FINAL

PFOA AND PFOS GROUNDWATER SAMPLING REPORT

FORT WILLIAM HENRY HARRISON
HELENA MONTANA

Prepared for:

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CONTRACT DMA # ENV 10-17

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1.0 INTRODUCTION

Purpose

This report presents the results of groundwater sampling and groundwater static water level measurement at Fort William Henry Harrison (FWHH) on October 25, 2017 and December 12, 2017. Tetra Tech, Inc. (EMI Unit) (Tetra Tech) was tasked to collect specific groundwater samples by the Montana Army National Guard (MTARNG) under contract DMA # ENV 10 -17. The purpose of this work was to sample for poly- and perfluoralkyl substances (PFAS) in groundwater at FWHH.

Background

PFAS (perfluoroalkyl and polyfluoroalkyl substances) are a suite of emerging contaminants of concern with potential human health risks. Aqueous Film Forming Foam (AFFF), used from the 1970's to the present, commonly contains PFAS; AFFF was used by the Department of Defense (DoD) to extinguish petroleum fires during response actions and to train firefighters. Both DoD, other federal agencies and commercial entities used AFFF as a firefighting agent. PFAS also were used industrially (e.g., in metal plating shops, water resistance for fabrics and carpets) and in common consumer products (e.g. Teflon in pans, inside popcorn bags); therefore, these chemicals may enter the environment through landfills and wastewater, or may do so as surface runoff from fire training areas or AFFF release sites.

Project Planning

Before field work, a project work plan (Tetra Tech 2017) was prepared and approved by MTARNG. The work plan is included in **Appendix A**.

This report contains three tables, three figures, and four appendices, including:

TABLE 1: STATIC WATER LEVELS AND WELL LOCATIONS

TABLE 2: FIELD PARAMETERS DURING GROUNDWATER SAMPLING AND PURGING

TABLE 3: ANALYTICAL DATA RESULTS

FIGURE 1: DATA/SAMPLE COLLECTION LOCATIONS

FIGURE 2: GROUNDWATER SURFACE

FIGURE 3: ANALYTICAL DATA

APPENDIX A: WORK PLAN

APPENDIX B: FIELD FORMS

APPENDIX C: ANALYTICAL DATA PACKAGES

APPENDIX D: PHOTOGRAPHIC LOG

2.0 METHODS AND DEVIATIONS

Sample collection, handling, and methods were detailed in the Tetra Tech work plan (**Appendix A**). The work plan was provided to, and approved by, MTARNG before field work began. This section presents an overview of methods and describes any deviations from the work plan. A photographic log showing each of the sampled groundwater wells is included in **Appendix D**.

Static Water Level, Groundwater Flow and Purging

On October 25, 2017 static water levels (SWL) were recorded relative to the top of the well casing (TOC) prior to purging and sampling. A minimum of three well volumes were purged prior to sampling using a flow rate that did not exceed 0.5 liter per minute (0.26 gallon per minute). Groundwater parameters were monitored during purging using a YSI DSSPro meter. None of the wells were purged dry. The final parameters collected before samples were collected are shown in **Table 2,** and full parameter records are presented in **Appendix B.**

MTARNG requested that water-levels be re-measured following presentation of the draft groundwater surface. Additionally, MTARNG provided a real-time kinematic global positioning system (RTK GPS) to measure well locations and elevations to improve projections for groundwater flow direction. SWL and well GPS surveying was performed on December 12, 2017 at the 9 wells originally measured on October 25, 2017.A Trimble R8 RTK was setup on Control Point 1 using WGS 84 coordinates (N46°37'43.18988", W112°05'57.74749") using the WGS 84 Ellipsoid height as the elevation (1208.69964 m). Tetra Tech could not locate sufficient additional control points to check survey network; the elevations provided in the survey should be considered relative and not contrasted to elevations in other datums.

Groundwater flow direction was estimated using SWL measurements from nine wells at FWHH. The groundwater surface was interpolated using a spline algorithm in ArcGIS 10.3 (**Figure 2**). Well BH-01 was dry and was not included in the interpolation. MTARNG and Tetra Tech staff surveyed or resurveyed well TOC elevations. Based on the RTK survey method used by MTARNG, the relative accuracy (root mean square) of the groundwater elevations is 21 millimeters.

PFAS Sampling in Groundwater

Groundwater was collected from three wells selected by MTARNG (FH-02, MW-06, and MW-08) at FWHH (shown on **Figure 1**) on October 25, 2017, using low-flow methodology. A high-density polyethylene (HDPE) bladder pump (manufactured by Geotech, Inc.) and HDPE tubing were used to collect groundwater samples. A duplicate sample (FWHH_DUPE_20171025) was also collected at well FH-02. Note that the time of sampling for FH-02 provided in the chain-of-custody document is incorrect; the actual sample collection time was 12:20 p.m. The time was intentionally entered incorrectly to ensure that the sample was submitted blind to the analytical laboratory.

Two additional quality assurance/quality control samples were collected. First, a field reagent blank (FRB) was poured at well site MW-06, using PFAS-free water provided by Test America. Wind at the time was 5 miles per hour (mph) from the northwest, gusting to 15 mph. Second, a rinsate blank was collected by passing PFAS-free water over the reusable sampling equipment (bladder pump) after it had been decontaminated. This sample was also collected at location MW-06 following groundwater sampling and decontamination procedures.

Groundwater samples were collected in two 250-milliliter (mL) bottles (500 mL per sample) provided by Test America and immediately placed on ice. After completion of field activities, the sample bottles were packed in Ziploc bags, covered with ice, and shipped overnight priority to the Test America PFAS laboratory in Sacramento, California. Samples were processed and analyzed under DoD Quality Systems Manual (QSM) 5.0 protocols, analytical Method 537 Modified.

Level IV data packages were received from Test America and validated to Stage IV by Tetra Tech chemists. Validation was performed in accordance with the EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA 2009). Analytical data were evaluated in general accordance with the EPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (EPA 2017).

The results presented in this document, and associated data qualifiers, reflect the Tetra Tech validated data. The validation report, and all analytical materials and reports for this sampling effort, are presented in **Appendix C**.

Deviations from Work Plan: The work plan reported that samples would be submitted to ALS laboratories (Kelso, Washington). However, the laboratory was unable to receive the samples as a result of recent DoD decertification. Test America laboratories was instead selected as an alternate after consultation and approval by MTARNG. Also in the work plan, sample collection was specified using two 60 mL HDPE containers. Instead, Test America provided two 250 mL containers for sample collection. No other modifications of field activities were necessary to accommodate the changed analytical laboratory protocol.

As stated previously, water level measurements were taken again in December 2017, which represents a deviation from the original work plan.

3.0 RESULTS

Figure 1 shows both the location map with wells used for either static water levels and/or sampling. **Figure 2** shows the resulting groundwater flow from the modeled results from only those 9 wells. **Figure 3** shows the validated analytical results at each well sampled. The groundwater elevation model presented in **Figure 2** should not be viewed as definitive due to the sparsity of the monitoring well network.

MONITORING WELL LEGEND

ANALYTICAL SAMPLE + GROUNDWATER LEVEL

GROUNDWATER LEVEL ONLY

N

0 500 1,000

1 Inch = 500 Feet

Fort Harrison
Helena, Montana

FIGURE 1
DATA/SAMPLE COLLECTION LOCATIONS

TETRA TECH

Figure-1_Sample Locations.mxd - DWH - 11/13/2017

Aerial Imagery Source: © 2017 DigitalGlobe ©CNES (2017) Distribution Airbus DS © 2017 HERE © 2017 Microsoft Corporation

Groundwater elevations interpolated using spline algorithm in ArcGIS 10.3.
The well names and groundwater elevations are shown adjacent to each interpolation point.
Well BH-01 was not included in interpolation because the well was dry.
Groundwater elevation accuracy is estimated to be +/- one inch based upon RTK GPS survey.

Fort Harrison
Helena, Montana

FIGURE 2
GROUNDWATER SURFACE
12/12/2017

TETRA TECH

Figure-2_ Groundwater_Surf_Rev2.mxd - SLM - 12/15/2017

Detected Analytes	FH-02	FH-02 (DUPE)	MW-06	MW-08
Perfluorobutanesulfonic acid (PFBS)	2.7	2.7	0.74 J	29
Perfluorobutanoic acid (PFBA)	7.4	7.3	6.8	46
Perfluoroheptanoic acid (PFHpA)	4.5	4.2	1.4 J	22
Perfluorohexanesulfonic acid (PFHxS)	16	17	2.4 J+	57
Perfluorohexanoic acid (PFHxA)	13	13	2.2 J	120
Perfluorononanoic acid (PFNA)	0.58 J	0.58 J	<1.5 U	0.22 J
Perfluorooctanesulfonic acid (PFOS)	9.4	10	<3.1 U	5.8
Perfluorooctanoic acid (PFOA)	7.2	7.3	1.6 J	11
Perfluoropentanoic acid (PFPeA)	18	17	2.4	180
Perfluorotetradecanoic acid (PFTeA)	<1.5 U	0.23 J	<1.5 U	<1.5 U
6:2FTS	3.2 J	<15 U	<15 U	<15 U

LEGEND

SAMPLED WELL

N

0 500 1,000

1 Inch = 500 Feet

Full analytical results presented in Table 3.
Analyte concentrations in nanograms per liter (ng/L).

< The analyte was analyzed for, but was not detected at or above the associated value (reporting limit)
J The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample
J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased high
U The analyte was analyzed for, but was not detected at or above the associated value (reporting limit)

Fort Harrison
Helena, Montana

FIGURE 3
ANALYTICAL DATA

TETRA TECH

Figure-3_Analytical.mxd - DWH - 11/13/2017

Analytical results are presented in **Table 3** and shown on **Figure 3**. No data were disqualified or rejected during validation. The data presented in **Table 3** and **Figure 3** represent the Tetra Tech validated data; laboratory data, reports, and validation data are found in **Appendix C**.

No analytes were detected in the field reagent blank. Trace concentrations of perfluorobutanoic acid, perfluorohexanesulfonic acid, and perfluorooctanesulfonic acid were found in the rinsate blank. The occurrence of these analytes in the rinsate blank did not have an appreciable impact on the data quality, with the exception of perfluorohexanesulfonic acid in the sample from MW-06, which was qualified as biased high (J+). Analyte concentrations in the sample duplicate varied by less than 10 percent relative to the primary sample.

4.0 REFERENCES

Tetra Tech, Inc. 2017. Groundwater Sampling Work Plan. Fort William Henry Harrison, Helena, MT. October.

U.S. Army Corps of Engineers (USACE). 2016. Chemistry Requirements – PFAS. Omaha, NE. August.

USACE. 2017. Uniform federal policy – quality assurance project plan. Sampling and analysis for perfluorooctane sulfonate (PFOS) and perfluoroctanoic acid (PFOA) for Army National Guard – owned/operated drinking water systems nationwide. Volume I. Revision 0. Baltimore, MD. February.

U.S. Environmental Protection Agency (EPA). 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. EPA 540-R-08-005. January.*

EPA. 2016. Fact sheet: PFOA and PFOS Drinking Water Health Advisories. EPA 800-F-16-003. November.

EPA. 2017. National Functional Guidelines (NFG) for Organic Superfund Methods Data Review. EPA-540-R-2017-002. January

TABLES

TABLE 1: STATIC WATER LEVELS AND WELL LOCATIONS
TABLE 2: FIELD PARAMATERS DURING GROUNDWATER SAMPLING AND PURGING
TABLE 3: ANALYTICAL RESULTS

TABLE 1
STATIC WATER LEVELS AND WELL LOCATIONS

Well ID	Sample ID	Static Water Level [feet btoc] 10/25/2017	10/12/2017	Easting [m UTM Zone 12]	Northing [m UTM Zone 12]	TOC Elevation [feet]	Latitude (WGS 84) [dd]	Longitude (WGS 84) [dd]
BH-01	N/A	DRY	DRY	415878.414	5163395.036	3967.74	46.61885	-112.09872
BH-02	N/A	30.88	30.81	415878.783	5163328.128	3968.11	46.61825	-112.09870
FH-02	FHWW_FH-02_20171025 FHWW_DUPE_20171025	42.02	42.28	416159.225	5163575.064	3955.03	46.62050	-112.09508
MW-02	N/A	58.09	51.71	415699.578	5164564.436	3975.47	46.62935	-112.10127
MW-05	N/A	31.29	30.1	416066.328	5164538.169	3954.94	46.62916	-112.09647
MW-06	FHWW_MW-06_20171025	28.88	27.74	416155.703	5164533.929	3952.51	46.62913	-112.09530
MW-07	N/A	24.67	23.54	416279.287	5164547.283	3948.37	46.62927	-112.09369
MW-08	FHWW_MW-08_20171025	38.21	37.11	415941.963	5164234.652	3959.16	46.62641	-112.09804
MW-10	N/A	48.51	46.96	415607.290	5164355.525	3977.07	46.62746	-112.10243

Notes

Coordinates based upon relative RTK GPS survey using a Trimble R8 based at control point 1 (N46°37'43.18988", W112°05'57.74749") with an ellipsoid height of 1208.6996 meters. Horizontal coordinates converted to UTM using ArcGIS 10.3 and a NAD 83 datum.

-	No data
dd	Decimal degree
DRY	No water was observed in the well
feet btoc	Feet below top of column
m	meter
N/A	Not applicable / no sample collected
NAD 83	North American Datum of 1983
RTK GPS	Real Time Kinematic Global Positioning System
UTM	Universal Transverse Mercator coordinate system
WGS84	World Geodetic System 1984

TABLE 2
FIELD PARAMATERS DURING GROUNDWATER SAMPLING AND PURGING

Sample	Location	Sample Collection				Reading at End of Purging[a]					
		Date	Time	Purge Volume [gal]	Depth to Water [ft btoc]	pH	Sp. Cond. [µS/cm]	ORP [mV]	DO [mg/L]	Turbidity [NTU]	Temp [°C]
FHWW_FH-02_20171025	FH-02	10/25/2017	12:20	10.4	42.02	7.52	1289	21.80	7.99	-0.7	12.0
FHWW_MW-06_20171025	MW-06	10/25/2017	14:40	6.6	28.88	7.45	1025	13.90	6.28	5.5	11.8
FHWW_MW-08_20171025	MW-08	10/25/2017	17:30	13.1	38.21	7.66	1342	23.80	8.76	5.4	11.1

Notes:

Analytical Sample FWHH_DUPE_20171025 was a duplicate of FWHH_FH-02_20171025.

°C	Degrees centigrade
(a)	Field measurements were collected during well purging, prior to sample collection.
btoc	Below top of casing
DO	Dissolved oxygen
gal	Gallons
mg/L	Milligrams per liter
µS/cm	Microsiemens per centimeter
mV	Millivolt
ORP	Oxidation reduction potential
Sp. Cond.	Specific conductance
Temp	Temperature

TABLE 3
ANALYTICAL DATA

	Sample Location/Type:		**FH-02**	**FH-02 (DUPLICATE)**	**MW-06**	**MW-08**	**Rinsate**	**Field Reagent Blank**
		Sample ID:	**FWHH_FH-02_20171025**	**FWHH_DUPE_20171025**	**FWHH_MW-06_20171025**	**FWHH_MW-08_20171025**	**FWHH_RINSATE_20171025**	**FWHH_FRB_20171025**
Analyte	**Units**	**Date**						
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	ng/L	10/25/2017	<15 U	<15 U	<15 U	<15 U	<15 U	<18 U
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	ng/L	10/25/2017	<15 U	<15 U	<15 U	<15 U	<15 U	<18 U
Perfluorobutanesulfonic acid (PFBS)	ng/L	10/25/2017	2.7	2.7	0.74 J	29	<1.5 U	<1.8 U
Perfluorobutanoic acid (PFBA)	ng/L	10/25/2017	7.4	7.3	6.8	46	0.34 J	<1.8 U
Perfluorodecanoic acid (PFDA)	ng/L	10/25/2017	<1.5 U	<1.5 U	<1.5 U	<1.5 U	<1.5 U	<1.8 U
Perfluorododecanoic acid (PFDoA)	ng/L	10/25/2017	<3.1 U	<3.1 U	<3.1 U	<3.1 U	<3.1 U	<3.5 U
Perfluoroheptanoic acid (PFHpA)	ng/L	10/25/2017	4.5	4.2	1.4 J	22	<1.5 U	<1.8 U
Perfluorohexanesulfonic acid (PFHxS)	ng/L	10/25/2017	16	17	2.4 J+	57	0.26 J	<1.8 U
Perfluorohexanoic acid (PFHxA)	ng/L	10/25/2017	13	13	2.2 J	120	<3.1 U	<3.5 U
Perfluorononanoic acid (PFNA)	ng/L	10/25/2017	0.58 J	0.58 J	<1.5 U	0.22 J	<1.5 U	<1.8 U
Perfluorooctanesulfonic acid (PFOS)	ng/L	10/25/2017	9.4	10	<3.1 U	5.8	0.42 J	<3.5 U
Perfluorooctanoic acid (PFOA)	ng/L	10/25/2017	7.2	7.3	1.6 J	11	<3.1 U	<3.5 U
Perfluoropentanoic acid (PFPeA)	ng/L	10/25/2017	18	17	2.4	180	<1.5 U	<1.8 U
Perfluorotetradecanoic acid (PFTeA)	ng/L	10/25/2017	<1.5 U	0.23 J	<1.5 U	<1.5 U	<1.5 U	<1.8 U
Perfluorotridecanoic Acid (PFTriA)	ng/L	10/25/2017	<3.1 U	<3.1 U	<3.1 U	<3.1 U	<3.1 U	<3.5 U
Perfluoroundecanoic acid (PFUnA)	ng/L	10/25/2017	<3.1 U	<3.1 U	<3.1 U	<3.1 U	<3.1 U	<3.5 U
6:2FTS	ng/L	10/25/2017	3.2 J	<15 U	<15 U	<15 U	<15 U	<18 U
8:2FTS	ng/L	10/25/2017	<15 U	<15 U	<15 U	<15 U	<15 U	<18 U

Notes:

Analytes in bold were detected in one or more groundwater sample(s)
Duplicate sample was collected from well FH-02; Rinsate and Field Regent Blank samples collected at MW-06
The values presented were validated by Tetra Tech chemists using EPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (EPA 2017)
Validation report, Laboratory reports, and electronic data are included in Appendix C

ng/L Nanogram per liter
< The analyte was analyzed for, but was not detected at or above the associated value (reporting limit)
J The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample
J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased high
U The analyte was analyzed for, but was not detected at or above the associated value (reporting limit)

APPENDIX A

WORK PLAN

SAMPLING AND ANALYSIS PLAN

GROUNDWATER SAMPLING
MONTANA ARMY NATIONAL GUARD
FORT WILLIAM HENRY HARRISON

Helena, Montana

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CONTENTS

ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
AFFF	Aqueous film forming foam
CoC	Chain of custody
DEQ	Department of Environmental Quality
DO	Dissolved oxygen
DoD	Department of Defense
EDD	Electronic data deliverable
EPA	United States Environmental Protection Agency
FRB	Field reagent blank
FWWH	Fort William Henry Harrison
HA	Health Advisory
HASP	Health and Safety Plan
HDPE	High-density polyethylene
LDPE	Low-density polyethylene
mL	Milliliter
MTARNG	Montana Army National Guard
ng/L	Nanograms per liter
ORP	Oxidation-reduction potential
PFBA	Perfluorobutanoic acid
PFAS	Polyfluoroalkyl substance
PFC	Perfluorinated compound
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
QSM	Quality Systems Manual
SOP	Standard operating procedure
Tetra Tech	Tetra Tech, Inc. (EMI Unit)
USACE	United States Army Corps of Engineers

1.0 INTRODUCTION

Tetra Tech, Inc. (EMI Unit) (Tetra Tech) was tasked to conduct groundwater sampling for the Montana Army National Guard (MTARNG) at Fort William Henry Harrison (FWHH) under contract DMA # ENV 10 -17. The purpose of this work was to assess presence of perfluorinated compounds (PFC) in groundwater resulting from previous releases of aqueous film forming foams (AFFF).

PFCs represent a family of manmade fluorinated chemicals. The term “PFCs” in this report refers to perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and similar, related perfluoroalkyl and polyfluoroalkyl substances (PFAS). PFCs are a suite of emerging contaminants of concern that may pose potential human health risks to sensitive populations. The U.S. Environmental Protection Agency (EPA) has determined that exposure to PFCs at concentrations above certain levels may result in adverse health effects. In May 2016, EPA issued Drinking Water Health Advisories (HA) specifying 70 nanograms per liter (ng/L) as the health benchmark for PFOA and PFOS (individual and combined concentrations) in drinking water (EPA 2016).

A common military source of PFCs was use of PFOS-containing AFFF to extinguish petroleum fires during response actions, and to train firefighters to respond to petroleum fires or suppression of fires in uncontained areas. AFFF is a firefighting agent used both commercially and by the Department of Defense (DoD). Military use of AFFF began in the 1970s, significantly at DoD installations with airfields. PFCs also were utilized industrially (for example, in metal plating shops). Because of their presence in many consumer products, these chemicals may enter the environment through landfills and wastewater, or may do so as surface runoff from fire training areas or release sites.

In addition to this introduction, this abbreviated work plan includes the following sections:

- Section 2: Preliminary Tasks
- Section 3: Field Sampling Plan
- Section 4: Laboratory Analysis
- Section 5: Data Validation and Reduction Methods
- Section 6: Reporting

Four appendices after the text of this report are as follows:

A Health and Safety Plan (HASP)
B. Standard Operating Procedures (SOP)
C. Chain-of-Custody (COC) Documentation
D. Laboratory Credentials and Reporting Limits

2.0 PRELIMINARY TASKS

Prior to initiation of field work, and based on written authorization from MTARNG, Tetra Tech will:

1. Coordinate with the MTARNG point of contact (LTC Adel Johnson, PE) and MTARNG staff to schedule field work. Groundwater sampling is expected to take 1 day, and will occur on or prior to October 27, 2017. MTARNG will help Tetra Tech identify any applicable personnel or entities affected by the field work, and ensure that they receive notice prior to field operations. (Note: The strict sampling protocol for PFCs could require rescheduling of sampling in the event of rain, snow, or high winds.)
2. Submit a draft and final work plan to MTARNG for the proposed work, and receive written authorization and concurrence for the work to proceed.
3. Develop a HASP complying with all applicable safety laws and standards. MTARNG will review the HASP to ensure compliance with FWHH safety protocols.

3.0 SAMPLING PLAN

Tetra Tech will perform groundwater level monitoring and groundwater sampling at three wells (MW-06, MW-08, and FH-02) at FWHH. Locations of these wells are shown on Figure 1. Groundwater levels also will be measured at additional wells specified by MTARNG if access is granted. Groundwater samples will be collected and analyzed for PFCs via EPA Method 537 Modified; a discussion of the analysis and analytes is in Section 4.0.

Groundwater sampling will proceed by application of low-flow methodologies (PFC-free portable bladder pump), as specified in Tetra Tech SOP 15-2 (Tetra Tech 2014, see Appendix B). Consistent with uniform federal policy for PFC sampling (USACE 2016, 2017), groundwater sampling procedures will include the following modifications to minimize the potential for samples for PFCs to be contaminated by common personal and professional items:

1. None of the following items will be allowed on field personnel, and will not be used or present during sampling: any Teflon or low-density polyethylene (LDPE) item, aluminum foil, waterproof field books, plastic clipboards, binders, spiral hardcover notebooks, Post-It Notes, re-usable chemical (blue) ice packs, new cotton clothing, synthetic water-resistant clothing, waterproof clothing, stain-treated clothing, clothing containing Gore-Tex, clothing laundered in fabric softener, Tyvek, cosmetics, moisturizers, Decon 90, and shampoo/conditioner.
2. Food and drink will not be present or consumed during sampling. Bottled water and hydration drinks will be left in the staging area.
3. Sample exposure to light will be minimized by use of amber collection vessels and opaque sampling tubing, if available.

