Brunswick County Public Utilities - NC

PO Box 249
Bolivia, NC 28422-0249

Northwest Water Plant
Leland, N.C

Samples Received: 7/13/2023

Analytical Report
0723-780

PFAS by Isotope Dilution
PFAS

Report Issue Date: 8/14/2023

I certify that to the best of my knowledge all analytical data presented in this report have been checked for completeness, accuracy, errors and legibility in addition to having 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 ___24____ pages. This report shall not be reproduced except in full without approval of the laboratory. This will provide assurance that parts of the report are not taken out of context.

Signature:

Laura Boivin, QA Associate II

Amendments:

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2714 Exchange Drive, Wilmington, NC 28405

Summary of Results

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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

Summary

	Compound	CAS	071323-SO1 ng/L	071323-EO1 ng/L
Acids	PFBA	375-22-4	4.62	5.84
	PFPeA	2706-90-3	6.50	7.60
	PFHxA	307-24-4	5.31	6.13
	PFHpA	375-85-9	2.64	2.72
	PFOA	335-67-1	4.97	5.10
	PFNA	375-95-1	0.711	0.715
	PFDA	335-76-2	0.369 J	0.420 J
	PFUnDA	2058-94-8	ND U	ND U
	PFDoDA	307-55-1	ND U	ND U
	PFTrDA	72629-94-8	ND U	ND U
	PFTeDA	376-06-7	ND U	ND U
	PFHxDA	67905-19-5	0.0295 L	0.0622 L
Sulfonates	PFBS	375-73-5	2.92	3.33
	PFPeS	2706-91-4	0.461 J	0.416 J
	PFHxS	355-46-4	2.87	3.47
	PFHpS	375-92-8	0.0856 L	0.0407 L
	PFOS	1763-23-1	8.59	9.35
	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	0.0616 L	0.123 L
	8:2 FTS	39108-34-4	ND U	ND U
	10:2 FTS	120226-60-0	ND U	ND U
Sulfonamidos	FBSA	30334-69-1	0.264 L	0.268 J
	N-EtFOSA	4151-50-2	ND U	ND U
	N-EtFOSAA	2991-50-6	ND U	ND U
	N-EtFOSE	1691-99-2	ND U	ND U
	N-MeFOSA	31506-32-8	ND U	ND U
	N-MeFOSAA	2355-31-9	ND U	0.00628 L
	N-MeFOSE	24448-09-7	ND U	ND U
	PFOSA	754-91-6	0.0436 L	0.0278 L

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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

Summary

	Compound	CAS	071323-SO1 ng/L	071323-EO1 ng/L
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND U	ND U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	0.0725 L	0.0548 L
PFECAs	ADONA	919005-14-4	ND U	ND U
	EVE Acid	69087-46-3	ND U	ND U
	HFPO-DA	13252-13-6	1.30	0.929
	Hydro-EVE Acid	773804-62-9	0.0635 L	0.0587 L
	NFDHA	151772-58-6	ND U	ND U
	PEPA	267239-61-2	0.472 J	0.444 J
	PFECA-G	801212-59-9	ND U	ND U
	PFMOAA	674-13-5	3.27	2.93
	PFMOBA	863090-89-5	ND U	ND U
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	1.58	1.65
	PFO3OA	39492-89-2	0.470 J	0.524 J
	PFO4DA	39492-90-5	ND U	0.279 L
	PFO5DA	39492-91-6	0.0653 L	0.0403 L
	PMPA	13140-29-9	2.06	2.04
	R-EVE	2416366-22-6	4.40	2.76
PFESAs	11Cl-PF3OUdS	763051-92-9	ND U	ND U
	9Cl-PF3ONS	756426-58-1	ND U	ND U
	Hydrolyzed PSDA	2416366-19-1	0.471 J	0.562
	NVHOS	1132933-86-8	ND U	ND U
	PFEESA	113507-82-7	ND U	ND U
	R-PSDA	2416366-18-0	2.56	1.68 L
	R-PSDCA	241636-21-5	ND U	ND U

Detailed Results

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	0723-780-001-1	Prep Batch	EU15657	Sample Vol (mL)	281.96
Sample Name	071323-SO1	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-18 00:34	Split Factor	N/A
Sampling Date	2023-07-13 07:20	Analyst	bahager	Method Code	WM-026
Received Date	2023-07-13	Instrument	Pippin	Sample Type	Sample

