Your Project #: PFC USACE Baltimore District
Your C.O.C. #: 593810-01-01

**Attention:Scott Forbes**

USACE WAB
Baltimore District
10 S. Howard St
Baltimore, MD
USA 21201

**Report Date: 2017/01/25**
Report #: R4337162
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B706385**
**Received: 2017/01/11, 13:55**

Sample Matrix: Water
# Samples Received: 6

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| PFOS and PFOA in water | 6 | 2017/01/13 | 2017/01/16 | CAM SOP-00894 | EPA 537 m |

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.



Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

Your Project #: PFC  USACE Baltimore District
Your C.O.C. #: 593810-01-01

**Attention:Scott Forbes**

USACE WAB
Baltimore District
10 S. Howard St
Baltimore, MD
USA 21201

**Report Date: 2017/01/25**
Report #: R4337162
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B706385**
**Received: 2017/01/11, 13:55**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
(b) (6), Customer Experience Team Lead
Email: (b) (6)
Phone# (b) (6)

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B706385
Report Date: 2017/01/25

USACE WAB
Client Project #: PFC USACE Baltimore District

## RESULTS OF ANALYSES OF WATER

| Maxxam ID | | DSX791 | DSX792 | | | | DSX793 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2017/01/10 | 2017/01/10 | | | | 2017/01/10 | | | |
| COC Number | | 593810-01-01 | 593810-01-01 | | | | 593810-01-01 | | | |
| | UNITS | MW-10 | MW-10 FBR | RDL | MDL | QC Batch | MW-8 MS/MSD | RDL | MDL | QC Batch |
| 6:2 Fluorotelomer sulfonate | ug/L | 0.051 | 0.0065 U | 0.020 | 0.0065 | 4823878 | 3.4 (1) | 0.80 | 0.21 | 4827845 |
| 8:2 Fluorotelomer sulfonate | ug/L | 0.0055 U | 0.0055 U | 0.020 | 0.0055 | 4823878 | 0.0055 U | 0.020 | 0.0055 | 4823878 |
| Perfluorobutane Sulfonate (PFBS) | ug/L | 0.0019 U | 0.0019 U | 0.020 | 0.0019 | 4823878 | 0.11 | 0.020 | 0.0019 | 4823878 |
| Perfluorobutanoic acid | ug/L | 0.0085 J | 0.0066 U | 0.020 | 0.0066 | 4823878 | 0.46 | 0.020 | 0.0066 | 4823878 |
| Perfluorodecane Sulfonate | ug/L | 0.0043 U | 0.0043 U | 0.020 | 0.0043 | 4823878 | 0.0043 U | 0.020 | 0.0043 | 4823878 |
