

County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Plant
Leland, NC

Samples Received: 8-29-19

Analytical Report
0819-752

Isotope Dilution Method

PFAS - Legacy 24 + Gen-X / PFMOAA



Enthalpy Analytical, LLC – Ultratrace

Lindsay Boone

O: (910) 212-5855 / F: 910-212-5866

lboone@enthalpy.com / 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 _____ pages.

....."Report Issued Date: _____"



Summary of Results

Summary of Results: PFAS
Enthalpy Ultratrace Batch #
10444
PFAS

| Analyte | Method Blank ng/L | 082919-S01 ng/L | 082919-E01 ng/L |
|-------------------|----------------------|--------------------|--------------------|
| Acids | | | |
| PFBA | 0.305 J | 6.57 | 7.43 |
| PFPeA | 0.0573 J L | 16.0 | 17.0 |
| PFHxA | 0.264 J | 14.3 | 14.3 |
| PFHpA | 0.154 J | 9.71 | 9.05 |
| PFOA | 0.180 J | 6.44 | 5.68 |
| PFNA | 0.0195 J L | 0.965 J | 0.860 J |
| PFDA | 0.131 J | 0.953 J B | 0.817 J B |
| PFUnA | 0.0590 J | 0.108 J B | 0.0364 J B L |
| PFDoA | 0.356 J | 0.102 J B | 0.0223 J B L |
| PFTTrA | 0.616 J | 0.0904 J B | ND U |
| PFTA | 1.38 J | 0.414 J B | ND U |
| Sulfonates | | | |
| L-PFBS | 0.332 J | ND U | ND U |
| PFPeS | 0.0988 J L | 1.70 | 0.922 J |
| PFHxS | 0.157 J | 8.71 | 6.28 |
| PFHpS | 0.120 J | 0.364 J B | 0.190 J B |
| PFOS | 0.229 J | 15.2 | 12.2 |
| PFNS | 0.122 J | ND U | 0.0118 J B L |
| PFDS | 0.343 J | ND U | ND U |
| 4:2 FTS | 0.239 J | ND U | ND U |
| 6:2 FTS | 0.341 J | 0.210 J B | 0.453 J B |
| 8:2 FTS | 0.295 J | 0.0727 J B | ND U |
| Other | | | |
| PFOSA | 0.182 J L | ND U | ND U |
| N-MeFOSAA | 0.0763 J | ND U | ND U |
| N-EtFOSAA | 0.107 J | ND U | ND U |
| HFPO-DA (Gen-X) | 4.34 J | 8.59 J B | 7.28 J B |
| PFMOAA*† | ND U | 212 | 212 |
| Lab Sample ID | LMB_10444_PFC | 0819-752_10444_001 | 0819-752_10444_002 |

† - Gen-X and related compounds are currently not accredited analytes under the TNI standard

* - Analytical standard used is a non-accredited quality control standard

Narrative Summary



Enthalpy Analytical Narrative Summary

| | |
|-------------------------|--|
| Company | Brunswick County Water |
| Job# | 0819-752 PFAS – Legacy 24 + Gen-X / PFMOAA |
| Client Project # | n/a |

| | |
|------------------------|---|
| Custody | <p>Robin Appelle of Enthalpy Analytical Wilmington received the samples (via courier) on 08/29/19 on ice at 2.0°C in good condition.</p> <p>Prior to, during, and after analysis, the samples were stored in the laboratory with access only by authorized personnel of Enthalpy Analytical, LLC.</p> |
| Analysis | <p>The samples were analyzed by isotope dilution method for PFAS using Waters Acquity UPLC equipped with Xevo TQ MS (LC/MS/MS “Kili”).</p> <p>For each sample, the entire sample (approximately 250mL) was weighed and spiked with Extraction Standard (ES). The sample was then mixed well and centrifuged.</p> <p>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.</p> |
| Calibration | <p>The analytes and labeled standards in the initial calibration met the R² coefficient correlation criteria. All analytes exhibited RSDs less than 50% with the exception of M5PFPeA and M8FOSA. Due to R² criteria being met, the ICAL is accepted for all analytes. The continuing calibration met the ±30% criteria for native analytes and ±50% criteria for ES recoveries. All Instrument Blank injections met criteria.</p> |
| QC Notes | <p>The QC injection met the ±50% criteria for ES recoveries and ±30% criteria for % Recovery.</p> <p>Some analytes were detected in the method blank (MB) above the LOD. Any analytes detected in the samples at 10 times the amount in the MB are notated with a “B” qualifier. All analytes met the ±50% criteria for ES recoveries.</p> <p>The samples were extracted within the 14-day from collection holding time (Sep 3). Extracts were analyzed within the 28-days from extraction to analysis holding time required by the method.</p> |
| Reporting Notes | <p>Some analytes in the samples fell outside the limits for ES recoveries. Although the cause was undetermined, it is theorized to be matrix effects. Based on the native results in the OPR meeting criteria, the out-of- range ES recoveries have no impact on the accuracy of the target analyte (native) compounds. Therefore, the data are considered acceptable.</p> |



