			U
	PFNS	68259-12-1	ND	ND	<LOD	0.0864	0.616			U
	PFDS	335-77-3	ND	ND	<LOD	0.192	0.616			U
	4:2 FTS	757124-72-4	ND	ND	<LOD	0.118	0.600			U
	6:2 FTS	27619-97-2	ND	ND	<LOD	0.116	0.610			U
	8:2 FTS	39108-34-4	ND	ND	<LOD	0.171	0.613			U
Other	PFOSA	754-91-6	5.41	0.00866	<LOD	0.130	0.640			U
	N-MeFOSAA	2355-31-9	ND	ND	<LOD	0.144	0.640			U
	N-EiFOSAA	2991-50-6	ND	ND	<LOD	0.109	0.640			U
	HFPO-DA	13252-13-6	ND	ND	<LOD	0.228	0.640			U
	PFMOA	674-13-5	112.38	0.180	<LOD	1.44	1.44			U
	PFMOPrA	377-73-1	ND	ND	<LOD	0.240	0.640			U
	PF02HxA	39492-88-1	ND	ND	<LOD	1.44	1.44			U
	PF03OA	39492-89-2	ND	ND	<LOD	1.44	1.44			U
	PF04DA	39492-90-5	ND	ND	<LOD	1.52	1.52			U
	Nafion Byproduct 1	29311-67-9	ND	ND	<LOD	0.304	0.640			U
	ADONA	919005-14-4	ND	ND	<LOD	0.120	0.606			U
	9Cl-PF3ONS	756426-58-1	ND	ND	<LOD	0.120	0.596			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	<LOD	0.120	0.603			U
	10:2 FTS	120226-60-0	ND	ND	<LOD	0.240	0.640			U
	EVE Acid	69087-46-3	ND	ND	<LOD	1.44	1.44			U
	FBSA	30334-69-1	ND	ND	<LOD	0.240	0.640			U
	Hydro-EVE Acid	773804-62-9	ND	ND	<LOD	1.44	1.44			U
	Hydrolyzed PSDA	2416366-19-1	ND	ND	<LOD	1.44	1.44			U
	Nafion Byproduct 2	749836-20-2	ND	ND	<LOD	0.304	0.640			U
	N-EiFOSA	4151-50-2	ND	ND	<LOD	0.240	0.640			U
	N-EiFOSE	1691-99-2	ND	ND	<LOD	7.20	7.20			U
	NFDHA	151772-58-6	ND	ND	<LOD	0.240	0.640			U
	N-MeFOSA	31506-32-8	ND	ND	<LOD	0.240	0.640			U
	N-MeFOSE	24448-09-7	ND	ND	<LOD	7.20	7.20			U
	NvHOS	1132933-86-8	ND	ND	<LOD	1.44	1.44			U
	PEPA	267239-61-2	ND	ND	<LOD	1.44	1.44			U
	PFECA-G	801212-59-9	ND	ND	<LOD	0.304	1.44			U
	PFEESA	113507-82-7	ND	ND	<LOD	0.240	0.640			U
	PFHxDA	67905-19-5	ND	ND	<LOD	1.44	1.44			U
	PFMOBA	863090-89-5	ND	ND	<LOD	1.44	1.44			U
PFOSDA	39492-91-6	ND	ND	<LOD	1.52	1.52			U	
PMPA	13140-29-9	ND	ND	<LOD	1.44	1.44			U	
R-EVE	2416366-22-6	ND	ND	<LOD	1.44	1.44			U	
R-PSDA	2416366-18-0	ND	ND	<LOD	1.44	1.44			U	
R-PSDCA	241636-21-5	ND	ND	<LOD	1.44	1.44			U	
ES	MPFBA		5196.60	8.31				20-150%	103.9%	
	M5PFPeA		4679.75	7.49				20-150%	93.6%	
	M3PFBS		3315.90	5.31				20-150%	66.3%	
	M2-4:2 FTS		6834.20	10.9				20-150%	136.7%	
	M5PFHxA		5071.41	8.11				20-150%	101.4%	
	M3HFPO-DA		5589.24	8.94				20-150%	111.8%	
	M4PFHpA		4932.09	7.89				20-150%	98.6%	
	M3PFHxS		4668.14	7.47				20-150%	93.4%	
	M2-6:2 FTS		6031.10	9.65				20-150%	120.6%	
	M8PFOA		4913.19	7.86				20-150%	98.3%	
	M9PFNA		4593.38	7.35				20-150%	91.9%	
	M8PFOS		4956.95	7.93				20-150%	99.1%	
	M2-8:2 FTS		5555.79	8.89				20-150%	111.1%	
	M8FOSA-I		3468.87	5.55				20-150%	69.4%	
	M6PFDA		4805.19	7.69				20-150%	96.1%	
	d3-N-MeFOSAA		5233.32	8.37				20-150%	104.7%	
	d5-N-EiFOSAA		4589.48	7.34				20-150%	91.8%	
	M7PFUdA		4123.96	6.60				20-150%	82.5%	
	MPFDoA		2956.58	4.73				20-150%	59.1%	
	M2PFTeDA		1255.65	2.01				20-150%	25.1%	
d3-N-MeFOSA		23.08	0.0369				10-200%	0.2%	Q	
d5-N-EiFOSA		18.36	0.0294				10-200%	0.2%	Q	
d7-N-MeFOSE		2908.82	4.65				10-200%	29.1%		
d9-N-EiFOSE		2265.52	3.62				10-200%	22.7%		