Groundwater level monitoring will be completed prior to sampling by application of standard methods (Tetra Tech SOP 014, see Appendix B) (Tetra Tech 2009).

A minimum of three borehole volumes of groundwater will be removed from each well prior to sampling at a maximum purge rate of 1 liter per minute. Field parameters to be monitored and recorded during purging include temperature, pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), and specific conductance. Sampling will begin when field parameters have stabilized and the minimum volume has been purged. Purge data will be recorded on standard forms provided in Appendix B.

Purge water will be released to the soil surface to infiltrate the soil, consistent with USACE (2016) protocols and at the direction of MTARNG.

For each sample, 120 milliliters (mL) of water will be collected in two 60-mL high-density polyethylene (HDPE) bottles with unlined polypropylene caps. Samples then will be cooled to 4 degrees Celsius (plus or minus 2 degrees). Following completion of all sampling, groundwater vials will be shipped overnight to the analytical laboratory. Holding times for PFCs are 14 days from sampling to extraction, and 28 days from extraction to analysis.

Groundwater samples will be analyzed via EPA Method 537 Modified. Quality assurance and quality control samples will consist of one field reagent blank (FRB), one duplicate sample, one matrix spike/matrix spike duplicate sample, and one equipment rinsate sample of water run through the low-flow purge pump following decontamination of that pump.

Note: The only analytes previously identified in FWWH groundwater at concentrations exceeding screening levels were arsenic (maximum concentration 17 micrograms per liter [μg/L]) and trichloroethene (maximum concentration 6.2 μg/L) (Morrison-Maierle 2013). However, trichloroethene was not detected in the three sampling wells to be sampled for PFCs. The maximum arsenic concentration from the 2013 sampling in the wells to be sampled was at MW-08 (7 μg/L).

The FRB sample will be identified with its source location, and will be collected before collection of the corresponding field sample. Field samplers will change gloves following FRB sample collection, prior to the corresponding field sample collection. For collection of an FRB sample, the analytical laboratory will send a container of PFC-free water and an empty bottle. To collect the FRB, the field crew will open the PFC-free water bottle and carefully pour the PFC-free water into the empty, laboratory-supplied bottle. This sample container will be sent back to the analytical laboratory for PFC analysis.

If one or more analyte concentrations in a FRB are detected at greater than 7 nanograms per liter, the corresponding field sample(s) will be considered for re-collection on a case-by-case basis, in consultation with MTARNG. The rationale for this criterion is that it corresponds to DoD Quality Systems Manual (QSM) guidance for method blank acceptance criterion. The EPA HA level for PFOA, PFOS, and PFOA+PFOS is 70 ng/L.

Four groundwater samples will be collected, including one sample from each well and one duplicate (sent blind to the laboratory). Additionally, an equipment rinsate and a trip blank will be included. Thus, a total of six samples will be submitted to the analytical laboratory for analysis. Standard COC procedures will be followed, and full documentation will be provided in the final report. If COC documents are not provided by the laboratory, Tetra Tech will use the standard COC form included in Appendix C.

The naming convention for samples will be as follows:

FWWH_ID_YYYYMMDD

Where ID is the name of the well (MW-06, MW-08, and FH-02), dupe (for blind duplicate), rinsate, or travel. YYYY refers to the year, MM the month, and DD the day. For example, if well MW-06 was sampled on October 20, 2017, the sample ID would be FWWH_MW-06_20171020.

Following sampling, waste (personal and sampling equipment) will be doubled bagged and disposed of as solid waste at the local landfill.

Standard field notebooks and permanent pens (such as Sharpies) cannot be used during sampling because of the potential for sample contamination. All data and observations will be recorded on standard field sheets using ball-point pens. Field sheets will be scanned following field operations. Photographs will not be taken on FWHH property unless MTARNG grants explicit permission in writing.

4.0 SAMPLE ANALYSIS

Groundwater samples will be submitted to ALS Global (Kelso, WA) for analysis via EPA Method 537 Modified. Analytes will be as follows:

- Perfluorobutanoic acid (PFBA)
- Perfluoropentanoic acid (PFPeA)
- Perfluorobutane sulfonic acid (PFBS)
- Perfluorohexanoic acid (PFHxA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexane sulfonic acid (PFHxS)
- Perfluorooctanoic acid (PFOA)
- Perfluorononanoic acid (PFNA)
- Perfluorooctane sulfonic acid (PFOS)
- Perfluorodecanoic acid (PFDA)
- Perfluoroundecanoic acid (PFUnDA)
- Perfluorodecane sulfonic acid (PFDS)
- Perfluorododecanoic acid (PFDoDA)
- Perfluoroheptane sulfonic acid (PFHpS)
- Perfluorooctanesulfonamide (FOSA)
- N-Methyl perfluorooctane sulfonamide (MeFOSA)
- N-Ethyl perfluorooctane sulfonamide (EtFOSA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluorotetradecanoic acid (PFTeDA)
- N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)
- N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)
- N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)
- N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)
- 6:2 Fluorotelomer sulfonic acid (6:2 FTS)
- 8:2 Fluorotelomer sulfonic acid (8:2 FTS)

The standard reporting limit for all analytes will be 5 ng/L except for perfluorobutanoic acid (PFBA) (10 ng/L). Method detection limits and reporting limits are presented in Appendix D. EPA HA levels for PFOA and PFOS are set at 70 ng/L, well above the reporting limits for Method 537 Modified. None of the analytes listed above is included in Montana numerical water quality standards (Montana Department of Environmental Quality [DEQ]-7) (DEQ 2017).

ALS Global is accredited by the United States DoD Environmental Laboratory Accreditation Program for Method 537 Modified. Prior to submitting samples, Tetra Tech will confirm with the laboratory that analysis for PFCs will conform to analytical requirements specified in USACE SOPs (USACE 2016, 2017).

Sample analysis and delivery of analytical results will be expedited. Tetra Tech will contact MTARNG when the samples are submitted, and convey an estimated delivery date from the contracted laboratory. The laboratory will submit analytical data to Tetra Tech as a Level IV electronic data deliverable (EDD) package, and those data will be included in an appendix to the final investigation report. Notably, received data must be validated by Tetra Tech chemists.

5.0 DATA VALIDATION AND REDUCTION

Tetra Tech will manage analytical laboratory data packages and EDDs to ensure that data received from the analytical laboratory will meet specifications for laboratory data deliverables. Upon receipt, analytical data packages and EDDs will be reviewed for compliance with the data deliverable requirements to ensure provision of all analytical method quality control summary data and raw instrument data. Laboratory EDDs will be checked for completeness by project scientists and Tetra Tech chemists performing data validation.

Laboratory data packages will undergo validation in accordance with EPA and DoD QSM validation requirements as outlined in USACE (2017). Data validation findings will be documented in a data usability summary report that includes:

- Qualified analytical data
- Results reported by the laboratory
- Evidence that supports qualifications.

Any detected data anomalies will be discussed in the final report, and the data usability summary will be included as an appendix to the final investigation report.

6.0 REPORTING

Following data validation and analysis, Tetra Tech will submit to the Department of Military Affairs a summary report detailing investigation findings. The final report will include:

- A summary of all analytical and groundwater level monitoring data
- A map showing sampling locations
- A groundwater potentiometric surface map (assuming well elevations are known)
- A comparison of data to EPA HA levels
- An interpretation of data and recommendations.

Field notes, field sheets, and laboratory EDDs will be provided in appendices.

7.0 REFERENCES

Montana Department of Environmental Quality (DEQ). 2017. Circular DEQ-7. Montana Numerical Water Quality Standards. Helena, MT. April.

Morrison-Maierle. 2013. Fort Harrison Ground Water Sampling Summary Memorandum. Helena, MT. August.

Tetra Tech, Inc. (EMI Unit) (Tetra Tech). 2009. Environmental standard operating procedure. Static water level, total well depth, and immiscible layer measurement. SOP No. 014, revision 1. July.

Tetra Tech. 2014. Environmental standard operating procedure. Groundwater sample collection using low-flow sampling methodology. SOP No. 015, revision 2. November.

United States Army Corps of Engineers (USACE). 2016. Chemistry Requirements – PFAS. Omaha, NE. August.

USACE. 2017. Uniform federal policy – quality assurance project plan. Sampling and analysis for perfluorooctane sulfonate (PFOS) and perfluoroctonoic acid (PFOA) for Army National Guard – owned/operated drinking water systems nationwide. Volume I. Revision 0. Baltimore, MD. February.

United States Environmental Protection Agency (EPA). 2016. Fact sheet: PFOA & PFOS Drinking Water Health Advisories. EPA 800-F-16-003. November.

FIGURE

1. SAMPLE LOCATION MAP

Aerial Imagery Source: © 2017 DigitalGlobe ©CNES (2017) Distribution Airbus DS © 2017 Microsoft Corporation © 2017 HERE

LEGEND

MONITORING WELL

N

0 400 800

1 Inch = 400 Feet

Fort Harrison
Helena, Montana

FIGURE 1

SAMPLE LOCATION MAP

TETRA TECH

Figure-1_ Sampling_Locations.mxd - DWH - 10/13/2017

APPENDIX A

HEALTH AND SAFETY PLAN

Site Name: MTARNG – Fort William Henry Harrison	**Site Contact: LTC Adel Johnson, PE**	**Telephone: 406-324-3089**
Location: Fort William Henry Harrison, Helena MT	**Client Contact:Wade Juntunen**	**Telephone: 406-324-3088**
EPA ID No.	**Prepared By: Scott Morford**	**Date Prepared:10/11/2017**
Project No.	**Dates of Activities:** (HASP is not valid for periods longer than 12 months)	**Emergency Response** ☐ Yes ☒ No

Objectives:

Perform static water level measurement on between 3 and 10 groundwater monitoring wells.

Sample three wells that may be contamined with PFCs.

Site Type: *Check as many as applicable.*

☒ Active	☐ Landfill	☐ Inner-City
☐ Inactive	☐ Railroad	☐ Rural
☒ Secured	☐ Residential	☐ Remote
☐ Unsecured	☒ Industrial	☒ Other (*specify*)
		Military Base

Project Scope of Work and Site Background

Tetra Tech, Inc. (EMI Unit) (Tetra Tech) is tasked to conduct groundwater sampling for the Montana Army National Guard (MTARNG) at Fort William Henry Harrison (FWHH) under contract DMA # ENV 10 -17. The purpose of this work is to determine the presence of perfluorinated compounds (PFCs) in groundwater resulting from previous releases of aqueous film forming foams (AFFF). PFCs are classified as an emerging class of environmental contaminants and a pose a potential risk to human health and the environment.

No additional potential contamination of soils and groundwater is known at the site.

Groundwater monitoring wells are already established and located within paved areas of parking lots.

Primary hazards are large machinery equipment moving around the base. Second consideration is that sampling requires cotton clothing to prevent cross-contamination. No Tyvek, waterproof, or other synthetic barriers are acceptable.

Health and Safety Approver Comments or Additional Instructions: wear long-sleeved cotton clothing. Avoid use of sunscreen and insect reppellents, especially on hands. PPE must also include steel-toed boots. safety glasses, hardhats, and class 2 or better high-visiblity vest as well as Nitrile gloves when sampling.

Health and Safety Plan Approver Signature: Chris Draper **Date:** APPROVED *By Chris Draper at 1:26 pm, Oct 13, 2017*

Note: A minimum of two persons with appropriate training and medical surveillance must be on site for any fieldwork subject to Level 2 HASP requirements.

Initial Isolation and Protective Action Distances (for emergency response operations only): NA

Establishment of Work Zones; including exclusion, contamination reduction, and support zones; is required for ALL HAZWOPER projects. For heavy equipment (i.e. drilling operations), exclusions zone will established around each equipment or sampling location based on site conditions and or noise levels (DCN 2-04, Hearing Conservation Program) at drilling operations (i.e. a circular exclusion zone based on noise levels >85 dbA from the drill rig or a minimum of 20 feet around the rig, whichever is greater). Work zones will be delineated using cones, barrier tape or similar visual indicators.

ALL investigation-derived waste shall be drummed and remain onsite pending characterization for subsequent disposal.

Spill control shall be conducted in accordance with the requirements of SWP 5-14, *Spill and Discharge Control Practices*.

Wind Speed and Direction (approach from upwind) Use www.weather.com or www.wunderground.com		**Temperature (ºF)**	**Relative Humidity (%)**	**Probability of Precipitation (%)**	**Weather Forecast (such as partly cloudy, snow, etc.)**
Speed (mph):	**From Direction:**				
Capture weather information daily on Tailgate Safety Briefing form or in site logbook					

On-Site Supplies: ☒ First Aid Kit ☒ Fire Extinguisher ☐ Air Horn ☐ Oral Thermometer ☐ Noise Dosimeter

Known or Anticipated Site Hazards or Concerns:		
☒ Work on active roadway	☐ Overhead utilities	☐ Energized electrical systems
☐ Work over or near water	☐ Buried Utilities	☐ Portable hand tool use
☐ Explosion or fire hazard	☐ Surface or underground storage tanks	☐ Portable electrical tool use
☐ Oxygen deficiency	☒ General slips, trips, falls	☐ Machine guarding
☒ Unknown or poorly characterized chemical hazards	☐ Uneven, muddy, rugged terrain	☐ Portable fire extinguisher use
☐ Inorganic chemicals	☐ Lift (man lift, cherry picker) use	☐ Driving personal vehicles
☒ Organic chemicals	☐ Industrial truck (forklift) use	☐ All-terrain vehicle use
☐ Asbestos	☐ Wood or metal ladder use	☐ Injury and Illness Prevention Program (California only)
☐ Respirable particulates	☐ Dangerous goods shipped by air	☐ Ergonomics (California only)
☐ Respirable silica	☐ Elevated work (over 6' high)	☐ Work in strip or shaft mines
☐ Blasting and explosives	☒ Heavy equipment use or operation	☐ Client-specific safety requirements (attach to HASP)
☐ Non-ionizing radiation (lasers, UV)	☐ Construction work	☐ Confined space entry and/or rescue
☐ Ionizing radiation (alpha, beta, gamma, etc.)	☐ Excavation or trenching	☐ Methamphetamine lab
☐ Heat stress	☐ Benching, shoring, bracing	☒ Biological hazards (i.e. ticks, snakes, poisouos plants)
☒ Cold stress	☐ Scaffold use	☐ Mold
☒ Sun Exposure	☒ High noise	☐ *Other (insert)*

Explosion or Fire Potential: ☐ High ☐ Medium ☒ Low ☐ Unknown

Chemical Products Tetra Tech EM Inc. Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] for each item.)

☒ Alconox or Liquinox	☐ Calibration gas (Methane)	☐ Hydrogen gas	☐ Isopropyl alcohol
☐ Hydrochloric acid (HCl)	☐ Calibration gas (Isobutylene)	☐ Household bleach (NaOCl)	☐ HazCat Kit
☐ Nitric acid (HNO_3)	☐ Calibration gas (4-gas mixture)	☐ Sulfuric acid (H_2SO_4)	☐ Mark I Kits (*number?*) _______
☐ Sodium hydroxide (NaOH)	☒ Eyewash solution (potable water)	☐ Hexane	☒ Other (*specify*) Strong Acids

WARNING: Eyewash solution shall be readily available on ALL projects where corrosives (acids or bases) are used, including sample preservatives

Applicable Safety Programs and Safe Work Practices (SWP). Attach to HASP:

- ☒ DCN 2-04 Hearing Conservation Program (always checked)
- ☐ DCN 4-05 Trenching and Excavation Safety
- ☐ DCN 4-08 Asbestos Protection Program
- ☐ DCN 4-09 Haulage and Earth Moving
- ☐ DCN 4-10 Lead Protection Program
- ☐ SWP DCN 5-01 General Safe Work Practices
- ☒ SWP DCN 5-02 General Safe Work Practices HAZWOPER
- ☐ SWP DCN 5-03 Safe Work Practices for Office Employees
- ☐ SWP DCN 5-04 Safe Drilling Practices
- ☐ SWP DCN 5-05 Safe Direct Push (GeoProbe) Practices
- ☐ SWP DCN 5-06 Working Over or Near Water
- ☐ SWP DCN 5-07 Use of Heavy Equipment
- ☐ SWP DCN 5-08 Special Site Hazards (Firearms, Remote Sites, Mines, aircraft, etc.)
- ☐ SWP DCN 5-09 Safe Electrical Work Practices
- ☐ SWP DCN 5-10 Fall Protection Practices
- ☐ SWP DCN 5-11 Portable Ladder Safety
- ☐ SWP DCN 5-12 Drum and Container Handling Practices
- ☐ SWP DCN 5-13 Flammable Hazards and Ignition Sources
- ☒ SWP DCN 5-14 Spill and Discharge Control Practices (always checked)
- ☐ SWP DCN 5-15 Heat Stress
- ☒ SWP DCN 5-16 Cold Stress
- ☒ SWP DCN 5-17 Biohazards
- ☐ SWP DCN 5-18 Underground Storage Tank Removal Practices
- ☐ SWP DCN 5-19 Safe Lifting Procedures
- ☐ SWP DCN 5-22 Hydrographic Data Collection
- ☐ SWP DCN 5-23 Permit-Required Confined Space Entry Practices
- ☐ SWP DCN 5-24 Non-Permit-Required Confined Space Entry Practices
- ☐ SWP DCN 5-26 Prevention of Sun Exposure
- ☐ SWP DCN 5-27 Respirator Cleaning Practices
- ☐ SWP DCN 5-28 Safe Use Practices for Use of Respirators
- ☐ SWP DCN 5-35 Underground Utilities, including 5-35F, Ground Disturbance Permit
- ☐ SWP DCN 5-36 Drill Rigs

Tasks Performed At Job Site that are NOT Covered by SWPs

NOTE: Many AHA's can be found on the Health & Safety intranet site at: https://int.tetratech.com/sites/EMI/hs/Activity%20Hazard%20Analysis%20Documents/Forms/AllItems.aspx

Attach Activity Hazard Analysis (AHA) for each non-covered task

- ☒ Groundwater Sampling
- ☐ (non-covered task)
- ☐ (non-covered task)
- ☐ (non-covered task)
- ☐ (non-covered task)

Tetra Tech Employee Training and Medical Requirements:

Basic Training and Medical

- ☒ Initial 40 Hour Training
- ☐ 8-Hour Supervisor Training (one-time)
- ☒ Current 8-Hour Refresher Training
- ☐ Current Medical Clearance (including respirator use)
- ☒ Current First Aid Training and CPR Training
- ☐ Current Respirator Fit-Test

Other Specific Training and Medical Surveillance Requirements

- ☐ Confined Space Training
- ☐ Level A Training
- ☐ Radiation Training
- ☐ OSHA 10-hour Construction Safety Training
- ☐ OSHA 30-hour Construction Safety Training
- ☐ Asbestos Awareness Training
- ☐ Asbestos B-Reader X-Ray
- ☐ Blood Lead Level and ZPP Pre, during and Post-Project
- ☐ Urinary Arsenic Level Pre and Post-Project
- ☐ Other ______________________________
- ☐ Other ______________________________

Materials Present or Suspected at Site	Highest Observed Concentration (specify units and sample medium)	Exposure Limit (specify ppm or mg/m³)	IDLH Level (specify ppm or mg/m³)	Primary Hazards of the Material (explosive, flammable, corrosive, toxic, volatile, radioactive, biohazard, oxidizer, or other)	Symptoms and Effects of Acute Exposure	Photoionization Potential (eV)
Perfluorinated compounds including: Perfluorooctanoic acid Perfluorooctane sulfonic acid	Unknown	PEL = NA REL = NA TLV =NA [Skin] Hazard ☒	NA	Toxic: strong acid, cause burns	Harmful is swallowed, Causes serious eye damage.	NA
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
Specify Information Sources:						

Note: In the Exposure Limit column, include Ceiling (C) and Short-Term Exposure Limits (STEL) if they are available. Also, use the following short forms and abbreviations to complete the table above.

A = Air	IDLH = Immediately dangerous to life or health	PEL = Permissible exposure limit	TLV = Threshold limit value
Ca = Carcinogenic	mg/m³ = Milligram per cubic meter	ppm = Part per million	GW = Groundwater
eV = Electron volt	NA = Not available	REL = Recommended exposure limit	SW = Surface water
U = Unknown	NE = None established	S = Soil	Sed = Sediment

Note: If no contingency level of protection is selected, all employees covered under this plan must evacuate the immediate site area if air contaminant levels require upgrading PPE. Level A field work typically requires a Level 3 HASP. This information is available on the chemical hazards page of this HASP.

Field Activities Covered Under this HASP:

Task Description	Level of Protection[1] Primary	Level of Protection[1] Contingency	Date of Activities
1 Groundwater Level Monitoring	☐ A ☐ B ☐ C ☒ D	Level C is not authorized	October 2017
2 Groundwater Sampling	☐ A ☐ B ☐ C ☒ D	☐ A ☐ B ☐ C ☐ D	October 2017
3	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
4	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
5	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	

Site Personnel and Responsibilities (include subcontractors):

Employee Name and Office Code / Location	Task(s)	Responsibilities
Scott Morford, Helena MT. 406-437.9834. 406-461-4910.	Project Manager/Field Team Leader/Site Safety Coordinator/Field Personell	• Project Manager: Manages the overall project, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with client as necessary. Additionally, For projects lasting longer than one consecutive week on-site, the PM is responsible for conducting one field audit using Form AF-1.
Dustin Gardner, Helena MT, 406-443-521-	Field Personell	• Field Team Leader: Directs field activities, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with the Project Manager and the client as necessary
		• Field Personnel: Completes tasks as directed by the project manager, field team leader, and SSC, and follows the HASP and all SWPs and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.
		•

Note:
1. See next page for details on levels of protection

NOTE: Contingency level of protection section should be completed only if the upgraded level of protection is immediately available at the job site. If no contingency level of protection is denoted, all employees covered under this HASP must evacuate the immediate site area if air contaminant levels would require an upgrade of PPE.

Protective Equipment: (Indicate type or material as necessary for each task.)

Task	Primary Level of Protection (A,B,C,D)	PPE Component Description (Primary)	Contingency Level of Protection (A, B, C, D)	PPE Component Description (Contingency)
1	D	Respirator type: NA Cartridge type (if applicable): NA CPC material: Cotton only (due to sampling protocol) Glove material(s): Nitrile Boot material: Leather/Canvas. No waterproof materials. Other: safety glasses, hardhats, and class 2 or better high-visiblity vest		Level C is not authorized
2		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,
3		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,
4		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,
5		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other: ,

Respirator Notes:
Respirator cartridges may only be used for a maximum time of 8 hours or one work shift, whichever is less, and must be discarded at that time. For job sites with organic vapors, respirator cartridges may be used as described in this note as long as the concentration is less than 200 parts per million (ppm), the boiling point is greater than 70 °Celsius, and the relative humidity is less than 85 percent. If any of these levels are exceeded, a site-specific respirator cartridge change-out schedule must be developed and included in the HASP using Tetra Tech Form RP-2 (Respiratory Hazard Assessment Form)

Notes:
All levels of protection must include eye, head, and foot protection.
CPC = Chemical protective clothing
Thermoluminescent Dosimeter (TLD) Badges must be worn during all field activities on sites with radiation hazards. TLDs must be worn under CPC.