Enthalpy Analytical Narrative Summary (continued)

Reporting Notes (continued)

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.

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

The samples, calibrations and standards for the data presented in this report were analyzed at 2714 Exchange Drive, Wilmington, NC 28405.



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.
- C – 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 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).
- 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.
- J – Indicates that an analyte has a concentration below the reporting limit (lowest point of the calibration curve).
- L - Indicates that an analyte has a concentration below the Minimum Detection Limit (MDL).
- ND – Indicates a non-detect.
- NR – Indicates a value that is not reportable.
- 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 Estimated Detection Limit (EDL) may be reported for this analyte.
- V – The labeled standard recovery was found to be outside of the method control limits.

DRBC/TMDL Specific Data Qualifiers / Data Attributes

- J – The reported result is an estimate. The value is less than the minimum calibration level but greater than the Estimated Detection Limit (EDL).
- U – The analyte was not detected in the sample at the Estimated Detection Limit (EDL).



General Reporting Notes – Data Qualifiers

- E – The reported concentration is an estimate. The value exceeds the upper calibration range (upper point of the calibration curve).
- D – Dilution Data. Result was obtained from the analysis of a dilution.
- B – Analyte found in the sample and associated method blank.
- Cxx – Co-elutes with the indicated congener, data is reported under the lowest IUPAC congener. ‘xx’ denotes the IUPAC number with the lowest numerical designated congener.
- NR – Analyte is not reportable because of problems in sample preparation or analysis.
- V – Labeled standard recovery is not within method control limits.
- X – Results from re-injection/repeat/second-column analysis.
- EMPC – Estimated Maximum Possible Concentration. Indicates that a peak is identified but did not meet the method specified ion-abundance ratio.

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.
- D – Indicates a dilution of the sample extract. 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.
- 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 |
| PFUnDA | Perfluoroundecanoic acid |
| PFDoDA (PFTDoA) | Perfluorododecanoic acid |
| PFTrDA (PFTrA) | Perfluorotridecanoic acid |
| PFTeDA (PFTA) | Perfluorotetradecanoic acid |
| PFBS | Perfluorobutane sulfonate |
| PFPeS | Perfluoropentane sulfonate |
| PFHxS | Perfluorohexane sulfonate |
| PFHpS | Perfluoroheptane sulfonate |
| PFOS | Perfluorooctane sulfonate |
| PFNS | Perfluorononane sulfonate |
| PFDS | Perfluorodecane sulfonate |
| 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 | 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 | |
| M3PFBA | Perfluoro-n-[2,3,4-13C3]butanoic acid |
| M5PFPeA | Perfluoro-n-[13C5]pentanoic acid |
| M3PFBS | Sodium perfluoro-1-[2,3,4-13C3]-butanesulfonate |
| M2-4:2 FTS | Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonate |
| 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]-hexanesulfonate |
| M2-6:2 FTS | Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonate |
| M8PFOA | Perfluoro-n-[13C8]octanoic acid |
| M9PFNA | Perfluoro-n-[13C9]nonanoic acid |
| M8PFOS | Sodium perfluoro-1-[13C8]-octanesulfonate |
| M2-8:2 FTS | Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonate |
| 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 | |
|---------------------|---|
| MPFBA | Perfluoro-n-[13C4]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]-octanesulfonate |

Sample Custody



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