| Perfluorodecanoic Acid (PFDA) | ug/L | 0.0066 U | 0.0066 U | 0.020 | 0.0066 | 4823878 | 0.0066 U | 0.020 | 0.0066 | 4823878 |
| Perfluorododecanoic Acid (PFDoA) | ug/L | 0.0057 U | 0.0057 U | 0.020 | 0.0057 | 4823878 | 0.0057 U | 0.020 | 0.0057 | 4823878 |
| Perfluoroheptanoic Acid (PFHpA) | ug/L | 0.0087 J | 0.0047 U | 0.020 | 0.0047 | 4823878 | 0.34 | 0.020 | 0.0047 | 4823878 |
| Perfluorohexane Sulfonate (PFHxS) | ug/L | 0.043 | 0.0040 U | 0.020 | 0.0040 | 4823878 | 0.23 | 0.020 | 0.0040 | 4823878 |
| Perfluorohexanoic Acid (PFHxA) | ug/L | 0.021 | 0.0046 U | 0.020 | 0.0046 | 4823878 | 1.5 (1) | 0.80 | 0.17 | 4827845 |
| Perfluoro-n-Octanoic Acid (PFOA) | ug/L | 0.0063 J | 0.0053 U | 0.020 | 0.0053 | 4823878 | 0.077 | 0.020 | 0.0053 | 4823878 |
| Perfluorononanoic Acid (PFNA) | ug/L | 0.0046 U | 0.0046 U | 0.020 | 0.0046 | 4823878 | 0.0046 U | 0.020 | 0.0046 | 4823878 |
| Perfluorooctane Sulfonamide (PFOSA) | ug/L | 0.0058 U | 0.0058 U | 0.020 | 0.0058 | 4823878 | 0.0058 U | 0.020 | 0.0058 | 4823878 |
| Perfluorooctane Sulfonate (PFOS) | ug/L | 0.015 J | 0.0033 U | 0.020 | 0.0033 | 4823878 | 0.051 | 0.020 | 0.0033 | 4823878 |
| Perfluoropentanoic Acid (PFPeA) | ug/L | 0.019 J | 0.0036 U | 0.020 | 0.0036 | 4823878 | 2.4 (1) | 0.80 | 0.21 | 4827845 |
| Perfluorotetradecanoic Acid | ug/L | 0.0052 U | 0.0052 U | 0.020 | 0.0052 | 4823878 | 0.0052 U | 0.020 | 0.0052 | 4823878 |
| Perfluorotridecanoic Acid | ug/L | 0.0032 U | 0.0032 U | 0.020 | 0.0032 | 4823878 | 0.0032 U | 0.020 | 0.0032 | 4823878 |
| Perfluoroundecanoic Acid (PFUnA) | ug/L | 0.0037 U | 0.0037 U | 0.020 | 0.0037 | 4823878 | 0.0037 U | 0.020 | 0.0037 | 4823878 |
| **Surrogate Recovery (%)** | | | | | | | | | | |
| 13C4-Perfluorooctanesulfonate | % | 77 | 91 | N/A | N/A | 4823878 | 86 | N/A | N/A | 4823878 |
| 13C4-Perfluorooctanoic acid | % | 93 | 96 | N/A | N/A | 4823878 | 89 | N/A | N/A | 4823878 |
| 13C8-Perfluorooctanesulfonamide | % | 70 | 83 | N/A | N/A | 4823878 | 73 | N/A | N/A | 4823878 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to high concentration of the target analyte, sample required high level analysis. Detection limit was adjusted accordingly.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B706385
Report Date: 2017/01/25