Monitoring Equipment: All monitoring equipment on site must be calibrated before and after each use and results recorded in the site logbook

Instrument (Check all required)	Task	Instrument Reading	Action Guideline	Comments
☐ Combustible gas indicator model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	0 to 10% LEL	Monitor; evacuate if confined space	
		10 to 25% LEL	Potential explosion hazard; notify SSC	
		>25% LEL	Explosion hazard; interrupt task; evacuate site; notify SSC	
☐ Oxygen meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	>23.5% Oxygen	Potential fire hazard; evacuate site	
		23.5 to 19.5% Oxygen	Oxygen level normal	
		<19.5% Oxygen	Oxygen deficiency; interrupt task; evacuate site; notify SSC	
☐ Radiation survey meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Normal background	Proceed	Annual exposure not to exceed 1,250 mrem per quarter Background reading must be taken in an area known to be free of radiation sources.
		Two to three times background	Notify SSC	
		>Three times background	Radiological hazard; interrupt task; evacuate site; notify RSO	
☐ Photoionization detector model: ☐ 11.7 eV ☐ 10.6 eV ☐ 10.2 eV ☐ 9.8 eV ☐ Other (specify): ____________	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Any response above background to 5 ppm above background	Level B is recommended Level C[a] may be acceptable	These action levels are for unknown gases or vapors. After the contaminants are identified, action levels should be based on the specific contaminants involved.
		> 5 to 500 ppm above background	Level B	
		> 500 ppm above background	Level A	
☐ Flame ionization detector model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Any response above background to 5 ppm above background	Level B is recommended Level C[a] may be acceptable	These action levels are for unknown gases or vapors. After the contaminants are identified, action levels should be based on the specific contaminants involved.
		>5 to 500 ppm above background	Level B	
		>500 above background	Level A	
☐ Detector tube models:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify: < 1/2 the PEL > 1/2 the PEL	Specify:	The action level for upgrading the level of protection is one-half of the contaminant's PEL. If the PEL is reached, evacuate the site and notify a safety specialist
☐ Other (specify):	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify:	Specify:	

Notes:
eV= electron volt LEL=Lower explosive limit mrem=Millirem PEL=Permissible exposure limit ppm=Part per million
a. Level B is required when chemical hazards are present, but are uncharacterized. Level C may be acceptable for certain tasks in some situations. If you are uncertain, consult your Safety Manager.

Project-Specific Industrial Hygiene Requirements

OSHA-Regulated Chemicals*:

Check any present on the job site in any medium (air, water, soil)

- ☐ No chemicals below are located on the job site
- ☐ Friable Asbestos
- ☐ Silica, crystalline
- ☐ alpha-Napthylamine
- ☐ Methyl chloromethyl ether
- ☐ 3,3'-Dichlorobenzidine (and its salts)
- ☐ bis-Chloromethyl ether
- ☐ beta-Napthylamine
- ☐ Benzidine
- ☐ 4-Aminodiphenyl
- ☐ Ethyleneimine
- ☐ beta-Propiolactone
- ☐ 2-Acetylaminoflourene
- ☐ 4-Dimethylaminoazobenzene
- ☐ N-nitrosomethylamine
- ☐ Vinyl chloride
- ☐ Inorganic arsenic
- ☐ Lead
- ☐ Chromium (VI)
- ☐ Cadmium
- ☐ Benzene
- ☐ Coke oven emissions
- ☐ 1,2-Dibromo-3-chloropropane
- ☐ Acrylonitrile
- ☐ Ethylene oxide
- ☐ Formaldehyde
- ☐ Methylenedianiline
- ☐ 1,3-Butadiene
- ☐ Methylene chloride

* NOTE: Many states, including California and New Jersey, have chemical-specific worker protection requirements and standards for many chemicals and known or suspected carcinogens.

Emergency Contacts:	**Telephone No.**
WorkCare and Incident Intervention	888.449.7787, or 800.455.6155
Tetra Tech EMI 24-hour Anonymous Hazard Reporting Line	866.383.8070
U.S. Coast Guard National Response Center	800.424.8802
InfoTrac	800.535.5053
Poison Control	800.222.1222
Fire department	911
Police department	911

Personnel Call-Down List:

Job Title or Position:	**Name**	**Cell Phone:**
Safety Manager	Denny COX	(816) 412-1747
Project Manager:	Scott Morford	(406) 461-4910
Field Team Leader:	Scott Morford	(406) 461-4910
Site Safety Coordinator (SSC):	Scott Morford	(406) 461-4910
Subcontractor SSC:		

Medical and Site Emergencies:

Signal a site or medical emergency with three blasts of a loud horn (car horn, fog horn, or similar device). Site personnel should evacuate to the area of safe refuge designated on the site map.

Hospital Name: St. Peters
Address: 2475 E Broadway St
Helena MT

General Phone: 406) 442-2480
Emergency Phone: 911
Ambulance Phone: 911

Hospital called to verify emergency services are offered? YES ☒ NO ☐

Step-by-step Route to Hospital: (see Page 11 of 12 for route map)

See next page

Note: This page must be posted on site.

Directions to hospital

1. Head south on Williams St toward Honors Dr

3 min (1.2 mi)

Continue on Euclid Ave to Helena

11 min (4.6 mi)

2. Turn left onto Euclid Ave

2.4 mi

3. Continue onto W Lyndale Ave

1.0 mi

4. Continue onto N Montana Ave

0.6 mi

5. Use the left 2 lanes to turn left onto US-12 E/11th Ave (signs for I-15 E/US-287 E)

0.7 mi

Take Colonial Dr to E Broadway St

2 min (1.0 mi)

6. Slight right onto 11th Ave

0.3 mi

7. Continue onto Colonial Dr

0.6 mi

8. Turn right onto E Broadway St

Destination will be on the left

0.1 mi

Decontamination Procedures

The site safety coordinator overseas implementation of project decontamination procedures and is responsible for ensuring they are effective.

Personnel Decontamination

Level D Decon - ☒ Wet ☐ Dry

Level C Decon - ☐ Wet ☐ Dry

Level B Decon – Briefly outline the level B decontamination methods to be used on a separate page attached to this HASP.

Level A Decon – A Level 3 HASP is required. Notify your Safety Manager.

Equipment Decontamination

All tools, equipment, and machinery from the Exclusion Zone (hot) or Contamination Reduction Zone (warm) are decontaminated in the CRZ before they are removed to the Support Zone (cold). Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure, cross-contamination, and chemical incompatibilities.

Respirator Decontamination

Respirators are decontaminated in compliance with SWP 5-27 and should be included with this HASP.

Waste Handling for Decontamination

Procedures for decontamination waste disposal meet all applicable local, state, and federal regulations.

Decontamination Equipment

☐ Washtubs
☒ Buckets
☐ Scrub brushes
☐ Pressurized sprayer
☒ Detergent [Liquinox
☐ Solvent [Type]
☐ Household bleach solution
Concentration/Dilution: ___________
☐ Deionized water
☐ Disposable sanitizer wipes
☒ Potable eyewash/drench/wash water
☐ Wire brush
☐ Spray bottle
☒ Tubs / pools
☐ Banner/barrier tape
☐ Plastic sheeting
☐ Tarps and poles
☒ Trash bags
☐ Trash cans
☐ Duct tape
☒ Paper towels
☐ Folding chairs
☐ Other

Emergency Response Planning

During the pre-work briefing and daily tailgate safety meetings, all on-site employees will be trained in the provisions of emergency response planning, site communication systems, and site evacuation routes.

In the event of an emergency that necessitates evacuation of a work task area or the site, the following procedures will take place.

- The Tetra Tech SSC will contact all nearby personnel using the on-site communications to advise the personnel of the emergency.
- The personnel will proceed along site roads to a safe distance upwind from the hazard source.
- The personnel will remain in that area until the SSC or an authorized individual provides further instructions.

In the event of a severe spill or a leak, site personnel will follow the procedures listed below.

- Evacuate the affected area and relocate personnel to an upwind location.
- Inform the Tetra Tech SSC, a Tetra Tech office, and a site representative immediately.
- Locate the source of the spill or leak, and stop the flow if it is safe to do so.
- Begin containment and recovery of spilled or leaked materials.
- Notify appropriate local, state, and federal agencies.

In the event of severe weather, site personnel will follow the procedures listed below.

- Site work shall not be conducted during severe weather, including high winds and lightning.
- In the event of severe weather, stop work, lower any equipment (drill rigs) and evacuate the affected area.
- Severe weather may cause heat or cold stress. Refer to SWPs 5-15 and 5-16 for additional information.

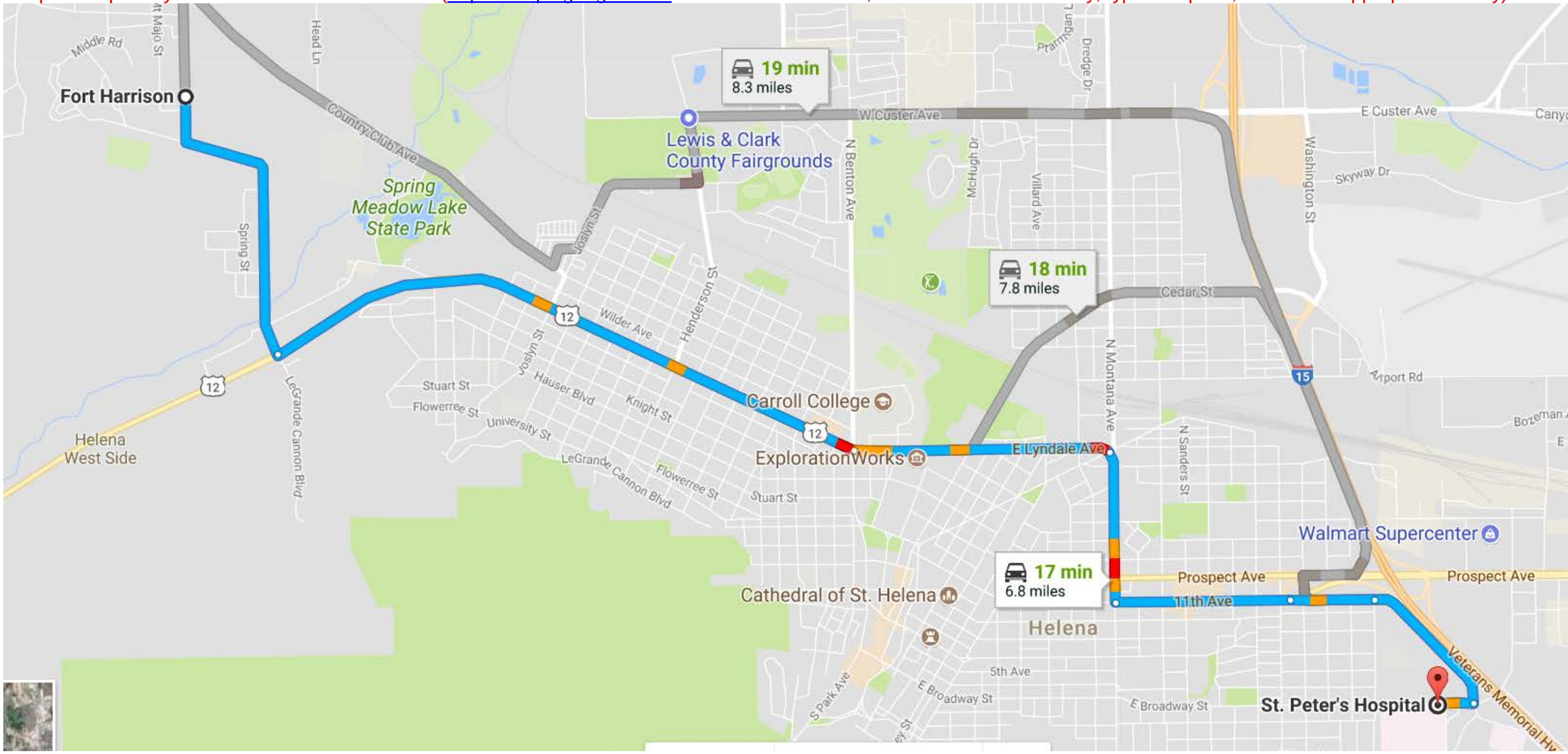
All personnel working on Tetra Tech projects are expected to and responsible for reporting ANY unsafe conditions, behaviors or incidents -- including injuries, illnesses, fires, spills/releases, property damages and near-misses -- they face or encounter while performing their work. According to TtEMI's reporting procedures, for non-emergency incidents you should:

- Notify WorkCare and Incident Intervention at 888.449.7787, or 800.455.6155
- Notify your Office, Project or Safety Manager via phone immediately.
- Complete a "Tetra Tech Incident Report" (Form IR) within 24 hours and send it to your Safety Manager. If an injury or illness has occurred, the Form IR-A must also be completed.
- Additional reports may be necessary

Site Map (May be drawn after crews arrive onsite or inserted using aerial photographs (https://maps.google.com/), site figures, etc.):

Hospital Route Map (attach or insert):

Hospital maps may be obtained from the Internet (https://maps.google.com/ -- search the address, then click Search nearby, type “hospital”, and select appropriate facility)



Note: A dry-run should be conducted to establish a physical location associated with the map included in the HASP. Verbal verification from the hospital emergency room should also be obtained to ensure that the hospital will accept chemically-contaminated patients.

Emergency Contacts

WorkCare - For issues requiring an Occupational Health Physician; assistance is available 24 hours per day, 7 days per week.

InfoTrac - For issues related to incidents involving the transportation of hazardous chemicals; this hotline provides accident assistance 24 hours per day, 7 days per week

U.S. Coast Guard National Response Center - For issues related to spill containment, cleanup, and damage assessment; this hotline will direct spill information to the appropriate state or region

Poison Control Center – For known or suspected poisoning.

Limitations:

The Level-Two HASP is not appropriate in some cases:

- Projects involving unexploded ordnance (UXO), radiation sources as the primary hazard, or known chemical/biological weapons site must employ the Level 3 HASP
- Projects of duration longer than 90 days may need a Level 3 HASP (consult your RSO)

Decontamination:

Decontamination Solutions for Chemical and Biological Warfare Agents[a]: PPE and equipment can be decontaminated using 0.5 percent bleach (1 gallon laundry bleach to 9 gallons water) for biological agents (15 minutes of contact time for anthrax spores; 3 minutes for others) followed by water rinse for chemical and biological agents. In the absence of bleach, dry powders such as soap detergents, earth, and flour can be used. The powders should be applied and then wiped off using wet tissue paper. Finally, water and water/soap solutions can be used to physically remove or dilute chemical and biological agents. Do not use bleach solution on bare skin; use soap and water instead. Protect decontamination workers from exposure to bleach.

Decontamination for Radiological and Other Chemicals: Primary decontamination should use Alconox and water unless otherwise specified in chemical specific information resources. The effectiveness of radiation decontamination should be checked using a radiation survey instrument. Decontamination procedures should be repeated until the radiation meter reads less than 100 counts per minute over a 100-square-centimeter area when the probe is held 1 centimeter from the surface and moving slower than 2.5 centimeters per second.

Decontamination Corridor: The decontamination setup can be adjusted to meet the needs of the situation. The decontamination procedures can be altered to meet the needs of the specific situation when compound- and site-specific information is available.

Decontamination Waste: All disposable equipment, clothing, and decontamination solutions will be double-bagged or containerized in an acceptable manner and disposed of with investigation-derived waste.

Decontamination Personnel: Decontamination personnel should dress in the same level of PPE or one level below the entry team PPE level.

All investigation-derived waste should be left on site with the permission of the property owner and the EPA on-scene coordinator. In some instances, another contractor will dispose of decontamination waste and investigation-derived waste. DO NOT place waste in regular trash. DO NOT dispose of waste until proper procedures are established.

Notes:

[a] Source: Jane's Information Group. 2002. *Jane's Chem-Bio Handbook*. Page 39.

APPENDIX B

STANDARD OPERATING PROCEDURES (SOP)

SOP APPROVAL FORM

TETRA TECH EM INC.

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

STATIC WATER LEVEL, TOTAL WELL DEPTH,
AND IMMISCIBLE LAYER MEASUREMENT

SOP NO. 014

REVISION NO. 1

Last Reviewed: July 2009

KRiesing

Quality Assurance Approved

July 2009

Date

1.0 BACKGROUND

Measurement of static water level, total well depth, and any immiscible layers is necessary before a well can be sampled and groundwater flow direction can be determined. If an immiscible layer is present, its depth and thickness must be determined. In addition, the static water level and total depth of a monitoring well are often needed to determine a purging volume prior to sampling.

1.1 PURPOSE

This standard operating procedure (SOP) provides guidelines for field personnel measuring: (a) static water levels, (b) total water depths, and (c) immiscible layers in monitoring wells or piezometers.

1.2 SCOPE

This SOP describes the methodologies for measuring static water level, total well depth, and immiscible layer depth and thickness.

1.3 DEFINITIONS

Electrical Water Level Meter: An electrical probe used to determine the depth to fluid. The probe has a light or sound alarm connected to an open circuit. The circuit is closed and the alarm is activated when the probe contacts a conducting fluid such as water.

Immiscible Layer: A liquid phase that cannot be uniformly mixed or blended with water. Heavy immiscible phases or dense nonaqueous-phase liquids (DNAPL) sink in water; light immiscible phases or light nonaqueous-phase liquids (LNAPL) float on water.

Interface Probe: An electrical probe used to determine the presence and thicknesses of LNAPL or DNAPL in the water column of a monitoring well.

Ionization Detector: A photoionization detector (PID) or a flame ionization detector (FID) is used to measure the level of volatile organic compounds (VOC) in the gaseous phase. Ionization detectors are generally not compound-specific and thus measure only total volatile organic compounds. A PID generally cannot detect as complete a range of compounds as the FID. This difference is the result of the relative ionization energies of the two detectors. Most PIDs cannot detect methane, but FIDs can. The

Photovac and Minirae are examples of PIDs; the Foxboro organic vapor analyzer (OVA) is an example of an FID.

Static Water Level: The level of water in a monitoring well or piezometer left open and allowed to stabilize by equilibrating to existing atmospheric pressure prior to measuring. The static water level can be measured as the depth to water or as the elevation of water relative to a reference mark or datum.

Total Well Depth: The distance from the ground surface to the bottom of a monitoring well or piezometer

1.4 REFERENCES

Tetra Tech EM Inc. 2009. SOP No. 002, General Equipment Decontamination

U.S. Environmental Protection Agency (USEPA). 2007. "Groundwater Level and Well Depth Measurement." Region 4, Field Branches Quality System and Technical Procedures. November 1. http://www.epa.gov/region4/sesd/fbqstp/Groundwater-Level-Measurement.pdf

U.S. EPA. 2000. "Manual Water Level Measurement." Environmental Response Team. SOP #2043 (Rev. #0.0, 02/11/00). http://www.dem.ri.gov/pubs/sops/wmsr2043.pdf

1.5 REQUIREMENTS AND RESOURCES

The equipment required for measuring static water levels, total well depths, and immiscible layers is as follows:

- Electrical water level meter
- Interface probe
- PID or FID
- Decontamination supplies (wash and rinse solutions, buckets, paper towels, etc.)
- Keys or wrenches for well locks and well caps
- Light source such as a flashlight or mirror to inspect inside well vaults

- Appropriate level of personal protective equipment (PPE) as specified in the site-specific health and safety plan
- Appropriate signage and traffic control to protect personnel during monitoring activities

2.0 PROCEDURES

This section provides general guidance followed by specific procedures for measurement of static water level, total well depth, and immiscible layer.

Procedures for measuring the depth to water and the depth to the bottom of a monitoring well should be identified in the planning stage of field work. Also at this stage, measuring devices should be chosen, and an individual should be assigned to take and record measurements.

All measurement instruments should be decontaminated before and after use and between measurement locations. Refer to SOP No. 002, General Equipment Decontamination. In addition, as a general rule wells with the lowest known contaminant concentrations should be measured first followed by progressively more contaminated wells. This technique helps avoid cross-contamination from a more contaminated water source to a less contaminated water source resulting in inaccurate or false sample analytic results.

Before initiating any measuring activities, the ambient air at a monitoring well head should be monitored for possible emissions of VOCs using a PID or an FID. The site-specific health and safety plan for on-site activities should provide action levels and the rationale for selection of the appropriate ionization detector.

The sampling team should wear appropriate respiratory protection equipment when necessary. The sampling team should approach wells from the upwind side and systematically survey the inside of the well casing, the area from the casing to the ground, the area from above the well casing to the breathing zone, and the area around the well for VOCs. VOC monitoring for comparison to action levels should occur in the breathing zone(s) rather than from within the well casing. If PID or FID readings of VOCs are above action levels, the sampling team should retreat to a safe area and determine if engineering controls, increased PPE, or both are necessary to reduce exposure to VOCs above action levels listed in the site-specific health and safety plan.

Sampling team should be careful when opening a well to check for insects or reptiles within the protective casing and use appropriate work gloves when reaching inside. The site-specific health and safety plan should be consulted for information on insects or reptiles that may be present in the project area.

2.1 STATIC WATER LEVEL MEASUREMENT

An electric water level meter is typically used to measure static water levels. The electrical probe of the meter is lowered into the monitoring well until the light or sound alarm is activated indicating the probe has touched the water surface. To ensure accuracy, the well or piezometer should be opened to allow groundwater in the well to equilibrate with atmospheric pressures before measuring depth to water. Ideally, static groundwater measurements will be collected prior to purging or sampling activities. The static water level is read directly from the graduated tape on the meter to the nearest 0.01-foot. Two to three measurements should be taken over several minutes to ensure water levels are not fluctuating. If water levels continue to fluctuate, the groundwater has not equilibrated or become static. Measurements should continue until static water levels readings are obtained before recording a final measurement. If the monitoring well top is not flush with the ground surface, the distance between the static water level and the top of the riser pipe should be measured; the height of the riser pipe above ground surface should then be subtracted from the first measurement to determine the depth to static water below ground surface. Surveyed elevations should be used if available to establish the water level elevation. The well number, measurement date and time, and individual readings should be recorded in a field logbook.

2.2 TOTAL WELL DEPTH MEASUREMENT

Total well depth can also be measured using an electric water level meter. The electrical probe of the indicator is lowered into the monitoring well until resistance is met, indicating that the probe has reached the bottom of the well. During measurement, the probe should be positioned in the well so that resistance is met, but there is no slack in the measuring tape. The total well depth is read directly from the graduated tape on the indicator to the nearest 0.01-foot. Measurements become less accurate with increased depth as the length of measuring tape deployed increases and the distance under the water column increases making it more difficult to determine if the bottom of the well has reached. In this circumstance, a weighted water level meter or measuring tape may be necessary to allow the user to “feel” the bottom of the well. Care should be taken to ensure the use of only inert and chemical-free weighted devices such as stainless steel are used. If the monitoring well top is not flush with the ground surface, the distance between the bottom of the well and the top of the riser pipe should be measured; the height of the riser pipe above ground surface should then be subtracted from the first measurement to determine the depth from ground surface to the bottom of the well. The well number, measurement date and time, and individual readings should be recorded in a field logbook.

2.3 IMMISCIBLE LAYER DETECTION AND MEASUREMENT

A LNAPL immiscible layer in a monitoring well can be detected by slowly lowering an interface probe to the surface of the water in the well. When the audible alarm sounds, the depth of the probe should be recorded. If the alarm is continuous, a light immiscible layer has been detected. To measure the thickness of this layer, the probe should then be slowly lowered until the alarm changes to an oscillating signal. The oscillating alarm indicates that the probe has reached a water layer. The probe depth at the time the alarm begins oscillating should be recorded as the depth to water. The thickness of the light immiscible layer should then be determined by subtracting the depth at which a continuous alarm occurred from the depth at which the alarm began to oscillate. The well number, measurement date and time, individual readings for depth and thickness, and average values for depth and thickness should be recorded in a field logbook.

To determine whether a DNAPL immiscible layer is present, the interface probe is lowered into the monitoring well and allowed to slowly drop below the water causing an oscillating alarm. If the alarm changes from an oscillating to a continuous signal, a heavier immiscible layer has been detected, and the probe depth should be recorded at that point. Total well depth obtained in Section 2.2 should be used for calculating the thickness of the DNAPL layer within the well casing. The DNAPL layer is then calculated by subtracting the depth at which the alarm became continuous from the total well depth. This procedure provides an estimate of the thickness of the DNAPL layer in the monitoring well. The well number, measurement date and time, and individual readings for depth and thickness should be recorded in a field logbook.

