County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Plant Lab

Leland, NC
Samples Received: 11/14/2019

Analytical Report
1119-725

Isotope Dilution Method

PFAS – Legacy 24, Gen-X, PFMOAA

Enthalpy Analytical, LLC – Ultratrace
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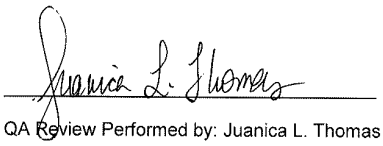
I certify that to the best of my knowledge all analytical data presented in this report:

- 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 __14__ pages.



QA Review Performed by: Juanica L. Thomas

Report Issued Date: 11/25/19

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Summary of Results

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Summary of Results: PFAS

Enthalpy Ultratrace Batch

10557

PFAS

Analyte	Method Blank ng/L	111419 E01 ng/L	111419 S01 ng/L
Acids			
PFBA	ND U	ND U	ND U
PFPeA	ND U	16.6	ND U
PFHxA	ND U	12.9	14.2
PFHpA	ND U	6.07	6.86
PFOA	ND U	5.12	5.24
PFNA	ND U	0.815	0.821
PFDA	ND U	0.513	0.428
PFUnA	ND U	0.0684 J	ND U
PFDoA	0.0198 J L	ND U	ND U
PFTrA	0.0126 J L	ND U	0.0162 J B L
PFTA	ND U	0.00480 J L	ND U
Sulfonates			
L-PFBS	ND U	ND U	ND U
PFPeS	ND U	ND U	ND U
PFHxS	0.0449 J L	5.41	5.35
PFHpS	ND U	ND U	ND U
PFOS	ND U	8.53	10.3
PFNS	ND U	ND U	ND U
PFDS	ND U	ND U	ND U
4:2 FTS	ND U	ND U	ND U
6:2 FTS	0.0668 J L	0.342 B	0.260 B
8:2 FTS	ND U	ND U	ND U
Other			
PFOSA	ND U	ND U	0.0246 J L
N-MeFOSAA	ND U	ND U	ND U
N-EtFOSAA	ND U	ND U	ND U
HFPO-DA (Gen-X)	ND U	8.81	10.4
PFMOAA	ND U	77.7	83.5
Lab Sample ID	MB-10557-PFAS	1119-725-001-1	1119-725-002-1

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	County of Brunswick
Job#	1119-725 PFAS – Legacy 24, Gen X, PFMOAA
Client Project #	N/A

Custody	Bryan Vining and Braidy May of Enthalpy Analytical Wilmington received the samples (via courier) on 11/14/19 on ice at 1.1°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"). For aqueous samples, a 280mL nominal aliquot of each sample, as determined gravimetrically by the laboratory, was 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) and Continuing calibration (concal) met the ±30% criteria for native analytes and ±50% criteria for ES recoveries.
QC Notes	The QC injection (OPR) met the ±30% criteria for % Recovery and method criteria for ES recoveries for all analytes. Some analytes were detected in the method blank below the MDL at more than 1/10 the sample amount. Any analytes detected in the samples were notated with a B qualifier. ES recoveries met method criteria for all analytes with the exception of M3HFPO-DA which fell outside the upper limit. There is no impact on the data as the associated native analyte was not detected indicating there was not a false positive detected. 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.
Reporting Notes	Some labeled standards in the samples fell outside the lower limits for ES recoveries. The target analytes are quantified based on their ratio to the labeled standards, therefore, 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.

Reporting Notes (cont.)	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. 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, 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.

- 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
PFTrDA (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

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1119-725

ENTHALPY analytical

Chain of Custody Record

Enthalpy Ultratrace Job#: ________ COC Page____of____

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: Brunswick County Water
Project Manager: Glenn Walker
Report To: Same

Project Number: ________
Site Name: N.W. Plant Lab
Location: Leland

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	# 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	EPA 537 + GenX PFMOAA		Notes:
111419 E01	11-14-19	0800	250mL	G	DW	2													✓		
111419 S01	11-14-19	0800	250mL	G	NW	2													✓		

Relinquished By:	Date:	Received By:	Date:	Time:	Sample Temperature Upon Receipt:
[signature]	11-14-19	[signature]	11/14/19	1415	☒ Iced ☐ Ambient °C 1.1 (TS)
		[signature]	11/14/19	14:15	☑ Iced ☐ Ambient °C ____
					☐ Iced ☐ Ambient °C ____

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

Arrived by courier in good condition. BAV 14 NOV 19

Brunswick courier. No seal, cooler. On Ice, good condition. Bm 11/14/19

This Is The Last Page Of This Report.

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