USACE WAB
Client Project #: PFC USACE Baltimore District

## RESULTS OF ANALYSES OF WATER

| Maxxam ID | | DSX794 | | | | DSX795 | DSX796 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2017/01/10 | | | | 2017/01/10 | 2017/01/10 | | | |
| COC Number | | 593810-01-01 | | | | 593810-01-01 | 593810-01-01 | | | |
| | UNITS | DUP-1 | RDL | MDL | QC Batch | FIELD BLANK | TRIP BLANK | RDL | MDL | QC Batch |
| 6:2 Fluorotelomer sulfonate | ug/L | 3.7 (1) | 0.80 | 0.21 | 4827845 | 0.0065 U | 0.0065 U | 0.020 | 0.0065 | 4823878 |
| 8:2 Fluorotelomer sulfonate | ug/L | 0.0055 U | 0.020 | 0.0055 | 4823878 | 0.0055 U | 0.0055 U | 0.020 | 0.0055 | 4823878 |
| Perfluorobutane Sulfonate (PFBS) | ug/L | 0.10 | 0.020 | 0.0019 | 4823878 | 0.0019 U | 0.0019 U | 0.020 | 0.0019 | 4823878 |
| Perfluorobutanoic acid | ug/L | 0.46 | 0.020 | 0.0066 | 4823878 | 0.0066 U | 0.0066 U | 0.020 | 0.0066 | 4823878 |
| Perfluorodecane Sulfonate | ug/L | 0.0043 U | 0.020 | 0.0043 | 4823878 | 0.0043 U | 0.0043 U | 0.020 | 0.0043 | 4823878 |
| Perfluorodecanoic Acid (PFDA) | ug/L | 0.0066 U | 0.020 | 0.0066 | 4823878 | 0.0066 U | 0.0066 U | 0.020 | 0.0066 | 4823878 |
| Perfluorododecanoic Acid (PFDoA) | ug/L | 0.0057 U | 0.020 | 0.0057 | 4823878 | 0.0057 U | 0.0057 U | 0.020 | 0.0057 | 4823878 |
| Perfluoroheptanoic Acid (PFHpA) | ug/L | 0.36 | 0.020 | 0.0047 | 4823878 | 0.0047 U | 0.0047 U | 0.020 | 0.0047 | 4823878 |
| Perfluorohexane Sulfonate (PFHxS) | ug/L | 0.22 | 0.020 | 0.0040 | 4823878 | 0.0040 U | 0.0040 U | 0.020 | 0.0040 | 4823878 |
| Perfluorohexanoic Acid (PFHxA) | ug/L | 1.2 (1) | 0.80 | 0.17 | 4827845 | 0.0046 U | 0.0046 U | 0.020 | 0.0046 | 4823878 |
| Perfluoro-n-Octanoic Acid (PFOA) | ug/L | 0.076 | 0.020 | 0.0053 | 4823878 | 0.0053 U | 0.0053 U | 0.020 | 0.0053 | 4823878 |
| Perfluorononanoic Acid (PFNA) | ug/L | 0.0046 U | 0.020 | 0.0046 | 4823878 | 0.0046 U | 0.0046 U | 0.020 | 0.0046 | 4823878 |
| Perfluorooctane Sulfonamide (PFOSA) | ug/L | 0.0058 U | 0.020 | 0.0058 | 4823878 | 0.0058 U | 0.0058 U | 0.020 | 0.0058 | 4823878 |
| Perfluorooctane Sulfonate (PFOS) | ug/L | 0.048 | 0.020 | 0.0033 | 4823878 | 0.0033 U | 0.0033 U | 0.020 | 0.0033 | 4823878 |
| Perfluoropentanoic Acid (PFPeA) | ug/L | 2.3 (1) | 0.80 | 0.21 | 4827845 | 0.0036 U | 0.0036 U | 0.020 | 0.0036 | 4823878 |
| Perfluorotetradecanoic Acid | ug/L | 0.0052 U | 0.020 | 0.0052 | 4823878 | 0.0052 U | 0.0052 U | 0.020 | 0.0052 | 4823878 |
| Perfluorotridecanoic Acid | ug/L | 0.0032 U | 0.020 | 0.0032 | 4823878 | 0.0032 U | 0.0032 U | 0.020 | 0.0032 | 4823878 |
| Perfluoroundecanoic Acid (PFUnA) | ug/L | 0.0037 U | 0.020 | 0.0037 | 4823878 | 0.0037 U | 0.0037 U | 0.020 | 0.0037 | 4823878 |
| **Surrogate Recovery (%)** | | | | | | | | | | |
| 13C4-Perfluorooctanesulfonate | % | 90 | N/A | N/A | 4823878 | 69 Q (2) | 56 Q (2) | N/A | N/A | 4823878 |
| 13C4-Perfluorooctanoic acid | % | 95 | N/A | N/A | 4823878 | 84 | 78 | N/A | N/A | 4823878 |
| 13C8-Perfluorooctanesulfonamide | % | 85 | N/A | N/A | 4823878 | 56 Q (2) | 56 Q (2) | N/A | N/A | 4823878 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to high concentration of the target analyte, sample required high level analysis. Detection limit was adjusted accordingly.