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	4.62	0.225	0.567			
	PFPeA	2706-90-3	6.50	0.162	0.567			
	PFHxA	307-24-4	5.31	0.190	0.567			
	PFHpA	375-85-9	2.64	0.199	0.567			
	PFOA	335-67-1	4.97	0.130	0.567			
	PFNA	375-95-1	0.711	0.128	0.567			
	PFDA	335-76-2	0.369	0.162	0.567			J
	PFUnDA	2058-94-8	ND	0.128	0.567			U
	PFDoDA	307-55-1	ND	0.231	0.567			U
	PFTrDA	72629-94-8	ND	0.188	0.567			U
	PFTeDA	376-06-7	ND	0.216	0.567			U
	PFHxDA	67905-19-5	0.0295	0.301	0.567			L
Sulfonates	PFBS	375-73-5	2.92	0.301	0.567			
	PFPeS	2706-91-4	0.461	0.117	0.535			J
	PFHxS	355-46-4	2.87	0.438	0.520			
	PFHpS	375-92-8	0.0856	0.275	0.541			L
	PFOS	1763-23-1	8.59	0.300	0.526			
	PFNS	68259-12-1	ND	0.176	0.547			U
	PFDS	335-77-3	ND	0.298	0.547			U
	4:2 FTS	757124-72-4	ND	0.0736	0.532			U
	6:2 FTS	27619-97-2	0.0616	0.268	0.541			L
	8:2 FTS	39108-34-4	ND	0.127	0.544			U
	10:2 FTS	120226-60-0	ND	0.434	0.567			U
Sulfonamidos	FBSA	30334-69-1	0.264	0.270	0.567			L
	N-EtFOSA	4151-50-2	ND	0.351	0.567			U
	N-EtFOSAA	2991-50-6	ND	0.231	0.567			U
	N-EtFOSE	1691-99-2	ND	0.869	2.55			U
	N-MeFOSA	31506-32-8	ND	0.234	0.567			U
	N-MeFOSAA	2355-31-9	ND	0.159	0.567			U
	N-MeFOSE	24448-09-7	ND	0.539	2.55			U
	PFOSA	754-91-6	0.0436	0.0796	0.567			L
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND	0.303	0.567			U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	0.0725	0.470	0.567			L

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Enthalpy ID	0723-780-001-1	Prep Batch	EU15657	Sample Vol (mL)	281.96
Sample Name	071323-SO1	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-18 00:34	Split Factor	N/A
Sampling Date	2023-07-13 07:20	Analyst	bahager	Method Code	WM-026
Received Date	2023-07-13	Instrument	Pippin	Sample Type	Sample

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
PFECAs	ADONA	919005-14-4	ND	0.154	0.538			U
	EVE Acid	69087-46-3	ND	0.181	1.28			U
	HFPO-DA	13252-13-6	1.30	0.0601	0.567			
	Hydro-EVE Acid	773804-62-9	0.0635	0.186	0.567			L
	NFDHA	151772-58-6	ND	0.119	0.567			U
	PEPA	267239-61-2	0.472	0.106	0.567			J
	PFECA-G	801212-59-9	ND	0.0757	0.567			U
	PFMOAA	674-13-5	3.27	0.287	0.567			
	PFMOBA	863090-89-5	ND	0.952	1.28			U
	PFMOPrA	377-73-1	ND	0.202	0.567			U
	PFO2HxA	39492-88-1	1.58	0.183	0.567			
	PFO3OA	39492-89-2	0.470	0.261	0.567			J
	PFO4DA	39492-90-5	ND	0.449	2.84			U
	PFO5DA	39492-91-6	0.0653	0.454	2.84			L
	PMPA	13140-29-9	2.06	0.134	0.567			
	R-EVE	2416366-22-6	4.40	0.942	1.28			
PFESAs	11Cl-PF3OUdS	763051-92-9	ND	0.268	0.535			U
	9Cl-PF3ONS	756426-58-1	ND	0.364	0.529			U
	Hydrolyzed PSDA	2416366-19-1	0.471	0.378	0.567			J
	NVHOS	1132933-86-8	ND	0.0874	0.567			U
	PFEESA	113507-82-7	ND	0.171	0.567			U
	R-PSDA	2416366-18-0	2.56	2.50	2.50			
	R-PSDCA	241636-21-5	ND	0.239	0.567			U
ES	MPFBA					20-150%	99.1%	
	M5PFPeA					20-150%	159.5%	Q
	M3PFBS					20-150%	222.0%	Q
	M2-4:2 FTS					20-150%	122.7%	
	M5PFHxA					20-150%	75.7%	
	M3HFPO-DA					20-150%	57.4%	
	M4PFHpA					20-150%	110.7%	
	M3PFHxS					20-150%	92.1%	
	M2-6:2 FTS					20-150%	102.9%	
	M8PFOA					20-150%	97.5%	
	M9PFNA					20-150%	92.3%	
	M8PFOS					20-150%	82.5%	
	M2-8:2 FTS					20-150%	86.6%	
	M8FOSA-I					20-150%	66.8%	
	M6PFDA					20-150%	90.5%	
	d3-N-MeFOSAA					20-150%	74.2%	
	d5-N-EtFOSAA					20-150%	83.6%	
	M7PFUdA					20-150%	84.5%	
	MPFDoA					20-150%	65.4%	
	M2PFTeDA					20-150%	32.6%	
	d3-N-MeFOSA					10-200%	0.7%	Q
	d5-N-EtFOSA					10-200%	0.6%	Q
	d7-N-MeFOSE					10-200%	31.8%	
	d9-N-EtFOSE					10-200%	35.0%	