SOP APPROVAL FORM

TETRA TECH, INC.

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

GROUNDWATER SAMPLE COLLECTION
USING LOW-FLOW SAMPLING METHODOLOGY

SOP NO. 015

REVISION NO. 2

Last Reviewed: November 2014

Carla J Buriks

Quality Assurance Approved	November 24, 2014 Date

1.0 BACKGROUND

Groundwater sample collection is an integral part of environmental site characterization. Groundwater samples must be collected from the aquifer and submitted to a laboratory for analysis. Therefore, samples must be collected and handled in a manner that minimizes alteration of the chemical characteristics of the groundwater.

In the past, most sample collection techniques followed federal and state guidance that included removing water in the casing of a monitoring well (purging), followed by sample collection. The water in the casing was removed so that groundwater from the formation could flow into the casing and be available for sample collection. Samples were commonly collected with a bailer, bladder pump, controlled flow impeller pump, or peristaltic pump. Depending on the analysis, samples were often preserved during collection. Often, samples to be analyzed for metals were filtered through a 0.45-micron filter before they were preserved and placed into the sample container.

Research conducted by several investigators has demonstrated that movement of contaminants while sorbed onto colloid particles constitutes a significant component of contaminant transport. Colloid mobility in an aquifer is a complex, aquifer-specific transport issue, and its description is beyond the scope of this standard operating procedure (SOP). However, concentrations of suspended colloids have been measured during steady-state conditions and during purging. Investigation results indicate that standard purging procedures may cause a significant increase in suspended colloids, which in turn may bias analytical results.

Low-flow sample collection (also known as micropurge, low-stress, or minimal drawdown) is a groundwater sampling method that minimizes increased colloid mobilization by removing water from a well at the screened interval at a rate that preserves or minimally disrupts steady-state flow conditions in the aquifer. During low-flow sampling, groundwater is discharged from the aquifer at a rate that minimizes the cone of depression around the sampled well (a rate of discharge less than or equal to the rate of recharge). Research indicates that colloid mobilization will not increase above steady-state conditions during low-flow discharge. Therefore, a groundwater sample collected using this method is more likely to represent steady-state groundwater chemistry.

1.1 PURPOSE

The purpose of this SOP is to describe the procedures to be used to collect a groundwater sample from a well using low-flow sampling methodology. The following sections describe the equipment to be used and the methods to be followed to promote uniform sample collection techniques. Sampling is to be conducted by field personnel who are experienced in sample collection and handling for environmental investigations.

1.2 SCOPE

This SOP applies to groundwater sampling using low-flow sampling methodology. It is intended to be used as an alternate SOP to SOP No. 010 (Groundwater Sampling). This SOP provides procedures for various methods of low-flow sample collection. The type of sampling pump to be used should be specified in the project-specific work plan or field sampling plan (FSP).

1.3 DEFINITIONS

Colloid: Suspended particles that range in diameter from 5 nanometers to 0.2 micrometers.

Dissolved oxygen: The ratio of the concentration or mass of oxygen in water relative to the partial pressure of gaseous oxygen above the liquid, which is a function of temperature, pressure, and the concentration of other solutes.

Flow-through cell: A device connected to the discharge line of a groundwater purge pump that allows regular or continuous measurement of selected parameters of the water and minimizes contact between the water and air.

pH: A measure of the acidity or basicity of an aqueous solution. Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline. Pure water has a pH very close to 7. The pH is equal to $-\log_{10} c$, where c is the hydrogen ion concentration in moles per litre.

Oxidation-reduction potential: A numerical index of the intensity of oxidizing/reducing conditions within a system, with the hydrogen-electrode potential serving as a reference point of zero volts.

Specific conductance: The reciprocal of the resistance in ohms measured between opposite faces of a centimeter cube of aqueous solution at a specified temperature.

Turbidity: A measurement of the suspended particles in a liquid that have the ability to reflect or refract part of the visible portion of the light spectrum.

1.4 REFERENCES

U.S. Environmental Protection Agency (EPA), Office of Research and Development. April 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. Publication: EPA/540/S-95/504. Accessed at: http://www.agsolve.com.br/pdf/artigos/407EPA.pdf

EPA, Office of Solid Waste and Emergency Response. May 2002. *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*. Publication: EPA542-S-02-001. Accessed at: http://www.epa.gov/superfund/remedytech/tsp/download/gw_sampling_guide.pdf

EPA, Science and Ecosystem Support Division. March 2013. *Operating Procedure – Groundwater Sampling.* Publication SESDPROC-301-R3. Accessed at: http://www.epa.gov/region4/sesd/fbqstp/Groundwater-Sampling.pdf

1.5 REQUIREMENTS AND RESOURCES

The following equipment is required to complete low-flow groundwater sample collection:

- Water level indicator
- Adjustable flow rate pump (bladder, piston, peristaltic, or impeller)
- Power source for the pump (such as a battery or generator, or compressed air source)
- Discharge flow controller
- Flow-through cell
- pH probe
- Dissolved oxygen (DO) probe
- Turbidity meter
- Oxidation-reduction potential (ORP) probe (if required – see Section 2.1)
- Specific conductance (SC) probe
- Temperature probe
- Meter to display data for the probes

- Calibration solutions for pH, SC, turbidity, ORP, and DO probes, as necessary
- Container of known volume for flow measurement or calibrated flow meter
- Data recording and management system

2.0 PROCEDURE

The following procedures and criteria are based on EPA guidance titled Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (1996) and Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers (2002). These references may be consulted for a more detailed description of low-flow sampling theory.

Low-flow groundwater sampling is most commonly accomplished with low discharge-rate pumps, such as bladder pumps, piston pumps, controlled velocity impeller pumps, or peristaltic pumps. Bailers and high-capacity submersible pumps are not considered acceptable low-flow sample collection devices. The purged water is monitored (in a flow-through cell or other constituent monitoring device) for chemical and optical parameters that indicate steady-state flow conditions between the sample extraction point and the aquifer. Samples are collected when steady-state conditions are indicated.

Groundwater extraction equipment may be permanently installed in the monitoring well as a dedicated system, or it may be brought on site by the sampling team for temporary groundwater sampling. Most investigators agree that dedicated systems will provide the best opportunity for collecting samples most representative of steady-state aquifer conditions, but the scope and budget of a particular investigation will dictate equipment selection.

2.1 EQUIPMENT CALIBRATION

Before samples are collected, the monitoring meters used to measure pH, ORP (if required), DO, turbidity, and SC should be calibrated according to manufacturers' directions. (See SOP No. 061 for procedures regarding the measurement of groundwater indicator parameters.) All meters should be calibrated each day before sampling occurs. Before the meters are calibrated, be sure to record the expiration date of the calibration solutions and their identifying lot numbers. The pH meter calibration should bracket the pH range of the wells to be sampled (acidic to neutral pH range [4.00 to 7.00] or neutral to basic pH range [7.00 to 10.00]). It is common to use either a 2-point or a 3-point calibration for pH. The DO meter should be calibrated to one point (air-saturated water) or two points (air-saturated water and water devoid of all oxygen).

The SC meter and turbidity meter cannot be calibrated in the field; instead, they are checked against a known standard. The offset of the measured value of the calibration standard can be used as a correction value. Samplers should refer to project- or region-specific guidance regarding the use of ORP as a stabilization parameter. The ORP probe, if used, cannot be calibrated in the field, but is checked against a known standard (such as Zobell solution). The instrument should display a millivolt (mV) value that falls within the range set by the manufacturer. The measured value should be corrected for site-specific variance from standard temperature (25 °C) because ORP is temperature dependent. The ORP probe should be replaced if the reading is not within the manufacturer's specified range. All calibration data should be recorded on the Low-Flow Groundwater Sampling Data Sheet (example included as Figure 1), in a digital format, or in a field logbook.

2.2 WELL PURGING

The well to be sampled should be opened, and groundwater in the well allowed to equilibrate to atmospheric pressure. Equilibration should be determined by measuring the depth to water below the marked reference at the well. This reference point (which is typically the top of the well casing, but can be also be referenced to ground surface) is generally specified in the sampling protocol for the particular job, event, or client. Ground water level readings are taken over two or more 5-minute intervals. Equilibrium conditions exist when the measured depth to water varies by less than 0.01 foot over two consecutive readings. The measurement of the total depth of the well should be made after samples have been collected, unless the datum is required to place non-dedicated sample collection equipment. Depth to water and total well depth measurements should be made in accordance with procedures outlined in SOP No. 014 (Static Water Level, Total Well Depth, and Immiscible Layer Measurement).

If the well does not have a dedicated sample collection device, a new or previously decontaminated portable sample collection device should be inserted in the well. If non-dedicated sampling equipment is used, the least contaminated wells should be purged and sampled first and the most contaminated wells should be purged and sampled last (if past sampling data are available to make this determination). The intake of the device should be positioned at the midpoint of the well screen interval or the midpoint of the water column if the level is below the top of the well screen. The device should be installed slowly to minimize turbulence within the water within the casing and to minimize mixing of stagnant water above the screened interval with water in the screened interval. After it has been installed, the flow controller should be connected to the sample pump, and the flow-through cell connected to the outlet of the sample collection device. The calibrated groundwater chemistry monitoring probes should be installed in the flow-through cell. If a flow meter is used, it should be installed ahead of the flow-through cell.

If the well has a dedicated sample collection device, the controller for the device should be connected to the sample pump. The flow meter and flow-through cell should be connected in line to the discharge tube and the probes installed in the flow-through cell.

The controller should be activated and groundwater extracted (purged) from the well. The purge rate should be monitored and should not exceed the recharge capacity of the well. The well recharge capacity is defined as the maximum discharge rate that can be obtained with less than 0.1 meter (0.33 foot) drawdown. The maximum purge rate should not exceed 1 liter per minute (L/min) (0.25 gallon per minute) and should be adjusted to achieve minimal drawdown.

Water levels, effluent parameters, and flow rate should be continuously monitored while the well is purged. Purging should continue until the measured chemical and optical parameters are stable. Stable parameters are defined as monitored chemistry values that do not fluctuate by more than the following ranges over three successive readings at 3- to 5-minute intervals:

- pH ±0.1 unit
- SC ±3 percent
- Turbidity ±10 percent, when greater than 10 nephelometric turbidity units (NTUs)
- DO ±10 percent or 0.3 milligrams per liter (mg/L)
- ORP ±10 mV (if required)
- Temperature (while listed in EPA guidance, this parameter is described as the least important and is not required to be stable if all other parameters have been met)

Purging will continue until these stabilization criteria have been met, excluding temperature, or three well casing volumes have been purged. If three casing volumes of water have been purged and the stabilization criteria have not been met, a comment should be made on the data sheet that sample collection began after three well casing volumes were purged.

The volume of water in the well is based on the following formula:

$$V = \pi r^2 h \times 7.48$$

where

V	=	static volume of water in the well (gallons)
r	=	inside radius of the well (feet)
h	=	length of water in the well (total well depth minus depth to water) (feet)
7.48	=	conversion factor (cubic feet to gallons)

Common well diameter sizes and corresponding volumes are listed below.

- 1-inch well = h x 0.041 gallons per foot (gal/ft)
- 2-inch well = h x 0.163 gal/ft
- 3-inch well = h x 0.367 gal/ft
- 4-inch well = h x 0.652 gal/ft

For wells with water table screen intervals: If a stabilized drawdown in the well cannot be maintained within 0.33 foot or the water level is approaching the bottom of the screened interval, reduce the flow rate or turn the pump off for 15 minutes and allow for recharge. The well should not be pumped dry. Resume pumping at a lower flow rate; if the water draws down to the bottom of the screened interval again, turn the pump off and allow for recovery. If sufficient yield cannot be obtained, consider an alternative sampling method.

For wells with submerged or targeted screen intervals: If a stabilized drawdown in the well cannot be maintained within 0.33 foot or the water level is approaching the top of the screened interval, reduce the flow rate, or turn the pump off for 15 minutes, and allow for recovery. The well should not be pumped dry. Resume pumping at a lower flow rate; if the water draws down to the top of the screened interval again, turn pump off and allow for recovery. If sufficient yield cannot be obtained, consider either further drawdown or an alternative sampling method.

Wells that are slow to recharge should be identified and purged at the beginning of the workday to maximize the efficiency of field work. Samples should be collected from these wells within the same workday. Professional judgment should be exercised regarding representative groundwater sample collection from wells that recharge slowly.

The final pH, SC, ORP (if required), turbidity, and DO values should be recorded. All data should be recorded using the Low-Flow Groundwater Sampling Data Sheet (Figure 1), a data entry form on a personal digital assistant (PDA), or in a field logbook.

2.3 SAMPLE COLLECTION

After the well has been purged, the flow-through cell (and any flow meter) will be disconnected, and groundwater samples should be collected directly from the discharge line. Discharge rates should be adjusted so that groundwater is dispensed into the sample container with minimal aeration of the sample. Samples collected for analysis of volatile organic compounds (VOCs) should be dispensed into the sample container at a flow rate equal to or less than 100 milliliters per minute. Samples collected with the use of a peristaltic pump for VOC analysis may require collection by the "soda straw" method or other approved means that prevent the sample from being drawn through the latex portion of the hose.

The "soda straw" method involves allowing the tubing to fill, by either lowering it into the water column (method A) or by filling it via suction applied by the pump head (method B). If method A is used, the tubing is removed from the well after filling and the captured sample is allowed to drain into the sample vial. If method B is used, after running the pump and filling the tubing with sample, the pump speed is reduced and the direction reversed to push the sample out of the tubing into the vials. Samplers should avoid completely emptying the tubing when filling the sample vials when using method B to prevent introducing water that was in contact with the flexible pump head tubing.

Samplers should also refer to project- or region-specific guidance when collecting VOC samples. Samples should be preserved and handled as described in the investigation field sampling plan or quality assurance project plan. Depending on the project-specific types of analyses required, the preferred order of sample collection is as follows:

1. Volatile organic compounds (VOCs)
2. Purgeable organic halogens (POXs)
3. Total organic halogens (TOXs)
4. Cyanide
5. Extractable organics
6. Purgeable organic carbon (POC)
7. Total metals

8. Dissolved metals
9. Total organic carbon (TOC)
10. Phenols
11. Sulfate and chloride
12. Nitrate and ammonia
13. Radionuclides

See SOP No. 010 (Groundwater Sampling) for more information on groundwater sample collection.

2.3 HEALTH AND SAFETY CONSIDERATIONS

In addition to the procedures outlined in this SOP, all field staff must be aware of and follow the health and safety practices that result from the Activity Hazard Analyses (AHA) for the project. The AHAs include critical safety procedures, required controls, and minimum personal protective equipment (PPE) necessary to address potential hazards. The hazards specific to project tasks must be identified and controlled to the extent practicable and communicated to all project personnel via the approved, project-specific Health and Safety Plan (HASP).

FIGURE 1

LOW-FLOW GROUNDWATER SAMPLING DATA SHEET

Date/Time of Sample Collection: ___________/____________Project
Site/Subsite: _______________
Sample ID: ______________________________
Field ID: _________________________ Point Name: ________________
Depth to Well Bottom: ______________ ft. below top of casing (PVC cap)
Depth to Water Level: ______________ ft. below PVC cap
Depth to Water Level: ______________ ft. below PVC cap prior to sampling
Method of Purging: Bladder Pump ____ Submersible Pump ____
Peristaltic Pump ____
Static Well Volume: 1-inch well ____Gallons /2-inch well ____Gallons
Control Box Settings: Box # ______ Refill _______ Discharge _______
Throttle ________ psi
Total Purged: ___________ Gallons
Actual Purge Rate: ____________ Gallons/Min.

Purge Calculations

PHYSIO-CHEMICAL PARAMETERS DURING PURGING

Measure in order listed**	Initial Reading									Stabiliz-ation Criteria	Final
Time											
pH										+/-0.1	
Temperature (°C)										NC*	
Specific Conductance (µmhos/cm)										+/-3%	
Turbidity (NTU)										+/-10%	
Dissolved Oxygen (mg/L)										+/-10% or +/-0.3	
ORP (mV)										+/-10	
Volume Purged (Gal)											

*NC = No Criteria. **Stabilization criteria listed should be used unless project-specific plans specify alternate stabilization criteria.

Duplicate Sample Collected? No Yes (Sample ID of Duplicate) ____________________________
MS/MSD Sample Collected? No Yes ____
Sample Remarks (odors, colors, sediment): ____________________________________
Comments: ____
Sample(s) Collected By: ____

APPENDIX C

CHAIN-OF-CUSTODY (COC) DOCUMENTATION

Chain of Custody Record

Name:
Address:

Phone Number:

Page 1 of 1

Project Account Code		**Lab Matrix**	**Survey Location**	
Contact Person	**Sampler(s) Signature**	**Survey Type**	**Survey Initiation Date**	**Sample Matrix**

Sample ID	Date	Time	Composite / Grab	Equipment Used	Sample Location	No. of Containers	Analysis Required: Fecal Coliform	E. coli	TSS	CBOD5	TP, N-N, TKN, NH3	Orthophosphate	Metals (Cd, Cu, Pb, Ni, Zn)	Hexavalent Chromium	Hardness				Remarks

Relinquished By: Sampler	Date	Time	Accepted By: Field Runner	Date	Time	Remarks
Relinquished By: Field Runner	Date	Time	Received By: Laboratory	Date	Time	Remarks

APPENDIX D

LABORATORY CREDENTIALS AND REPORTING LIMITS

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 5.0 July 2013 and is accredited is accordance with the:

**United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)**

This accreditation demonstrates technical competence for the defined scope:

Chemical and Environmental Testing

(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
July 19, 2011	February 13, 2016	February 28, 2018
Revision Date:	*Accreditation No.:*	*Certificate No.:*
March 7, 2017	65188	L16-58-R3

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 1631E	CVAFS	Mercury (Low level)
Aqueous	EPA 1664A	Gravimetry	Hexane Extractable Material (HEM)
Aqueous	EPA 1664A	Gravimetry	Total Petroleum Hydrocarbons (TPH)
Aqueous	EPA 180.1	Turbidimetry	Turbidity
Aqueous	EPA 2340B	Calculation by 6010	Hardness as $CaCO_{3)}$
Aqueous	EPA 245.1	CVAA	Mercury
Aqueous	EPA 300.0	IC	Bromide
Aqueous	EPA 300.0	IC	Chloride
Aqueous	EPA 300.0	IC	Fluoride
Aqueous	EPA 300.0	IC	Nitrate + Nitrite as N
Aqueous	EPA 300.0	IC	Nitrate as N
Aqueous	EPA 300.0	IC	Nitrite as N
Aqueous	EPA 300.0	IC	Sulfate
Aqueous	EPA 353.2	Colorimetry	Nitrate + Nitrite as N
Aqueous	EPA 537 MOD	HPLC/MS/MS	6:2 Fluorotelomersulfonate
Aqueous	EPA 537 MOD	HPLC/MS/MS	8:2 Fluorotelomersulfonate
Aqueous	EPA 537 MOD	HPLC/MS/MS	N-Ethylperfluorooctanesulfonamide
Aqueous	EPA 537 MOD	HPLC/MS/MS	N-Ethylperfluorooctanesulfonamidoethanol
Aqueous	EPA 537 MOD	HPLC/MS/MS	N-Methylperfluorooctanesulfonamide
Aqueous	EPA 537 MOD	HPLC/MS/MS	N-Methylperfluorooctanesulfonamidoethanol
Aqueous	EPA 537 MOD	HPLC/MS/MS	Perfluoroheptanesulfonate
Aqueous	EPA 537 MOD	HPLC/MS/MS	Perfluorooctane Sulfonamide
Aqueous	EPA 537 MOD	HPLC/MS/MS	Perfluorotetradecanoic acid
Aqueous	EPA 537 MOD	HPLC/MS/MS	Perfluorotridecanoic
Aqueous	EPA 1632	HG-CT-GC-AAS	Arsenic (III)
Aqueous	EPA 1632	HG-CT-GC-AAS	Arsenic (V)
Aqueous	EPA 1632	HG-CT-GC-AAS	Total Inorganic Arsenic
Aqueous	EPA 7196A	Colorimetry	Chromium VI
Aqueous	EPA 7470A	CVAA	Mercury
Aqueous	EPA 8260C SIM	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1,2-Trichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dibromoethane
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,3 Butadine
Aqueous	EPA 8260C SIM	GC-MS	1,4-Dichlorobenzene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 8260C SIM	GC-MS	Bromodichloromethane
Aqueous	EPA 8260C SIM	GC-MS	Carbon Tetrachloride
Aqueous	EPA 8260C SIM	GC-MS	Chlorodibromomethane
Aqueous	EPA 8260C SIM	GC-MS	Chloroform
Aqueous	EPA 8260C SIM	GC-MS	Chloromethane
Aqueous	EPA 8260C SIM	GC-MS	cis-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous	EPA 8260C SIM	GC-MS	Tetrachloroethene
Aqueous	EPA 8260C SIM	GC-MS	trans-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Trichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Vinyl chloride
Aqueous	EPA 9020B	Titrimetry	Total Organic Halides (TOX)
Aqueous	EPA 9040C	Potentiometry	pH
Aqueous	EPA 9060A	UV-VIS Spectrophotometry	Total Organic Carbons (TOC)
Aqueous	SM 10200 H	Colorimetry	Chlorophyll-A
Aqueous	SM 2130B	Turbidimetry	Turbidity
Aqueous	SM 2320B	Titrimetry	Total Alkalinity (as $CaCO_3$)
Aqueous	SM 2510B	Potentiometry	Specific Conductance
Aqueous	SM 2540B	Gravimetry	Solids, Total
Aqueous	SM 2540C	Gravimetry	Solids, Total Dissolved
Aqueous	SM 2540D	Gravimetry	Solids, Total Suspended
Aqueous	SM 4500-CN- G	Colorimetry	Cyanide, Amenable
Aqueous	SM 4500-P-E	Colorimetry	ortho-phosphorous
Aqueous	SM 4500-S2 D	Titrimetry	Sulfide
Aqueous	SM 4500-CN E	Colorimetry	Total Cyanide
Aqueous	SM4500-NH3 G	Colorimetry	Ammonia
Aqueous	SM5220C	Titrimetry	Chemical Oxygen Demand (COD)
Aqueous	SM5310C	UV-VIS Spectrophotometry	Total Organic Carbons (TOC)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	6:2 Fluorotelomersulfonate
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	8:2 Fluorotelomersulfonate
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Ethylperfluorooctanesulfonamide
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Ethylperfluorooctanesulfonamidoethanol
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Methylperfluorooctanesulfonamide
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Methylperfluorooctanesulfonamidoethanol

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ISO/IEC 17025:2005 and DoD-ELAP

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1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner   Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroheptanesulfonate
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctane Sulfonamide
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluorotetradecanoic acid
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluorotridecanoic
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromo-3-chloropropane (DBCP)
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,1,1,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,1-Trichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,2,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichloropropane
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,2-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,3,5-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,4-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	2,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	2-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Isopropyltoluene
Drinking Water	EPA 524.2	GC-MS	Benzene
Drinking Water	EPA 524.2	GC-MS	Bromobenzene
Drinking Water	EPA 524.2	GC-MS	Bromochloromethane
Drinking Water	EPA 524.2	GC-MS	Bromodichloromethane
Drinking Water	EPA 524.2	GC-MS	Bromoform
Drinking Water	EPA 524.2	GC-MS	Bromomethane
Drinking Water	EPA 524.2	GC-MS	Carbon Tetrachloride
Drinking Water	EPA 524.2	GC-MS	Chlorobenzene

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	Chlorodibromomethane
Drinking Water	EPA 524.2	GC-MS	Chloroethane
Drinking Water	EPA 524.2	GC-MS	Chloroform
Drinking Water	EPA 524.2	GC-MS	Chloromethane
Drinking Water	EPA 524.2	GC-MS	cis-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	cis-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Dibromomethane
Drinking Water	EPA 524.2	GC-MS	Dichlorodifluoromethane
Drinking Water	EPA 524.2	GC-MS	Dichloromethane (Methylene Chloride)
Drinking Water	EPA 524.2	GC-MS	Ethylbenzene
Drinking Water	EPA 524.2	GC-MS	Hexachlorobutadiene
Drinking Water	EPA 524.2	GC-MS	Isopropylbenzene
Drinking Water	EPA 524.2	GC-MS	m+p-Xylene
Drinking Water	EPA 524.2	GC-MS	Naphthalene
Drinking Water	EPA 524.2	GC-MS	n-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	n-Propylbenzene
Drinking Water	EPA 524.2	GC-MS	o-Xylene
Drinking Water	EPA 524.2	GC-MS	sec-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	Styrene
Drinking Water	EPA 524.2	GC-MS	tert-butylbenzene
Drinking Water	EPA 524.2	GC-MS	Tetrachloroethene
Drinking Water	EPA 524.2	GC-MS	Toluene
Drinking Water	EPA 524.2	GC-MS	trans-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	trans-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Trichloroethene
Drinking Water	EPA 524.2	GC-MS	Trichlorofluoromethane (Freon 11)
Drinking Water	EPA 524.2	GC-MS	Vinyl chloride
Drinking Water	EPA 524.2	GC-MS	Xylenes, total
Solid	ASTM D4129-92M, Lloyd Kahn	UV-VIS Spectrophotometry	Total Organic Carbons (TOC)
Solid	EPA 160.3M	Gravimetry	Solids, Total
Solid	EPA 1631E	CVFAS	Mercury (low level)
Solid	EPA 7471A, B	CVAA	Mercury
Solid	EPA 9045D	Potentiometry	pH
Solid	EPA 9056A	IC	Nitrate as N
Solid	EPA 9056A	IC	Nitrite as N

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ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

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Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Solid	EPA 9071B	Gravimetry	Hexane Extractable Material (HEM)
Solid	GEN-AVS	Colorimetry	Acid Volatile Sulfides
Solid	GEN-NCEL	Colorimetry	Nitrocellulose
Solid	LCP-LCMS4	HPLC/MS/MS	1,3,5-Trinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	1,3-Dinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4,6-Trinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,6-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2-Amino-4,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	3,5-Dinitroaniline
Solid	LCP-LCMS4	HPLC/MS/MS	4-Amino-2,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Solid	LCP-LCMS4	HPLC/MS/MS	Pentaerythritoltetranitrate
Solid	LCP-LCMS4	HPLC/MS/MS	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Solid	LCP-LCMS4	HPLC/MS/MS	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Solid	LCP-Nitro	HPLC/MS/MS	2,4-Dinitrophenol
Solid	LCP-Nitro	HPLC/MS/MS	Picramic Acid
Solid	LCP-Nitro	HPLC/MS/MS	Picric Acid
Solid	PSEP	Gravimetry	Particle Size
Solid	SOP-GEN-AVS	Colorimetry	Acid Volatile Sulfides
Tissue	EPA 1630	CVAFS	Methyl Mercury
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorobutane Sulfonate
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorobutanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorodecane Sulfonate
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorodecanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorododecanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluoroheptanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorohexane Sulfonate
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorohexanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorononanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorooctane Sulfonate
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluorooctanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluoropentanoic Acid
Tissue	EPA 537 MOD	HPLC/MS/MS	Perfluoroundecanoic Acid
Tissue	EPA 1631E	CVAFS	Mercury (low level)

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner   Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 1632	HG-CT-GC-AAS	Arsenic (III)
Tissue	EPA 1632	HG-CT-GC-AAS	Arsenic (V)
Tissue	EPA 1632	HG-CT-GC-AAS	Total Inorganic Arsenic
Tissue	EPA 6010B, C/200.7	ICP	Aluminum
Tissue	EPA 6010B, C/200.7	ICP	Antimony
Tissue	EPA 6010B, C/200.7	ICP	Arsenic
Tissue	EPA 6010B, C/200.7	ICP	Barium
Tissue	EPA 6010B, C/200.7	ICP	Beryllium
Tissue	EPA 6010B, C/200.7	ICP	Boron
Tissue	EPA 6010B, C/200.7	ICP	Cadmium
Tissue	EPA 6010B, C/200.7	ICP	Calcium
Tissue	EPA 6010B, C/200.7	ICP	Chromium, total
Tissue	EPA 6010B, C/200.7	ICP	Cobalt
Tissue	EPA 6010B, C/200.7	ICP	Copper
Tissue	EPA 6010B, C/200.7	ICP	Iron
Tissue	EPA 6010B, C/200.7	ICP	Lead
Tissue	EPA 6010B, C/200.7	ICP	Magnesium
Tissue	EPA 6010B, C/200.7	ICP	Manganese
Tissue	EPA 6010B, C/200.7	ICP	Molybdenum
Tissue	EPA 6010B, C/200.7	ICP	Nickel
Tissue	EPA 6010B, C/200.7	ICP	Potassium
Tissue	EPA 6010B, C/200.7	ICP	Selenium
Tissue	EPA 6010B, C/200.7	ICP	Silver
Tissue	EPA 6010B, C/200.7	ICP	Sodium
Tissue	EPA 6010B, C/200.7	ICP	Strontium
Tissue	EPA 6010B, C/200.7	ICP	Thallium
Tissue	EPA 6010B, C/200.7	ICP	Tin
Tissue	EPA 6010B, C/200.7	ICP	Titanium
Tissue	EPA 6010B, C/200.7	ICP	Vanadium
Tissue	EPA 6010B, C/200.7	ICP	Zinc
Tissue	EPA 6020A/200.8	ICP-MS	Aluminum
Tissue	EPA 6020A/200.8	ICP-MS	Antimony
Tissue	EPA 6020A/200.8	ICP-MS	Arsenic
Tissue	EPA 6020A/200.8	ICP-MS	Barium
Tissue	EPA 6020A/200.8	ICP-MS	Beryllium
Tissue	EPA 6020A/200.8	ICP-MS	Boron

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 6020A/200.8	ICP-MS	Cadmium
Tissue	EPA 6020A/200.8	ICP-MS	Chromium, total
Tissue	EPA 6020A/200.8	ICP-MS	Cobalt
Tissue	EPA 6020A/200.8	ICP-MS	Copper
Tissue	EPA 6020A/200.8	ICP-MS	Iron
Tissue	EPA 6020A/200.8	ICP-MS	Lead
Tissue	EPA 6020A/200.8	ICP-MS	Manganese
Tissue	EPA 6020A/200.8	ICP-MS	Molybdenum
Tissue	EPA 6020A/200.8	ICP-MS	Nickel
Tissue	EPA 6020A/200.8	ICP-MS	Selenium
Tissue	EPA 6020A/200.8	ICP-MS	Silver
Tissue	EPA 6020A/200.8	ICP-MS	Strontium
Tissue	EPA 6020A/200.8	ICP-MS	Thallium
Tissue	EPA 6020A/200.8	ICP-MS	Tin
Tissue	EPA 6020A/200.8	ICP-MS	Titanium
Tissue	EPA 6020A/200.8	ICP-MS	Vanadium
Tissue	EPA 6020A/200.8	ICP-MS	Zinc
Tissue	EPA 7471A, B	CVAA	Mercury
Tissue	EPA 7742	AA, Borohydride Reduction; GFAA	Selenium
Tissue	EPA 8081A, B	GC-ECD	Aldrin
Tissue	EPA 8081A, B	GC-ECD	alpha-BHC
Tissue	EPA 8081A, B	GC-ECD	alpha-Chlordane
Tissue	EPA 8081A, B	GC-ECD	Chlordane (total)
Tissue	EPA 8081A, B	GC-ECD	DDD (4,4)
Tissue	EPA 8081A, B	GC-ECD	DDE (4,4)
Tissue	EPA 8081A, B	GC-ECD	DDT (4,4)
Tissue	EPA 8081A, B	GC-ECD	delta-BHC
Tissue	EPA 8081A, B	GC-ECD	Dieldrin
Tissue	EPA 8081A, B	GC-ECD	Endosulfan I
Tissue	EPA 8081A, B	GC-ECD	Endosulfan II
Tissue	EPA 8081A, B	GC-ECD	Endosulfan sulfate
Tissue	EPA 8081A, B	GC-ECD	Endrin
Tissue	EPA 8081A, B	GC-ECD	Endrin aldehyde
Tissue	EPA 8081A, B	GC-ECD	Endrin ketone
Tissue	EPA 8081A, B	GC-ECD	gamma-BHC

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ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8081A, B	GC-ECD	gamma-Chlordane
Tissue	EPA 8081A, B	GC-ECD	Heptachlor
Tissue	EPA 8081A, B	GC-ECD	Heptachlor Epoxide (beta)
Tissue	EPA 8081A, B	GC-ECD	Methoxychlor
Tissue	EPA 8081A, B	GC-ECD	Toxaphene (total)
Tissue	EPA 8081B	GC-ECD	2,4-DDD
Tissue	EPA 8081B	GC-ECD	2,4-DDE
Tissue	EPA 8081B	GC-ECD	2,4-DDT
Tissue	EPA 8081B	GC-ECD	Chlorpyrifos
Tissue	EPA 8081B	GC-ECD	cis-Nonachlor
Tissue	EPA 8081B	GC-ECD	Hexachlorobenzene
Tissue	EPA 8081B	GC-ECD	Hexachloroethane
Tissue	EPA 8081B	GC-ECD	Hexchlorobutadiene
Tissue	EPA 8081B	GC-ECD	Isodrin
Tissue	EPA 8081B	GC-ECD	Mirex
Tissue	EPA 8081B	GC-ECD	Oxychlordane
Tissue	EPA 8081B	GC-ECD	trans-Nonachlor
Tissue	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,5',6,6' Decachlorobiphenyl (PCB 209)
Tissue	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’,5,5’,6-Nonachlorobiphenyl (PCB 206)
Tissue	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’,5,6-Octachlorobiphenyl (PCB 195)
Tissue	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’,5-Heptachlorobiphenyl (PCB 170)
Tissue	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’-Hexachlorobiphenyl (PCB 128)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4,4’,5,5’-Heptachlorobiphenyl (PCB 180)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4,4’,5’,6-Heptachlorobiphenyl (PCB 183)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4,4’,5’-Hexachlorobiphenyl (PCB 138)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4,4’,6,6’-Heptachlorobiphenyl (PCB 184)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4,5’-Pentachlorobiphenyl (PCB 87)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4’,5,5’,6-Heptachlorobiphenyl (PCB 187)
Tissue	EPA 8082A	GC-ECD	2,2’,3,4’,5-Pentachlorobiphenyl (PCB 90)
Tissue	EPA 8082A	GC-ECD	2,2’,3,5’-Tetrachlorobiphenyl (PCB 44)
Tissue	EPA 8082A	GC-ECD	2,2’,4,4’,5,5’-Hexachlorobiphenyl (PCB 153)

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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8082A	GC-ECD	2,2’,4,5,5’-Pentachlorobiphenyl (PCB 101)
Tissue	EPA 8082A	GC-ECD	2,2’,5,6’-Tetrachlorbiphenyl (PCB 53)
Tissue	EPA 8082A	GC-ECD	2,2’,5-Trichlorobiphenyl (PCB 18)
Tissue	EPA 8082A	GC-ECD	2,3,3’,4,4’,5,5’-Heptachlorobiphenyl (PCB 189)
Tissue	EPA 8082A	GC-ECD	2,3,3’,4,4’,5’-Hexachlorobiphenyl (PCB 157)
Tissue	EPA 8082A	GC-ECD	2,3,3’,4,4’,5-Hexachlorobiphenyl (PCB 156)
Tissue	EPA 8082A	GC-ECD	2,3,3’,4,4’,6-Hexachlorobiphenyl (PCB 158)
Tissue	EPA 8082A	GC-ECD	2,3,3’,4,4’-Pentachlorobiphenyl (PCB 105)
Tissue	EPA 8082A	GC-ECD	2,3,4,4’,5-Pentachlorobiphenyl (PCB 114)
Tissue	EPA 8082A	GC-ECD	2,3,4,4’-Tetrachlorobiphenyl (PCB 60)
Tissue	EPA 8082A	GC-ECD	2,3’,4,4’,5,5’ Hexachlorobiphenyl (PCB 167)
Tissue	EPA 8082A	GC-ECD	2,3’,4,4’,5’,6-Hexachlorobiphenyl (PCB 168)
Tissue	EPA 8082A	GC-ECD	2,3’,4,4’,5-Pentachlorobiphenyl (PCB 118)
Tissue	EPA 8082A	GC-ECD	2,3’,4,4’,5-Pentachlorobiphenyl (PCB 123)
Tissue	EPA 8082A	GC-ECD	2,3’,4,4’-Tetrachlorobiphenyl (PCB 66)
Tissue	EPA 8082A	GC-ECD	2,4,4’-Trichlorobiphenyl (PCB 28)
Tissue	EPA 8082A	GC-ECD	2,4’-Dichlorobiphenyl (PCB 8)
Tissue	EPA 8082A	GC-ECD	3,3’,4,4’,5,5’-Hexachlorobiphenyl (PCB 169)
Tissue	EPA 8082A	GC-ECD	3,3’,4,4’,5-Pentachlorobiphenyl (PCB 126)
Tissue	EPA 8082A	GC-ECD	3,3’,4,4’-Tetrachlorobiphenyl (PCB 77)
Tissue	EPA 8082A	GC-ECD	3,4,4’,5-Tetrachlorobiphenyl (PCB 81)
Tissue	EPA 8082A	GC-ECD	Aroclor 1016
Tissue	EPA 8082A	GC-ECD	Aroclor 1221
Tissue	EPA 8082A	GC-ECD	Aroclor 1232
Tissue	EPA 8082A	GC-ECD	Aroclor 1242
Tissue	EPA 8082A	GC-ECD	Aroclor 1248
Tissue	EPA 8082A	GC-ECD	Aroclor 1254
Tissue	EPA 8082A	GC-ECD	Aroclor 1260
Tissue	EPA 8082A	GC-ECD	Aroclor 1262
Tissue	EPA 8082A	GC-ECD	Aroclor 1268
Tissue	EPA 8270 SIM	GC-MS	PBDE 100
Tissue	EPA 8270 SIM	GC-MS	PBDE 128
Tissue	EPA 8270 SIM	GC-MS	PBDE 138
Tissue	EPA 8270 SIM	GC-MS	PBDE 153
Tissue	EPA 8270 SIM	GC-MS	PBDE 154

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Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8270 SIM	GC-MS	PBDE 17
Tissue	EPA 8270 SIM	GC-MS	PBDE 183
Tissue	EPA 8270 SIM	GC-MS	PBDE 190
Tissue	EPA 8270 SIM	GC-MS	PBDE 203
Tissue	EPA 8270 SIM	GC-MS	PBDE 206
Tissue	EPA 8270 SIM	GC-MS	PBDE 209
Tissue	EPA 8270 SIM	GC-MS	PBDE 28
Tissue	EPA 8270 SIM	GC-MS	PBDE 47
Tissue	EPA 8270 SIM	GC-MS	PBDE 66
Tissue	EPA 8270 SIM	GC-MS	PBDE 71
Tissue	EPA 8270 SIM	GC-MS	PBDE 85
Tissue	EPA 8270 SIM	GC-MS	PBDE 99
Tissue	EPA 8270 SIM PAH	GC-MS	2-Methylnaphthalene
Tissue	EPA 8270 SIM PAH	GC-MS	Acenaphthene
Tissue	EPA 8270 SIM PAH	GC-MS	Acenaphthylene
Tissue	EPA 8270 SIM PAH	GC-MS	Anthracene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(a)anthracene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(a)pyrene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(b)fluoranthene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(g,h,i)perylene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(k)fluoranthene
Tissue	EPA 8270 SIM PAH	GC-MS	Chrysene
Tissue	EPA 8270 SIM PAH	GC-MS	Dibenzo(a,h)anthracene
Tissue	EPA 8270 SIM PAH	GC-MS	Fluoranthene
Tissue	EPA 8270 SIM PAH	GC-MS	Fluorene
Tissue	EPA 8270 SIM PAH	GC-MS	Indeno(1,2,3, cd)pyrene
Tissue	EPA 8270 SIM PAH	GC-MS	Naphthalene
Tissue	EPA 8270 SIM PAH	GC-MS	Phenanthrene
Tissue	EPA 8270 SIM PAH	GC-MS	Pyrene
Tissue	EPA 8270D SIM	GC-MS	1,2,4,5-Tetrachlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,2,4-Trichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,2-Dichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,3-Dichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,4-Dichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	2,3,4,6-Tetrachlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4,5-Trichlorophenol

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Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8270D SIM	GC-MS	2,4,6-Trichlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dichlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dimethylphenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dinitrophenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dinitrotoluene
Tissue	EPA 8270D SIM	GC-MS	2,6-Dinitrotoluene
Tissue	EPA 8270D SIM	GC-MS	2-Chloronaphthalene
Tissue	EPA 8270D SIM	GC-MS	2-Chlorophenol
Tissue	EPA 8270D SIM	GC-MS	2-Methyl-4,6-Dinitrophenol
Tissue	EPA 8270D SIM	GC-MS	2-Methylnaphthalene
Tissue	EPA 8270D SIM	GC-MS	2-Methylphenol
Tissue	EPA 8270D SIM	GC-MS	2-Nitroaniline
Tissue	EPA 8270D SIM	GC-MS	2-Nitrophenol
Tissue	EPA 8270D SIM	GC-MS	3,3-Dichlorobenzidine
Tissue	EPA 8270D SIM	GC-MS	3-Nitroaniline
Tissue	EPA 8270D SIM	GC-MS	4-Bromophenyl-phenylether
Tissue	EPA 8270D SIM	GC-MS	4-Chloro-3-methylphenol
Tissue	EPA 8270D SIM	GC-MS	4-Chloroaniline
Tissue	EPA 8270D SIM	GC-MS	4-Chlorophenyl-phenylether
Tissue	EPA 8270D SIM	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Tissue	EPA 8270D SIM	GC-MS	4-Nitroaniline
Tissue	EPA 8270D SIM	GC-MS	4-Nitrophenol
Tissue	EPA 8270D SIM	GC-MS	Acenaphthene
Tissue	EPA 8270D SIM	GC-MS	Acenaphthylene
Tissue	EPA 8270D SIM	GC-MS	Anthracene
Tissue	EPA 8270D SIM	GC-MS	Benzo(a)anthracene
Tissue	EPA 8270D SIM	GC-MS	Benzo(a)pyrene
Tissue	EPA 8270D SIM	GC-MS	Benzo(b)fluoranthene
Tissue	EPA 8270D SIM	GC-MS	Benzo(g,h,i)perylene
Tissue	EPA 8270D SIM	GC-MS	Benzo(k)fluoranthene
Tissue	EPA 8270D SIM	GC-MS	Benzoic acid
Tissue	EPA 8270D SIM	GC-MS	Benzyl alcohol
Tissue	EPA 8270D SIM	GC-MS	bis(2-Chloroethoxy)methane
Tissue	EPA 8270D SIM	GC-MS	bis(2-Chloroethyl)ether
Tissue	EPA 8270D SIM	GC-MS	bis(2-Chloroisopropyl)ether
Tissue	EPA 8270D SIM	GC-MS	bis(2-ethylhexy)phthalate

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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8270D SIM	GC-MS	Butyl benzyl phthalate
Tissue	EPA 8270D SIM	GC-MS	Carbazole
Tissue	EPA 8270D SIM	GC-MS	Chrysene
Tissue	EPA 8270D SIM	GC-MS	Dibenzo(a,h)anthracene
Tissue	EPA 8270D SIM	GC-MS	Dibenzofuran
Tissue	EPA 8270D SIM	GC-MS	Diethyl phthalate
Tissue	EPA 8270D SIM	GC-MS	Dimethylphthalate
Tissue	EPA 8270D SIM	GC-MS	di-n-butylphthalate
Tissue	EPA 8270D SIM	GC-MS	Di-n-octylphthalate
Tissue	EPA 8270D SIM	GC-MS	Fluoranthene
Tissue	EPA 8270D SIM	GC-MS	Fluorene
Tissue	EPA 8270D SIM	GC-MS	Hexachlorobenzene
Tissue	EPA 8270D SIM	GC-MS	Hexachlorobutadiene
Tissue	EPA 8270D SIM	GC-MS	Hexachlorocyclopentadiene
Tissue	EPA 8270D SIM	GC-MS	Hexachloroethane
Tissue	EPA 8270D SIM	GC-MS	Indeno(1,2,3, cd)pyrene
Tissue	EPA 8270D SIM	GC-MS	Isophorone
Tissue	EPA 8270D SIM	GC-MS	Naphthalene
Tissue	EPA 8270D SIM	GC-MS	Nitrobenzene
Tissue	EPA 8270D SIM	GC-MS	N-Nitrosodimethylamine
Tissue	EPA 8270D SIM	GC-MS	N-Nitroso-di-n-propylamine
Tissue	EPA 8270D SIM	GC-MS	N-Nitrosodiphenylamine
Tissue	EPA 8270D SIM	GC-MS	Pentachlorophenol
Tissue	EPA 8270D SIM	GC-MS	Phenanthrene
Tissue	EPA 8270D SIM	GC-MS	Phenol
Tissue	EPA 8270D SIM	GC-MS	Pyrene
Tissue	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Tissue	EPA 8330B	HPLC	1,3-Dinitrobenzene
Tissue	EPA 8330B	HPLC	2,4,6-Trinitrotoluene
Tissue	EPA 8330B	HPLC	2,4-Dinitrotoluene
Tissue	EPA 8330B	HPLC	2,6-Dinitrotoluene
Tissue	EPA 8330B	HPLC	2-Amino-4,6-dinitrotoluene
Tissue	EPA 8330B	HPLC	2-Nitrotoluene
Tissue	EPA 8330B	HPLC	3,5-Dinitroaniline
Tissue	EPA 8330B	HPLC	3-Nitrotoluene
Tissue	EPA 8330B	HPLC	4-Amino-2,6-dinitrotoluene

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Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8330B	HPLC	4-Nitrotoluene
Tissue	EPA 8330B	HPLC	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Tissue	EPA 8330B	HPLC	Nitrobenzene
Tissue	EPA 8330B	HPLC	Nitroglycerin
Tissue	EPA 8330B	HPLC	Pentachloronitrobenzene
Tissue	EPA 8330B	HPLC	Pentaerythritoltetranitrate
Tissue	EPA 8330B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Tissue	EPA 8330B	HPLC	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Tissue	OPPMS2	GC/MS/MS	Azinphos-methyl (Guthion)
Tissue	OPPMS2	GC/MS/MS	Chlorpyrifos
Tissue	OPPMS2	GC/MS/MS	Demeton O & S
Tissue	OPPMS2	GC/MS/MS	Diazinon
Tissue	OPPMS2	GC/MS/MS	Dichlorvos
Tissue	OPPMS2	GC/MS/MS	dimethoate
Tissue	OPPMS2	GC/MS/MS	Disulfoton
Tissue	OPPMS2	GC/MS/MS	Ethoprop
Tissue	OPPMS2	GC/MS/MS	Parathion, ethyl
Tissue	OPPMS2	GC/MS/MS	Parathion, methyl
Tissue	OPPMS2	GC/MS/MS	Phorate
Tissue	OPPMS2	GC/MS/MS	Ronnel
Tissue	OPPMS2	GC/MS/MS	Stirophos
Tissue	OPPMS2	GC/MS/MS	Sulfotepp
Tissue	SOC-Butyl	GC-FPD	Di-n-butyltin
Tissue	SOC-Butyl	GC-FPD	n-Butyltin
Tissue	SOC-Butyl	GC-FPD	Tetra-n-butyltin
Tissue	SOC-Butyl	GC-FPD	Tri-n-butyltin
Tissue	SOC-PESTMS2	GC/MS/MS	Aldrin
Tissue	SOC-PESTMS2	GC/MS/MS	Alpha-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	beta-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	DDD (4,4)
Tissue	SOC-PESTMS2	GC/MS/MS	DDE (4,4)
Tissue	SOC-PESTMS2	GC/MS/MS	DDT (4,4)
Tissue	SOC-PESTMS2	GC/MS/MS	delta-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	Dieldrin
Tissue	SOC-PESTMS2	GC/MS/MS	Endosulfan I

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	SOC-PESTMS2	GC/MS/MS	Endosulfan II
Tissue	SOC-PESTMS2	GC/MS/MS	Endosulfan sulfate
Tissue	SOC-PESTMS2	GC/MS/MS	Endrin
Tissue	SOC-PESTMS2	GC/MS/MS	Endrin aldehyde
Tissue	SOC-PESTMS2	GC/MS/MS	Endrin ketone
Tissue	SOC-PESTMS2	GC/MS/MS	gamma-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	Heptachlor
Tissue	SOC-PESTMS2	GC/MS/MS	Heptachlor Epoxide (beta)
Tissue	SOC-PESTMS2	GC/MS/MS	Methoxychlor
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	1,3,5-Trinitrobenzene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	1,3-Dinitrobenzene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2,4,6-Trinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2,4-Dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2,6-Dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2-Amino-4,6-dinitrtoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	3,5-Dinitroaniline
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	4-Amino-2,6-dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	Pentaerythritoltetranitrate
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Tissue	SOP LCP-Nitro	HPLC/MS/MS	2,4-Dinitrophenol
Tissue	SOP LCP-Nitro	HPLC/MS/MS	Picramic Acid
Tissue	SOP LCP-Nitro	HPLC/MS/MS	Picric Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorododecanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroheptanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorononanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctanoic Acid

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Matrix	Standard/Method	Technology	Analyte
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluoropentanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroundecanoic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorobutanesulfonic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluoroheptanoic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorohexanesulfonic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorononanoic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorooctanesulfonic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorooctanoic Acid
Aqueous/Solid	ASTM D 1426-93B	Potentiometry	Nitrogen, Total Kjeldahl (TKN)
Aqueous/Solid	EPA 1020A	Physical Property	Ignitability
Aqueous/Solid	EPA 1630	CVAFS	Methyl Mercury
Aqueous/Solid	EPA 314.0	IC	Perchlorate
Aqueous/Solid	EPA 350.1	Colorimetry	Ammonia
Aqueous/Solid	EPA 365.3	Colorimetry	Total Phosphorus
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorobutane sulfonate
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorobutanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorodecane Sulfonate
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorodecanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorododecanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluoroheptanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorohexane sulfonate
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorohexanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorononanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorooctane sulfonate
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluorooctanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluoropentanoic acid
Aqueous/Solid	EPA 537 MOD	HPLC/MS/MS	Perfluoroundecanoic acid
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Aluminum
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Antimony
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Arsenic
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Barium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Beryllium

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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Boron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cadmium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Calcium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Chromium, total
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cobalt
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Copper
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Iron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Lead
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Magnesium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Manganese
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Molybdenum
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Nickel
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Potassium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Selenium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Silver
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Sodium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Strontium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Thallium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Tin
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Titanium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Vanadium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Zinc
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Aluminum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Antimony
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Arsenic
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Barium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Beryllium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Boron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cadmium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Chromium, total
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cobalt
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Copper
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Iron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Lead
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Manganese
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Molybdenum

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Nickel
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Selenium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Silver
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Strontium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Thallium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Tin
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Titanium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Vanadium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Zinc
Aqueous/Solid	EPA 6850	HPLC/MS/MS	Perchlorate
Aqueous/Solid	EPA 7742	AA, Borohydride Reduction; GFAA	Selenium
Aqueous/Solid	EPA 8011	GC-ECD	Ethylene Dibromide
Aqueous/Solid	EPA 8011	GC-ECD	1,2-Dibrom-3-chloropropane
Aqueous/Solid	EPA 8015C/AK103-RRO	GC-FID	Residual Range Organics (RRO)
Aqueous/Solid	EPA 8015C; AK101-GRO; NWTPH-Gx	GC-FID	Gasoline Range Organics (GRO)
Aqueous/Solid	EPA 8015C; AK102-DRO; NWTPH-Dx	GC-FID	Diesel Range Organics (DRO)
Aqueous/Solid	EPA 8081A, B	GC-ECD	Aldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Alpha-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	alpha-Chlordane
Aqueous/Solid	EPA 8081A, B	GC-ECD	Chlordane (total)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDD (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDE (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDT (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	delta-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	Dieldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan I
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan II
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan sulfate
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin aldehyde
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin ketone
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-Chlordane

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ALS Environmental-Kelso

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Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor Epoxide (beta)
Aqueous/Solid	EPA 8081A, B	GC-ECD	Methoxychlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Toxaphene (total)
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDD
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDE
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDT
Aqueous/Solid	EPA 8081B	GC-ECD	Chlorpyrifos
Aqueous/Solid	EPA 8081B	GC-ECD	cis-Nonachlor
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobenzene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobutadiene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachloroethane
Aqueous/Solid	EPA 8081B	GC-ECD	Isodrin
Aqueous/Solid	EPA 8081B	GC-ECD	Mirex
Aqueous/Solid	EPA 8081B	GC-ECD	Oxychlordane
Aqueous/Solid	EPA 8081B	GC-ECD	trans-Nonachlor
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’,5,5’,6-Nonachlorobiphenyl (PCB 206)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’,5,6-Octachlorobiphenyl (PCB 195)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,5',6,6' Decachlorobiphenyl (PCB 209)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’,5-Heptachlorobiphenyl (PCB 170)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,3’,4,4’-Hexachlorobiphenyl (PCB 128)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4,4’,5,5’-Heptachlorobiphenyl (PCB 180)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4,4’,5’,6-Heptachlorobiphenyl (PCB 183)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4,4’,5’-Hexachlorobiphenyl (PCB 138)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4,4’,6,6’-Heptachlorobiphenyl (PCB 184)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4’,5,5’,6-Heptachlorobiphenyl (PCB 187)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4,5’-Pentachlorobiphenyl (PCB 87)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,4’,5-Pentachlorobiphenyl (PCB 90)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,3,5’-Tetrachlorobiphenyl (PCB 44)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,4,4’,5,5’-Hexachlorobiphenyl (PCB 153)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,4,5,5’-Pentachlorobiphenyl (PCB 101)

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ALS Environmental-Kelso

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,5,6’-Tetrachlorbiphenyl (PCB 53)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2’,5-Trichlorobiphenyl (PCB 18)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3’,4,4’,5,5’-Heptachlorobiphenyl (PCB 189)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3’,4,4’,5-Hexachlorobiphenyl (PCB 156)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3’,4,4’,5’-Hexachlorobiphenyl (PCB 157)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3’,4,4’,6-Hexachlorobiphenyl (PCB 158)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3’,4,4’-Pentachlorobiphenyl (PCB 105)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3’,4,4’,5,5’ Hexachlorobiphenyl (PCB 167)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3’,4,4’,5’,6-Hexachlorobiphenyl (PCB 168)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,4,4’,5-Pentachlorobiphenyl (PCB 114)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3’,4,4’,5-Pentachlorobiphenyl (PCB 118)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3’,4,4’,5-Pentachlorobiphenyl (PCB 123)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,4,4’-Tetrachlorobiphenyl (PCB 60)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3’,4,4’-Tetrachlorobiphenyl (PCB 66)
Aqueous/Solid	EPA 8082A	GC-ECD	2,4,4’-Trichlorobiphenyl (PCB 28)
Aqueous/Solid	EPA 8082A	GC-ECD	2,4’-Dichlorobiphenyl (PCB 8)
Aqueous/Solid	EPA 8082A	GC-ECD	3,3’,4,4’,5,5’-Hexachlorobiphenyl (PCB 169)
Aqueous/Solid	EPA 8082A	GC-ECD	3,3’,4,4’,5-Pentachlorobiphenyl (PCB 126)
Aqueous/Solid	EPA 8082A	GC-ECD	3,3’,4,4’-Tetrachlorobiphenyl (PCB 77)
Aqueous/Solid	EPA 8082A	GC-ECD	3,4,4’,5-Tetrachlorobiphenyl (PCB 81)
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1016
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1221
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1232
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1242
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1248
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1254
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1260
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1262
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1268
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-T
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-TP (Silvex)
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-D
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-DB
Aqueous/Solid	EPA 8151A	GC-ECD	Dalapon
Aqueous/Solid	EPA 8151A	GC-ECD	Dicamba

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1317 South 13th Avenue, Kelso, WA 98626
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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8151A	GC-ECD	Dichloroprop
Aqueous/Solid	EPA 8151A	GC-ECD	Dinoseb
Aqueous/Solid	EPA 8151A	GC-ECD	MCPA
Aqueous/Solid	EPA 8151A	GC-ECD	MCPP
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1-Trichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2-Trichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dibromoethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3,5-Trimethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1-phenylpropane
Aqueous/Solid	EPA 8260B, C	GC-MS	2,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Butanone (MEK)
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chloroethylvinylether
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Hexanone
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Isopropyltoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetone
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrolein
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrylonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromochloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromodichloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromoform
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromomethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon disulfide
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon Tetrachloride
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorodibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroform
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Dibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichlorodifluoromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous/Solid	EPA 8260B, C	GC-MS	Di-isopropylether (DIPE)
Aqueous/Solid	EPA 8260B, C	GC-MS	DIPE
Aqueous/Solid	EPA 8260B, C	GC-MS	ETBE
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethyl Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 11
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 113
Aqueous/Solid	EPA 8260B, C	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8260B, C	GC-MS	Isopropylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Methyl-tert-butylether (MTBE)
Aqueous/Solid	EPA 8260B, C	GC-MS	Naphthalene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Propylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	sec-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Styrene
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-amylmethylether (TAME)
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-Butyl alcohol
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Tetrachloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Toluene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichlorofluoromethane (Freon 11)

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl acetate
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl chloride
Aqueous/Solid	EPA 8260B, C	GC-MS	Xylene, total
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,3-Trichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,3-Trichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,4-Trimethylbenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dimethylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chloronaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methyl-4,6-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	3,3-Dichlorobenzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	3-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitrophenol

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ALS Environmental-Kelso

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Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Aniline
Aqueous/Solid	EPA 8270C, D	GC-MS	Anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(k)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzoic acid
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzyl alcohol
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethoxy)methane
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroisopropyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-ethylhexy)phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Butyl benzyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Carbazole
Aqueous/Solid	EPA 8270C, D	GC-MS	Chrysene
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzofuran
Aqueous/Solid	EPA 8270C, D	GC-MS	Diethyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Dimethylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	di-n-butylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Di-n-octylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluorene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorocyclopentadiene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachloroethane
Aqueous/Solid	EPA 8270C, D	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Isophorone
Aqueous/Solid	EPA 8270C, D	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	Nitrobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodimethylamine

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ALS Environmental-Kelso

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Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitroso-di-n-propylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodiphenylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyridine
Aqueous/Solid	EPA 8270C, D	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solid	EPA 8270C,D	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solid	EPA 8270D	GC-MS	1- Methylnaphthalene
Aqueous/Solid	EPA 8270 SIM	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Anthracene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(k)fluoranthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Chrysene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Fluorene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 100
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 128
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 138
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 153
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 154
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 17
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 183
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 190
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 203
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 206

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 209
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 28
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 47
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 66
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 71
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 85
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 99
Aqueous/Solid	EPA 8270 SIM	GC-MS	p-Dioxane
Aqueous/Solid	EPA 8270 SIM	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Pyrene
Aqueous/Solid	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	1,3-Dinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	2,4,6-Trinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Amino-4,6-dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	3,5-Dinitroaniline
Aqueous/Solid	EPA 8330B	HPLC	3-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Amino-2,6-dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Aqueous/Solid	EPA 8330B	HPLC	Nitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Nitroglycerin
Aqueous/Solid	EPA 8330B	HPLC	Pentachloronitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Pentaerythritoltetranitrate
Aqueous/Solid	EPA 8330B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Aqueous/Solid	EPA 8330B	HPLC	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Aqueous/Solid	EPA 9012B	Colorimetry	Total Cyanide
Aqueous/Solid	EPA 9030B	Distillation	Sulfide
Aqueous/Solid	EPA 9056A	IC	Bromide
Aqueous/Solid	EPA 9056A	IC	Chloride
Aqueous/Solid	EPA 9056A	IC	Fluoride
Aqueous/Solid	EPA 9056A	IC	Sulfate
Aqueous/Solid	EPA 9065	Spectrophotometer	Total Phenolics

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1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	LCP-NITG	HPLC/UV	Nitroguanidine
Aqueous/Solid	NWTPH-Dx	GC-FID	Residual Range Organics
Aqueous/Solid	OPPMS2	GC/MS/MS	Azinphos-methyl (Guthion)
Aqueous/Solid	OPPMS2	GC/MS/MS	Chlorpyrifos
Aqueous/Solid	OPPMS2	GC/MS/MS	Demeton O & S
Aqueous/Solid	OPPMS2	GC/MS/MS	Diazinon
Aqueous/Solid	OPPMS2	GC/MS/MS	Dichlorvos
Aqueous/Solid	OPPMS2	GC/MS/MS	dimethoate
Aqueous/Solid	OPPMS2	GC/MS/MS	Disulfoton
Aqueous/Solid	OPPMS2	GC/MS/MS	Ethoprop
Aqueous/Solid	OPPMS2	GC/MS/MS	Parathion, ethyl
Aqueous/Solid	OPPMS2	GC/MS/MS	Parathion, methyl
Aqueous/Solid	OPPMS2	GC/MS/MS	Phorate
Aqueous/Solid	OPPMS2	GC/MS/MS	Ronnel
Aqueous/Solid	OPPMS2	GC/MS/MS	Stirophos
Aqueous/Solid	OPPMS2	GC/MS/MS	Sulfotepp
Aqueous/Solid	SM4500 NH3 G	Colorimetry	Ammonia
Aqueous/Solid	SOC-Butyl	GC-FPD	Di-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	n-Butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tetra-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tri-n-butyltin
Aqueous/Solid	SOC-OTTO	GC-ECD	Otto Fuel
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Aldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Alpha-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	beta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDD (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDE (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDT (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	delta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Dieldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan I
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan II
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan sulfate
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin aldehyde
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin ketone

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	gamma-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor Epoxide (beta)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Methoxychlor
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutane sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecane Sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorododecanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroheptanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexane sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorononanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctane sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluoropentanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroundecanoic acid

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 1640	Reductive Metals Precipitation	Prep Method
Aqueous	EPA 3010A	Acid Digestion	Metals Digestion
Aqueous	EPA 3020A	Acid Digestion	Metals Digestion
Aqueous	EPA 3511	Microextraction	Extractable Prep
Aqueous	EPA 3520C	Continuous Liquid-Liquid Extraction	Extractable Prep
Aqueous	EPA 3535A	Solid Phase Extraction	Prep Method
Aqueous	EPA 5030B	Purge and Trap	Volatile Prep
Aqueous	SOP-MET-DIG	Acid Digestion	Metals Digestion
Solid	EPA 3050B	Acid Digestion	Metals Digestion
Solid	EPA 3060	Alkaline Digestion	Alkaline Digestion for Cr(VI) only
Solid	EPA 3541	Automated Soxhlet Extraction	Extractable Prep
Solid	EPA 3546	Microwave Extraction	Extractable Prep
Solid	EPA 3550B	Ultrasonic Extraction	Extractable Prep
Solid	EPA 5035A	Purge and Trap	Voc Organics
Solid	EPA 5050	Bomb Digestion	Prep Method
Solid	EPA 9013	Midi-Distillation	Cyanides
Solid	SOP-GEN-AVS	Acid Digestion	Simultaneously Extracted Metals
Aqueous/Solids	ASTM D3590-89	Digestion	TKN
Aqueous/Solids	EPA 1311	TCLP Extraction	Physical Extraction
Aqueous/Solids	EPA 3620C	Florisil Clean Up	Extractable Cleanup
Aqueous/Solids	EPA 3630C	Silica Gel Clean Up	Extractable Prep
Aqueous/Solids	EPA 3640A	Gel-Permeation Clean Up	Extractable Cleanup
Aqueous/Solids	EPA 3660	Sulfur Clean Up	Extractable Prep
Aqueous/Solids	EPA 3665A	Acid Clean Up	Extractable Cleanup

APPENDIX D. ALS DETECTION AND QUANTITATION LIMITS

METHOD	ANALYTE	CAS No.	MATRIX	MDLa	LODb	LOQc	UNITS
537 Mod	Perfluorobutanoic acid (PFBA)	375-22-4	Water	0.57	2	10	ng/L
537 Mod	Perfluoropentanoic acid (PFPeA)	2706-90-3	Water	0.31	1.2	5.0	ng/L
537 Mod	Perfluorobutane sulfonic acid (PFBS)	375-73-5	Water	0.41	1.2	5.0	ng/L
537 Mod	Perfluorohexanoic acid (PFHxA)	307-24-4	Water	0.89	2.4	5.0	ng/L
537 Mod	Perfluoroheptanoic acid (PFHpA)	375-85-9	Water	0.31	1.2	5.0	ng/L
537 Mod	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Water	0.35	1.2	5.0	ng/L
537 Mod	Perfluorooctanoic acid (PFOA)	335-67-1	Water	0.27	0.8	5.0	ng/L
537 Mod	Perfluorononanoic acid (PFNA)	375-95-1	Water	0.51	1.2	5.0	ng/L
537 Mod	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Water	0.60	1.2	5.0	ng/L
537 Mod	Perfluorodecanoic acid (PFDA)	335-76-2	Water	0.46	1.2	5.0	ng/L
537 Mod	Perfluoroundecanoic acid (PFUnDA)	2058-94-8	Water	0.60	1.2	5.0	ng/L
537 Mod	Perfluorodecane sulfonic acid (PFDS)	335-77-3	Water	0.58	1.2	5.0	ng/L
537 Mod	Perfluorododecanoic acid (PFDoDA)	307-55-1	Water	0.53	1.2	5.0	ng/L
537 Mod	Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	Water	0.49	1.2	5.0	ng/L
537 Mod	Perfluorooctanesulfonamide (FOSA)	754-91-6	Water	0.70	2.4	5.0	ng/L
537 Mod	N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	Water	0.56	1.2	5.0	ng/L
537 Mod	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	Water	0.79	2.4	5.0	ng/L
537 Mod	Perfluorotridecanoic acid (PFTrDA)	72629-94-8	Water	0.24	0.8	5.0	ng/L
537 Mod	Perfluorotetradecanoic acid (PFTeDA)	376-06-7	Water	0.44	1.2	5.0	ng/L
537 Mod	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	Water	0.86	2.4	5.0	ng/L
537 Mod	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	Water	0.70	2.4	5.0	ng/L
537 Mod	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	Water	TBD	TBD	5.0	ng/L
537 Mod	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	Water	TBD	TBD	5.0	ng/L
537 Mod	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	Water	0.72	2.4	5.0	ng/L
537 Mod	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	Water	1.1	2.4	5.0	ng/L

APPENDIX B

FIELD FORMS

TETRA TECH EM INC.

FIELD ACTIVITY LOG

Site Name:	FWHH Groundwater	Date:	10/25/17
Site Project No.:	10355414	Weather:	Clear -> windy
Field Staff:	S. Morford	POV Mileage:	18.4 miles
	D. Gardner		MMI Pelican
Equipment Usage:	Geotech HDPE LF Bladder pump + Controller		
	Geotech water level reader		
	YSI DSS Pro water parameter Meter		

0830: Leave office. Pickup Ice.
0900: Pickup Bottle order from Fedex
0920: Arrive FWHH. Meet WADE
sm 0945 ~~0920~~: Arrive FH-02. Safety Talk.
1000: Start work @ FH-02
1220: Sample. Collect FH-02 + Duplicate. COC time for Duplicate was altered to Confuse Lab. Sample time same as FH-02 Sample.
1230: Decon + Clean up
1305: Leave FH-02
1315: Arrive MW-06. Winds pickup out of NW - 5mpH to 15mph Gusts
1350: Start Purge
1410: Collect FRB Sample / 14:40 Collect MW-06
1505: Collect Rinsate Sample
1515: Leave MW-06
1535: Arrive MW-08
1558: Start Purge. Winds Gusting to 20 mpH
1730: Sample, MW-08
1740: Decon/Cleanup.
1750: Leave Base.
1805: At office.

TETRA TECH EM INC.

FIELD ACTIVITY LOG (CONTINUED)

ADDITIONAL WATER Level DATA from 10/25/17.

MW-05	31.29ft
MW-07	24.67ft
MW-10	48.51 ft
MW-02	58.09 ft
BH-1	Dry @ 30ft
BH-2	38.88ft

MONITORING WELL/GROUNDWATER SAMPLING SHEET

Monitoring Well No.: FH-02
Date: 10/25/17
Project Name: FWHH Groundwater
Project No.: 103S5414
Sampler: S. Morford
Depth to Well Bottom: ~~50~~ 56.04 ft
Depth to Water: 42.02 ft
Water Column: 14.02 ft
Well Diameter: 2 in
Immiscible Layers (Y/N): N

Well Volume:
1-inch well = water column (ft) x 0.041 gal/ft
2-inch well = water column (ft) x 0.163 gal/ft
3-inch well = water column (ft) x 0.367 gal/ft
4-inch well = water column (ft) x 0.653 gal/ft

Well Volume: 2.28526 gal

Time	Vol. Purged (L)	Water Level	pH	Conductivity ~~(µmhos/cm)~~	Temperature (°C/°F)	Turbidity NTU	DO mg/L	~~Other~~ ORP mV
1105	2L		7.79	964 µS/cm*	11.6°C	40.2	8.14	—
1120	9.5		7.61	955*	11.3	7.3	8.06	—
1135	17.0		7.50	948*	11.2	2.1	8.00	—
1145	22.0		7.51	1289 µS/cm	11.2	-0.7	8.00	—
1152	25.5		7.51	1290	11.3	-1.0	8.01	—
1155	27.0		7.51	1288	11.4	-1.1	8.00	20.4
1200	29.5		7.51	1288	11.4	-1.2	8.00	20.5
1205	—		7.51	1289	11.6	-0.3	8.00	20.7
1210	34.5		7.52	1289	11.8	-0.3	7.98	20.0
1215	—		7.52	1290	11.9	-0.2	8.00	19.5
1220	39.5		7.52	1289	12.0	-0.7	7.99	21.8

Purge start time: 1045
Purge end time: 1220
Total Volume Purged: 39.5L

Method of Purging: ☒ Pump (specify type below) ☐ Bailer (specify type below)
Purged Dry (y/n)? N
HDPE Bladder
How Measured? Bucket + Timer

QA/QC Sample Collected Here? ☒ Duplicate ☐ Matrix Spike ☐ Equip. Blank ☐ No QA/QC Sample

Date and Time of Sample Collection: 10/25/17 1220
Sample Number(s): FWHH_FH-02_2017102

Comments: 2.28526 gal = 10.389 L => 3 casings = 31.2L
* Conductivity reported first 3 readings. Specific Conductivity thereafter
Collected duplicate. FWHH_DUPE_20171025.
Reported collection time of 1400 on COC. Actual
Collection time 1220.
Collected pictures + GPS waypoint 065

MONITORING WELL/GROUNDWATER SAMPLING SHEET

Monitoring Well No.: MW-06 Date: 10/25/17

Project Name: FWHH Groundwater Project No.: 10355414

Sampler: S. MORFORD

Depth to Well Bottom: 38.17 ft

Depth to Water: 28.88 ft

Water Column: 9.29 ft

Well Diameter: 2 in

Immiscible Layers (Y/N): N

Well Volume:
1-inch well = water column (ft) x 0.041 gal/ft
2-inch well = water column (ft) x 0.163 gal/ft
3-inch well = water column (ft) x 0.367 gal/ft
4-inch well = water column (ft) x 0.653 gal/ft

Well Volume: 1.51427 gal

Time	Vol. Purged (L)	Water Level	pH	Specific Conductivity ~~(µmhos/cm)~~ µS/cm	Temperature (°C/°F)	Turbidity NTU	DO mg/L	Other ORP mV
1400	5L		7.73	1016 µS/cm	12.0°C	154.0	6.69	38.4
1405	7.5		7.49	1013	11.7	98.4	6.68	13.7
1417			7.46	1016	11.6	27.0	6.74	13.3
1420	15.0L		7.45	1016	11.6	17.0	6.64	13.7
1425			7.45	1017	11.6	10.2	6.52	13.9
1430	20L		7.51	1024	11.7	13.8	6.62	19.8
1433			7.45	1023	11.8	8.4	6.43	15.4
1438			7.45	1027	11.8	5.8	6.31	14.1
1440	25L		7.45	1025	11.8	5.5	6.28	13.9

Purge start time: 1350 Method of Purging: ☒ Pump (specify type below) ☐ Bailer (specify type below)

Purge end time: 1440 Purged Dry (y/n)? N HDPE Bladder

Total Volume Purged: 25L How Measured? Bucket + timer

QA/QC Sample Collected Here? ☐ Duplicate ☐ Matrix Spike ☒ Equip. Blank ☐ No QA/QC Sample XFRB

Date and Time of Sample Collection: 1440 10/25/17 Sample Number(s): FWHH_MW-06-20171025

Comments: 1.51427 Gal = 6.8837L => 3 casings = 20.6511 L
Purge @ 500 mL/minute
Collected FRB Sample @ 1440: FWHH_FRB-20171025
Collected Rinsate Sample @ 1505: FWHH_Rinsate_20171025
Took 2 photos. GPS pt 066

MONITORING WELL/GROUNDWATER SAMPLING SHEET

Monitoring Well No.: MW-Ø8 Date: 10/25/17

Project Name: FWHH Groundwater Project No.: 10355414

Sampler: S. MORFORD

Depth to Well Bottom: 60.02 ft

Depth to Water: 38.21 ft

Water Column: 21.81 ft

Well Diameter: 2 in

Immiscible Layers (Y/N): N

Well Volume:
1-inch well = water column (ft) x 0.041 gal/ft
2-inch well = water column (ft) x 0.163 gal/ft
3-inch well = water column (ft) x 0.367 gal/ft
4-inch well = water column (ft) x 0.653 gal/ft

Well Volume: 3.55503 gal

Time	Vol. Purged (L)	Water Level	pH	Conductivity ~~(µmhos/cm)~~	Temperature (°C/°F)	Turbidity NTU	DO mg/L	ORP mV ~~Other~~
1610			8.02	1333 µS/cm	11.6 °C	24.1	8.76	44.1
1625	14.6 L		7.80	1332	11.6	17.1	8.72	16.0
1645	25.4		7.79	1338	11.4	18.2	8.75	-12.2
1705	36.20		7.63	1340	11.3	11.7	8.75	18.7
1710			7.63	1340	11.3	8.8	8.76	16.5
1715	41.58		7.63	1341	11.2	7.3	8.75	16.6
1720			7.64	1342	11.2	5.8	8.75	17.5
1725			7.64	1342	11.1	5.5	8.75	18.1
1730	49.68		7.66	1342	11.1	5.4	8.76	23.8

Purge start time: 1558 Method of Purging: ☒ Pump (specify type below) ☐ Bailer (specify type below)

Purge end time: 1730 Purged Dry (y/n)? ____ HDPE Bladder

Total Volume Purged: 49.68 L How Measured? Bucket + timer

QA/QC Sample Collected Here? ☐ Duplicate ☐ Matrix Spike ☐ Equip. Blank ☒ No QA/QC Sample

Date and Time of Sample Collection: 10/25/17 17:30 Sample Number(s): FWHH_MW-08_20171025

Comments: 3.555 gal = 16.1615 L => 3 casings = 48.48 L
Purge rate 0.54 L/min => 90 minute purge
Took Photos + GPS (068 in GPS)
Gusts up to 20 mpH.

APPENDIX C

ANALYTICAL REPORTS

1. **TETRA TECH DATA VALIDATION SUMMARY**
2. **LEVEL II ANALYTICAL REPORT FROM TEST AMERICA**
3. **EDD FROM TEST AMERICA (ELECTRONIC ONLY)**
4. **VALIDATED DATA FROM TETRA TECH (ELECTRONIC ONLY)**
5. **LEVEL IV ANALYTICAL REPORT FROM TEST AMERICA (ELECTRONIC ONLY)**

DATA VALIDATION CHECKLIST – STAGE 4

Site Name	Fort William Henry Harrison	Project No.	103Z5414
Data Reviewer (signature and date)	Shanna Davis November 7, 2017	Technical Reviewer (signature and date)	Jessica A. Vickers November 7, 2017
Laboratory Report No.	320-32756-1	Laboratory	TestAmerica/West Sacramento, California
Analyses	Perfluorinated hydrocarbons by EPA Method 537		
Samples and Matrix	Six water samples, including a field duplicate, rinsate blank, and field reagent blank		
Field Duplicate Pairs	FWHH_FH-02_20171025/FWHH_DUPE_20171025		
Field Blanks	FWHH_RINSATE_20171025 and FWHH_FRB_20171025		

INTRODUCTION

This checklist summarizes the Stage 4 validation performed on the subject laboratory report, in accordance with the U.S. Environmental Protection Agency (EPA) *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009). Analytical data were evaluated in general accordance with the EPA *National Functional Guidelines (NFG) for Organic Superfund Methods Data Review* (January 2017).

OVERALL EVALUATION

No rejection of results was required for this data package. The results may be used as qualified based on the findings of this validation effort.

Data completeness:

Within Criteria	Exceedance/Notes
Y	

Sample preservation, receipt, and holding times:

Within Criteria	Exceedance/Notes
Y	

DATA VALIDATION CHECKLIST – STAGE 4

Instrument Performance Checks:

Within Criteria	Exceedance/Notes
Y	

Initial Calibration:

Within Criteria	Exceedance/Notes
Y	

Continuing Calibration:

Within Criteria	Exceedance/Notes
Y	

Calibration Verification:

Within Criteria	Exceedance/Notes
Y	

Method blanks:

Within Criteria	Exceedance/Notes
Y	

Field blanks:

Within Criteria	Exceedance/Notes
N	FWHH_RINSATE_20171025 contained perfluorobutanoic acid (PFBA), perfluorohexanesulfonic acid (PFHxS), and perfluorooctanesulfonic acid (PFOS). For sample FWHH_MW06_20171025, the PFHxS result was qualified as estimated with a possible high bias (J+), and the PFOS result was raised to the LOQ and qualified as non-detect (U). No other qualifications were applied (associated sample results greater than ten times the blank values).

Interference Check Samples (ICS) (ICP metals only):

Within Criteria	Exceedance/Notes
NA	

System monitoring compounds (surrogates and labeled compounds):

Within Criteria	Exceedance/Notes
Y	

MS/MSD:

Within Criteria	Exceedance/Notes
NA	Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate.

Post digestion spikes:

Within Criteria	Exceedance/Notes
NA	

DATA VALIDATION CHECKLIST – STAGE 4

Serial dilutions:

Within Criteria	Exceedance/Notes
NA	

Laboratory duplicates:

Within Criteria	Exceedance/Notes
NA	

Field duplicates:

Within Criteria	Exceedance/Notes
Y	

LCSs/LCSDs:

Within Criteria	Exceedance/Notes
Y	

Sample dilutions:

Within Criteria	Exceedance/Notes
NA	

Re-extraction and reanalysis:

Within Criteria	Exceedance/Notes
NA	

Second column confirmation (GC and HPLC analyses only):

Within Criteria	Exceedance/Notes
NA	

Internal Standards:

Within Criteria	Exceedance/Notes
Y	

Target analyte identification:

Within Criteria	Exceedance/Notes
NA	

Analyte quantitation and MDLs/RLs:

Within Criteria	Exceedance/Notes
Y	Several analytes were detected at concentrations above detection limits but below the LOQ. The laboratory qualified these results as estimated (J).

Tentatively identified compounds:

Within Criteria	Exceedance/Notes
NA	

System performance and instrument stability:

Within Criteria	Exceedance/Notes
Y	

Other [specify]:

Within Criteria	Exceedance/Notes
NA	

Overall Qualifications:

See results summary pages attached for changes to the laboratory qualifiers based upon this validation. The following is a list of qualifiers and definitions that may be used for the validation of this data package:

J	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample.
J+	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased high.
J-	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased low.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated value is the approximate concentration of the analyte in the sample.
R	The sample result is rejected as unusable due to serious deficiencies in one or more quality control criteria. The analyte may or may not be present in the sample.
U	The analyte was analyzed for, but was not detected at or above the associated value (reporting limit).
UJ	The analyte was analyzed for, but was not detected at or above the associated value (reporting limit), which is considered approximate due to deficiencies in one or more quality control criteria.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

TestAmerica Job ID: 320-32756-1
TestAmerica Sample Delivery Group: FWHH
Client Project/Site: FWHH Groundwater

For:
Tetra Tech, Inc.
825 West Custer Ave
Helena, Montana 59602

Attn: Scott Morford

Authorized for release by:
11/6/2017 11:29:53 AM

David Alltucker, Project Manager I
(916)374-4383
david.alltucker@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Definitions/Glossary

Client: Tetra Tech, Inc.
Project/Site: FWHH Groundwater

TestAmerica Job ID: 320-32756-1
SDG: FWHH

Qualifiers

LCMS

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
U	Undetected at the Limit of Detection.
M	Manual integrated compound.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: Tetra Tech, Inc.
Project/Site: FWHH Groundwater

TestAmerica Job ID: 320-32756-1
SDG: FWHH

Job ID: 320-32756-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative
320-32756-1

Receipt
The samples were received on 10/27/2017 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.9º C.

LCMS
Method(s) 537 (modified): The first level standard from the initial calibration curve is used to evaluate the tune criteria. The instrument mass windows are set at +/- 0.5amu; therefore, detection of the analyte serves as verification that the assigned mass is within +/- 0.5amu of the true value, which meets the DoD/DOE QSM tune criterion.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method(s) 3535: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-191929 .

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Client Sample ID: FWHH_FH-02_20171025 — Lab Sample ID: 320-32756-1

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	7.4		1.5	0.27	ng/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	13		3.1	0.44	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	4.5		1.5	0.19	ng/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	18		1.5	0.38	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	7.2	M	3.1	0.65	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.58	J	1.5	0.21	ng/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	2.7		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	16		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	9.4		3.1	0.41	ng/L	1		537 (modified)	Total/NA
6:2FTS	3.2	J	15	2.3	ng/L	1		537 (modified)	Total/NA

Client Sample ID: FWHH_MW-06_20171025 — Lab Sample ID: 320-32756-2

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	6.8		1.5	0.27	ng/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	2.2	J	3.1	0.44	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	1.4	J	1.5	0.19	ng/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	2.4		1.5	0.37	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	1.6	J M	3.1	0.65	ng/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.74	J	1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2.4		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	2.1	J M	3.1	0.41	ng/L	1		537 (modified)	Total/NA

Client Sample ID: FWHH_MW-08_20171025 — Lab Sample ID: 320-32756-3

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	46	M	1.5	0.27	ng/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	120		3.1	0.45	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	22		1.5	0.19	ng/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	180		1.5	0.38	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	11		3.1	0.65	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.22	J	1.5	0.21	ng/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	29		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	57		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	5.8		3.1	0.42	ng/L	1		537 (modified)	Total/NA

Client Sample ID: FWHH_DUPE_20171025 — Lab Sample ID: 320-32756-4

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	7.3		1.5	0.27	ng/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	13		3.1	0.45	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	4.2		1.5	0.19	ng/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	17		1.5	0.38	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	7.3	M	3.1	0.66	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.58	J M	1.5	0.21	ng/L	1		537 (modified)	Total/NA
Perfluorotetradecanoic acid (PFTeA)	0.23	J	1.5	0.22	ng/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	2.7		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	17		1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	10	M	3.1	0.42	ng/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Tetra Tech, Inc.
Project/Site: FWHH Groundwater

TestAmerica Job ID: 320-32756-1
SDG: FWHH

Client Sample ID: FWHH_RINSATE_20171025 — Lab Sample ID: 320-32756-5

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.34	J	1.5	0.27	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.26	J	1.5	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.42	J M	3.1	0.41	ng/L	1		537 (modified)	Total/NA

Client Sample ID: FWHH_FRB_20171025 — Lab Sample ID: 320-32756-6

No Detections.

This Detection Summary does not include radiochemical test results.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Client Sample ID: FWHH_FH-02_20171025 Lab Sample ID: 320-32756-1

Date Collected: 10/25/17 12:20 **Matrix: Water**
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**7.4**		1.5	0.27	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorohexanoic acid (PFHxA)	**13**		3.1	0.44	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluoroheptanoic acid (PFHpA)	**4.5**		1.5	0.19	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluoropentanoic acid (PFPeA)	**18**		1.5	0.38	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorooctanoic acid (PFOA)	**7.2**	**M**	3.1	0.65	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorononanoic acid (PFNA)	**0.58**	**J**	1.5	0.21	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorodecanoic acid (PFDA)	0.77	U	1.5	0.24	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluoroundecanoic acid (PFUnA)	2.3	U	3.1	0.84	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorododecanoic acid (PFDoA)	1.5	U	3.1	0.42	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorotridecanoic Acid (PFTriA)	2.3	U	3.1	1.0	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorotetradecanoic acid (PFTeA)	0.77	U	1.5	0.22	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorobutanesulfonic acid (PFBS)	**2.7**		1.5	0.23	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorohexanesulfonic acid (PFHxS)	**16**		1.5	0.23	ng/L		10/30/17 14:57	11/03/17 11:51	1
Perfluorooctanesulfonic acid (PFOS)	**9.4**		3.1	0.41	ng/L		10/30/17 14:57	11/03/17 11:51	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/03/17 11:51	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	7.7	U	15	2.4	ng/L		10/30/17 14:57	11/03/17 11:51	1
6:2FTS	**3.2**	**J**	15	2.3	ng/L		10/30/17 14:57	11/03/17 11:51	1
8:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/03/17 11:51	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*107*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C4 PFOA	*92*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C5 PFNA	*107*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C2 PFDA	*111*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C2 PFUnA	*104*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C2 PFDoA	*96*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C4 PFBA	*91*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
18O2 PFHxS	*106*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C4 PFOS	*101*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C5-PFPeA	*99*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C4-PFHpA	*103*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
M2-6:2FTS	*70*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
M2-8:2FTS	*146*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
d3-NMeFOSAA	*110*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
d5-NEtFOSAA	*109*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C3-PFBS	*97*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*
13C2-PFTeDA	*94*		*25 - 150*	*10/30/17 14:57*	*11/03/17 11:51*	*1*

Client Sample ID: FWHH_MW-06_20171025 Lab Sample ID: 320-32756-2

Date Collected: 10/25/17 14:40 **Matrix: Water**
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**6.8**		1.5	0.27	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorohexanoic acid (PFHxA)	**2.2**	**J**	3.1	0.44	ng/L		10/30/17 14:57	11/02/17 07:46	1

Client Sample ID: FWHH_MW-06_20171025

Lab Sample ID: 320-32756-2
Matrix: Water

Date Collected: 10/25/17 14:40
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**1.4**	**J**	1.5	0.19	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluoropentanoic acid (PFPeA)	**2.4**		1.5	0.37	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorooctanoic acid (PFOA)	**1.6**	**J M**	3.1	0.65	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorononanoic acid (PFNA)	0.76	U	1.5	0.21	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorodecanoic acid (PFDA)	0.76	U	1.5	0.24	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluoroundecanoic acid (PFUnA)	2.3	U	3.1	0.84	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorododecanoic acid (PFDoA)	1.5	U	3.1	0.42	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorotridecanoic Acid (PFTriA)	2.3	U	3.1	0.99	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorotetradecanoic acid (PFTeA)	0.76	U	1.5	0.22	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorobutanesulfonic acid (PFBS)	**0.74**	**J**	1.5	0.23	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorohexanesulfonic acid (PFHxS)	**2.4**		1.5	0.23	ng/L		10/30/17 14:57	11/02/17 07:46	1
Perfluorooctanesulfonic acid (PFOS)	**2.1**	**J M**	3.1	0.41	ng/L		10/30/17 14:57	11/02/17 07:46	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	7.6	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 07:46	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	7.6	U	15	2.4	ng/L		10/30/17 14:57	11/02/17 07:46	1
6:2FTS	7.6	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 07:46	1
8:2FTS	7.6	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 07:46	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*93*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C4 PFOA	*82*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C5 PFNA	*96*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C2 PFDA	*99*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C2 PFUnA	*89*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C2 PFDoA	*83*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C4 PFBA	*91*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
18O2 PFHxS	*91*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C4 PFOS	*91*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C5-PFPeA	*91*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C4-PFHpA	*95*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
M2-6:2FTS	*72*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
M2-8:2FTS	*137*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
d3-NMeFOSAA	*98*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
d5-NEtFOSAA	*96*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C3-PFBS	*97*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*
13C2-PFTeDA	*81*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:46*	*1*

Client Sample ID: FWHH_MW-08_20171025

Lab Sample ID: 320-32756-3
Matrix: Water

Date Collected: 10/25/17 17:30
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**46**	**M**	1.5	0.27	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorohexanoic acid (PFHxA)	**120**		3.1	0.45	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluoroheptanoic acid (PFHpA)	**22**		1.5	0.19	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluoropentanoic acid (PFPeA)	**180**		1.5	0.38	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorooctanoic acid (PFOA)	**11**		3.1	0.65	ng/L		10/30/17 14:57	11/02/17 07:54	1

Client Sample ID: FWHH_MW-08_20171025

Lab Sample ID: 320-32756-3

Date Collected: 10/25/17 17:30
Date Received: 10/27/17 10:10

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorononanoic acid (PFNA)	**0.22**	**J**	1.5	0.21	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorodecanoic acid (PFDA)	0.77	U	1.5	0.24	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluoroundecanoic acid (PFUnA)	2.3	U	3.1	0.85	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorododecanoic acid (PFDoA)	1.5	U	3.1	0.42	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorotridecanoic Acid (PFTriA)	2.3	U	3.1	1.0	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorotetradecanoic acid (PFTeA)	0.77	U	1.5	0.22	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorobutanesulfonic acid (PFBS)	**29**		1.5	0.23	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorohexanesulfonic acid (PFHxS)	**57**		1.5	0.23	ng/L		10/30/17 14:57	11/02/17 07:54	1
Perfluorooctanesulfonic acid (PFOS)	**5.8**		3.1	0.42	ng/L		10/30/17 14:57	11/02/17 07:54	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 07:54	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	7.7	U	15	2.4	ng/L		10/30/17 14:57	11/02/17 07:54	1
6:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 07:54	1
8:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 07:54	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*98*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C4 PFOA	*90*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C5 PFNA	*103*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C2 PFDA	*102*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C2 PFUnA	*95*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C2 PFDoA	*81*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C4 PFBA	*72*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
18O2 PFHxS	*101*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C4 PFOS	*98*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C5-PFPeA	*90*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C4-PFHpA	*105*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
M2-6:2FTS	*78*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
M2-8:2FTS	*123*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
d3-NMeFOSAA	*105*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
d5-NEtFOSAA	*100*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C3-PFBS	*92*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*
13C2-PFTeDA	*82*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:54*	*1*

Client Sample ID: FWHH_DUPE_20171025

Lab Sample ID: 320-32756-4

Date Collected: 10/25/17 14:00
Date Received: 10/27/17 10:10

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**7.3**		1.5	0.27	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorohexanoic acid (PFHxA)	**13**		3.1	0.45	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluoroheptanoic acid (PFHpA)	**4.2**		1.5	0.19	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluoropentanoic acid (PFPeA)	**17**		1.5	0.38	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorooctanoic acid (PFOA)	**7.3**	**M**	3.1	0.66	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorononanoic acid (PFNA)	**0.58**	**J M**	1.5	0.21	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorodecanoic acid (PFDA)	0.77	U	1.5	0.24	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluoroundecanoic acid (PFUnA)	2.3	U	3.1	0.85	ng/L		10/30/17 14:57	11/02/17 08:02	1

Client Sample ID: FWHH_DUPE_20171025 Lab Sample ID: 320-32756-4

Date Collected: 10/25/17 14:00 **Matrix: Water**
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorododecanoic acid (PFDoA)	1.5	U	3.1	0.43	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorotridecanoic Acid (PFTriA)	2.3	U	3.1	1.0	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorotetradecanoic acid (PFTeA)	**0.23**	**J**	1.5	0.22	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorobutanesulfonic acid (PFBS)	**2.7**		1.5	0.23	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorohexanesulfonic acid (PFHxS)	**17**		1.5	0.23	ng/L		10/30/17 14:57	11/02/17 08:02	1
Perfluorooctanesulfonic acid (PFOS)	**10**	**M**	3.1	0.42	ng/L		10/30/17 14:57	11/02/17 08:02	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 08:02	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	7.7	U	15	2.4	ng/L		10/30/17 14:57	11/02/17 08:02	1
6:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 08:02	1
8:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 08:02	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*105*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C4 PFOA	*94*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C5 PFNA	*108*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C2 PFDA	*110*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C2 PFUnA	*101*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C2 PFDoA	*95*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C4 PFBA	*94*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
18O2 PFHxS	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C4 PFOS	*101*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C5-PFPeA	*101*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C4-PFHpA	*107*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
M2-6:2FTS	*80*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
M2-8:2FTS	*147*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
d3-NMeFOSAA	*114*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
d5-NEtFOSAA	*115*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C3-PFBS	*102*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*
13C2-PFTeDA	*90*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:02*	*1*

Client Sample ID: FWHH_RINSATE_20171025 Lab Sample ID: 320-32756-5

Date Collected: 10/25/17 15:05 **Matrix: Water**
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**0.34**	**J**	1.5	0.27	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorohexanoic acid (PFHxA)	1.5	U	3.1	0.45	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluoroheptanoic acid (PFHpA)	0.77	U	1.5	0.19	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluoropentanoic acid (PFPeA)	0.77	U	1.5	0.38	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorooctanoic acid (PFOA)	1.5	U	3.1	0.65	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorononanoic acid (PFNA)	0.77	U	1.5	0.21	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorodecanoic acid (PFDA)	0.77	U	1.5	0.24	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluoroundecanoic acid (PFUnA)	2.3	U	3.1	0.84	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorododecanoic acid (PFDoA)	1.5	U	3.1	0.42	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorotridecanoic Acid (PFTriA)	2.3	U	3.1	1.0	ng/L		10/30/17 14:57	11/02/17 08:10	1

Client Sample ID: FWHH_RINSATE_20171025

Lab Sample ID: 320-32756-5

Date Collected: 10/25/17 15:05
Matrix: Water
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorotetradecanoic acid (PFTeA)	0.77	U	1.5	0.22	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorobutanesulfonic acid (PFBS)	0.77	U	1.5	0.23	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorohexanesulfonic acid (PFHxS)	**0.26**	**J**	1.5	0.23	ng/L		10/30/17 14:57	11/02/17 08:10	1
Perfluorooctanesulfonic acid (PFOS)	**0.42**	**J M**	3.1	0.41	ng/L		10/30/17 14:57	11/02/17 08:10	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 08:10	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	7.7	U	15	2.4	ng/L		10/30/17 14:57	11/02/17 08:10	1
6:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 08:10	1
8:2FTS	7.7	U	15	2.3	ng/L		10/30/17 14:57	11/02/17 08:10	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C4 PFOA	*94*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C5 PFNA	*109*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C2 PFDA	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C2 PFUnA	*108*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C2 PFDoA	*107*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C4 PFBA	*106*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
18O2 PFHxS	*105*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C4 PFOS	*103*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C5-PFPeA	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C4-PFHpA	*111*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
M2-6:2FTS	*80*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
M2-8:2FTS	*132*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
d3-NMeFOSAA	*125*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
d5-NEtFOSAA	*112*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C3-PFBS	*100*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*
13C2-PFTeDA	*96*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:10*	*1*

Client Sample ID: FWHH_FRB_20171025

Lab Sample ID: 320-32756-6

Date Collected: 10/25/17 14:10
Matrix: Water
Date Received: 10/27/17 10:10

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	0.89	U	1.8	0.31	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorohexanoic acid (PFHxA)	1.8	U	3.5	0.51	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluoroheptanoic acid (PFHpA)	0.89	U	1.8	0.22	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluoropentanoic acid (PFPeA)	0.89	U	1.8	0.43	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorooctanoic acid (PFOA)	1.8	U	3.5	0.75	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorononanoic acid (PFNA)	0.89	U	1.8	0.24	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorodecanoic acid (PFDA)	0.89	U	1.8	0.27	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluoroundecanoic acid (PFUnA)	2.7	U	3.5	0.97	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorododecanoic acid (PFDoA)	1.8	U	3.5	0.49	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorotridecanoic Acid (PFTriA)	2.7	U	3.5	1.2	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorotetradecanoic acid (PFTeA)	0.89	U	1.8	0.26	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorobutanesulfonic acid (PFBS)	0.89	U	1.8	0.27	ng/L		10/30/17 14:57	11/02/17 08:18	1
Perfluorohexanesulfonic acid (PFHxS)	0.89	U	1.8	0.27	ng/L		10/30/17 14:57	11/02/17 08:18	1

Client Sample Results

Client: Tetra Tech, Inc.
Project/Site: FWHH Groundwater

TestAmerica Job ID: 320-32756-1
SDG: FWHH

Client Sample ID: FWHH_FRB_20171025
Date Collected: 10/25/17 14:10
Date Received: 10/27/17 10:10

Lab Sample ID: 320-32756-6
Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	1.8	U	3.5	0.48	ng/L		10/30/17 14:57	11/02/17 08:18	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	8.9	U	18	2.7	ng/L		10/30/17 14:57	11/02/17 08:18	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	8.9	U	18	2.7	ng/L		10/30/17 14:57	11/02/17 08:18	1
6:2FTS	8.9	U	18	2.7	ng/L		10/30/17 14:57	11/02/17 08:18	1
8:2FTS	8.9	U	18	2.7	ng/L		10/30/17 14:57	11/02/17 08:18	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*103*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C4 PFOA	*94*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C5 PFNA	*108*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C2 PFDA	*111*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C2 PFUnA	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C2 PFDoA	*96*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C4 PFBA	*103*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
18O2 PFHxS	*103*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C4 PFOS	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C5-PFPeA	*101*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C4-PFHpA	*110*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
M2-6:2FTS	*76*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
M2-8:2FTS	*126*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
d3-NMeFOSAA	*109*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
d5-NEtFOSAA	*111*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C3-PFBS	*100*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*
13C2-PFTeDA	*97*		*25 - 150*	*10/30/17 14:57*	*11/02/17 08:18*	*1*

Method: 537 (modified) - Perfluorinated Hydrocarbons

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	3C2 PFHx (25-150)	3C4 PFO/ (25-150)	3C5 PFN/ (25-150)	3C2 PFD/ (25-150)	3C2 PFUn (25-150)	3C2 PFDo (25-150)	3C4 PFB/ (25-150)	3O2 PFHx (25-150)
320-32756-1	FWHH_FH-02_20171025	107	92	107	111	104	96	91	106
320-32756-2	FWHH_MW-06_20171025	93	82	96	99	89	83	91	91
320-32756-3	FWHH_MW-08_20171025	98	90	103	102	95	81	72	101
320-32756-4	FWHH_DUPE_20171025	105	94	108	110	101	95	94	104
320-32756-5	FWHH_RINSATE_20171025	104	94	109	104	108	107	106	105
320-32756-6	FWHH_FRB_20171025	103	94	108	111	104	96	103	103
LCS 320-191929/2-A	Lab Control Sample	102	92	101	106	106	93	104	105
LCSD 320-191929/3-A	Lab Control Sample Dup	105	93	109	110	104	102	99 M	104
MB 320-191929/1-A	Method Blank	100	91	103	101	104	96	87	100

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	3C4 PFO: (25-150)	3C5-PFPe (25-150)	3C4-PFHp (25-150)	M2-6:2FTS (25-150)	M2-8:2FTS (25-150)	-NMeFOS/ (25-150)	-NEtFOS/ (25-150)	3C3-PFB: (25-150)
320-32756-1	FWHH_FH-02_20171025	101	99	103	70	146	110	109	97
320-32756-2	FWHH_MW-06_20171025	91	91	95	72	137	98	96	97
320-32756-3	FWHH_MW-08_20171025	98	90	105	78	123	105	100	92
320-32756-4	FWHH_DUPE_20171025	101	101	107	80	147	114	115	102
320-32756-5	FWHH_RINSATE_20171025	103	104	111	80	132	125	112	100
320-32756-6	FWHH_FRB_20171025	104	101	110	76	126	109	111	100
LCS 320-191929/2-A	Lab Control Sample	101	99	107	73	123	111	107	103
LCSD 320-191929/3-A	Lab Control Sample Dup	104	102	109	75	124	111	107	97
MB 320-191929/1-A	Method Blank	99	94	100	70	122	110	105	95

		Percent Isotope Dilution Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	C2-PFTeD (25-150)
320-32756-1	FWHH_FH-02_20171025	94
320-32756-2	FWHH_MW-06_20171025	81
320-32756-3	FWHH_MW-08_20171025	82
320-32756-4	FWHH_DUPE_20171025	90
320-32756-5	FWHH_RINSATE_20171025	96
320-32756-6	FWHH_FRB_20171025	97
LCS 320-191929/2-A	Lab Control Sample	98
LCSD 320-191929/3-A	Lab Control Sample Dup	94
MB 320-191929/1-A	Method Blank	92

Surrogate Legend

13C2 PFHxA = 13C2 PFHxA
13C4 PFOA = 13C4 PFOA
13C5 PFNA = 13C5 PFNA
13C2 PFDA = 13C2 PFDA
13C2 PFUnA = 13C2 PFUnA
13C2 PFDoA = 13C2 PFDoA
13C4 PFBA = 13C4 PFBA
18O2 PFHxS = 18O2 PFHxS
13C4 PFOS = 13C4 PFOS
13C5-PFPeA = 13C5-PFPeA
13C4-PFHpA = 13C4-PFHpA
M2-6:2FTS = M2-6:2FTS
M2-8:2FTS = M2-8:2FTS
d3-NMeFOSAA = d3-NMeFOSAA

d5-NEtFOSAA = d5-NEtFOSAA
13C3-PFBS = 13C3-PFBS
13C2-PFTeDA = 13C2-PFTeDA

Method: 537 (modified) - Perfluorinated Hydrocarbons

Lab Sample ID: MB 320-191929/1-A **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 192548 **Prep Batch: 191929**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	1.0	U	2.0	0.35	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorohexanoic acid (PFHxA)	2.0	U	4.0	0.58	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	0.25	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluoropentanoic acid (PFPeA)	1.0	U	2.0	0.49	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorooctanoic acid (PFOA)	2.0	U	4.0	0.85	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	0.27	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	0.31	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluoroundecanoic acid (PFUnA)	3.0	U	4.0	1.1	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorododecanoic acid (PFDoA)	2.0	U	4.0	0.55	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorotridecanoic Acid (PFTriA)	3.0	U	4.0	1.3	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorotetradecanoic acid (PFTeA)	1.0	U	2.0	0.29	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	0.30	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorohexanesulfonic acid (PFHxS)	1.0	U	2.0	0.30	ng/L		10/30/17 14:57	11/02/17 07:07	1
Perfluorooctanesulfonic acid (PFOS)	2.0	U M	4.0	0.54	ng/L		10/30/17 14:57	11/02/17 07:07	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	10	U	20	3.0	ng/L		10/30/17 14:57	11/02/17 07:07	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	10	U	20	3.1	ng/L		10/30/17 14:57	11/02/17 07:07	1
6:2FTS	10	U	20	3.0	ng/L		10/30/17 14:57	11/02/17 07:07	1
8:2FTS	10	U	20	3.0	ng/L		10/30/17 14:57	11/02/17 07:07	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFHxA	*100*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C4 PFOA	*91*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C5 PFNA	*103*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C2 PFDA	*101*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C2 PFUnA	*104*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C2 PFDoA	*96*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C4 PFBA	*87*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
18O2 PFHxS	*100*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C4 PFOS	*99*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C5-PFPeA	*94*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C4-PFHpA	*100*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
M2-6:2FTS	*70*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
M2-8:2FTS	*122*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
d3-NMeFOSAA	*110*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
d5-NEtFOSAA	*105*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C3-PFBS	*95*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*
13C2-PFTeDA	*92*		*25 - 150*	*10/30/17 14:57*	*11/02/17 07:07*	*1*

Lab Sample ID: LCS 320-191929/2-A **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 192548 **Prep Batch: 191929**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorobutanoic acid (PFBA)	40.0	40.5	M	ng/L		101	89 - 128
Perfluorohexanoic acid (PFHxA)	40.0	40.0		ng/L		100	86 - 126
Perfluoroheptanoic acid (PFHpA)	40.0	40.3		ng/L		101	89 - 127
Perfluoropentanoic acid (PFPeA)	40.0	41.9		ng/L		105	66 - 136

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCS 320-191929/2-A **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 192548 **Prep Batch: 191929**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorooctanoic acid (PFOA)	40.0	41.1		ng/L		103	80 - 120
Perfluorononanoic acid (PFNA)	40.0	42.0		ng/L		105	77 - 137
Perfluorodecanoic acid (PFDA)	40.0	41.4		ng/L		103	84 - 123
Perfluoroundecanoic acid (PFUnA)	40.0	38.0		ng/L		95	73 - 122
Perfluorododecanoic acid (PFDoA)	40.0	43.2		ng/L		108	82 - 122
Perfluorotridecanoic Acid (PFTriA)	40.0	41.1		ng/L		103	56 - 163
Perfluorotetradecanoic acid (PFTeA)	40.0	39.3		ng/L		98	66 - 120
Perfluorobutanesulfonic acid (PFBS)	35.4	36.2		ng/L		102	88 - 130
Perfluorohexanesulfonic acid (PFHxS)	36.4	34.6		ng/L		95	87 - 126
Perfluorooctanesulfonic acid (PFOS)	37.1	37.6	M	ng/L		101	83 - 126
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	40.0	37.8		ng/L		95	86 - 132
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	40.0	39.8		ng/L		99	87 - 128
6:2FTS	37.9	38.3		ng/L		101	90 - 135
8:2FTS	38.3	39.1		ng/L		102	88 - 132

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 PFHxA	*102*		*25 - 150*
13C4 PFOA	*92*		*25 - 150*
13C5 PFNA	*101*		*25 - 150*
13C2 PFDA	*106*		*25 - 150*
13C2 PFUnA	*106*		*25 - 150*
13C2 PFDoA	*93*		*25 - 150*
13C4 PFBA	*104*		*25 - 150*
18O2 PFHxS	*105*		*25 - 150*
13C4 PFOS	*101*		*25 - 150*
13C5-PFPeA	*99*		*25 - 150*
13C4-PFHpA	*107*		*25 - 150*
M2-6:2FTS	*73*		*25 - 150*
M2-8:2FTS	*123*		*25 - 150*
d3-NMeFOSAA	*111*		*25 - 150*
d5-NEtFOSAA	*107*		*25 - 150*
13C3-PFBS	*103*		*25 - 150*
13C2-PFTeDA	*98*		*25 - 150*

Lab Sample ID: LCSD 320-191929/3-A **Client Sample ID: Lab Control Sample Dup**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 192548 **Prep Batch: 191929**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	40.0	41.2	M	ng/L		103	89 - 128	2	30

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCSD 320-191929/3-A
Matrix: Water
Analysis Batch: 192548

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 191929

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorohexanoic acid (PFHxA)	40.0	41.1		ng/L		103	86 - 126	3	30
Perfluoroheptanoic acid (PFHpA)	40.0	39.0		ng/L		97	89 - 127	3	30
Perfluoropentanoic acid (PFPeA)	40.0	40.8		ng/L		102	66 - 136	3	30
Perfluorooctanoic acid (PFOA)	40.0	41.1		ng/L		103	80 - 120	0	30
Perfluorononanoic acid (PFNA)	40.0	40.5		ng/L		101	77 - 137	3	30
Perfluorodecanoic acid (PFDA)	40.0	39.7		ng/L		99	84 - 123	4	30
Perfluoroundecanoic acid (PFUnA)	40.0	39.1		ng/L		98	73 - 122	3	30
Perfluorododecanoic acid (PFDoA)	40.0	40.5		ng/L		101	82 - 122	6	30
Perfluorotridecanoic Acid (PFTriA)	40.0	39.6		ng/L		99	56 - 163	4	30
Perfluorotetradecanoic acid (PFTeA)	40.0	39.6		ng/L		99	66 - 120	1	30
Perfluorobutanesulfonic acid (PFBS)	35.4	39.3		ng/L		111	88 - 130	8	30
Perfluorohexanesulfonic acid (PFHxS)	36.4	35.2		ng/L		97	87 - 126	2	30
Perfluorooctanesulfonic acid (PFOS)	37.1	37.4	M	ng/L		101	83 - 126	0	30
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	40.0	40.7		ng/L		102	86 - 132	7	30
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	40.0	40.3		ng/L		101	87 - 128	1	30
6:2FTS	37.9	37.8		ng/L		100	90 - 135	1	30
8:2FTS	38.3	39.1		ng/L		102	88 - 132	0	30

Isotope Dilution	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
13C2 PFHxA	*105*		*25 - 150*
13C4 PFOA	*93*		*25 - 150*
13C5 PFNA	*109*		*25 - 150*
13C2 PFDA	*110*		*25 - 150*
13C2 PFUnA	*104*		*25 - 150*
13C2 PFDoA	*102*		*25 - 150*
13C4 PFBA	*99*	*M*	*25 - 150*
18O2 PFHxS	*104*		*25 - 150*
13C4 PFOS	*104*		*25 - 150*
13C5-PFPeA	*102*		*25 - 150*
13C4-PFHpA	*109*		*25 - 150*
M2-6:2FTS	*75*		*25 - 150*
M2-8:2FTS	*124*		*25 - 150*
d3-NMeFOSAA	*111*		*25 - 150*
d5-NEtFOSAA	*107*		*25 - 150*
13C3-PFBS	*97*		*25 - 150*
13C2-PFTeDA	*94*		*25 - 150*

Client: Tetra Tech, Inc.
Project/Site: FWHH Groundwater

TestAmerica Job ID: 320-32756-1
SDG: FWHH

LCMS

Prep Batch: 191929

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32756-1	FWHH_FH-02_20171025	Total/NA	Water	3535	
320-32756-2	FWHH_MW-06_20171025	Total/NA	Water	3535	
320-32756-3	FWHH_MW-08_20171025	Total/NA	Water	3535	
320-32756-4	FWHH_DUPE_20171025	Total/NA	Water	3535	
320-32756-5	FWHH_RINSATE_20171025	Total/NA	Water	3535	
320-32756-6	FWHH_FRB_20171025	Total/NA	Water	3535	
MB 320-191929/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-191929/2-A	Lab Control Sample	Total/NA	Water	3535	
LCSD 320-191929/3-A	Lab Control Sample Dup	Total/NA	Water	3535	

Analysis Batch: 192548

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32756-2	FWHH_MW-06_20171025	Total/NA	Water	537 (modified)	191929
320-32756-3	FWHH_MW-08_20171025	Total/NA	Water	537 (modified)	191929
320-32756-4	FWHH_DUPE_20171025	Total/NA	Water	537 (modified)	191929
320-32756-5	FWHH_RINSATE_20171025	Total/NA	Water	537 (modified)	191929
320-32756-6	FWHH_FRB_20171025	Total/NA	Water	537 (modified)	191929
MB 320-191929/1-A	Method Blank	Total/NA	Water	537 (modified)	191929
LCS 320-191929/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	191929
LCSD 320-191929/3-A	Lab Control Sample Dup	Total/NA	Water	537 (modified)	191929

Analysis Batch: 192820

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32756-1	FWHH_FH-02_20171025	Total/NA	Water	537 (modified)	191929

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Client Sample ID: FWHH_FH-02_20171025
Lab Sample ID: 320-32756-1
Date Collected: 10/25/17 12:20
Matrix: Water
Date Received: 10/27/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			326.3 mL	10.00 mL	191929	10/30/17 14:57	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192820	11/03/17 11:51	JRB	TAL SAC

Client Sample ID: FWHH_MW-06_20171025
Lab Sample ID: 320-32756-2
Date Collected: 10/25/17 14:40
Matrix: Water
Date Received: 10/27/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			327.3 mL	10.00 mL	191929	10/30/17 14:57	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192548	11/02/17 07:46	JRB	TAL SAC

Client Sample ID: FWHH_MW-08_20171025
Lab Sample ID: 320-32756-3
Date Collected: 10/25/17 17:30
Matrix: Water
Date Received: 10/27/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			325 mL	10.00 mL	191929	10/30/17 14:57	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192548	11/02/17 07:54	JRB	TAL SAC

Client Sample ID: FWHH_DUPE_20171025
Lab Sample ID: 320-32756-4
Date Collected: 10/25/17 14:00
Matrix: Water
Date Received: 10/27/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			322.9 mL	10.00 mL	191929	10/30/17 14:57	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192548	11/02/17 08:02	JRB	TAL SAC

Client Sample ID: FWHH_RINSATE_20171025
Lab Sample ID: 320-32756-5
Date Collected: 10/25/17 15:05
Matrix: Water
Date Received: 10/27/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			325.8 mL	10.00 mL	191929	10/30/17 14:57	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192548	11/02/17 08:10	JRB	TAL SAC

Client Sample ID: FWHH_FRB_20171025
Lab Sample ID: 320-32756-6
Date Collected: 10/25/17 14:10
Matrix: Water
Date Received: 10/27/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			282.1 mL	10.00 mL	191929	10/30/17 14:57	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192548	11/02/17 08:18	JRB	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Tetra Tech, Inc. TestAmerica Job ID: 320-32756-1
Project/Site: FWHH Groundwater SDG: FWHH

Laboratory: TestAmerica Sacramento

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	UST-055	12-18-17
Arizona	State Program	9	AZ0708	08-11-18
Arkansas DEQ	State Program	6	88-0691	06-17-18
California	State Program	9	2897	01-31-18
Colorado	State Program	8	CA00044	08-31-18
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-18
Georgia	State Program	4	N/A	01-29-18
Hawaii	State Program	9	N/A	01-29-18
Illinois	NELAP	5	200060	03-17-18
Kansas	NELAP	7	E-10375	10-31-17 *
L-A-B	DoD ELAP		L2468	01-20-18
Louisiana	NELAP	6	30612	06-30-18
Maine	State Program	1	CA0004	04-18-18
Michigan	State Program	5	9947	01-31-18
Nevada	State Program	9	CA00044	07-31-18
New Hampshire	NELAP	1	2997	04-18-18
New Jersey	NELAP	2	CA005	06-30-18
New York	NELAP	2	11666	04-01-18
Oregon	NELAP	10	4040	01-28-18
Pennsylvania	NELAP	3	68-01272	03-31-18
Texas	NELAP	6	T104704399	05-31-18
US Fish & Wildlife	Federal		LE148388-0	07-31-18
USDA	Federal		P330-11-00436	12-30-17
USEPA UCMR	Federal	1	CA00044	11-06-18
Utah	NELAP	8	CA00044	02-28-18
Virginia	NELAP	3	460278	03-14-18
Washington	State Program	10	C581	05-05-18
West Virginia (DW)	State Program	3	9930C	12-31-17
Wyoming	State Program	8	8TMS-L	01-28-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Method	Method Description	Protocol	Laboratory
537 (modified)	Perfluorinated Hydrocarbons	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: Tetra Tech, Inc.
Project/Site: FWHH Groundwater

TestAmerica Job ID: 320-32756-1
SDG: FWHH

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-32756-1	FWHH_FH-02_20171025	Water	10/25/17 12:20	10/27/17 10:10
320-32756-2	FWHH_MW-06_20171025	Water	10/25/17 14:40	10/27/17 10:10
320-32756-3	FWHH_MW-08_20171025	Water	10/25/17 17:30	10/27/17 10:10
320-32756-4	FWHH_DUPE_20171025	Water	10/25/17 14:00	10/27/17 10:10
320-32756-5	FWHH_RINSATE_20171025	Water	10/25/17 15:05	10/27/17 10:10
320-32756-6	FWHH_FRB_20171025	Water	10/25/17 14:10	10/27/17 10:10

TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone: 916.373.5600 Fax:

Chain of Custody Record

242288

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Scott Morford	Site Contact: Scott Morford	Date: 10/25/17	COC No:
Company Name: Tetra Tech	Tel/Fax: 406-437-9834	Lab Contact:	Carrier:	1 of 1 COCs
Address: 825 Custer Ave	Analysis Turnaround Time			Sampler:
City/State/Zip: Helena MT 59601	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: 406-461-4910	TAT if different from Below ____			Walk-in Client:
Fax:	☐ 2 weeks			Lab Sampling:
Project Name: FWHH Groundwater	☐ 1 week 5days			
Site: FWHH	☐ 2 days			Job / SDG No.:
P O # 10335414	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	PFC/PFOA	Sample Specific Notes:
FWHH_FH02_20171025	10/25/17	1220	G	W	2	N		X	
FWHH_MW-06_20171025	10/25/17	1440						X	
FWHH_MW-08_20171025	10/25/17	1730						X	
FWHH_DUPE_20171025	10/25/17	1400						X	
FWHH_RINSATE_20171025	10/25/17	1505						X	
FWHH_FRB_20171025	10/25/17	1410						X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other 1

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☒ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: 1.9 Corr'd: — | Therm ID No.: A

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Scott Morford	TetraTech	10/26/17 15:00	[signature]	TAus	10/27/17 1010
Relinquished by:		Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:		Date/Time:	Received in Laboratory by:	Company:	Date/Time:

320-32756 Chain of Custody

Login Sample Receipt Checklist

Client: Tetra Tech, Inc.

Job Number: 320-32756-1
SDG Number: FWHH

Login Number: 32756
List Number: 1
Creator: Turpen, Troy

List Source: TestAmerica Sacramento

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

APPENDIX D

PHOTOGRAPHIC LOG

APPENDIX D
FORT WILLIAM HENRY HARRISON GROUNDWATER SAMPLING
PHOTO LOG 10/25/2017

Photo: 1

Direction: Looking West

Description: FH-02

Date: 10/25/2017

Photo: 2

Direction: Looking East

Description: FH-02

Date: 2/8/16

APPENDIX D
FORT WILLIAM HENRY HARRISON GROUNDWATER SAMPLING
PHOTO LOG 10/25/2017

Photo: 3

Direction: Northeast

Description:MW-06.

Date: 10/25/2017

Photo: 4

Direction: Soutwest

Description: MW-06

Date: 10/25/2017

APPENDIX D
FORT WILLIAM HENRY HARRISON GROUNDWATER SAMPLING
PHOTO LOG 10/25/2017

Photo: 5

Direction: Looking North

Description: MW-08

Date: 10/25/2017

Photo: 6

Direction: Looking South

Description: MW-08

Date: 10/25/2017