(2) Surrogate recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the surrogate. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low surrogate recovery.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B706385
Report Date: 2017/01/25

USACE WAB
Client Project #: PFC USACE Baltimore District

## TEST SUMMARY

**Maxxam ID:** DSX791
**Sample ID:** MW-10
**Matrix:** Water

**Collected:** 2017/01/10
**Shipped:**
**Received:** 2017/01/11

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| PFOS and PFOA in water | LCMS | 4823878 | 2017/01/13 | 2017/01/16 | (b) (6) |

**Maxxam ID:** DSX792
**Sample ID:** MW-10 FBR
**Matrix:** Water

**Collected:** 2017/01/10
**Shipped:**
**Received:** 2017/01/11

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| PFOS and PFOA in water | LCMS | 4823878 | 2017/01/13 | 2017/01/16 | (b) (6) |

**Maxxam ID:** DSX793
**Sample ID:** MW-8 MS/MSD
**Matrix:** Water

**Collected:** 2017/01/10
**Shipped:**
**Received:** 2017/01/11

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| PFOS and PFOA in water | LCMS | 4827845 | 2017/01/17 | 2017/01/17 | (b) (6) |

**Maxxam ID:** DSX794
**Sample ID:** DUP-1
**Matrix:** Water

**Collected:** 2017/01/10
**Shipped:**
**Received:** 2017/01/11

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| PFOS and PFOA in water | LCMS | 4827845 | 2017/01/17 | 2017/01/17 | (b) (6) |

**Maxxam ID:** DSX795
**Sample ID:** FIELD BLANK
**Matrix:** Water

**Collected:** 2017/01/10
**Shipped:**
**Received:** 2017/01/11

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| PFOS and PFOA in water | LCMS | 4823878 | 2017/01/13 | 2017/01/16 | (b) (6) |

**Maxxam ID:** DSX796
**Sample ID:** TRIP BLANK
**Matrix:** Water

**Collected:** 2017/01/10
**Shipped:**
**Received:** 2017/01/11

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| PFOS and PFOA in water | LCMS | 4823878 | 2017/01/13 | 2017/01/16 | (b) (6) |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

## GENERAL COMMENTS

Sample DSX793, PFOS and PFOA in water: Test repeated.
Sample DSX794, PFOS and PFOA in water: Test repeated.

**Results relate only to the items tested.**



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B706385
Report Date: 2017/01/25