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	0723-780-002-1	Prep Batch	EU15657	Sample Vol (mL)	287.92
Sample Name	071323-EO1	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-18 00:56	Split Factor	N/A
Sampling Date	2023-07-13 07:20	Analyst	bahager	Method Code	WM-026
Received Date	2023-07-13	Instrument	Pippin	Sample Type	Sample

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	5.84	0.221	0.556			
	PFPeA	2706-90-3	7.60	0.159	0.556			
	PFHxA	307-24-4	6.13	0.186	0.556			
	PFHpA	375-85-9	2.72	0.194	0.556			
	PFOA	335-67-1	5.10	0.127	0.556			
	PFNA	375-95-1	0.715	0.126	0.556			
	PFDA	335-76-2	0.420	0.159	0.556			J
	PFUnDA	2058-94-8	ND	0.126	0.556			U
	PFDoDA	307-55-1	ND	0.226	0.556			U
	PFTrDA	72629-94-8	ND	0.184	0.556			U
	PFTeDA	376-06-7	ND	0.212	0.556			U
	PFHxDA	67905-19-5	0.0622	0.295	0.556			L
Sulfonates	PFBS	375-73-5	3.33	0.295	0.556			
	PFPeS	2706-91-4	0.416	0.114	0.524			J
	PFHxS	355-46-4	3.47	0.429	0.509			
	PFHpS	375-92-8	0.0407	0.269	0.529			L
	PFOS	1763-23-1	9.35	0.293	0.515			
	PFNS	68259-12-1	ND	0.172	0.535			U
	PFDS	335-77-3	ND	0.292	0.535			U
	4:2 FTS	757124-72-4	ND	0.0721	0.521			U
	6:2 FTS	27619-97-2	0.123	0.262	0.529			L
	8:2 FTS	39108-34-4	ND	0.125	0.532			U
	10:2 FTS	120226-60-0	ND	0.425	0.556			U
Sulfonamidos	FBSA	30334-69-1	0.268	0.264	0.556			J
	N-EtFOSA	4151-50-2	ND	0.344	0.556			U
	N-EtFOSAA	2991-50-6	ND	0.226	0.556			U
	N-EtFOSE	1691-99-2	ND	0.851	2.50			U
	N-MeFOSA	31506-32-8	ND	0.229	0.556			U
	N-MeFOSAA	2355-31-9	0.00628	0.156	0.556			L
	N-MeFOSE	24448-09-7	ND	0.528	2.50			U
	PFOSA	754-91-6	0.0278	0.0780	0.556			L
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND	0.297	0.556			U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	0.0548	0.460	0.556			L

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Sample Name	071323-EO1	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-18 00:56	Split Factor	N/A
Sampling Date	2023-07-13 07:20	Analyst	bahager	Method Code	WM-026
Received Date	2023-07-13	Instrument	Pippin	Sample Type	Sample

