

County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Plant Lab

Leland, NC
Samples Received: 01/17/2020

Analytical Report (0120-735)

Isotope Dilution Method

PFAS – Legacy 24, Gen-X, PFMOAA



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.: 0120-735-1 PFAS by Isotope Dilution (non-potable water)

County of Brunswick N. W. Plant

Summary

	Compound	CAS	011720-SO1 ng/L	011720-EO1 ng/L
Acids	PFBA	375-22-4	ND U	ND U
	PFPeA	2706-90-3	7.11	7.16
	PFHxA	307-24-4	9.02	10.4
	PFHpA	375-85-9	4.82	4.69
	PFOA	335-67-1	4.56	4.63
	PFNA	375-95-1	0.688	0.654
	PFDA	335-76-2	0.441	0.310
	PFUnDA	2058-94-8	0.145 J-IR	ND U
	PFDoDA	307-55-1	0.0779 J-IR	0.0338 JL-IR
	PFTTrDA	72629-94-8	ND U	ND U
	PFTeDA	376-06-7	0.219	0.0923 JB
Sulfonates	PFBS	375-73-5	ND U	ND U
	PFPeS	2706-91-4	ND U	ND U
	PFHxS	355-46-4	3.27	3.43
	PFHpS	375-92-8	ND U	ND U
	PFOS	1763-23-1	8.35	8.19
	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	0.332	0.191 J
Other	8:2 FTS	39108-34-4	ND U	ND U
	PFOSA	754-91-6	ND U	ND U
	N-MeFOSAA	2355-31-9	ND U	ND U
	N-EtFOSAA	2991-50-6	ND U	ND U
	HFPO-DA	13252-13-6	2.43 JL	3.78 J
	PFMOAA	674-13-5	19.8	28.0

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	County of Brunswick
Job#	1019-735 PFAS – Legacy 24, Gen X, PFMOAA
Client Project #	N/A

Custody	Braidy May of Enthalpy Analytical Wilmington received the samples on 1/17/2020 on ice at 3.4°C in good condition. Prior to, during, and after analysis, the samples were stored in the laboratory with access only by authorized personnel of Enthalpy Analytical, LLC.
Analysis	The samples were analyzed by isotope dilution method for PFAS using Waters Acquity UPLC equipped with Xevo TQ MS (LC/MS/MS “Kili”). A 250mL aliquot of each aqueous sample was weighed to determine final sample volume and spiked with Extraction Standard (ES). The sample was then mixed well and centrifuged. Cleanup procedures were performed on the supernatant and then extracted via SPE. Each final sample extract was transferred to an autosampler vial and spiked with 400 µL of Injection Standard (IS), prior to analysis.
Calibration	The analytes and labeled standards in the initial calibration exhibited RSDs less than 50%. All analytes passed the R^2 coefficient correlation criterion. The internal calibration verification (ICV) met the $\pm 30\%$ criteria for native analytes and $\pm 50\%$ criteria for ES recoveries.
QC Notes	The samples were extracted within the 14-day from collection holding time. Extracts were analyzed within the 28-days from extraction to analysis holding time required by the method. The LCS (OPR) analysis met the $\pm 30\%$ analyte recovery criteria and 20%-150% ES recovery criteria. No analytes were detected in the method blank above the LOQ. The 20%-150% ES recovery criterion was met for all labeled compounds with the following exceptions. The recovery values for M2-8:2 FTS, M6PFDA and d5-N-EtFOSAA were outside the upper control limits.
Reporting Notes	The recovery values for some labeled extraction standards in the samples were outside ES control limits. The target analytes are quantified based on their ratio to the labeled extraction standards and undergo the same losses as the labeled standards. As a result, low or high recoveries do not cause any change to ratios or contribute any additional error in the measurement of the target analytes. Therefore, the data are considered acceptable.

Enthalpy Analytical Narrative Summary

(continued)

Reporting Notes (contued)

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. Gen-X and PFMOAA are not accredited analytes under TNI. Any deviations from the requirements of the reference method or TNI Standard have been stated above.



General Reporting Notes – Data Qualifiers

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

General Data Qualifiers / Data Attributes

- B – The analyte was found in the method blank, at a concentration that was at least 10% of the concentration in the sample.
- Cxx – Two or more congeners co-elute. In EDDs, C denotes the lowest IUPAC congener in a co-elution group and additional co-eluters for the group ('xx') are shown with the number of the lowest IUPAC co-eluter.
- E – The reported concentration exceeds the calibration range (upper point of the calibration curve) and is considered an estimate.
- EMPC – Represents an estimated maximum possible concentration. EMPCs arise in cases where the signal/noise ratio is not sufficient for peak identification (the determined ion-abundance ratio is outside the allowed theoretical range), or where there is a co-eluting interference. Indicates that a peak is identified but did not meet the method specified ion-abundance ratio.
- J – Indicates that an analyte has a concentration below the reporting limit (lowest point of the calibration curve). The value is less than the minimum calibration level but greater than the Reporting Limit (RL) or Estimated Detection Limit (EDL).
- 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 value may have a S/N less than 3.
- ND – Indicates a non-detect.
- NR – Indicates a value that is not reportable due to issues observed in sample preparation or analysis.
- PR – Due to interference, the associated congener is poorly resolved.
- DI – Indicates the presence of a quantitative interference.
- 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. The Minimum Detection Limit (MDL) or Estimated Detection Limit (EDL) may be reported for this analyte.
- V – The labeled standard recovery is not within method control limits.



General Reporting Notes – Data Qualifiers

- Q – The ion ratio between the primary and secondary ions was observed to be outside the method criteria therefore the actual analyte concentration cannot be accurately determined as defined by DoD QSM 5.3 Table B-15.

DRBC/TMDL Specific Data Qualifiers / Data Attributes

- D – Dilution Data. Result was obtained from the analysis of a dilution. The number that follows the “D” indicates the dilution factor.
- X – Results from re-injection/repeat/second-column analysis.

Lab Identifiers

- 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.
- DE – Indicates a dilution performed with the addition of ES (Extraction Standard) solution.
- DUP – Designation for a duplicate sample.
- MS – Designation for a matrix spike.
- MSD – Designation for a matrix spike duplicate.
- RJ – Indicates a reinjection of the sample extract.
- S – Indicates a sample split. The number that follows the “S” indicates the split factor.

PFAS Compound Acronym List	
Acronym	Compound Name
Target Analytes	
PFBA	Perfluorobutanoic Acid
PFPeA	Perfluoropentanoic Acid
PFHxA	Perfluorohexanoic Acid
PFHpA	Perfluoroheptanoic Acid
PFOA	Perfluorooctanoic Acid
PFNA	Perfluorononanoic Acid
PFDA	Perfluorodecanoic acid
PFUnA (PFUnDA)	Perfluoroundecanoic acid
PFDoA (PFDoDA)	Perfluorododecanoic acid
PFTriDA (PFTriA)	Perfluorotridecanoic acid
PFTeDA (PFTA)	Perfluorotetradecanoic acid
PFBS	Perfluorobutane sulfonic acid
PFPeS	Perfluoropentane sulfonic acid
PFHxS	Perfluorohexane sulfonic acid
PFHpS	Perfluoroheptane sulfonic acid
PFOS	Perfluorooctane sulfonic acid
PFNS	Perfluorononane sulfonic acid
PFDS	Perfluorodecane sulfonic acid
4:2 FTS	4:2 fluorotelomer sulfonic acid
6:2 FTS	6:2 fluorotelomer sulfonic acid
8:2 FTS	8:2 fluorotelomer sulfonic acid
PFOSA (FOSA)	Perfluorooctane sulfonamide
N-MeFOSAA	N-methyl perfluorooctane sulfonamido acetic acid
N-EtFOSAA	N-ethyl perfluorooctane sulfonamido acetic acid
HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (Gen-X)
Extraction Standards	
MPFBA	Perfluoro-n-[13C4]butanoic acid
M5PFPeA	Perfluoro-n-[13C5]pentanoic acid
M3PFBS	Sodium perfluoro-1-[2,3,4-13C3]-butanesulfonic acid
M2-4:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
M3HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-13C3-propanoic acid
M4PFHpA	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid
M3PFHxS	Sodium perfluoro-1-[1,2,3-13C3]-hexanesulfonic acid
M2-6:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
M8PFOS	Sodium perfluoro-1-[13C8]-octanesulfonic acid
M2-8:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid
M8FOSA	Perfluoro-1-[13C8]octanesulfonamide
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
d3-N-MeFOSAA	N-methyl-d3-perfluoro-1-octanesulfonamide
d5-N-EtFOSAA	N-ethyl-d5-perfluoro-1-octanesulfonamide
M7PFUnDA (M7PFUdA)	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoA	Perfluoro-n-[1,2-13C2]dodecanoic acid
M2PFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid

Injection Standards	
M3PFBA	Perfluoro-n-[2,3,4-13C3]butanoic acid
M2PFOA	Perfluoro-n-[1,2-13C2]octanoic acid
MPFDA	Perfluoro-n-[1,2-13C2]decanoic acid
MPFOS	Sodium perfluoro-1-[1,2,3,4-13C4]-octanesulfonic acid

Sample Custody

Chain of Custody Record

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.Jarnes@enthalpy.com.

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

Client Name: BRUNSWICK COUNTY WATER

Project Manager: GLENN WALKER

Report To: SAME

Project Number:

Site Name: N.W. Plant

Location: LELAND

PO#

Telephone#:

Email:

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 Containers

Analyses:

Method 1613

Method 8290

Method 1668A/B/C PCB

PFAS by LC/MS/MS

PAHs by HRGC/HRMS

Sample on Hold

EPA 537 + GENX

Notes:

Relinquished By:

Date: _____

Received By:

Date:

Time:

Sample Temperature Upon Receipt:

☒ Iced ☐ Ambient °C☐ Iced ☐ Ambient °C☐ Iced ☐ Ambient °C

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