USACE WAB
Client Project #: PFC USACE Baltimore District

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4823878 | CM5 | Matrix Spike(DSX793) | 13C4-Perfluorooctanesulfonate | 2017/01/16 | | 94 | % | 70 - 130 |
| | | | 13C4-Perfluorooctanoic acid | 2017/01/16 | | 91 | % | 70 - 130 |
| | | | 13C8-Perfluorooctanesulfonamide | 2017/01/16 | | 73 | % | 60 - 120 |
| | | | 6:2 Fluorotelomer sulfonate | 2017/01/16 | | NC | % | 70 - 130 |
| | | | 8:2 Fluorotelomer sulfonate | 2017/01/16 | | 119 | % | 70 - 130 |
| | | | Perfluorobutane Sulfonate (PFBS) | 2017/01/16 | | 117 | % | 70 - 130 |
| | | | Perfluorobutanoic acid | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorodecane Sulfonate | 2017/01/16 | | 93 | % | 70 - 130 |
| | | | Perfluoroheptanoic Acid (PFHpA) | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorohexane Sulfonate (PFHxS) | 2017/01/16 | | 121 | % | 70 - 130 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorononanoic Acid (PFNA) | 2017/01/16 | | 120 | % | 70 - 130 |
| | | | Perfluorooctane Sulfonamide (PFOSA) | 2017/01/16 | | 117 | % | 70 - 130 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorotetradecanoic Acid | 2017/01/16 | | 114 | % | 70 - 130 |
| | | | Perfluorotridecanoic Acid | 2017/01/16 | | 125 | % | 70 - 130 |
| | | | Perfluoroundecanoic Acid (PFUnA) | 2017/01/16 | | 129 | % | 70 - 130 |
| | | | Perfluorodecanoic Acid (PFDA) | 2017/01/16 | | 107 | % | 70 - 130 |
| | | | Perfluorododecanoic Acid (PFDoA) | 2017/01/16 | | 104 | % | 70 - 130 |
| | | | Perfluoro-n-Octanoic Acid (PFOA) | 2017/01/16 | | 116 | % | 70 - 130 |
| | | | Perfluorooctane Sulfonate (PFOS) | 2017/01/16 | | 111 | % | 70 - 130 |
| 4823878 | CM5 | Matrix Spike DUP(DSX793) | 13C4-Perfluorooctanesulfonate | 2017/01/16 | | 82 | % | 70 - 130 |
| | | | 13C4-Perfluorooctanoic acid | 2017/01/16 | | 90 | % | 70 - 130 |
| | | | 13C8-Perfluorooctanesulfonamide | 2017/01/16 | | 74 | % | 60 - 120 |
| | | | 6:2 Fluorotelomer sulfonate | 2017/01/16 | | NC | % | 70 - 130 |
| | | | 8:2 Fluorotelomer sulfonate | 2017/01/16 | | 110 | % | 70 - 130 |
| | | | Perfluorobutane Sulfonate (PFBS) | 2017/01/16 | | 116 | % | 70 - 130 |
| | | | Perfluorobutanoic acid | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorodecane Sulfonate | 2017/01/16 | | 96 | % | 70 - 130 |
| | | | Perfluoroheptanoic Acid (PFHpA) | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorohexane Sulfonate (PFHxS) | 2017/01/16 | | 107 | % | 70 - 130 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorononanoic Acid (PFNA) | 2017/01/16 | | 114 | % | 70 - 130 |
| | | | Perfluorooctane Sulfonamide (PFOSA) | 2017/01/16 | | 120 | % | 70 - 130 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/16 | | NC | % | 70 - 130 |
| | | | Perfluorotetradecanoic Acid | 2017/01/16 | | 117 | % | 70 - 130 |
| | | | Perfluorotridecanoic Acid | 2017/01/16 | | 139 (1) | % | 70 - 130 |
| | | | Perfluoroundecanoic Acid (PFUnA) | 2017/01/16 | | 109 | % | 70 - 130 |
| | | | Perfluorodecanoic Acid (PFDA) | 2017/01/16 | | 120 | % | 70 - 130 |
| | | | Perfluorododecanoic Acid (PFDoA) | 2017/01/16 | | 122 | % | 70 - 130 |
| | | | Perfluoro-n-Octanoic Acid (PFOA) | 2017/01/16 | | 119 | % | 70 - 130 |
| | | | Perfluorooctane Sulfonate (PFOS) | 2017/01/16 | | 112 | % | 70 - 130 |
| 4823878 | CM5 | MS/MSD RPD | 6:2 Fluorotelomer sulfonate | 2017/01/16 | NC | | % | 30 |