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
PFECAs	ADONA	919005-14-4	ND	0.151	0.526			U
	EVE Acid	69087-46-3	ND	0.177	1.25			U
	HFPO-DA	13252-13-6	0.929	0.0589	0.556			
	Hydro-EVE Acid	773804-62-9	0.0587	0.182	0.556			L
	NFDHA	151772-58-6	ND	0.117	0.556			U
	PEPA	267239-61-2	0.444	0.104	0.556			J
	PFECA-G	801212-59-9	ND	0.0742	0.556			U
	PFMOAA	674-13-5	2.93	0.281	0.556			
	PFMOBA	863090-89-5	ND	0.933	1.25			U
	PFMOPrA	377-73-1	ND	0.198	0.556			U
	PFO2HxA	39492-88-1	1.65	0.179	0.556			
	PFO3OA	39492-89-2	0.524	0.255	0.556			J
	PFO4DA	39492-90-5	0.279	0.439	2.78			L
	PFO5DA	39492-91-6	0.0403	0.445	2.78			L
	PMPA	13140-29-9	2.04	0.131	0.556			
	R-EVE	2416366-22-6	2.76	0.922	1.25			
PFESAs	11Cl-PF3OUdS	763051-92-9	ND	0.262	0.524			U
	9Cl-PF3ONS	756426-58-1	ND	0.356	0.518			U
	Hydrolyzed PSDA	2416366-19-1	0.562	0.370	0.556			
	NVHOS	1132933-86-8	ND	0.0856	0.556			U
	PFEESA	113507-82-7	ND	0.167	0.556			U
	R-PSDA	2416366-18-0	1.68	2.45	2.45			L
	R-PSDCA	241636-21-5	ND	0.234	0.556			U
ES	MPFBA					20-150%	94.8%	
	M5PFPeA					20-150%	158.2%	Q
	M3PFBS					20-150%	187.5%	Q
	M2-4:2 FTS					20-150%	94.7%	
	M5PFHxA					20-150%	71.6%	
	M3HFPO-DA					20-150%	60.6%	
	M4PFHpA					20-150%	94.4%	
	M3PFHxS					20-150%	81.6%	
	M2-6:2 FTS					20-150%	78.6%	
	M8PFOA					20-150%	89.1%	
	M9PFNA					20-150%	71.9%	
	M8PFOS					20-150%	67.6%	
	M2-8:2 FTS					20-150%	57.9%	
	M8FOSA-I					20-150%	41.1%	
	M6PFDA					20-150%	69.2%	
	d3-N-MeFOSAA					20-150%	54.4%	
	d5-N-EtFOSAA					20-150%	52.5%	
	M7PFUdA					20-150%	66.2%	
	MPFDoA					20-150%	60.0%	
	M2PFTeDA					20-150%	49.9%	
	d3-N-MeFOSA					10-200%	1.2%	Q
	d5-N-EtFOSA					10-200%	1.5%	Q
	d7-N-MeFOSE					10-200%	30.3%	
	d9-N-EtFOSE					10-200%	30.9%	

QC Data

ENTHALPY ANALYTICAL

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	MB_15657_PFAS	Prep Batch	EU15657	Sample Vol (mL)	250
Sample Name	MB_15657_PFAS	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-17 21:31	Split Factor	N/A
Sampling Date		Analyst	bahager	Method Code	WM-026
Received Date		Instrument	Pippin	Sample Type	Blank

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	ND	0.254	0.640			U
	PFPeA	2706-90-3	ND	0.183	0.640			U
	PFHxA	307-24-4	ND	0.214	0.640			U
	PFHpA	375-85-9	ND	0.224	0.640			U
	PFOA	335-67-1	ND	0.146	0.640			U
	PFNA	375-95-1	ND	0.145	0.640			U
	PFDA	335-76-2	ND	0.183	0.640			U
	PFUnDA	2058-94-8	ND	0.145	0.640			U
	PFDoDA	307-55-1	ND	0.260	0.640			U
	PFTrDA	72629-94-8	ND	0.212	0.640			U
	PFTeDA	376-06-7	ND	0.244	0.640			U
	PFHxDA	67905-19-5	ND	0.340	0.640			U
Sulfonates	PFBS	375-73-5	ND	0.340	0.640			U
	PFPeS	2706-91-4	ND	0.131	0.603			U
	PFHxS	355-46-4	ND	0.494	0.586			U
	PFHpS	375-92-8	ND	0.310	0.610			U
	PFOS	1763-23-1	ND	0.338	0.593			U
	PFNS	68259-12-1	ND	0.199	0.616			U
	PFDS	335-77-3	ND	0.336	0.616			U
	4:2 FTS	757124-72-4	ND	0.0830	0.600			U
	6:2 FTS	27619-97-2	0.0261	0.302	0.610			L
	8:2 FTS	39108-34-4	0.00610	0.143	0.613			L
	10:2 FTS	120226-60-0	ND	0.490	0.640			U
Sulfonamidos	FBSA	30334-69-1	ND	0.304	0.640			U
	N-EtFOSA	4151-50-2	ND	0.396	0.640			U
	N-EtFOSAA	2991-50-6	ND	0.260	0.640			U
	N-EtFOSE	1691-99-2	ND	0.980	2.88			U
	N-MeFOSA	31506-32-8	ND	0.264	0.640			U
	N-MeFOSAA	2355-31-9	ND	0.180	0.640			U
	N-MeFOSE	24448-09-7	ND	0.608	2.88			U
	PFOSA	754-91-6	0.0149	0.0898	0.640			L
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND	0.342	0.640			U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	ND	0.530	0.640			U

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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Enthalpy ID	MB_15657_PFAS	Prep Batch	EU15657	Sample Vol (mL)	250
Sample Name	MB_15657_PFAS	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-17 21:31	Split Factor	N/A
Sampling Date		Analyst	bahager	Method Code	WM-026
Received Date		Instrument	Pippin	Sample Type	Blank

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
PFECAs	ADONA	919005-14-4	ND	0.173	0.606			U
	EVE Acid	69087-46-3	ND	0.204	1.44			U
	HFPO-DA	13252-13-6	ND	0.0678	0.640			U
	Hydro-EVE Acid	773804-62-9	ND	0.210	0.640			U
	NFDHA	151772-58-6	0.00856	0.135	0.640			L
	PEPA	267239-61-2	ND	0.120	0.640			U
	PFECA-G	801212-59-9	ND	0.0854	0.640			U
	PFMOAA	674-13-5	ND	0.324	0.640			U
	PFMOBA	863090-89-5	ND	1.07	1.44			U
	PFMOPrA	377-73-1	ND	0.228	0.640			U
	PFO2HxA	39492-88-1	ND	0.206	0.640			U
	PFO3OA	39492-89-2	ND	0.294	0.640			U
	PFO4DA	39492-90-5	ND	0.506	3.20			U
	PFO5DA	39492-91-6	ND	0.512	3.20			U
	PMPA	13140-29-9	ND	0.151	0.640			U
	R-EVE	2416366-22-6	ND	1.06	1.44			U
PFESAs	11Cl-PF3OUdS	763051-92-9	ND	0.302	0.603			U
	9Cl-PF3ONS	756426-58-1	ND	0.410	0.596			U
	Hydrolyzed PSDA	2416366-19-1	ND	0.426	0.640			U
	NVHOS	1132933-86-8	ND	0.0986	0.640			U
	PFEESA	113507-82-7	ND	0.192	0.640			U
	R-PSDA	2416366-18-0	ND	2.82	2.82			U
	R-PSDCA	241636-21-5	ND	0.270	0.640			U
ES	MPFBA					20-150%	95.6%	
	M5PFPeA					20-150%	110.7%	
	M3PFBS					20-150%	90.9%	
	M2-4:2 FTS					20-150%	110.8%	
	M5PFHxA					20-150%	97.8%	
	M3HFPO-DA					20-150%	68.5%	
	M4PFHpA					20-150%	102.6%	
	M3PFHxS					20-150%	102.5%	
	M2-6:2 FTS					20-150%	100.7%	
	M8PFOA					20-150%	91.1%	
	M9PFNA					20-150%	93.1%	
	M8PFOS					20-150%	92.0%	
	M2-8:2 FTS					20-150%	88.6%	
	M8FOSA-I					20-150%	79.6%	
	M6PFDA					20-150%	103.9%	
	d3-N-MeFOSAA					20-150%	101.5%	
	d5-N-EtFOSAA					20-150%	104.4%	
	M7PFUdA					20-150%	105.8%	
	MPFDoA					20-150%	102.9%	
	M2PFTeDA					20-150%	82.7%	
	d3-N-MeFOSA					10-200%	3.3%	Q
	d5-N-EtFOSA					10-200%	3.3%	Q
	d7-N-MeFOSE					10-200%	64.5%	
	d9-N-EtFOSE					10-200%	76.1%	

Enthalpy Analytical

Job No.: 0723-780-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	OPR_15657_PFAS	Prep Batch	EU15657	Sample Vol (mL)	250
Sample Name	OPR_15657_PFAS	Prep Date	2023-07-17 10:23	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-07-17 21:54	Split Factor	N/A
Sampling Date		Analyst	bahager	Method Code	WM-026
Received Date		Instrument	Pippin	Sample Type	Control

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	18.7	0.254	0.640	69.1-122%	93.7%	
	PFPeA	2706-90-3	18.2	0.183	0.640	68.5-121%	91.0%	
	PFHxA	307-24-4	19.6	0.214	0.640	68.3-121%	97.9%	
	PFHpA	375-85-9	20.5	0.224	0.640	62.4-128%	102.5%	
	PFOA	335-67-1	19.1	0.146	0.640	66.3-124%	95.3%	
	PFNA	375-95-1	20.4	0.145	0.640	70.5-120%	102.0%	
	PFDA	335-76-2	19.0	0.183	0.640	68.9-117%	95.0%	
	PFUnDA	2058-94-8	18.9	0.145	0.640	58.1-132%	94.4%	
	PFDoDA	307-55-1	19.1	0.260	0.640	52.1-140%	95.5%	
	PFTrDA	72629-94-8	25.0	0.212	0.640	65-144%	124.8%	
	PFTeDA	376-06-7	21.1	0.244	0.640	36.1-161%	105.7%	
Sulfonates	PFBS	375-73-5	14.9	0.340	0.640	67.5-111.6%	83.8%	
	PFPeS	2706-91-4	14.1	0.131	0.603	51.8-142%	75.1%	
	PFHxS	355-46-4	20.2	0.494	0.586	59.6-128%	110.3%	
	PFHpS	375-92-8	19.3	0.310	0.610	46.9-157%	101.0%	
	PFOS	1763-23-1	18.6	0.338	0.593	59.2-132%	100.2%	
	PFNS	68259-12-1	19.7	0.199	0.616	53.9-133%	102.5%	
	PFDS	335-77-3	20.3	0.336	0.616	38.1-142%	105.0%	
	4:2 FTS	757124-72-4	17.2	0.0830	0.600	61.9-131%	92.0%	
	6:2 FTS	27619-97-2	20.3	0.302	0.610	62.3-129%	106.9%	
	8:2 FTS	39108-34-4	17.4	0.143	0.613	37.5-159%	90.6%	
Sulfonamidos	N-EtFOSAA	2991-50-6	20.2	0.260	0.640	61.5-133%	100.9%	
	N-MeFOSAA	2355-31-9	22.5	0.180	0.640	57.3-138%	112.7%	
	PFOSA	754-91-6	17.3	0.0898	0.640	49.1-143%	86.6%	
PFECAs	HFPO-DA	13252-13-6	21.7	0.0678	0.640	57.2-130%	108.4%	
ES	MPFBA					20-150%	92.9%	
	M5PFPeA					20-150%	103.2%	
	M3PFBS					20-150%	97.0%	
	M2-4:2 FTS					20-150%	115.1%	
	M5PFHxA					20-150%	103.0%	
	M3HFPO-DA					20-150%	77.3%	
	M4PFHpA					20-150%	102.6%	
	M3PFHxS					20-150%	92.4%	
	M2-6:2 FTS					20-150%	93.5%	
	M8PFOA					20-150%	108.2%	
	M9PFNA					20-150%	98.8%	
	M8PFOS					20-150%	94.7%	
	M2-8:2 FTS					20-150%	83.2%	
	M8FOSA-I					20-150%	92.5%	
	M6PFDA					20-150%	107.7%	
	d3-N-MeFOSAA					20-150%	94.5%	
	d5-N-EtFOSAA					20-150%	95.2%	
	M7PFUdA					20-150%	118.4%	
	MPFDoA					20-150%	110.1%	
	M2PFTeDA					20-150%	91.0%	

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0723-780-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant Leland, N.C

1. Custody

Summer Banning received the samples on July 13, 2023 at 5.5 °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
0723-780-001-1	071323-SO1	AQ
0723-780-002-1	071323-EO1	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	PFAS - Brunswick 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, unless otherwise indicated by a screening analysis, the sample volume was measured gravimetrically by the laboratory, and all contents spiked with Extraction Standard (ES). The samples were mixed well and centrifuged (if needed), and then extracted by SPE. If the extracts are discolored after initial SPE, ENVI-Carb cleanup procedure is used. Injection Standards (IS) were added prior to analysis.

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 accuracy criterion for native analytes.

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.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0723-780-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant Leland, N.C

5. QC Notes

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

Target analytes are quantified based on their ratio to their labeled standard analogs. As a result, low or high labeled standard recovery in the method blank (MB) and OPR does not cause any change to ratios or contribute any additional error in the measurement of the target analyte(s). The data has been accepted and reported with no further action.

The ion ratios for all compounds were within tolerance.

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

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

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

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. 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.

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.

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

Lab Identifiers/ Data Attributes

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

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

	PFAS Compound Acronym List		
	Acronym	**CAS #**	**Compound Name**
	Target Analytes		
	*** Analyte is not accredited for SOP EU047**		***# Method 537.1 Accredited ^ Method 533 Accredited***
^	PFBA	375-22-4	Perfluorobutanoic Acid
^	PFPeA	2706-90-3	Perfluoropentanoic Acid
#, ^	PFHxA	307-24-4	Perfluorohexanoic Acid
#, ^	PFHpA	375-85-9	Perfluoroheptanoic Acid
#, ^	PFOA	335-67-1	Perfluorooctanoic Acid
#, ^	PFNA	375-95-1	Perfluorononanoic Acid
#, ^	PFDA	335-76-2	Perfluorodecanoic acid
#, ^	PFUnA (PFUnDA)	2058-94-8	Perfluoroundecanoic acid
#, ^	PFDoA (PFDoDA)	307-55-1	Perfluorododecanoic acid
#	PFTrDA (PFTriA)	72629-94-8	Perfluorotridecanoic acid
#	PFTeDA (PFTA)	376-06-7	Perfluorotetradecanoic acid
#, ^	PFBS	375-73-5	Perfluorobutane sulfonic acid
^	PFPeS	2706-91-4	Perfluoropentane sulfonic acid
#, ^	PFHxS	355-46-4	Perfluorohexane sulfonic acid
^	PFHpS	375-92-8	Perfluoroheptane sulfonic acid
#, ^	PFOS	1763-23-1	Perfluorooctane sulfonic acid
	PFNS	68259-12-1	Perfluorononane sulfonic acid
	PFDS	335-77-3	Perfluorodecane sulfonic acid
^	4:2 FTS	757124-72-4	4:2 fluorotelomer sulfonic acid
^	6:2 FTS	27619-97-2	6:2 fluorotelomer sulfonic acid
^	8:2 FTS	39108-34-4	8:2 fluorotelomer sulfonic acid
	PFOSA (FOSA)	754-91-6	Perfluorooctane sulfonamide
#	N-MeFOSAA	2355-31-9	N-methyl perfluorooctane sulfonamido acetic acid
#	N-EtFOSAA	2991-50-6	N-ethyl perfluorooctane sulfonamido acetic acid
#, ^	HFPO-DA	13252-13-6	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (Gen-X)
*, #, ^	11Cl-PF3OUdS	763051-92-9	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
*, #, ^	9Cl-PF3ONS	756426-58-1	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
*, #, ^	ADONA	919005-14-4	4,8-dioxa-3H-perfluorononanoic acid
*,^	PFEESA	113507-82-7	Perfluoro(2-ethoxyethane)sulphonic acid
*, ^	PFMOBA (PFMBA)	863090-89-5	Perfluoro-4-methoxybutanic acid
*, ^	NFDHA	151772-58-6	Nonafluoro-3,6-dioxaheptanoic acid
*, ^	PFMOPrA (PFMPA)	377-73-1	Perfluoro-3-methoxypropanoic acid
*	PFMOAA	674-13-5	Perfluoro-2-methoxyacetic acid
*	PFO2HxA	39492-88-1	Perfluoro (3,5-dioxahexanoic) acid
*	PFO3OA	39492-89-2	Perfluoro (3,5,7-trioxaoctanoic) acid
*	PFO4DA	39492-90-5	Perfluoro (3,5,7,9-tetraoxadecanoic) acid
*	PFO5DA	39492-91-6	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid
*	Nafion Byproduct 1	29311-67-9	Nafion Byproduct 1
*	Nafion Byproduct 2	749836-20-2	Nafion Byproduct 2
*	PEPA	267239-61-2	Perfluoro-2-ethoxypropanoic acid
*	PMPA	13140-29-9	Perfluoro-2-methoxypropanoic acid
*	10:2 FTS	120226-60-0	Fluorotelomer sulfonate 10:2
*	N-EtFOSA	4151-50-2	N-ethylperfluoro-1-octanesulfonamide
*	N-EtFOSE	1691-99-2	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
*	N-MeFOSA	31506-32-8	N-methylperfluoro-1-octanesulfonamide
*	N-MeFOSE	24448-09-7	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
*	PFECA-G	801212-59-9	4-(Heptafluoroisopropoxy)hexafluorobutanoic acid
*	PFHxDA	67905-19-5	Perfluorohexadecanoic acid
*	R-PSDA (Nafion Byproduct 4)	2416366-18-0	Perfluoro-4-(2-sulfoethoxy)pentanoic acid

	PFAS Compound Acronym List		
	Acronym	**CAS #**	**Compound Name**
	Target Analytes		
	*** Analyte is not accredited for SOP EU047**	***# Method 537.1 Accredited ^ Method 533 Accredited***	
*	Hydrolyzed PSDA (Nafion Byproduct 5)	2416366-19-1	2-fluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2-tetrafluoro-2-sulfoethoxy)propoxy]-acetic acid
*	R-PSDCA (Nafion Byproduct 6)	2416366-21-5	1,1,2,2-tetrafluoro-2-[1,2,2,3,3-pentafluoro-1-(trifluoromethyl)propoxy] ethanesulfonic acid
*	EVE Acid	69087-46-3	2,2,3,3-tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-[(1,2,2-trifluoroethenyl)oxy]propan-2-yl}oxy)propionic acid
*	FBSA	30334-69-1	Perfluorobutylsulfonamide
*	Hydro-EVE Acid	773804-62-9	2,2,3,3-Tetrafluoro-3-{[1,1,1,2,3,3-hexafluoro-3-(1,2,2,2-tetrafluoroethoxy)propan-2-yl]oxy}propanoic acid
*	R-EVE Acid	2416366-22-6	4-(2-carboxy-1,1,2,2-tetrafluoroethoxy)-2,2,3,3,4,5,5,5-octafluoro-pentanoic acid
*	NVHOS	1132933-86-8	Perfluoroethoxysulfonic acid
*	PFDoS	79780-39-5	Perfluorododecane sulfonic acid
*	PFODA	16517-11-6	Perfluorooctadecanoic acid
*	3:3 FTCA	356-02-5	2H,2H,3H,3H-Perfluorohexanoic acid
*	5:3 FTCA	914637-49-3	2H,2H,3H,3H-Perfluorooctanoic acid
*	7:3 FTCA	812-70-4	2H,2H,3H,3H-Perfluorodecanoic acid
*	N-AP-FHxSA	50598-28-2	N-(3-(Dimethylamino)propyl)tridecafluoro-1-hexanesulfonamide
*	N-CMAmP-6:2 FOSA	34455-29-3	N-(Carboxymethyl)-N,N-dimethyl-3-(((3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl)sulfonyl)amino)1-propanaminium

Sample Custody

ENTHALPY
ANALYTICAL

0723-780

Chain of Custody Record

ENTHALPY analytical

Enthalpy Ultratrace Job#: _____ COC Page__1__of__1__

Special Handling:

X Standard Turn Around Time

☐ Rush Turn Around Time -- Date Needed_____

• All Fast TATs Subject to Approval by Enthalpy Analytical, Inc.

• All Samples Disposed of After 6 months Unless Otherwise Instructed.

Enthalpy Analytical-Wilmington, NC has added enhancements to standard methods to improve accuracy, precision and permit an assessment of laboratory performance in the context of your specific data needs. For more information email Cindy.James@enthalpy.com.

Client Name:__BRUNSWICK COUNTY UTILITIES_____

Project Manager:_GLENN WALKER_____

Report To:__SAME_____

Project Number:_____

Site Name:_NORTHWEST WATER PLANT_____

Location:_LELAND N.C._____

PO#:_____

Telephone#:_____

Email:_____

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

Client Special Instructions:

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

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

Sample ID	Date	Time	Sample Volume	Type	Matrix	Sample Containers: # of Bottles	# of Jars	# of Bags	# Other	Analyses: Method 1613	Method 8290	Method 1668A/B/C PCB	PFAS by LC/MS/MS	PAHs by HRGC/HRMS	Sample on Hold	Method 23	ALL PFAS	Notes:
071323-SO1	7/13/2023	0720AM	250 ml	G	NW	2											X	
071323-EO1	7/13/2023	0720AM	250 ml	G	DW	2											X	

counter, cooler in a box, on ice, no seals, good condition
SB 7/13/23

Relinquished By:	Date:	Received By:	Date:	Time:	Sample Temperature Upon Receipt:
BILLY BENTON	7/13/2023	[signature]	7/13/23	14:12	☑ Iced ☐ Ambient °C 5.5°C TH
					☐ Iced ☐ Ambient °C_____
					☐ Iced ☐ Ambient °C_____

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