# Enthalpy Analytical

Job No.: 0722-785-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant

Enthalpy ID	OPR-13746-PFAS	Prep Batch	EU13746	Sample Vol (mL)	250
Sample Name	OPR-13746-PFAS	Prep Date	2022-07-25 13:43	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-07-26 17:20	Split Factor	N/A
Sampling Date		Analyst	wicleve	Method Code	WM-026
Received Date		Instrument	Sauron	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	11810.75	18.9	18.9	0.153	0.640	73-129%	94.5%	
	PFPeA	2706-90-3	13020.15	20.8	20.8	0.170	0.640	72-129%	104.2%	
	PFHxA	307-24-4	13378.59	21.4	21.4	0.193	0.640	72-129%	107.0%	
	PFHpA	375-85-9	12078.24	19.3	19.3	0.122	0.640	72-130%	96.6%	
	PFOA	335-67-1	11910.39	19.1	19.1	0.177	0.640	71-133%	95.3%	
	PFNA	375-95-1	11877.03	19.0	19.0	0.0761	0.640	69-130%	95.0%	
	PFDA	335-76-2	12545.32	20.1	20.1	0.0845	0.640	71-129%	100.4%	
	PFUnDA	2058-94-8	12509.05	20.0	20.0	0.185	0.640	69-133%	100.1%	
	PFDaDA	307-55-1	12386.10	19.8	19.8	0.202	0.640	72-134%	99.1%	
	PFTrDA	72629-94-8	12298.50	19.7	19.7	0.151	0.640	65-144%	98.4%	
PFTeDA	376-06-7	13396.98	21.4	21.4	0.218	0.640	71-132%	107.2%		
Sulfonates	PFBS	375-73-5	10908.06	17.5	17.5	0.355	0.747	72-134%	98.4%	
	PFPeS	2706-91-4	11783.94	18.9	18.9	0.206	0.603	71-127%	100.2%	
	PFHxS	355-46-4	10960.31	17.5	17.5	0.191	0.586	68-131%	95.9%	
	PFHpS	375-92-8	11410.92	18.3	18.3	0.135	0.610	69-134%	95.8%	
	PFOS	1763-23-1	10888.94	17.4	17.4	0.160	0.593	65-140%	93.9%	
	PFNS	68259-12-1	11433.21	18.3	18.3	0.0864	0.616	69-127%	95.1%	
	PFDS	335-77-3	11239.59	18.0	18.0	0.192	0.616	53-142%	93.2%	
	4:2 FTS	757124-72-4	11021.28	17.6	17.6	0.118	0.600	63-143%	94.1%	
6:2 FTS	27619-97-2	11774.20	18.8	18.8	0.116	0.610	64-140%	99.0%		
8:2 FTS	39108-34-4	12531.27	20.1	20.1	0.171	0.613	67-138%	104.4%		
Other	PFOSA	754-91-6	11820.77	18.9	18.9	0.130	0.640	67-137%	94.6%	
	N-MeFOSAA	2355-31-9	12463.38	19.9	19.9	0.144	0.640	65-136%	99.7%	
	N-EtFOSAA	2991-50-6	12824.35	20.5	20.5	0.109	0.640	61-135%	102.6%	
	HFPO-DA	13252-13-6	9874.62	15.8	15.8	0.228	0.640	70-130%	79.0%	
ES	MPFBA		4719.89	7.55				20-150%	94.4%	
	M5PFPeA		4091.08	6.55				20-150%	81.8%	
	M3PFBS		3397.64	5.44				20-150%	68.0%	
	M2-4:2 FTS		5886.63	9.42				20-150%	117.7%	
	M5PFHxA		4194.04	6.71				20-150%	83.9%	
	M3HFPO-DA		5582.38	8.93				20-150%	111.6%	
	M4PFHpA		4647.38	7.44				20-150%	92.9%	
	M3PFHxS		4741.31	7.59				20-150%	94.8%	
	M2-6:2 FTS		5596.23	8.95				20-150%	111.9%	
	M8PFOA		4757.95	7.61				20-150%	95.2%	
	M9PFNA		4506.82	7.21				20-150%	90.1%	
	M8PFOS		4909.15	7.85				20-150%	98.2%	
	M2-8:2 FTS		5565.96	8.91				20-150%	111.3%	
	M8FOSA-I		4590.88	7.35				20-150%	91.8%	
	M6PFDA		4421.27	7.07				20-150%	88.4%	
	d3-N-MeFOSAA		4823.95	7.72				20-150%	96.5%	
	d5-N-EtFOSAA		4760.65	7.62				20-150%	95.2%	
	M7PFUdA		4096.92	6.56				20-150%	81.9%	
MPFDoA		3785.09	6.06				20-150%	75.7%		
M2PFTeDA		4071.31	6.51				20-150%	81.4%		

# Narrative Summary



# Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0722-785-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant

## 1. Custody

Megan Holden received the samples on July 22, 2022 at 6.2 °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
0722-785-001-1	072222-SO1	AQUEOUS
0722-785-002-1	072222-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) instruments designated as "Sauron" and "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.

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

## 4. Calibration

The analytes of interest in the initial calibration exhibited R<sup>2</sup> values of ≥ 0.99. The analytes of interest in the calibration, continuing calibration (concal) and Initial Calibration Verification (ICV) standards met the 30% accuracy criterion for native analytes.

# Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0722-785-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant

## 5. QC Notes

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

The recovery values for the ES, d3-N-MeFOSA and d5-N-EtFOSA, fell below the low control limit in the analyses of the method blank (MB-13746-PFAS). Due to known poor recovery issues with these ES, when the peak is detected at a signal noise greater than 10:1, the peak area is used to quantify the associated target analyte and the data are accepted and reported with no further actions.

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 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
<b>Target Analytes</b>		
<b>* Analyte is not accredited</b>		
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)
11CI-PF3OUdS	763051-92-9	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
9CI-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
<b>Target Analytes</b>		
<b>* Analyte is not accredited</b>		
* 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





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