| | | | 8:2 Fluorotelomer sulfonate | 2017/01/16 | 8.4 | | % | 30 |
| | | | Perfluorobutane Sulfonate (PFBS) | 2017/01/16 | 0.69 | | % | 30 |
| | | | Perfluorobutanoic acid | 2017/01/16 | NC | | % | 30 |
| | | | Perfluorodecane Sulfonate | 2017/01/16 | 3.6 | | % | 30 |
| | | | Perfluoroheptanoic Acid (PFHpA) | 2017/01/16 | NC | | % | 30 |
| | | | Perfluorohexane Sulfonate (PFHxS) | 2017/01/16 | 13 | | % | 30 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/16 | NC | | % | 30 |
| | | | Perfluorononanoic Acid (PFNA) | 2017/01/16 | 5.5 | | % | 30 |
| | | | Perfluorooctane Sulfonamide (PFOSA) | 2017/01/16 | 2.5 | | % | 30 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/16 | NC | | % | 30 |
| | | | Perfluorotetradecanoic Acid | 2017/01/16 | 2.4 | | % | 30 |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Perfluorotridecanoic Acid | 2017/01/16 | 11 (1) | | % | 30 |
| | | | Perfluoroundecanoic Acid (PFUnA) | 2017/01/16 | 16 | | % | 30 |
| | | | Perfluorodecanoic Acid (PFDA) | 2017/01/16 | 11 | | % | 30 |
| | | | Perfluorododecanoic Acid (PFDoA) | 2017/01/16 | 16 | | % | 30 |
| | | | Perfluoro-n-Octanoic Acid (PFOA) | 2017/01/16 | 3.2 | | % | 30 |
| | | | Perfluorooctane Sulfonate (PFOS) | 2017/01/16 | 1.4 | | % | 30 |
| 4823878 | CM5 | Spiked Blank | 13C4-Perfluorooctanesulfonate | 2017/01/16 | | 90 | % | 70 - 130 |
| | | | 13C4-Perfluorooctanoic acid | 2017/01/16 | | 94 | % | 70 - 130 |
| | | | 13C8-Perfluorooctanesulfonamide | 2017/01/16 | | 78 | % | 60 - 120 |
| | | | 6:2 Fluorotelomer sulfonate | 2017/01/16 | | 124 | % | 70 - 130 |
| | | | 8:2 Fluorotelomer sulfonate | 2017/01/16 | | 107 | % | 70 - 130 |
| | | | Perfluorobutane Sulfonate (PFBS) | 2017/01/16 | | 118 | % | 70 - 130 |
| | | | Perfluorobutanoic acid | 2017/01/16 | | 117 | % | 70 - 130 |
| | | | Perfluorodecane Sulfonate | 2017/01/16 | | 109 | % | 70 - 130 |
| | | | Perfluoroheptanoic Acid (PFHpA) | 2017/01/16 | | 129 | % | 70 - 130 |
| | | | Perfluorohexane Sulfonate (PFHxS) | 2017/01/16 | | 129 | % | 70 - 130 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/16 | | 114 | % | 70 - 130 |
| | | | Perfluorononanoic Acid (PFNA) | 2017/01/16 | | 121 | % | 70 - 130 |
| | | | Perfluorooctane Sulfonamide (PFOSA) | 2017/01/16 | | 115 | % | 70 - 130 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/16 | | 110 | % | 70 - 130 |
| | | | Perfluorotetradecanoic Acid | 2017/01/16 | | 120 | % | 70 - 130 |
| | | | Perfluorotridecanoic Acid | 2017/01/16 | | 114 | % | 70 - 130 |
| | | | Perfluoroundecanoic Acid (PFUnA) | 2017/01/16 | | 123 | % | 70 - 130 |
| | | | Perfluorodecanoic Acid (PFDA) | 2017/01/16 | | 125 | % | 70 - 130 |
| | | | Perfluorododecanoic Acid (PFDoA) | 2017/01/16 | | 110 | % | 70 - 130 |
| | | | Perfluoro-n-Octanoic Acid (PFOA) | 2017/01/16 | | 124 | % | 70 - 130 |
| | | | Perfluorooctane Sulfonate (PFOS) | 2017/01/16 | | 121 | % | 70 - 130 |
| 4823878 | CM5 | Method Blank | 13C4-Perfluorooctanesulfonate | 2017/01/16 | | 73 | % | 70 - 130 |
| | | | 13C4-Perfluorooctanoic acid | 2017/01/16 | | 88 | % | 70 - 130 |
| | | | 13C8-Perfluorooctanesulfonamide | 2017/01/16 | | 68 | % | 60 - 120 |
| | | | 6:2 Fluorotelomer sulfonate | 2017/01/16 | 0.0065 U, MDL=0.0065 | | ug/L | |
| | | | 8:2 Fluorotelomer sulfonate | 2017/01/16 | 0.0055 U, MDL=0.0055 | | ug/L | |
| | | | Perfluorobutane Sulfonate (PFBS) | 2017/01/16 | 0.0019 U, MDL=0.0019 | | ug/L | |
| | | | Perfluorobutanoic acid | 2017/01/16 | 0.0066 U, MDL=0.0066 | | ug/L | |
| | | | Perfluorodecane Sulfonate | 2017/01/16 | 0.0043 U, MDL=0.0043 | | ug/L | |
| | | | Perfluoroheptanoic Acid (PFHpA) | 2017/01/16 | 0.0047 U, MDL=0.0047 | | ug/L | |
| | | | Perfluorohexane Sulfonate (PFHxS) | 2017/01/16 | 0.0040 U, MDL=0.0040 | | ug/L | |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/16 | 0.0046 U, MDL=0.0046 | | ug/L | |
| | | | Perfluorononanoic Acid (PFNA) | 2017/01/16 | 0.0046 U, MDL=0.0046 | | ug/L | |
| | | | Perfluorooctane Sulfonamide (PFOSA) | 2017/01/16 | 0.0058 U, MDL=0.0058 | | ug/L | |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/16 | 0.0036 U, MDL=0.0036 | | ug/L | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Perfluorotetradecanoic Acid | 2017/01/16 | 0.0052 U, MDL=0.0052 | | ug/L | |
| | | | Perfluorotridecanoic Acid | 2017/01/16 | 0.0032 U, MDL=0.0032 | | ug/L | |
| | | | Perfluoroundecanoic Acid (PFUnA) | 2017/01/16 | 0.0037 U, MDL=0.0037 | | ug/L | |
| | | | Perfluorodecanoic Acid (PFDA) | 2017/01/16 | 0.0066 U, MDL=0.0066 | | ug/L | |
| | | | Perfluorododecanoic Acid (PFDoA) | 2017/01/16 | 0.0057 U, MDL=0.0057 | | ug/L | |
| | | | Perfluoro-n-Octanoic Acid (PFOA) | 2017/01/16 | 0.0053 U, MDL=0.0053 | | ug/L | |
| | | | Perfluorooctane Sulfonate (PFOS) | 2017/01/16 | 0.0033 U, MDL=0.0033 | | ug/L | |
| 4827845 | DZU | Matrix Spike(DSX793) | 6:2 Fluorotelomer sulfonate | 2017/01/17 | | 110 | % | 70 - 130 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/17 | | 107 | % | 70 - 130 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/17 | | 103 | % | 70 - 130 |
| 4827845 | DZU | Matrix Spike DUP(DSX793) | 6:2 Fluorotelomer sulfonate | 2017/01/17 | | 117 | % | 70 - 130 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/17 | | 96 | % | 70 - 130 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/17 | | 107 | % | 70 - 130 |
| 4827845 | DZU | MS/MSD RPD | 6:2 Fluorotelomer sulfonate | 2017/01/17 | 6.3 | | % | 30 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/17 | 10 | | % | 30 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/17 | 4.4 | | % | 30 |
| 4827845 | DZU | Spiked Blank | 6:2 Fluorotelomer sulfonate | 2017/01/17 | | 112 | % | 70 - 130 |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/17 | | 104 | % | 70 - 130 |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/17 | | 114 | % | 70 - 130 |
| 4827845 | DZU | Method Blank | 6:2 Fluorotelomer sulfonate | 2017/01/17 | 0.21 U, MDL=0.21 | | ug/L | |
| | | | Perfluorohexanoic Acid (PFHxA) | 2017/01/17 | 0.17 U, MDL=0.17 | | ug/L | |
| | | | Perfluoropentanoic Acid (PFPeA) | 2017/01/17 | 0.21 U, MDL=0.21 | | ug/L | |

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

(1) Recovery of the matrix spike was above the upper control limit. Laboratory spiked water resulted in satisfactory recovery of the compound of interest. When considered together, these QC data suggest that matrix interferences may be biasing the data high. For results that were not detected (ND), this potential bias has no impact.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B706385
Report Date: 2017/01/25

USACE WAB
Client Project #: PFC USACE Baltimore District

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

(b) (6)

(b) (6), Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca