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Land and Waste Management

January 31, 2019

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SUBJECT: Submittal of the Final Site Inspections Report of Fire Fighting Foam Usage at Shaw Air Force Base Sumter County, South Carolina, dated January 2019

Dear Mr. Danielsen

Shaw AFB respectfully submits the Final Site Inspections Report of Fire Fighting Foam Usage at Shaw Air Force Base Sumter County, South Carolina, dated January 2019 for your records.

If you have any questions, please contact me at (803) 895-9991.

Sincerely


JUVENAL Q. SALOMON, GS-12, DAF

Attachment:
Two hard copies and two compact discs of the subject document.

cc:
AFCEC/CSOE (Juvenal Q. Salomon)

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SC DHEC - Bureau of
Land & Waste Management

MEMORANDUM FOR RECORD

SUBJECT: Submittal of the Draft Final Site Inspections Report of Fire Fighting Foam Usage at Shaw Air Force Base Sumter County, South Carolina, dated January 2019

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.


JUVENAL Q. SALMON
Remedial Project Manager

Comment and Response Worksheet (Version 3)

Date 12/03/18		Surveillance Activity Number						Draft Final SI Report, Shaw AFB		Contract/TO Number	
Item	Source	Section	Page	Para	Line	Class	Comment		Response		
Comments From: Michael W. Danielsen (Project Manager) and Gabrielle Munn (P.G.), South Carolina Department of Health and Environmental Control (SCDHEC)											
1	SCDHEC		7				The text states that the 16 temporary wells were removed, and all borings were back filled with bentonite. The DHEC approval for the temporary monitoring wells and borings greater than five feet below ground surface were to have been abandoned with bentonite-cement mixture. Also, DHEC stated in the approval that a SC certified well driller be used to complete the temporary monitoring wells and the environmental soil borings. There was no record of the driller listed in being certified in South Carolina. Please explain why the DHEC approval was not followed.		All of the borings and temporary wells installed during the SI were abandoned by pressure grouting with a cement/bentonite slurry from total depth to surface in accordance with the SCDHEC well approval. The text has been revised to reflect this. A SC certified driller, Christopher Matthew Lacko (License Number: 1982) of Cascade Drilling, oversaw all drilling operations. This information has been added to the text.		
2	SCDHEC		7				For future investigations SC certified drillers and surveyors must be used for conducting field work.		A SC certified driller and a surveyor were used during all drilling and surveying operations and will be used during any future work.		
3	SCDHEC	Sect 3.9	35				This section states that revised USAF guidance was provided for handling IDW disposal to minimize waste generation. DHEC was not aware of the revised guidance since it was developed after approval of the UFP QAPP. For informational purposes, please submit a copy of the revised USAF guidance for IDW handling.		The USAF IDW Guidance for AFFF waste streams is currently in draft form only and will be provided when it is finalized.		
4	SCDHEC	Sect 4.0					<p>This section discusses the groundwater detections for each area and identifies the nearest down gradient drinking water wells. For the drinking water wells screened in the surficial aquifer the pathway is complete and there is a potential for impact. For the deeper wells impact is not known as there were no samples collected from the deeper aquifers. Due to the stratigraphy at Site 1 (SWMU 59) as shown in the Draft 2018 CMIPR for SWMU 59, where the Upper Black Creek formation does not exist and possibly a non-continuous confining unit, there is the possibility for communication between the surficial aquifer and the deeper aquifers at Site 1. DHEC recommends the deeper wells at Site 1 be sampled during the next sampling event.</p> <p>In addition, since the surficial aquifer does discharge to Long Branch Creek as stated in Figure 4-2 in the Draft 2018 CMIPR for SWMU 59, the continued annual monitoring of Long Brach Creek as part of the CMIPR, and the positive detections of PFC compounds in the groundwater at Site 1, DHEC recommends sampling Long Branch Creek during the next sampling event.</p>		<p>The recommendation for sampling wells screened in the deeper aquifer at AFFF Area 1 have been added to Section 8.1 and will be included in the QAPP for the ESI.</p> <p>The recommendation for collecting surface water/sediment samples from Long Branch Creek has been added to Section 8.1 and will be included in the QAPP for the ESI.</p>		
5	SCDHEC	Sects 8.1 through 8.6					<p>This section discusses each site and recommends an expanded site investigation (SI) to be followed by a remedial investigation (RI). DHEC agrees with this recommendation for each site.</p> <p>The January 10, 2017 DHEC comments for the review of the November 2016 and January 2016 work plans outlining the field work to conduct the PFC investigation (which this current report documents) DHEC suggested that the land application of sludge area (east of Site 4 and listed in the SAFB Hazardous Waste Permit as SWMU 56) be investigated for PFC compounds. Since there were detections of PFC compounds in the drying beds at Site 6, DHEC highly suggests that the land application areas of sludge from the WWTP (Site 6) be included in the expanded SI the Air Force has recommended.</p>		<p>Concurrence noted regarding the recommendations for each site.</p> <p>The Air Force will consider conducting additional investigation of the land application areas for PFAS compounds in accordance with the SCDHEC recommendations. No change to the document.</p>		
End of Comments											



Final Site Inspections Report of Fire Fighting Foam Usage at Shaw Air Force Base Sumter County, South Carolina

January 2019

Submitted to:

**Air Force Civil Engineer Center
3515 General McMullen Suite 155
San Antonio, Texas 78226-2018**

Submitted by:

**U.S. Army Corps of Engineers
Savannah District
100 W. Oglethorpe Avenue
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Oak Ridge, Tennessee 37830-8022
under
Contract No. W912HN-15-C-0022**

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Acronyms and Abbreviations

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFFF	aqueous film forming foam
amsl	above mean sea level
ASL	Aerostar SES LLC
bgs	below ground surface
BRAC	Base Closure and Realignment
btoc	below top of casing
CAS	Chemical Abstracts Service
CSM	conceptual site model
DPT	direct push technology
dup	duplicate sample
DW	drinking water
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
EZ	exclusion zone
ft	foot or feet
FTA	fire training area
GW	groundwater
HA	health advisory
HDPE	high-density polyethylene
Hi-Ex	high-expansion
HQ	hazard quotient
ID	identification
IDW	investigation-derived waste
J	estimated value
mg/kg	milligrams per kilogram
NAD83	North American Datum 1983
NAVD88	North American Vertical Datum 1988
ND	not detected at the method detection limit
NL	not listed
No.	number
PA	preliminary assessment
PFAS	per- and polyfluorinated alkyl substances
PFBS	perfluorobutane sulfonate
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
pH	potential of hydrogen
PID	photoionization detector
PPE	personal protective equipment
PPM	parts per million
QAPP	quality assurance project plan
QC	quality control
RI	remedial investigation
RSL	Regional Screening Level

Rust	Rust Environmental & Infrastructure
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SD	sediment
SHAW	ERPIMS code for Shaw Air Force Base
SI	site inspection
SO	subsurface soil
SS	surface soil
SW	surface water
TOC	total organic carbon
U	parameter not detected at the method detection limit
USCS	Unified Soil Classification System
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
WWTP	wastewater treatment plant

1.0 INTRODUCTION

Aerostar SES LLC (ASL) under contract to the United States Army Corps of Engineers Savannah District (Contract No. W912HN-15-C-0022) conducted screening-level site inspections (SIs) for six areas at Shaw Air Force Base (AFB) in Sumter County, South Carolina (Figure 1, Appendix A). The purpose of the SI is to determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorobutane sulfonate (PFBS) in the environment at these areas. These compounds are a class of synthetic fluorinated chemicals used in industrial and consumer products, including defense-related applications. This class of compounds is also referred to as per- and polyfluorinated alkyl substances (PFAS).

In 1970, the United States Air Force (USAF) began using aqueous film forming foam (AFFF), firefighting agents containing PFOS and PFOA, to extinguish petroleum fires. Releases of AFFF to the environment routinely occurred during fire training and equipment maintenance, storage, and use. Although manufacturers have reformulated AFFF to eliminate PFOS, the USAF maintains a significant inventory of PFOS-based AFFF. As of this report, the USAF is actively removing PFOS-based AFFF from its inventory and replacing it with formulations based on shorter carbon chains, which may be less persistent and bioaccumulative in the environment.

The objectives of this study are to

- determine if a confirmed release of PFOS, PFOA, or PFBS has occurred at AFFF areas selected for inspection;
- determine if PFOS or PFOA is present in groundwater or surface water in the areas at concentrations exceeding the Environmental Protection Agency (EPA) lifetime health advisory (HA);
- determine if PFBS is present in groundwater or surface water in the areas at concentrations exceeding the EPA Regional Screening Levels (RSLs);
- determine if PFOA or PFOS is present in soil or sediment in the areas at concentrations exceeding the calculated RSLs;
- determine if PFBS is present in soil or sediment in the areas at concentrations exceeding the EPA RSLs; and
- identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS or PFOA above the HA or PFBS above the RSL).

This report does not include assessment of ecological exposure pathways, receptors, or risk from PFAS impacts to the environment. Confirmed releases may require further investigation to fully delineate the extent of contamination and perform a complete risk assessment that includes ecological receptors.

In the quality assurance project plan (QAPP) (ASL, January 2016), screening levels for soil and sediment were established in accordance with *Interim AF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Closure and Realignment (BRAC) Installations* (USAF, August 2012). However, after publication of the QAPP, the USAF determined that more conservative screening levels were appropriate. Therefore, screening levels for PFOS and PFOA in soil and sediment were calculated using EPA's RSL calculator (https://epaprgs.ornl.gov/cgi-bin/chemicals/csl_search). The calculations published in the final site-specific QAPP addendum (ASL, February 2017) were conducted using the residential scenario with a hazard quotient (HQ) of 1.0. The HQ was revised after publication of the QAPP addendum, and the calculations for this SI report were conducted using an HQ of 0.1. The toxicity value input for the calculator is the Tier 3 value reference dose of 0.02 micrograms per kilogram ($\mu\text{g}/\text{kg}$) per day derived by EPA in its drinking water HAs for both PFOS (EPA, May 2016a) and PFOA

(EPA, May 2016b). The calculations are available in Appendix B. A release is considered confirmed when the following concentrations are exceeded:

PFOS:

- 0.07 micrograms per liter (µg/L) in groundwater or surface water (independently or combined with PFOA value).
- 126 µg/kg in soil (calculated, in the absence of EPA RSL values).
- 126 µg/kg in sediment (calculated, in the absence of RSL values).

PFOA:

- 0.07 µg/L in groundwater or surface water (independently or combined with PFOS value).
- 126 µg/kg in soil (calculated, in the absence of RSL values).
- 126 µg/kg in sediment (calculated, in the absence of RSL values).

EPA has derived RSL values for PFBS, for which there is a Tier 2 toxicity value (Provisional Peer Reviewed Toxicity Value) (EPA, June 2014). The requirement to screen for PFBS, which is regulated by EPA, was not recognized before the QAPP (ASL, January 2016) was finalized and was added by the Air Force Civil Engineer Center (AFCEC) before the development of the QAPP addendum. The USAF will also consider a release to be confirmed if the following concentrations are exceeded:

PFBS:

- 40 µg/L in groundwater or surface water.
- 130,000 µg/kg in soil or sediment.

To streamline reporting and discussion of PFOS, PFOA, and PFBS sampling and analysis, these compounds will hereafter be referred to, collectively, as “PFAS.” Table 1 presents the screening values for comparing the analytical results for these three PFAS compounds.

Table 1 Screening Values

Parameter	Chemical Abstracts Number	EPA Regional Screening Level (May 2018) ^a		Calculated RSL for Soil and Sediment ^b (µg/kg)	Health Advisory for Drinking Water (Surface Water or Groundwater) (µg/L) ^c
		Residential Soil (µg/kg)	Drinking Water (µg/L)		
Perfluorobutane sulfonate (PFBS)	29420-43-3	130,000	40	NL	NL
Perfluorooctanoic acid (PFOA)	335-67-1	NL	NL	126	0.07*
Perfluorooctane sulfonate (PFOS)	1763-23-1	NL	NL	126	

^a EPA Regional Screening Levels (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^b Screening levels calculated using the EPA Regional Screening Level calculator for residential soil (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search). The toxicity value input for the calculator is the Tier 3 value reference dose of 0.02 µg/kg per day derived by EPA in its drinking water HAs for both PFOS (May 2016a) and PFOA (May 2016b).

^c EPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*.

*Note: When PFOA and PFOS are both detected, the combined concentrations of the compounds should be compared with the 0.07 µg/L HA value. Only groundwater and surface water were sampled during the SI, but analytical results have been compared to the drinking water screening levels.

µg/kg = micrograms per kilogram

µg/L = micrograms per liter

EPA = Environmental Protection Agency

NL = not listed

AFFF areas were selected for further inspection through the SI process at Shaw AFB during the preliminary assessment (PA) phase and documented in a PA report (CH2M Hill, October 2015). Eleven sites were evaluated during the PA, and four (former Fire Training Area [FTA] 1, former FTA 2, former FTA 3/Current Explosive Ordnance Disposal [EOD] Area, and the current FTA) were identified as

requiring initiation of an SI. Two additional areas (Building 1511 and the Wastewater Treatment Plant [WWTP]) were added after the SI scoping visit. The areas were selected based on the reported or suspected release of AFFF. The six AFFF areas selected for SI and the rationale for inclusion are listed in Table 2. Media evaluated during the SI included surface soil (0 to 6 inches deep); subsurface soil (in the vadose zone collected immediately above the water saturated/unsaturated soil interface); groundwater (including samples from existing monitoring wells, temporary wells, and/or direct push sampling); surface water; and sediment.

Table 2 Areas for Site Inspections at Shaw Air Force Base

AFFF Area	AFFF Inspection Area	Associated Existing ERP Site	Area Selection Rationale
1	Former FTA 1	FT-01	According to some records, the FTA was closed prior to 1970. However, discrepancies exist in the documentation on the years of operation and whether AFFF was used at the area. Quantities of AFFF potentially discharged in the area are unknown.
2	Former FTA 2	FT-07	The FTA was operational from 1970 to 1991. AFFF was reportedly used during training exercises, but quantities discharged are unknown.
3	Former FTA 3/ Current EOD Area	FT-06	The FTA was operational from 1981 to 1989. AFFF was reportedly used during training exercises, but quantities discharged are unknown.
4	Current FTA	New site	The FTA has been in operation since 1992. AFFF is not used during regular training exercises at this propane-fueled FTA. Annual AFFF system spray testing for the fire department vehicles is performed in the area, but the quantities released are unknown. The lined FTA channels water to the adjacent foam collection pond, which has an outfall to the adjacent low-lying area.
5	Building 1511	New site	Bays 1 and 2 have an AFFF fire suppression system. The building was evaluated during the PA, but there have been no known AFFF discharges, and it was suggested for close out with no additional investigation. Although there have been no known discharges of AFFF, SCDHEC requested that the area be added to the SI.
6	Wastewater Treatment Plant	New site	The WWTP was not evaluated during the PA. The USAF added the WWTP to the SI because it serves as the collection point for AFFF releases entering the sanitary sewer system at the base.

AFFF = aqueous film forming foam
 EOD = explosive ordnance disposal
 PA = preliminary assessment
 SI = site inspection
 WWTP = wastewater treatment plant

ERP = Environmental Restoration Program
 FTA = fire training area
 SCDHEC = South Carolina Department of Health and Environmental Control
 USAF = United States Air Force

Shaw AFB is approximately 37 miles east of Columbia and 7 miles northwest of Sumter near the center of Sumter County in central South Carolina. The base was constructed in 1941 to provide flight training to air cadets and was named in honor of Lieutenant Ervin David Shaw, one of the first Americans to fly combat missions in World War I. During World War II, thousands of pilots learned basic and advanced flying techniques at Shaw AFB in single and multi-engine aircraft. The base also served as a camp for German prisoners of war in 1945. Through the years, Shaw AFB has been home to numerous divisions of the military and currently serves as headquarters for the Ninth Air Force and as host wing for the 20th Fighter Wing. The base encompasses approximately 3,326 acres in a mostly rural and agricultural area,

but there are residential and commercial developments on the western and southeastern sides of the facility (Rust Environmental & Infrastructure [Rust], February 1995).

Shaw AFB has a humid, subtropical climate with an annual average temperature of 62.15 degrees Fahrenheit. Temperatures range from an average low of 50.5 degrees Fahrenheit in winter to 73.8 degrees Fahrenheit in summer. The average annual precipitation is 46.93 inches and is generally distributed evenly throughout the year. Prevailing winds in the area are predominantly from the south-southwest and average 9 miles per hour (U.S. Climate Data, August 2016).

2.0 AFFF AREA DESCRIPTIONS

The following sections describe the AFFF areas inspected during the SI. Figure 2 (Appendix A) shows the relative position of the AFFF areas on Shaw AFB.

2.1 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

Former FTA 1 (also known as Environmental Restoration Program [ERP] Site FT-01) is roughly 3.5 acres and approximately 0.5 mile northeast of the northeast end of Runway 4R/22L, near the northeast perimeter of Shaw AFB (Figure 3, Appendix A). Firefighting training was conducted at FTA 1 from 1941 to approximately 1969. The FTA consisted of an unlined 100-foot-diameter burn circle surrounded by a low earthen berm. The fire training exercises consisted of igniting aviation gasoline, jet fuel, and waste oil in the burn pit and then extinguishing the fire with high-pressure water (sprayed from a fire hose). No records are available regarding the quantities of AFFF discharged at FTA 1, and there is some uncertainty as to whether AFFF was actually used at the area. AFFF was not introduced into USAF inventory prior to 1970; therefore, operations should have ceased at FTA 1 prior to the introduction of AFFF. However, previous reports have indicated that at least some quantities of AFFF were used as an extinguishing agent during the later operating periods of the area. Therefore, it is possible that the period of operation for the area may not have been accurately reported or that Shaw AFB fire crews were early adopters of AFFF (CH2M Hill, October 2015).

2.2 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

Former FTA 2 (also known as ERP Site FT-07) is in a clearing within a wooded area approximately 1,800 feet east of Runway 4R/22L and near the southeast corner of the munitions unloading pad (Figure 4, Appendix A). Firefighting training activities were conducted at FTA 2 from 1970 to 1981. Training exercises consisted of spraying the unlined earthen burn pit with water and applying approximately 300 to 1,000 gallons of flammable material (reportedly only JP-4), igniting the fuel, and extinguishing the resulting fire using water and AFFF. There were documented releases of AFFF at FTA 2, but the quantities released were not recorded (CH2M Hill, October 2015).

2.3 FORMER FIRE TRAINING AREA 3/ CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

Former FTA 3 (also known as ERP Site FT-06) is in a clearing in a wooded area approximately 2,500 feet southeast of Runway 4R/22L (Figure 5, Appendix A). The area is used for explosive ordnance disposal. The EOD burn pit consists of concrete walls in an "L" shape approximately 5 feet high and arranged in a rectangular pattern. The concrete structure is approximately 60 feet south and west of the former burn pit area and is used to contain detonations. Firefighting training activities were conducted at FTA 3 from 1981 to 1989. The former FTA consisted of a flat, 75-foot, circular burn pit area with a runoff collection

sump and a tile drain field. The burn pit was lined with compacted clay soil and surrounded by a 2-foot-high earthen berm. Training exercises consisted of spraying the burn pit area with water, applying approximately 300 to 1,000 gallons of flammable material (reportedly only JP-4), igniting the fuel, and extinguishing the resulting fire with water. AFFF was also reportedly used during fire training exercises; however, the quantities of AFFF discharged at FTA 3 are unknown (CH2M Hill, October 2015).

2.4 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

The current FTA is approximately 2,200 feet southeast of Runway 4R/22L and south of former FTA 2 (Figure 6, Appendix A). Firefighting training activities have been conducted at the current FTA since 1989. The FTA burn pit consists of gravel covering an impermeable liner with a mock aircraft in the center. The fuel source for the training fires is propane. Water used in the fire training exercises collects in the burn pit and flows to a lined holding pond on the southeast side of the burn pit for reuse. Reportedly, AFFF is not used during the training exercises and only high-pressure water (sprayed from a fire hose) is used to extinguish the fires. However, annual certification testing of the AFFF systems on the Shaw AFB fire trucks is conducted in the area. During the certification testing, AFFF is pumped through the truck systems into the holding pond. The quantity of AFFF discharged during the annual foam system testing has not been recorded. Although the foam is discharged into the lined holding pond, it is possible water containing elevated concentrations of PFASs may have been released through the outfall piping from the pond to a low-lying area adjacent to the south side of the area.

2.5 BUILDING 1511 (AFFF AREA 5)

Building 1511 is a five-bay hangar at the north end of the hangar area on the west side of the Shaw AFB airfield (Figure 7, Appendix A). An AFFF fire suppression system serves Bays 1 and 2 (fuel repair bays) with two under-wing turrets. A high-expansion (Hi-Ex) foam system serves Bay 4 (paint spray booth) with overhead sprinklers. Floor drains in the hangar lead to a holding tank at the north end of the building that discharges to the Shaw AFB sanitary sewer system. Although no discharges from the AFFF system were reported in the PA, interviews with base personnel indicate there may have been multiple small releases from the AFFF tank system and from overflow at the holding tank. The South Carolina Department of Health and Environmental Control (SCDHEC) requested that the building be added to the SI process because of the results of interviews with base personnel. During the ASL site scoping visit, facility personnel indicated there had been a one-time accidental release of the foam system in the hangar, but it was not clear whether this was Hi-Ex foam or AFFF. The majority of the foam released during the system dump was reportedly captured in the floor drains of the hangar and carried to the holding tank, but some of the foam reportedly exited through the main hangar doors and was allowed to dissipate on the tarmac. Surface water drainage from the hangar is east toward the grass infield of the taxiway.

2.6 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

The Shaw AFB WWTP is at the corner of Aiken Street and Chapin Street in the southwest portion of Shaw AFB (Figure 8, Appendix A). The WWTP was not evaluated during the PA, but AFCEC added it to the SI because releases of AFFF in the hangar area of the base would be carried through the sanitary sewer system to the WWTP. The focus of investigation at the WWTP was the sludge drying beds where concentration of PFAS compounds is most likely to occur. Seven sludge drying beds are at the WWTP (four large and three small beds). The large drying beds are 65 feet long and 20 feet wide. The smaller beds are each 50 feet long and 20 feet wide. Up to 12 inches of sludge can be pumped onto each bed. Digested sludge can be drawn to the drying beds from the digesters by gravity flow depending on the level of sludge in the digester. Alternatively, sludge can be pumped into the drying beds from the

digesters by the new digested sludge pump station. Water from these drying beds flows through underdrains to the wastewater holding tanks and is then pumped to the equalization basin for treatment (Parsons Engineering Science, Inc., September 1995).

3.0 FIELD ACTIVITIES

ASL personnel mobilized to Shaw AFB on Tuesday, January 23, 2018, to perform SI sampling activities for all six AFFF areas, and all field activities were completed by Wednesday, January 31, 2018. A readiness review was conducted with all ASL field personnel prior to mobilizing to Shaw AFB. Readiness review forms are presented in Appendix C. The readiness review covered anticipated hazards, types and proper use of equipment needed for field activities, sampling procedures, and procedures to prevent cross-contamination of samples with PFAS-containing compounds.

3.1 FIELD ACTIVITIES AND SAMPLING PROCEDURES

Field activities for the SI included collecting groundwater samples from existing groundwater monitoring wells and temporary direct push technology (DPT) wells, collecting surface and subsurface soil samples from DPT soil borings, and collecting surface water and sediment samples. In accordance with the QAPP (ASL, January 2016) and the site-specific field sampling plan QAPP addendum (ASL, February 2017), ASL used a targeted sampling design to collect samples in locations most likely to have detectable concentrations of PFBS, PFOA, and PFOS as a result of an AFFF release. Field forms generated during the sampling activities are in Appendix C. Field forms include readiness review forms, boring logs, well development forms, groundwater sampling logs, soil sampling logs, and surface water and sediment sampling logs. Samples were submitted via overnight courier to Maxxam Analytics International Corporation of Mississauga, Ontario, Canada, under chain of custody procedures. The samples were analyzed by modified EPA Method 537 for 18 PFAS compounds, including the following three PFAS compounds, which are the only ones to have associated health-based screening levels.

<u>Analyte</u>	<u>*CAS Number</u>
• Perfluorooctane sulfonate (PFOS)	1763-23-1
• Perfluorooctanoic acid (PFOA)	335-67-1
• Perfluorobutane sulfonate (PFBS)	29420-43-3

*CAS = Chemical Abstracts Service

Field duplicate samples were collected at a frequency of one for every 10 samples for each sample media. Matrix spike samples and matrix spike duplicate samples were collected at a frequency of one per every 20 samples for each media. Third-party data validation was conducted on 100% of the analytical data for the PFAS compounds. Stage 2B validation was completed on 90% of the analytical data, and Stage 4 validation was completed on the remaining 10% of the results. Data validation qualifiers were applied as needed. All the results were evaluated as usable for the decisions being made. No determinations of an AFFF release are based upon quality control (QC)-qualified data. The data validation report, laboratory data sheets, and chain of custody forms are in Appendix D.

Field activities were conducted in accordance with the QAPP (ASL, January 2016) and the Shaw AFB site-specific addendum to the QAPP (ASL, February 2017). Soil borings in the areas were advanced with a track-mounted DPT system. Surface soil samples were collected to 6 inches below ground surface (bgs) using stainless steel hand augers and stainless steel spoons. Subsurface soil samples were collected immediately above the water saturated/unsaturated soil interface using a DPT macro-core sampler with acetate liners. For each soil boring, a representative composite soil sample was collected for each depth where samples were collected for PFAS analysis. The composite soil samples were submitted to the

project laboratory for analyses of soil physiochemical properties, including soil potential of hydrogen (pH), grain size, total organic carbon (TOC), and percent solids. The physiochemical analytical results and a summary table (Table E-1) are presented in Appendix E. Groundwater samples were collected with peristaltic pumps through disposable polyvinyl tubing. The groundwater sample from one well in AFFF Area 5 (SHAW05-MW002) was collected as a grab sample using polyvinyl tubing with a check valve on the end because the well did not produce sufficient water to pump. The groundwater samples were collected from temporary wells constructed of 3/4-inch diameter polyvinyl chloride prepacked screens in the DPT borings. Sixteen temporary wells were installed during the SI, and 14 of the wells were installed with 10 feet of prepacked screens. Two wells in AFFF Area 5 (SHAW05-MW001 and SHAW05-MW002) were installed with 15 feet of prepacked screens in an attempt to find groundwater because the borings were dry during drilling. The 16 temporary wells were removed at the end of the sampling event, and all borings were backfilled pressure grouted from total depth to surface with a cement/bentonite slurry. Sediment samples were collected using stainless steel spoons. Surface water samples were collected directly from surface water bodies into the sample containers. All drilling operations were overseen by a South Carolina certified well driller, Christopher Matthew Lacko (License Number: 1982) of Cascade Drilling.

Wellston Associates Land Surveyors of Warner Robins, Georgia, conducted the land survey on January 29, 2018, to establish the coordinates, surface elevations of the soil borings, and top of casing elevations for the temporary wells. ASL personnel recorded surface water and sediment sample locations using a Trimble Geo7X handheld global positioning system (GPS) unit. Northing and easting coordinates were recorded in South Carolina State Plane Coordinates based on the North American Datum 1983 (NAD83) (using the International Foot standard in South Carolina). Elevations were recorded referenced to the North American Vertical Datum 1988 (NAVD88).

Sample locations, site-specific lithology, groundwater flow direction, analytical results, and conclusions for each AFFF area are presented in Sections 3.3 through 3.8.

3.2 PFAS CROSS-CONTAMINATION AVOIDANCE PROCEDURES

Field personnel complied with PFAS cross-contamination avoidance procedures and considerations, which are included in ASL Standard Operating Procedure 028 “Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Compounds (PFCs) Sites:”

3.2.1 Field Equipment

- Teflon[®]-containing materials (Teflon[®] tubing, bailers, tape, plumbing paste, or other Teflon[®] materials) were not used because Teflon[®] contains fluorinated compounds.
- High-density polyethylene (HDPE) and silicon materials are acceptable.
- Peristaltic pumps were used to collect groundwater samples from 19 of the 20 wells through disposable polyethylene tubing. The groundwater sample from monitoring well SHAW05-MW002 was collected as a grab sample using polyethylene tubing with a check valve because the well did not produce sufficient water to use the peristaltic pump. Field notes were recorded in a bound logbook that did not have waterproof paper. All personnel changed gloves between recording and sampling activities to prevent cross-contamination.
- Post-It Notes[®] were not allowed on site.
- Only Sharpie[®] brand markers were used. Pens were used to document field activities in the logbooks and on field forms, to label sample containers, and to prepare the chains of custody.
- Chemical (blue) ice packs were not used to store samples, food, or drinks.

3.2.2 Field Clothing and Personal Protective Equipment

- The sampling personnel wore field clothing made of synthetic and natural fibers (preferably cotton). The clothing had to have been laundered at least six times without using a fabric softener since it was purchased. New clothing was not allowed because it could contain PFAS-related treatments.
- Only rain gear made from polyurethane and wax-coated materials was allowed.
- Clothing or boots containing Gore-Tex™ was not allowed because it consists of a PFAS membrane.
- Tyvek® clothing was not allowed on site because it contains fluorinated compounds.
- Disposable nitrile gloves were worn at all times when field activities were being conducted, and a new pair was donned prior to the following activities at each sample location:
 - Decontamination of reusable sampling equipment;
 - Contact with sample bottles or water containers;
 - Insertion of anything into the well (HDPE tubing, water depth probes, etc.);
 - Insertion of silicon tubing into the peristaltic pump;
 - Completion of monitoring well purging;
 - Sample collection; and
 - Handling of any quality assurance/QC samples, including field blanks and equipment blanks.
- A new pair of nitrile gloves was worn after handling any nondedicated sampling equipment, after contact with surfaces that had not been decontaminated, or when field personnel thought it was necessary.

3.2.3 Sample Containers

- All samples were collected in polypropylene or HDPE bottles with screw caps made of the same materials. The liners of lined screw caps were not made of Teflon® and did not contain PFASs.
- Glass sample containers were not used.
- Container labels were completed using a Sharpie® pen after the caps had been placed on each bottle.

3.2.4 Wet Weather

- Field personnel who were sampling during rainy conditions wore appropriate clothing that did not pose a risk of cross-contamination. Sampling personnel avoided synthetic gear treated with water-repellent finishes containing PFASs. Only rain gear made from polyurethane and wax-coated materials was allowed.
- Field personnel wore gloves when erecting or moving a gazebo tent overtop used for protection from rain at sampling locations because the canopy material may have been treated with a PFAS-based coating. Gloves were changed immediately after handling the tent, and any further contact with the tent was avoided until all sampling activities were finished and the team was ready to move on to the next sample location.

3.2.5 Equipment Decontamination

Field sampling equipment, including oil/water interface meters and water level indicators, were decontaminated using Alconox® or Liquinox® soap. Decon 90® was not used during decontamination activities. Laboratory-certified PFAS-free water was used for the final decontamination rinse of sampling

equipment. Larger equipment, such as drill rigs, was decontaminated using potable water and a high-pressure washer and then rinsed with potable water.

3.2.6 Personnel Hygiene

- Field personnel did not use cosmetics, moisturizers, hand cream, or other related products as part of their personal hygiene routine before a sampling event because these products may contain surfactants and be a potential source of PFASs.
- Because many manufactured sunblock and insect repellents contain PFASs, only sunblock and insect repellents that contain 100% natural ingredients were allowed.
- For restroom breaks, field personnel left the exclusion zone (EZ) before removing personal protective equipment (PPE). Before returning to the EZ, field personnel washed as normal, allowing extra time to rinse with water after using soap. Field personnel used a mechanical dryer to avoid using paper towels if possible.

3.2.7 Food Considerations

Field personnel did not eat or drink inside the EZ.

3.2.8 Visitors

Site visitors remained outside the EZ during all sampling activities.

3.3 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

The media of concern at FTA 1 are surface soil, subsurface soil, and groundwater. No storm drains or ditches are within the vicinity of FTA 1, and surface water apparently drains to the surrounding subsurface at the area. Therefore, no surface water or sediment samples were collected at FTA 1.

3.3.1 Sample Locations

Surface and subsurface soil samples were collected from DPT soil borings at three locations (SHAW01-001, SHAW01-002, and SHAW01-003) arranged in a triangular pattern over the area of the former burn pit. Groundwater samples were collected from three existing wells (MW-105, MW-121A, and MW-122A) on the downgradient (east) side of the former burn pit. Surface soil samples were collected from the top 6 inches of soil, and subsurface soil samples were collected within 2 feet of the water saturated/unsaturated soil interface, a depth of 2 to 4 feet bgs at FTA 1. The sample locations for AFFF Area 1 are shown on Figure 3 (Appendix A).

3.3.2 Soils

Soil borings SHAW01-001, SHAW01-002, and SHAW01-003 were all terminated at 5.0 feet bgs within the Quaternary sediments of the surficial aquifer. The soils encountered in the borings consisted of Unified Soil Classification System (USCS) codes SM (silty sands) and CH (sandy fat clay). Detailed boring logs are presented in Appendix C.

3.3.3 Groundwater Flow

Depth to groundwater measurements were taken in the three groundwater monitoring wells on January 29, 2018. The groundwater depth measurements are presented in Appendix F and ranged from 11.97 to 13.85 feet bgs (groundwater surface elevations ranged from 200.59 to 202.10 feet NAVD88). Figure 3 (Appendix A) shows the potentiometric surface contours developed from these measurements. The contours indicate that the groundwater flow direction at AFFF Area 1 is to the east.

3.3.4 Analytical Results

Five surface soil samples (three primary, one field duplicate, and one composite physiochemical sample); five subsurface soil samples (three primary, one field duplicate, and one composite physiochemical sample); and four groundwater samples (three primary and one field duplicate sample) were submitted to the project laboratory for analyses from AFFF Area 1. The laboratory case narrative, data validation report, and laboratory data sheets are presented in Appendix D.

Surface Soil

PFBS was not detected in any surface soil samples from AFFF Area 1. PFOA was detected in three of the four surface soil samples, but none of the concentrations exceeded the screening levels. PFOS was detected in all four surface soil samples, and three samples exceeded the screening level of 126 µg/kg for soil. The results ranged from an estimated concentration of 140 µg/kg in duplicate sample SHAW01-001-SS-901 to an estimated concentration of 360 µg/kg in sample SHAW01-001-SS-001. Table 3 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the surface soil samples. Figure 9 (Appendix A) shows the sample locations and the results of PFBS, PFOA, and PFOS in soil at AFFF Area 1.

Subsurface Soil

PFBS was not detected in any of the subsurface soil samples for AFFF Area 1. PFOA was detected in two of the four samples, but none of the concentrations exceeded the screening levels for soil. PFOS was detected in all four samples. Two samples exceeded the soil screening value of 126 µg/kg (SHAW01-001-SO-002 at an estimated concentration of 960 µg/kg and duplicate sample SHAW01-001-SO-902 at an estimated concentration of 280 µg/kg). Table 4 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the subsurface soil samples. Figure 9 (Appendix A) shows the sample locations and the results of PFBS, PFOA, and PFOS in soil at AFFF Area 1.

Groundwater

PFBS, PFOA, and PFOS were detected in all four groundwater samples from AFFF Area 1. PFBS did not exceed the screening value (40 µg/L) in any samples. PFOA and PFOS exceeded the individual screening value (0.07 µg/L) in all four groundwater samples. The combined concentrations of PFOA and PFOS in all four samples also exceeded the screening level (combined concentration of 0.07 µg/L), with combined concentrations ranging from 1.492 µg/L to 26.88 µg/L. Table 5 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the groundwater samples. Figure 10 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in groundwater at AFFF Area 1.

Physiochemical Sample

To provide basic soil parameter information, composite surface and subsurface soil samples were collected from AFFF Area 1 soil borings and analyzed for pH, TOC, percent solids, and grain size. The surface soil sample (SHAW01-004-SS-001) was composed of aliquots of surface soil (0 to 6 inches bgs) collected from the borings. The subsurface soil sample (SHAW01-004-SO-004) was composed of aliquots of the subsurface soil collected from the borings immediately above the water saturated/

unsaturated soil interface (approximately 2 to 4 feet bgs). The results of the analyses of the physiochemical sample are presented in Appendix E.

3.3.5 Conclusions

Former FTA 1 was reportedly closed prior to 1970. However, discrepancies exist in the documentation on the years of operation and whether AFFF was used at the area. During the SI, samples were collected where concentrations of PFAS compounds would most likely be detected based on surface drainage patterns and the groundwater flow direction. The results for the analyses of the surface and subsurface soil samples indicated that concentrations of PFOS remain in the soil above the screening criteria. Further, PFOA and PFOS were detected in all four groundwater samples at concentrations exceeding the individual and combined screening levels. Based on the analytical results, a release of AFFF to the surface soil, subsurface soil, and groundwater at AFFF Area 1 has been confirmed.

Table 3 AFFF Area 1 (Former Fire Training Area 1) Surface Soil Analytical Results

Field Sample ID		SHAW01-001-SS-001	SHAW01-001-SS-901 (Field Duplicate)	SHAW01-002-SS-001	SHAW01-003-SS-001
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.48 U	0.46 U	0.49 U	0.42 U
PFOA	126 ^b	6.8	5.1	3.3	0.66 U
PFOS	126 ^b	360 J	140 J	180	82

Notes: A bold value indicates the concentration was detected above the method detection limit. A shaded value exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SS = surface soil

Table 4 AFFF Area 1 (Former Fire Training Area 1) Subsurface Soil Analytical Results

Field Sample ID		SHAW01-001-SO-002	SHAW01-001-SO-902 (Field Duplicate)	SHAW01-002-SO-003	SHAW01-003-SO-002
Depth (feet bgs)		2-3	2-3	3-4	2-3
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.49 U	0.60 U	0.48 U	0.48 U
PFOA	126 ^b	2.3 J	0.97 J	0.76 U	0.76 U
PFOS	126 ^b	960 J	280 J	91	64

Note: A bold value indicates the concentration was detected above the method detection limit. A shaded value exceeds the corresponding screening level.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SO = subsurface soil

bgs = below ground surface

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

Table 5 AFFF Area 1 (Former Fire Training Area 1) Groundwater Analytical Results

Field Sample ID		SHAW01-MW105-GW-019	SHAW01-MW105-GW-919 (Field Duplicate)	SHAW01-MW121A-GW-022	SHAW01-MW122A-GW-026
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.040	0.034	0.085 J	0.063 J
PFOA	0.07 ^b	0.096	0.092	0.88	2.9
PFOS	0.07 ^b	1.4	1.4	26	5.4
PFOA + PFOS	0.07 ^b	1.496	1.492	26.88	8.3

Notes: A bold value indicates the concentration was detected above the method detection limit. A shaded value indicates the parameter exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Tap Water (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bEPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L HA value.

µg/L micrograms per liter

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

GW = groundwater

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

3.4 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

The media of concern at former FTA 2 are subsurface soil and groundwater. At the time of the field effort for the SI, the former FTA 2 area was used to store fill material, so the ground surface had been regularly disturbed by vehicle traffic and the placement and removal of fill material. Therefore, no surface soil samples were collected in AFFF Area 2. No storm drains or ditches are within the vicinity of FTA 2, and surface water apparently drains to the surrounding subsurface at the area. Therefore, no surface water or sediment samples were collected in AFFF Area 2.

3.4.1 Sample Locations

Subsurface soil samples were collected from DPT soil borings at three locations (SHAW02-001, SHAW02-002, and SHAW02-003) arranged in a triangular pattern over the area of the former burn pit. Subsurface soil samples were collected within 2 feet of the water saturated/unsaturated soil interface. Groundwater samples were collected from temporary wells installed in the borings and screened in the uppermost water-bearing zone (surficial aquifer). All three temporary wells were installed to a depth of 25 feet bgs with 10 feet of prepacked screens. The sample locations for AFFF Area 2 are shown on Figure 4 (Appendix A).

3.4.2 Soils

Soil borings SHAW02-001, SHAW02-002, and SHAW02-003 were all terminated at 25.0 feet bgs within the Quaternary sediments of the surficial aquifer. The soils encountered in the borings consisted of USCS codes SC (clayey sands), SW (well-graded sands), and SP (poorly graded sands). Detailed boring logs are contained in Appendix C.

3.4.3 Groundwater Flow

Depth to groundwater measurements were taken on January 29, 2018, in the three temporary wells at AFFF Area 2. The groundwater depth measurements are presented in Appendix F and ranged from 17.66 to 18.08 feet bgs (groundwater surface elevations ranged from 204.80 to 204.87 feet NAVD88). The depth to groundwater measurements from Area 2 and from the wells in adjacent AFFF Areas 3 and 4 were combined to develop potentiometric surface contours. Figure 4 (Appendix A) shows the potentiometric surface contours developed from these measurements. The contours indicate that the groundwater flow direction at AFFF Area 2 is to the southeast.

3.4.4 Analytical Results

Four subsurface soil samples (three primary samples and one composite physiochemical sample) and three groundwater samples were submitted to the project laboratory for analyses from AFFF Area 2. The laboratory case narrative, data validation report, and laboratory data sheets are presented in Appendix D.

Subsurface Soil

PFBS was not detected in any subsurface soil samples. PFOA was detected in one sample, but the concentration did not exceed the screening levels. PFOS was detected in all three subsurface soil samples, but none of the concentrations exceeded the screening level. Table 6 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the subsurface soil samples. Figure 11 (Appendix A) shows the sample locations and the results of PFBS, PFOA, and PFOS in soil at AFFF Area 2.

Groundwater

PFBS, PFOA, and PFOS were detected in one or more groundwater samples from AFFF Area 2. PFBS did not exceed the screening value (40 µg/L) in any sample. PFOA was detected in all three groundwater samples, and one sample (SHAW02-003-GW-020 at 0.10 µg/L) exceeded the screening value of 0.07 µg/L. PFOS concentrations in all three samples exceeded the screening level (0.07 µg/L), with concentrations ranging from 0.071 µg/L to 3.4 µg/L. The combined concentrations of PFOA and PFOS in all three samples exceeded the EPA HA (combined concentration for PFOA and PFOS of 0.07 µg/L), with concentrations ranging from 0.105 µg/L to 3.50 µg/L. Table 7 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the groundwater samples. Figure 12 (Appendix A) shows sample locations and results of PFBS, PFOA, and PFOS in groundwater at AFFF Area 2.

Physiochemical Sample

To provide basic soil parameter information, a composite subsurface soil sample was collected from AFFF Area 2 soil borings and analyzed for pH, TOC, percent solids, and grain size. The subsurface soil sample (SHAW02-004-SO-018) was composed of aliquots of the subsurface soil from the borings immediately above the water saturated/ unsaturated soil interface (between 19 and 22 feet bgs). The results of the analyses of the physiochemical samples are presented in Appendix E.

3.4.5 Conclusions

Former FTA 2 was used for firefighter training from 1970 until 1981, and an unknown volume of AFFF was released in the area. During the SI, samples were collected where concentrations of PFBS, PFOA, and PFOS were most likely to be detected based on surface drainage patterns and the groundwater flow direction. The results for the analyses of the subsurface soil samples did not indicate concentrations of PFBS, PFOA, and PFOS remain in the soil in excess of the screening criteria. However, the combined concentrations of PFOS and PFOA in all three groundwater samples exceeded the EPA HA screening level. Based on the analytical results, a release of AFFF that has impacted the groundwater at AFFF Area 2 has been confirmed.

Table 6 AFFF Area 2 (Former FTA 2) Subsurface Soil Analytical Results

Field Sample ID		SHAW02-001-SO-018	SHAW02-002-SO-021	SHAW02-003-SO-019
Depth (feet bgs)		18–19	21–22	19–20
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.47 U	0.55 U	0.50 U
PFOA	126 ^b	0.57 J	0.88 U	0.80 U
PFOS	126 ^b	19	0.66 J	1.0

Notes: A bold value indicates the concentration was detected above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.onrl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate bgs = below ground surface

SHAW = Shaw Air Force Base

bgs = below ground surface

J = estimated value

PFOA = perfluorooctanoic acid

SO = subsurface soil

U = parameter not detected at the method detection limit

Table 7 AFFF Area 2 (Former FTA 2) Groundwater Analytical Results

Field Sample ID		SHAW02-001-GW-021	SHAW02-002-GW-022	SHAW02-003-GW-020
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.010 J	0.015 U	0.038 J
PFOA	0.07 ^b	0.034	0.021	0.10
PFOS	0.07 ^b	0.071	0.43	3.4
PFOA + PFOS	0.07 ^b	0.105	0.451	3.50

Notes: A bold value indicates the parameter was detected above the method detection limit. A shaded value indicates the detected concentration exceeded the corresponding screening limit.

^bEPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L health advisory value.

µg/L micrograms per liter

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

U = parameter not detected at the method detection limit

GW = groundwater

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

3.5 FORMER FIRE TRAINING AREA 3 / CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

The media of concern at former FTA 3/Current EOD Area are surface soil, subsurface soil, and shallow groundwater. No storm drains or ditches are within the vicinity of AFFF Area 3, and surface water apparently drains to the surrounding subsurface in the area. Therefore, no surface water or sediment samples were collected for AFFF Area 3.

3.5.1 Sample Locations

Surface and subsurface soil samples were collected from DPT soil borings at three locations (SHAW03-001, SHAW03-002, and SHAW03-003) arranged in a triangular pattern over the area of the former burn pit. Groundwater samples were collected from the temporary wells installed in the borings and screened in the uppermost water-bearing zone (surficial aquifer) and from an existing groundwater monitoring well (FT3-MW5) on the downgradient (south) side of the former burn pit. Surface soil samples were collected from the top 6 inches of soil, and subsurface soil samples were collected within 2 feet of the water saturated/ unsaturated soil interface. Temporary wells SHAW03-MW001, SHAW03-MW002, and SHAW03-MW003 were installed to a depth of 20.0 feet bgs. The sample locations for AFFF Area 3 are shown on Figure 5 (Appendix A).

3.5.2 Soils

Soil samples were collected from three DPT borings in AFFF Area 3. All three borings were terminated at 20.0 feet bgs in Quaternary sediments of the surficial aquifer. The soils encountered in the borings consisted of USCS codes SC (clayey sand), CL (sandy lean clay), and SW (well graded sands). Detailed boring logs are in Appendix C.

3.5.3 Groundwater Flow

Depth to groundwater measurements were taken in the three temporary wells and the existing well at AFFF Area 3 on January 29, 2018. The groundwater depth measurements are presented in Appendix F and ranged from 12.30 to 13.78 feet bgs (groundwater surface elevations ranged from 202.88 to 203.41 feet NAVD88). The depth to groundwater measurements from Area 3 and from the wells in adjacent AFFF Areas 2 and 4 were combined to develop potentiometric surface contours. Figure 5 (Appendix A) shows the potentiometric surface contours developed from these measurements. The contours indicate that the groundwater flow direction at AFFF Area 3 is to the southeast.

3.5.4 Analytical Results

Four surface soil samples (three primary samples and one composite physiochemical sample), four subsurface soil samples (three primary samples and one composite physiochemical sample), and five groundwater samples (four primary samples and a field duplicate) were submitted to the project laboratory for analyses from AFFF Area 3. The laboratory case narrative, data validation report, and laboratory data sheets are presented in Appendix D.

Surface Soil

PFBS was detected in one sample, but the concentration did not exceed the screening level. PFOA was detected in three samples, but none of the concentrations exceeded the screening level of 126 µg/kg.

PFOS was detected in three surface soil samples from AFFF Area 3, but only one sample (SHAW03-002-001 at 740 µg/kg) exceeded the screening level of 126 µg/kg for soil. Table 8 presents the screening values and analytical results of PFBS, PFOA, and PFOS detected in the surface soil samples. Figure 13 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in surface soil at AFFF Area 3.

Subsurface Soil

PFBS and PFOA were detected in two subsurface soil samples, but the concentrations did not exceed screening levels. PFOS was detected in all three samples, and the concentrations in two samples (SHAW03-001-SO-016 at 170 µg/kg and SHAW03-003-SO-016 at 200 µg/kg) exceeded the screening level of 126 µg/kg for soil. Table 9 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the subsurface soil samples. Figure 13 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in subsurface soil at AFFF Area 3.

Groundwater

PFBS, PFOA, and PFOS were detected in all five groundwater samples from AFFF Area 3. The concentration of PFBS did not exceed the screening level in any samples. The individual concentrations for PFOA and PFOS and the combined concentrations of PFOA and PFOS exceeded the screening level (0.07 µg/L) in all five samples. The combined PFOA and PFOS concentrations ranged from 0.81 µg/L to 43 µg/L. Table 10 presents the screening values and analytical results of PFBS, PFOA, and PFOS detected in the groundwater samples. Figure 14 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in groundwater at AFFF Area 3.

Physiochemical Sample

To provide basic soil parameter information, composite surface and subsurface soil samples were collected from AFFF Area 3 soil borings and analyzed for pH, TOC, percent solids, and grain size. The surface soil sample (SHAW03-004-SS-001) was composed of aliquots of surface soil (0 to 6 inches bgs) from the borings. The subsurface soil sample (SHAW03-004-SO-016) was composed of aliquots of the subsurface soil from the borings (between 16 and 18 feet bgs) immediately above the water saturated/unsaturated soil interface. The results of the analyses of the physiochemical samples are presented in Appendix E.

3.5.5 Conclusions

AFFF was reportedly released in the burn pit at former FTA 3/ Current EOD Area during firefighter training exercises from 1981 to 1989; however, the quantities of AFFF discharged in the area are unknown. During the SI, samples were collected where concentrations of PFBS, PFOA, and PFOS would most likely be detected based on surface drainage patterns and the groundwater flow direction. The results for the analyses of the surface and subsurface soil samples indicated that concentrations of PFOS remained in the surface and subsurface soil in excess of the screening criteria. Also, the individual and combined concentrations of PFOA and PFOS were detected in all five groundwater samples at concentrations exceeding the screening levels. Based on the analytical results, a release of AFFF that has impacted the surface soil, subsurface soil, and groundwater at AFFF Area 3 has been confirmed.

Table 8 AFFF Area 3 (Former Fire Training Area 3/ Current Explosive Ordnance Disposal Area) Surface Soil Analytical Results

Field Sample ID		SHAW03-001-SS-001	SHAW03-002-SS-001	SHAW03-003-SS-001
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.49 U	0.48 J	0.44 U
PFOA	126 ^b	6.6	12	4.1
PFOS	126 ^b	13	740	47

Notes: A bold value indicates the parameter was detected at or above the method detection limit.

A shaded value indicates that the concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

J = estimated value

PFBS = perfluorobutane sulfonate

PFOA = perfluorooctanoic acid

PFOS = perfluorooctane sulfonate

SHAW = Shaw Air Force Base

SS = surface soil

U = parameter not detected at the method detection limit

Table 9 AFFF Area 3 (Former Fire Training Area 3/ Current Explosive Ordnance Disposal Area) Subsurface Soil Analytical Results

Field Sample ID		SHAW03-001-SO-016	SHAW03-002-SO-017	SHAW03-003-SO-016
Depth (feet bgs)		16–17	17–18	16–17
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.95 J	0.50 U	8.3
PFOA	126 ^b	4.5	0.79 U	19
PFOS	126 ^b	170	0.96 J	200

Note: A bold value indicates the parameter was detected at or above the method detection limit.

A shaded value indicates that the concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

bgs = below ground surface

ID = identification

J = estimated value

PFBS = perfluorobutane sulfonate

PFOA = perfluorooctanoic acid

PFOS = perfluorooctane sulfonate

SHAW = Shaw Air Force Base

SO = subsurface soil

U = parameter not detected at the method detection limit

Table 10 AFFF Area 3 (Former Fire Training Area 3/ Current Explosive Ordnance Disposal Area) Groundwater Analytical Results

Field Sample ID		SHAW03-FT3-MW5-GW-016	SHAW03-FT3-MW5-GW-916 (field duplicate)	SHAW03-001-GW-018	SHAW03-002-GW-017	SHAW03-003-GW-018
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.16 J	0.12	0.95	0.18	18
PFOA	0.07 ^b	3.3	3.2	1.7	0.17	13
PFOS	0.07 ^b	21	20	14	0.64	30
PFOA + PFOS	0.07 ^b	24.3	23.2	15.7	0.81	43

Notes: A bolded value indicates parameter was detected above the method detection limit.

A shaded value indicates that the concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Tap Water (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bEPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined concentrations of the compounds are compared with the 0.07 µg/L health advisory value.

µg/L = micrograms per liter

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

GW = groundwater

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

3.6 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

The media of concern at the current FTA are surface soil, subsurface soil, shallow groundwater on the east side of the area, and surface water and sediment at the holding pond outfall.

3.6.1 Sample Locations

Surface soil, subsurface soil, and groundwater samples were collected from DPT soil borings at three locations (SHAW04-001, SHAW04-002, and SHAW04-003) arranged in a triangular pattern over the low-lying area adjacent to the east side of the holding pond. A surface water and sediment sample were collected at the outfall of the holding pond. Surface soil samples were collected from the top 6 inches of soil, and subsurface soil samples were collected within 2 feet of the water saturated/unsaturated soil interface. Groundwater samples were collected from temporary wells installed in the borings and screened in the uppermost water-bearing zone (surficial aquifer). All three temporary wells were installed at 20 feet bgs with 10 feet of prepacked screens. The sample locations for AFFF Area 4 are shown on Figure 6 (Appendix A).

3.6.2 Soils

Soil samples were collected from three DPT borings in AFFF Area 4. All three borings (SHAW04-001, SHAW04-002, and SHAW04-003) were terminated at 20.0 feet bgs. All three borings were drilled in Quaternary sediments of the surficial aquifer. The soils encountered in the borings consisted of USCS codes SP (poorly graded sands) and SC (clayey sand). Detailed boring logs are in Appendix C.

3.6.3 Groundwater Flow

Depth to groundwater measurements were taken in the three temporary wells on January 29, 2018. The groundwater depth measurements are presented in Appendix F and ranged from 11.10 to 11.35 feet bgs (groundwater surface elevations ranged from 203.07 to 203.49 feet NAVD88). The depth to groundwater measurements from Area 4 and from the wells in adjacent AFFF Areas 2 and 3 were combined to develop potentiometric surface contours. Figure 6 (Appendix A) shows the potentiometric surface contours developed from these measurements. The contours indicate that the groundwater flow direction at AFFF Area 4 is to the southeast.

3.6.4 Analytical Results

Four surface soil samples (three primary and one composite physiochemical sample); five subsurface soil samples (three primary, one field duplicate sample, and one composite physiochemical sample); three groundwater samples; two sediment samples (one primary sample and field duplicate sample); and two surface water samples (one primary sample and a field duplicate sample) were submitted to the project laboratory for analyses from AFFF Area 4. The laboratory case narrative, data validation report, and laboratory data sheets are presented in Appendix D.

Surface Soil

PFBS was not detected in the surface soil samples from Area 4. PFOA was detected in one sample, but the concentration did not exceed the screening level of 126 µg/kg. PFOS was detected in three surface soil samples, but none of the concentrations exceeded the screening level of 126 µg/kg. Table 11 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the surface soil samples. Figure

15 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in surface soil at AFFF Area 4.

Subsurface Soil

PFBS was not detected in any subsurface soil samples. PFOA was detected in one sample, but the concentration did not exceed the screening level of 126 µg/kg. PFOS was detected in four subsurface soil samples from AFFF Area 4, but none of the concentrations exceeded the screening level of 126 µg/kg. Table 12 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the subsurface soil samples. Figure 15 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in subsurface soil at AFFF Area 4.

Groundwater

PFBS, PFOA, and PFOS were detected in the three groundwater samples from AFFF Area 4. None of the concentrations of PFBS exceeded the screening level (40 µg/L). Individual concentrations of PFOA and PFOS exceeded the screening value of 0.07 µg/L in all three samples. The combined concentrations of PFOA and PFOS in all three groundwater samples also exceeded the EPA HA for drinking water (combined PFOA and PFOS value of 0.07 µg/L), with concentrations ranging from 5.1 µg/L to 8.9 µg/L. Table 13 presents the screening values and analytical results of PFBS, PFOA, and PFOS detected in the groundwater samples. Figure 16 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in groundwater at AFFF Area 4.

Sediment

PFBS was not detected in either the primary or duplicate sediment sample from AFFF Area 4. PFOA and PFOS were detected in both samples, but the concentration did not exceed the screening level of 126 µg/kg. Table 14 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the sediment samples. Figure 15 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in sediment at AFFF Area 4.

Surface Water

PFBS, PFOA, and PFOS were detected in both the primary and duplicate surface water sample from AFFF Area 4. PFBS did not exceed the screening level (40 µg/L) in either sample. Individual concentrations of PFOA and PFOS exceeded the screening value of 0.07 µg/L in both samples. The combined concentrations of PFOA and PFOS in both surface water samples also exceeded the EPA HA for drinking water (combined PFOA and PFOS value of 0.07 µg/L), with concentrations of 0.80 µg/L and 0.85 µg/L. Table 15 presents the screening values and analytical results of PFBS, PFOA, and PFOS detected in the surface water samples. Figure 16 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in surface water at AFFF Area 4.

Physiochemical Sample

To provide basic soil parameter information, composite surface and subsurface soil samples were collected from AFFF Area 4 soil borings and analyzed for pH, TOC, percent solids, and grain size. The surface soil sample (SHAW04-005-SS-001) was composed of aliquots of surface soil (0 to 6 inches bgs) from the borings. The subsurface soil sample (SHAW04-005-SO-013) was composed of aliquots of the subsurface soil from the borings (13 to 14 feet bgs) immediately above the water saturated/ unsaturated soil interface. The results of the analyses of the physiochemical samples are presented in Appendix E.

3.6.5 Conclusions

Annual certification testing of the AFFF systems on the Shaw AFB fire trucks is conducted at the current FTA. Although the AFFF foam is discharged into the lined holding pond, it is possible that an unknown quantity of water containing elevated concentrations of PFASs may have been released through the outfall piping from the pond to the low-lying area adjacent to the south side of the FTA. During the SI, samples were collected where concentrations of PFBS, PFOA, and PFOS would most likely be detected based on surface drainage patterns and the groundwater flow direction. The results for the analyses of the surface soil, subsurface soil, and sediment samples did not indicate concentrations of PFBS, PFOA, or PFOS remained in the soil or sediment in excess of the screening criteria. However, combined concentrations of PFOA and PFOS were detected in the groundwater and surface water samples at concentrations exceeding the EPA HA. Based on the analytical results, a release of AFFF to the groundwater and surface water at AFFF Area 4 has been confirmed.

Table 11 AFFF Area 4 (Current Fire Training Area) Surface Soil Analytical Results

Field Sample ID		SHAW04-001-SS-001	SHAW04-002-SS-001	SHAW04-003-SS-001
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.44 U	0.50 U	0.46 U
PFOA	126 ^b	0.90	0.80 U	0.73 U
PFOS	126 ^b	27	6.2	11

Note: A bold value indicates the parameter was detected at or above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SS = surface soil

ID = identification

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

Table 12 AFFF Area 4 (Current Fire Training Area) Subsurface Soil Analytical Results

Field Sample ID		SHAW04-001-SO-013	SHAW04-002-SO-013	SHAW04-002-SO-913 (Field Duplicate)	SHAW04-003-SO-012
Depth (feet bgs)		13–14	13–14	13–14	13–14
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.44 U	0.45 U	0.49 U	0.49 U
PFOA	126 ^b	0.78 J	0.71 U	0.78 U	0.78 U
PFOS	126 ^b	3.4	1.4 J	11 J	6.3

Note: A bold value indicates the parameter was detected at or above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SO = subsurface soil

bgs = below ground surface

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

Table 13 AFFF Area 4 (Current Fire Training Area) Groundwater Analytical Results

Field Sample ID		SHAW04-001-GW-018	SHAW04-002-GW-018	SHAW04-003-GW-015
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.26	0.30	0.098
PFOA	0.07 ^b	4.7	1.2	0.60
PFOS	0.07 ^b	4.2	3.9	7.9
PFOA + PFOS	0.07 ^b	8.9	5.1	8.50

Notes: A bold value indicates the parameter was detected at or above the method detection limit. A shaded value indicates the detected concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Tap Water (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bEPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L Health Advisory value.

µg/L = micrograms per liter

ID = identification

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

GW = groundwater

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

Table 14 AFFF Area 4 (Current Fire Training Area) Sediment Analytical Results

Field Sample ID		SHAW04-004-SD-001	SHAW04-004-SD-901 (Field Duplicate)
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.50 U	0.70 U
PFOA	126 ^b	0.40 J	1.1 J
PFOS	126 ^b	26 J	67 J

Note: A bold value indicates the parameter was detected at or above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

U = parameter not detected at the method detection limit

bgs = below ground surface

J = estimated value

PFOA = perfluorooctanoic acid

SD = sediment

SHAW = Shaw Air Force Base

Table 15 AFFF Area 4 (Current Fire Training Area) Surface Water Analytical Results

Field Sample ID		SHAW04-004-SW-001	SHAW04-004-SW-901 (Field Duplicate)
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.045	0.037
PFOA	0.07 ^b	0.18	0.17
PFOS	0.07 ^b	0.67	0.63
PFOA + PFOS	0.07 ^b	0.85	0.80

Notes: A bold value indicates the parameter was detected at or above the method detection limit. A shaded value indicates the detected concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Tap Water (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bEPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L Health Advisory value.

µg/L = micrograms per liter

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SW = surface water

ID = identification

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

3.7 BUILDING 1511 (AFFF AREA 5)

The media of concern at Building 1511 are surface soil, subsurface soil, and shallow groundwater. No surface water or sediment samples were collected for the area because no surface water features are near the building, and surface water runoff apparently flows off the paved areas to the surrounding grassy areas and infiltrates to the subsurface.

3.7.1 Sample Locations

Surface soil and subsurface soil samples were collected from DPT soil borings at four locations. One DPT boring (SHAW05-001) was installed at the rear door of the building near the AFFF tank where multiple small releases have reportedly occurred. The second DPT boring (SHAW05-002) was installed adjacent to the holding tank at the north end of the building, where overflows of the tank were reported. The third and fourth DPT borings (SHAW05-003 and SHAW05-004) were installed on the grass infield southeast of the building, where surface runoff collects. Groundwater samples were collected from temporary wells installed in three borings, but the temporary well installed in SHAW05-MW001 was dry and did not produce enough water to sample. Surface soil samples were collected from the top 6 inches of soil, and subsurface soil samples were collected within 2 feet of the water saturated/unsaturated soil interface. Groundwater samples were collected from temporary wells installed in the borings and screened in the uppermost water-bearing zone (surficial aquifer). Temporary well SHAW05-MW001 was installed at a depth of 25.5 feet bgs with 15 feet of prepacked screen, but it never produced any water. The other three temporary wells (SHAW05-MW002, SHAW05-MW003, and SHAW05-MW004) were installed at 35.0 feet bgs. Well SHAW05-MW002 was also installed with 15 feet of prepacked screen, but wells SHAW05-MW003 and SHAW05-MW004 were installed with 10 feet of prepacked screen. The sample locations for AFFF Area 5 are shown on Figure 7 (Appendix A).

3.7.2 Soils

Soil samples were collected from four DPT borings in AFFF Area 5. All four borings were drilled in Quaternary sediments of the surficial aquifer. Soil boring SHAW05-001 was terminated at 25.5 feet bgs and soil borings SHAW05-002, SHAW05-003, and SHAW05-004 were terminated at 35.0 feet bgs. The soils encountered in the borings consisted of USCS codes GC (clayey gravel), CL (sandy lean clay), SP (poorly graded sand), SW (well graded sand), and SC (clayey sand). Detailed boring logs are in Appendix C.

3.7.3 Groundwater Flow

Depth to groundwater measurements were taken in three temporary wells on January 31, 2018. Temporary well SHAW05-MW001 never produced sufficient water to measure. The groundwater depth measurements are presented in Appendix F and ranged from 25.39 to 28.10 feet bgs (groundwater surface elevations ranged from 217.55 to 227.00 feet NAVD88). Figure 7 (Appendix A) shows the potentiometric surface contours developed from these measurements. The contours indicate that the groundwater flow direction at AFFF Area 5 is to the southeast.

3.7.4 Analytical Results

Six surface soil samples (four primary samples, one field duplicate sample, and one composite physiochemical sample); five subsurface soil samples (four primary samples and one composite physiochemical sample); and three groundwater samples were submitted to the project laboratory for

analyses from AFFF Area 5. The laboratory case narrative, data validation report, and laboratory data sheets are presented in Appendix D.

Surface Soil

PFBS was not detected in the surface soil samples from Area 5. PFOA was detected in three samples, but the concentration did not exceed the screening level of 126 µg/kg. PFOS was detected in all five surface soil samples, but none of the concentrations exceeded the screening level of 126 µg/kg. Table 16 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the surface soil samples. Figure 17 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in surface soil at AFFF Area 5.

Subsurface Soil

PFBS was not detected in the subsurface soil samples from Area 5. PFOA was detected in one sample, but the concentration did not exceed the screening level of 126 µg/kg. PFOS was detected in three of the four subsurface soil samples from AFFF Area 5, but the concentrations did not exceed the screening level of 126 µg/kg. Table 17 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the subsurface soil samples. Figure 17 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in subsurface soil at AFFF Area 5.

Groundwater

PFBS, PFOA, and PFOS were detected in all three groundwater samples from AFFF Area 5. None of the concentrations of PFBS in the samples exceeded the screening level (40 µg/L). Individual concentrations of PFOA and PFOS exceeded the screening value of 0.07 µg/L in all three samples. The combined concentrations of PFOA and PFOS in all three groundwater samples also exceeded the EPA HA for drinking water (combined PFOA and PFOS value of 0.07 µg/L), with concentrations ranging from 0.162 µg/L to 0.586 µg/L. Table 18 presents the screening values and analytical results of PFBS, PFOA, and PFOS detected in the groundwater samples. Figure 18 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in groundwater at AFFF Area 5.

Physiochemical Sample

To provide basic soil parameter information, composite surface and subsurface soil samples were collected from AFFF Area 5 soil borings and analyzed for pH, TOC, percent solids, and grain size. The surface soil sample (SHAW05-005-SS-001) was composed of aliquots of surface soil (0 to 6 inches bgs) from the borings. The subsurface soil sample (SHAW05-005-SO-031) was composed of aliquots of the subsurface soil from the borings either immediately above the water saturated/ unsaturated soil interface (between 28 and 30 feet bgs) (borings SHAW05-003 and SHAW05-004) or within 2 feet of the total depth of the boring if no groundwater was encountered (borings SHAW05-001 and SHAW05-002). The results of the analyses of the physiochemical samples are presented in Appendix E.

3.7.5 Conclusions

Conversations with base personnel indicate that there may have been multiple small releases from the AFFF tank system at Building 1511 and overflow from the holding tank. Based on this information, SCDHEC requested that the building be added to the SI process. During the SI, samples were collected where concentrations of PFBS, PFOA, and PFOS would most likely be detected based on surface water drainage patterns and the groundwater flow direction. The results for the analyses of the surface and subsurface soil samples do not indicate concentrations of PFBS, PFOA, or PFOS remain in the soil in excess of the screening criteria. However, the combined concentrations of PFOA and PFOS were detected in all three groundwater samples at concentrations exceeding the EPA HA. Based on the analytical results, a release of AFFF to the groundwater at AFFF Area 5 has been confirmed.

Table 16 AFFF Area 5 (Building 1511) Surface Soil Analytical Results

Field Sample ID		SHAW05-001-SS-001	SHAW05-002-SS-001	SHAW05-002-SS-901 (Field Duplicate)	SHAW05-003-SS-001	SHAW05-004-SS-001
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.44 U	0.50 U	0.48 U	0.50 U	0.55 U
PFOA	126 ^b	1.0	0.76 J	0.60 J	0.80 U	0.88 U
PFOS	126 ^b	1.7	1.6	1.6	6.2	5.1

Note: A bold value indicates the parameter was detected above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SS = surface soil

Table 17 AFFF Area 5 (Building 1511) Subsurface Soil Analytical Results

Field Sample ID		SHAW05-001-SO-024	SHAW05-002-SO-034	SHAW05-003-SO-027	SHAW05-004-SO-028
Depth (feet bgs)		24–25	34–35	27–28	28–29
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.43 U	0.44 U	0.43 U	0.50 U
PFOA	126 ^b	0.76 J	0.70 U	0.68 U	0.80 U
PFOS	126 ^b	20	0.70 U	0.26 J	0.78 J

Note: A bold value indicates the parameter was detected above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SO = subsurface soil

bgs = below ground surface

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

Table 18 AFFF Area 5 (Building 1511) Groundwater Analytical Results

Field Sample ID		SHAW05-002-GW-033	SHAW05-003-GW-032	SHAW05-004-GW-031
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.017 J	0.058	0.021
PFOA	0.07 ^b	0.12	0.076	0.082
PFOS	0.07 ^b	0.18	0.51	0.080
PFOA + PFOS	0.07 ^b	0.30	0.586	0.162

Notes: A bold value indicates the parameter was detected above the method detection limit. A shaded value indicates the detected concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Tap Water (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^b EPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L Health Advisory value.

µg/L = micrograms per liter

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

GW = groundwater

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

3.8 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

The media of concern at the WWTP are surface soil, subsurface soil, and groundwater. There are no surface water features near the WWTP; therefore, no surface water or sediment samples were collected in Area 6.

3.8.1 Sample Locations

Surface soil, subsurface soil, and groundwater samples were collected from three DPT soil borings. One DPT boring (SHAW06-001) was installed at the northeast end of the sludge drying beds. The second DPT boring (SHAW06-002) was installed on the south end of the sludge drying beds. The third DPT boring (SHAW06-003) was installed west of the sludge drying beds, adjacent to clarifying tanks. The sample locations for AFFF Area 6 are shown on Figure 8 (Appendix A).

3.8.2 Soils

Soil samples were collected from three DPT borings in AFFF Area 6. Soil boring SHAW06-001 was terminated at 33.0 feet bgs on DPT refusal. Soil boring SHAW06-002 was terminated at 30.0 feet bgs. Soil boring SHAW06-003 was terminated at 28.0 feet bgs. All three borings were drilled in Quaternary sediments of the surficial aquifer. The soils encountered in the borings consisted of USCS codes SC (clayey sand), CL (sandy clay), SP (poorly graded sand), SM (silty sand), and CH (fat clay). Detailed boring logs are in Appendix C.

3.8.3 Groundwater Flow

Depth to groundwater measurements were taken in the three temporary wells on January 29, 2018. The groundwater depth measurements are presented in Appendix F and ranged from 24.0 to 27.17 feet bgs (groundwater surface elevations ranged from 280.15 to 280.30 feet NAVD88). The depth to groundwater measurements were used to develop potentiometric surface contours. Figure 8 (Appendix A) shows the potentiometric surface contours developed from these measurements. The contours indicate that the groundwater flow direction at AFFF Area 6 is to the west.

3.8.4 Analytical Results

Four surface soil samples (three primary and one composite physiochemical sample), four subsurface soil samples (three primary samples and one composite physiochemical sample), and three groundwater samples were submitted to the project laboratory for analyses from AFFF Area 6. The laboratory case narrative, data validation report, and laboratory data sheets are presented in Appendix D.

Surface Soil

PFBS was not detected in the surface soil samples from Area 6. PFOA was detected in two samples, but the concentrations did not exceed the screening level of 126 µg/kg. PFOS was detected in all three surface soil samples, but none of the concentrations exceeded the screening level of 126 µg/kg. Table 19 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the surface soil samples. Figure 19 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in surface soil at AFFF Area 6.

Subsurface Soil

PFBS and PFOA were not detected in the subsurface soil samples from Area 6. PFOS was detected in two subsurface soil samples from AFFF Area 6, but the concentrations did not exceed the screening level of 126 µg/kg. Table 20 presents the screening values and analytical results of PFBS, PFOA, and PFOS in the subsurface soil samples. Figure 19 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in subsurface soil at AFFF Area 6.

Groundwater

PFBS, PFOA, and PFOS were detected in all three groundwater samples from AFFF Area 6. None of the concentrations of PFBS in the samples exceeded the screening level (40 µg/L). Individual concentrations of PFOA and PFOS exceeded the screening value of 0.07 µg/L in all three samples. The combined concentrations of PFOA and PFOS in all three groundwater samples also exceeded the EPA HA for drinking water (combined PFOA and PFOS value of 0.07 µg/L), with concentrations ranging from 0.40 µg/L to 0.80 µg/L. Table 21 presents the screening values and analytical results of PFBS, PFOA, and PFOS detected in the groundwater samples. Figure 20 (Appendix A) shows the sample locations and results of PFBS, PFOA, and PFOS in groundwater at AFFF Area 6.

Physiochemical Sample

To provide basic soil parameter information, composite surface and subsurface soil samples were collected from AFFF Area 6 soil borings and analyzed for pH, TOC, percent solids, and grain size. The surface soil sample (SHAW06-004-SS-001) was composed of aliquots of surface soil (0 to 6 inches bgs) from the borings. The subsurface soil sample (SHAW06-004-SO-027) was composed of aliquots of the subsurface soil from the borings immediately above the water saturated/ unsaturated soil interface (between 26 and 29 feet bgs). The results of the analyses of the physiochemical samples are presented in Appendix E.

3.8.5 Conclusions

AFFF released in the hangar area of the base would be carried through the sanitary sewer system to the WWTP. An unknown volume of treated water and sludge containing PFAS residue may have been placed on the sludge drying beds. During the SI, samples were collected where concentrations of PFBS, PFOA, and PFOS would most likely be detected based on surface water drainage patterns and groundwater flow direction. The results for the analyses of the surface and subsurface soil samples do not indicate concentrations of PFBS, PFOA, or PFOS remain in the soil in excess of the screening criteria. However, the combined concentrations of PFOA and PFOS exceeded the EPA HA in all three groundwater samples. Based on the analytical results, a release of AFFF to the groundwater at AFFF Area 6 has been confirmed.

Table 19 AFFF Area 6 (Wastewater Treatment Plant) Surface Soil Analytical Results

Field Sample ID		SHAW06-001-SS-001	SHAW06-002-SS-001	SHAW06-003-SS-001
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.49 U	0.50 U	0.55 U
PFOA	126 ^b	0.78 U	1.5	1.4
PFOS	126 ^b	5.1	45	33

Note: A bold value indicates the parameter was detected above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semsub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SS = surface soil

ID = identification

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

Table 20 AFFF Area 6 (Wastewater Treatment Plant) Subsurface Soil Analytical Results

Field Sample ID		SHAW06-001-SO-028	SHAW06-002-SO-026	SHAW06-003-SO-026
Depth (feet bgs)		28–29	26–27	26–27
Parameter	Screening Level (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)	Concentration (µg/kg)
PFBS	130,000 ^a	0.65 U	0.55 U	0.60 U
PFOA	126 ^b	1.0 U	0.88 U	0.96 U
PFOS	126 ^b	0.83 J	1.0 J	0.96 U

Note: A bold value indicates the parameter was detected at or above the method detection limit.

^aEPA Regional Screening Levels for Residential Soil (May 2018) (<https://semsub.epa.gov/work/HQ/197235.pdf>).

^bScreening levels calculated using the EPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

µg/kg = micrograms per kilogram

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

SO = subsurface soil

bgs = below ground surface

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

U = parameter not detected at the method detection limit

Table 21 AFFF Area 6 (Wastewater Treatment Plant) Groundwater Analytical Results

Field Sample ID	SHAW06-001-GW-033	SHAW06-002-GW-028	SHAW06-003-GW-027
Parameter	Screening Level (µg/L)	Concentration (µg/L)	Concentration (µg/L)
PFBS	40 ^a	0.038	0.027
PFOA	0.07 ^b	0.30	0.19
PFOS	0.07 ^b	0.50	0.21
PFOA + PFOS	0.07 ^b	0.80	0.48

Notes: A bold value indicates the parameter was detected at or above the method detection limit. A shaded value indicates the detected concentration exceeded the corresponding screening level.

^aEPA Regional Screening Levels for Tap Water (May 2018) (<https://semspub.epa.gov/work/HQ/197235.pdf>).

^bEPA, May 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)* and EPA, May 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L Health Advisory value.

µg/L = micrograms per liter

ID = identification

PFBS = perfluorobutane sulfonate

PFOS = perfluorooctane sulfonate

GW = groundwater

J = estimated value

PFOA = perfluorooctanoic acid

SHAW = Shaw Air Force Base

3.9 INVESTIGATION-DERIVED WASTE

The QAPP addendum (ASL, February 2017) included prescribed procedures for handling and analyses of investigation-derived waste (IDW) generated during the SI. After the QAPP addendum was approved, the USAF provided revised guidance on handling IDW disposal to minimize waste generation. In accordance with this guidance, the minimal soil and water generated during the field activities was placed on the ground adjacent to, and downgradient from, each sampling location. General waste – such as paper, plastic, trash, and PPE – was contained in plastic garbage bags and placed in on-base dumpsters for disposal.

4.0 GROUNDWATER PATHWAY

Shaw AFB is within the Atlantic Coastal Plain Physiographic Province of South Carolina. The province is divided into three subprovinces: Upper, Middle, and Lower Coastal Plain. The subprovinces are separated by scarps, changes in elevation that represent ancient depositional or erosional regimes. Shaw AFB lies along the border between the Upper and Middle Coastal Plain subprovinces. The Orangeburg Scarp in the western portion of the base is the demarcation line between the Upper and Middle subprovinces. The Upper Coastal Plain is characterized by deeply incised streams on a rolling topographic surface. The coastal plain sediments pinch out to the west against the soils and rocks of the Piedmont Physiographic Province. The Middle and Lower Coastal Plain subprovinces have much lower relief than the Upper Coastal Plain, and terrace deposits cover the surface of these two subprovinces. Each terrace represents the approximate shoreline at the time the terrace formed.

The topography at Shaw AFB is flat in the east, changing to rolling hills in the west. The terrain is a flat terrace surface in the vicinity of the runways and rises approximately 100 feet to roughly 300 feet above mean sea level (amsl) on the western edge of the base perimeter. Beyond the western base boundary, the land surface drops down across Beech Creek at approximately 200 feet amsl and then rises back to more than 300 feet amsl on the west side of the creek.

The geologic units underlying Shaw AFB are the Duplin Formation terrace deposits (Pliocene/Pleistocene), the Lang Syne and Sawdust Landing Members of the Black Mingo Formation (Paleocene), and the Black Creek Formation (late Cretaceous). A subsurface extension of the Orangeburg Scarp on the west side of the base creates an unconformity dipping to the east, dividing the younger Duplin Formation from the older Black Mingo and Black Creek deposits in the central and eastern portions of the base. Figure 21 (Appendix A) presents a generalized cross-section of the geologic formations at Shaw AFB. The individual formations are described from oldest to youngest here (Rust, February 1995).

Black Creek Formation – The Black Creek Formation is subdivided into the Upper Black Creek and Lower Black Creek units. The units are separated by a dense clay layer (known as the “100-foot clay”) that is approximately 25 feet thick in the eastern portion of the base and thins to the west beneath the Orangeburg Scarp. The clay is encountered at 100 to 220 feet bgs depending on the elevation of the land surface. Both units of the Black Creek Formation consist of sand, often clayey with pyrite and organic materials and represent a near-shore deltaic terrestrial depositional environment. The units may be laterally discontinuous and cross-cut locally by more permeable sands and gravel where channel deposits have been laid down. The top of the Black Creek Formation is encountered at 140 to 240 feet bgs (depending on surface elevation). The base of the Black Creek Formation is marked by the presence of a dark gray to black organic clay. This clay separates the Black Creek Formation from the underlying Middendorf Formation. In the area of the Orangeburg Scarp, the base of the Black Creek Formation is approximately 320 feet bgs.

Black Mingo Group – The Black Mingo Group consists of the Sawdust Landing and Lang Syne Formations. The Sawdust Landing Formation is comprised primarily of interbedded silt, clay, and clayey sand. The Sawdust Landing Formation is generally encountered between elevations of 170 and 260 feet amsl (60 to 70 feet bgs), and the thickness of the formation ranges from approximately 100 feet in the western portion of the base to nonexistent in the eastern portion of the base, where erosion along the Orangeburg Scarp has occurred. On the Orangeburg Scarp, the top of the Sawdust Landing Formation is approximately 55 feet bgs. The Lang Syne Formation is comprised predominantly of unconsolidated sand, silt, and clay. Lenses of iron-cemented sandstone and gravel layers are also encountered, often near the base of the unit. The Lang Syne is present only in the western half of Shaw AFB and outcrops on the Orangeburg Scarp at an elevation of approximately 260 to 270 feet amsl. The thickness of the formation ranges from a few feet along its eastern limits to approximately 100 feet on the western edge of Shaw AFB. The Lang Syne Formation positioned on the hill overlooking Shaw AFB forms one of the two surficial aquifers at Shaw AFB. The aquifer features a radial groundwater flow pattern with a steep hydraulic gradient to the southwest and southeast. The aquifer is recharged from precipitation and discharges to springs and seeps along the Beech Creek Valley to the west and to the Duplin Formation to the east. The silts and clays of the Sawdust Landing member below the Lang Syne serve as a confining unit separating the Lang Syne aquifer from the aquifers in the Black Creek Formation.

Duplin Formation – Beginning at the Orangeburg Scarp and going east, the Duplin Formation overlays the older geologic units. The Duplin Formation consists predominantly of interlayered poorly sorted to well-sorted and clayey, coarse- to fine-grained sands with occasional localized clay layers. The thickness of the Duplin Formation ranges from a few feet in the western portion of the base to more than 70 feet in the eastern portion of Shaw AFB. The Duplin Formation forms the second of two surficial aquifers at Shaw AFB. Recharge to the Duplin aquifer occurs directly from precipitation and as seepage from the edge of the Lang Syne aquifer along the edge of the Orangeburg Scarp. The Duplin aquifer discharges to the Upper Black Creek aquifer beneath it and to springs and streams beyond the southeastern edge of the base property.

The combined surficial aquifer systems extend from the ground surface to approximately 80 to 90 feet bgs and are divided hydrogeologically into upper and lower zones. The upper zone extends approximately 35 feet bgs and generally flows east-northeast into Long Branch. The lower zone extends from approximately 35 feet bgs to a semipermeable aquitard (the 100-foot clay) at approximately 90 to 100 feet bgs and generally flows east-southeast. The Black Creek aquifer (consisting of upper and lower units separated by the semipermeable 100-foot clay) underlies most of Sumter County and provides drinking water for the majority of the central Coastal Plain. Six water supply wells provide drinking water for Shaw AFB. Five wells are screened in the Black Creek aquifer, and the sixth well (Well 4) is screened in the deeper Middendorf aquifer system. At Shaw AFB, the Upper Black Creek aquifer is encountered at an elevation of approximately 175 feet amsl in the western portion of the base but is absent in the eastern portion of the base. The Lower Black Creek aquifer is encountered at Shaw AFB at an elevation of approximately 100 feet amsl. Recharge to the Black Creek aquifer is from the east and northeast through general downward leakage from overlying units (Duplin aquifer). Previous reports indicate that the potentiometric surface in the Black Creek aquifer is relatively flat but with a flow direction to the west and north discharging into the Wateree River approximately 8 miles west of Shaw AFB (Rust, February 1995).

Shaw AFB has six drinking water supply wells on base serving approximately 4,120 on-base personnel (CH2M Hill, October 2015). A search of the Federal Public Water Supply Database (Environmental Data Resources, Inc., September 2015) showed 12 public water wells within 4 miles of Shaw AFB, and a search of the South Carolina Well Inventory showed 81 public or private drinking water wells within a 4 mile radius of the base. Figure 22 shows the locations of the off-base public and private wells; it should

be noted that some of the posted locations contain multiple wells. Because of security concerns, the USAF does not allow the locations of on-base drinking water wells to be shown in public documents.

4.1 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

Individual and combined concentrations of PFOA and PFOS exceeded screening levels in all four groundwater samples collected in AFFF Area 1. Therefore, the groundwater in the area presents a potential hazard to human health. The closest drinking water supply well is Shaw AFB Well BW-1R. This well was completed in 2016 and is not listed in the South Carolina Department of Natural Resources (SCDNR) well data base. Shaw AFB personnel indicated that this well is 621 feet in depth and is screened in the Middendorf aquifer. Well BW-1R is approximately 2,900 feet south-southwest (sidegradient) of AFFF Area 1. Multiple public and private drinking water wells are within 4 miles downgradient (north-northeast) of AFFF Area 1. The closest off-base drinking water supply well (Major Ospum Well, SCDNR Well ID SUM-152) is approximately 1 mile downgradient (east) of AFFF Area 1. The state database contains no information on the number of people served by this well or the screened interval for SUM-152, but other drinking water wells to the east of Shaw AFB and within 4 miles of AFFF Area 1 are screened in the surficial aquifer (Duplin Formation), so it can be assumed SUM-152 is as well. Therefore, based on the groundwater samples exceeding the EPA HA and the presence of drinking water supply wells screened in the surficial aquifer within 4 miles downgradient of the area, the groundwater pathway for AFFF Area 1 is potentially complete and drinking water may be impacted.

4.2 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

Individual concentrations of PFOA in one sample and PFOS concentrations in all three groundwater samples in AFFF Area 2 exceeded screening levels during the SI. In addition, the combined concentrations of PFOA and PFOS exceeded screening levels in all three groundwater samples. Therefore, the groundwater in AFFF Area 2 presents a potential hazard to human health. The closest drinking water supply well is Shaw AFB Well BW-1R (total depth 621 feet bgs and not listed in the SCDNR well data base) approximately 3,300 feet south-southeast (downgradient) of AFFF Area 2. Multiple public and private drinking water wells are within 4 miles downgradient (south-southeast) of AFFF Area 2. The closest off-base drinking water supply well (Crescent Motor Home Park, SCDHEC Well ID G43194) is approximately 1 mile downgradient (southeast) of AFFF Area 2. The state database has no information on the number of people served by this well, the depth, or screened interval. However, given the depth of the other water supply wells in the area (100 feet or less bgs), it can be assumed that the well is screened within the surficial aquifer. Therefore, based on groundwater samples exceeding the EPA HA and the presence of drinking water supply wells screened in the surficial aquifer within 4 miles downgradient of the area, the groundwater pathway for AFFF Area 2 is potentially complete and drinking water may be impacted.

4.3 FORMER FIRE TRAINING AREA 3 / CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

Individual and combined concentrations of PFOA and PFOS exceeded screening levels in all five groundwater samples collected in AFFF Area 3 during the SI. This indicates that the groundwater in the area presents a potential hazard to human health. The closest drinking water supply well is Shaw AFB Well BW-1R (total depth 621 feet bgs and not listed in the SCDNR well data base) approximately 2,300 feet south-southeast (downgradient) of AFFF Area 3. Multiple public and private drinking water wells are within 4 miles downgradient (south-southeast) of AFFF Area 3. The closest off-base drinking water supply well (Crescent Motor Home Park, SCDHEC Well ID G43194) is approximately 0.75 mile

downgradient (southeast) of AFFF Area 3. The state database has no information on the number of people served by this well, the depth, or screened interval. However, given the depth of the other water supply wells in the area (100 feet or less bgs), it can be assumed that the well is screened within the surficial aquifer. Therefore, based on groundwater samples exceeding the EPA HA and the presence of drinking water supply wells screened in the surficial aquifer within 4 miles downgradient of the area, the groundwater pathway for AFFF Area 3 is potentially complete and drinking water may be impacted.

4.4 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

Combined concentrations of PFOA and PFOS exceeded screening levels in all three groundwater samples collected in AFFF Area 4 during the SI. Therefore, the groundwater in AFFF Area 4 presents a potential hazard to human health. The closest drinking water supply well is Shaw AFB Well BW-1R (total depth 621 feet bgs and not listed in the SCDNR well data base) approximately 3,300 feet south-southeast (downgradient) of AFFF Area 4. Multiple public and private drinking water wells are within 4 miles downgradient (south-southeast) of AFFF Area 4. The closest off-base drinking water supply well (Crescent Motor Home Park, SCDHEC Well ID G43194) is approximately 0.75 mile downgradient (southeast) of AFFF Area 4. The state database has no information on the number of people served by this well, the depth, or screened interval. However, given the depth of the other water supply wells in the area (100 feet or less bgs), it can be assumed that the well is screened within the surficial aquifer. Therefore, based on groundwater samples exceeding the EPA HA and the presence of drinking water supply wells screened in the surficial aquifer within 4 miles downgradient of the area, the groundwater pathway for AFFF Area 4 is potentially complete and drinking water may be impacted.

4.5 BUILDING 1511 (AFFF AREA 5)

Combined concentrations of PFOA and PFOS exceeded screening levels in all three groundwater samples collected in AFFF Area 5 during the SI. Therefore, the groundwater in AFFF Area 5 presents a potential hazard to human health. The closest drinking water supply well is Shaw AFB Well #5A (SCDNR Well ID SUM-137), approximately 0.5 mile northwest (upgradient) of AFFF Area 5. Multiple public and private drinking water wells are within 4 miles downgradient (south-southeast) of AFFF Area 5. The closest off-base drinking water supply well (Crescent Motor Home Park, SCDHEC Well ID G43194) is approximately 1.75 miles downgradient (southeast) of AFFF Area 5. The state database has no information on the number of people served by this well, the depth, or screened interval. However, given the depth of the other water supply wells in the area (100 feet or less bgs), it can be assumed that the well is screened within the surficial aquifer. Therefore, based on groundwater samples exceeding the EPA HA and the presence of drinking water supply wells screened in the surficial aquifer within 4 miles downgradient of the area, the groundwater pathway for AFFF Area 5 is potentially complete and drinking water may be impacted.

4.6 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

Combined concentrations of PFOA and PFOS exceeded screening levels in all three groundwater samples collected in AFFF Area 6 during the SI. Therefore, the groundwater in AFFF Area 6 presents a potential hazard to human health. Multiple public and private drinking water wells are within 4 miles downgradient (west-southwest) of AFFF Area 6. The closest drinking water supply well is the Ideal Trailer Park Well (SCDNR Well ID SUM-218), approximately 0.25 mile southwest (downgradient) of AFFF Area 6. The state database has no information on the number of people served by SUM-218, but the screened interval is shown as 203 feet bgs to 207 feet bgs. This depth would put the screened interval below clays of the Sawdust Landing Member of the Black Mingo Formation and in the Upper Black Creek Member of the

surficial aquifer. A search of the database indicates that top of the screened intervals for drinking water wells west (downgradient) of AFFF Area 6 and atop the Orangeburg Scarp are consistently more than 100 feet bgs and often exceed 200 feet bgs. Based on the general formation depths in the area, wells shallower than approximately 220 feet bgs are presumed to be screened in the Upper Black Creek Member of the surficial aquifer, and wells deeper than approximately 220 feet bgs are presumed to be screened below the 100-foot clay in the Lower Black Creek Member of the Black Creek aquifer. The groundwater samples from AFFF Area 6 exceeded the EPA HA, and many of the drinking water supply wells within 4 miles downgradient of the area are screened in the surficial aquifer. Therefore, the groundwater pathway for AFFF Area 6 is potentially complete and drinking water may be impacted.

5.0 SURFACE WATER AND SEDIMENT PATHWAY

Surface water features at Shaw AFB include Long Branch Creek at the northern end of the base and several ponds near the golf course. A series of canals and ditches associated with runways and taxiways was created to drain stormwater from the airfield. The base topography ranges from rolling uplands on the western side to nearly level plains with mature streams and swampy areas on the eastern side. Elevations range from about 300 feet in the northwest to about 200 feet in the southeast. Lowland areas of the base contain shallow oval depressions, trending northwest-southeast, which are known as Carolina Bays. Surface drainage from the southern portion of the base flows south into Mush Swamp and Bluffhead Branch south of the base. Drainage from the northern and eastern portions of the base flows northeast into Long Branch Creek. All streams draining the base eventually flow southeast into the Pocotaligo River. Minor amounts of interior drainage are directed to on-base ponds near the golf course. Two major naturally occurring wetland features are on Shaw AFB: Spann Branch and Long Branch (CH2M Hill, October 2015).

5.1 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

No storm drains or ditches are within the vicinity of former FTA 1, and surface water drains to the subsurface in the area. Therefore, surface water and sediment were not identified as potential media of concern, and no surface water or sediment samples were collected in AFFF Area 1 during the SI.

5.2 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

No storm drains or ditches are within the vicinity of former FTA 2, and surface water drains to the subsurface in the area. Therefore, surface water and sediment were not identified as potential media of concern, and no surface water or sediment samples were collected in AFFF Area 2 during the SI.

5.3 FORMER FIRE TRAINING AREA 3 / CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

No storm drains or ditches are within the vicinity of former FTA 3/ Current EOD Area, and surface water drains to the subsurface in the area. Therefore, surface water and sediment were not identified as potential media of concern, and no surface water or sediment samples were collected in AFFF Area 3 during the SI.

5.4 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

A surface water sample and sediment sample were collected at the outfall of the holding pond at AFFF Area 4. PFAS compounds were not detected above screening levels in the sediment sample. However, individual and combined concentrations of PFOA and PFOS exceeded the screening levels in both the

primary and duplicate surface water sample. Therefore, the surface water leaving the holding pond in AFFF Area 4 presents a potential hazard to human health. No surface water intakes are identified adjacent to the surface water migration path within 15 miles downstream of AFFF Area 4. Therefore, there is no potential impact to drinking water from the surface water at AFFF Area 4.

5.5 BUILDING 1511 (AFFF AREA 5)

No storm drains or ditches are within the vicinity of Building 1511, and surface water drains to the subsurface in the area. Therefore, surface water and sediment were not identified as potential media of concern, and no surface water or sediment samples were collected in AFFF Area 5 during the SI.

5.6 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

No storm drains or ditches are within the vicinity of the Shaw WWTP, and surface water drains to the subsurface in the area. Therefore, surface water and sediment were not identified as potential media of concern, and no surface water or sediment samples were collected in AFFF Area 6 during the SI.

6.0 SOIL EXPOSURE AND AIR PATHWAYS

The objective of soil sampling during the SI was to determine if concentrations of PFAS compounds exceeded the screening levels caused by release of AFFF in the individual areas. Soil screening levels were based on direct soil exposure in a residential scenario and calculated to an HQ of 0.1.

6.1 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

The analytical results of the soil samples collected in AFFF Area 1 during the SI indicated that the concentrations of PFOS in surface and subsurface soil exceeded the screening values, presenting a potential hazard to human health. However, former FTA 1 is a grass-covered field that would inhibit dust emissions and direct contact with the surface and subsurface soil. Therefore, given the current use of the area, the human exposure pathway for soil (both ingestion and dust inhalation) is incomplete for AFFF Area 1.

6.2 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

Because of the continued disturbance of the ground surface in the area, surface soil samples were not collected in AFFF Area 2 during the SI. The analytical results of the subsurface soil samples collected in AFFF Area 2 during the SI indicated that the concentrations of PFAS compounds were below soil screening values. Therefore, given the analytical results of the soil samples, soil at AFFF Area 2 does not present a hazard to human health.

6.3 FORMER FIRE TRAINING AREA 3 / CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

The analytical results of the soil samples collected from the former burn pit in AFFF Area 3 during the SI indicated that the concentrations of PFOS in the surface and subsurface soil exceeded the screening values, presenting a potential hazard to human health. However, former FTA 3 is a grass-covered field that would inhibit dust emissions and direct contact with the surface and subsurface soil. Therefore, given the current use of the area, the human exposure pathway for soil (both ingestion and dust inhalation) is incomplete for AFFF Area 3.

6.4 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

The analytical results of the soil samples collected in AFFF Area 4 during the SI indicated that the concentrations of PFAS compounds were below soil screening values in both surface and subsurface soils. Therefore, given the analytical results of the soil samples, soil at AFFF Area 4 does not present a hazard to human health.

6.5 BUILDING 1511 (AFFF AREA 5)

The analytical results of the soil samples collected in AFFF Area 5 during the SI indicated that the concentrations of PFAS compounds were below soil screening values in both surface and subsurface soils. Therefore, given the analytical results of the soil samples, soil at AFFF Area 5 does not present a hazard to human health.

6.6 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

The analytical results of the soil samples collected in AFFF Area 6 during the SI indicated that the concentrations of PFAS compounds were below soil screening values in both surface and subsurface soils. Therefore, given the analytical results of the soil samples, soil at AFFF Area 6 does not present a hazard to human health.

7.0 UPDATE TO CONCEPTUAL SITE MODELS

The following sections contain updates to the conceptual site models (CSMs) for AFFF Areas 1 through 6 and discuss PFOA and PFOS in soil, groundwater, surface water, and sediment. PFBS has been eliminated as a contaminant of concern based on analytical results presented in Section 3.0 and will not be discussed further.

7.1 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

The CSM for AFFF Area 1 presented in the QAPP addendum (ASL, February 2017) identified surface soil, subsurface soil, and groundwater as media of concern at the location of former FTA 1. The PA identified on-site workers as potential receptors for impacted soil and on- and off-base users of impacted drinking water as potential human receptors (CH2M Hill, October 2015). Based on the findings discussed in Section 3.3, PFOS concentrations exceeded the screening level in surface and subsurface soil. However, the area is an open grass field with no residents or regular visitors, so given the current use of the area, exposure from the surface soil to human receptors is not anticipated. Based on the findings discussed in Section 4.1, combined concentrations of PFOA and PFOS in groundwater at AFFF Area 1 exceeded the EPA HA screening level of 0.07 µg/L. Given that drinking water supply wells are screened in the surficial aquifer within 4 miles downgradient of AFFF Area 1, the drinking water may be impacted.

7.2 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

The CSM for AFFF Area 2 presented in the QAPP addendum (ASL, February 2017) identified subsurface soil and groundwater as media of concern at former FTA 2. The PA identified on-site workers as potential receptors for impacted soil and on- and off-base users of impacted drinking water as potential human receptors (CH2M Hill, October 2015). Based on the findings discussed in Section 3.4, concentrations of

PFAS compounds did not exceed the screening levels in subsurface soil. Therefore, exposure from the soil to human receptors would not represent a hazard to human health. Based on the findings discussed in Section 4.2, combined concentrations of PFOA and PFOS exceeded the EPA HA screening level of 0.07 µg/L in groundwater samples. Given that drinking water supply wells are screened in the surficial aquifer within 4 miles downgradient of AFFF Area 2, drinking water may be impacted.

7.3 FORMER FIRE TRAINING AREA 3 / CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

The CSM for AFFF Area 3 presented in the QAPP addendum (ASL, February 2017) identified surface soil, subsurface soil, and groundwater as media of concern at former FTA 3. The PA identified on-site workers as potential receptors for impacted soil and on- and off-base users of impacted drinking water as potential human receptors (CH2M Hill, October 2015). Based on the findings discussed in Section 3.5, concentrations of PFOS exceeded the screening level in the surface and subsurface soils representing a potential hazard to human health. However, the area is an open grass field with no residents or regular visitors, so given the current use of the area, exposure from the soil in the area to human receptors is not anticipated. Based on the findings discussed in Section 4.3, combined concentrations of PFOA and PFOS exceeded the EPA HA screening level of 0.07 µg/L for groundwater. Given that drinking water supply wells are screened in the surficial aquifer within 4 miles downgradient of AFFF Area 3, the drinking water may be impacted.

7.4 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

The CSM for AFFF Area 4 presented in the QAPP addendum (ASL, February 2017) identified surface soil, subsurface soil, groundwater, surface water, and sediment as media of concern at the current FTA. The PA identified on-site workers as potential receptors for impacted soil and on- and off-base users of impacted drinking water as potential human receptors (CH2M Hill, October 2015). Based on the findings discussed in Section 3.6, concentrations of PFAS compounds did not exceed screening levels in the surface and subsurface soil samples and would not represent a potential hazard to human health. Based on the findings discussed in Section 4.4, combined concentrations of PFOA and PFOS exceeded the EPA HA screening level of 0.07 µg/L in groundwater. Given that drinking water supply wells are screened in the surficial aquifer within 4 miles downgradient of AFFF Area 4, the drinking water may be impacted.

7.5 BUILDING 1511 (AFFF AREA 5)

The CSM for AFFF Area 5 presented in the QAPP addendum (ASL, February 2017) identified surface soil, subsurface soil, and groundwater as media of concern at Building 1511. The PA did not identify any potential receptors for any media from Building 1511 (CH2M Hill, October 2015). Based on the findings discussed in Section 3.7, concentrations of PFAS compounds did not exceed the screening levels in the surface and subsurface soils and do not represent a potential hazard to human health. Based on the findings discussed in Section 4.5, combined concentrations of PFOA and PFOS exceeded the EPA HA screening level of 0.07 µg/L for groundwater. Given that drinking water supply wells are screened in the surficial aquifer within 4 miles downgradient of AFFF Area 5, the drinking water may be impacted.

7.6 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

The CSM for AFFF Area 6 presented in the QAPP addendum (ASL, February 2017) identified surface soil, subsurface soil, and groundwater as media of concern at the WWTP. The PA (CH2M Hill, October 2015) did not evaluate the WWTP. Based on the findings discussed in Section 3.8, concentrations of PFAS compounds did not exceed the screening levels in surface and subsurface soils and do not represent a potential hazard to human health. Based on the findings discussed in Section 4.6, combined

concentrations of PFOA and PFOS exceeded the EPA HA screening level of 0.07 µg/L for groundwater. Given that drinking water supply wells are screened in the surficial aquifer within 4 miles downgradient of AFFF Area 6, the drinking water may be impacted.

8.0 SUMMARY AND CONCLUSIONS

The PA (CH2M Hill, October 2015) identified four AFFF areas at Shaw AFB requiring additional evaluation through the SI process based on the reported or suspected release of AFFF material containing PFAS compounds.

- AFFF Area 1 – Former FTA 1 (ERP Site FT-01),
- AFFF Area 2 – Former FTA 2 (ERP Site FT-07),
- AFFF Area 3 – Former FTA 3 / Current EOD Area (ERP Site FT-06), and
- AFFF Area 4 – Current FTA (not a previously identified ERP site).

Two areas that were not previously identified ERP sites were also added to the SI.

- AFFF Area 5 – Building 1511 (added at the request of SCDHEC and not a previously identified ERP site), and
- AFFF Area 6 – WWTP (added at the request of AFCEC and not a previously identified ERP site).

Media evaluated during the SI included surface soil (0 to 6 inches in depth), subsurface soil (vadose zone in the source area), groundwater (samples from temporary and permanent groundwater wells), surface water, and sediment. The objectives of the SI were to

- determine if a confirmed release of PFOS, PFOA, or PFBS has occurred at AFFF areas selected for inspection;
- determine if PFOS or PFOA are present in groundwater or surface water in the areas at concentrations exceeding the EPA lifetime HA;
- determine if PFBS is present in groundwater or surface water in the areas at concentrations exceeding the EPA RSLs;
- determine if PFOA or PFOS is present in soil or sediment in the areas at concentrations exceeding the calculated RSLs;
- determine if PFBS is present in soil or sediment in the areas at concentrations exceeding the EPA RSLs; and
- identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS or PFOA above the HA or PFBS above the RSL).

All samples were analyzed for PFBS, PFOA, and PFOS using modified EPA Method 537. Soil and sediment PFBS analytical results were compared to published EPA RSLs (130,000 µg/kg for residential soil) (EPA, May 2018). PFOA and PFOS analytical results were compared to calculated RSLs (126 µg/kg for both PFOA and PFOS). Groundwater and surface water PFBS analytical results were compared to the published EPA RSL (40 µg/L for tap water); PFOA and PFOS analytical results were compared to the EPA HA (for tap water) of 0.07 µg/L for the individual and combined concentrations of PFOA and PFOS.

Table 22 presents a summary of the maximum detected concentrations of PFBS, PFOA, and PFOS for each media in the six areas; indicates where those concentrations exceeded the corresponding screening levels; and provides recommendations for the next activities in each area. The maximum detected concentrations of PFBS did not exceed the screening criteria in any media in any of the six areas. However, all six AFFF areas had concentrations of PFOA and/or PFOS in one or more media that exceeded the corresponding screening levels. Potential impacts to human health were identified in all six

AFFF areas at Shaw AFB based on the results of the analyses of groundwater samples and the presence of drinking water supply wells within 4 miles downgradient of each area.

Table 22 Summary of Analytical Results and Screening Level Exceedances

AFFF Area	Associated Existing ERP Site	Parameter	Maximum Detected Concentration	Screening Value	Units	*Number of Samples / Number of Exceedances	Exceeds Screening Value	Potentially Complete DW Exposure Pathway	Recommendation		
AFFF Area 1 Former FTA 1	FT-01	Surface Soil (0 to 6 inches)									
		PFBS	ND	130,000	µg/kg	3 / 0	No	Yes	Expanded SI followed by an RI		
		PFOA	6.8	126	µg/kg	3 / 0	No				
		PFOS	360 J	126	µg/kg	3 / 2	Yes				
		Subsurface Soil									
		PFBS	ND	130,000	µg/kg	3 / 0	No				
		PFOA	2.3 J	126	µg/kg	3 / 0	No				
		PFOS	960 J	126	µg/kg	3 / 1	Yes				
		Groundwater									
		PFBS	0.085 J	40	µg/L	3 / 0	No				
		PFOA	2.9	0.07	µg/L	3 / 3	Yes				
		PFOS	26	0.07	µg/L	3 / 3	Yes				
PFOA + PFOS	26.88	0.07	µg/L	3 / 3	Yes						
AFFF Area 2 Former FTA 2	FT-07	Subsurface Soil									
		PFBS	ND	130,000	µg/kg	3 / 0	No	Yes	Expanded SI followed by an RI		
		PFOA	0.57 J	126	µg/kg	3 / 0	No				
		PFOS	19	126	µg/kg	3 / 0	No				
		Groundwater									
		PFBS	0.038 J	40	µg/L	3 / 0	No				
		PFOA	0.10	0.07	µg/L	3 / 1	Yes				
		PFOS	3.4	0.07	µg/L	3 / 3	Yes				
PFOA + PFOS	3.50	0.07	µg/L	3 / 3	Yes						

AFFF Area	Associated Existing ERP Site	Parameter	Maximum Detected Concentration	Screening Value	Units	*Number of Samples / Number of Exceedances	Exceeds Screening Value	Potentially Complete DW Exposure Pathway	Recommendation	
AFFF Area 3 Former FTA 3/ Current EOD Area	FT-06	Surface Soil (0 to 6 inches bgs)							Yes	Expanded SI followed by an RI
		PFBS	0.48 J	130,000	µg/kg	3 / 0	No			
		PFOA	12	126	µg/kg	3 / 0	No			
		PFOS	740	126	µg/kg	3 / 1	Yes			
		Subsurface Soil								
		PFBS	8.3	130,000	µg/kg	3 / 0	No			
		PFOA	19	126	µg/kg	3 / 0	No			
		PFOS	200	126	µg/kg	3 / 2	Yes			
		Groundwater								
		PFBS	18	40	µg/L	4 / 0	No			
		PFOA	13	0.07	µg/L	4 / 4	Yes			
		PFOS	30	0.07	µg/L	4 / 4	Yes			
		PFOA + PFOS	43	0.07	µg/L	4 / 4	Yes			

AFFF Area	Associated Existing ERP Site	Parameter	Maximum Detected Concentration	Screening Value	Units	*Number of Samples / Number of Exceedances	Exceeds Screening Value	Potentially Complete DW Exposure Pathway	Recommendation
AFFF Area 4 Current FTA	New site	Surface Soil (0 to 6 inches bgs)						Yes	Expanded SI followed by an RI
		PFBS	ND	130,000	µg/kg	3 / 0	No		
		PFOA	0.90	126	µg/kg	3 / 0	No		
		PFOS	27	126	µg/kg	3 / 0	No		
		Subsurface Soil							
		PFBS	ND	130,000	µg/kg	3 / 0	No		
		PFOA	0.78 J	126	µg/kg	3 / 0	No		
		PFOS	11 J	126	µg/kg	3 / 0	No		
		Groundwater							
		PFBS	0.30	40	µg/L	3 / 0	No		
		PFOA	4.7	0.07	µg/L	3 / 3	Yes		
		PFOS	7.9	0.07	µg/L	3 / 3	Yes		
		PFOA + PFOS	**8.9	0.07	µg/L	3 / 3	Yes		
		Sediment							
		PFBS	ND	130,000	µg/kg	1 / 0	No		
		PFOA	1.1 J	126	µg/kg	1 / 0	No		
		PFOS	67 J	126	µg/kg	1 / 0	No		
		Surface Water							
		PFBS	0.045	40	µg/L	1 / 0	No		
		PFOA	0.18	0.07	µg/L	1 / 1	Yes		
PFOS	0.67	0.07	µg/L	1 / 1	Yes				
PFOA + PFOS	0.85	0.07	µg/L	1 / 1	Yes				

AFFF Area	Associated Existing ERP Site	Parameter	Maximum Detected Concentration	Screening Value	Units	*Number of Samples / Number of Exceedances	Exceeds Screening Value	Potentially Complete DW Exposure Pathway	Recommendation
AFFF Area 5 Building 1511	New Site	Surface Soil (0 to 6 inches)						Yes	Expanded SI followed by an RI
		PFBS	ND	130,000	µg/kg	4 / 0	No		
		PFOA	1.0	126	µg/kg	4 / 0	No		
		PFOS	6.2	126	µg/kg	4 / 0	No		
		Subsurface Soil							
		PFBS	ND	130,000	µg/kg	4 / 0	No		
		PFOA	0.76 J	126	µg/kg	4 / 0	No		
		PFOS	20	126	µg/kg	4 / 0	No		
		Groundwater							
		PFBS	0.058	40	µg/L	3 / 0	No		
		PFOA	0.12	0.07	µg/L	3 / 3	Yes		
		PFOS	0.51	0.07	µg/L	3 / 3	Yes		
PFOA + PFOS	**0.586	0.07	µg/L	3 / 3	Yes				
AFFF Area 6 WWTP	New Site	Surface Soil (0 to 6 inches)						Yes	Expanded SI followed by an RI
		PFBS	ND	130,000	µg/kg	3 / 0	No		
		PFOA	1.5	126	µg/kg	3 / 0	No		
		PFOS	45	126	µg/kg	3 / 0	No		
		Subsurface Soil							
		PFBS	ND	130,000	µg/kg	3 / 0	No		
		PFOA	ND	126	µg/kg	3 / 0	No		
		PFOS	1.0 J	126	µg/kg	3 / 0	No		
		Groundwater							
		PFBS	0.064	40	µg/L	3 / 0	No		
		PFOA	0.30	0.07	µg/L	3 / 3	Yes		
		PFOS	0.50	0.07	µg/L	3 / 3	Yes		
PFOA + PFOS	0.80	0.07	µg/L	3 / 3	Yes				

*The number of samples and exceedances do not include field duplicate samples.

**The combined PFOA plus PFOS value is the highest value for a sample in the area and is not the combination of the highest individual PFOA and PFOS value for the area.

Note: Bold value indicates an exceedance of the corresponding screening value.

µg/kg = micrograms per kilogram

µg/L = micrograms per liter

AFFF = aqueous film forming foam

DW = drinking water

ERP = Environmental Restoration Program

FTA = fire training area

J = estimated value

ND = not detected at the method detection limit

PFBS = perfluorobutane sulfonate

PFOA = perfluorooctanoic acid

PFOS = perfluorooctane sulfonate

RI = remedial investigation

WWTP = Wastewater Treatment Plant

EOD = explosive ordnance disposal

SI = site inspection

8.1 FORMER FIRE TRAINING AREA 1 (AFFF AREA 1)

An unknown volume of AFFF was released in the area during the active life of former FTA 1. Releases of AFFF in the area have resulted in PFOS concentrations in surface and subsurface soil above the screening levels, but given current use of the area, no potential receptor pathways for the soils have been identified. Concentrations of PFOA and PFOS in groundwater exceeded the screening levels, and drinking water supply wells are within 4 miles downgradient of the area. Therefore, groundwater in AFFF Area 1 has also been impacted by the release of AFFF. This creates the potential for impact to human health. Therefore, an expanded SI followed by a remedial investigation (RI) are recommended to determine the extent of contamination at former FTA 1. It should be noted that the three existing wells sampled in AFFF Area 1 during the SI were screened in the shallow aquifer and did not evaluate the impacts to deeper zones in the aquifer system. Based on the stratigraphy in AFFF Area 1, there is a possibility for communication between the surficial aquifer and the deeper aquifers in this area. Activities recommended in the ESI should include collecting groundwater samples from deeper existing wells in AFFF Area 1 to evaluate potential impacts to the deeper aquifers in the area. In addition, since the surficial aquifer discharges to Long Branch Creek, activities recommended in the ESI should include the collection of surface water and sediment samples from Long Brach Creek.

8.2 FORMER FIRE TRAINING AREA 2 (AFFF AREA 2)

An unknown volume of AFFF was released in the area during the active life of former FTA 2. Surface soil was not sampled in the area because of the continued placement and removal of fill dirt in the area. PFOA and PFOS were not detected in subsurface soil at concentrations exceeding the screening levels. Releases of AFFF in the area have resulted in PFOA and PFOS concentrations in groundwater at concentrations exceeding the screening levels. Given the presence of drinking water supply wells within 4 miles downgradient of the area, there is a potential for impact to human health from the groundwater in AFFF Area 2. Therefore, an expanded SI followed by an RI are recommended to determine the extent of contamination in the area of Former FTA 2.

8.3 FORMER FIRE TRAINING AREA 3 / CURRENT EXPLOSIVE ORDNANCE DISPOSAL AREA (AFFF AREA 3)

An unknown volume of AFFF was released in the area during the active life of former FTA 3. Releases of AFFF in the area have resulted in PFOS concentrations in surface and subsurface soil above the screening levels, but given current use of the area, no potential receptor pathways for the soils have been identified. Releases of AFFF in the area have resulted in PFOA and PFOS concentrations in groundwater at concentrations exceeding the screening levels. Given the presence of drinking water supply wells within 4 miles downgradient of the area, there is a potential for impact to human health from the groundwater in AFFF Area 3. Therefore, an expanded SI followed by an RI are recommended to determine the extent of contamination in the area of Former FTA 3.

8.4 CURRENT FIRE TRAINING AREA (AFFF AREA 4)

An unknown quantity of AFFF has been discharged in AFFF Area 4 during annual foam system testing. PFOA and PFOS were not detected in surface soil, subsurface soil, or sediment samples at concentrations exceeding the screening levels. Releases of AFFF in the area have resulted in PFOA and PFOS in surface water and groundwater at concentrations exceeding the screening levels. Given the presence of drinking water supply wells within 4 miles downgradient of the area, there is a potential for impact to human

health from the groundwater in AFFF Area 4. Therefore, an expanded SI followed by an RI are recommended to determine the extent of contamination in the area of the Current FTA.

8.5 BUILDING 1511 (AFFF AREA 5)

Interviews with base personnel indicate that an unknown volume of AFFF was released in AFFF Area 5 from multiple small releases from the AFFF tank system and from overflow at the holding tank. PFOA and PFOS were not detected in surface or subsurface soil samples at concentrations exceeding the screening levels. Releases of AFFF in the area have resulted in PFOA and PFOS concentrations in groundwater at concentrations exceeding the screening levels. Given the presence of drinking water supply wells within 4 miles downgradient of the area, there is a potential for impact to human health from the groundwater in AFFF Area 5. Therefore, an expanded SI followed by an RI are recommended to determine the extent of contamination in the area of Building 1511.

8.6 WASTEWATER TREATMENT PLANT (AFFF AREA 6)

Releases of AFFF in the hangar area of the base would be carried through the sanitary sewer system to the WWTP and treated waste sludge, containing an unknown quantity of AFFF material, is placed on the sludge drying beds. PFOA and PFOS were not detected in surface or subsurface soil samples at concentrations exceeding the screening levels. The groundwater in AFFF Area 6 was found to contain PFOA and PFOS concentrations exceeding the screening levels and represents a potential hazard to human health. Given the presence of drinking water supply wells within 4 miles downgradient of the area, there is a potential for impacts to human health from the groundwater in AFFF Area 6. Therefore, an expanded SI followed by an RI are recommended to determine the extent of contamination in the area of the WWTP.

9.0 REFERENCES

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Appendix A
AFFF Area-Specific Figures

G:\M2032_0001_Savannah\Shaw\MXD\SI_Report\Figure_1_Location_of_Shaw_AFB.mxd; Date: 6/12/2018

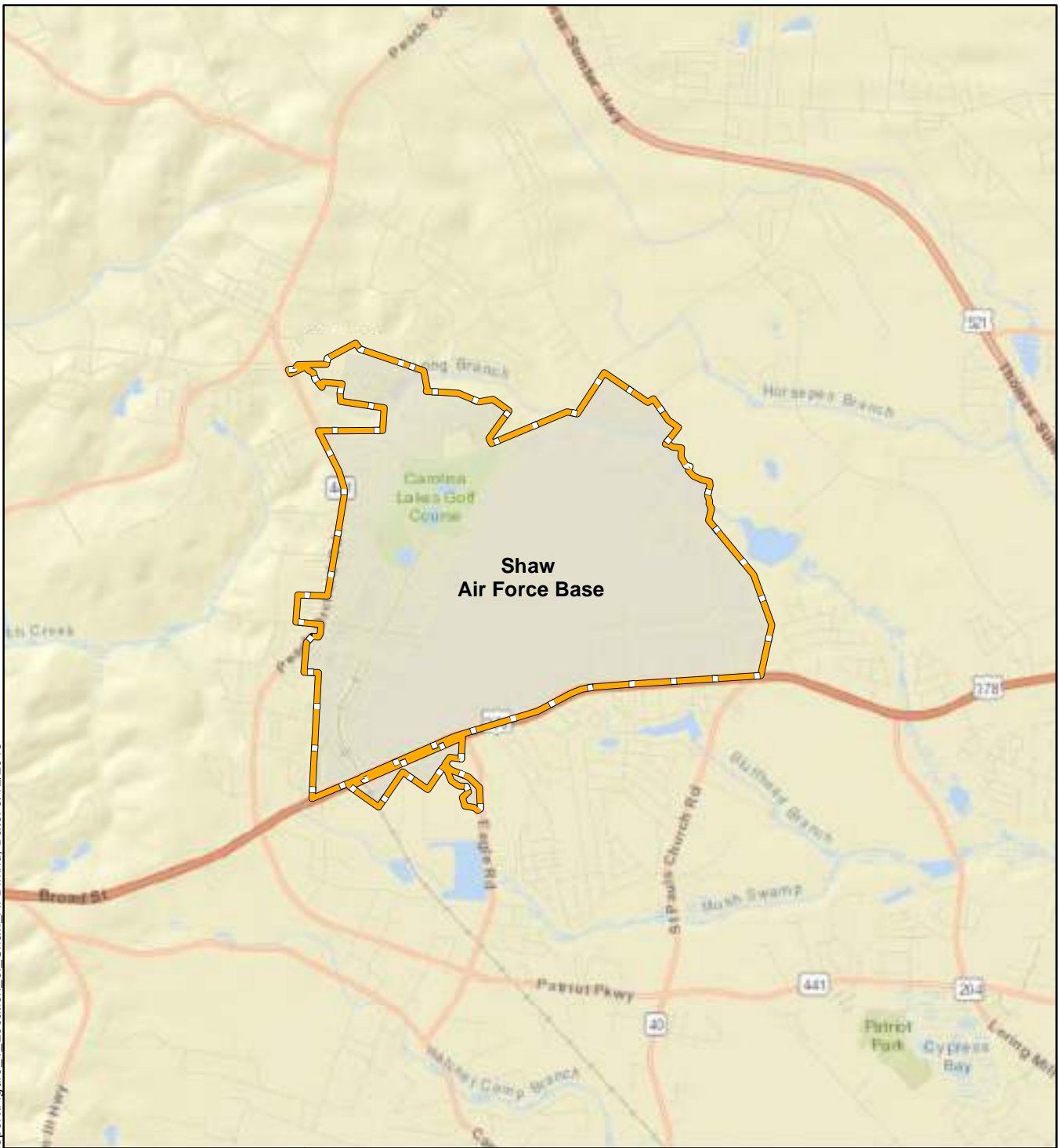



Figure 1
Location of Shaw Air Force Base
Sumter County, South Carolina

Legend
 Installation Boundary

Service Layer Credits: Esri StreetMap North America

Drawn: tmorse

Date: 6/12/2018



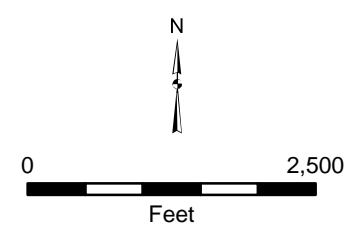
G:\M2032_0001_Savannah\ShawMXD\SI Report\Figure 2 Shaw Site Location_AFFF.mxd; Date: 8/29/2018



Legend

- Surface Water
- Installation Boundary
- AFFF Inspection
- Groundwater flow direction in the Duplin Formation.*

Note; Adapted from: Shaw AFB Southwest Lobe Conceptual Site Model (AECOM, December 2015)



Shaw Air Force Base
Sumter County, South Carolina

Figure 2
Shaw Air Force Base AFFF Areas



Drawn: tmorse | Date: 8/29/2018
Service Layer Credits: Esri ArcGIS Online Aerial Photography



Legend

- DPT Boring Surface and Subsurface Soil Samples
- + Existing Groundwater Monitoring Well Sampled
- Installation Boundary
- AFFF Inspection Area
- Surface Water
- Groundwater Elevation Contour
- ← Groundwater Flow Direction

MW-105 (200.59) = Groundwater Elevation (ft NAVD88) Measured on January 29, 2018.

0 100
Feet

Shaw Air Force Base
Sumter County, South Carolina

Figure 3
Former Fire Training Area 1 (FT-01) (AFFF Area 1) Sample Locations and Potentiometric Contours



Date: 7/13/2018
Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001 Savannah\ShawMXD\SI Report\Figure 4 Shaw Area 2 SI.mxd Date: 7/9/2018

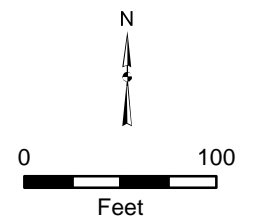


Note: Water Level data from AFFF Areas 2, 3, and 4 were used to develop the GW contours.



- Legend**
- DPT Boring Subsurface Soil and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Groundwater Elevation Contour
 - Groundwater Flow Direction

SHAW02-001 (204.80) = Groundwater Elevation (ft NAVD88) Measured on January 29, 2018.



Shaw Air Force Base
Sumter County, South Carolina

Figure 4
Former Fire Training Area 2 (FT-07) (AFFF Area 2) Sample Locations and Potentiometric Contours

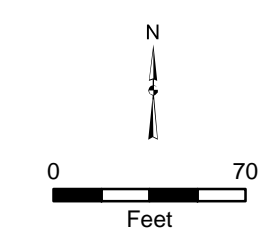


Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Existing Groundwater Monitoring Well Sampled
 - Installation Boundary
 - AFFF Inspection Area
 - Groundwater Elevation Contour
 - Groundwater Flow Direction
- SHAW03-001 (203.07) = Groundwater Elevation (ft NAVD88) Measured on January 29, 2018.



Shaw Air Force Base
Sumter County, South Carolina

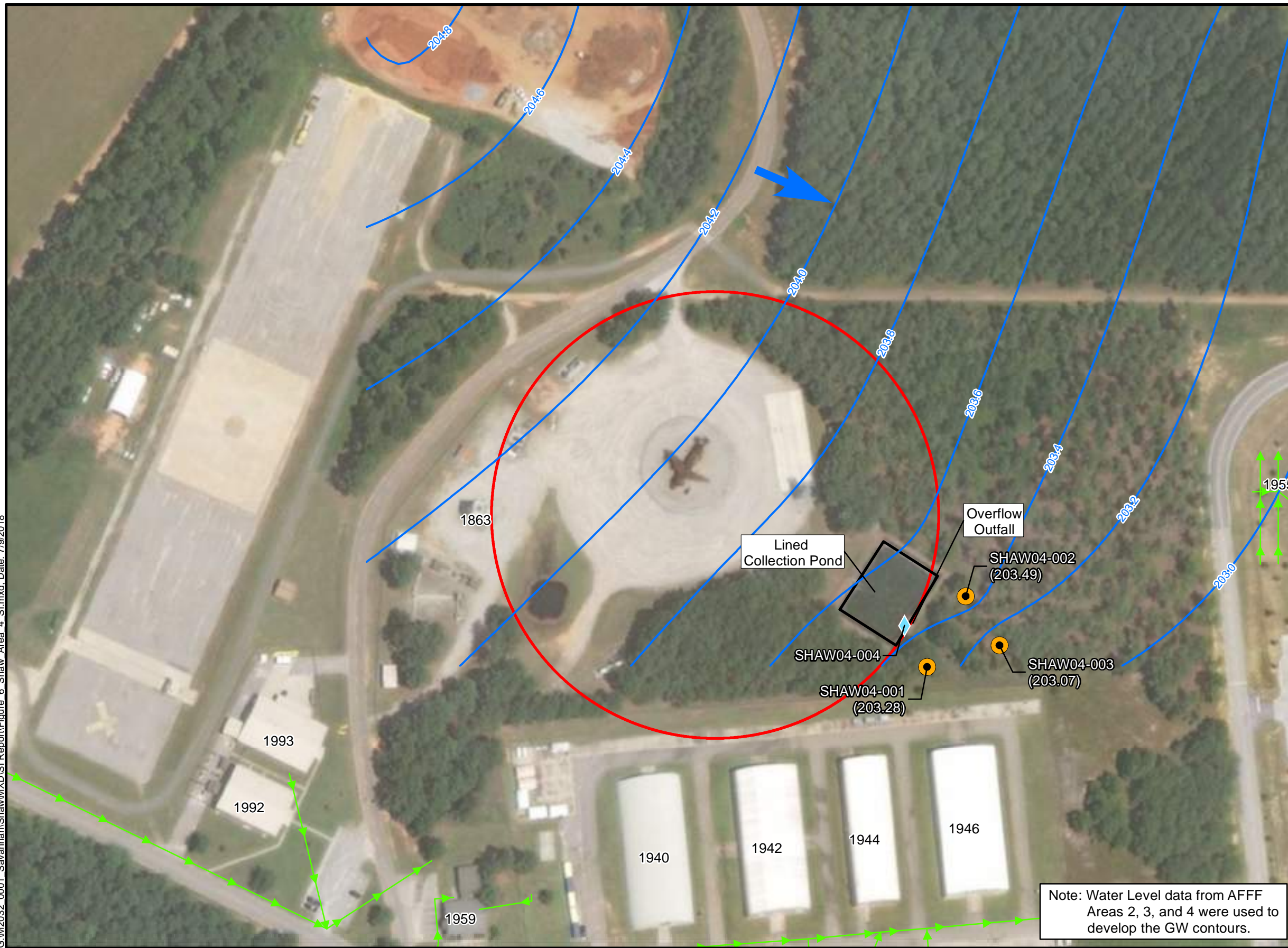
Figure 5
Former Fire Training Area 3 (FT-06) /
Current Explosive Ordnance Disposal
(EOD) Area (AFFF Area 3) Sample
Locations and Potentiometric Contours

Note: Water Level data from AFFF Areas 2, 3, and 4 were used to develop the GW contours.

Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001 Savannah\Shaw\MXD\SI Report\Figure 6 Shaw Area 4 SI.mxd Date: 7/9/2018



Legend

- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
- Surface Water and Sediment Samples
- Installation Boundary
- AFFF Inspection Area
- Storm Sewer Line
- Groundwater Elevation Contour
- Groundwater Flow Direction

SHAW04-001
(203.28) = Groundwater Elevation (ft NAVD88) Measured on January 29, 2018.

N
0 140
Feet

Shaw Air Force Base
Sumter County, South Carolina

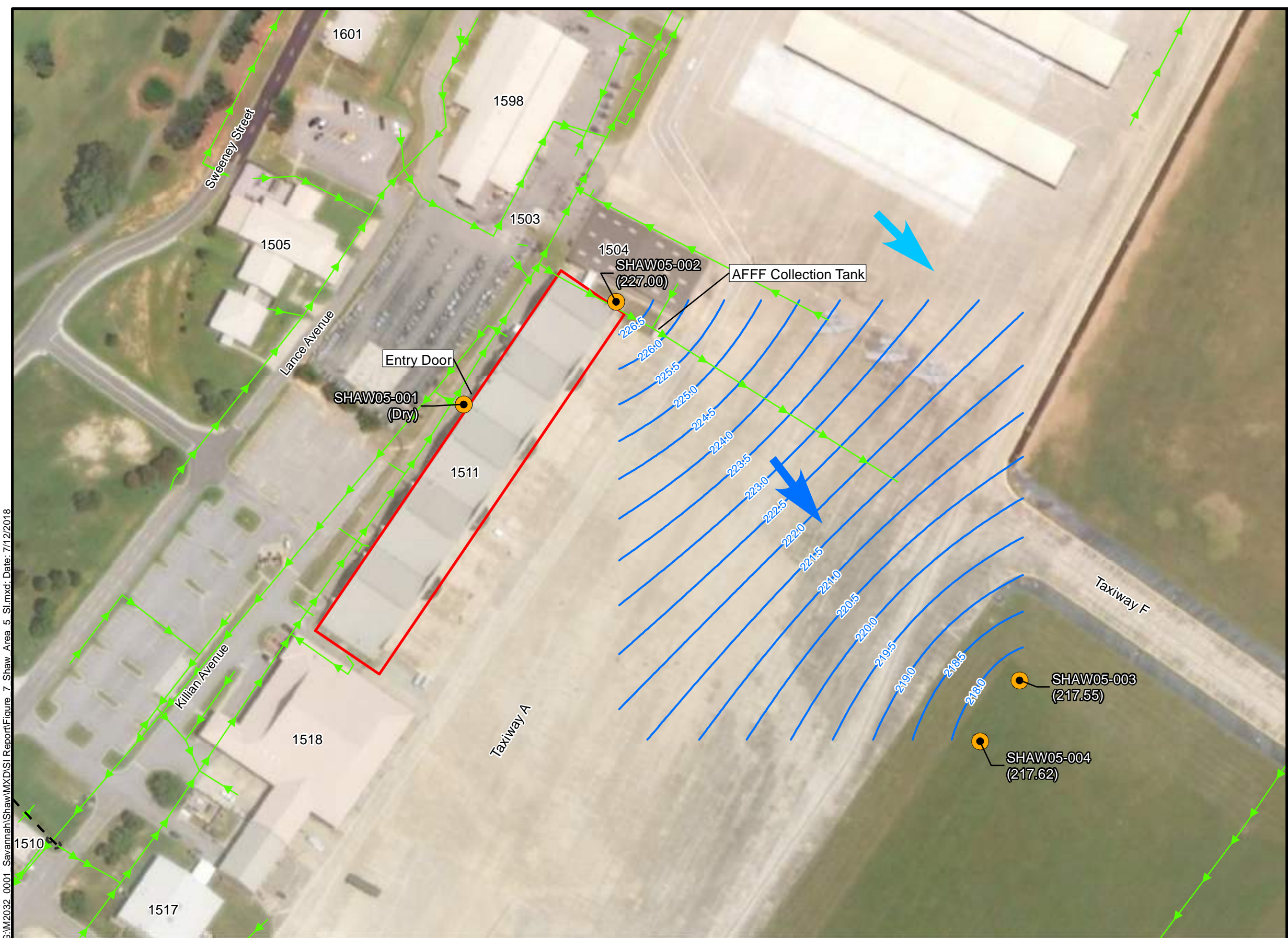
Figure 6
Current Fire Training Area (AFFF Area 4) Sample Locations and Potentiometric Contours



Drawn: tmorse Date: 7/9/2018
Service Layer Credits: Esri ArcGIS Online Aerial Photography

Note: Water Level data from AFFF Areas 2, 3, and 4 were used to develop the GW contours.

G:\M2032_0001_Savannah\Shaw\MXD\SI_Report\Figure 7 Shaw Area 5 SI.mxd Date: 7/12/2018



Legend

- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
- Installation Boundary
- AFFF Inspection Area
- Storm Sewer Headwall
- Storm Sewer Line
- Storm Sewer Open Drainage
- Groundwater Elevation Contour
- Surface Water Flow Direction
- Groundwater Flow Direction

SHAW05-002 (227.00) = Groundwater Elevation (ft NAVD88) Measured on January 29, 2018.

N

0 140
Feet

Shaw Air Force Base
Sumter County, South Carolina

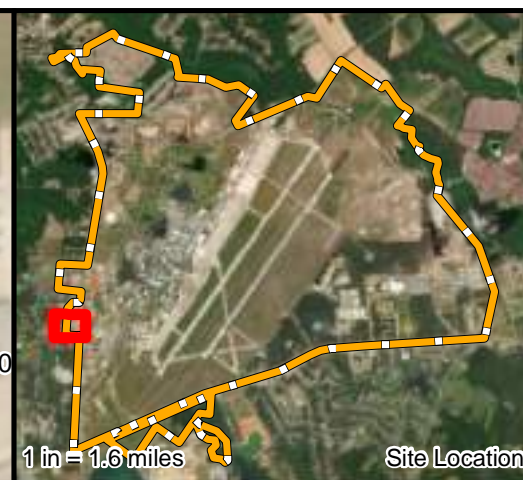
Figure 7
Building 1511 (AFFF Area 5)
Sample Locations and
Potentiometric Contours



Drawn: tmorse Date: 7/12/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001_Savannah\Shaw\MXD\SI_Report\Figure 8 Shaw Area 6 SI.mxd; Date: 7/18/2018



Legend

- DPT Boring Surface Soil, Subsurface Soil and Groundwater Samples
- Installation Boundary
- AFFF Inspection Area
- Storm Sewer Line
- Groundwater Elevation Contour
- Groundwater Flow Direction

SHAW06-001
(280.30) = Groundwater Elevation
(ft NAVD88) Measured on
January 29, 2018.

N

0 90
Feet

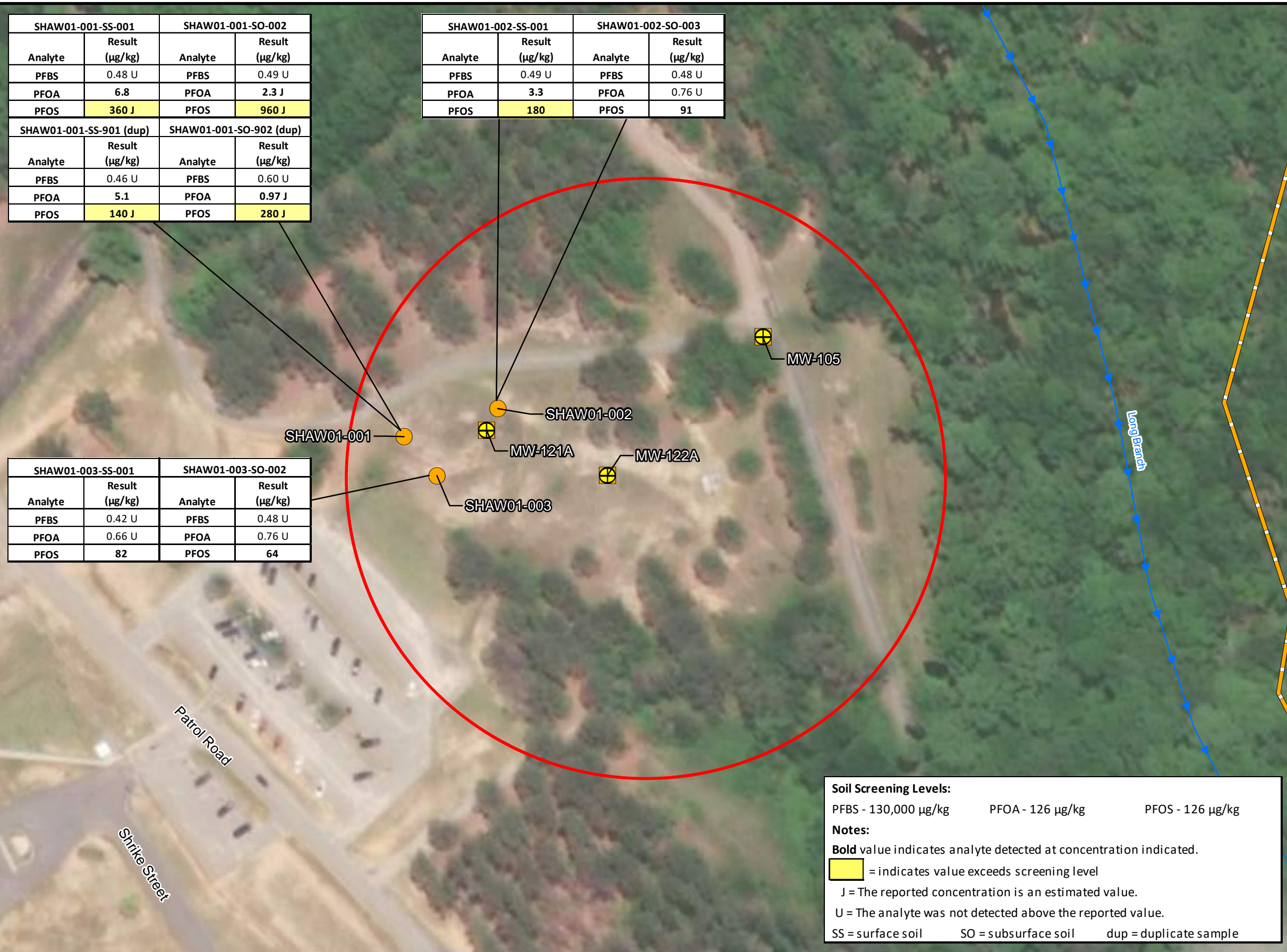
Shaw Air Force Base
Sumter County, South Carolina

Figure 8
Wastewater Treatment Plant
(AFFF Area 6) Sample Locations and
Potentiometric Contours

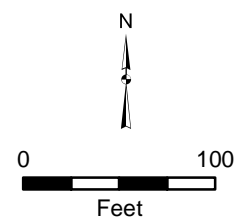


Drawn: tmorse | Date: 7/18/2018
Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure 9_Shaw_Area_1_Soil.mxd: Date: 7/13/2018



- Legend**
- DPT Boring Surface and Subsurface Soil Samples
 - ⊕ Existing Groundwater Monitoring Well Sampled
 - Installation Boundary
 - AFFF Inspection Area
 - Surface Water



Shaw Air Force Base
Sumter County, South Carolina

Figure 9
Former Fire Training Area 1 (FT-01) (AFFF Area 1)
PFBS, PFOA, and PFOS in Soil



Drawn: tmorse Date: 7/13/2018
Service Layer Credits: Esri ArcGIS Online Aerial Photography

SHAW01-001-SS-001		SHAW01-001-SO-002	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.48 U	PFBS	0.49 U
PFOA	6.8	PFOA	2.3 J
PFOS	360 J	PFOS	960 J
SHAW01-001-SS-901 (dup)		SHAW01-001-SO-902 (dup)	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.46 U	PFBS	0.60 U
PFOA	5.1	PFOA	0.97 J
PFOS	140 J	PFOS	280 J

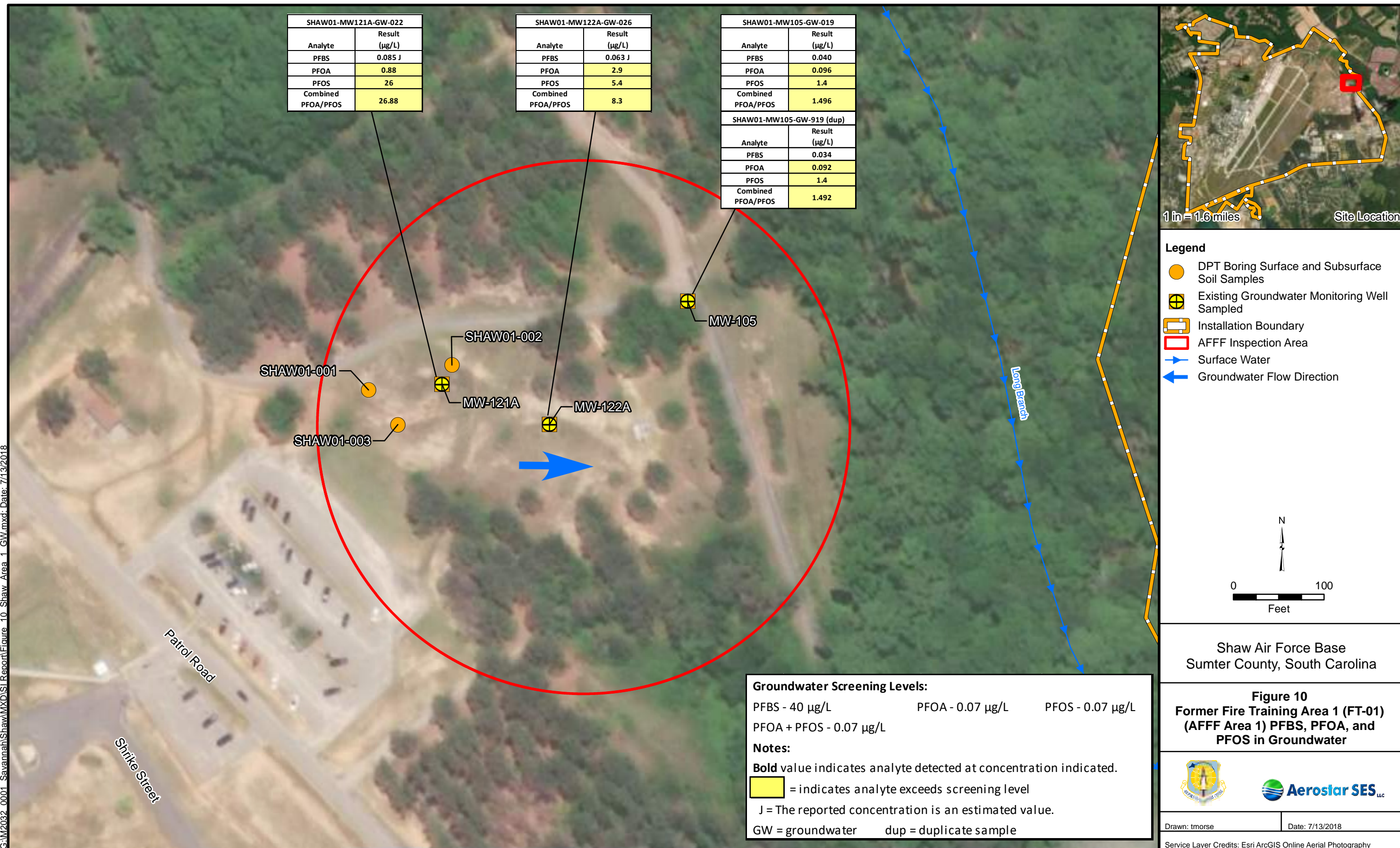
SHAW01-002-SS-001		SHAW01-002-SO-003	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.49 U	PFBS	0.48 U
PFOA	3.3	PFOA	0.76 U
PFOS	180	PFOS	91

SHAW01-003-SS-001		SHAW01-003-SO-002	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.42 U	PFBS	0.48 U
PFOA	0.66 U	PFOA	0.76 U
PFOS	82	PFOS	64

Soil Screening Levels:
 PFBS - 130,000 µg/kg PFOA - 126 µg/kg PFOS - 126 µg/kg

Notes:
Bold value indicates analyte detected at concentration indicated.
 = indicates value exceeds screening level
 J = The reported concentration is an estimated value.
 U = The analyte was not detected above the reported value.
 SS = surface soil SO = subsurface soil dup = duplicate sample

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure_10_Shaw_Area_1_GW.mxd: Date: 7/13/2018



SHAW01-MW121A-GW-022	
Analyte	Result (µg/L)
PFBS	0.085 J
PFOA	0.88
PFOS	26
Combined PFOA/PFOS	26.88

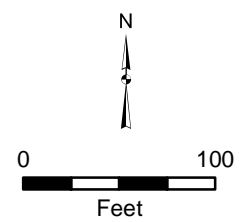
SHAW01-MW122A-GW-026	
Analyte	Result (µg/L)
PFBS	0.063 J
PFOA	2.9
PFOS	5.4
Combined PFOA/PFOS	8.3

SHAW01-MW105-GW-019	
Analyte	Result (µg/L)
PFBS	0.040
PFOA	0.096
PFOS	1.4
Combined PFOA/PFOS	1.496

SHAW01-MW105-GW-919 (dup)	
Analyte	Result (µg/L)
PFBS	0.034
PFOA	0.092
PFOS	1.4
Combined PFOA/PFOS	1.492



- Legend**
- DPT Boring Surface and Subsurface Soil Samples
 - ⊕ Existing Groundwater Monitoring Well Sampled
 - Installation Boundary
 - AFFF Inspection Area
 - Surface Water
 - ← Groundwater Flow Direction



Shaw Air Force Base
Sumter County, South Carolina

Figure 10
Former Fire Training Area 1 (FT-01)
(AFFF Area 1) PFBS, PFOA, and
PFOS in Groundwater



Drawn: tmorse Date: 7/13/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Groundwater Screening Levels:
 PFBS - 40 µg/L PFOA - 0.07 µg/L PFOS - 0.07 µg/L
 PFOA + PFOS - 0.07 µg/L

Notes:
Bold value indicates analyte detected at concentration indicated.
 = indicates analyte exceeds screening level
 J = The reported concentration is an estimated value.
 GW = groundwater dup = duplicate sample

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure 11 Shaw Area 2 Soil.mxd; Date: 6/21/2018

SHAW02-001-SO-018	
Analyte	Result (µg/kg)
PFBS	0.47 U
PFOA	0.57 J
PFOS	19

SHAW02-002-SO-021	
Analyte	Result (µg/kg)
PFBS	0.55 U
PFOA	0.88 U
PFOS	0.66 J

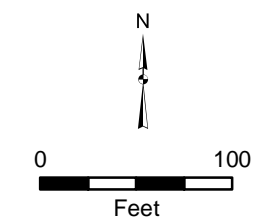
SHAW02-003-SO-019	
Analyte	Result (µg/kg)
PFBS	0.50 U
PFOA	0.80 U
PFOS	1.0

Soil Screening Levels:
 PFBS - 130,000 µg/kg PFOA - 126 µg/kg PFOS - 126 µg/kg

Notes:
Bold value indicates analyte detected at concentration indicated.
 J = The reported concentration is an estimated value.
 U = The analyte was not detected above the reported value.
 SO = subsurface soil



- Legend**
- DPT Boring Subsurface Soil and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area



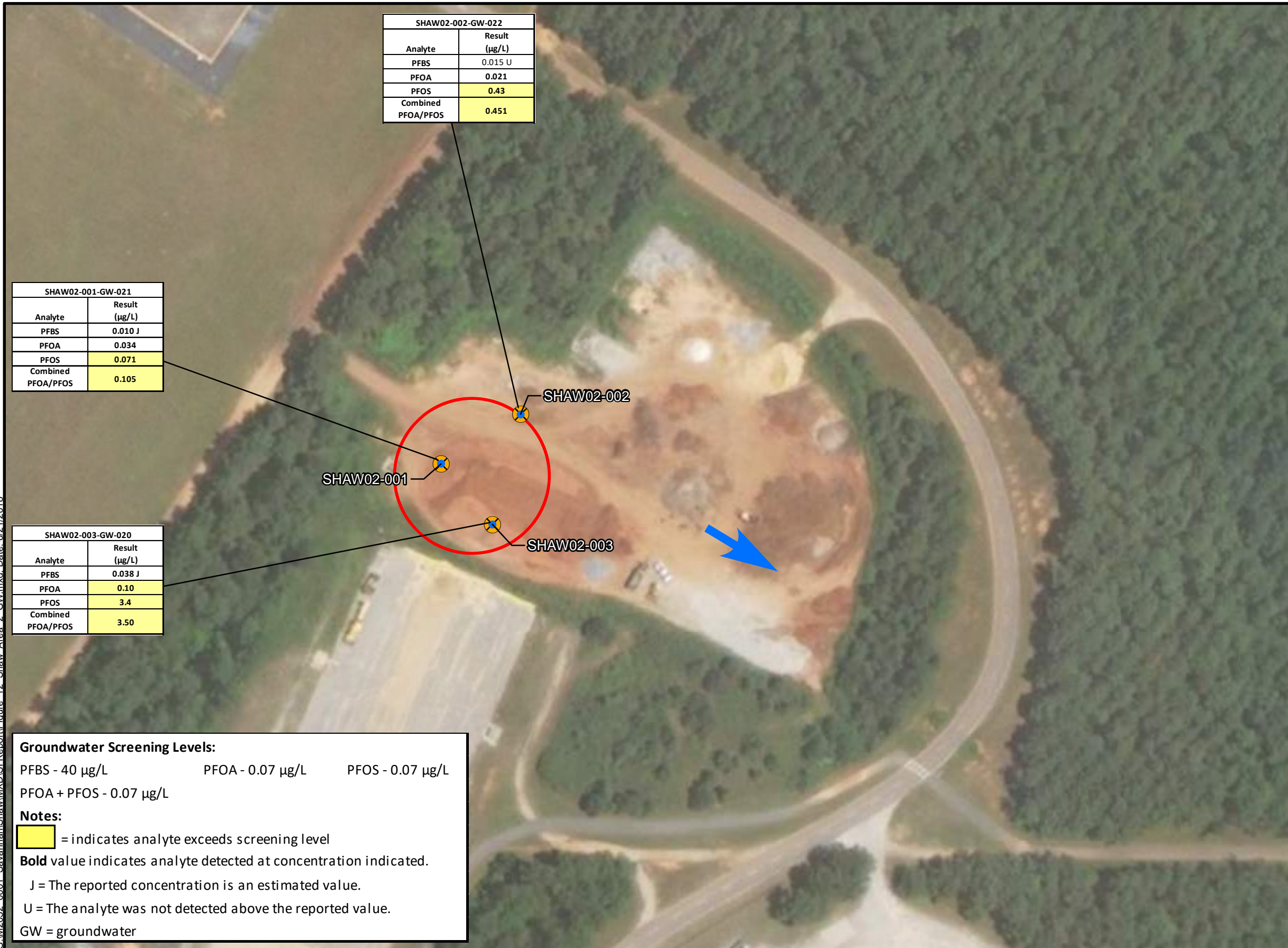
Shaw Air Force Base
 Sumter County, South Carolina

Figure 11
Former Fire Training Area 2 (FT-07) (AFFF Area 2) PFBS, PFOA, and PFOS in Soil



Drawn: tmorse Date: 6/21/2018
 Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure_12_Shaw_Area_2_GW.mxd; Date: 6/21/2018



SHAW02-002-GW-022	
Analyte	Result (µg/L)
PFBS	0.015 U
PFOA	0.021
PFOS	0.43
Combined PFOA/PFOS	0.451

SHAW02-001-GW-021	
Analyte	Result (µg/L)
PFBS	0.010 J
PFOA	0.034
PFOS	0.071
Combined PFOA/PFOS	0.105

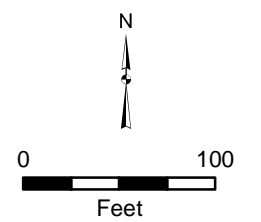
SHAW02-003-GW-020	
Analyte	Result (µg/L)
PFBS	0.038 J
PFOA	0.10
PFOS	3.4
Combined PFOA/PFOS	3.50

Groundwater Screening Levels:
 PFBS - 40 µg/L PFOA - 0.07 µg/L PFOS - 0.07 µg/L
 PFOA + PFOS - 0.07 µg/L

Notes:
 [Yellow highlight] = indicates analyte exceeds screening level
Bold value indicates analyte detected at concentration indicated.
 J = The reported concentration is an estimated value.
 U = The analyte was not detected above the reported value.
 GW = groundwater



- Legend**
- DPT Boring Subsurface Soil and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Groundwater Flow Direction



Shaw Air Force Base
 Sumter County, South Carolina

Figure 12
Former Fire Training Area 2 (FT-07) (AFFF Area 2) PFBS, PFOA, and PFOS in Groundwater



Drawn: tmorse Date: 6/21/2018
 Service Layer Credits: Esri ArcGIS Online Aerial Photography

SHAW03-002-SS-001		SHAW03-002-SO-017	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.48 J	PFBS	0.50 U
PFOA	12	PFOA	0.79 U
PFOS	740	PFOS	0.96 J

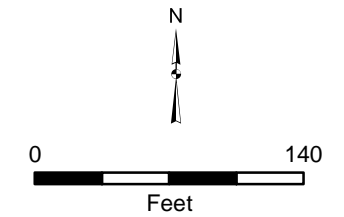


Legend

- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
- Existing Groundwater Monitoring Well Sampled
- Installation Boundary
- AFFF Inspection Area

SHAW03-003-SS-001		SHAW03-003-SO-016	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.44 U	PFBS	8.3
PFOA	4.1	PFOA	19
PFOS	47	PFOS	200

SHAW03-001-SS-001		SHAW03-001-SO-016	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.49 U	PFBS	0.95 J
PFOA	6.6	PFOA	4.5
PFOS	13	PFOS	170



Shaw Air Force Base
Sumter County, South Carolina

Figure 13
Former Fire Training Area 3 (FT-06) /
Current Explosive Ordnance Disposal
(EOD) Area (AFFF Area 3) PFBS,
PFOA, and PFOS in Soil



Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Soil Screening Levels:
PFBS - 130,000 µg/kg PFOA - 126 µg/kg PFOS - 126 µg/kg

Notes:
 = indicates value exceeds screening level
Bold value indicates analyte detected at concentration indicated.
 J = The reported concentration is an estimated value.
 U = The analyte was not detected above the reported value.
 SS = surface soil SO = subsurface soil

SHAW03-002-GW-017	
Analyte	Result (µg/L)
PFBS	0.18
PFOA	0.17
PFOS	0.64
Combined PFOA/PFOS	0.81

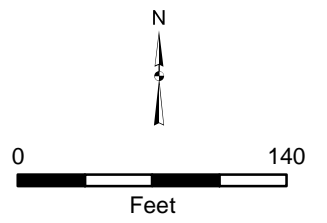
SHAW03-003-GW-018	
Analyte	Result (µg/L)
PFBS	18
PFOA	13
PFOS	30
Combined PFOA/PFOS	43

SHAW03-001-GW-018	
Analyte	Result (µg/L)
PFBS	0.95
PFOA	1.7
PFOS	14
Combined PFOA/PFOS	15.7

SHAW03-FT3-MW5-GW-016	
Analyte	Result (µg/L)
PFBS	0.16 J
PFOA	3.3
PFOS	21
Combined PFOA/PFOS	24.3
SHAW03-FT3-MW5-GW-916 (dup)	
Analyte	Result (µg/L)
PFBS	0.12
PFOA	3.2
PFOS	20
Combined PFOA/PFOS	23.2



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Existing Groundwater Monitoring Well Sampled
 - Installation Boundary
 - AFFF Inspection Area
 - Groundwater Flow Direction



Shaw Air Force Base
Sumter County, South Carolina

Figure 14
Former Fire Training Area 3 (FT-06) /
Current Explosive Ordnance Disposal
(EOD) Area (AFFF Area 3) PFBS,
PFOA, and PFOS in Groundwater

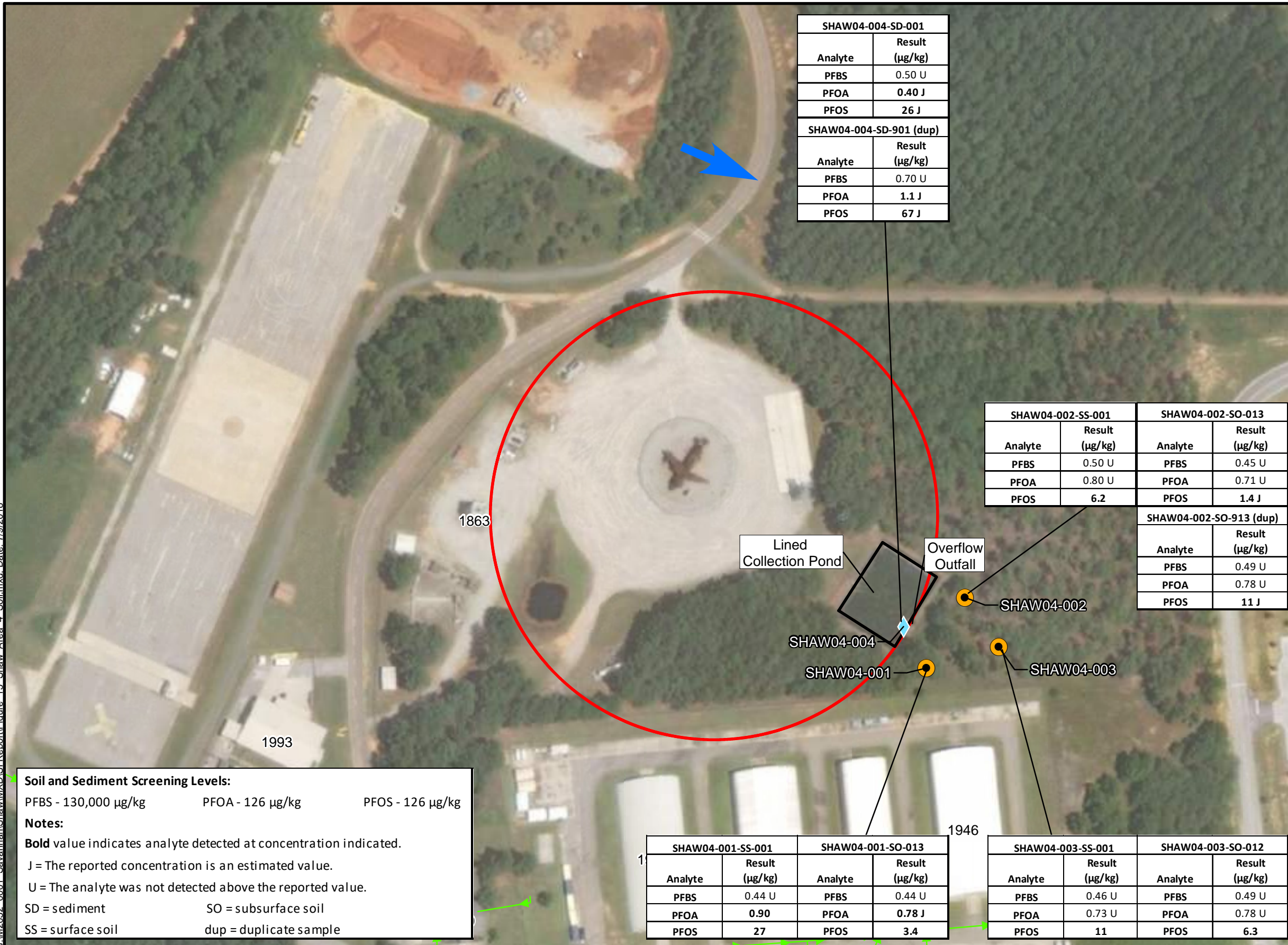


Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Groundwater Screening Levels:
PFBS - 40 µg/L PFOA - 0.07 µg/L PFOS - 0.07 µg/L
PFOA + PFOS - 0.07 µg/L

Notes:
Bold value indicates analyte detected at concentration indicated.
 = indicates analyte exceeds screening level
GW = groundwater dup = duplicate sample



SHAW04-004-SD-001	
Analyte	Result (µg/kg)
PFBS	0.50 U
PFOA	0.40 J
PFOS	26 J

SHAW04-004-SD-901 (dup)	
Analyte	Result (µg/kg)
PFBS	0.70 U
PFOA	1.1 J
PFOS	67 J

SHAW04-002-SS-001		SHAW04-002-SO-013	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.50 U	PFBS	0.45 U
PFOA	0.80 U	PFOA	0.71 U
PFOS	6.2	PFOS	1.4 J

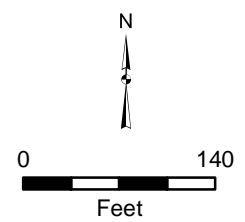
SHAW04-002-SO-913 (dup)	
Analyte	Result (µg/kg)
PFBS	0.49 U
PFOA	0.78 U
PFOS	11 J

SHAW04-001-SS-001		SHAW04-001-SO-013	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.44 U	PFBS	0.44 U
PFOA	0.90	PFOA	0.78 J
PFOS	27	PFOS	3.4

SHAW04-003-SS-001		SHAW04-003-SO-012	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.46 U	PFBS	0.49 U
PFOA	0.73 U	PFOA	0.78 U
PFOS	11	PFOS	6.3



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Surface Water and Sediment Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Storm Sewer Line
 - Groundwater Flow Direction



Shaw Air Force Base
Sumter County, South Carolina

Figure 15
Current Fire Training Area
(AFFF Area 4) PFBS, PFOA, and
PFOS in Soil and Sediment

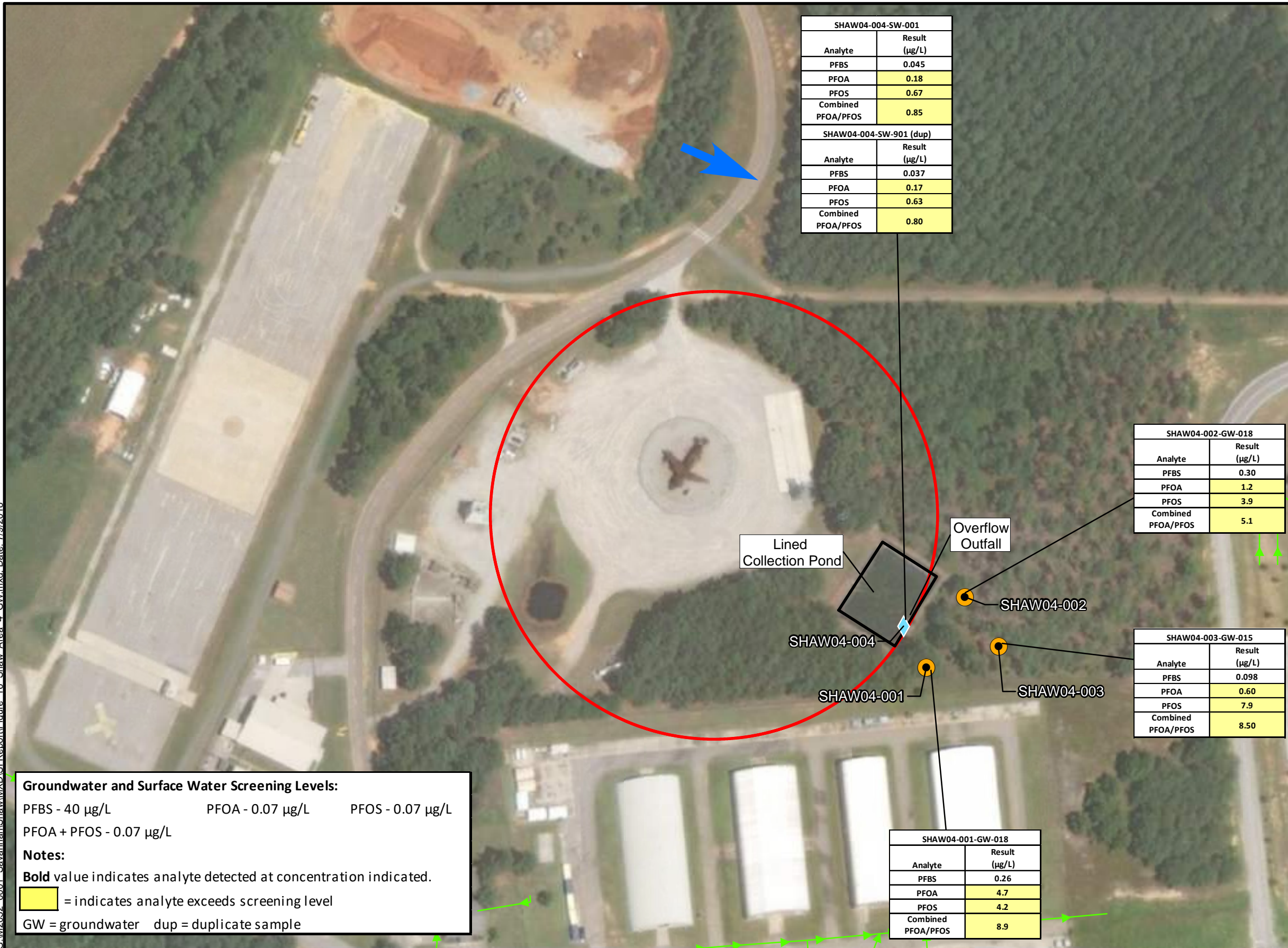


Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Soil and Sediment Screening Levels:
PFBS - 130,000 µg/kg PFOA - 126 µg/kg PFOS - 126 µg/kg

Notes:
Bold value indicates analyte detected at concentration indicated.
J = The reported concentration is an estimated value.
U = The analyte was not detected above the reported value.
SD = sediment SO = subsurface soil
SS = surface soil dup = duplicate sample



SHAW04-004-SW-001	
Analyte	Result (µg/L)
PFBS	0.045
PFOA	0.18
PFOS	0.67
Combined PFOA/PFOS	0.85

SHAW04-004-SW-901 (dup)	
Analyte	Result (µg/L)
PFBS	0.037
PFOA	0.17
PFOS	0.63
Combined PFOA/PFOS	0.80

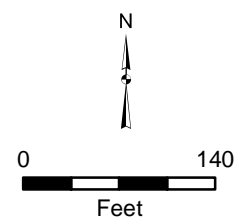
SHAW04-002-GW-018	
Analyte	Result (µg/L)
PFBS	0.30
PFOA	1.2
PFOS	3.9
Combined PFOA/PFOS	5.1

SHAW04-003-GW-015	
Analyte	Result (µg/L)
PFBS	0.098
PFOA	0.60
PFOS	7.9
Combined PFOA/PFOS	8.50

SHAW04-001-GW-018	
Analyte	Result (µg/L)
PFBS	0.26
PFOA	4.7
PFOS	4.2
Combined PFOA/PFOS	8.9



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Surface Water and Sediment Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Storm Sewer Line
 - Groundwater Flow Direction



Shaw Air Force Base
Sumter County, South Carolina

Figure 16
Current Fire Training Area
(AFFF Area 4) PFBS, PFOA, and PFOS
in Groundwater and Surface Water



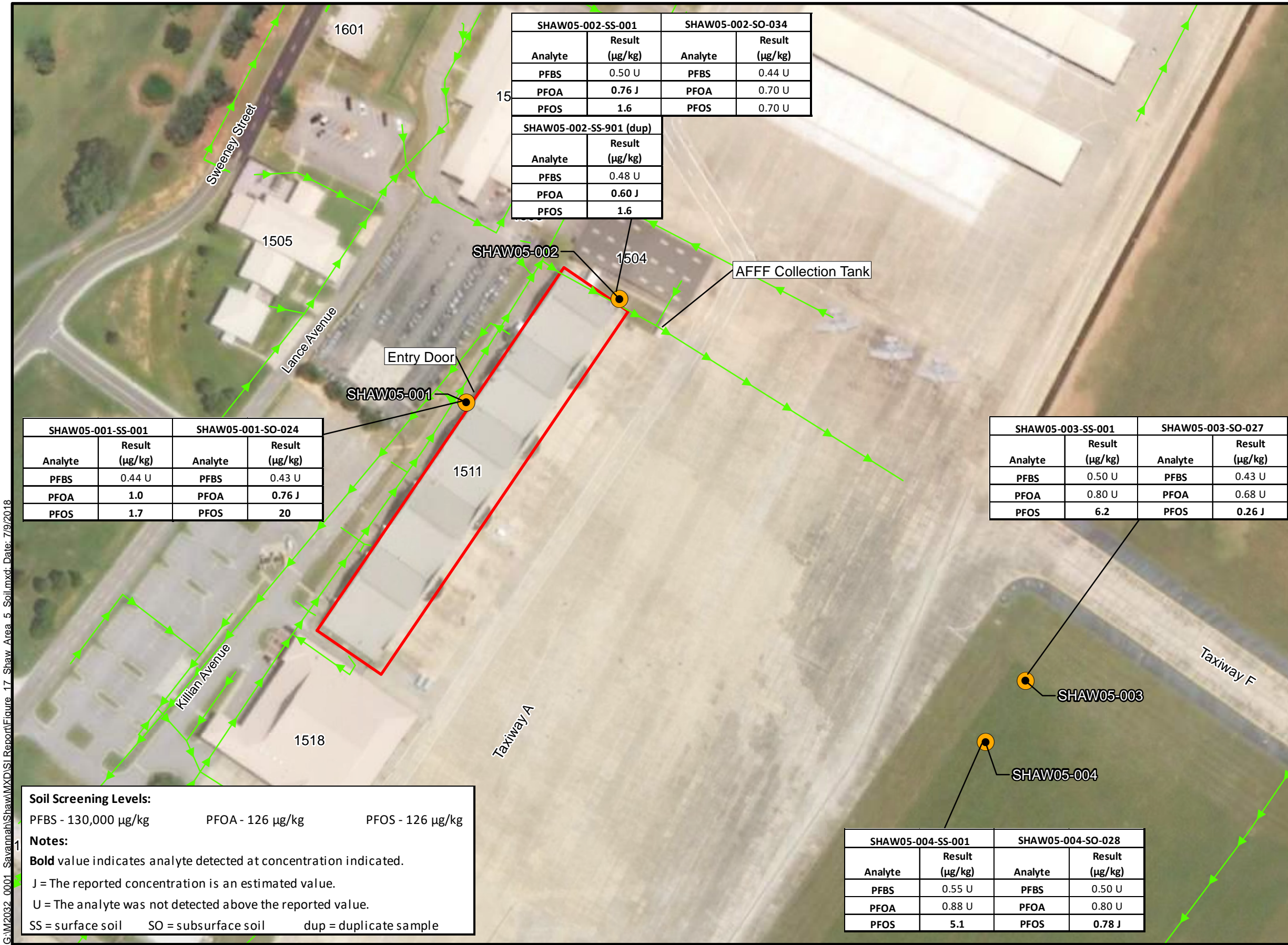
Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Groundwater and Surface Water Screening Levels:
 PFBS - 40 µg/L PFOA - 0.07 µg/L PFOS - 0.07 µg/L
 PFOA + PFOS - 0.07 µg/L

Notes:
Bold value indicates analyte detected at concentration indicated.
 = indicates analyte exceeds screening level
 GW = groundwater dup = duplicate sample

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SHAW05-002-SS-001		SHAW05-002-SO-034	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.50 U	PFBS	0.44 U
PFOA	0.76 J	PFOA	0.70 U
PFOS	1.6	PFOS	0.70 U

SHAW05-002-SS-901 (dup)	
Analyte	Result (µg/kg)
PFBS	0.48 U
PFOA	0.60 J
PFOS	1.6

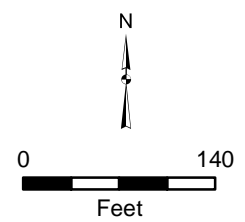
SHAW05-001-SS-001		SHAW05-001-SO-024	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.44 U	PFBS	0.43 U
PFOA	1.0	PFOA	0.76 J
PFOS	1.7	PFOS	20

SHAW05-003-SS-001		SHAW05-003-SO-027	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.50 U	PFBS	0.43 U
PFOA	0.80 U	PFOA	0.68 U
PFOS	6.2	PFOS	0.26 J

SHAW05-004-SS-001		SHAW05-004-SO-028	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.55 U	PFBS	0.50 U
PFOA	0.88 U	PFOA	0.80 U
PFOS	5.1	PFOS	0.78 J



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Storm Sewer Line



Shaw Air Force Base
Sumter County, South Carolina

Figure 17
Building 1511 (AFFF Area 5)
PFBS, PFOA, and
PFOS in Soil



Drawn: tmorse Date: 7/9/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

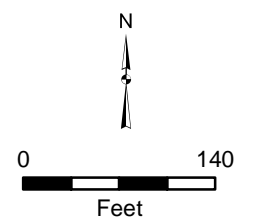
SHAW05-002-GW-033	
Analyte	Result (µg/L)
PFBS	0.017 J
PFOA	0.12
PFOS	0.18
Combined PFOA/PFOS	0.30

SHAW05-003-GW-032	
Analyte	Result (µg/L)
PFBS	0.058
PFOA	0.076
PFOS	0.51
Combined PFOA/PFOS	0.586

SHAW05-004-GW-031	
Analyte	Result (µg/L)
PFBS	0.021
PFOA	0.082
PFOS	0.080
Combined PFOA/PFOS	0.162



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Storm Sewer Line
 - Surface Water Flow Direction
 - Groundwater Flow Direction



Shaw Air Force Base
Sumter County, South Carolina

Figure 18
Building 1511 (AFFF Area 5)
PFBS, PFOA, and
PFOS in Groundwater

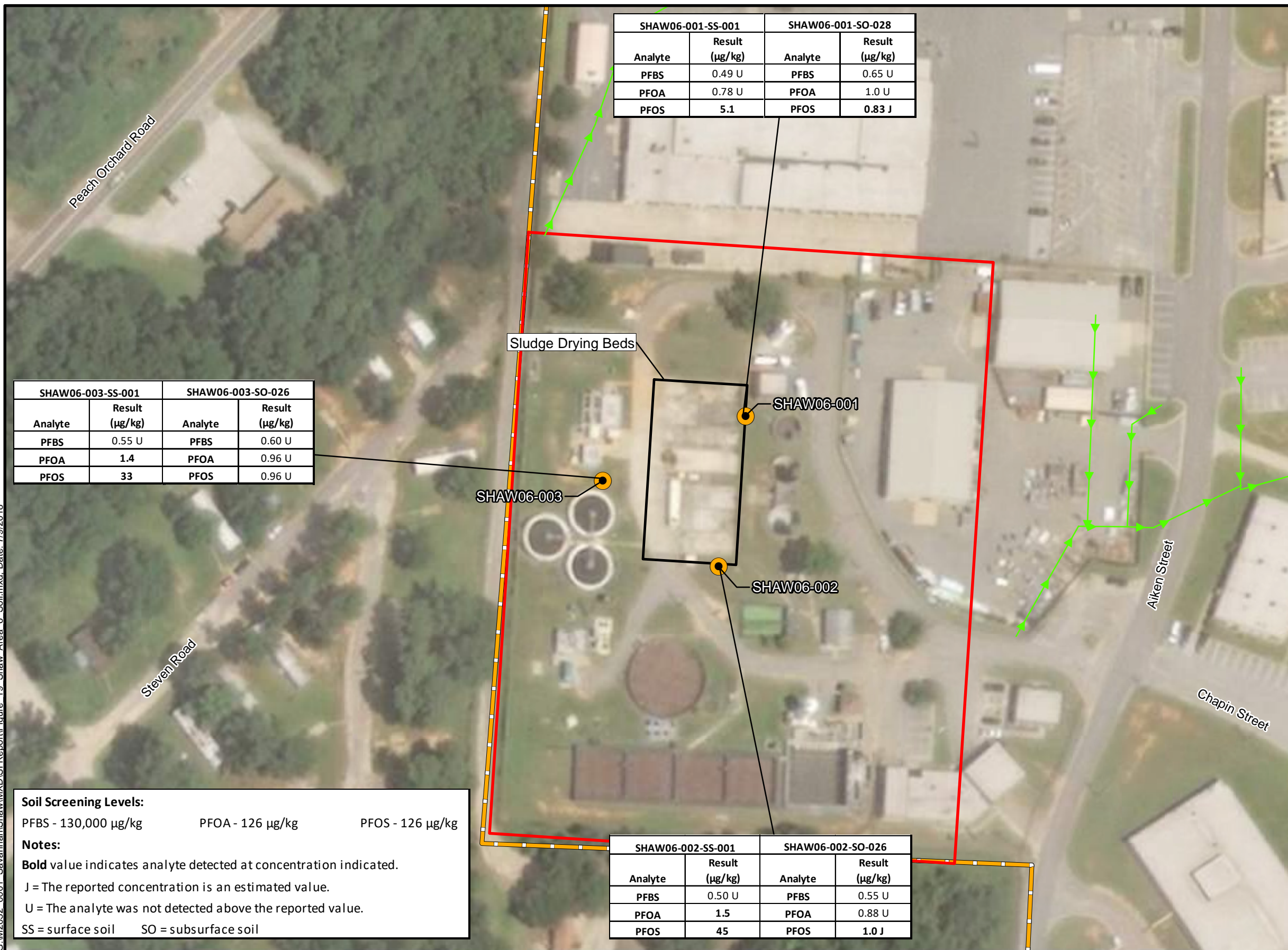


Drawn: tmorse Date: 7/12/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure_18_Shaw_Area_5_GW.mxd; Date: 7/12/2018

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure_19_Shaw_Area_6_Soil.mxd; Date: 7/9/2018



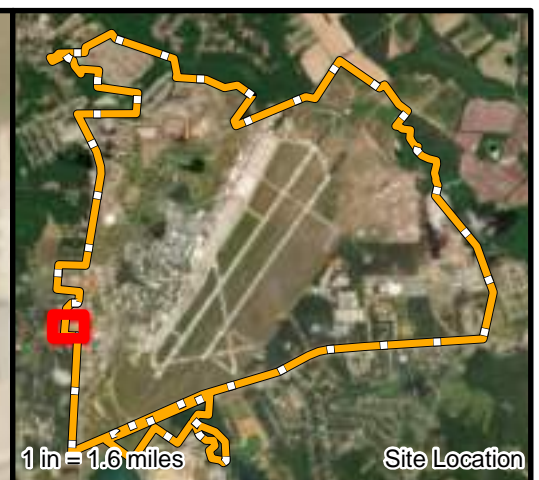
SHAW06-001-SS-001		SHAW06-001-SO-028	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.49 U	PFBS	0.65 U
PFOA	0.78 U	PFOA	1.0 U
PFOS	5.1	PFOS	0.83 J

SHAW06-003-SS-001		SHAW06-003-SO-026	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.55 U	PFBS	0.60 U
PFOA	1.4	PFOA	0.96 U
PFOS	33	PFOS	0.96 U

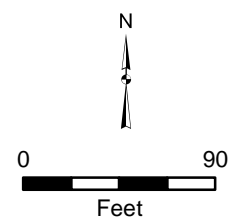
SHAW06-002-SS-001		SHAW06-002-SO-026	
Analyte	Result (µg/kg)	Analyte	Result (µg/kg)
PFBS	0.50 U	PFBS	0.55 U
PFOA	1.5	PFOA	0.88 U
PFOS	45	PFOS	1.0 J

Soil Screening Levels:
 PFBS - 130,000 µg/kg PFOA - 126 µg/kg PFOS - 126 µg/kg

Notes:
Bold value indicates analyte detected at concentration indicated.
 J = The reported concentration is an estimated value.
 U = The analyte was not detected above the reported value.
 SS = surface soil SO = subsurface soil



- Legend**
- DPT Boring Surface Soil, Subsurface Soil, and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Storm Sewer Line



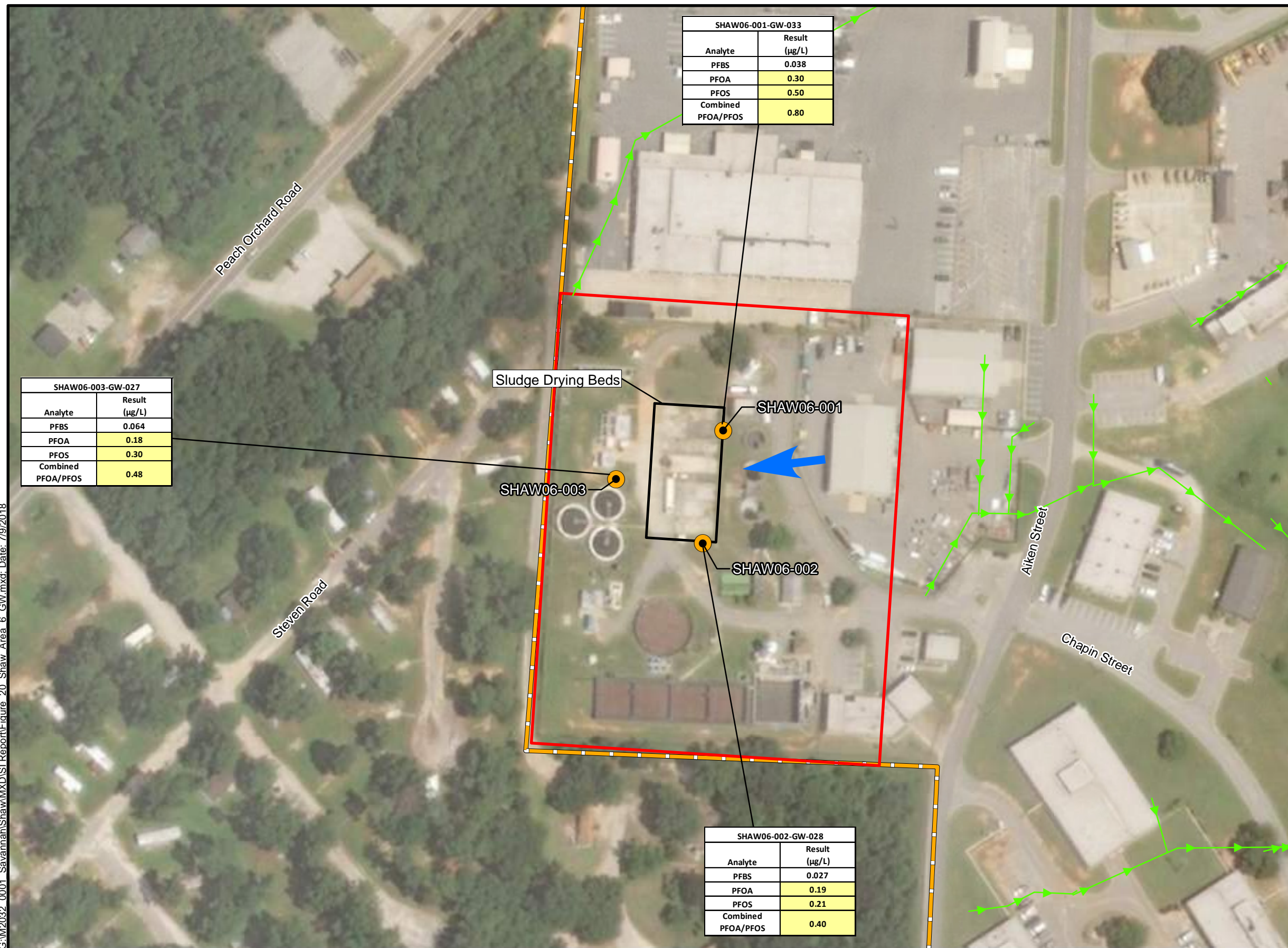
Shaw Air Force Base
 Sumter County, South Carolina

Figure 19
Wastewater Treatment Plant (AFFF Area 6) PFBS, PFOA, and PFOS in Soil



Drawn: tmorse Date: 7/9/2018
 Service Layer Credits: Esri ArcGIS Online Aerial Photography

G:\M2032_0001_Savannah\Shaw\MXD\SI\Report\Figure 20 Shaw Area 6 GW.mxd; Date: 7/9/2018



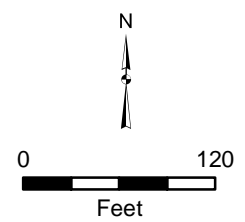
SHAW06-001-GW-033	
Analyte	Result (µg/L)
PFBS	0.038
PFOA	0.30
PFOS	0.50
Combined PFOA/PFOS	0.80

SHAW06-003-GW-027	
Analyte	Result (µg/L)
PFBS	0.064
PFOA	0.18
PFOS	0.30
Combined PFOA/PFOS	0.48

SHAW06-002-GW-028	
Analyte	Result (µg/L)
PFBS	0.027
PFOA	0.19
PFOS	0.21
Combined PFOA/PFOS	0.40



- Legend**
- DPT Boring Surface Soil, Subsurface Soil and Groundwater Samples
 - Installation Boundary
 - AFFF Inspection Area
 - Storm Sewer Line
 - Groundwater Flow Direction

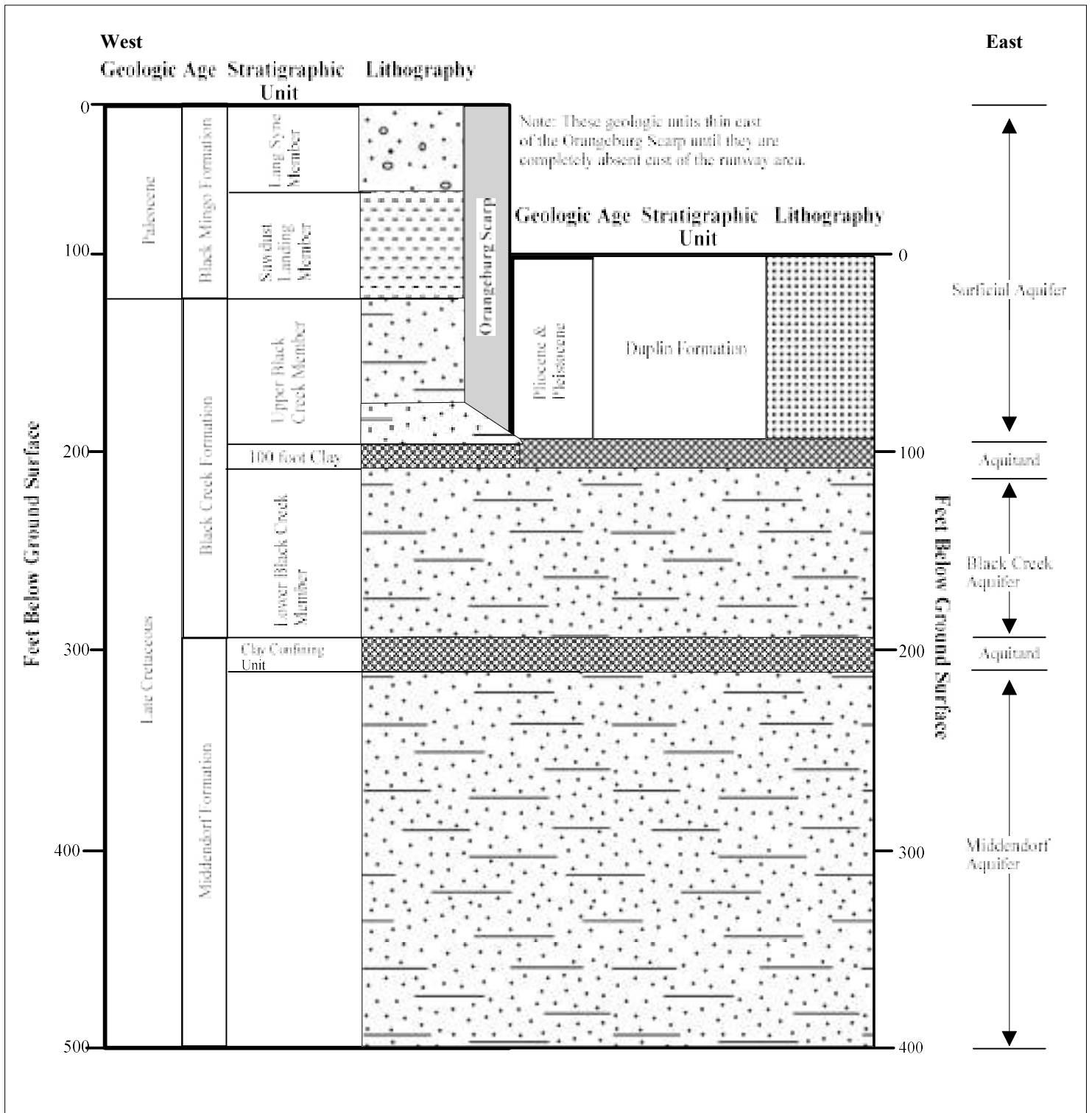


Shaw Air Force Base
Sumter County, South Carolina

Figure 20
Wastewater Treatment Plant
(AFFF Area 6) PFBS, PFOA,
and PFOS in Groundwater



Drawn: tmorse | Date: 7/9/2018
Service Layer Credits: Esri ArcGIS Online Aerial Photography



Modified from: Rust, 1995

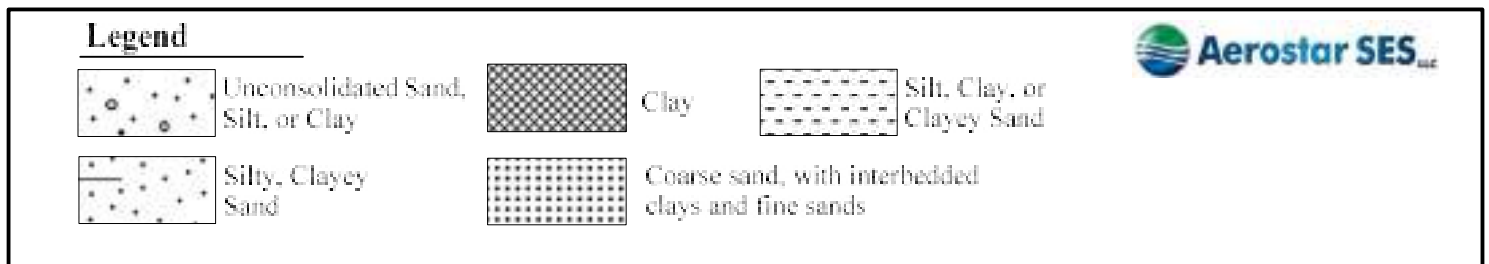
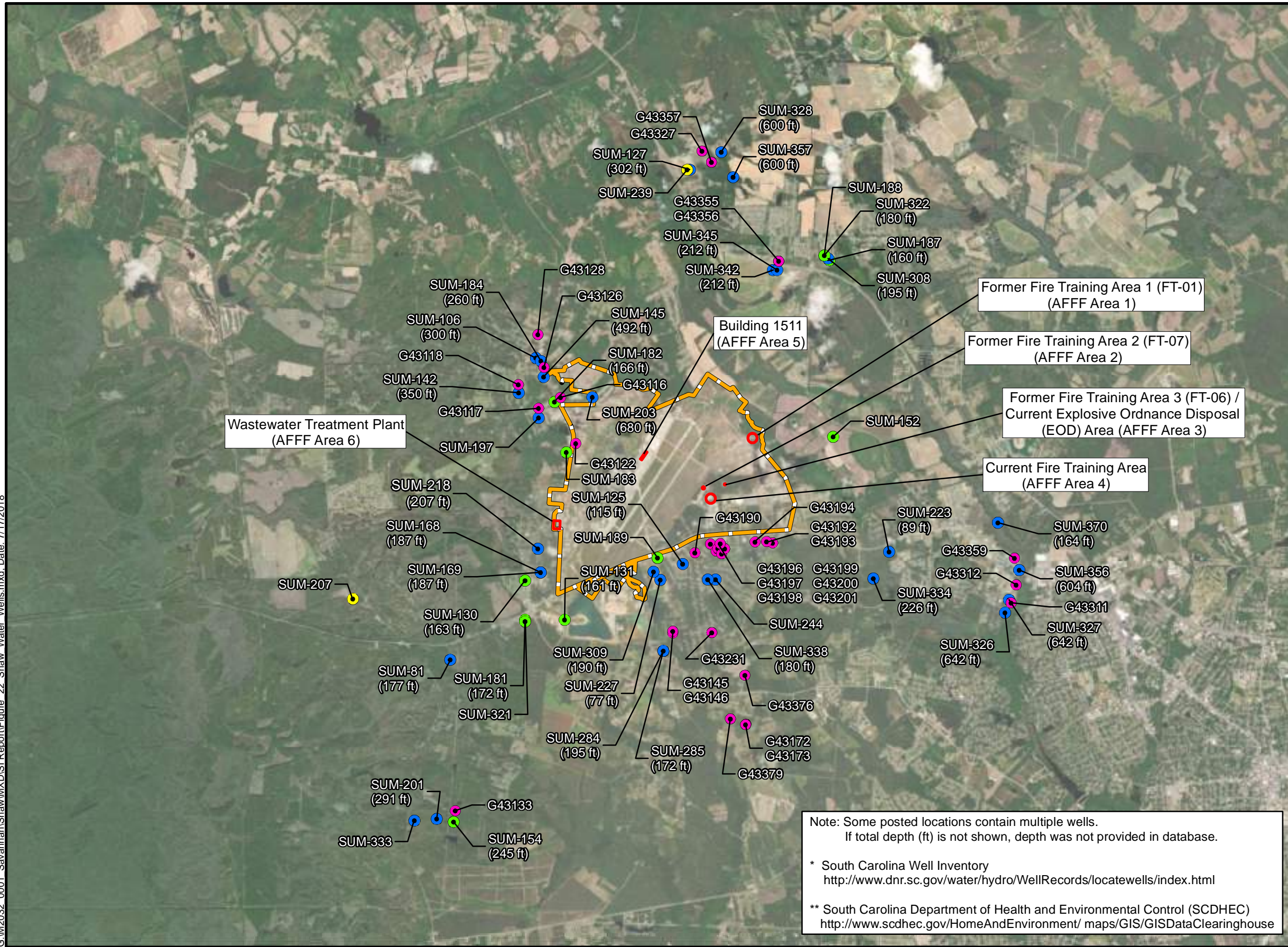


Figure 21 Generalized Hydrogeologic Column of Shaw Air Force Base

G:\M2032_0001_Savannah\Shaw\MXD\SI_Report\Figure 22 Shaw Water Wells.mxd; Date: 7/17/2018



Legend

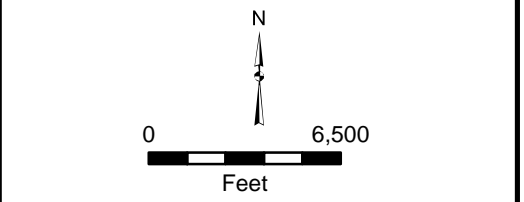
South Carolina Well Inventory *

- Domestic Well
- Public Supply
- Unknown Use
- SCDHEC Public Drinking Water Supply Well **

□ AFFF Inspection Area

▭ Installation Boundary

SUM-127 = Well ID
 (302 ft) = Total Depth (ft)



Shaw Air Force Base
 Sumter County, South Carolina

Figure 22
Shaw Air Force Base
Well Survey



Drawn: tmorse Date: 7/17/2018

Service Layer Credits: Esri ArcGIS Online Aerial Photography

Note: Some posted locations contain multiple wells.
 If total depth (ft) is not shown, depth was not provided in database.

* South Carolina Well Inventory
<http://www.dnr.sc.gov/water/hydro/WellRecords/locatewells/index.html>

** South Carolina Department of Health and Environmental Control (SCDHEC)
<http://www.scdhec.gov/HomeAndEnvironment/maps/GIS/GISDataClearinghouse>

Appendix B
Regional Screening Level Calculations
for
PFOA and PFOS in Soil and Sediment

Default Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	0.1
TR (target risk) unitless	1E-06
LT (lifetime) years	70
ET _{rac} (exposure time) hours/day	24
ET _{rac-r} (child exposure time) hours/day	24
ET _{rac-a} (adult exposure time) hours/day	24
ET ₀₋₂ (mutagenic exposure time) hours/day	24
ET ₂₋₆ (mutagenic exposure time) hours/day	24
ET ₆₋₁₆ (mutagenic exposure time) hours/day	24
ET ₁₆₋₂₆ (mutagenic exposure time) hours/day	24
ED _{rac} (exposure duration) years	26
ED _{rac-r} (exposure duration - child) years	6
ED _{rac-a} (exposure duration - adult) years	20
ED ₀₋₂ (mutagenic exposure duration) years	2
ED ₂₋₆ (mutagenic exposure duration) years	4
ED ₆₋₁₆ (mutagenic exposure duration) years	10
ED ₁₆₋₂₆ (mutagenic exposure duration) years	10
BW _{rac-r} (body weight - child) kg	15
BW _{rac-a} (body weight - adult) kg	80
BW ₀₋₂ (mutagenic body weight) kg	15
BW ₂₋₆ (mutagenic body weight) kg	15
BW ₆₋₁₆ (mutagenic body weight) kg	80
BW ₁₆₋₂₆ (mutagenic body weight) kg	80
SA _{res-c} (skin surface area - child) cm ² /day	2373
SA _{res-a} (skin surface area - adult) cm ² /day	6032
SA ₀₋₂ (mutagenic skin surface area) cm ² /day	2373
SA ₂₋₆ (mutagenic skin surface area) cm ² /day	2373
SA ₆₋₁₆ (mutagenic skin surface area) cm ² /day	6032
SA ₁₆₋₂₆ (mutagenic skin surface area) cm ² /day	6032
EF _{rac} (exposure frequency) days/year	350
EF _{rac-r} (exposure frequency - child) days/year	350
EF _{res-a} (exposure frequency - adult) days/year	350

Default Resident Equation Inputs for Soil

Variable	Value
EF _{n,γ} (mutagenic exposure frequency) days/year	350
EF _{γ,ε} (mutagenic exposure frequency) days/year	350
EF _{ε,1ε} (mutagenic exposure frequency) days/year	350
EF _{1ε,2ε} (mutagenic exposure frequency) days/year	350
IFS _{res,arti} (age-adjusted soil ingestion factor) mg/kg	36750
IFSM _{res,arti} (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3
IRS _{res,r} (soil intake rate - child) mg/day	200
IRS _{res,a} (soil intake rate - adult) mg/day	100
IRS _{n,γ} (mutagenic soil intake rate) mg/day	200
IRS _{γ,ε} (mutagenic soil intake rate) mg/day	200
IRS _{ε,1ε} (mutagenic soil intake rate) mg/day	100
IRS _{1ε,2ε} (mutagenic soil intake rate) mg/day	100
AF _{res-a} (skin adherence factor - adult) mg/cm ²	0.07
AF _{res-c} (skin adherence factor - child) mg/cm ²	0.2
AF ₀₋₂ (mutagenic skin adherence factor) mg/cm ²	0.2
AF ₂₋₆ (mutagenic skin adherence factor) mg/cm ²	0.2
AF ₆₋₁₆ (mutagenic skin adherence factor) mg/cm ²	0.07
AF ₁₆₋₂₆ (mutagenic skin adherence factor) mg/cm ²	0.07
DFS _{res,arti} (age-adjusted soil dermal factor) mg/kg	103390
DFSM _{res,arti} (mutagenic age-adjusted soil dermal factor) mg/kg	428260
AT _{res} (averaging time - resident carcinogenic)	365
City _{DEC} (Climate Zone) Selection	Default
A _c (PEF acres)	0.5
Q/C _{wind} (g/m ² -s per kg/m ³)	93.77
PEF (particulate emission factor) m ³ /kg	1359344438
A (PEF Dispersion Constant)	16.2302
B (PEF Dispersion Constant)	18.7762
C (PEF Dispersion Constant)	216.108
V (fraction of vegetative cover) unitless	0.5
U _m (mean annual wind speed) m/s	4.69
U _t (equivalent threshold value)	11.32
F(x) (function dependent on U _m /U _t) unitless	0.194

Default Resident Equation Inputs for Soil

Variable	Value
City _{VE} (Climate Zone) Selection	Default
A _c (VF acres)	0.5
Q/C _{vol} (g/m ² -s per kg/m ³)	68.18
foc (fraction organic carbon in soil) g/g	0.006
p _b (dry soil bulk density) g/cm ³	1.5
p _s (soil particle density) g/cm ³	2.65
n (total soil porosity) L _{void} /L _{soil}	0.43396
Theta _a (air-filled soil porosity) L _{air} /L _{soil}	0.28396
Theta _w (water-filled soil porosity) L _{water} /L _{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.911
B (VF Dispersion Constant)	18.4385
C (VF Dispersion Constant)	209.7845
City _{VF mass-limiting} (Climate Zone) Selection	Default
VF _{ml} (volitization factor - mass-limit) m ³ /kg	.
Q/C _{vol} (g/m ² -s per kg/m ³)	68.18
A _c (VF mass-limit acres)	0.5
T (exposure interval) yr	26
d _c (depth of source) m	.
p _b (dry soil bulk density) g/cm ³	1.5
A (VF Dispersion Constant - Mass Limit)	11.911
B (VF Dispersion Constant - Mass Limit)	18.4385
C (VF Dispersion Constant - Mass Limit)	209.7845
T _w (groundwater temperature) Celsius	25

Resident Risk-Based Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day) ⁻¹	SFO Ref	Inhalation Unit Risk (ug/m ³) ⁻¹	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m ³)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	-		-		2.00E-05	D	-		1	0.1	1	-	6.80E+02
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	7.00E-02	D	-		2.00E-05	D	-		1	0.1	1	-	9.50E+03

K _{oc} (cm ³ /g)	K _d (cm ³ /g)	HLC (atm-m ³ /mole)	Henry's Law Constant (unitless)	H ⁺ and HLC Ref	Normal Boiling Point T _{boil} (K)	BP Ref	Critical Temperature T _{crit} (K)	T _{crit} Ref	D _{ia} (cm ² /s)	D _{iw} (cm ² /s)	D _A (cm ² /s)	Particulate Emission Factor (m ³ /kg)	Volatilization Factor (m ³ /kg)
3.72E+02	-	-	-		532.15	PHYSPROP	-		2.07E-02	5.25E-06	-	1.36E+09	-
1.15E+02	-	-	-		465.55	PHYSPROP	-		2.26E-02	5.79E-06	-	1.36E+09	-

Ingestion SL (mg/kg)	Dermal SL (mg/kg)	Inhalation SL (mg/kg)	Carcinogenic SL (mg/kg)	Ingestion SL Child THQ=0.1 (mg/kg)	Dermal SL Child THQ=0.1 (mg/kg)	Inhalation SL Child THQ=0.1 (mg/kg)	Noncarcinogenic SL Child THI=0.1 (mg/kg)	Ingestion SL Adult THQ=0.1 (mg/kg)	Dermal SL Adult THQ=0.1 (mg/kg)	Inhalation SL Adult THQ=0.1 (mg/kg)	Noncarcinogenic SL Adult THI=0.1 (mg/kg)	Screening Level (mg/kg)
TR=1E-06	TR=1E-06	TR=1E-06	TR=1E-06	THQ=0.1	THQ=0.1	THQ=0.1	THI=0.1	THQ=0.1	THQ=0.1	THQ=0.1	THI=0.1	1.26E-01 nc
-	-	-	-	1.56E-01	6.59E-01	-	1.26E-01	1.67E+00	3.95E+00	-	1.17E+00	1.26E-01 nc
9.93E+00	3.53E+01	-	7.75E+00	1.56E-01	6.59E-01	-	1.26E-01	1.67E+00	3.95E+00	-	1.17E+00	1.26E-01 nc

Chemical	CASNUM	Inhalation Unit Risk (µg/m ³) ⁻¹	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species	Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference	Inhalation Unit Risk Notes
Perfluorooctane sulfonic acid (PFOS)	1763-23-1											
Perfluorooctanoic acid (PFOA)	335-67-1											

Oral Slope Factor Toxicity Metadata

Chemical	CASNUM	Oral Slope Factor (mg/kg-day) ⁻¹	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species	Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference	Oral Slope Factor Notes
Perfluorooctane sulfonic acid (PFOS)	1763-23-1											
Perfluorooctanoic acid (PFOA)	335-67-1	7.00E-02	DWSHA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Chemical	CASNUM	Chronic Oral Reference Dose (mg/kg-day)	Toxicity Source	Oral Chronic Reference Dose Basis	Oral Chronic Reference Dose Confidence Level	Oral Chronic Reference Dose Critical Effect
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	2.00E-05	DWSHA	NA	NA	NA
Perfluorooctanoic acid (PFOA)	335-67-1	2.00E-05	DWSHA	NA	NA	NA

Oral Chronic Reference Dose Target Organ	Oral Chronic Reference Dose Modifying Factor	Oral Chronic Reference Dose Uncertainty Factor	Oral Chronic Reference Dose Species	Oral Chronic Reference Dose Route	Oral Chronic Reference Dose Study Duration	Oral Chronic Reference Dose Study Reference	Oral Chronic Reference Dose Notes
NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA

Chemical	CASNUM	Chronic Inhalation Reference Concentration (mg/m ³)	Toxicity Source	Inhalation Chronic Reference Concentration Basis	Inhalation Chronic Reference Concentration Confidence Level	Inhalation Chronic Reference Concentration Critical Effect	Inhalation Chronic Reference Concentration Target Organ
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	-	-				
Perfluorooctanoic acid (PFOA)	335-67-1	-	-				

Inhalation Chronic Reference Concentration Modifying Factor	Inhalation Chronic Reference Concentration Uncertainty Factor	Inhalation Chronic Reference Concentration Species	Inhalation Chronic Reference Concentration Route	Inhalation Chronic Reference Concentration Study Duration	Inhalation Chronic Reference Concentration Study Reference	Inhalation Chronic Reference Concentration Notes

Appendix C
Boring Logs and Field Forms



BORING LOG - SHAW01-001

(Page 1 of 1)

Site Name : Area 1
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/26/18
 DTW During Drilling (ft) : No water encountered
 Logged By : Jeremy Klein

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 782031.14
 Easting : 2166359.17
 Surface Elev. (ft)* : 215.37
 Total Depth (ft)** : 5.0

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	REMARKS
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)							
			DESCRIPTION								
0				(0.0 - 3.5) SILTY SAND, 10YR 6/6, brownish yellow, non-plastic, sub-rounded, soft, fine grained, slight odor					SS	SHAW01-001-SS-001 Note: Interval 0.0 - 0.5 ft	
1	100								SM		
										SO	SHAW01-001-SO-002 Note: Interval 2.0 - 3.0 ft
				(3.5 - 5.0) SANDY CLAY, high plasticity, 5Y 4/1 dark gray, medium stiff, sand sub-angular/fine grained, poorly graded, fuel odor, wet					▼		
										CH	
5				End of Borehole 5.0 ft bgs	28						



BORING LOG - SHAW01-002

(Page 1 of 1)

Site Name : Area 1
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/26/18
 DTW During Drilling (ft) : 4.5
 Logged By : Jeremy Klein

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 782058.53
 Easting : 2166451.24
 Surface Elev. (ft)* : 214.97
 Total Depth (ft)** : 5.0

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	REMARKS
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)							
			DESCRIPTION								
0				(0.0 - 5.0) SILTY SAND, 10YR 6/6, brownish yellow, sub-rounded, soft, slight fuel odor, fine grained, sub-rounded, damp to wet					SS	SHAW01-002-SS-001 Note: Interval 0.0 - 0.5 ft	
1	100					SM					
									SO	SHAW01-002-S0-003 Note: Interval 3.0 - 4.0 ft	
5				End of Borehole 5.0 ft bgs	16			▼			



BORING LOG - SHAW01-003

(Page 1 of 1)

Site Name : Area 1
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/26/18
 DTW During Drilling (ft) : 3.5
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 781992.92
 Easting : 2166391.47
 Surface Elev. (ft)* : 215.29
 Total Depth (ft)** : 5.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	REMARKS
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)							
			DESCRIPTION								
0				(0.0 - 4.0) SILTY SAND, 10YR 6/6, brownish yellow, sub-rounded, soft, fine grained, fuel odor, damp to wet					SS	SHAW01-003-SS-001 Note: Interval 0.0 - 0.5 ft	
1	100					SM			SO	SHAW01-003-S0-002 Note: Interval 2.0 - 3.0 ft	
5				(4.0 - 5.0) SANDY CLAY, high plasticity, 7.5YR 6/6, reddish yellow, medium stiff, sub-angular, fine grained, poorly graded sand, fuel odor, wet	18	CH		▼			
End of Borehole 5.0 ft bgs											



BORING LOG - SHAW02-001

(Page 1 of 1)

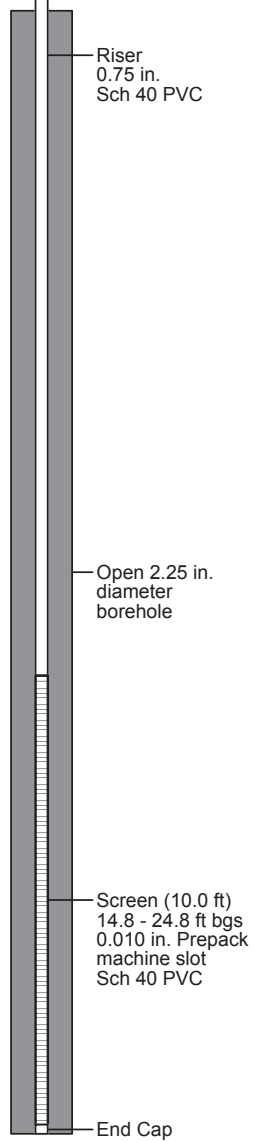
Site Name : Area 2
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 19.4
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Shaw Air Force Base

Start Date : 01/25/18
 End Date : 01/25/18
 Northing : 778794.81
 Easting : 2163433.83
 Surface Elev. (ft)* : 222.89
 Total Depth (ft)** : 25.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels		Measurements	
										▼ During Drilling		*North American Vertical Datum (NAVD88) feet (ft)	**Below Ground Surface (bgs) feet (ft)
0			(0.0 - 9.5) CLAYEY SAND, 2.5YR 3/6, dark red, sub-rounded, medium density, fine grained, no odor, damp	0				SS	SHAW02-001-SS-001 Note: Interval 0.0 - 0.5 ft				
1		100											
5			(9.5 - 12.3) CLAYEY SAND, 5YR 5/8, yellowish red, sub-rounded, medium density, fine grained, no odor, damp	0	SC								
2		68											
10			(12.3 - 19.4) SAND, poorly graded, 2.5YR 8/1, white, sub-rounded, very loose, fine grained, no odor, dry	0	SP								
3		54											
15			(19.4 - 25.0) SAND, poorly graded, 2.5YR 8/1, white, sub-round, very loose, fine grained, no odor, wet	0	SP				SHAW02-001-S0-018 Note: Interval 18.0 - 19.0 ft				
4		52											
20													
5		44											
25			End of Borehole 25.0 ft bgs	0									
30													





BORING LOG - SHAW02-002

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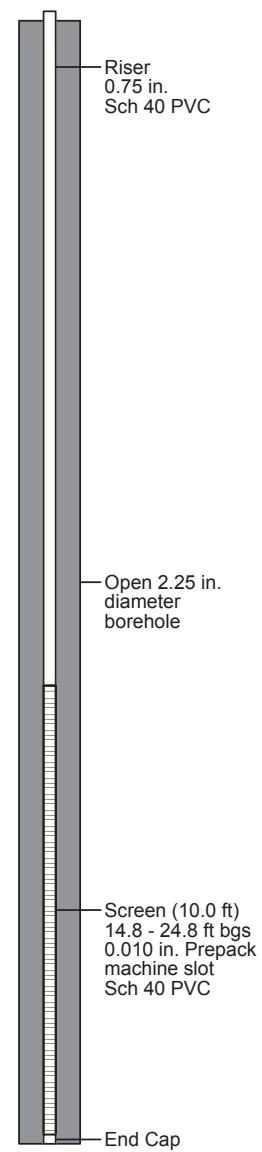
Site Name : Area 2
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 22.0
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Shaw Air Force Base

Start Date : 01/25/18
 End Date : 01/25/18
 Northing : 778843.56
 Easting : 2163512.41
 Surface Elev. (ft)* : 222.54
 Total Depth (ft)** : 25.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW02-002 Elev (TOC): 222.74
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)							
			DESCRIPTION								
0					0				SS	SHAW02-002-SS-001 Note: Interval 0.0 - 0.5 ft	
1		100		(0.0 - 9.0) CLAYEY SAND, 2.5YR 3/6, dark red, high density, fine grained, sub-rounded, poorly graded sand, no odor, damp							
5					0	SC					
2		66									
10				(9.0 - 13.9) CLAYEY SAND, 5YR 5/8, yellowish red, medium density, fine grained, sub-rounded, poorly graded sand, no odor, damp	0	SC					
3		54									
15				(13.9 - 22.0) SAND, poorly graded, 2.5YR 8/1, white, very loose, sub-rounded, fine grained, damp	0	SP					
4		46									
20					0				SO	SHAW02-002-SO-021 Note: Interval 21.0 - 22.0 ft	
5		42		(22.0 - 25.0) SAND, well graded, 2.5YR 7/1, light reddish gray, medium grained, sub-angular, loose, mild fuel odor, wet		SW					
18											
25	End of Borehole 25.0 ft bgs										
30											





BORING LOG - SHAW02-003

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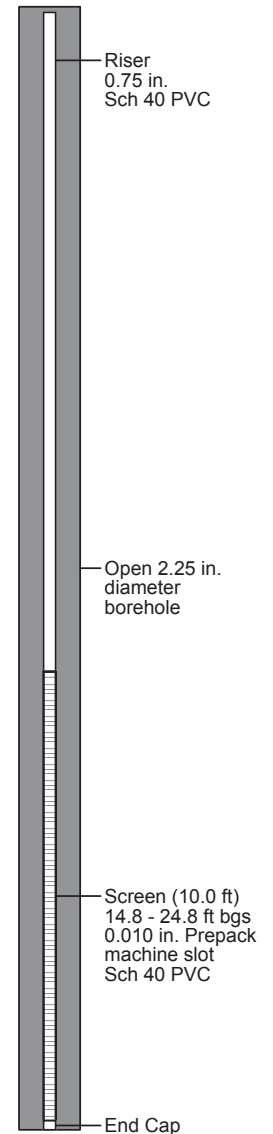
Site Name : Area 2
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 20.0
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Shaw Air Force Base

Start Date : 01/25/18
 End Date : 01/25/18
 Northing : 778735.26
 Easting : 2163484.49
 Surface Elev. (ft)* : 222.58
 Total Depth (ft)** : 25.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels		Measurements	
										▼ During Drilling		*North American Vertical Datum (NAVD88) feet (ft)	**Below Ground Surface (bgs) feet (ft)
0			(0.0 - 3.0) CLAYEY SAND, with small gravel, well graded, subangular, 5YR 4/6, yellowish red, medium density, no odor, damp		SC			SS	SHAW02-003-SS-001 Note: Interval 0.0 - 0.5 ft				
1		100											
5			(3 - 9.8) CLAYEY SAND, poorly graded, subrounded, dark red, 2.5YR 3/6, damp, no odor.	0	SC								
2		54											
10			(9.8 - 13.7) CLAYEY SAND, 5YR 5/8, dark red, medium density, fine grained, sub-rounded, poorly graded sand, no odor, damp	0	SC								
3		58											
15			(13.7 - 20.0) SAND, poorly graded, 2.5YR 8/1, white, very loose, sub-rounded, fine grained, damp	0	SP								
4		46											
20			(20.0 - 25.0) SAND, well graded, 2.5YR 7/1, light reddish gray, medium grained, sub-angular, loose, mild fuel odor, wet	0	SW			SO	SHAW02-003-S0-019 Note: Interval 19.0 - 20.0 ft				
5		60											
25	End of Borehole 25.0 ft bgs												
28													
30													





BORING LOG - SHAW03-001

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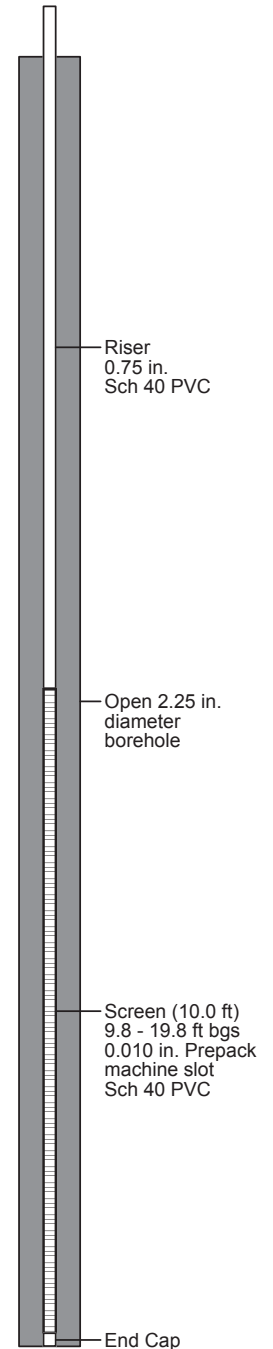
Site Name : Area 3
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 17.2
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 778989.58
 Easting : 2164878.31
 Surface Elev. (ft)* : 216.66
 Total Depth (ft)** : 20.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels		Measurements	
										▼ During Drilling		*North American Vertical Datum (NAVD88) feet (ft)	**Below Ground Surface (bgs) feet (ft)
0			(0.0 - 9.6) CLAYEY SAND, 2.5YR 3/3, dark reddish brown, loose, fine grained, sub-rounded, poorly graded sand, no odor, damp					SS	SHAW03-001-SS-001 Note: Interval 0.0 - 0.5 ft				
1		100											
5			(9.6 - 13.2) CLAYEY SAND, 5Y 2.5/1, black, loose, fine grained, sub-rounded, poorly graded sand, no odor, damp	0	SC								
2		48											
10			(13.2 - 17.2) SANDY LEAN CLAY, medium plasticity, 5Y 5/1, gray, medium stiff, sub-angular, medium grained sand, no odor damp	0	SC								
3		46											
15			(17.2 - 20.0) SAND, well graded, 5Y 8/2, pale yellow, sub-angular, medium grained, loose, no odor	0	CL				SHAW03-001-S0-016 Note: Interval 16.0 - 17.0 ft				
4		78											
20			End of Borehole 20.0 ft bgs	0	SW								

Temporary Well: SHAW03-001
 Elev (TOC): 218.40





BORING LOG - SHAW03-002

(Page 1 of 1)

Site Name : Area 3
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 18.0
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 779001.65
 Easting : 2164790.81
 Surface Elev. (ft)* : 216.36
 Total Depth (ft)** : 20.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW03-002 Elev (TOC): 217.93	
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)								
			DESCRIPTION									
0			(0.0 - 1.5) CLAYEY SAND, organic, 2.5YR 3/3, dusky red, sub-rounded, loose, poorly graded sand, no odor, damp									
1	100		(1.5 - 4.5) CLAYEY SAND, 2.5YR 4/8, red, sub-rounded, fine grained, poorly graded sand, loose, no odor, damp									
5			(4.5 - 9.3) CLAYEY SAND, 2.5YR 2.5/2, very dusky red, loose, sub-rounded, fine grained poorly graded sand, no odor, damp									
10			(9.3 - 13.4) CLAYEY SAND, 10YR 2/1, black, poorly graded, fine grained, subrounded, loose, no odor, damp									
15			(13.4 - 18.0) SANDY LEAN CLAY, medium plasticity, medium stiff, 5Y 5/1, gray, sub-angular, medium grained sand, well graded, damp									
18	68		(18.0 - 20.0) SAND, well graded, 2.5Y 7/2, light gray, sub-angular, medium grained, loose, no odor, wet									
20			End of Borehole 20.0 ft bgs									



BORING LOG - SHAW03-003

(Page 1 of 1)

Site Name : Area 3
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 17.5
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 779032.18
 Easting : 2164854.95
 Surface Elev. (ft)* : 216.50
 Total Depth (ft)** : 20.0

Shaw Air Force Base

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW03-003 Elev (TOC): 218.25	
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)								
			DESCRIPTION									
0			(0.0 - 2.5) CLAYEY SAND, 2.5YR 3/3, dark reddish brown, sub-rounded, fine grained, poorly graded sand, no odor, damp									<p>Riser 1.0 in. Sch 40 PVC</p> <p>Open 2.25 in. diameter borehole</p> <p>Screen (10.0 ft) 9.8 - 19.8 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC</p> <p>End Cap</p>
1	100		(2.5 - 3.0) SANDY CLAY, high plasticity, 2.5YR 3/3, dark reddish brown, medium stiff, fine grained poorly graded sand, mild odor, damp									
			(3.0 - 4.0) CLAYEY SAND, 2.5YR 5/8, red, loose, sub-rounded, fine grained poorly graded sand, fuel odor, damp									
5			(4.0 - 9.3) CLAYEY SAND, 5YR 3/2, dark reddish brown, loose, sub-rounded, fine grained poorly graded sand, fuel odor, damp									
2	50		(9.3 - 13.2) CLAYEY SAND, 10YR 3/2, very dark grayish brown, loose, sub-rounded, fine grained poorly graded sand, fuel odor									
10			(13.2 - 17.5) SANDY LEAN CLAY, medium plasticity, medium stiff, 5Y 5/1, gray, sub-angular, medium grained sand, well graded, damp									
3	72		(17.5 - 20.0) SAND, well graded, 2.5Y 7/2, light gray, sub-angular, medium grained, loose, fuel odor									
15			End of Borehole 20.0 ft bgs									
4	68											
20												



BORING LOG - SHAW04-001

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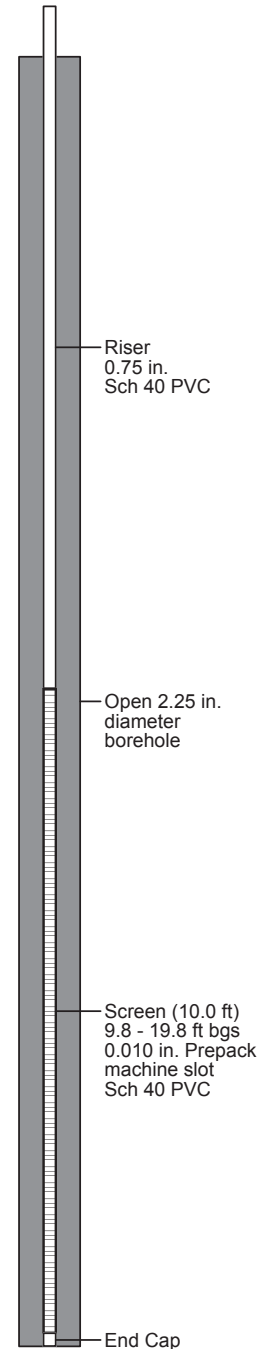
Site Name : Area 4
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 14.5
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 777900.03
 Easting : 2164211.39
 Surface Elev. (ft)* : 214.63
 Total Depth (ft)** : 20.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels		Measurements	
										▼ During Drilling		*North American Vertical Datum (NAVD88) feet (ft)	**Below Ground Surface (bgs) feet (ft)
0			(0.0 - 2.0) CLAYEY SAND, organic, low plasticity, 5YR 3/3, dark reddish brown, sub-rounded, fine grained, poorly graded sand, no odor, damp		SC			SS	SHAW04-001-SS-001 Note: Interval 0.0 - 0.5 ft				
1		100	(2.0 - 9.5) CLAYEY SAND, low plasticity, 7.5YR 5/8, strong brown, soft, sub-rounded, loose, poorly graded sand, soft, no odor, damp		SC								
5				0	SC								
10		76	(9.5 - 14.5) SAND, poorly graded, 7.5YR 6/8, reddish yellow, medium grained, loose, no odor, damp		SP								
15		48						SO	SHAW04-001-SO-013 Note: Interval 13.0 - 14.0 ft				
20		40	(14.5 - 20.0) SAND, poorly graded, 10YR 8/1, white, medium grained, sub-rounded, loose, no odor, wet		SP								
20			End of Borehole 20.0 ft bgs	0									

Temporary Well: SHAW04-001
 Elev (TOC): 217.42





BORING LOG - SHAW04-002

(Page 1 of 1)

Site Name : Area 4
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 14.5
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Shaw Air Force Base

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 777997.28
 Easting : 2164264.51
 Surface Elev. (ft)* : 214.72
 Total Depth (ft)** : 20.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW04-002 Elev (TOC): 217.14	
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)								
			DESCRIPTION									
0			(0.0 - 3.0) CLAYEY SAND, 5YR 5/8, yellowish red, sub-rounded, fine grained, poorly graded, no odor, damp									
1	100		(3.0 - 9.0) CLAYEY SAND, 7.5YR 5/8, strong brown, soft, sub-rounded, loose, poorly graded sand, soft, no odor, damp									
5			(9.0 - 14.5) SAND, poorly graded, 7.5YR 6/8, reddish yellow, medium grained, loose, no odor, damp									
10	76		(14.5 - 20.0) SAND, poorly graded, 10YR 8/1, white, medium grained, sub-rounded, loose, no odor, wet									
15			End of Borehole 20.0 ft bgs									
20	40											



BORING LOG - SHAW04-003

(Page 1 of 1)

Site Name : Area 4
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/29/18
 DTW During Drilling (ft) : 13.9
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/26/18
 End Date : 01/26/18
 Northing : 777929.60
 Easting : 2164311.15
 Surface Elev. (ft)* : 214.17
 Total Depth (ft)** : 20.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW04-003 Elev (TOC): 215.60
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)							
			DESCRIPTION								
0										SHAW04-003-SS-001 Note: Interval 0.0 - 0.5 ft	
1		100				SC					
5					0	SC					Riser 0.75 in. Sch 40 PVC
2		76				SC					
10					0	SC					Open 2.25 in. diameter borehole
3		54							SO	SHAW04-003-S0-013 Note: Interval 13.0 - 14.0 ft	
15					0	SP					Screen (10.0 ft) 9.8 - 19.8 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC
4		50				SP					
20					0	SP					End Cap
End of Borehole 20.0 ft bgs											



BORING LOG - SHAW05-001

(Page 1 of 1)

Site Name : Area 5
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : Not encountered
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Start Date : 01/30/18
 End Date : 01/30/18
 Northing : 780959.39
 Easting : 2159616.48
 Surface Elev. (ft)* : 252.61
 Total Depth (ft)** : 25.5

Shaw Air Force Base

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW05-001 Elev (TOC): 252.90	
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)								
			DESCRIPTION									
0			(0.0 - 2.0) CLAYEY GRAVEL with sand, 2.5YR 3/4, dark reddish brown, medium density, medium grained sand, sub-rounded, well graded, no odor, damp									
1		100	(2.0 - 13.2) CLAYEY SAND, 10YR 3/6, dark red, fine grained, sub-rounded, poorly graded sand, no odor									
5												
2		88										
10												
3		62										
15			(13.2 - 17.2) CLAYEY SAND, yellowish red, 5YR 5/8, poorly graded, fine grained, subrounded, loose, no odor, damp									
4		78										
20			(17.2 - 18.0) SAND, well graded, 7.5YR 8/3, pink, sub-rounded, loose, no odor, fine grained, damp									
5		86										
25			(18.0 - 22.0) CLAYEY SAND, 7.5YR 5/8, strong brown, medium density, sub-rounded, poorly graded sand, fine grained, no odor, damp									
			(22.5 - 25.5) SANDY LEAN CLAY, 2.5YR 8/3, pink, dense, stiff, sub-angular, poorly graded sand, no odor, damp									
End of Borehole 25.5 ft bgs												



BORING LOG - SHAW05-002

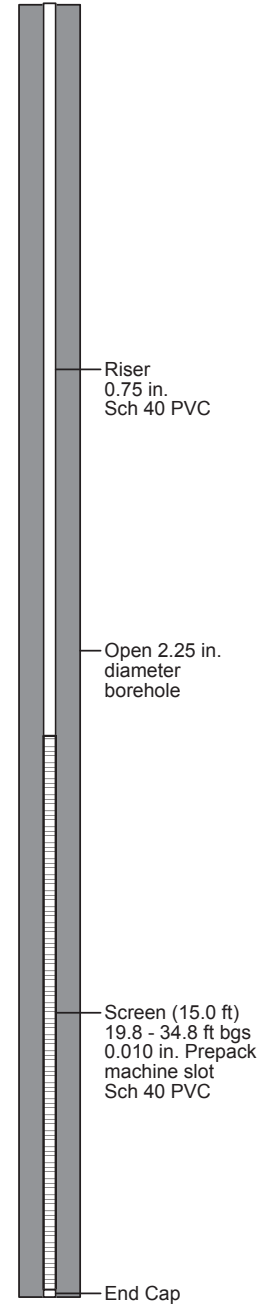
(Page 1 of 1)

Site Name : Area 5
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : Not Encountered
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/27/18
 End Date : 01/27/18
 Northing : 781102.62
 Easting : 2159828.92
 Surface Elev. (ft)* : 252.39
 Total Depth (ft)** : 35.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW05-002 Elev (TOC): 252.57
0			(0.0 - 2.5) CLAYEY GRAVEL with sand, 2.5YR 3/4, dark reddish brown, medium density, medium grained sand, sub-rounded, well graded, no odor, damp		GC			SS	SHAW05-002-SS-001 Note: Interval 0.0 - 0.5 ft	
1		100	(2.5 - 12.2) CLAYEY SAND, 10YR 3/6, dark red, medium density, fine grained, sub-rounded, poorly graded sand, no odor							
5				0						
2		74			SC					
10				0						
3		62	(12.2 - 17.2) SANDY LEAN CLAY, 7.5YR 5/6, strong brown, medium plasticity, medium stiff, medium density, fine grained, poorly graded sand, sub-rounded, no odor, damp		CL					
15				0						
4		92	(17.2 - 24.0) CLAYEY SAND, low plasticity, 7.5YR 5/6, strong brown, medium stiff, medium density, poorly graded sand, fine grained, sub-rounded, no odor, damp		SC					
20				0						
5		100								
25			(24.0 - 28.6) SANDY LEAN CLAY, medium plasticity, 7.5YR 6/1, gray, with 7.5YR 5/6, strong brown mottling, stiff, dense, poorly graded sand, fine grained, sub-angular, no odor, damp		CL					
6		94								
30			(28.6 - 32.0) CLAYEY SAND, 7.5YR 5/6, strong brown, medium density, fine grained, poorly graded sand, no odor, damp		SC					
7		98								
35			(32.0 - 35.0) SANDY LEAN CLAY, medium plasticity, 10YR 4/4, dark yellowish brown, stiff, dense, fine grained, poorly graded sand, no odor, damp		CL			SO	SHAW05-002-S0-024 Note: Interval 34.0 - 35.0 ft	
Refusal - End of Borehole 35.0 ft bgs										





BORING LOG - SHAW05-003

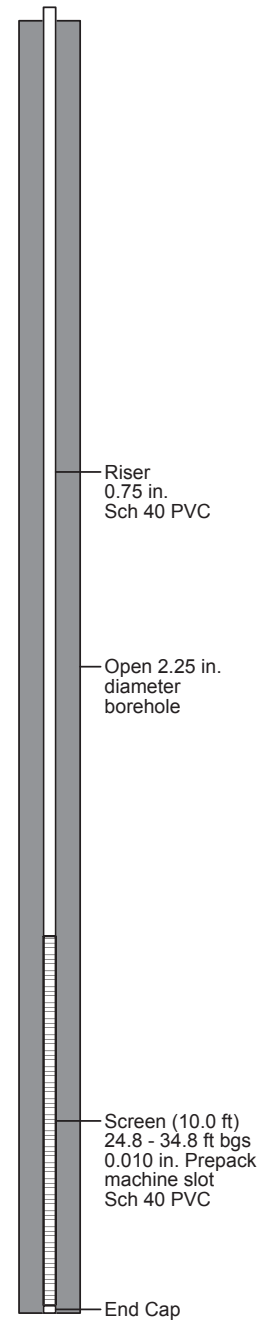
(Page 1 of 1)

Site Name : Area 5
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : 28.0
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/27/18
 End Date : 01/27/18
 Northing : 780574.38
 Easting : 2160392.04
 Surface Elev. (ft)* : 245.66
 Total Depth (ft)** : 35.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels ▼ During Drilling	Measurements *North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)	Temporary Well: SHAW05-003 Elev (TOC): 246.01
0			(0.0 - 2.8) CLAYEY SAND, 5YR 3/4, dark reddish brown, loose, medium density, medium grained sand, sub-rounded, poorly graded, no odor, damp		SC			SS	SHAW05-003-SS-001 Note: Interval 0.0 - 0.5 ft			
1		100	(2.8 - 15.3) CLAYEY SAND, 2.5Y 8/1, dark red, medium density, fine grained, sub-rounded, poorly graded sand, no odor		SC							
5				0								
2		72			SC							
10				0								
3		78			SC							
15			(15.3 - 19.2) CLAYEY SAND, 5YR 5/8, yellowish red, medium density, fine grained, poorly graded sand, dry	0								
4		64			SC							
20			(19.2 - 22.2) CLAYEY SAND, 7.5YR 6/8, reddish yellow, loose, fine grained, poorly graded sand, sub-rounded, medium density, no odor, damp	0								
5		86	(22.2 - 28.0) SAND, poorly graded, 2.5Y 8/1, white, fine grained, sub-angular, loose, no odor		SC							
25					SP							
6		56						SO	SHAW05-003-S0-027 Note: Interval 27.0 - 28.0 ft			
30			(28.0 - 35.0) CLAYEY SAND, 7.5YR 6/6, reddish yellow, medium grained, sub-angular, loose, poorly graded sand, no odor, wet		SC							
7		72										
35			End of Borehole 35.0 ft bgs									





BORING LOG - SHAW05-004

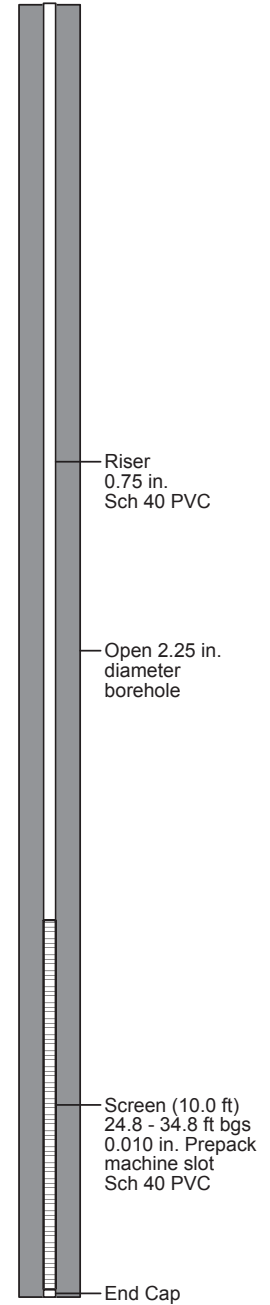
(Page 1 of 1)

Site Name : Area 5
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : 29.5
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/27/18
 End Date : 01/27/18
 Northing : 780489.45
 Easting : 2160336.72
 Surface Elev. (ft)* : 245.60
 Total Depth (ft)** : 35.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels ▼ During Drilling	Measurements *North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)	Temporary Well: SHAW05-004 Elev (TOC): 245.64
0			(0.0 - 14.2) CLAYEY SAND, 5YR 3/4 to 3/6, dark reddish brown to dark red, loose, medium density, medium grained sand, sub-rounded, poorly graded, no odor, damp					SS	SHAW05-004-SS-001 Note: Interval 0.0 - 0.5 ft			
1		100										
5				0								
2		72			SC							
10				0								
3		78										
15			(14.2 - 19.0) CLAYEY SAND, 5YR 5/8, yellowish red, medium density, fine grained, poorly graded sand, dry	0	SC							
4		64										
20			(19.0 - 23.0) CLAYEY SAND, 7.5YR 6/8, reddish yellow, loose, fine grained, poorly graded sand, sub-rounded, medium density, no odor, damp	0	SC							
5		86										
25			(23.0 - 28.5) SAND, poorly graded, 7.5YR 8/1, white, fine grained, sub-angular, soft, loose, no odor		SP							
6		56						SO	SHAW05-004-SO-028 Note: Interval 28.0 - 29.0 ft			
30			(28.5 - 29.5) CLAYEY SAND, 7.5YR 6/8, reddish yellow, medium grained, sub-angular, loose, poorly graded sand, no odor, damp		SC							
7		72	(29.5 - 35) CLAYEY SAND, 7.5YR 6/8, reddish yellow, medium grained, sub-angular, loose, well graded sand, no odor, wet		SC							
35			End of Borehole 35.0 ft bgs									





BORING LOG - SHAW06-001

(Page 1 of 1)

Site Name : Area 6
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : 29.2
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/24/18
 End Date : 01/25/18
 Northing : 776549.45
 Easting : 2154067.92
 Surface Elev. (ft)* : 307.48
 Total Depth (ft)** : 33.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Temporary Well: SHAW06-001 Elev (TOC): 310.44	
			▼ During Drilling	*North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)								
			DESCRIPTION									
0			(0.0 - 14.0) CLAYEY SAND, 2.5YR 4/6, red, soft, medium density, fine grained sand, sub-rounded, poorly graded, no odor, damp									<p>Riser 0.75 in. Sch 40 PVC</p> <p>Open 2.25 in. diameter borehole</p> <p>Screen (10.0 ft) 22.8 - 32.8 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC</p> <p>End Cap</p>
1	100											
5												
2	100											
10												
3	78											
15			(14.0 - 18.9) CLAYEY SAND, 2.5YR 4/6, red, angular, fine grained, poorly graded sand, dry									
4	84											
20			(18.9 - 22.8) CLAYEY SAND, 7.5YR 5/8, strong brown, fine grained, poorly graded sand, sub-angular, medium density, no odor									
5	50											
25			(22.8 - 29.2) CLAY, light gray, 10YR 7/2, sandy, medium plasticity, stiff, no odor									
6	78											
30			(29.2 - 33.0) SAND, poorly graded, 2.5Y 6/8, olive yellow, medium grained, sub-rounded, loose, no odor, wet									
7	52											
Refusal - End of Borehole 33.0 ft bgs												



BORING LOG - SHAW06-002

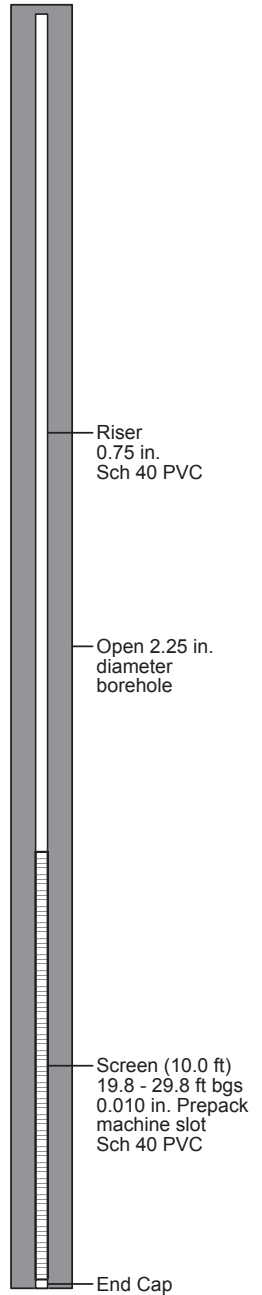
(Page 1 of 1)

Site Name : Area 6
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : 27.3
 Logged By : Jeremy Klein

AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001
 Shaw Air Force Base

Start Date : 01/23/18
 End Date : 01/23/18
 Northing : 776416.42
 Easting : 2154043.84
 Surface Elev. (ft)* : 305.62
 Total Depth (ft)** : 30.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels ▼ During Drilling	Measurements *North American Vertical Datum (NAVD88) feet (ft) **Below Ground Surface (bgs) feet (ft)	Temporary Well: SHAW06-002 Elev (TOC): 305.40
0			(0.0 - 5.0) CLAYEY SAND, 2.5YR 4/6, red, angular, well graded sand, medium density, loose, no odor,					SS	SHAW06-002-SS-001 Note: Interval 0.0 - 0.5 ft			
1		100			SC							
5			(5.0 - 13.2) CLAYEY SAND, 2.5YR 4/6, red, medium density, fine grained, well graded sand, dry	0								
2		100			SC							
10			(13.2 - 22.4) SILTY SAND, reddish yellow, 5YR 6/8, poorly graded, subangular, fine grained, no odor, dry	0								
3		82										
15			(22.4 - 23.6) CLAY, white 5YR 8/1 with 5Y 6/8 mottling, high plasticity, stiff, no odor, dry	0								
4		84			SM							
20			(23.6 - 24.1) CLAYEY SAND, yellowish red, 5YR 4/6, poorly graded, subangular, fine grained, loose, no odor, damp	0								
5		74			CH							
25			(24.1 - 25.0) CLAY, white, 5YR 8/1, with 5Y 6/8 mottling, high plasticity, stiff, very dense, no odor, dry	0								
6		84			SC							
30			(25 - 30) SAND, silty, strong brown, 7.5YR 5/8, poorly graded, medium grained, soft, no odor, loose, wet	0								
			End of Borehole 30.0 ft bgs						SHAW06-002-S0-026 Note: Interval 26.0 - 27.0 ft			





BORING LOG - SHAW06-003

(Page 1 of 1)

Site Name : Area 6
 Drilling Company : CASCADE
 Drilling Method : DPT
 Driller : Brian Thomas
 Borehole Diameter : 2.25 in.
 Boring Completion : Grouted to surface
 Abandonment Date : 01/31/18
 DTW During Drilling (ft) : 27.5
 Logged By : Jeremy Klein

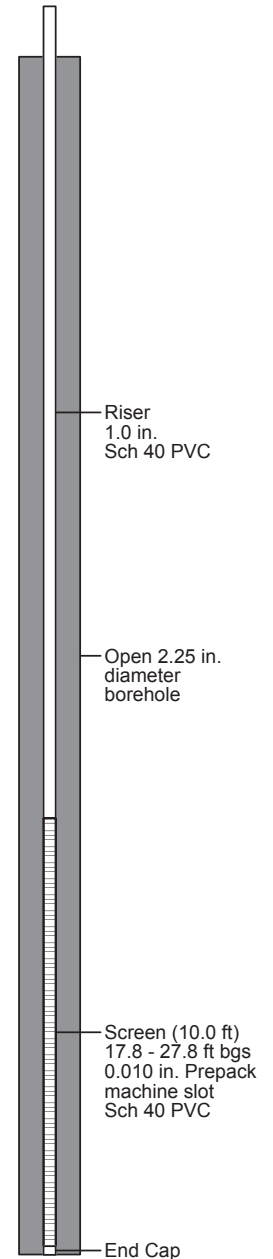
AFFF Areas (Savannah District)
 AFFF Site Inspection
 Project# M2032.0001

Shaw Air Force Base

Start Date : 01/23/18
 End Date : 01/23/18
 Northing : 776492.32
 Easting : 2153941.24
 Surface Elev. (ft)* : 304.15
 Total Depth (ft)** : 28.0

DEPTH IN FEET (bgs)	INTERVAL	% RECOVERY	DESCRIPTION	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Water Levels		Measurements	
										▼ During Drilling		*North American Vertical Datum (NAVD88) feet (ft)	**Below Ground Surface (bgs) feet (ft)
0			(0.0 - 2.0) CLAYEY SAND, 2.5YR 4/6, red, medium density, sub-rounded, loose, no odor, damp		SC			SS	SHAW06-003-SS-001 Note: Interval 0.0 - 0.5 ft				
1		100	(2.0 - 5.0) SILTY SAND, 5YR 5/6, yellowish red, sub-rounded, loose, no odor, damp		SM								
5			(5.0 - 18.7) CLAYEY SAND, 2.5YR 4/6, red, medium density, fine grained, poorly graded sand, dry	0									
2		100											
10				0	SC								
3		82											
15				0									
4		84											
20			(18.7 - 21.0) CLAYEY SAND, 7.5YR 5/6, strong brown with 7.5YR 8/2, pinkish white mottling, loose, fine grained, poorly graded sand, sub-rounded, medium density, no odor, damp	0	SC								
5		74	(21.0 - 23.7) SILTY SAND, red, 2.5YR 4/6, well graded, medium grained, subangular, no odor, damp		SM								
25			(23.7 - 28.0) SILTY SAND, 2.5Y 7/6, yellow, sub-angular, loose, no odor, wet		SM								
6		84						SO	SHAW06-003-S0-026 Note: Interval 26.0 - 27.0 ft				
End of Borehole 28.0 ft bgs													
30													

Temporary Well: SHAW06-003
 Elev (TOC): 307.09



WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 1
 Date: 1/23/18
 Sample Technician: J. Vojnic
 Well ID No: SHAW01-MW121A

Initial Measurements

Well Total Depth: <u>25.34'</u> # BTOC	Water Level: <u>15.91'</u> # BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = <u>(25.34 Ft - 15.91 Ft) x 0.163 gal/ft = 1.54 Gal</u>	
Calculated Well Volume: _____ Gallons	Well Diameter: <u>2</u> inches
Calculations:	1" diameter = 0.041 gal/ft 2" diameter = 0.163 gal/ft 4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): Monsoon Flow rate (incl. units): 1000 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
1152	1000	—	—	—	—	15.91	—	—	—	<u>Development Initiated.</u>
1156	1000	69.8	21.30	0.065	5.57	17.43	0.51	-83.20	1.056	
1200	1000	80.3	21.40	0.075	5.85	17.51	0.31	-49.40	2.112	
1205	1000	27.8	21.40	0.052	5.99	17.62	0.27	-61.0	3.44	
1208	1200	17.7	21.30	0.057	5.99	17.93	0.33	-58.7	4.39	
1213	1200	12.9	21.30	0.080	5.99	19.15	0.25	-74.7	5.98	
1217	1200	10.2	21.30	0.087	5.97	19.66	0.30	-79.9	7.25	
1219	1200	10.1	21.30	0.099	5.99	19.00	0.33	-80.7	7.984	<u>Well Developed</u>
<i>JV</i>										
Results At End Of Purging: <u>10.1</u> <u>21.30</u> <u>0.088</u> <u>5.99</u> <u>19.00</u> <u>0.33</u> <u>-80.7</u> <u>7.984</u>										

COMMENTS:
 7.7 gallons = 5 well volumes.
 0.264 gal per min
 0.217 gpm
 Well development complete after 5 well volumes & stable parameters.

WELL DEVELOPMENT LOG

Project Name: SI APFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: FORMER FIRE STATION TRAINING AREA 1 (APFF AREA 1)
 Date: 01/23/18
 Sample Technician: A. Willis / J. Vank
 Well ID No.: SHAW01-MW122A

Initial Measurements

Well Total Depth:	<u>27.09</u>	# BTOC	Water Level:	<u>16.23</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY					
(only fill out if applicable)	=	(<u>27.09</u> Ft - <u>16.23</u> Ft) x <u>0.163</u> gal/ft = <u>1.77</u> Gal			
Calculated Well Volume:	<u>1.77</u>	Gallons	Well Diameter:	<u>2.0</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft		2" diameter = 0.163 gal/ft		4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): Monsoon Flow rate (gpm, units): 1300-1600 gpm

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
1531	1300	—	—	—	—	16.20	—	—	—	Development initiated
1535	1400	181	21.0	0.133	5.33	18.63	1.34	-2.6	1.48	
1540	1600	18.0	20.8	0.140	5.40	18.62	0.93	-33.4	3.59	
1545	1600	20.2	20.8	0.141	5.45	18.62	0.90	-35.5	5.70	
1550	1600	20.455	20.7	0.138	5.45	18.62	0.85	-32.6	7.81	
1555	1600	1.30	20.7	0.137	5.44	18.63	0.82	-36.0	9.92	Developed

Results At End Of Purging: 1.30 20.7 0.137 5.44 18.63 0.82 -36.0 9.92

COMMENTS: 8.85 = 5 well volumes

Well developed after purging 5 well volumes and stable parameters.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASE Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 1
 Date: 1/23/18
 Sample Technician: J. Vojak
 Well ID No.: SHAW01-MW105

Initial Measurements

Well Total Depth: <u>21.88</u>	ft BTOC	Water Level: <u>13.75</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = <u>(21.88 Ft - 13.75ft) x .163 gal/ft = 1.33 Gal</u>			
Calculated Well Volume: <u>1.33</u>	Gallons	Well Diameter: <u>2</u>	inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): ~~peristaltic~~ PP Flow rate (incl. units): 680 mL/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
1544	680	—	—	—	—	13.75	—	—	—	Development initiated
1550	680	8.37	14.50	0.035	4.45	14.15	0.48	122.8	1.08	
1555	680	2.62	14.50	0.034	4.75	14.16	0.35	128.3	1.98	
1600	680	2.19	14.50	0.034	4.89	14.16	0.31	162.9	2.88	
1605	680	6.06	14.40	0.034	4.84	14.16	0.30	160.8	3.78	
1610	680	6.49	14.40	0.034	5.00	14.16	0.30	147.8	4.68	
1615	680	4.49	14.40	0.034	4.99	14.16	0.31	145.5	5.58	
1620	680	5.39	14.40	0.034	5.03	14.16	0.22	139.1	6.48	
1625	680	4.75	14.40	0.034	4.98	14.17	0.25	139.0	7.02	Development complete

Results At End Of Purging: 4.75 14.40 0.034 4.98 14.17 0.25 139.0 7.02

COMMENTS:
 0.18 gpm
 5 well volumes = 6.65 gal
 Development complete after 5 well volumes, stabilization reached.
 * Due to casing offset @ 210', newson pump was unable to reach development depth. To overcome this a pp was used to develop the well.

WELL DEVELOPMENT LOG

Project Name: SI AFFX MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 2
 Date: 1/26/18
 Sample Technician: J. Hojak
 Well ID No.: SHAW02-001

Initial Measurements

Well Total Depth: <u>24.68</u>	ft BTOC	Water Level: <u>18.30</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = <u>24.68</u> Ft - <u>18.30</u> Ft) x <u>0.041</u> gal/ft = <u>0.26</u> Gal			
Calculated Well Volume: <u>0.26</u>	Gallons	Well Diameter: <u>1"</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.853 gal/ft

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. units): 600 mL/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
0942	600	—	—	—	—	18.30	—	—	—	Development begins
0946	600	304	19.5	0.047	6.29	XX	4.17	-6.2	0.64	
0950	600	82.1	19.6	0.030	5.94	↓	5.05	47.9	1.28	
0953	600	35.0	19.7	0.025	5.74	↓	5.09	64.1	1.76	
0956	600	18.8	19.6	0.023	5.67	↓	5.18	77.2	2.24	
0959	600	13.8	19.7	0.021	5.47	↓	6.07	13.4	2.72	
1002	600	19.5	19.7	0.020	5.47	↓	6.24	99.8	3.2	
1005	600	9.06	19.8	0.020	5.38	↓	6.24	109.8	3.68	Development Complete
<i>JV</i>										

Results At End Of Purging: 9.06 19.8 0.020 5.38 XX 6.24 109.8 3.68

COMMENTS:
 Small volumes = 1.3 gal 0.16 gpm
 Development complete after purging over 5 well volumes & reaching stabilization
 **! Due to well casing diameter both water level meter & polyflow are unable to fit down hole. No DTW data available.

WELL DEVELOPMENT LOG

Project Name: SI AFFX MULTIPLE SITES (Savannah)
 ASI Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 2
 Date: 1/26/18
 Sample Technician: J. Vojak
 Well ID No.: SHAW02-002

Initial Measurements

Well Total Depth: <u>24.82</u>	ft BTOC	Water Level: <u>17.88</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable) = $(24.82 \text{ Ft} - 17.88 \text{ Ft}) \times 0.041 \text{ gal/ft} = 0.28 \text{ gal}$			
Calculated Well Volume: <u>0.28</u>	Gallons	Well Diameter: <u>1"</u>	inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. units): 640 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
1044	640	—	—	—	—	17.98	—	—	—	Development Begins
1046	640	1.00	19.9	0.050	5.89	17.98	3.13	-2.5	0.85	
1050	640	31.4	20.3	0.042	6.02	↓	1.72	-33.2	1.53	
1053	640	19.1	20.2	0.041	6.10	↓	1.48	-34.8	2.04	
1056	640	14.8	20.1	0.036	6.10	↓	1.42	-27.4	2.55	
1059	640	10.8	20.2	0.036	6.05	↓	1.42	-17.6	3.06	
1102	640	8.91	20.3	0.034	5.99	↓	1.41	-7.1	3.57	Development Complete

Results At End Of Purging: 8.91 20.3 0.034 5.99 ~~17.98~~ 1.41 -7.1 3.57

COMMENTS:
 Well volumes = 1.4 gal 0.17 gpm
 Development complete after purging over 5 well volumes & reaching stability parameters.
 **! Due to well casing diameter both water level meter & polyflow cannot fit down hole. No draw data available.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: FORMER FIRE TRAINING AREA - AFFF SITE 2
 Date: 1-26-18
 Sample Technician: A. Willis
 Well ID No.: SHAW02-003

Initial Measurements

Well Total Depth: <u>24.72</u> ft BTOC	Water Level: <u>17.92</u> ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = $(24.72 \text{ Ft} - 17.92 \text{ Ft}) \times 0.041 \text{ gal/ft} = 0.28 \text{ Gal}$	
Calculated Well Volume: <u>0.28</u> Gallons	Well Diameter: <u>1.0</u> inches
Calculations:	1" diameter = 0.041 gal/ft 2" diameter = 0.163 gal/ft 4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): Peristaltic Flow rate (incl. units): 400 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
0935	400	—	—	—	—	<u>X</u>	—	—	—	Development initiated
0940	400	393	19.6	0.147	6.80		1.05	-149.9	0.53	
0945	400	377	19.7	0.137	6.97		0.71	-165.0	1.06	
0950	400	297	20.0	0.137	6.90		0.77	-202.9	1.59	5 well volumes
0955	400	200	20.0	0.127	6.92		0.36	-222.9	2.12	
1000	400	122	20.0	0.120	6.90		0.32	-219.1	2.65	
1005	400	93.3	20.0	0.119	6.90		0.31	-217.8	3.19	
1010	400	65.5	20.1	0.119	6.89		0.30	-213.8	3.78	
1015	400	53.6	20.2	0.118	6.87		0.31	-210.3	4.23	
1020	400	50.6	20.2	0.118	6.85		0.29	-210.2	4.76	
1025	400	37.3	20.2	0.117	6.83		0.27	-200.3	5.23	
1030	400	32.4	20.2	0.117	6.82	↓	0.25	-200.2	5.82	well developed
Results At End Of Purging:		<u>XX</u>	<u>20.2</u>	<u>0.117</u>	<u>6.82</u>	<u>X</u>	<u>0.25</u>	<u>-200.2</u>	<u>5.82</u>	

COMMENTS:
 * Due to size of well, both WLM and tubing could not fit - no WL data recorded during development.
 ** Turbidity remaining high after purging 5.82 gal.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 3
 Date: 1/27/18
 Sample Technician: J. Uojak
 Well ID No.: SHAW03-001

Initial Measurements

Well Total Depth: <u>21.71</u>	# BTOC	Water Level: <u>15.62</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable) = (<u>21.71</u> Ft. - <u>15.62</u> Ft) x <u>0.041</u> gal/ft = <u>0.25</u> Gal			
Calculated Well Volume: <u>0.25</u>	Gallons	Well Diameter: <u>1"</u>	Inches
Calculations: 1" diameter = 0.041 gal/ft 2" diameter = 0.163 gal/ft 4" diameter = 0.653 gal/ft			

Well Purging Activities

Purging Method (pump type): PP Flow rate (vol. units): 800 mL/min

Time	Flow Rate (mL/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/Cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
1045	800	—	—	—	—	15.62	—	—	—	Development Begins
1050	800	135	19.6	0.121	5.83	15.62	1.17	24.6	1.05	
1054	800	74.5	19.8	0.117	5.94	↓	0.47	5.6	1.89	
1058	800	58.5	19.9	0.114	5.92	↓	0.39	1.9	2.73	
1103	800	28.5	19.9	0.112	5.91	↓	0.32	-0.5	3.78	
1107	800	17.8	19.9	0.110	5.86	↓	0.26	1.6	4.62	
1110	800	19.7	19.9	0.109	5.86	↓	0.24	0.5	5.25	
1113	800	19.4	19.8	0.109	5.86	↓	0.25	0.4	5.98	Development Complete

Results At End Of Purging: 18.4 19.8 0.109 5.96 ~~5.86~~ 0.25 0.4 5.98

COMMENTS:
 Well volumes = 1.25 gal @ 0.215 gpm
 Development complete after purging over 5 well volumes & reaching stabilization.
 * Due to well casing diameter both water level meter & polyflow could not fit down hole. No DTW data available.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASI Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 3
 Date: 1/27/18
 Sample Technician: J. Ujail
 Well ID No.: SHAW03-002

Initial Measurements

Well Total Depth: <u>21.55</u>	ft BTOC	Water Level: <u>14.60</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable) = (<u>21.55</u> Ft - <u>14.60</u> Ft) x <u>0.041</u> gal/ft = <u>0.28</u> Gal			
Calculated Well Volume: <u>0.28</u>	Galons	Well Diameter: <u>1"</u>	inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. units): 600 mL/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
0940	600	—	—	—	—	14.60	—	—	—	Development
0944	600	over	14.1	0.112	5.83	14.60	2.36	-17.3	0.64	Begin 5
0949	600	487	14.4	0.075	5.81	↓	1.20	-47.0	1.44	
0954	600	203	14.7	0.061	5.74		0.43	-32.6	2.24	
0958	600	112	14.6	0.056	5.68		0.67	-27.8	3.04	
1004	600	50.5	14.8	0.053	5.64		0.55	-21.0	3.84	
1009	600	27.1	14.6	0.052	5.59		0.46	-15.6	4.64	
1012	600	20.0	14.6	0.051	5.57	0.47	-12.2	5.12		
1015	600	11.6	14.6	0.050	5.56	0.48	-9.3	5.6		
1019	600	7.72	14.6	0.050	5.56	0.48	-8.5	6.08	Development Complete	

Results At End Of Purging: 7.72 14.6 0.050 5.56 0.48 -8.5 6.08

COMMENTS:
 0.16 gpm, 5 well volumes = 1.6 gal
 Development complete after purging over 5 well volumes & reaching stable parameters.
 Due to well casing diameter both water level meter & probe flow could not fit down hole. No RTW data available.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: FORMER FIRE TRAINING AREA - AFFF SITE 3
 Date: 01-27-18
 Sample Technician: A Willis
 Well ID No.: SHAW03-003

Initial Measurements

Well Total Depth:	<u>21.17</u>	# BTOC	Water Level:	<u>15.23</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY					
(only fill out if applicable) = $(21.17 \text{ Ft} - 15.23 \text{ Ft}) \times 0.041 \text{ gal/ft} = 0.24 \text{ Gal}$					
Calculated Well Volume:	<u>0.24</u>	Gallons	Well Diameter:	<u>1.0</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft		2" diameter = 0.163 gal/ft		4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): peristaltic Flow rate (incl. units): 550 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
0937	550	—	—	—	—	X	—	—	—	Development initiated
0945	550	over range	19.0	0.181	6.42	↓	1.29	-20.0	0.92	
0950	550	277	19.9	0.176	6.16	↓	0.54	-64.4	1.65	5 < well volume
0955	550	270	20.0	0.177	6.12	↓	0.50	-64.7	2.35	
1005	550	38.5	20.0	0.175	6.11	↓	0.50	-70.6	3.8	
1010	550	23.2	20.0	0.172	6.10	↓	0.49	-67.4	4.5	
1015	550	19.9	20.0	0.171	6.10	↓	0.47	-67.6	5.2	Developed

Results At End Of Purging: 19.9 20.0 0.171 6.10 X 0.47 -67.6 5.2

COMMENTS: * Due to size of well, both well and tubing could not fit - no WL data recorded during development.
 Developed after purging to 2x well volume w/ stable parameters and NTUs > 20.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 3
 Date: 1/24/18
 Sample Technician: J. Vojak / A. Williams
 Well ID No.: SHAW03-FT3MWS

Initial Measurements

Well Total Depth: <u>18.21</u>	ft BTOC	Water Level: <u>15.15</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable)	=	(<u>18.21</u> Ft - <u>15.15</u> Ft) x <u>0.163</u> gal/ft = <u>0.50</u> Gal	
Calculated Well Volume: <u>0.50</u>	Gallons	Well Diameter: <u>2</u>	inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): Manual Flow rate (incl. units): 1000 mL/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/Cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
1511	1000	—	—	—	—	—	—	—	—	Development begins
1517	1000	65.8	18.6	0.030	4.49	15.93	3.35	290.0	1.58	
1520	1000	143	18.7	0.031	4.38	15.94	3.04	312.3	2.372	
1523	1000	33.4	19.1	0.033	4.39	16.08	2.27	325.1	3.164	> 5 well volumes
1526	1000	33.3	19.0	0.033	4.33	16.70	2.19	340.8	3.96	
1528	1000	26.9	19.0	0.034	4.36	16.70	2.32	348.9	4.49	
1533	1000	29.3	19.1	0.035	4.30	16.72	1.90	353.1	5.81	
1536	1000	28.3	19.0	0.035	4.37	16.72	1.96	348.5	6.60	
1540	1000	27.5	19.0	0.036	4.33	16.72	2.27	344.2	7.66	
1544	1000	143	19.0	0.036	4.39	15.68	2.06	345.5	8.72	Development Complete.

Results At End Of Purging: 143 19.0 0.036 4.39 15.68 2.06 345.5 8.72

COMMENTS:

Well volumes = 2.5 gal. 0.264 gpm
 After extensive development & stable parameters turbidity was unable to fall below 20 NTU threshold.

WELL DEVELOPMENT LOG

Project Name: SI AFFE MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Current Fire Station Area - AFFF site 4
 Date: 1-27-18
 Sample Technician: A. Willis
 Well ID No.: SHAW04-001

Initial Measurements

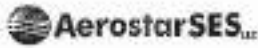
Well Total Depth:	<u>22.52</u> ft BTOC	Water Level:	<u>14.22</u> ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = $(22.52 \text{ Ft} - 14.22 \text{ Ft}) \times 0.041 \text{ gal/ft} = 0.34 \text{ gal}$			
Calculated Well Volume:	<u>0.34</u> Gallons	Well Diameter:	<u>1.0</u> Inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.853 gal/ft

Well Purging Activities

Purging Method (pump type): Peristaltic Flow rate (incl. units): 500 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (µS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments	
1104	500	—	—	—	—	*	—	—	—	Development initiated	
1114	500 600	900	18.2	0.048	5.85	↓	3.77	71.2	1.32	5 well volumes	
1120	500	203	18.5	0.042	5.66		3.63	72.9	2.11		
1125	500	74.2	18.7	0.040	5.63		3.68	87.0	2.77		
1130	500	45.3	18.7	0.038	5.52		3.69	90.0	3.43		
1134	500	46.4	18.7	0.038	5.53		3.65	89.3	4.09		
1140	500	44.4	18.8	0.036	5.53		3.67	90.2	4.75		
1145	500	41.0	18.8	0.036	5.52		3.70	91.7	5.41		
1150	500	36.8	18.8	0.036	5.52		3.69	93.2	6.07		
1155	500	31.7	18.8	0.035	5.53		3.70	95.8	6.93		Developed
Results At End Of Purging:											
		31.7	18.8	0.035	5.53	*	3.70	95.8	6.73		

COMMENTS: * Due to size of well, both well and tubing could not fit - no WL data recorded during development
 Developed after purging ~ 19.79 well volumes w/ stable parameter. NTUs coming down too slowly - we are on time restraint. Area is silty clay.



WELL DEVELOPMENT LOG

Project Name: SI AFFX MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 4
 Date: 1/26/18
 Sample Technician: J. Vojak
 Well ID No.: SHAW04-002

Initial Measurements

Well Total Depth: <u>22.02</u>	# BTCC	Water Level: <u>13.69</u>	# BTCC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTCC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = $(22.02 \text{ Ft} - 13.69 \text{ Ft}) \times 0.041 \text{ gal/ft} = 0.34 \text{ Gal}$			
Calculated Well Volume: <u>0.34</u>	Gallons	Well Diameter: <u>1"</u>	inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. units): 400 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTCC)	DO (mg/l)	ORP	Total Gal Pumped	Comments	
1634	400	—	—	—	—	13.69	—	—	—	Development Begins	
1637	400	Overrange	18.0	0.082	5.87	**	4.15	69.7	0.53		
1643	400	939	18.3	0.075	5.66	↓	3.69	65.6	0.15		
1648	400	713	18.4	0.071	5.59	↓	3.92	77.8	1.48		
1853	400	614	18.2	0.069	5.58	↓	4.17	85.0	2.01		
1858	400	569	19.3	0.067	5.52	↓	4.29	93.3	2.54		
1903	400	536	18.3	0.066	5.40	↓	4.36	104.7	3.07		
1708	400	474	18.3	0.065	5.42	↓	4.44	106.5	3.60		
1713	400	475	18.3	0.064	5.42	↓	4.35	110.4	4.13		
1718	400	427	18.2	0.064	5.42	↓	4.47	112.4	4.66		
1723	400	398	18.2	0.063	5.37	↓	4.39	119.1	5.19		
JV											

Results At End Of Purging: 398 18.2 0.063 5.37 ** 4.39 118.1 5.19

COMMENTS:
 0.106 gpm Well volumes = 1.7 gal
 ** Due to well casing diameter both water level meter & polyflow are unable to fit downhole. No DTH data available.
 Per Ash Willis call development @ 1723 due to lack of NTU reduction after extensive well volume purge.

TM 1/27/18

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASI Project No: M2032.0001
 Installation: Shaw AFB
 Site: Current Fire Station TRAINING AREA - AFFF SITE 4
 Date: 1-26-18
 Sample Technician: A. Willis
 Well ID No.: SHAW04-003

Initial Measurements

Well Total Depth:	<u>29.29</u>	# BTOC	Water Level:	<u>12.62</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - BTOC - STATIC DEPTH TO WATER) X WELL CAPACIT					
(only fill out if applicable) - <u>(29.29 Ft - 12.62 Ft) x 0.041 gal/ft = 0.36 Gal</u>					
Calculated Well Volume:	<u>0.36</u>	Gallons	Well Diameter:	<u>1.0</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft		2" diameter = 0.163 gal/ft		4" diameter = 0.653 gal/ft

Well Purgng Activities

Purgng Method (pump type): Peristaltic Flow rate (incl. units): _____

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
<u>1625</u>	<u>500</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>*</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>Development initiated</u>
<u>1630</u>	<u>500</u>	<u>over range</u>	<u>17.9</u>	<u>0.081</u>	<u>6.16</u>	<u>—</u>	<u>4.75</u>	<u>107.8</u>	<u>0.58</u>	
<u>1635</u>	<u>500</u>	<u>989</u>	<u>18.3</u>	<u>0.056</u>	<u>5.61</u>	<u>—</u>	<u>5.13</u>	<u>92.9</u>	<u>1.18</u>	
<u>1640</u>	<u>500</u>	<u>717</u>	<u>18.3</u>	<u>0.053</u>	<u>5.55</u>	<u>—</u>	<u>5.15</u>	<u>118.6</u>	<u>1.84</u>	<u>5 well volumes</u>
<u>1650</u>	<u>500</u>	<u>397</u>	<u>18.3</u>	<u>0.050</u>	<u>5.52</u>	<u>—</u>	<u>5.70</u>	<u>132.1</u>	<u>3.16</u>	
<u>1700</u>	<u>500</u>	<u>288</u>	<u>18.3</u>	<u>0.050</u>	<u>5.50</u>	<u>—</u>	<u>5.71</u>	<u>140.6</u>	<u>4.48</u>	
<u>1710</u>	<u>500</u>	<u>266</u>	<u>18.3</u>	<u>0.051</u>	<u>5.49</u>	<u>—</u>	<u>5.70</u>	<u>147.1</u>	<u>5.8</u>	
<u>1720</u>	<u>500</u>	<u>200</u>	<u>18.3</u>	<u>0.050</u>	<u>5.48</u>	<u>—</u>	<u>5.70</u>	<u>155.0</u>	<u>7.12</u>	<u>** Developed</u>
<hr/>										
Results At End Of Purgng: <u>200</u> <u>18.3</u> <u>0.050</u> <u>5.48</u> <u>*</u> <u>5.70</u> <u>155.0</u> <u>7.12</u>										

COMMENTS: * Due to size of well, both bailer and tubing could not fit - no well data recorded during development
 ** Developed after purging 20 well volumes. NTUs not coming down

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)

ASL Project No: M2032.0001

Installation: Shaw AFB

Site: Building 1611 - AFFF Site 5

Date: 1/30/2018

Sample Technician: A. Willis/J. Klein

Well ID No.: SHAW05-001

Initial Measurements

Well Total Depth:	# BTOC	Water Level: <u>DRY</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable)	=	(Ft. - Ft.) x gal/ft	Gal
Calculated Well Volume:	Galons	Well Diameter:	Inches
Calculated @:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.853 gal/ft

Well Purging Activities

Purging Method (pump type): _____ Flow rate (incl. units): _____

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
Results At End Of Purging:										

COMMENTS:

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 5
 Date: 1/27/18
 Sample Technician: J. Volak
 Well ID No.: SHAW05-002

Initial Measurements

Well Total Depth: <u>35.09</u>	# BTOC	Water Level: <u>31.81</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STARTG DEPTH TO WATER) X WELL CAPACIT			
(only fill out if applicable) = <u>(35.09 Ft - 31.8(Ft)) x 0.041 gal/Ft = 0.13 Gal</u>			
Calculated Well Volume: <u>0.13</u>	Galons	Well Diameter: <u>1"</u>	inches
Calculations:	1" diameter = 0.041 gal/Ft	2" diameter = 0.163 gal/Ft	4" diameter = 0.653 gal/Ft

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. units): _____

Time	Flow Rate (ml/min)	Turbidity (NTU)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
<p>Due to depth of water which exceeds peristaltic capabilities, this will be a grab sample. <i>(Signature)</i> see grab sheet</p>										
Results At End Of Purging:										

COMMENTS:
Well volumes = 0.65 gal

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 5
 Date: 1/27/18
 Sample Technician: J. Vojak
 Well ID No.: SHAW05-003

Initial Measurements

Well Total Depth: <u>35.10</u>	# BTOC	Water Level: <u>28.40</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = <u>(35.10 Ft - 28.40 Ft) X 0.041 gal/ft = 0.27 Gal</u>			
Calculated Well Volume: <u>0.27</u>	Gallons	Well Diameter: <u>1"</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft	4" diameter = 0.653 gal/ft

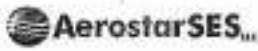
Well Purging Activities

Purging Method (pump type): PP Flow rate (gall. units): 400 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	DRP	Total Gal Pumped	Comments
1316	400	-	-	-	-	28.40	-	-	-	Development Begins
1322	400	404	22.5	0.105	5.76	28.40	4.25	62.9	0.64	
1327	400	64.1	22.5	0.095	5.69		3.05	62.9	0.17	
1332	400	30.8	22.5	0.083	5.64		3.33	75.2	1.7	
1335	400	24.3	22.5	0.078	5.57		3.85	84.7	2.02	
1338	400	19.9	22.4	0.076	5.52		3.99	92.2	2.39	
1341	400	17.9	22.3	0.073	5.52		3.99	94.3	2.67	
1344	400	17.6	22.3	0.072	5.47	↓	4.13	102.9	2.99	Development Complete
JV										

Results At End Of Purging: 17.6 22.3 0.072 5.47 4.13 102.9 2.99

COMMENTS:
 Well volumes = 1.35 gal 0.106 spm
 Development complete after purging over 5 well volumes & reaching stabilization
 * Due to well casing diameter both water level meter & polyflow cannot fit downhole. No BTOC data available.



WELL DEVELOPMENT LOG

Project Name: SI AFFX MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: BUILDING 1511 - AFFX SITE 5
 Date: 1-27-18
 Sample Technician: A. Willis
 Well ID No.: SHAW05-004

Initial Measurements

Well Total Depth:	<u>34.84</u>	ft BTOC	Water Level:	<u>27.97</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = <u>(34.84 Ft - 27.97 Ft) x 0.041 gal/ft = 0.28 Gal</u>					
Calculated Well Volume:	<u>0.28</u>	Gallons	Well Diameter:	<u>1.0</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft		2" diameter = 0.163 gal/ft		4" diameter = 0.853 gal/ft

Well Purging Activities

Purging Method (pump type): Peristaltic Flow rate (incl. units): 5.50 mL/min

Time	Flow Rate (mL/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
<u>1330</u>	<u>5.50</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>4</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>Development initiated</u>
<u>1345</u>	<u>5.50</u>	<u>over range</u>	<u>21.7</u>	<u>0.050</u>	<u>5.55</u>	<u>1</u>	<u>4.61</u>	<u>194.4</u>	<u>2.18</u>	<u>5 < well volume</u>
<u>1350</u>	<u>5.50</u>	<u>19.4</u>	<u>21.9</u>	<u>0.045</u>	<u>5.22</u>	<u>1</u>	<u>4.99</u>	<u>160.5</u>	<u>2.91</u>	
<u>1353</u>	<u>5.50</u>	<u>10.0</u>	<u>22.0</u>	<u>0.046</u>	<u>5.21</u>	<u>1</u>	<u>5.00</u>	<u>165.9</u>	<u>3.35</u>	
<u>1356</u>	<u>5.50</u>	<u>5.70</u>	<u>21.9</u>	<u>0.046</u>	<u>5.20</u>	<u>1</u>	<u>5.02</u>	<u>165.2</u>	<u>3.79</u>	<u>Developed</u>
Results At End Of Purging:		<u>5.70</u>	<u>21.9</u>	<u>0.046</u>	<u>5.20</u>	<u>1</u>	<u>5.02</u>	<u>165.2</u>	<u>3.75</u>	

COMMENTS: * Due to size of well, both WELM and testing could not fit - NO WELDATA recorded during development.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 6
 Date: 1/24/18
 Sample Technician: J. Wojcik / A. W. His
 Well ID No.: SHAW06-001

Initial Measurements

Well Total Depth: <u>34.90</u>	ft BTOC	Water Level: <u>30.75</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable) = $(34.90 \text{ Ft} - 30.75 \text{ Ft}) \times 0.041 \text{ gal/ft} = 0.17 \text{ Gal}$			
Calculated Well Volume: <u>0.17</u>	Gallons	Well Diameter: <u>1</u>	inches
Calculations: 1" diameter = 0.041 gal/ft 2" diameter = 0.163 gal/ft 4" diameter = 0.653 gal/ft			

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. units): 250 mL/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments	
1220	250	—	—	—	—	4.50	—	—	—	Development Begins	
1227	250	414	20.6	0.319	4.50	↓	3.68	2245	0.462		
1230	250	226	20.5	0.318	4.26		3.70	252.3	0.66		
1235	250	154	20.4	0.315	4.16		2.97	261.1	0.99		
1240	250	107	20.2	0.314	4.12		2.90	273.8	1.32		
1245	250	78.4	20.3	0.315	4.07		3.14	278.1	1.65		
1250	250	61.5	20.2	0.315	4.06		3.26	281.0	1.98		
1255	250	45	20.1	0.315	4.05		3.34	2826	2.31		
1300	250	34.7	20.1	0.315	4.03		3.31	2849	2.64		
1305	250	29	19.9	0.313	4.02		3.53	2854	2.97		
1310	250	27.8	19.9	0.314	4.02		3.37	2861	3.3		
1315	250	19.5	20.1	0.315	4.01		3.52	2866	3.63	Development Complete	
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> JW </div>											
Results At End Of Purging:		19.5	20.1	0.315	4.01		4.01	3.52	2866	3.63	

COMMENTS:
 5 well volumes = 0.85 gallons, 0.066 gpm
 * Due to well casing diameter both water level meter & polyflow are unable to fit downhole

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: Area 6
 Date: 1/24/18
 Sample Technician: J. Vojak
 Well ID No.: SHAW06-002

Initial Measurements

Well Total Depth: <u>29.76</u>	ft BTOC	Water Level: <u>25.25</u>	ft BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY			
(only fill out if applicable) = (<u>29.76</u> Ft - <u>25.25</u> Ft) x <u>0.041</u> gal/ft = <u>0.18</u> gal			
Calculated Well Volume: <u>0.18</u>	Gallons	Well Diameter: <u>1</u>	Inches
Calculations:		1" diameter = 0.041 gal/ft	2" diameter = 0.163 gal/ft
		4" diameter = 0.653 gal/ft	

Well Purging Activities

Purging Method (pump type): PP Flow rate (incl. unbr): 400 mL/min

Time	Flow Rate (m³/min)	Turbidity (NTUs)	Temp (°C)	Cond. (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments	
1058	400	—	—	—	—	##	—	—	—	Development Initiated	
1102	400	44.3	20.0	0.226	4.68	↓	4.75	189.9	0.424		
1105	400	230	20.4	0.227	4.24	↓	4.22	181.2	0.712		
1109	400	50.9	20.4	0.222	4.59	↓	4.31	193.1	1.166		
1112	400	7.55	20.2	0.207	4.57	↓	4.10	176.1	1.494		
1115	400	35.8	20.0	0.202	4.54	↓	4.21	172.9	1.802		
1118	400	6.90	20.1	0.201	4.52	↓	4.59	173.0	2.12		
1121	400	3.23	20.0	0.200	4.49	↓	4.89	175.2	2.479		
1124	400	2.28	20.1	0.199	4.48	↓	4.96	175.9	2.756		Development Complete
JV											

Results At End Of Purging: 2.28 20.1 0.199 4.48 ~~##~~ 4.96 175.9 2.756

COMMENTS:
 5 well volumes = 0.9 gal 0.106 gal
 ##! Due to well diameter size both (water level) & polyflow cannot fit downhole. No OTW data available.

WELL DEVELOPMENT LOG

Project Name: SI AFFF MULTIPLE SITES (Savannah)
 ASL Project No: M2032.0001
 Installation: Shaw AFB
 Site: WASTE WATER TREATMENT PLANT - AFFF SITE 6
 Date: 01-24-18
 Sample Technician: A. WITH
 Well ID No.: SHAW06-003

Initial Measurements

Well Total Depth:	<u>28.85</u>	# BTOC	Water Level:	<u>26.88</u>	# BTOC
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY					
(only fill out if applicable) = <u>(28.85 Ft - 26.88 Ft) x 0.041 gal/ft = 0.08 Gal</u>					
Calculated Well Volume:	<u>0.08</u>	Gallons	Well Diameter:	<u>2.0"</u>	Inches
Calculations:	1" diameter = 0.041 gal/ft		2" diameter = 0.163 gal/ft		4" diameter = 0.653 gal/ft

Well Purging Activities

Purging Method (pump type): Peristaltic Flow rate (incl. units): 400 ml/min

Time	Flow Rate (ml/min)	Turbidity (NTUs)	Temp (°C)	Cond (mS/cm)	pH	Depth to water (BTOC)	DO (mg/l)	ORP	Total Gal Pumped	Comments
0913	400	—	—	—	—	X	—	—	—	Development initiated
0922	400	50.6	20.0	0.166	5.26	↓	3.16	28.9	0.951	5 Well volumes
0930	400	27.8	20.0	0.152	5.20	↓	3.53	27.5	1.792	
0938	400	15.7	20.0	0.150	5.19	↓	3.70	32.9	2.63	Well developed

Results At End Of Purging: 15.7 20.0 0.150 5.19 X 3.70 32.9 2.63

COMMENTS: X Due to size of well, both tubing and WLM could not fit - NO WL Data recorded during development.

[Signature] 1/27/18



GROUNDWATER SAMPLING LOG

Location: 2000001 Shaw AFB
 Well ID: SHAW01-MW105 Sample ID: SHAW01-MW105-GW-019 Date: 1-25-18

PURGING DATA

WELL: 2.0" TUBING: 1/4" WELL COVER/STAGNANT DEPTH: 21.88 m - 11.78 m STATIC DEPTH TO WATER (TO WATER SURFACE): 13.75 PURGE PUMP TYPE: Peristaltic
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - BLOC - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if not applicable) $\cdot 1 \cdot 21.88 \text{ m} - 13.75 \text{ m} \cdot 0.16 \text{ m}^3 = 1.30 \text{ m}^3$

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if not applicable) $\cdot 0 \text{ m}^3 - (0.0026 \cdot 19 \text{ m}) + 0.10 \text{ m}^3 = 0 \text{ m}^3$

TOTAL PUMP ON TUBING DEPTH IN WELL (m): 19 PUMP ON TUBING DEPTH IN WELL (m): 19 PURGING METHOD AT: 0258 PURGING METHOD AT: 0155 TOTAL VOLUME PURGED (gallons): 2.31

DATE	STARTING PERIOD (min)	ORNL VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (m)	pH (approx)	TEMP (°C)	COND (µmhos)	DISSOLVED OXYGEN (mg/L)	OSP (psi)	TURBIDITY (NTU)	COLOR (PCU)	DIRTY
0128	—	—	0.045	17.75	—	—	—	—	—	—	—	—
0132	0.34	0.34	0.095	14.88	5.12	17.2	0.032	1.32	138.4	3.51	UR	Pat
0137	0.43	0.77	0.085	14.05	4.80	17.4	0.032	2.16	144.6	2.42	UR	Pat
0140	0.255	1.025	0.085	14.07	4.96	17.5	0.032	1.54	142.1	1.18	UR	Pat
0143	0.255	1.28	0.085	14.07	4.99	17.6	0.033	1.28	140.5	3.77	UR	Pat
0146	0.255	1.53	0.085	14.05	5.06	17.6	0.034	1.04	135.9	2.07	UR	Pat
0149	0.255	1.80	0.085	14.05	5.10	17.6	0.034	0.79	134.1	1.41	UR	Pat
0152	0.255	2.055	0.085	14.05	5.06	17.8	0.034	0.65	134.4	3.61	UR	Pat
0155	0.255	2.31	0.085	14.05	5.11	17.4	0.033	0.53	132.7	0.68	UR	Pat

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.08; 2" = 0.16; 3" = 0.37; 4" = 0.68; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0009; 3/16" = 0.0017; 1/4" = 0.0026; 5/16" = 0.0034; 3/8" = 0.0050; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Baler; BP = Bladder Pump; ESP = Electric Submersible Pump; RP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) AFFILIATION: J. Vojak / ASL SAMPLED BY (SIGNATURE): [Signature] PURP LING MINUTES AT: 0156 SAMPLED TO DEPTH (ft.): 1005
 PUMP ON TUBING DEPTH IN WELL (m): 19 TUBING: 1/4" FIELD FILTERED: Y Filter Dia: —
 PURGING METHOD CODE: 0258 Purging Equipment Type: Peristaltic

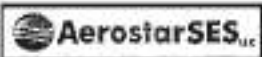
SAMPLE ID/DOC	# CONTAINERS	MATERIAL CODE	VOLUME (mL)	PRESERVATIVE (UNIT)	TOTAL VOL ADDED BY FIELD (mL)	FINAL pH (Standard)	INTENDED ANALYSIS ADDRESS (METHOD)	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (gpm)
<u>SHAW01-MW105-CU-019</u>	<u>2</u>	<u>PE</u>	<u>125</u>	<u>ICE</u>	<u>—</u>	<u>—</u>	<u>EPA 821M</u>	<u>APP</u>	<u>320</u>
<u>SHAW01-MW105-GW-019</u>	<u>4</u>	<u>PE</u>	<u>125</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>APP</u>	<u>320</u>

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Baler; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Cleanly Drained); O = Other (Specify)

pH ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ± 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2010



GROUNDWATER SAMPLING LOG

Location: Shaw AFB
 Well ID: SHAW01-mw121A-6W-022 SAMPLE ID: SHAW01-mw121A-6W-022 DATE: 01/24/18

PURGING DATA

WELL CHARACTERISTICS: WELL DIAMETER (Inches) 2.0" TUBING DIAMETER (Inches) 1/4 OD WELL BOTTOM/EXTERNAL DEPTH (ft) 25.34 ft - 15.96 ft STATIC DEPTH TO WATER (ft) 15.96 PURGING PUMP TYPE PP

WELL VOLUME PURGE: WELL VOLUME = (TOTAL WELL DEPTH (STOC - STATIC DEPTH TO WATER) X WELL CAPACITY)
 $25.34 \text{ ft} - 15.96 \text{ ft} = 9.38 \text{ ft} \times 0.38 \text{ gal/ft} = 3.56 \text{ gal}$

EQUIPMENT VOLUME PURGE: EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 $0 \text{ gal} + (0.006 \text{ gal/ft} \times 22 \text{ ft}) + 0.28 \text{ gal} = 0.33 \text{ gal}$

TOTAL PUMP OR TUBING DEPTH IN WELL (ft) 22 TOTAL PUMP OR TUBING DEPTH IN WELL (ft) 22 PURGING ESTIMATED AT 1710 PURGING ENDED AT 1710 TOTAL VOLUME PURGED (gallons) 0.70

TIME	VOLUME PURGED (gallons)	CUMULATIVE VOLUME PURGED (gallons)	PERCENT TO TARGET	DEPTH TO WATER (ft)	pH (standard water)	TEMP (°C)	DO (mg/L)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (describe)
1656	-	-	0.05	15.96	-	-	-	-	-	-	Clear	none
1702	0.3	0.3	0.05	15.96	5.56	19.3	0.084	0.60	24.2	32.2		
1705	0.15	0.45	0.05	15.96	5.58	19.5	0.085	0.57	20.0	31.4		
1710	0.25	0.70	0.05	15.96	5.59	19.4	0.087	0.52	15.2	16.6		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.60; 5" = 1.02; 6" = 1.47; 8" = 2.88
 TUBING INSIDE DIA. CAPACITY (Gal/ft): 1/8" = 0.0008; 3/16" = 0.0016; 1/4" = 0.0020; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: A. Willis / ASL SAMPLED LOCATION: SHAW01-mw121A-6W-022 DEPTH (ft) 1710 SAMPLE NO: 1711

PUMP OR TUBING DEPTH IN WELL (ft) 22 TUBING MATERIAL CODE: PE FIELD FILTERED: Y FILTER MEDIA: None

FIELD RECORDING NOTES: PUMP: Y FLOW: Y DUPLICATE: Y

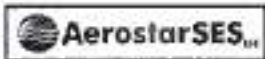
SAMPLE NO	#CONTAINERS	WATER CODE	VOLUME (L)	PRESERVATIVE	TOTAL VOL ADDED (FIELD USE)	FINAL pH (Standard)	STORAGE AND/OR ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PURP. (see notes)
<u>SHAW01-mw121A-6W-022</u>	<u>2</u>	<u>PE</u>	<u>US each</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>DMA 5000</u>	<u>APP</u>	<u>200</u>

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silica; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = Air Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Sinter Method (Tubing Gravity Draw); O = Other (Specify)

pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ± 20% saturation; optionally, ± 0.2 resl, or ± 10% (whichever is greater) Turbidity: all readings ± 30 NTU, optionally ± 5 NTU or ± 10% (whichever is greater)

[Signature] 1/27/18



GROUNDWATER SAMPLING LOG

WELL ID: SHAW01-MW122A SAMPLE ID: SHAW01-MW122A-GW-026 DATE: 1/24/18

PURGING DATA

WELL: 2 TUBING DIAMETER: 3/16" WELL DEPTH: 28' STATIC DEPTH: 16.31' PUMP TYPE: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
 = 127.09 ft - 16.31 ft x 0.16 gal/ft = 1.72 gal

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 N/A

TOTAL PUMP ON TUBING DEPTH IN WELL (ft): 26 PULSED PUMP ON TUBING DEPTH IN WELL (ft): 26 PULSED RATE (GPM): 1712 PUMPING RATE (GPM): 1744 TOTAL VOLUME PUMPED (gallons): 221

TIME	VOLUME PUMPED (gallons)	CORRECTION VOLUME PUMPED (gallons)	PERCENTAGE (REV)	DEPTH TO WATER (ft)	DEPTH TO WATER (ft) @ 1000	TEMP (°C)	CORRECTION (ppm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	CONDUCTIVITY (µmhos/cm)	PH
1718			0.085	16.31								
1722	0.34	0.34	0.085	16.49	5.85	18.9	0.117	1.60	-164	2.95	492	Pe+
1726	0.34	0.68	0.085	16.50	5.85	18.9	0.118	1.30	-326	5.56	492	
1730	0.34	1.02	0.085	16.51	5.87	18.9	0.122	0.75	-503	6.81	492	
1734	0.34	1.36	0.085	16.45	5.90	18.6	0.122	0.57	-627	6.65	492	
1738	0.34	1.70	0.085	16.46	5.88	17.9	0.120	0.54	-654	7.82	492	
1740	0.17	1.87	0.085	16.46	5.85	17.8	0.117	0.64	-645	4.45	492	
1742	0.17	2.04	0.085	16.46	5.84	17.9	0.116	0.61	-656	6.57	492	
1744	0.17	2.21	0.085	16.46	5.86	18.0	0.116	0.57	-616	3.14	492	✓

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.00; 1" = 0.04; 1.25" = 0.08; 1.5" = 0.16; 1.75" = 0.37; 2" = 0.66; 2.25" = 1.02; 2.5" = 1.47; 2.75" = 2.08

TUBING INSIDE DIA. CAPACITY (GPM/FT): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0028; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.016; 5/8" = 0.018

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

ANALYST: J. W. [Signature] SAMPLE NO: 1745 SAMPLE NO: 1747

PUMP ON TUBING DEPTH IN WELL (ft): 26 TUBING DEPTH IN WELL (ft): 26 FIELD FILTERED: Y FILTER EQUIPMENT TYPE: 0

FIELD IDENTIFICATION: PUMP Y G TUBING Y 8 (circled) DUPLICATION: Y 0 (circled)

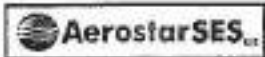
SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE CODE	# FORBIDDERS	MATERIAL CODE	VOLUME (mL)	PRESERVATIVE USED	TOTAL VOL. ACID IN P.D. (mL)	PH (Standard Value)			
SHAW01-MW122A-GW-026	2	PE	125				EPK 027M	APP	320

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SW = Suction Method (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ± 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ± 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2018



GROUNDWATER SAMPLING LOG

Location: M2032.0001 In: Shaw AFB
 Well ID: SHAW02-001 Sample ID: SHAW02-001-6W-021 Date: 11/27/18

PURGING DATA

Well Diameter (inches): 1" Tubing Diameter (inches): 3/16" Well Screen Interval Depth (ft): 24.68 ft Static Depth to Water (ft): 18.30 Pump Type: PA
 Well Volume Purge: 1 Well Volume = (Total Well Depth BTOC - Static Depth to Water) x Well Capacity
 = (24.68 ft - 18.30 ft) x 6.04 gal/ft = 0.26 gal

Equipment Volume Purge: 1 Equipment Vol. = Pump Volume + (Tubing Capacity x Tubing Length) + Flow Cell Volume
 = N/A

Final Pump or Tubing Depth (ft): 21 Purge Volume (gallons): 1.30

Time	Volume Purged (gallons)	Conductivity (µmhos/cm)	Flow Rate (gpm)	Depth to Water (ft)	pH	Temp (°F)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Baridity (PSI)	Color (PCU)	Turbidity (NTU)
1722	-	-	0.085	19.30	-	-	-	-	-	-	-	-
1725	0.26	6.26	0.085	19.8	5.49	19.8	0.018	6.79	247.5	77.7	SLIPPY	None
1728	0.26	0.52	0.085	19.9	5.45	19.9	0.017	6.69	249.8	34.5	CLR	None
1731	0.26	0.78	0.085	20.0	5.43	20.0	0.017	5.81	232.5	16.8	CLR	None
1734	0.26	1.04	0.085	20.0	5.38	20.0	0.016	5.91	230.5	6.97	CLR	None
1737	0.26	1.30	0.085	20.0	5.35	20.0	0.015	5.81	230.6	4.51	CLR	None

JW

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.68; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0002; 3/16" = 0.0014; 1/4" = 0.0022; 5/16" = 0.004; 3/8" = 0.009; 1/2" = 0.018; 5/8" = 0.038
 PURGING EQUIPMENT CODES: B = Bailer; BP = Bailer Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; C = Other (Specify)

SAMPLING DATA

Analyst: J.V. JAK/ASL Sampler: [Signature] Sampling Started At: 1738 Sampled At: 1740
 Pump or Tubing Depth: 21 Field ID: Y Duplicate: Y

Sample ID	# Containers	Material Code	Volume (L)	Preservative Used	Total Vol. Added in Field (L)	Final pH (Sample)	Reference Analyzed Method	Sample Collection Code	Sample Pump Flow Rate (L/min)
SHAW02-001-6W-021	2	PE	125				EPA 820M	APP	320

* Due to well casing diameter both water level meter & polyflow could not fit downhole. No DTW data available.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bailer Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Straw Manifold (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ± 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ± 30 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2018

[Signature] 1/27/18



GROUNDWATER SAMPLING LOG

Location: Shaw AFB
 Well No: SHAW02-002 Sample ID: SHAW02-002-GW-022 Date: 01-27-18

PURGING DATA

WELL DIAMETER (inches): 1.0 TUBING DIAMETER (inches): 1/4 OD WELL SCREEN INTERVAL (feet): 24.82 - 15.82 STATIC DEPTH (feet): 17.9 PUMPS/PUMP TYPE: PP
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if not applicable) $= 24.82' - 17.9' \times 0.041 \text{ gal/ft} = 0.28 \text{ gal}$
 EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if not applicable) $= 0 \text{ gal} + (0.026 \text{ gal/ft} \times 22 \text{ ft}) + 0.20 \text{ gal} = 0.26 \text{ gal}$

TIME	VOLUME PURGED (gallons)	CUMULATIVE VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (measured)	TEMP. (°C)	DO (mg/L)	DISSOLVED OXYGEN (mg/L)	SP. COND. (µmhos/cm)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (describe)
1745	-	-	0.05	*	-	-	-	-	-	-	Cloudy	Petro
1750	0.25	0.25	0.05		5.41	18.2	0.018	5.03	100.6	348	↓	↓
1755	0.25	0.50	0.05		5.96	19.8	0.030	1.16	95.2	129	↓	↓
1800	0.25	0.75	0.05		5.99	19.9	0.031	0.84	25.2	65.2	↓	↓
1805	0.25	1.00	0.05		5.98	20.0	0.031	0.80	20.6	19.9	↓	↓
1810	0.25	1.25	0.05	↓	5.97	20.0	0.030	0.81	19.4	11.7	↓	↓

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.32; 4" = 0.66; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal/ft): 1/8" = 0.0008; 3/16" = 0.0016; 1/4" = 0.0032; 5/16" = 0.0064; 3/8" = 0.0096; 1/2" = 0.0192; 5/8" = 0.0384
 PURGING EQUIPMENT CODES: B = Baler; BP = Bailer Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: A Willis (ASL) SAMPLED BY SIGNATURE: [Signature] SAMPLED AT: 1810 SAMPLED DEPTH AT: 1811
 PUMP OR TUBING DEPTH IN WELL (ft): 22 TUBING MATERIAL CODE: PE FIELD POSITIONED: Y Filtered Equipment Type: Y
 FIELD DISCONTINUITY: Y TURBIDITY: Y CONDUCTIVITY: Y
 SAMPLE CONTAINER OF USE (CODES): PE VOLUME (mL): 125 each PRESERVATION: NONE TOTAL VOL. ROOM IN FIELD (mL): INITIAL pH (measured): INTENDED ANALYSIS AND/OR USES: EPA 8210 SAMPLING EQUIPMENT CODES: APP FLOW RATE (mL per minute): 200

REMARKS: * Due to size of the well, both WLM and tubing could not fit - no WL data recorded during GW sampling.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Baler; BP = Bailer Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Shaw Method (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ± 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ± 25 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2016

[Handwritten signature]

[Handwritten signature] 1/27/18



GROUNDWATER SAMPLING LOG

Location: Shaw AFB
 Well ID: SHAW02-003 Sample ID: SHAW02-003-GW-020 Date: 1-27-18

PURGING DATA
 WELL: 1-0 TUBING: 1/40D WELL SCREEN INTERNAL DIAMETER: 21.68 in - 11.69 in STATIC DEPTH TO WATER (last READING): 17.93 P ORISEL PUMP TYPE (OR BALLER): PP
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH (FT) - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if not applicable) 21.48 " - 17.93 " = 0.041 " 0.25 " X

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if not applicable) 0 " + 0.0026 " X 20 " + 0.20 " = 0.25 "

TIME	VOLUME PUMPED (gallons)	CUMULATIVE VOLUME PUMPED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	PH	TEMP (°C)	COND (µmhos/cm)	DO (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	SMELL
1700	—	—	0.05	*	—	—	—	—	—	—	—	—
1705	0.25	0.25	0.05		6.00	20.0	0.069	1.27	-37.4	686	Cloudy	Retro
1710	0.25	0.50	0.05		6.21	20.2	0.060	0.33	-115.1	32.1	Clear	
1715	0.25	0.75	0.05		6.31	20.2	0.058	0.27	-118.0	15.0		
1720	0.25	1.00	0.05		6.28	20.3	0.055	0.24	-116.1	9.82		
1725	0.25	1.25	0.05		6.28	20.3	0.055	0.22	-116.4	8.46		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02, 1" = 0.04, 1.25" = 0.08, 2" = 0.16, 3" = 0.37, 4" = 0.68, 6" = 1.52, 8" = 1.47, 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal.Ft): 1/8" = 0.0008, 3/16" = 0.0014, 1/4" = 0.0028, 5/16" = 0.004, 3/8" = 0.006, 1/2" = 0.010, 5/8" = 0.018
 PURGING EQUIPMENT CODES: B = Baller, BP = Baller Pump, ESP = Electric Submersible Pump, SP = Portable Pump, O = Other (Specify)

SAMPLING DATA
 SAMPLED BY (PRINT) / AFFILIATION: A.W. / USL SAMPLES REQUESTED AT: 1725 SAMPLES RECEIVED AT: 1726
 PUMP OR TUBING DEPTH IN WELL (ft): 20 TUBING MATERIAL CODE: PC FIELD FILTERED: Y (H) HOW: BA / RB
 FIELD OBSERVATION: Y (H) TUBING: Y (H) (H) ELUATE: Y (H)

DATE & TIME	# CONTAINERS	MATERIAL CODE	VOLUME (L)	PRESERVATION USED	TOTAL VOL. ADDED IN FIELD (L)	FIELD pH (30 min)	ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (L/min)
<u>SHAW02-003-GW-020</u>	<u>2</u>	<u>PE</u>	<u>125</u> each				<u>EPA 816M</u>	<u>APP</u>	<u>200</u>

REMARKS: Due to size of well, both WLM and tubing could not fit - no WL data recorded during GW sampling.

MATERIAL CODES: AG = Amber Glass, CG = Clear Glass, PE = Polyethylene, PP = Polypropylene, S = Silicone, T = Teflon, O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump, B = Baller, BP = Baller Pump, ESP = Electric Submersible Pump, RFPF = Reverse Flow Peristaltic Pump, SB = Siphon Method (Tubing Gravity Drain), O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ± 20% saturation; optionally ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ± 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)



GROUNDWATER SAMPLING LOG

Location: 60023001 Site: Shaw AFB
 Well ID: SHAW03-001 Sample ID: SHAW03-001-6W-018 Date: 1/28/17

PURGING DATA

Well Diameter (inches): 1" Tubing Diameter (inches): 3/16" Well Screen/Bypass Depth: 21.71 ft Static Depth to Water (in feet): 15.52 Purge Pump Type: PP
 Well Volume Purge: 1 Well Volume = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY
 (Only fill out if applicable) = (21.71 ft - 15.52 ft) x 0.04 gal/ft = 0.25 gal

Equipment Volume Purge: 1 Equipment Vol. = Pump Volume + (Tubing Capacity X Tubing Length) + Flow Cell Volume
 (Only fill out if applicable) NA

Initial Pump on Tubing Depth in Well (feet): 18 Final Pump on Tubing Depth in Well (feet): 19 Purge Volume (gallons): 1146 Purge Time (minutes): 1203 Total Volume Pumped (gallons): 1.36

TIME	VOLUME PUMPED (gallons)	CUMULATIVE VOLUME PUMPED (gallons)	FLOW RATE (gpm)	DEPTH TO WATER (feet)	pH	TEMP (°C)	COND (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (PCU)	ODOR (describe)
1146	—	—	0.079	15.52	—	—	—	—	—	—	—	—
1150	0.32	0.32	0.079	15.52	5.96	19.7	0.121	1.51	-33.1	54.7	2000	None
1154	0.32	0.64	0.079	15.52	5.89	19.1	0.113	0.79	-31.6	22.1	CLR	None
1157	0.24	0.88	0.079	15.52	5.88	19.2	0.109	0.60	-32.0	13.0	CLR	None
1200	0.24	1.12	0.079	15.52	5.88	19.3	0.107	0.51	-33.1	8.96	CLR	None
1203	0.24	1.36	0.079	15.52	5.87	19.4	0.106	0.48	-31.3	6.48	CLR	None

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.02; 2" = 0.16; 3" = 0.37; 4" = 0.61; 6" = 1.02; 8" = 1.42; 12" = 6.88
 TUBING INSIDE DIA. CAPACITY (Gal/ft): 1/4" = 0.0008; 3/16" = 0.0014; 1/2" = 0.0028; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Balzac; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

Sampled by (Print/Initial): J. Vajjal/ASL Sampler ID Number: J. Vajjal
 Pump on Tubing Depth in Well (feet): 18 Tubing Material Code: PE Filtered: Y Sampled on (Date): 1/28/17
 Well Contamination: PMP Y TMS Y Duplicate: Y

SAMPLE CODE	# COPIES	MATERIAL CODE	VOLUME (mL)	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (mL)	FINAL pH (Sampler/Field)	BATCH ANALYSIS NUMBER METH ID	SAMPLING EQUIPMENT CODES	SAMPLE PURGE FUDGE (mL per sample)
SHAW03-001-6W-018	2	PE	125	—	—	—	078.537M	APP	300

Remarks: Due to well casing diameter both water level meter & polyflow cannot fit downhole. No DTW data available.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Balzac; BP = Bladder Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≤ 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2016

1/29/18



GROUNDWATER SAMPLING LOG

Well No: **SHAW03-002** Sample ID: **SHAW03-002-GW-017** Date: **1/28/17**
 Location: **Shaw AFB**

PURGING DATA
 WELL: **1"** TUBING: **3/16** WELL SCREEN INTERNAL DIAMETER: **21.55** STATIC DEPTH TO WATER: **14.56** PUMPS/PUMP TYPE: **PP**
 (WELL VOLUME PURGE) 1 WELL VOLUME = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if not applicable) - **21.55** ft - **14.56** ft = **0.04** ft \times **0.28** gal

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if not applicable) **NA**

WELL PUMP OR TUBING DEPTH IN WELL (ft)	TOTAL PUMP OR TUBING DEPTH IN WELL (ft)	PURGE(S) INITIATED AT	PURGE(S) STOPPED AT	TOTAL VOLUME PURGED (gallons)
17	17	1103	1121	1.44

TIME	VOLUME PURGED (gallons)	CUMULATIVE VOLUME PURGED (gallons)	PERCENT BPTC	DEPTH TO WATER (ft)	pH (Standard 4000)	TEMP (°F)	COND (µmhos)	DISSOLVED OXYGEN (mg/L)	ESP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (Describe)
1103	-	-	0.079	14.56	-	-	-	-	-	-	-	-
1107	0.32	0.32	0.079	14.56	5.57	18.9	0.063	1.02	52.8	126	0.02	None
1112	0.40	0.72	0.079	14.56	5.92	19.2	0.056	0.65	-24.9	29.2	0.02	None
1115	0.24	0.96	0.079	14.56	5.86	19.3	0.053	0.78	-23.3	17.9	0.02	None
1118	0.24	1.20	0.079	14.56	5.87	19.3	0.051	0.84	-21.1	10.4	0.02	None
1121	0.24	1.44	0.079	14.56	5.88	19.4	0.049	0.76	-21.1	5.12	0.02	None

WELL CAPACITY (Gallons Per Foot): 0.70" = 0.00; 1" = 0.04; 1.25" = 0.05; 2" = 0.19; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.89
 TUBING INSIDE DIA. CAPACITY (Gal/ft): 1/8" = 0.0000; 3/16" = 0.0114; 1/4" = 0.0228; 5/16" = 0.0342; 3/8" = 0.0514; 1/2" = 0.0771; 5/8" = 0.1320
 PURGING EQUIPMENT CODES: B = Baker; BP = Booster Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

ANALYZED BY: J. Vojta/ASL	SAMPLER SIGNATURE: <i>[Signature]</i>	SAMPLING INITIATED AT: 1122	SAMPLING STOPPED AT: 1123
PUMP OR TUBING DEPTH IN WELL (ft): 17	TUBING MATERIAL CODE: PE	FIELD FILTERED: Y	FIELD EQUIPMENT TYPE: PP
FIELD IDENTIFICATION CODE: PE	FLY TAG: 125	DUPLICATE: Y	

SAMPLE CONTAINER IDENTIFICATION	SAMPLER INFORMATION	ANALYSIS INFORMATION	SAMPLING EQUIPMENT CODES	SAMPLE PUMP FLOW RATE (g/L per stroke)
SAMPLE CODE: SHAW03-002-GW-017 # CONTAINER: 2 MATERIAL CODE: PE VOLUME (mL): 125	PRESERVATIVE USED: - TOTAL VOL ADDED BY FIELD (mL): - FINAL pH (Standard 4000): -	INTEGRATED ANALYSIS METHOD: EPA 820M	APP	300

XX Due to size of well, both tubing and wellm could not fit - no WL data recorded during GW sampling

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Baker; BP = Booster Pump; ESP = Electric Submersible Pump; RFBP = Reverse Flow Peristaltic Pump; SM = Slow Method (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2010

[Signature] 1/29/18



GROUNDWATER SAMPLING LOG

Well No: SHAW03-003 Well Screen Screen Depth: 21.17 ft Static Depth to Water: 11.17 ft Sample ID: SHAW03-003-GW-018 Date: 1-28-18

PURGING DATA

Well Diameter (inches): 1.0" Tubing Inside Dia: 0.400" Well Screen Screen Depth: 21.17 ft Static Depth to Water: 11.17 ft Pump Type: PP

Well Volume Purge: 1 Well Volume = (TOTAL WELL DEPTH (ft) - STATIC DEPTH TO WATER) X WELL CAPACITY
 = (21.17 ft - 11.17 ft) X 0.041 gal/ft = 0.42 gal

Equipment Volume Purge: 1 Equipment Vol = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 = 0.42 gal + (0.0026 gal/ft X 18 ft) + 0.2 gal = 0.87 gal

Details Pump or Tubing Depth in Well (ft): 18 Total Pump or Tubing Depth in Well (ft): 18 Purging Started At: 1119 Purging Ended At: 1145 Total Volume Purged (gallons): 1.38

TIME	VOLUME PURGED (GALLONS)	CUMULATIVE VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (NOMINAL)	TEMP. (°C)	COND. (µMHO/CM)	DISTILLED COND. (µMHO/CM)	GSP (GPM)	TURBIDITY (NTU)	COLOR (PCU)	ODOR (Description)
1119	-	-	0.05	*	-	-	-	-	-	-	-	cloudy none
1130	0.55	0.55	0.05	↓	5.98	19.6	0.155	0.38	-51.0	22.4	cloudy	↓
1135	0.25	0.80	0.05	↓	5.99	19.7	0.154	0.34	-52.7	15.4	↓	↓
1140	0.25	1.05	0.05	↓	5.98	19.6	0.155	0.32	-56.9	11.2	↓	↓
1145	0.25	1.30	0.05	↓	5.99	19.6	0.155	0.30	-56.5	11.0	↓	↓

WELL CAPACITY (Schedule Pw Factor): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 1.5" = 0.08; 1.75" = 0.10; 2" = 0.12; 2.25" = 0.14; 2.5" = 0.16; 2.75" = 0.18; 3" = 0.20; 3.25" = 0.22; 3.5" = 0.24; 3.75" = 0.26; 4" = 0.28; 4.25" = 0.30; 4.5" = 0.32; 4.75" = 0.34; 5" = 0.36; 5.25" = 0.38; 5.5" = 0.40; 5.75" = 0.42; 6" = 0.44; 6.25" = 0.46; 6.5" = 0.48; 6.75" = 0.50; 7" = 0.52; 7.25" = 0.54; 7.5" = 0.56; 7.75" = 0.58; 8" = 0.60; 8.25" = 0.62; 8.5" = 0.64; 8.75" = 0.66; 9" = 0.68; 9.25" = 0.70; 9.5" = 0.72; 9.75" = 0.74; 10" = 0.76; 10.25" = 0.78; 10.5" = 0.80; 10.75" = 0.82; 11" = 0.84; 11.25" = 0.86; 11.5" = 0.88; 11.75" = 0.90; 12" = 0.96

TUBING INSIDE DIA. CAPACITY (SAMPLE): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0028; 5/16" = 0.0042; 3/8" = 0.0060; 1/2" = 0.0090; 5/8" = 0.0135

PURGING EQUIPMENT CODES: B = Baller; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

Sampler by (Print) / Affiliation: A. Willis / ASL Sampling Date/Time: 1/28/18 1145 Sample No: 1146

Pump or Tubing Depth in Well (ft): 18 Tubing Material Code: PE Field Filtered: Y Filter Size: 0.45 µm

Field Oxidation: PUMP Y H TUBING Y H Duplicate: Y H

WATER CODE	CONTAINER	WELL CODE	WELL ID	PRESERVATIVE	TOTAL VOL. (L)	TOTAL pH (Standard)	ANALYSIS METHOD	SAMPLING CODE	SAMPLE PUMP FLOW RATE (ml per minute)
SHAW03-003-GW-018	2	PE	125 each				EPA 821M	APP	200

REMARKS: *Due to size of well, both NLM and tubing could not fit - no WL data recorded during GW sampling.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silica; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = Alter Peristaltic Pump; B = Baller; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Gravity Drain); O = Other (Specify)

pH ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings < 20% saturation; optionally, ± 0.2 mg/L or ± 0.2% (whichever is greater) Turbidity: all readings < 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

1/29/18



GROUNDWATER SAMPLING LOG

Location: M2032001 Site: Shaw AFB
 Well No: SHAW03-FT3MWS Sample ID: SHAW03-FT3MWS-GW-016 Date: 1-25-18

PURGING DATA

WELL DIAMETER (inches): 2.0" TUBING DIAMETER (inches): 1/400 WELL SCREEN DIAMETER (inches): 1.821" STATIC DEPTH (ft): 15.26 PUMP TYPE: Peristaltic
 WELL VOLUME PURGE: (WELL VOLUME = (TOTAL WELL DEPTH - BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY)
 = (18.21 ft - 15.26 ft) X 0.16 gal/ft = 0.47 gal

EQUIPMENT VOLUME PURGE: (EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME)
 = 0 gal + (0.026 gal/ft X 16 ft) + 0.20 gal = 0.24 gal

INITIAL PUMP OR TURBO DEPTH (WELL-LOG): 16 FINAL PUMP OR TURBO DEPTH (WELL-LOG): 16 PUMPING RATE (GPM): 1717 PUMPING DURATION (MIN): 1740 TOTAL VOLUME PUMPED (gallons): 1.15

TIME	VOLUME PUMPED (gallons)	EQUIP. VOLUME PUMPED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	FS (ft)	TEMP. (F)	DO (mg/L)	DISSOLVED OXYGEN (mg/L)	PH	TURBIDITY (NTU)	COLOR (PCU)	ODOR (MUSHB)
1717	—	—	0.05	15.26	—	—	—	—	—	—	Clear	None
1725	0.4	0.40	0.05	15.26	5.10	16.9	0.031	2.93	777.2	5.31		
1730	0.25	0.65	0.05	15.27	5.09	17.1	0.031	2.79	874.8	3.63		
1735	0.25	0.90	0.05	15.27	5.10	17.1	0.032	2.80	876.8	2.22		
1740	0.25	1.15	0.05	15.27	5.10	17.1	0.032	2.75	882.1	1.5		

WELL CAPACITY (Gallons Per Foot): 0.70" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.63; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0008; 3/16" = 0.0014; 1/4" = 0.0020; 5/16" = 0.0034; 3/8" = 0.0060; 1/2" = 0.010; 5/8" = 0.018
 PUMPING EQUIPMENT CODES: B = Bailer; BP = Booster Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / INITIALS: A. Willis / T.V.B.J.H. (KSL) SAMPLING SIGNATURE: [Signature] SAMPLED AT: 1740 SAMPLED AT: 1743
 PUMP OR TURBO DEPTH (WELL-LOG): 16 TUBING MATERIAL CODE: PE FIELD FILTERS: Y FILTER MEDIA: N

SAMPLE CONTAINER SPECIFICATION				SAMPLE IDENTIFICATION			INTENDED ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (g/L per minute)
ANALYTES	CONTAINER	MATERIAL CODE	VOLUME (mL)	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (mL)	FINAL pH (Sample Used)			
SHAW03-FT3MWS-GW-016	2	PE	125 each				EPA 821M	APP	200
SHAW03-FT3MWS-GW-016	2	PE	125 each				EPA 821M	APP	200

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Booster Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Suck Method (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≥ 2% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≥ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2016

[Signature] 1/27/18

GROUNDWATER SAMPLING LOG

PROJECT: M2032.0001	INSTALLATION: <u>SHAW APM</u>
WELL NO: <u>SHAW04-001</u>	SAMPLE ID: <u>SHAW04-001-GW-018</u> DATE: <u>1-28-18</u>

PURGING DATA

WELL DIAMETER (inches): <u>1.0</u>	TUBING DIAMETER (inches): <u>3/4</u>	WELL SCREEN INTERVAL DEPTH: <u>21.5</u> feet to <u>12.5</u> feet	STATIC DEPTH TO WATER (feet): <u>14.17</u>	PURGE PUMP TYPE OR BAILER: <u>PP</u>
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) <u>12.52</u> feet - <u>14.17</u> feet X <u>0.041</u> gallons/foot = <u>0.34</u> gallons				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) <u>0</u> gallons + (<u>0.062</u> gallons/foot X <u>18</u> feet) + <u>0.20</u> gallons = <u>1.25</u> gallons				
INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>18</u>	FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>18</u>	PID RESULT AT WELLHEAD (PPM): <u>0</u>	PURGING ENDED AT: <u>1510</u>	TOTAL VOLUME PURGED (gallons): <u>1.50</u>

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ammonia/nitrate	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	ORP (mV)	ODOR/ COLOR (describe)
1440	0	0	0.05	X	-	-	-	-	-	-	Cloudy
1445	0.25	0.25	0.05		5.07	17.7	0.034	5.83	184	166.8	↓
1450	0.25	0.50	0.05		5.02	17.8	0.032	5.75	66.4	165.3	clear
1455	0.25	0.75	0.05		5.07	17.8	0.032	5.73	56.5	165.2	
1500	0.25	1.00	0.05		5.09	17.9	0.031	3.73	35.9	166.4	
1505	0.25	1.25	0.05		5.10	17.8	0.031	3.72	27.2	167.7	
1510	0.25	1.50	0.05	L	5.09	17.7	0.031	3.72	19.7	170.3	L

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 6" = 1.02; 8" = 1.47; 12" = 5.80
 TUBING INSIDE DIA. CAPACITY (Gal/ft): 1/8" = 0.0008; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.015
 PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: <u>Azzalini</u>	SAMPLER(S) SIGNATURE(S): <u>[Signature]</u>	SAMPLING INITIATED AT: <u>1510</u>	SAMPLING ENDED AT: <u>1511</u>
PUMP OR TUBING DEPTH IN WELL (feet): <u>12</u>	TUBING MATERIAL CODE: <u>PE</u>	FIELD-FILTERED: <u>Y</u> (N)	FILTER SIZE: <u> </u> µm
FIELD DECONTAMINATION: PUMP <u>Y</u> (N) TUBING <u>Y</u> (N) (replaced)	DUPLICATE: <u>Y</u> (N)		

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (ml per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (ml)	FINAL pH			
<u>SHAW04-001-GW-018</u>	<u>2</u>	<u>PE</u>	<u>250ml each</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>537 m</u>	<u>APP</u>	<u>200</u>

REMARKS: Due to size of well, both tubing and WLM could not fit - no GW data available during GW sampling

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

Weather: Raining

[Signature] 1/29/18



GROUNDWATER SAMPLING LOG

ADDRESS: 8803001 Co: Shaw AFB
 WELL NO: SHAW04-002 SAMPLE ID: SHAW04-002-GW-018 DATE: 1-28-18

PURGING DATA

WELL DIAMETER (INCH): 1.0" TUBING DIAMETER (INCH): 1/4" ID WELL BOTTOM (FEET): 22.02 STATIC DEPTH TO WATER (FEET): 13.78 PUMP TYPE OR MODEL: PP
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH STOC - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if not specified) = 1 22.02 ft - 13.78 ft = 8.04 ft = 0.34 gal

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if not specified) = 0 gal + (0.0026 gal/ft x 18 ft) + 0.2 gal = 0.25 gal

WELL PUMP OR TUBING DEPTH (WELL LOG): 18 TUBING PUMP OR TUBING DEPTH (WELL LOG): 18 PURGING BEGINS AT: 0930 PURGING ENDS AT: 1035 TOTAL VOLUME PURGED (gallons): 3.25

TIME	VOLUME PURGED (GALLONS)	CUMULATIVE VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (Feet/ft)	TEMP. (°C)	COND. (µmhos/cm)	RESISTIVITY (ohm-cm)	SP. COND. (µmhos/cm)	TURBIDITY (NTU)	OTHER (Specify)	REMARKS
0930	-	-	0.05	*	-	-	-	-	-	-	Cloudy	None
0935	0.25	0.25	0.05	5.64	18.0	0.065	4.57	92.9	295			
0940	0.25	0.50	0.05	5.49	18.0	0.062	4.91	111.6	439			
0945	0.25	0.75	0.05	5.48	18.0	0.062	5.00	112.8	435			
0950	0.25	1.00	0.05	5.46	18.0	0.060	5.01	115.7	102			
0955	0.25	1.25	0.05	5.45	18.0	0.060	5.09	119.2	67.0			
1000	0.25	1.50	0.05	5.43	18.0	0.059	5.10	120.0	57.5			
1005	0.25	1.75	0.05	5.42	18.0	0.060	5.12	121.3	42.9			
1015	0.50	2.25	0.05	5.40	18.1	0.060	5.12	122.9	37.1			
1025	0.50	2.75	0.05	5.39	18.1	0.059	5.13	125.7	32.7			
1035	0.50	3.25	0.05	5.38	18.1	0.059	5.12	126.2	30.0			

SAMPLING Above 20NTUs due to time and the lack of NTUs dropping in timely manner. SEE develop log and boring log, also.

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 8" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gallons): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.016; 5/8" = 0.031
 PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT/FACILITY): A. Willis / ASL SAMPLED SIGNATURE: [Signature] SAMPLES RETRIEVED AT: 1035 SAMPLES EXPIRES AT: 1036
 PUMP OR TUBING DEPTH (WELL LOG): 18 TUBING MATERIAL CODE: PE FIELD RETURN: Y Filtered Equipment Type: Y
 FIELD CREST/FABRICATION: PUMP Y TUBING Y DATE/TIME: Y

SAMPLE CODE	# CONTAINERS	MATERIAL CODE	VOLUME (GAL)	PRESERVATIVE USED	TOTAL VOL. (GALLONS)	FIELD pH (Time/Date)	RETURNED ANALYSIS METHOD	SAMPLE CONTAINER CODE	SAMPLE PUMP FLOW RATE (gal/min)
SHAW04-002-GW-018	2	PE	125 each				EPS 83TH	APP	200

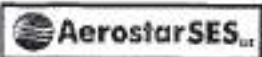
REMARKS: * Due to size of well, both well and tubing could not fit - no WL data recorded during GW sampling. WEATHER - CLOUDY/RAIN

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silica; Y = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Capacity Only); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2°C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≤ 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 20 NTU, optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2018

[Signature] 1/29/18



GROUNDWATER SAMPLING LOG

Location: **Shaw AFB**
 Well No: **SHAW 04-003** Sample ID: **SHAW04-003-GW-015** Date: **1/20/18**

PURGING DATA

Well Diameter (inches): **1"** Tubing Diameter (inches): **1/4"** Well Screen Interval Depth: **10 ft - 20 ft** Static Depth to Water (feet): **12.61'** Pump Type: **PP**
 Well Volume Purge: 1 Well Volume = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY
 $21.29' \times 12.61' \times 0.04 = 0.35'$

Equipment Volume Purge: 1 Equipment Vol. = Pump Volume + (Tubing Capacity X Tubing Length) + Flow Cell Volume
 $0 = 0.006 \times 15 + 0.25 = 0.14'$

TIME	VOLUME FORGED (gallons)	ORIG. VOLUME FORGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	WT. (lb)	TEMP. (°F)	COND. (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	PH	TURBIDITY (NTU)	COLOR (PCU)	ODOR (Description)
0925	-	-	0.053	12.61	6.4	-	-	-	-	-	-	-
0930	0.27	0.27	0.053	17.6	5.24	17.6	0.028	5.42	1090	526	6PCU	None
0935	0.27	0.54	0.053	17.7	5.24	17.7	0.021	5.70	125.6	101	6PCU	None
0940	0.27	0.81	0.053	17.9	5.02	17.9	0.029	5.37	126.5	43.3	CLR	None
0943	0.16	0.97	0.053	17.9	4.53	17.9	0.028	5.51	145.6	35.9	CLR	None
0946	0.16	1.13	0.053	17.9	4.90	17.9	0.028	5.47	150.9	31.8	CLR	None
0949	0.16	1.29	0.053	18.0	4.92	18.0	0.027	6.02	155.5	29.0	CLR	None
0954	0.27	1.56	0.053	18.0	5.04	18.0	0.027	5.06	147.9	26.0	CLR	None
0959	0.16	1.72	0.053	18.0	5.03	18.0	0.027	5.10	148.7	22.1	CLR	None
1000	0.16	1.88	0.053	18.0	4.90	18.0	0.026	6.09	152.8	20.05	CLR	None
1003	0.16	2.04	0.053	18.0	5.02	18.0	0.027	5.18	152.9	19.2	CLR	None
1006	0.16	2.22	0.053	18.0	5.03	18.0	0.026	5.09	152.6	18.7	CLR	None
1009	0.16	2.38	0.053	18.0	5.01	18.0	0.026	5.11	153.3	17.5	CLR	None

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.38" = 0.08; 2" = 0.16; 3" = 0.30; 4" = 0.65; 5" = 1.00; 6" = 1.47; 8" = 5.88
 TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/4" = 0.0020; 3/8" = 0.0044; 1/2" = 0.0086; 5/8" = 0.0144; 3/4" = 0.0200; 1" = 0.0310; 1 1/4" = 0.0510; 1 1/2" = 0.0760
 PUMPING EQUIPMENT CODES: R = Roller; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

Sampled by (PRINT) / AFFILIATION: **J. Vujalik / ASL** Sampler Signature: *[Signature]* Well No: **1010** Sampling Event No.: **1012**
 Pump or Submergible: **15'** Tubing Material Code: **PC** Field Filter No.: **1** Filter Size: **10µ**
 Field Identification: **PPSP** **W** Tubing / Equipment: Duplicate: **G**
 Sample Container Specification: **PE** Sample Description: **200**

SAMPLE CODE	# CONTAINERS	INTERNAL CODE	VOLUME (mL)	PRESERVATIVE USED	TOTAL VOL. ANALYZED IN FIELD (mL)	PARAM. (if stored data)	ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE FLOW RATE (mL per minute)
SHAW04-003-GW-015	2	PE	125	N/A	N/A	N/A	SP467M	APPD	200

**** Due to well casing diameter both water level meter & poly flow could not fit downhole. No DTW data available.**

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; B = Bibocone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bello; BP = Bladder Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Gravity Drain); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 3% Dissolved Oxygen: all readings ± 20% saturation, optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ± 20 NTU; optionally ± 8 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2016

[Signature] 1/29/18

PROJECT: M2032.001 - BAYVIEW	DATE: 1/30/2018
WELL ID: M2032-001	SAMPLE NO.:

PURGING DATA

WELL DIAMETER (inches)	SUBMIT	WELL SCREEN INTERVAL DEPTH	STATIC DEPTH TO WATER (see PLOG)	DRY	PUMP TYPE OR GALLON
	CONCENTRATION (ug/L)	FT - FT			

WELL VOLUME PURGE: $1 \text{ WELL VOLUME} = (\text{TOTAL WELL DEPTH} - \text{STATIC DEPTH TO WATER}) \times \text{WELL CAPACITY}$

EQUIPMENT VOLUME PURGE: $1 \text{ EQUIPMENT VOL.} = \text{PUMP VOLUME} + (\text{TUBING CAPACITY} \times \text{TUBING LENGTH}) + \text{FLOW CELL VOLUME}$

TOTAL PUMP OR TUBING DEPTH @ WELL (feet)		TOTAL PUMP OR TUBING DEPTH @ WELL (feet)		PURGING METHOD AT		PURGING METHOD AT		TOTAL VOLUME PURGED (gallons)		CLARITY (FTU)	COLOR (pcu)	ODOR (pvc)
TIME	VOLUME PURGED (gallons)	CORREL. VOLUME PURGED (gallons)	FURG. RATE (gpm)	DEPTH TO WATER (see PLOG)	PH (instant read)	TEMP (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	DEPTH (in)			

WELL CAPACITY (Dollans Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.10; 3" = 0.20; 4" = 0.30; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gallons): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.018

PURGING EQUIPMENT CODES: B = Baller; BP = Baller Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

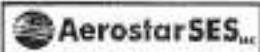
SAMPLED BY (PRINT) / AFFILIATION	SAMPLE NO. (SEPARATE)	SAMPLE PREPARED AT	SAMPLE RECEIVED AT
PUMP OR TUBING	DEPTH @ WELL (feet)	FIELD FILTERED	FIELD FILTERED TYPE
FIELD OCCURRENCE		DUPLICATE	
ANALYSE CONTAINER SPECIFICATION		SAMPLE PRESERVATION	
SAMPLE CODE	# CONTAINERS	ANAL. CODE	VOLUME (ml)
FRESHNESS	USE	TOTAL VOL. ADDED IN PFD (ml)	PHASE (Prep/Storage Code)
ANALYSE METHOD	SAMPLING EQUIPMENT CODES	FLOW RATE (gal per minute)	
EPA 537H			

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = Alter Peristaltic Pump; B = Baller; BP = Baller Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Stow Method (Tubing Gravity Drain); O = Other (Specify)

Reference Codes for issues of selection of test procedures needed.

pH ± 0.2 units; Temperature ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≤ 20% saturation, optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 25 NTU, optionally ± 5 NTU or ± 10% (whichever is greater)



GROUNDWATER SAMPLING LOG

Well No: SHAW05-002 SHAWS-002-GW-033 DATE: 1/27/18

PURGING DATA

WELL SCREEN DEPTH: 35.0 ft STATIC DEPTH TO WATER: 31.81 ft

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME

TIME	VOLUME PUMPED (gallons)	CUMULATIVE VOLUME PUMPED (gallons)	PURGE RATE (GPM)	DEPTH TO WATER (feet)	pH (field)	TEMP (°C)	COND. (µmhos/cm)	RESIDUAL OXYGEN (mg/L)	ESP (ft)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (field)
<i>Due to depth of water which exceeds peristaltic capabilities this will be a grab sample. See grab sheet.</i>												

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.00; 1" = 0.04; 1.25" = 0.06; 1.5" = 0.10; 1.75" = 0.15; 2" = 0.20; 2.25" = 0.26; 2.5" = 0.33; 2.75" = 0.41; 3" = 0.50

TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.0041; 3/8" = 0.0059; 1/2" = 0.010; 5/8" = 0.018

PURGING EQUIPMENT CODES: B = Baler; BP = Bailer Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (GAL PER MIN)
CONTAINER	VOLUME (L)	PRESERVATIVE	INITIAL VOL.	ADJUSTED VOL.	FINAL pH (Base & Urea)	RECORD ANALYSIS METHOD (EPA 8210)			
<i>(This section is crossed out with a large X)</i>									

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Baler; BP = Bailer Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Sine Method (Tapping Granular Media); O = Other (Specify)

pH ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ± 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ± 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2010

PO 1/27/18

GROUNDWATER SAMPLING LOG

PROJECT: M2032.0001	INSTALLATION: SHAW AFB	AREA: 5
WELL NO: SHAW05-003	SAMPLE ID: SHAW05-003-GW-032	DATE: 01/28/18

PURGING DATA

WELL DIAMETER (inches): 1"	TUBING DIAMETER (inches): 1/4"	WELL SCREEN INTERVAL DEPTH: 35.10 feet to 28.10 feet	STATIC DEPTH TO WATER (feet): 29.38	PURGE PUMP TYPE OR BAILER: PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = (35.10 feet - 28.38 feet) X 0.04 gallons/foot = 0.27 gallons				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) = 0 gallons + (gallons/foot X feet) + gallons = gallons				

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 32	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 32	PID RESULT AT WELLHEAD (PPM): 0	PURGING ENDED AT: 1353	TOTAL VOLUME PURGED (gallons):							
TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (micro units) with/without 25°C/5M	DISSOLVED OXYGEN (micro units) mg/L or % saturation	TURBIDITY (NTUs)	ORP (mV)	ODOR/COLOR (describe)
1322	0	0	0.066	28.38	—	—	—	—	—	—	—
1326	0.26	0.26		*	5.65	20.2	0.074	4.45	459	119.5	none/DPB
1329	0.20				5.43	20.6	0.071	4.27	50.5	127.7	none/DPB
1332	0.20				5.32	20.9	0.068	4.25	21.7	130.2	none/CLB
1335	0.20				5.22	21.1	0.065	4.57	13.0	139.6	
1338	0.20				5.20	21.2	0.064	4.72	8.89	140.2	
1341	0.20				5.10	21.3	0.061	5.07	10.2	144.7	
1344	0.20				5.09	21.3	0.061	5.30	11.4	146.2	
1347	0.20				5.09	21.3	0.061	4.55	6.84	144.2	
1350	0.20				5.11	21.3	0.060	4.56	10.2	144.0	
1353	0.20				5.09	21.3	0.060	4.71	5.31	143.9	

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal/Ft.): 1/8" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.016; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Z. Vojak (ASL) J. Klein (ASL)			SAMPLER(S) SIGNATURE(S): <i>J. Klein</i>			SAMPLING INITIATED AT: 1354		SAMPLING ENDED AT: 1358	
PUMP OR TUBING DEPTH IN WELL (feet): 32			TUBING MATERIAL CODE: PE		FIELD FILTERED: Y (N)		FILTER SIZE: ___ µm		
FIELD DECONTAMINATION: PUMP Y (N)			TUBING Y (N (replaced))			DUPLICATE: Y (N)			
SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
SHAW05-003-GW-032	2	PE	250 each	N/A	N/A	N/A	537 m	APP	250
REMARKS: * Due to well size, both water level monitor and tubing could not fit. No WL data recorded during GW sampling.									
MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; B = Silicone; T = Teflon; O = Other (Specify)									
SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)									

J. Klein 1/29/18



GROUNDWATER SAMPLING LOG

WELL NO: SHAW04-00305-004 DATE: 1-27-18
 LOCATION: Shaw AFB PROJECT: 8184 - PURGING DATA SH.P4

WELL DEPTH (ft): 1.0 TUBING DIAMETER (in): 1/4 OD WELL SCREEN INTERVAL (ft): 3.81 - 2.8 STATIC DEPTH TO WATER (ft): 27.97 PUMP TYPE: PP

WELL VOLUME PURSE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY
 = (1.0 - 27.97) X 0.04 = -26.97 X 0.04 = -1.08 gal

EQUIPMENT VOLUME PURSE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 NA

INITIAL PUMP OR TUBING DEPTH IN WELL (ft): 31 FINAL PUMP OR TUBING DEPTH IN WELL (ft): 31 PURGING STARTED AT: 1408 PURGING BEGAT AT: 1441 TOTAL VOLUME PURGED (gal): 1.52

TIME	VOLUME PURGED (gal)	LIQ. VOLUME (gal)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	PH	TEMP (°F)	DO (mg/L)	DIS. OXY. (mg/L)	SP. COND. (µmhos/cm)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR
1408	-	-	0.06	27.97	-	-	-	-	-	-	-	-
1421	0.20	0.20	0.066	27.6	5.26	20.0	0.048	3.87	52.3	282	0.0	None
1424	0.20	0.40	0.066	27.2	5.22	20.3	0.046	4.02	62.8	125	0.0	None
1429	0.37	0.73	0.066	26.8	5.08	20.7	0.042	4.96	87.2	18.7	0.0	None
1432	0.20	0.92	0.066	26.4	5.00	20.7	0.041	5.10	114.8	140	0.0	None
1435	0.20	1.12	0.066	26.0	4.98	20.7	0.041	4.77	102.7	54.8	0.0	None
1438	0.20	1.32	0.066	25.6	4.95	20.6	0.040	4.82	105.2	3.09	0.0	None
1441	0.20	1.52	0.066	25.2	4.92	20.7	0.040	4.95	110.9	2.65	0.0	None

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.66; 6" = 1.02; 8" = 1.47; 12" = 3.08
 TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0002; 3/16" = 0.0014; 1/4" = 0.0028; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.016; 5/8" = 0.032
 PURGING EQUIPMENT CODES: B = Bailer; BP = Bailer Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

ANALYST: J. V. K. / ASL SAMPLER: J. V. K. SAMPLED AT: 1442 SAMPLED BEGAT AT: 1446
 PUMP OR TUBING DEPTH IN WELL (ft): 31 TUBING INTERNAL CODE NO. FIELD FEATURES: Y FLOW RATE: FLOW METER TYPE: FIELD DECONTAMINATION: PUMP Y TUBING Y DUPLICATE: Y

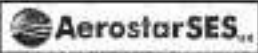
SAMPLE CODE	CONTAINER	MATERIAL CODE	VOLUME (mL)	TEMPERATURE (°C)	TOTAL VOL. ACCUM. IN FIELD (mL)	FIELD pH (Glass Electrode)	METHOD	EQUIPMENT CODE	SAMPLE FINE FLOW RATE (mL/min)
SHAW04-004-GW-031	1	PE	250	-	-	-	DPA 50M	APP	250
11	1	PE	125	-	-	-	11	APP	250

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bailer Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Squeeze Only); O = Other (Specify)

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 2%; Dissolved Oxygen: all readings ± 20% absolute; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: of readings ± 20 NTU; optionally ± 0 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2015

1/27/18



GROUNDWATER SAMPLING LOG

Well Name: **SHAW06-001** | Loc: **Shaw AFB**
 Well ID: **SHAW06-001-6W-033** | Date: **01/25/18**

PURGING DATA

Well Diameter (inches): **1.0"** | Tubing Diameter (inches): **1/4"**
 Well Bottom Elevation (feet): **34.90** | Static Depth (feet): **24.90** | Static Depth to Water (feet): **30.59**
 Well Volume Purge: $1 \text{ Well Volume} = (\text{Total Well Depth} - \text{Static Depth to Water}) \times \text{Well Capacity}$
 $= 1 \times 34.90 \text{ ft} - 30.59 \text{ ft} = 0.04 \text{ ft} = 0.17 \text{ gal}$

Equipment Volume Purge: $1 \text{ Equipment Vol.} = \text{Pump Volume} + (\text{Tubing Capacity} \times \text{Tubing Length}) + \text{Flow Cell Volume}$
 $= 0 \text{ gal} + 10.036 \text{ gal} + 33 \text{ ft} \times 0.20 \text{ gal/ft} = 0.29 \text{ gal}$

Time	Volume Purged (gallons)	Conductivity (µmhos/cm)	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Color (PCU)	Other				
1553	—	—	0.05	*	—	—	—	Clear				
1600	0.35	0.35	0.05	↓	4.74	20.1	0.279	3.45	207.8	29.6	Clear	↓
1605	0.25	0.60	0.05	↓	4.70	20.4	0.283	3.52	226.0	12.0	↓	↓
1610	0.25	0.85	0.05	↓	4.70	20.1	0.285	3.55	227.9	6.65	↓	↓
1615	0.25	1.1	0.05	↓	4.70	20.0	0.287	3.59	227.3	5.85	↓	↓

Well Capacity (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.66; 5" = 1.02; 6" = 1.47; 8" = 2.58
 Tubing Inside Dia. Capacity (GAL/FT): 1/8" = 0.000; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.015
 Purging Equipment Codes: B = Baller; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

Analyst: **A. Willis / J. G. ...** | Sampling Date: **1/15** | Equipment ID: **1616**
 Pump or Tubing ID: **33** | Field Filtered: **Y** | Filtered Equipment Type: **Y**
 Sample Container Description: **PE** | Sample Preservation: **45 each**
 Sample Code: **SHAW06-001-6W-033** | Forward: **2** | Media Code: **PE** | Volume: **45 each**
 Reference Analysis Method: **EPA 823M** | Sampling Equipment Code: **APP** | Sample Pump Flow Rate (L/min): **200**

* Due to size of well, both WLM and tubing could not fit - no WLM data recorded during bot sampling.

MATERIAL CODES: AG - Amber Glass; CG - Clear Glass; PE - Polyethylene; PP - Polypropylene; S - Silicone; T - Teflon; O - Other (Specify)
 SAMPLING EQUIPMENT CODES: APP - After Peristaltic Pump; B - Baller; BP - Bladder Pump; ESP - Electric Submersible Pump; RPPP - Reverse Flow Peristaltic Pump; SM - Straw Method (Using Gravity Drain); O - Other (Specify)

pH ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≤ 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2010

(Signature) 1/27/18



GROUNDWATER SAMPLING LOG

WELL NAME: M2032000 | Loc: Shaw AFB
 WELL NO: SHAW06-002 | SAMPLE ID: SHAW06-002-GW-029 | DATE: 1/25/18

PURGING DATA

WELL CHARACTERISTICS: WELL ID: 1 | TUBING CHARACTERISTICS: 3/16 | WELL SCREEN/SCREENAL DEPTH: 30 ft - 20 ft | STATIC DEPTH: 25.26 | PUMP TYPE: PP
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if well is applicable) - 1 30.0 ft - 25.26 ft = 0.04 ft³ = 0.19 gal

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if well is applicable) N/A

NETAL PUMP-ON TUBING DEPTH IN FEET: 28 | FINAL PUMP DE TUBING DEPTH IN FEET: 28 | PUMPON INITIATED AT: 1343 | PUMPON ENDED AT: 1407 | TOTAL VOLUME PUMPED (gallons): 1.776

TIME	VOLUME PUMPED (GALLONS)	CUMULATIVE VOLUME PUMPED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (UNADJUSTED)	TEMP (°C)	CO2 (ppm)	DISSOLVED O2 (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (PCU)	ODOR (DESCRIBED)
1343	—	—	0.074	25.26	—	—	—	—	—	—	—	—
1347	0.296	0.296	0.074	24.8	4.68	18.8	0.234	5.63	272.4	60.6	CLR	None
1351	0.296	0.592	0.074	24.8	4.54	18.8	0.238	5.05	272.0	21.6	CLR	None
1355	0.296	0.888	0.074	24.8	4.51	18.7	0.232	4.99	251.1	19.0	CLR	None
1358	0.222	1.110	0.074	24.8	4.48	18.7	0.223	4.83	236.3	18.7	CLR	None
1401	0.222	1.332	0.074	24.8	4.47	18.7	0.217	4.87	224.0	20.4	CLR	None
1404	0.222	1.554	0.074	24.8	4.48	18.7	0.211	4.80	212.4	18.3	CLR	None
1407	0.222	1.776	0.074	24.8	4.47	18.7	0.207	4.77	207.5	20.8	CLR	None

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0028; 5/16" = 0.0046; 3/8" = 0.0086; 1/2" = 0.0170; 5/8" = 0.0316
 PURGING EQUIPMENT CODES: B = Bailer; BP = bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

JW

SAMPLING DATA

INITIATED BY (PRINT) / AFFILIATION: J. Ujvalic / ASL | SAMPLE NO. (PRINT): SHAW06-002-GW-029 | SAMPLE ID (PRINT): SHAW06-002-GW-029
 PUMP ON TUBING DEPTH IN FEET: 28 | TUBING CHARACTERISTICS: 3/16 | FIELD FILTERED: Y | SAMPLE DATE: 1/25/18
 FIELD DECONTAMINATION: PUMP Y | TUBING Y | EQUIPMENT Y

SAMPLE ID CODE	# CONTAINER	ANALYSIS DATE	VOLUME (G)	PRESERVATIVE USED	TOTAL VOL. (G)	FIELD pH (at 25°C)	INTENDED ANALYSIS METHOD	ANALYSIS EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (L per minute)
SHAW06-002-GW-029	2	PE	125				EPA 821E	APP	250

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = SS core; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = Alter Peristaltic Pump; B = Bailer; BP = bladder Pump; ESP = Electric Submersible Pump; RPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gently Sucked); O = Other (Specify)

pH ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≤ 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 20 NTU; optionally ± 6 NTU or ± 10% (whichever is greater)

Revision Date: March 14, 2010

AP 1/27/18



GROUNDWATER SAMPLING LOG

WELLSHOW: M2032.0001
 loc: Shaw AFB
 WELL NO: SHAW06-003
 SAMPLE ID: SHAW06-003-6W-027
 DATE: 01/25/18

PURGING DATA

WELL CAPACITY (Gallon): 1.0"
 TUBING: 1/4" ID
 WELL SCREEN INTERNAL DEPTH: 21.35 ft - 19.85 ft
 STATIC DEPTH TO WATER (feet): 24.88
 PURGE PUMP TYPE OR BAL. OR: Peristaltic
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH DTWC - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only if not applicable) = 128.85 ft - 26.88 ft x 0.04 gal = 0.08 gal

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
 (only if not applicable) = 0 gal + (0.0024 x 27 ft) + 0.20 gal = 0.27 gal

FINAL PUMP OR TUBING DEPTH IN WELL (feet): 27
 FINAL PUMP OR TUBING DEPTH IN WELL (feet): 27
 PUMP NO. INSTALLED AT: 1335
 PURGE NO. SAVED AT: 1355
 TOTAL VOLUME PURGED (Gallons): 0.05 @ 1.00

TIME	VOLUME PURGED (Gallon)	CUMUL. VOLUME PURGED (Gallon)	PERCENT WATER (ppm)	DEPTH TO WATER (feet)	PH (standard)	TEMP. (F)	COND. (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (describe)
1335	-	-	0.05	X	-	-	-	-	-	-	Clear	None
1340	0.25	0.25	0.05	5.72	24.3	0.131	1.51	13.6	15.1			
1345	0.25	0.50	0.05	5.70	20.5	0.130	1.55	7.0	15.1			
1350	0.25	0.75	0.05	5.67	20.4	0.125	1.62	7.1	7.70			
1355	0.25	1.0	0.05	5.67	20.3	0.125	1.63	7.2	7.62			

WELL CAPACITY (Gallon Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.60; 6" = 1.00; 8" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (GAL/FT): 3/16" = 0.0026; 3/8" = 0.0044; 1/2" = 0.0088; 5/8" = 0.014; 3/4" = 0.020; 1" = 0.028; 1 1/2" = 0.054; 2" = 0.112
 PURGING EQUIPMENT CODES: B = Bailer; BP = Bleeder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT NAME): Awillu
 SAMPLED (DATE/TIME):
 PUMP OR TUBING DEPTH IN WELL (feet): 27
 TUBING INTERNAL CODE: PE
 FIELD FILTERED: (N)
 Filter Co. brand type:
 FIELD IDENTIFICATION: PUMP Y (N)
 TUBING Y (N)
 DUPLICATE: Y (N)

SAMPLE CODE	# CONTAINERS	MATERIAL CODE	VOLUME (L)	REFERENCE USE	TOTAL VOL. AMOUNT IN FIELD (L)		RESERVED ANALYSIS AND/OR ACTIVE	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (L per minute)
					INITIAL	FINAL (if standard)			
SHAW06-003-6W-027	2	PE	125 each				EPA 815M	APP	200

REMARKS: Due to size of well, both WEM and tubing could not fit. No water level data recorded during GW sampling.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = Air Peristaltic Pump; B = Bailer; BP = Bleeder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Siphon Method (Tubing Gravity Draw); O = Other (Specify)

Statistics Criteria for range of detection of test from consecutive readings
 pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ≥ 20% saturation; optionally, ± 0.2 mg/L or ± 10% (whichever is greater); Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

1/27/18



AerostarSES_{inc}

SAMPLE COLLECTION LOG

SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Shaw AFB

Date: 1-27-18

Sample Technician(s): A. Willis

Station ID: SITE 4 - Current FTA SHAW04-004

Location Description:
 380',
 @ 675', 165° SE OF TRAINING PLANE

Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

Sample Collected from (circle one): Channel/Ditch Holding Pond/Lagoon Lake/Pond
 River/Stream Trench Other

SEDIMENT SAMPLE

Sample ID: SHAW04-004-SD-901 AND 115/MGD
SHAW04-004-SD-001 Sample Collection Time: 1655

Sample Depth: 0-0.5' Sediment Description: sandy silt w/ organics

Collection Method: Spoon Analysis/Method: EPA 537M

Sample Container: 3, 250 mL PE Preservative: NONE

SURFACE WATER SAMPLE

Sample ID: SHAW04-004-SW-901 AND 115/MGD
SHAW04-004-SW-001 Sample Collection Time: 1655

Sample Depth: 0-0.5' Collection Method: GRAB

Analysis/Method: EPA 537M Sample Container: 3, 125 mL PE

Preservative: NONE Water Quality (circle one): Clear Cloudy Turbid Other

GROUNDWATER SAMPLE (GRAB)

Sample ID: _____ Sample Collection Time: _____

Sample Depth: _____ Collection Method: _____

Analysis/Method: EPA 537M Sample Container: _____

Preservative: NONE Water Quality (circle one): Clear Cloudy Turbid Other

COMMENTS: GPS ✓



AerostarSES_{LLC}

SAMPLE COLLECTION LOG

SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Shaw AFB

Date: 1/27/18

Sample Technician(s): J. Vojak / A. Willis

Station ID: Area 5 Building 1511 (AFFF AREAS)

Location Description: In grassy area between aircraft wash hangar & building 1511.

Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

Sample Collected from (circle one): Channel/Ditch Holding Pond/Lagoon Lake/Pond
 River/Stream Trench Other Check valve Grab

SEDIMENT SAMPLE

Sample ID: _____ Sample Collection Time: _____

Sample Depth: _____ Sediment Description: _____

Collection Method: _____ Analysis/Method: EPA 537M

Sample Container: _____ Preservative: NONE

SURFACE WATER SAMPLE

Sample ID: _____ Sample Collection Time: _____

Sample Depth: _____ Collection Method: _____

Analysis/Method: EPA 537M Sample Container: _____

Preservative: NONE Water Quality (circle one): Clear Cloudy Turbid Other

GROUNDWATER SAMPLE (GRAB)

Sample ID: SHAWOS-002-GW-033 Sample Collection Time: 1550

Sample Depth: 33' Collection Method: Check Valve

Analysis/Method: EPA 537M Sample Container: 3,125mL PE

Preservative: NONE Water Quality (circle one): Clear Cloudy Turbid Other

COMMENTS:
 Due to DTW sample was converted to a grab. Exceeded peristaltic capabilities.

SES FIELD READINESS REVIEW FORM

Employee Name: Ash Willis

Job Number: M2032.0001

Job Location: Shaw AFB

Job Tasks:

Surface Sampling, Groundwater Sampling, Soil Sampling – Surface Soil and subsurface soil, Soil boring logging,, Surface water and sediment sampling, Mobe/demobe tasks

Equipment Needed:

Soil boring: Munsell Charts, Tape measure, pens, soil boring forms, USCS Table,

GW Sampling: YSI, peristaltic pump, multiRAE, sample containers etc.

Sediment Sampling: Sample containers, spoons

SW Sampling: Sample containers, SW collection device

Proper PPE for all above tasks is a minimum Level D, plus nitriles.

Documents Needed:

Field forms: Boring log, GW sampling log, sample log, log book, calibration sheets – Meshew to print copies 11-27


Significant training conducted prior to departure:

- Drivers training will be conducted on the 23rd or 24th – specific date and time is yet to be determined. EAL has been approved.
- Dig permits were fully approved last week. Ash will call the various installation utilities on Wednesday this week to activate the dig permits as they all request a notification 3 days prior to beginning work. Additionally a further check was requested by the water utility at the WWTP. Greg is currently trying to get in contact with the operator but may have to track him down on Monday. We will not be starting at the WWTP until the operator has signed off on the locations.
- Surveyors are Wellston Associates – same group from Robins and Dobbins.
- Abandonment requires pressure grouting
- Well permits have been submitted to the state.
- GSI will be sending sample containers. We'll collect them at Area 1 or Area 4.
- Field QC Rev 10 reviewed

Equipment Packed for travel on: Ordered 01/17/18 – Packed 01/18/18

Travel Dates: 01/22/18 (Mob) to completion 01/27/18

Site Supervisor Signature



SES FIELD READINESS REVIEW FORM

Employee Name: J Klein

Job Number: M2032.0001

Job Location: Shaw AFB

Job Tasks:

Surface Sampling, Groundwater Sampling, Soil Sampling – Surface Soil and subsurface soil, Soil boring logging,, Surface water and sediment sampling, Mobe/demobe tasks

Equipment Needed:

Soil boring: Munsell Charts, Tape measure, pens, soil boring forms, USCS Table,

GW Sampling: YSI, peristaltic pump, multiRAE, sample containers etc.

Sediment Sampling: Sample containers, spoons

SW Sampling: Sample containers, SW collection device

Proper PPE for all above tasks is a minimum Level D, plus nitriles.

Documents Needed:

Field forms: Boring log, GW sampling log, sample log, log book, calibration sheets – Meshew to print copies 11-27

Significant training conducted prior to departure:

- Drivers training will be conducted on the 23rd or 24th – specific date and time is yet to be determined. EAL has been approved.
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- Abandonment requires pressure grouting
- Well permits have been submitted to the state.
- GSI will be sending sample containers. We'll collect them at Area 1 or Area 4.
- Field QC Rev 10 reviewed

Equipment Packed for travel on: Ordered 01/17/18 – Packed 01/18/18

Travel Dates: 01/22/18 (Mob) to completion 01/27/18

Site Supervisor Signature



SES FIELD READINESS REVIEW FORM

Employee Name: Justin Vojak

Job Number: M2032.0001

Job Location: Shaw AFB

Job Tasks:

Surface Sampling, Groundwater Sampling, Soil Sampling – Surface Soil and subsurface soil, Soil boring logging,, Surface water and sediment sampling, Mobe/demobe tasks

Equipment Needed:

Soil boring: Munsell Charts, Tape measure, pens, soil boring forms, USCS Table,

GW Sampling: YSI, peristaltic pump, multiRAE, sample containers etc.

Sediment Sampling: Sample containers, spoons

SW Sampling: Sample containers, SW collection device

Proper PPE for all above tasks is a minimum Level D, plus nitriles.

Documents Needed:

Field forms: Boring log, GW sampling log, sample log, log book, calibration sheets – Meshew to print copies 11-27

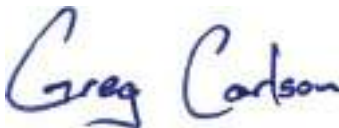
Significant training conducted prior to departure:

- Drivers training will be conducted on the 23rd or 24th – specific date and time is yet to be determined. EAL has been approved.
- Dig permits were fully approved last week. Ash will call the various installation utilities on Wednesday this week to activate the dig permits as they all request a notification 3 days prior to beginning work. Additionally a further check was requested by the water utility at the WWTP. Greg is currently trying to get in contact with the operator but may have to track him down on Monday. We will not be starting at the WWTP until the operator has signed off on the locations.
- Surveyors are Wellston Associates – same group from Robins and Dobbins.
- Abandonment requires pressure grouting
- Well permits have been submitted to the state.
- GSI will be sending sample containers. We'll collect them at Area 1 or Area 4.
- Field QC Rev 10 reviewed

Equipment Packed for travel on: Ordered 01/17/18 – Packed 01/18/18

Travel Dates: 01/22/18 (Mob) to completion 01/27/18

Site Supervisor Signature



Appendix D
Laboratory Case Narrative, Validation Report, and
Validated Sample Results

DATA VALIDATION REPORT

M2032.0001 (Savannah) Shaw AFB

SAMPLE DELIVERY GROUP: B820260, B823124

Prepared for
Aerostar SES LLC

March 5, 2018

MEC^x, Inc.
8864 Interchange Drive
Houston, Texas 77054

www.mecx.net





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ACRONYMS AND ABBREVIATIONS

°C	Celsius
%	Percent
%D	percent difference
B	blank contamination
CB	calibration blank
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody
CLP	Contract Laboratory Program
EPA	US Environmental Protection Agency
ER	equipment rinsate
FB	field blank
FD	field duplicate
ICAL	initial calibration
ICB	initial calibration blank
ICL	instrument calibration limit
ICV	initial calibration verification
IS	internal standard
J	estimated value
LCS	laboratory control sample
LOD	limit of detection
LOQ	limit of quantification
MB	method blank
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
ND	nondetect
PARCC	precision, accuracy, representativeness, comparability, completeness
PFC	perfluorinated compound
QAPP	Quality Assurance Program Plan
QC	quality control
QSM	Quality Systems Manual
R	Rejected
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
SDG	sample delivery group
TB	trip blank
U	not detected
UJ	not detected; associated value is an estimate



I. INTRODUCTION

Task Order Title: M2032.0001 (Savannah) Shaw AFB

Contract: W9128F-15-D-0051

MECX Project No.: 1529.001H.01

Sample Delivery Group: B820260, B823124

Project Manager: Jenny Vance

Matrix: Soil/Water

QC Level: Stage 2B, Stage 4

No. of Samples: 72

Laboratory: Maxxam

TABLE 1 - SAMPLE IDENTIFICATION

Sample Name	Lab Sample Name	Matrix	Collection	Method	Validation Level
SHAW01-MW105-GW-019	FZJ955	WG	2018-01-25 09:56	E537 m	Stage 2B
SHAW01-MW105-GW-919	FZJ956	WG	2018-01-25 09:56	E537 m	Stage 2B
SHAW01-MW121A-GW-022	FZJ953	WG	2018-01-24 17:10	E537 m	Stage 2B
SHAW01-MW122A-GW-026	FZJ954	WG	2018-01-24 17:45	E537 m	Stage 2B
SHAW02-001-SO-018	FZJ943	SO	2018-01-25 15:45	E537 m	Stage 2B
SHAW02-002-SO-021	FZJ945	SO	2018-01-25 17:50	E537 m	Stage 2B
SHAW02-003-SO-019	FZJ944	SO	2018-01-25 16:50	E537 m	Stage 2B
SHAW03-FT3MW5-GW-016	FZJ960	WG	2018-01-25 17:40	E537 m	Stage 2B
SHAW03-FT3MW5-GW-916	FZJ961	WG	2018-01-25 17:40	E537 m	Stage 2B
SHAW04-001-SO-013	FZJ951	SO	2018-01-26 10:35	E537 m	Stage 2B
SHAW04-001-SS-001	FZJ950	SO	2018-01-26 10:00	E537 m	Stage 2B
SHAW04-002-SO-013	FZJ948	SO	2018-01-26 09:40	E537 m	Stage 4
SHAW04-002-SO-913	FZJ949	SO	2018-01-26 09:40	E537 m	Stage 4
SHAW04-002-SS-001	FZJ947	SO	2018-01-26 09:10	E537 m	Stage 2B
SHAW04-003-SS-001	FZJ952	SO	2018-01-26 11:05	E537 m	Stage 2B
SHAW06-001-GW-033	FZJ959	WG	2018-01-25 16:15	E537 m	Stage 2B
SHAW06-001-SO-028	FZJ940	SO	2018-01-24 09:10	E537 m	Stage 2B
SHAW06-001-SS-001	FZJ939	SO	2018-01-24 08:25	E537 m	Stage 4



Sample Name	Lab Sample Name	Matrix	Collection	Method	Validation Level
SHAW06-002-GW-028	FZJ958	WG	2018-01-25 14:08	E537 m	Stage 2B
SHAW06-002-SO-026	FZJ937	SO	2018-01-23 17:20	E537 m	Stage 2B
SHAW06-002-SS-001	FZJ936	SO	2018-01-23 16:30	E537 m	Stage 2B
SHAW06-003-GW-027	FZJ957	WG	2018-01-25 13:55	E537 m	Stage 2B
SHAW06-003-SO-026	FZJ935	SO	2018-01-23 16:05	E537 m	Stage 2B
SHAW06-003-SS-001	FZJ933	SO	2018-01-23 14:55	E537 m	Stage 2B
SHAW-RS-001	FZJ934	WQ	2018-01-23 15:35	E537 m	Stage 2B
SHAW-RS-002	FZJ938	WQ	2018-01-24 08:10	E537 m	Stage 2B
SHAW-RS-003	FZJ942	WQ	2018-01-25 08:55	E537 m	Stage 2B
SHAW-RS-004	FZJ946	WQ	2018-01-26 08:55	E537 m	Stage 2B
SHAW-SB-001	FZJ941	WQ	2018-01-24 08:55	E537 m	Stage 2B
SHAW01-001-SO-002	FZY521	SO	2018-01-26 16:30	E537 m	Stage 2B
SHAW01-001-SO-902	FZY522	SO	2018-01-26 16:30	E537 m	Stage 2B
SHAW01-001-SS-001	FZY519	SO	2018-01-26 16:20	E537 m	Stage 2B
SHAW01-001-SS-901	FZY520	SO	2018-01-26 16:20	E537 m	Stage 2B
SHAW01-002-SO-003	FZY526	SO	2018-01-26 17:15	E537 m	Stage 2B
SHAW01-002-SS-001	FZY525	SO	2018-01-26 17:05	E537 m	Stage 2B
SHAW01-003-SO-002	FZY524	SO	2018-01-26 16:53	E537 m	Stage 2B
SHAW01-003-SS-001	FZY523	SO	2018-01-26 16:45	E537 m	Stage 2B
SHAW02-001-GW-021	FZY550	WG	2018-01-27 17:38	E537 m	Stage 2B
SHAW02-002-GW-022	FZY551	WG	2018-01-27 18:10	E537 m	Stage 2B
SHAW02-003-GW-020	FZY549	WG	2018-01-27 17:25	E537 m	Stage 2B
SHAW03-001-GW-018	FZY536	WG	2018-01-28 12:04	E537 m	Stage 4
SHAW03-001-SO-016	FZY518	SO	2018-01-26 15:40	E537 m	Stage 4
SHAW03-001-SS-001	FZY517	SO	2018-01-26 15:13	E537 m	Stage 2B
SHAW03-002-GW-017	FZY535	WG	2018-01-28 11:22	E537 m	Stage 2B
SHAW03-002-SO-017	FZY514	SO	2018-01-26 14:20	E537 m	Stage 2B
SHAW03-002-SS-001	FZY513	SO	2018-01-26 13:48	E537 m	Stage 2B
SHAW03-003-GW-018	FZY553	WG	2018-01-28 11:45	E537 m	Stage 2B



Sample Name	Lab Sample Name	Matrix	Collection	Method	Validation Level
SHAW03-003-SO-016	FZY516	SO	2018-01-26 15:00	E537 m	Stage 2B
SHAW03-003-SS-001	FZY515	SO	2018-01-26 14:35	E537 m	Stage 2B
SHAW04-001-GW-018	FZY554	WG	2018-01-28 15:10	E537 m	Stage 2B
SHAW04-002-GW-018	FZY552	WG	2018-01-28 10:35	E537 m	Stage 2B
SHAW04-003-GW-015	FZY534	WG	2018-01-28 10:10	E537 m	Stage 2B
SHAW04-003-SO-012	FZY512	SO	2018-01-26 12:15	E537 m	Stage 4
SHAW04-004-SD-001	FZY543	SE	2018-01-27 12:04	E537 m	Stage 4
SHAW04-004-SD-901	FZY544	SE	2018-01-27 12:04	E537 m	Stage 2B
SHAW04-004-SW-001	FZY545	WS	2018-01-27 12:04	E537 m	Stage 4
SHAW04-004-SW-901	FZY546	WS	2018-01-27 12:04	E537 m	Stage 2B
SHAW05-001-SO-024	FZY540	SO	2018-01-30 10:50	E537 m	Stage 2B
SHAW05-001-SS-001	FZY542	SO	2018-01-27 13:47	E537 m	Stage 2B
SHAW05-002-GW-033	FZY548	WG	2018-01-27 15:50	E537 m	Stage 2B
SHAW05-002-SO-034	FZY539	SO	2018-01-27 13:05	E537 m	Stage 2B
SHAW05-002-SS-001	FZY531	SO	2018-01-27 12:03	E537 m	Stage 2B
SHAW05-002-SS-901	FZY532	SO	2018-01-27 12:03	E537 m	Stage 2B
SHAW05-003-GW-032	FZY537	WG	2018-01-28 13:54	E537 m	Stage 2B
SHAW05-003-SO-027	FZY530	SO	2018-01-27 11:17	E537 m	Stage 2B
SHAW05-003-SS-001	FZY529	SO	2018-01-27 10:42	E537 m	Stage 2B
SHAW05-004-GW-031	FZY538	WG	2018-01-28 14:42	E537 m	Stage 2B
SHAW05-004-SO-028	FZY528	SO	2018-01-27 10:08	E537 m	Stage 2B
SHAW05-004-SS-001	FZY527	SO	2018-01-27 09:28	E537 m	Stage 2B
SHAW-RS-005	FZY547	WQ	2018-01-27 15:40	E537 m	Stage 2B
SHAW-RS-006	FZY533	WQ	2018-01-28 08:45	E537 m	Stage 2B
SHAW-RS-007	FZY541	WQ	2018-01-30 10:00	E537 m	Stage 2B



II. SAMPLE MANAGEMENT

According to the case narratives and the chains-of-custody (COCs) provided by the laboratory for sample delivery groups (SDGs) B820260, B823124:

- Cooler temperatures recorded on the COCs indicated all samples were received at temperatures within the control limits of $\leq 6^{\circ}\text{C}$ and $> 0^{\circ}\text{C}$.
- Field and laboratory personnel signed and dated the COCs.
- The case narrative noted custody seals were present and intact on the coolers upon receipt at the laboratory.
- Some chain of custody entries were corrected by overwriting the original entry, rather than lining out. Most corrections were initialed but not dated. All entries were legible.



TABLE 2 - DATA QUALIFIER REFERENCE

Qualifier	Definition
R	The sample results are rejected because of serious deficiencies in the ability to analyze the sample and to meet quality control (QC) criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was analyzed for but was nondetect (ND) above the reported sample quantification limit.
B	The reported concentration is less than 5 times the concentration reported in an associated field or lab blank.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. J- denotes a low bias for the sample results and J+ for a high bias.
UJ	The material was analyzed for but was ND. The associated value is an estimate and may be inaccurate or imprecise.

TABLE 3 - REASON CODE REFERENCE

Reason Code	Definition
01	Sample received outside of 4+/-2 degrees Celsius (°C)
01A	Improper sample preservation
02	Holding time exceeded
02A	Extraction
02B	Analysis
03	Instrument performance – outside criteria
03A*	Bromofluorobenzene (BFB)
03B*	Decafluorotriphenylphosphine (DFTPP)
03C*	dichlorodiphenyltrichloroethane (DDT) and/or endrin % breakdown exceeds criteria
03D	Retention time windows
03E	Resolution
04	ICAL results outside specified criteria
04A	Compound mean RRF QC criteria not met
04B	Individual % RSD criteria not met
04C	$r < 0.995$ or $r^2 < 0.99$
04D	ICAL % Recovery
05	Continuing calibration results outside specified criteria



Reason Code	Definition
05A	Compound mean RRF QC criteria not met
05B	Compound % Difference QC criteria not met
06	Result qualified as a result of the 5x/10x blank correction
06A	Method or preparation blank
06B	ICB or CCB
06C	ER
06D	TB
06E	FB
07	Surrogate recoveries outside control limits
07A	Sample
07B	Associated MB or LCS
08	MS/MSD/Duplicate results outside criteria
08A	MS and/or MSD recovery not within control limits (accuracy)
08B	% RPD outside acceptance criteria (precision)
09*	Post digestion spike outside criteria graphite furnace atomic absorption (GFAA)
10	Internal standards outside specified control limits
10A	Recovery
10B	Retention time
11	LCS recoveries outside specified limits
11A	Recovery
11B	% RPD (if run in duplicate)
12*	Interference check standard
13*	Serial dilution
14*	Tentatively identified compounds
15	Quantification
16	Multiple results available; alternate analysis preferred
17	Field duplicate RPD criteria is exceeded
18*	Percent difference between original and second column exceeds QC criteria
19	Professional judgment was used to qualify the data
20*	Pesticide clean-up checks
21	Target compound identification



Reason Code	Definition
22*	Radiological calibration
23*	Radiological quantification
24	Reported result and/or lab qualifier revised to reflect validation findings

*Indicates that this code is not expected to apply to the evaluation of PFAS analyses



III. METHOD ANALYSIS- PERFLUORINATED COMPOUNDS BY MODIFIED EPA METHOD 537 MODIFIED

L. Calvin of MEC^x reviewed these SDGs March 5 to March 9, 2018.

III.1. HOLDING TIMES

SDGs B820260, B823124

Although the case narratives noted several method holding time exceedances, the holding times specified in the QAPP were met. Samples were extracted within 28 days of collection and all samples were analyzed within 45 days of extraction.

III.2. CALIBRATION

Calibration criteria were met.

III.2.1. INITIAL CALIBRATION

SDGs B820260, B823124

Initial calibration criteria were met. Recoveries were within 70-130% for the lowest level of each initial calibration and 75-125% for the remaining levels, and all correlation coefficient r^2 values were within the control limit of ≥ 0.990 or r values ≥ 0.995 . Applicable %RSDs were within the control limit of $\leq 20\%$. The calculated peak asymmetry factors were within the control range of 0.8-1.5. MEC^x noted the laboratory utilized as the calibration method a weighted (1/X) linear initial calibration standard curve not forced through zero.

III.2.2. CONTINUING CALIBRATION

SDGs B820260, B823124

The initial calibration verification (ICV) and continuing calibration verification (CCV) recoveries were within the control limits of 75-125%. Low-level instrument sensitivity check standard (ISC) recoveries were within the control limits of 70-130%.

III.3. QUALITY CONTROL SAMPLES

III.3.1. METHOD BLANKS

SDGs B820260, B823124

The method blanks associated with the analyses of the soil and water samples had no target analyte detects above the respective soil and water detection limits (DLs).

III.3.2. LABORATORY CONTROL SAMPLES

SDGs B820260, B823124

LCS recoveries were within the control limits of 70-130%, and RPDs for water LCS/LCSD pairs were within the control limit of $\leq 30\%$.

III.3.3. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Outliers affecting parent sample data and qualifications assigned are noted below. Qualifications were not assigned for recovery outliers not occurring in both the MS and MSD, or for RPD outliers or high recoveries if the outlier compound was not detected in the parent sample. If the parent sample concentration of an analyte exceeded 4x the spike amount, recoveries and the RPD were



not evaluated. With exceptions noted below, recoveries and RPDs affecting sample data were within the control limits of 70-130% and $\leq 30\%$, respectively

SDG B820260

MS/MSD analyses were performed on soil sample SHAW04-002-SS-001 and on water sample SHAW01-MW105-GW-019. Recoveries were below the control limits of 70-130% for PFHxS in the MS (51%) and MSD (41%) of water sample SHAW01-MW105-GW-019. The detect for PFHxS was qualified as estimated (J) in the parent sample.

SDG B823124

MS/MSD analyses were performed on soil samples SHAW01-001-SO-002, SHAW05-001-SS-001, SHAW01-001-SS-001, SHAW04-004-SD-001, and on water sample SHAW04-004-SW-001. Recoveries were below the control limits of 70-130% for 6:2-FTS in the MS (13%) and MSD (59%) of water sample SHAW04-004-SW-001, and the RPD exceeded the control limit of $\leq 30\%$ AT 129%. The detect for 6:2-FTS was qualified as estimated (J) in the parent sample.

III.4. FIELD QC SAMPLES

MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.

III.4.1. FIELD BLANKS AND EQUIPMENT BLANKS

The field and equipment blanks are listed in the tables below. Site sample results were not qualified based on field blank detects, as the source water was used only for decontamination of drilling equipment and was not used for decontamination of sampling equipment. Equipment blank SHAW-RS-007 was associated with soil samples. The equipment blank concentrations in sample SHAW-RS-007 were not considered sufficient to qualify soil sample detects above the LOQ. As a conservative measure, detects for the equipment blank contaminants below the LOQ in soil site samples were qualified as possible field contamination (B).

Table 5-FB/EB Detects

SDG B820260

Field or Equipment Blank	Detects	Concentration $\mu\text{g/L}$	LOQ $\mu\text{g/L}$
SHAW-SB-001 (field blank)	6:2-FTS	0.64	0.20
	PFBA	0.018 J	0.020
	PFHpA	0.0094 J	0.020
	PFHxS	0.011 J	0.020
	PFHxA	0.27	0.020
	PFOA	0.0056 J	0.020
	PFOSA	0.016 J	0.020
	PFOS	0.84	0.20
	PFPeA	0.016 J	0.020



Field or Equipment Blank	Detects	Concentration µg/L	LOQ µg/L
SHAW-RS-001 (equipment blank)	none	N/A	N/A
SHAW-RS-002 (equipment blank)	none	N/A	N/A
SHAW-RS-003 (equipment blank)	none	N/A	N/A
SHAW-RS-004 (equipment blank)	none	N/A	N/A

SDG B823124

Field or Equipment Blank	Detects	Concentration µg/L	LOQ µg/L
SHAW-RS-005 (equipment blank)	none	N/A	N/A
SHAW-RS-006 (equipment blank)	none	N/A	N/A
SHAW-RS-007 (equipment blank)	6:2-FTS	0.0066	0.020
	PFHxA	0.0035	0.020
	PFPeA	0.0075	0.020

III.4.2. FIELD DUPLICATES

Field duplicate pairs are listed below. RPDs for common detects above the LOQ were within the control limit of $\leq 30\%$, and detects below the LOQ in one or both samples of a pair were within the reasonable control limit of $\pm LOQ$, with exceptions noted in the table below. Results for the outlier target analytes were qualified as estimated (J or UJ) in both samples of a pair.

Table 6-FD RPDs

SDG B820260

Parent Sample	Field Duplicate	Target Analyte	RPD Outliers
SHAW04-002-SO-013	SHAW04-002-SO-913	PFHxS	96%
		PFHxA	> \pm RL
		PFOS	155%
SHAW01-MW105-GW-019	SHAW01-MW105-GW-919	N/A	None
SHAW03-FT3MW5-GW-016	SHAW03-FT3MW5-GW-916	N/A	None

SDG B823124

Parent Sample	Field Duplicate	Target Analyte	RPD Outliers
SHAW01-001-SS-001	SHAW01-001-SS-901	PFDS	138%
		PFHxA	64%
		PFOS	88%
SHAW01-001-SO-002	SHAW01-001-SO-902	PFHxS	33%
		PFOA	> \pm RL
		PFOS	110%
SHAW05-002-SS-001	SHAW05-002-SS-901	N/A	None



Parent Sample	Field Duplicate	Target Analyte	RPD Outliers
SHAW04-004-SD-001	SHAW04-004-SD-901	6:2-FTS	60%
		8:2-FTS	38%
		PFDS	148%
		PFOSA	116%
		PFOS	88%
SHAW04-004-SW-001	SHAW04-004-SW-901	N/A	None

III.5. INTERNAL STANDARDS PERFORMANCE

The applicable labeled internal standard recoveries were within the control limits of $\pm 50\%$ of the average peak areas of the initial calibration, except as noted in the table below. Results for the associated target compounds were qualified as estimated (UJ for nondetects and J for detects) in the affected samples.

SDG B820260

Several samples were re-extracted and reanalyzed for internal standard outliers in the initial analyses. The re-extraction analyses were not performed at further dilutions, and only the acceptable internal standard and associated analyte(s) were reported from the re-extraction analyses. All recoveries were within control limits.

SDG B823124

Internal Standard	% Recovery	Affected Samples	Associated Target Analyte(s)
13C2-PFTeDA	38%	SHAW01-001-SO-002	PFTeDA, PFTrDA
	49%	SHAW05-004-GW-031	
	26%	SHAW05-001-SS-001	

III.6. COMPOUND IDENTIFICATION

SDGs B820260, B823124

Compound identification was verified for site samples SHAW06-001-SS-001, SHAW04-002-SO-013 and SHAW01-MW105-GW-019 (SDG B820260), and SHAW04-003-SO-012, SHAW03-001-SO-016, SHAW04-004-SD-001, SHAW03-001-GW-018, and SHAW04-004-SW-001 (B823124). The laboratory analyzed for 18 perfluorinated compounds by Modified EPA Method 537. Review of retention times and the ion chromatograms indicated no issues with compound identification.

III.7. COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Calculations were verified and sample results reported on the sample result summaries were verified against the raw data for the samples listed above (see Compound Identification section). Quantitation verification was limited based upon the significant figures presented in the raw data and were therefore estimations of the actual sample amounts. The reviewer considered the concentration verified within that limitation. The laboratory calculated and reported compound-specific detection limits. Detects below the LOQ were qualified as estimated (J). Nondetects are valid to the LOD.

The laboratory integrated isomeric forms for the PFCs with linear and branched isomers as required by Revision 1.1 of EPA Method 537.



Most samples were initially analyzed undiluted. The samples listed below were either re-extracted using reduced sample volumes and/or reanalyzed at one or more further dilutions to report various target analytes within the linear range of the calibration. Analytes were reported from the least dilute analysis possible of multiple dilutions to report all target analytes within the linear calibration range.

SDG B820260

Based on screening results indicating the presence of high concentrations of target analytes, six of the nine water site samples were extracted using reduced sample volumes, resulting in effective initial dilutions, and four were reanalyzed at further dilutions for one or more target analytes. One of the 15 soil samples was reanalyzed at a dilution for PFOS only. The DLs and LOQs were adjusted accordingly. Remaining results were reported from the undiluted or least dilute analyses.

SDG B823124

Based on screening results indicating the presence of high concentrations of target analytes, six of the 14 water site samples were extracted using reduced sample volumes, resulting in effective initial dilutions, and five were reanalyzed at further dilutions for one or more target analytes. All soil samples were initially analyzed undiluted, and 11 samples were reanalyzed at dilutions for one or more target analytes. The DLs and LOQs were adjusted accordingly. Remaining results were reported from the undiluted or least dilute analyses.

Sample SHAW01-001-SO-002 reported PFHxS from two analyses. The reviewer chose the most technically acceptable analysis for the target compound.

III.8. SYSTEM PERFORMANCE

No issues were noted with system performance.



IV. SUMMARY AND CONCLUSIONS

MECX evaluated a total of 1152 data records from field samples during the validation and qualified 53 records (4.6% of the data) as estimated values (J for detects and UJ for nondetects). The qualification was required for potential equipment rinsate contamination, matrix spike recovery and precision outliers, internal standard outliers and field duplicate precision outliers. Nondetect compounds were flagged (U) to indicate that the compound was analyzed for but not detected above the limit of detection (LOD). Specific qualification is discussed in the text above.

Overall, the quality of the data was acceptable. The precision (97.5%) and accuracy results (97.9%) were acceptable. Other data quality indicators (DQI) (representativeness, comparability and completeness) met the project objectives. Each of these DQIs is discussed below.

IV.1. PRECISION

Precision is a measure of the agreement between duplicate sample measurements of the same quantity and is reflected in the relative percent difference (RPD) between spikes and the RPD for the field duplicate pair analysis. Precision was measured at 97.5% primarily due to field duplicate outliers. Precision was considered acceptable for the project.

IV.2. ACCURACY

Accuracy is measured by the results from the recovery of known amounts of compounds or elements from calibration, method blanks, laboratory control samples (LCS), matrix spikes (MS), internal standard recoveries and surrogate recoveries. The primary qualification for accuracy was for potential equipment rinsate contamination (1.4%). The accuracy was 97.9%. Accuracy was considered acceptable for the project.

IV.3. REPRESENTATIVENESS

The measures of representativeness – sample handling, analytical blank analysis, were met. Designated analytical protocols were followed. The laboratory did utilize a weighted 1/X calibration curve which was not forced through zero. Although this is a deviation from Method 537, it is acceptable on DoD projects and was considered acceptable by the reviewer. Holding times were met for all analyses. No analytical problems were noted which would impact data representativeness.

IV.4. COMPARABILITY

The samples were analyzed using appropriate approved methods of analysis. All data were reported correctly using standard units.

IV.5. COMPLETENESS

Completeness is the amount of validated data compared to the planned amount of data and is expressed as a percentage of the usable data divided by the total number of data points. Of the 1152 target data points, no data points were rejected, resulting in a completeness of 100%.



V. REFERENCES

- Aerostar, 2016. *Final Quality Assurance Project Plan for Site Inspection of Aqueous Film Forming Foam Areas, Multiple Sites United States Air Force Installations*, March 2016
- Aerostar, 2016a. *Final Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) for Site Inspection of Fire Fighting Foam Usage at Various Air Force Bases in the Eastern United States, Addendum 9, Field Sampling Plan for Shaw Air Force Base Sumter County, South Carolina*, February 2017.
- Department of Defense (DOD), 2017. *DoD Quality Systems Manual for Environmental Laboratories*, Version 5.1. January 2017.
- EPA, 2009. *Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)*, Version 1.1, September 2009. EPA Document #: EPA/600/R-08/092.
- EPA, 2014. *EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review*, EPA/540-R-014-002.
- EPA (U.S. Environmental Protection Agency), January 2009. OSWER 9200-1-85. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. EPA-540/R-08-005.



1.0 Project Narrative

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Maxxam Job: B820260 – Soil Analysis

Sample Analysis

Soil extracts were initially pre-screened and estimated concentrations were obtained so that samples could be appropriately diluted for analysis on QC batch 5392395 (2018/02/17). Due to high concentration, dilution was required for Perfluorooctanesulfonate (PFOS) in the following sample:

FZI936 *SHAW06-002-SS-001*

Detection limit was adjusted accordingly.

Quantitation of PFAS

Many PFAS (e.g. PFOS) have several isomeric forms that may show up as separate or partially-merged peaks in the analytical chromatograms. These peaks will be integrated and the areas summed such that the result represents the concentration of the sum of the linear and branched isomers, per USEPA (2009). Instrumentation is calibrated using certified quantitative standards containing only the linear isomer for all target analytes, except Perfluorooctane sulfonate (PFOS) and Perfluorohexane sulfonate (PFHxS), which are calibrated using certified branched and linear isomer mixtures. As additional certified reference materials containing branched and linear isomers become commercially available, they will be incorporated into the analytical method.

Data Qualifiers

U – Analyte was not detected and is reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.

J – The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).

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Maxxam Job: B820260 – Water Analysis

Sample Analysis

Samples were initially pre-screened and estimated concentrations were obtained so that appropriate sample volumes could be extracted on QC batches 5386102 (2018/02/08), 5389177 (2018/02/09), 5391181 (2018/02/09-12) and 5393111 (2018/02/13). Due to high concentrations, the following samples were analyzed for selected analytes using reduced sample extraction volumes:

FZI941	SHAW-SB-001	Perfluorooctanesulfonate (PFOS), 6:2 Fluorotelomersulfonate (6:2FTS)
FZI953	SHAW01-MW121A-GW-022	All analytes
FZI954	SHAW01-MW122A-GW-026	All analytes
FZI955	SHAW01-MW105-GW-019	Perfluorohexanesulfonate (PFHxS), Perfluorooctanesulfonate (PFOS)
FZI956	SHAW01-MW105-GW-919	Perfluorohexanesulfonate (PFHxS), Perfluorooctanesulfonate (PFOS)
FZI960	SHAW03-FT3MW5-GW-016	All analytes
FZI961	SHAW03-FT3MW5-GW-916	All analytes

Detection limits were adjusted accordingly.

Extracted Internal Standard Analytes

The extracted internal standard analytes $^{13}\text{C}_2$ -Perfluorotetradecanoic acid ($^{13}\text{C}_2$ -PFTeDA) and $^{13}\text{C}_8$ -Perfluorooctane sulfonamide ($^{13}\text{C}_8$ -PFOSA) are used to quantify native Perfluorotridecanoic acid (PFTTrDA) & Perfluorotetradecanoic acid (PFTeDA) and Perfluorooctane sulfonamide (PFOSA) respectively. The recoveries observed for these extracted internal standard analytes were below the defined lower control limit (LCL) for the following samples:

FZI934	SHAW-RS-001	($^{13}\text{C}_8$ -PFOSA)
FZI957	SHAW06-003-GW-027	($^{13}\text{C}_2$ -PFTeDA)

These samples were re-extracted and re-analyzed for the associated native analytes on QC batches 5396699 (2018/02/15) and 5395679 (2018/02/13) respectively, past the method defined hold time. Because of their chemical structures, per- and polyfluorinated alkyl substances (PFAS) are chemically and biologically stable in the environment and resist typical environmental degradation processes. This would suggest the hold time exceedance would not have a significant impact on the data quality. Acceptable extracted internal standard analyte recoveries were obtained on re-analysis.

Quantitation of PFAS

Many PFAS (e.g. PFOS) have several isomeric forms that may show up as separate or partially-merged peaks in the analytical chromatograms. These peaks will be integrated and the areas summed such that the result represents the concentration of the sum of the linear and branched isomers, per USEPA (2009). Instrumentation is calibrated using certified quantitative standards containing only the linear isomer for all target analytes, except Perfluorooctane sulfonate (PFOS) and Perfluorohexane sulfonate (PFHxS), which are calibrated using certified branched and linear isomer mixtures. As additional certified reference materials containing branched and linear isomers become commercially available, they will be incorporated into the analytical method.

Data Qualifiers

U – Analyte was not detected and is reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.

J – The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).

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1.0 Project Narrative

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Maxxam Job: B823124 – Soil Analysis

Sample Analysis

Soil extracts were initially pre-screened and estimated concentrations were obtained so that samples could be appropriately diluted for analysis on QC batches 5398751 (2018/02/15-16), 5398813 (2018/02/15-16) and 5404121 (2018/02/20-21). Due to high concentrations, dilutions were required for selected analytes in the following samples:

FZY513	SHAW03-002-SS-001	All analytes
FZY515	SHAW03-003-SS-001	Perfluorooctanesulfonate (PFOS)
FZY516	SHAW03-003-SO-016	Perfluorohexanesulfonate (PFHxS), Perfluorooctanesulfonate (PFOS), 6:2 Fluorotelomersulfonate (6:2FTS)
FZY518	SHAW03-001-SO-016	Perfluorooctanesulfonate (PFOS), 6:2 Fluorotelomersulfonate (6:2FTS)
FZY519	SHAW01-001-SS-001	Perfluorooctanesulfonate (PFOS)
FZY520	SHAW01-001-SS-901	Perfluorohexanesulfonate (PFHxS), Perfluorooctanesulfonate (PFOS)
FZY522	SHAW01-001-SO-902	Perfluorooctanesulfonate (PFOS)
FZY523	SHAW01-003-SS-001	Perfluorooctanesulfonate (PFOS)
FZY524	SHAW01-003-SO-002	Perfluorooctanesulfonate (PFOS)
FZY525	SHAW01-002-SS-001	Perfluorooctanesulfonate (PFOS)
FZY526	SHAW01-002-SO-003	Perfluorooctanesulfonate (PFOS)
FZY544	SHAW04-004-SD-901	Perfluorooctanesulfonate (PFOS)

Detection limits were adjusted accordingly.

The recoveries observed for Perfluorobutanoic acid (PFBA), Perfluorohexanoic acid (PFHxA), Perfluorobutanesulfonate (PFBS), Perfluorooctanoic acid (PFOA), Perfluoroundecanoic acid (PFUnA), Perfluorotridecanoic acid (PFTrDA), Perfluorotetradecanoic acid (PFTeDA), Perfluorooctane sulfonamide (PFOSA), 6:2 Fluorotelomersulfonate (6:2FTS) and 8:2 Fluorotelomersulfonate (8:2FTS) were above acceptance limits for the Spike (LCS) on QC batches 5398751 (2018/02/15-16) and 5398813 (2018/02/15-16). Samples were re-extracted and re-analyzed for these analytes on QC batches 5406394 (2018/02/21-22) and 5407835 (2018/02/22).

The following samples were initially analyzed on QC batch 5398751 (2018/02/15-16):

FZY517	SHAW03-001-SS-001
FZY526	SHAW01-002-SO-003

The apparent recoveries of extracted internal standard analytes were below acceptance criteria for these samples, likely resulting from over-addition of the injection internal standards. These samples were re-extracted and re-analyzed on QC batch 5406394 (2018/02/21-22).

Extracted Internal Standard Analytes

The extracted internal standard $^{13}\text{C}_2$ -Perfluorotetradecanoic acid ($^{13}\text{C}_2$ -PFTeDA) is used to quantify native Perfluorotridecanoic acid (PFTrDA) & Perfluorotetradecanoic acid (PFTeDA). The recoveries observed for this extracted internal standard analyte were below the defined lower control limit (LCL) for the following samples:

FZY521	SHAW01-001-SO-002
FZY522	SHAW01-001-SO-902
FZY542	SHAW05-001-SS-001

Samples were re-extracted and re-analyzed for the associated native analytes on QC batches 5410884 (2018/02/23) and 5413446 (2018/02/28). Low $^{13}\text{C}_2$ -PFTeDA recoveries were confirmed for FZY542 (SHAW05-001-SS-001) and

FZY521 (SHAW01-001-SO-002) while acceptable recovery was obtained for FZY522 (SHAW01-001-SO-902) on re-analysis.

Quantitation of PFAS

Many PFAS (e.g. PFOS) have several isomeric forms that may show up as separate or partially-merged peaks in the analytical chromatograms. These peaks will be integrated and the areas summed such that the result represents the concentration of the sum of the linear and branched isomers, per USEPA (2009). Instrumentation is calibrated using certified quantitative standards containing only the linear isomer for all target analytes, except Perfluorooctane sulfonate (PFOS) and Perfluorohexane sulfonate (PFHxS), which are calibrated using certified branched and linear isomer mixtures. As additional certified reference materials containing branched and linear isomers become commercially available, they will be incorporated into the analytical method.

Data Qualifiers

U – Analyte was not detected and is reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.

J – The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).

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Validated Sample Result Forms: B820260

Analysis Method: EPA 537 m

Sample Name: SHAW01-MW105-GW-019 **Matrix Type:** W **Result Type:** TRG

Lab Sample Name: FZJ955 **Sample Date/Time:** 2018-01-25 09:56 **Validation Level:** Stage 2B

Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.040	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.074	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.027	0.0074	0.015	0.020	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	1.1	0.056	0.15	0.20	ug/L		J	08A
PERFLUOROHEXANOIC ACID	307-24-4	0.25	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	1.4	0.060	0.15	0.20	ug/L			
PERFLUOROOCCTANOIC ACID	335-67-1	0.096	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.047	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-MW105-GW-919	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ956	Sample Date/Time:	2018-01-25 09:56	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.034	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.076	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.024	0.0074	0.015	0.020	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	1.1	0.056	0.15	0.20	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	0.27	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	1.4	0.060	0.15	0.20	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.092	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.052	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-MW121A-GW-022	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ953	Sample Date/Time:	2018-01-24 17:10	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.15	0.066	0.15	0.20	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.15	0.066	0.15	0.20	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.085	0.054	0.15	0.20	ug/L	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	<0.15	0.055	0.15	0.20	ug/L	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.15	0.060	0.15	0.20	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.15	0.061	0.15	0.20	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.10	0.050	0.10	0.20	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.21	0.074	0.15	0.20	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	8.5	0.056	0.15	0.20	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	1.6	0.035	0.10	0.20	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.18	0.087	0.18	0.20	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.10	0.034	0.10	0.20	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	26	0.30	0.45	1.0	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.88	0.033	0.10	0.20	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.31	0.075	0.18	0.20	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.10	0.027	0.10	0.20	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.10	0.038	0.10	0.20	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.10	0.025	0.10	0.20	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-MW122A-GW-026	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ954	Sample Date/Time:	2018-01-24 17:45	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.075	0.033	0.075	0.10	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.075	0.033	0.075	0.10	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.063	0.027	0.075	0.10	ug/L	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	0.41	0.028	0.075	0.10	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.075	0.030	0.075	0.10	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.075	0.031	0.075	0.10	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.050	0.025	0.050	0.10	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.33	0.037	0.075	0.10	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	12	0.14	0.38	0.50	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	3.9	0.018	0.050	0.10	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.053	0.044	0.090	0.10	ug/L	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.050	0.017	0.050	0.10	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	5.4	0.15	0.38	0.50	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	2.9	0.017	0.050	0.10	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.78	0.038	0.090	0.10	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.050	0.014	0.050	0.10	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.050	0.019	0.050	0.10	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.050	0.013	0.050	0.10	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW02-001-SO-018	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ943	Sample Date/Time:	2018-01-25 15:45	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.75	0.24	0.75	0.94	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.75	0.31	0.75	0.94	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.47	0.16	0.47	0.94	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.47	0.22	0.47	0.94	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.75	0.37	0.75	0.94	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.75	0.26	0.75	0.94	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.75	0.26	0.75	0.94	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.47	0.18	0.47	0.94	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	1.0	0.23	0.47	0.94	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	0.24	0.13	0.47	0.94	ug/kg	J	J	
PERFLUORONONANOIC ACID	375-95-1	<0.47	0.21	0.47	0.94	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.47	0.13	0.47	0.94	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	19	0.24	0.75	0.94	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	0.57	0.24	0.75	0.94	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.75	0.24	0.75	0.94	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.75	0.29	0.75	0.94	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.75	0.31	0.75	0.94	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.75	0.32	0.75	0.94	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW02-002-SO-021	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ945	Sample Date/Time:	2018-01-25	17:50	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.88	0.29	0.88	1.1	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.55	0.19	0.55	1.1	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.55	0.25	0.55	1.1	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.88	0.43	0.88	1.1	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.55	0.21	0.55	1.1	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.55	0.26	0.55	1.1	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.55	0.24	0.55	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.66	0.29	0.88	1.1	ug/kg	J	J	
PERFLUOROOCTANOIC ACID	335-67-1	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.88	0.34	0.88	1.1	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.88	0.37	0.88	1.1	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW02-003-SO-019	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ944	Sample Date/Time:	2018-01-25 16:50	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.80	0.26	0.80	1.0	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	1.0	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	1.0	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.80	0.39	0.80	1.0	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	1.0	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.50	0.24	0.50	1.0	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.50	0.14	0.50	1.0	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	1.0	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.50	0.14	0.50	1.0	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	1.0	0.26	0.80	1.0	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.80	0.34	0.80	1.0	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-FT3MW5-GW-016	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ960	Sample Date/Time:	2018-01-25 17:40	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	32	0.33	0.75	1.0	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	4.9	0.066	0.15	0.20	ug/L			
PERFLUOROBUTANE SULFONATE	29420-43-3	0.16	0.054	0.15	0.20	ug/L	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	1.6	0.055	0.15	0.20	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.15	0.060	0.15	0.20	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.15	0.061	0.15	0.20	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.10	0.050	0.10	0.20	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	3.8	0.074	0.15	0.20	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	3.8	0.056	0.15	0.20	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	4.3	0.035	0.10	0.20	ug/L			
PERFLUORONONANOIC ACID	375-95-1	1.2	0.087	0.18	0.20	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.10	0.034	0.10	0.20	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	21	0.30	0.75	1.0	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	3.3	0.033	0.10	0.20	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	5.2	0.075	0.18	0.20	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.10	0.027	0.10	0.20	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.10	0.038	0.10	0.20	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.10	0.025	0.10	0.20	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-FT3MW5-GW-916	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ961	Sample Date/Time:	2018-01-25 17:40	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	32	0.33	0.75	1.0	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	4.2	0.033	0.075	0.10	ug/L			
PERFLUOROBUTANE SULFONATE	29420-43-3	0.12	0.027	0.075	0.10	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	1.6	0.028	0.075	0.10	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.075	0.030	0.075	0.10	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.075	0.031	0.075	0.10	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.050	0.025	0.050	0.10	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	4.0	0.037	0.075	0.10	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	3.3	0.028	0.075	0.10	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	4.0	0.018	0.050	0.10	ug/L			
PERFLUORONONANOIC ACID	375-95-1	1.3	0.044	0.090	0.10	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.050	0.017	0.050	0.10	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	20	0.30	0.75	1.0	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	3.2	0.017	0.050	0.10	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	4.9	0.19	0.45	0.50	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.050	0.014	0.050	0.10	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.050	0.019	0.050	0.10	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.050	0.013	0.050	0.10	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-001-SO-013	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ951	Sample Date/Time:	2018-01-26	10:35	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.84	0.23	0.70	0.88	ug/kg	J	J	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.70	0.29	0.70	0.88	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.44	0.15	0.44	0.88	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.44	0.20	0.44	0.88	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.70	0.34	0.70	0.88	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.70	0.25	0.70	0.88	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.70	0.25	0.70	0.88	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.44	0.17	0.44	0.88	ug/kg	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	2.4	0.21	0.44	0.88	ug/kg			
PERFLUOROHEXANOIC ACID	307-24-4	0.36	0.12	0.44	0.88	ug/kg	J	J	
PERFLUORONONANOIC ACID	375-95-1	<0.44	0.19	0.44	0.88	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.44	0.12	0.44	0.88	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	3.4	0.23	0.70	0.88	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	0.78	0.22	0.70	0.88	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.70	0.22	0.70	0.88	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.70	0.27	0.70	0.88	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.70	0.29	0.70	0.88	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.70	0.30	0.70	0.88	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-001-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ950	Sample Date/Time:	2018-01-26 10:00	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.70	0.23	0.70	0.88	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.70	0.29	0.70	0.88	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.44	0.15	0.44	0.88	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	0.92	0.20	0.44	0.88	ug/kg			
PERFLUORODECANE SULFONATE	335-77-3	<0.70	0.34	0.70	0.88	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.70	0.25	0.70	0.88	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.70	0.25	0.70	0.88	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.59	0.17	0.44	0.88	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	2.3	0.21	0.44	0.88	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	1.1	0.12	0.44	0.88	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	0.78	0.19	0.44	0.88	ug/kg	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.44	0.12	0.44	0.88	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	27	0.23	0.70	0.88	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	0.90	0.22	0.70	0.88	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	1.8	0.22	0.70	0.88	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.70	0.27	0.70	0.88	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.70	0.29	0.70	0.88	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.70	0.30	0.70	0.88	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-002-SO-013	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ948	Sample Date/Time:	2018-01-26 09:40	Validation Level:	Stage 4				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.71	0.23	0.71	0.89	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.71	0.29	0.71	0.89	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.45	0.15	0.45	0.89	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.45	0.20	0.45	0.89	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.71	0.35	0.71	0.89	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.71	0.25	0.71	0.89	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.71	0.25	0.71	0.89	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.45	0.17	0.45	0.89	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	4.0	0.21	0.45	0.89	ug/kg		J	17
PERFLUOROHXANOIC ACID	307-24-4	1.4	0.12	0.45	0.89	ug/kg		J	17
PERFLUORONONANOIC ACID	375-95-1	<0.45	0.20	0.45	0.89	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.45	0.12	0.45	0.89	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	1.4	0.23	0.71	0.89	ug/kg		J	17
PERFLUOROOCTANOIC ACID	335-67-1	<0.71	0.22	0.71	0.89	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.71	0.22	0.71	0.89	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.71	0.28	0.71	0.89	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.71	0.29	0.71	0.89	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.71	0.30	0.71	0.89	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-002-SO-913	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ949	Sample Date/Time:	2018-01-26 09:40	Validation Level:	Stage 4				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.61	0.25	0.78	0.97	ug/kg	J	J	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.78	0.32	0.78	0.97	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.49	0.16	0.49	0.97	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.49	0.22	0.49	0.97	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.78	0.38	0.78	0.97	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.78	0.27	0.78	0.97	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.78	0.27	0.78	0.97	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.49	0.18	0.49	0.97	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	1.4	0.23	0.49	0.97	ug/kg		J	17
PERFLUOROHXANOIC ACID	307-24-4	0.26	0.14	0.49	0.97	ug/kg	J	J	17
PERFLUORONONANOIC ACID	375-95-1	<0.49	0.21	0.49	0.97	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.49	0.14	0.49	0.97	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	11	0.25	0.78	0.97	ug/kg		J	17
PERFLUOROOCTANOIC ACID	335-67-1	<0.78	0.24	0.78	0.97	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.78	0.24	0.78	0.97	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.78	0.30	0.78	0.97	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.78	0.32	0.78	0.97	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.78	0.33	0.78	0.97	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-002-SS-001	Matrix Type:	S	Result Type:	TRG					
Lab Sample Name:	FZJ947	Sample Date/Time:	2018-01-26	09:10	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.80	0.26	0.80	1.0	ug/kg	U	U		
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.80	0.33	0.80	1.0	ug/kg	U	U		
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	1.0	ug/kg	U	U		
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	1.0	ug/kg	U	U		
PERFLUORODECANE SULFONATE	335-77-3	<0.80	0.39	0.80	1.0	ug/kg	U	U		
PERFLUORODECANOIC ACID	335-76-2	<0.80	0.28	0.80	1.0	ug/kg	U	U		
PERFLUORODODECANOIC ACID	307-55-1	<0.80	0.28	0.80	1.0	ug/kg	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	1.0	ug/kg	U	U		
PERFLUOROHEXANE SULFONATE	108427-53-8	0.44	0.24	0.50	1.0	ug/kg	J	J		
PERFLUOROHEXANOIC ACID	307-24-4	<0.50	0.14	0.50	1.0	ug/kg	U	U		
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	1.0	ug/kg	U	U		
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.50	0.14	0.50	1.0	ug/kg	U	U		
PERFLUOROOCTANE SULFONATE	1763-23-1	6.2	0.26	0.80	1.0	ug/kg				
PERFLUOROOCTANOIC ACID	335-67-1	<0.80	0.25	0.80	1.0	ug/kg	U	U		
PERFLUOROPENTANOIC ACID	2706-90-3	0.98	0.25	0.80	1.0	ug/kg	J	J		
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.80	0.33	0.80	1.0	ug/kg	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.80	0.34	0.80	1.0	ug/kg	U	U		

Analysis Method: EPA 537 m

Sample Name	SHAW04-003-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ952	Sample Date/Time:	2018-01-26 11:05	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.73	0.24	0.73	0.91	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.73	0.30	0.73	0.91	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.46	0.15	0.46	0.91	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.46	0.21	0.46	0.91	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.73	0.35	0.73	0.91	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.73	0.25	0.73	0.91	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.73	0.25	0.73	0.91	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.33	0.17	0.46	0.91	ug/kg	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	0.54	0.22	0.46	0.91	ug/kg	J	J	
PERFLUOROHEXANOIC ACID	307-24-4	0.26	0.13	0.46	0.91	ug/kg	J	J	
PERFLUORONONANOIC ACID	375-95-1	0.72	0.20	0.46	0.91	ug/kg	J	J	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.46	0.13	0.46	0.91	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	11	0.24	0.73	0.91	ug/kg			
PERFLUOROOCCTANOIC ACID	335-67-1	<0.73	0.23	0.73	0.91	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	0.70	0.23	0.73	0.91	ug/kg	J	J	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.73	0.28	0.73	0.91	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.73	0.30	0.73	0.91	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.73	0.31	0.73	0.91	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-001-GW-033	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ959	Sample Date/Time:	2018-01-25 16:15	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.064	0.0066	0.015	0.020	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.038	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.078	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.16	0.0074	0.015	0.020	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	0.43	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.20	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.11	0.0087	0.018	0.020	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.50	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.30	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.22	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	0.0092	0.0038	0.010	0.020	ug/L	J	J	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-001-SO-028	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ940	Sample Date/Time:	2018-01-24 09:10	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<1.0	0.34	1.0	1.3	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<1.0	0.43	1.0	1.3	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.65	0.22	0.65	1.3	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.65	0.30	0.65	1.3	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<1.0	0.51	1.0	1.3	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<1.0	0.36	1.0	1.3	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<1.0	0.36	1.0	1.3	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.65	0.25	0.65	1.3	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.65	0.31	0.65	1.3	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.65	0.18	0.65	1.3	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.65	0.29	0.65	1.3	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.65	0.18	0.65	1.3	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.83	0.34	1.0	1.3	ug/kg	J	J	
PERFLUOROOCTANOIC ACID	335-67-1	<1.0	0.33	1.0	1.3	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<1.0	0.33	1.0	1.3	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<1.0	0.40	1.0	1.3	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<1.0	0.43	1.0	1.3	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<1.0	0.44	1.0	1.3	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-001-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ939	Sample Date/Time:	2018-01-24 08:25	Validation Level:	Stage 4				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.78	0.25	0.78	0.98	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.78	0.32	0.78	0.98	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.49	0.17	0.49	0.98	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.49	0.23	0.49	0.98	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.78	0.38	0.78	0.98	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.78	0.27	0.78	0.98	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.78	0.27	0.78	0.98	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.49	0.19	0.49	0.98	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.49	0.24	0.49	0.98	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.49	0.14	0.49	0.98	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.49	0.22	0.49	0.98	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.49	0.14	0.49	0.98	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	5.1	0.25	0.78	0.98	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	<0.78	0.25	0.78	0.98	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.78	0.25	0.78	0.98	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.78	0.30	0.78	0.98	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.78	0.32	0.78	0.98	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.78	0.33	0.78	0.98	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-002-GW-028	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ958	Sample Date/Time:	2018-01-25 14:08	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.054	0.0066	0.015	0.020	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.027	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.036	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.071	0.0074	0.015	0.020	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	0.56	0.0056	0.015	0.020	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	0.14	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.054	0.0087	0.018	0.020	ug/L			
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	0.21	0.0060	0.015	0.020	ug/L			
PERFLUOROOCCTANOIC ACID	335-67-1	0.19	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.11	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-002-SO-026	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ937	Sample Date/Time:	2018-01-23 17:20	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.88	0.29	0.88	1.1	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.55	0.19	0.55	1.1	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.55	0.25	0.55	1.1	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.88	0.43	0.88	1.1	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.55	0.21	0.55	1.1	ug/kg	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.55	0.26	0.55	1.1	ug/kg	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.55	0.24	0.55	1.1	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	1.0	0.29	0.88	1.1	ug/kg	J	J	
PERFLUOROOCCTANOIC ACID	335-67-1	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.88	0.34	0.88	1.1	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.88	0.37	0.88	1.1	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-002-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ936	Sample Date/Time:	2018-01-23 16:30	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.80	0.26	0.80	1.0	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	1.0	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	1.0	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.80	0.39	0.80	1.0	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	0.62	0.28	0.80	1.0	ug/kg	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.39	0.19	0.50	1.0	ug/kg	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	2.3	0.24	0.50	1.0	ug/kg			
PERFLUOROHEXANOIC ACID	307-24-4	1.1	0.14	0.50	1.0	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	1.0	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	4.6	0.14	0.50	1.0	ug/kg			
PERFLUOROOCCTANE SULFONATE	1763-23-1	45	2.8	8.0	10	ug/kg			
PERFLUOROOCCTANOIC ACID	335-67-1	1.5	0.25	0.80	1.0	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	2.0	0.33	0.80	1.0	ug/kg			
PERFLUOROUNDECANOIC ACID	2058-94-8	1.0	0.34	0.80	1.0	ug/kg			

Analysis Method: EPA 537 m

Sample Name	SHAW06-003-GW-027	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ957	Sample Date/Time:	2018-01-25 13:55	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.050	0.0066	0.015	0.020	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.064	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.065	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.097	0.0074	0.015	0.020	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	0.41	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.15	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.066	0.0087	0.018	0.020	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.30	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.18	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.15	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.013	0.0034	0.013	0.025	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.013	0.0048	0.013	0.025	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-003-SO-026	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ935	Sample Date/Time:	2018-01-23 16:05	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.96	0.31	0.96	1.2	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.96	0.40	0.96	1.2	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.60	0.20	0.60	1.2	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.60	0.28	0.60	1.2	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.96	0.47	0.96	1.2	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.96	0.34	0.96	1.2	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.96	0.34	0.96	1.2	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.60	0.23	0.60	1.2	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.60	0.29	0.60	1.2	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.60	0.17	0.60	1.2	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.60	0.26	0.60	1.2	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.60	0.17	0.60	1.2	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	<0.96	0.31	0.96	1.2	ug/kg	U	U	
PERFLUOROOCCTANOIC ACID	335-67-1	<0.96	0.30	0.96	1.2	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.96	0.30	0.96	1.2	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.96	0.37	0.96	1.2	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.96	0.40	0.96	1.2	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.96	0.41	0.96	1.2	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW06-003-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZJ933	Sample Date/Time:	2018-01-23 14:55	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.88	0.29	0.88	1.1	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.55	0.19	0.55	1.1	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.55	0.25	0.55	1.1	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	0.81	0.43	0.88	1.1	ug/kg	J	J	
PERFLUORODECANOIC ACID	335-76-2	0.97	0.31	0.88	1.1	ug/kg	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.38	0.21	0.55	1.1	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	1.4	0.26	0.55	1.1	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	0.62	0.15	0.55	1.1	ug/kg	J	J	
PERFLUORONONANOIC ACID	375-95-1	0.71	0.24	0.55	1.1	ug/kg	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	33	0.29	0.88	1.1	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	1.4	0.28	0.88	1.1	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.88	0.34	0.88	1.1	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.88	0.37	0.88	1.1	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-001	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ934	Sample Date/Time:	2018-01-23 15:35	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.010	0.0035	0.010	0.020	ug/L	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUOROOCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-002	Matrix Type:	W	Result Type:	TRG					
Lab Sample Name:	FZJ938	Sample Date/Time:	2018-01-24	08:10	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U		
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U		
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U		
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U		
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U		
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U		
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U		
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U		
PERFLUOROHEXANOIC ACID	307-24-4	<0.010	0.0035	0.010	0.020	ug/L	U	U		
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U		
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U		
PERFLUOROOCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U		
PERFLUOROOCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U		
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U		
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U		

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-003	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ942	Sample Date/Time:	2018-01-25 08:55	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.010	0.0035	0.010	0.020	ug/L	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUOROOCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-004	Matrix Type:	W	Result Type:	TRG					
Lab Sample Name:	FZJ946	Sample Date/Time:	2018-01-26	08:55	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U		
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U		
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U		
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U		
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U		
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U		
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U		
PERFLUOROHXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U		
PERFLUOROHXANOIC ACID	307-24-4	<0.010	0.0035	0.010	0.020	ug/L	U	U		
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U		
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U		
PERFLUOROOCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U		
PERFLUOROOCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U		
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U		
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U		

Analysis Method: EPA 537 m

Sample Name	SHAW-SB-001	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZJ941	Sample Date/Time:	2018-01-24 08:55	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.64	0.066	0.15	0.20	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	0.018	0.0055	0.015	0.020	ug/L	J	J	
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.0094	0.0074	0.015	0.020	ug/L	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	0.011	0.0056	0.015	0.020	ug/L	J	J	
PERFLUOROHEXANOIC ACID	307-24-4	0.27	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	0.016	0.0034	0.010	0.020	ug/L	J	J	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.84	0.060	0.15	0.20	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.0056	0.0033	0.010	0.020	ug/L	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	0.016	0.0075	0.015	0.020	ug/L	J	J	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Validated Sample Result Forms: B823124

Analysis Method: EPA 537 m

Sample Name: SHAW01-001-SO-002 **Matrix Type:** S **Result Type:** TRG

Lab Sample Name: FZY521 **Sample Date/Time:** 2018-01-26 16:30 **Validation Level:** Stage 2B

Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.78	0.25	0.78	0.97	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.78	0.32	0.78	0.97	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.49	0.16	0.49	0.97	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.49	0.22	0.49	0.97	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	1.5	0.35	0.73	0.91	ug/kg			
PERFLUORODECANOIC ACID	335-76-2	<0.73	0.25	0.73	0.91	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.73	0.25	0.73	0.91	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.46	0.17	0.46	0.91	ug/kg	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	11	0.23	0.49	0.97	ug/kg		J	17
PERFLUOROHEXANE SULFONATE	108427-53-8	10	0.22		0.91	ug/kg		X	16
PERFLUOROHEXANOIC ACID	307-24-4	1.7	0.14	0.49	0.97	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	<0.46	0.20	0.46	0.91	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.49	0.14	0.49	0.97	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	960	24	73	91	ug/kg		J	17
PERFLUOROOCCTANOIC ACID	335-67-1	2.3	0.24	0.78	0.97	ug/kg		J	17
PERFLUOROPENTANOIC ACID	2706-90-3	<0.73	0.23	0.73	0.91	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.74	0.29	0.74	0.92	ug/kg	U	UJ	10A
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.74	0.30	0.74	0.92	ug/kg	U	UJ	10A
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.78	0.33	0.78	0.97	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-001-SO-902	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY522	Sample Date/Time:	2018-01-26 16:30	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.96	0.31	0.96	1.2	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.96	0.40	0.96	1.2	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.60	0.20	0.60	1.2	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.60	0.28	0.60	1.2	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.96	0.47	0.96	1.2	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.96	0.34	0.96	1.2	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.96	0.34	0.96	1.2	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.60	0.23	0.60	1.2	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	7.9	0.29	0.60	1.2	ug/kg		J	17
PERFLUOROHXANOIC ACID	307-24-4	0.96	0.17	0.60	1.2	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	<0.60	0.26	0.60	1.2	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.60	0.17	0.60	1.2	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	280	3.1	9.6	12	ug/kg		J	17
PERFLUOROOCCTANOIC ACID	335-67-1	0.97	0.30	0.96	1.2	ug/kg	J	J	17
PERFLUOROPENTANOIC ACID	2706-90-3	<0.96	0.30	0.96	1.2	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.96	0.41	0.96	1.2	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-001-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY519	Sample Date/Time:	2018-01-26	16:20	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.77	0.25	0.77	0.96	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.77	0.32	0.77	0.96	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.48	0.16	0.48	0.96	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.48	0.22	0.48	0.96	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	31	0.43	0.88	1.1	ug/kg		J	17
PERFLUORODECANOIC ACID	335-76-2	0.97	0.31	0.88	1.1	ug/kg	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.45	0.21	0.55	1.1	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	39	0.23	0.48	0.96	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	3.9	0.13	0.48	0.96	ug/kg		J	17
PERFLUORONONANOIC ACID	375-95-1	<0.55	0.24	0.55	1.1	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	12	0.13	0.48	0.96	ug/kg			
PERFLUOROOCCTANE SULFONATE	1763-23-1	360	2.9	8.8	11	ug/kg		J	17
PERFLUOROOCCTANOIC ACID	335-67-1	6.8	0.24	0.77	0.96	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	0.51	0.28	0.88	1.1	ug/kg	J	JB	06C
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.77	0.30	0.77	0.96	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.77	0.32	0.77	0.96	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.77	0.33	0.77	0.96	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-001-SS-901	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY520	Sample Date/Time:	2018-01-26	16:20	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.74	0.24	0.74	0.92	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.74	0.30	0.74	0.92	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.46	0.16	0.46	0.92	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.46	0.21	0.46	0.92	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	5.7	0.36	0.74	0.92	ug/kg		J	17
PERFLUORODECANOIC ACID	335-76-2	<0.74	0.26	0.74	0.92	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.74	0.26	0.74	0.92	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.42	0.17	0.46	0.92	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	51	2.2	4.6	9.2	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	7.6	0.13	0.46	0.92	ug/kg		J	17
PERFLUORONONANOIC ACID	375-95-1	<0.46	0.20	0.46	0.92	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	11	0.13	0.46	0.92	ug/kg			
PERFLUOROOCTANE SULFONATE	1763-23-1	140	2.4	7.4	9.2	ug/kg		J	17
PERFLUOROOCTANOIC ACID	335-67-1	5.1	0.23	0.74	0.92	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	1.4	0.23	0.74	0.92	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.74	0.29	0.74	0.92	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.74	0.30	0.74	0.92	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.74	0.31	0.74	0.92	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-002-SO-003	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY526	Sample Date/Time:	2018-01-26	17:15	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.76	0.25	0.76	0.95	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.76	0.31	0.76	0.95	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.48	0.16	0.48	0.95	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.48	0.22	0.48	0.95	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.76	0.37	0.76	0.95	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.76	0.27	0.76	0.95	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.76	0.27	0.76	0.95	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.48	0.18	0.48	0.95	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	3.0	0.23	0.48	0.95	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	0.71	0.13	0.48	0.95	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	<0.48	0.21	0.48	0.95	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.48	0.13	0.48	0.95	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	91	2.5	7.6	9.5	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	<0.76	0.24	0.76	0.95	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.76	0.24	0.76	0.95	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.76	0.29	0.76	0.95	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.76	0.31	0.76	0.95	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.76	0.32	0.76	0.95	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW01-002-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY525	Sample Date/Time:	2018-01-26 17:05	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.78	0.25	0.78	0.97	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.78	0.32	0.78	0.97	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.49	0.16	0.49	0.97	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	0.88	0.22	0.49	0.97	ug/kg	J	J	
PERFLUORODECANE SULFONATE	335-77-3	9.7	0.38	0.78	0.97	ug/kg			
PERFLUORODECANOIC ACID	335-76-2	0.58	0.27	0.78	0.97	ug/kg	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.78	0.27	0.78	0.97	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.53	0.18	0.49	0.97	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	38	0.23	0.49	0.97	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	4.6	0.14	0.49	0.97	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	<0.49	0.21	0.49	0.97	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	12	0.14	0.49	0.97	ug/kg			
PERFLUOROOCCTANE SULFONATE	1763-23-1	180	2.5	7.8	9.7	ug/kg			
PERFLUOROOCCTANOIC ACID	335-67-1	3.3	0.24	0.78	0.97	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	1.2	0.24	0.49	0.97	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.78	0.30	0.78	0.97	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.78	0.32	0.78	0.97	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	0.74	0.33	0.78	0.97	ug/kg	J	J	

Analysis Method: EPA 537 m

Sample Name	SHAW01-003-SO-002	Matrix Type:	S	Result Type:	TRG					
Lab Sample Name:	FZY524	Sample Date/Time:	2018-01-26	16:53	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.76	0.25	0.76	0.95	ug/kg	U	U		
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.76	0.31	0.76	0.95	ug/kg	U	U		
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.48	0.16	0.48	0.95	ug/kg	U	U		
PERFLUOROBUTANOIC ACID	375-22-4	<0.48	0.22	0.48	0.95	ug/kg	U	U		
PERFLUORODECANE SULFONATE	335-77-3	<0.76	0.37	0.76	0.95	ug/kg	U	U		
PERFLUORODECANOIC ACID	335-76-2	<0.76	0.27	0.76	0.95	ug/kg	U	U		
PERFLUORODODECANOIC ACID	307-55-1	<0.76	0.27	0.76	0.95	ug/kg	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<0.48	0.18	0.48	0.95	ug/kg	U	U		
PERFLUOROHXANE SULFONATE	108427-53-8	0.32	0.23	0.48	0.95	ug/kg	J	J		
PERFLUOROHXANOIC ACID	307-24-4	<0.48	0.13	0.48	0.95	ug/kg	U	U		
PERFLUORONONANOIC ACID	375-95-1	<0.48	0.21	0.48	0.95	ug/kg	U	U		
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.48	0.13	0.48	0.95	ug/kg	U	U		
PERFLUOROOCTANE SULFONATE	1763-23-1	64	2.5	7.6	9.5	ug/kg				
PERFLUOROOCTANOIC ACID	335-67-1	<0.76	0.24	0.76	0.95	ug/kg	U	U		
PERFLUOROPENTANOIC ACID	2706-90-3	<0.76	0.24	0.76	0.95	ug/kg	U	U		
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.76	0.29	0.76	0.95	ug/kg	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.76	0.31	0.76	0.95	ug/kg	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.76	0.32	0.76	0.95	ug/kg	U	U		

Analysis Method: EPA 537 m

Sample Name		Matrix Type: S			Result Type: TRG				
Lab Sample Name: FZY523		Sample Date/Time: 2018-01-26		16:45		Validation Level: Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.66	0.22	0.66	0.83	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.66	0.27	0.66	0.83	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.42	0.14	0.42	0.83	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.42	0.19	0.42	0.83	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	0.76	0.32	0.66	0.83	ug/kg	J	J	
PERFLUORODECANOIC ACID	335-76-2	<0.66	0.23	0.66	0.83	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.66	0.23	0.66	0.83	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.42	0.16	0.42	0.83	ug/kg	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.42	0.20	0.42	0.83	ug/kg	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.42	0.12	0.42	0.83	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.42	0.18	0.42	0.83	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	4.8	0.12	0.42	0.83	ug/kg			
PERFLUOROOCCTANE SULFONATE	1763-23-1	82	2.2	6.6	8.3	ug/kg			
PERFLUOROOCCTANOIC ACID	335-67-1	<0.66	0.21	0.66	0.83	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.66	0.21	0.66	0.83	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.66	0.26	0.66	0.83	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.66	0.27	0.66	0.83	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.66	0.28	0.66	0.83	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW02-001-GW-021	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY550	Sample Date/Time:	2018-01-27 17:38	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.010	0.0054	0.015	0.020	ug/L	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	0.14	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.019	0.0035	0.010	0.020	ug/L	J	J	
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.071	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.034	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW02-002-GW-022	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY551	Sample Date/Time:	2018-01-27	18:10	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.0084	0.0066	0.015	0.020	ug/L	J	J	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	0.038	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.018	0.0074	0.015	0.020	ug/L	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	0.13	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.061	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.43	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.021	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.039	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW02-003-GW-020	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY549	Sample Date/Time:	2018-01-27	17:25	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.027	0.013	0.030	0.040	ug/L	J	J	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.030	0.013	0.030	0.040	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.038	0.011	0.030	0.040	ug/L	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	0.031	0.011	0.030	0.040	ug/L	J	J	
PERFLUORODECANE SULFONATE	335-77-3	<0.030	0.012	0.030	0.040	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.030	0.012	0.030	0.040	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.020	0.010	0.020	0.040	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.032	0.015	0.030	0.040	ug/L	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	0.81	0.011	0.030	0.040	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.29	0.0070	0.020	0.040	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.036	0.017	0.036	0.040	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.020	0.0068	0.020	0.040	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	3.4	0.12	0.30	0.40	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.10	0.0066	0.020	0.040	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.054	0.015	0.036	0.040	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.020	0.0054	0.020	0.040	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.020	0.0076	0.020	0.040	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.020	0.0050	0.020	0.040	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-001-GW-018	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY536	Sample Date/Time:	2018-01-28 12:04	Validation Level:	Stage 4				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	71	0.66	1.5	2.0	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.10	0.066	0.15	0.20	ug/L	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.95	0.054	0.15	0.20	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	1.5	0.055	0.15	0.20	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.15	0.060	0.15	0.20	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.15	0.061	0.15	0.20	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.10	0.050	0.10	0.20	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	1.4	0.074	0.15	0.20	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	7.9	0.056	0.15	0.20	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	6.9	0.035	0.10	0.20	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.15	0.087	0.18	0.20	ug/L	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.10	0.034	0.10	0.20	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	14	0.60	1.5	2.0	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	1.7	0.033	0.10	0.20	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	5.0	0.075	0.18	0.20	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.10	0.025	0.10	0.20	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-001-SO-016	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY518	Sample Date/Time:	2018-01-26	15:40	Validation Level:	Stage 4			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	53	2.5	7.7	9.6	ug/kg			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.58	0.32	0.77	0.96	ug/kg	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.95	0.16	0.48	0.96	ug/kg	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	1.3	0.22	0.48	0.96	ug/kg			
PERFLUORODECANE SULFONATE	335-77-3	<0.73	0.35	0.73	0.91	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.73	0.25	0.73	0.91	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.73	0.25	0.73	0.91	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	1.9	0.17	0.46	0.91	ug/kg			
PERFLUOROHXANE SULFONATE	108427-53-8	11	0.23	0.48	0.96	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	5.6	0.13	0.48	0.96	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	0.38	0.20	0.46	0.91	ug/kg	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	0.80	0.13	0.48	0.96	ug/kg	J	J	
PERFLUOROOCTANE SULFONATE	1763-23-1	170	2.4	7.3	9.1	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	4.5	0.24	0.77	0.96	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	6.3	0.23	0.73	0.91	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.77	0.30	0.77	0.96	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.77	0.32	0.77	0.96	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.77	0.33	0.77	0.96	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-001-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY517	Sample Date/Time:	2018-01-26 15:13	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	1.2	0.25	0.78	0.98	ug/kg			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	18	0.32	0.78	0.98	ug/kg			
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.49	0.17	0.49	0.98	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	2.2	0.23	0.49	0.98	ug/kg			
PERFLUORODECANE SULFONATE	335-77-3	21	0.38	0.78	0.98	ug/kg			
PERFLUORODECANOIC ACID	335-76-2	8.1	0.27	0.78	0.98	ug/kg			
PERFLUORODODECANOIC ACID	307-55-1	3.6	0.27	0.78	0.98	ug/kg			
PERFLUOROHEPTANOIC ACID	375-85-9	3.7	0.19	0.49	0.98	ug/kg			
PERFLUOROHXANE SULFONATE	108427-53-8	6.8	0.24	0.49	0.98	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	2.9	0.14	0.49	0.98	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	4.5	0.22	0.49	0.98	ug/kg			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	9.3	0.14	0.49	0.98	ug/kg			
PERFLUOROOCTANE SULFONATE	1763-23-1	13	0.25	0.78	0.98	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	6.6	0.25	0.78	0.98	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	3.7	0.25	0.78	0.98	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	0.59	0.30	0.78	0.98	ug/kg	J	J	
PERFLUOROTRIDECANOIC ACID	72629-94-8	0.71	0.32	0.78	0.98	ug/kg	J	J	
PERFLUOROUNDECANOIC ACID	2058-94-8	6.6	0.33	0.78	0.98	ug/kg			

Analysis Method: EPA 537 m

Sample Name	SHAW03-002-GW-017	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY535	Sample Date/Time:	2018-01-28 11:22	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	1.4	0.066	0.15	0.20	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.019	0.0083	0.019	0.025	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.18	0.0068	0.019	0.025	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.13	0.0069	0.019	0.025	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.019	0.0075	0.019	0.025	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.019	0.0076	0.019	0.025	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.013	0.0063	0.013	0.025	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.20	0.0093	0.019	0.025	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	1.4	0.056	0.15	0.20	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	0.82	0.0044	0.013	0.025	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<0.023	0.011	0.023	0.025	ug/L	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.013	0.0043	0.013	0.025	ug/L	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	0.64	0.0075	0.019	0.025	ug/L			
PERFLUOROOCCTANOIC ACID	335-67-1	0.17	0.0041	0.013	0.025	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.46	0.0094	0.023	0.025	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.011	0.0030	0.011	0.022	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.011	0.0042	0.011	0.022	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.013	0.0031	0.013	0.025	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-002-SO-017	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY514	Sample Date/Time:	2018-01-26	14:20	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	2.6	0.26	0.79	0.99	ug/kg			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.79	0.33	0.79	0.99	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	0.99	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	0.99	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.79	0.39	0.79	0.99	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.79	0.28	0.79	0.99	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.79	0.28	0.79	0.99	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	0.99	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	1.3	0.24	0.50	0.99	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	0.97	0.14	0.50	0.99	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	0.99	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.50	0.14	0.50	0.99	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.96	0.26	0.79	0.99	ug/kg	J	J	
PERFLUOROOCTANOIC ACID	335-67-1	<0.79	0.25	0.79	0.99	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	0.35	0.25	0.79	0.99	ug/kg	J	JB	06C
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.79	0.31	0.79	0.99	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.79	0.33	0.79	0.99	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.79	0.34	0.79	0.99	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-002-SS-001	Matrix Type:	S	Result Type:	TRG					
Lab Sample Name:	FZY513	Sample Date/Time:	2018-01-26	13:48	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	39	0.27	0.83	1.0	ug/kg				
8:2 FLUOROTELOMER SULFONATE	39108-34-4	1600	34	83	100	ug/kg				
PERFLUOROBUTANE SULFONATE	29420-43-3	0.48	0.18	0.52	1.0	ug/kg	J	J		
PERFLUOROBUTANOIC ACID	375-22-4	1.9	0.24	0.52	1.0	ug/kg				
PERFLUORODECANE SULFONATE	335-77-3	<7.5	3.7	7.5	9.4	ug/kg	U	U		
PERFLUORODECANOIC ACID	335-76-2	6.0	2.6	7.5	9.4	ug/kg	J	J		
PERFLUORODODECANOIC ACID	307-55-1	<7.5	2.6	7.5	9.4	ug/kg	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<4.7	1.8	4.7	9.4	ug/kg	U	U		
PERFLUOROHXANE SULFONATE	108427-53-8	19	0.25	0.52	1.0	ug/kg				
PERFLUOROHXANOIC ACID	307-24-4	4.4	0.15	0.52	1.0	ug/kg				
PERFLUORONONANOIC ACID	375-95-1	14	2.1	4.7	9.4	ug/kg				
PERFLUOROOCTANE SULFONAMIDE	754-91-6	6.7	0.15	0.52	1.0	ug/kg				
PERFLUOROOCTANE SULFONATE	1763-23-1	740	24	75	94	ug/kg				
PERFLUOROOCTANOIC ACID	335-67-1	12	0.26	0.83	1.0	ug/kg				
PERFLUOROPENTANOIC ACID	2706-90-3	5.9	2.4	7.5	9.4	ug/kg	J	JB	06C	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.83	0.32	0.83	1.0	ug/kg	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.83	0.34	0.83	1.0	ug/kg	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.83	0.35	0.83	1.0	ug/kg	U	U		

Analysis Method: EPA 537 m

Sample Name	SHAW03-003-GW-018	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY553	Sample Date/Time:	2018-01-28 11:45	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	210	2.0	5.0	8.0	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<1.5	0.66	1.5	2.0	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	18	0.54	1.5	2.0	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	9.6	0.55	1.5	2.0	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<1.5	0.60	1.5	2.0	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<1.5	0.61	1.5	2.0	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<1.0	0.50	1.0	2.0	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	7.9	0.74	1.5	2.0	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	100	2.4	5.0	8.0	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	56	0.35	1.0	2.0	ug/L			
PERFLUORONONANOIC ACID	375-95-1	<1.8	0.87	1.8	2.0	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<1.0	0.34	1.0	2.0	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	30	0.60	1.5	2.0	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	13	0.33	1.0	2.0	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	24	0.75	1.8	2.0	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<1.0	0.27	1.0	2.0	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<1.0	0.38	1.0	2.0	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<1.0	0.25	1.0	2.0	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-003-SO-016	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY516	Sample Date/Time:	2018-01-26 15:00	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	250	2.9	8.8	11	ug/kg			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	8.3	0.19	0.55	1.1	ug/kg			
PERFLUOROBUTANOIC ACID	375-22-4	5.8	0.25	0.55	1.1	ug/kg			
PERFLUORODECANE SULFONATE	335-77-3	<0.85	0.41	0.85	1.1	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.85	0.30	0.85	1.1	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.85	0.30	0.85	1.1	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	5.0	0.20	0.53	1.1	ug/kg			
PERFLUOROHXANE SULFONATE	108427-53-8	67	2.6	5.5	11	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	27	0.15	0.55	1.1	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	<0.53	0.23	0.53	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	200	2.6	8.5	11	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	19	0.28	0.88	1.1	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	17	0.27	0.85	1.1	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.88	0.34	0.88	1.1	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.88	0.37	0.88	1.1	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW03-003-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY515	Sample Date/Time:	2018-01-26 14:35	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.93	0.23	0.70	0.87	ug/kg			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.69	0.29	0.70	0.87	ug/kg	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.44	0.15	0.44	0.87	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	1.3	0.20	0.44	0.87	ug/kg			
PERFLUORODECANE SULFONATE	335-77-3	3.2	0.37	0.76	0.95	ug/kg			
PERFLUORODECANOIC ACID	335-76-2	2.4	0.27	0.76	0.95	ug/kg			
PERFLUORODODECANOIC ACID	307-55-1	1.0	0.27	0.76	0.95	ug/kg			
PERFLUOROHEPTANOIC ACID	375-85-9	1.2	0.18	0.48	0.95	ug/kg			
PERFLUOROHXANE SULFONATE	108427-53-8	5.5	0.21	0.44	0.87	ug/kg			
PERFLUOROHXANOIC ACID	307-24-4	2.0	0.12	0.44	0.87	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	2.1	0.21	0.48	0.95	ug/kg			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	1.2	0.12	0.44	0.87	ug/kg			
PERFLUOROOCTANE SULFONATE	1763-23-1	47	2.5	7.6	9.5	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	4.1	0.22	0.70	0.87	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	3.3	0.24	0.76	0.95	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.70	0.27	0.70	0.87	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	0.42	0.29	0.70	0.87	ug/kg	J	J	
PERFLUOROUNDECANOIC ACID	2058-94-8	1.6	0.30	0.70	0.87	ug/kg			

Analysis Method: EPA 537 m

Sample Name	SHAW04-001-GW-018	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY554	Sample Date/Time:	2018-01-28 15:10	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	1.1	0.033	0.075	0.10	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.047	0.033	0.075	0.10	ug/L	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.26	0.027	0.075	0.10	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.32	0.028	0.075	0.10	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.075	0.030	0.075	0.10	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.075	0.031	0.075	0.10	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.050	0.025	0.050	0.10	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.37	0.037	0.075	0.10	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	12	0.28	0.75	1.0	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	2.2	0.018	0.050	0.10	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.051	0.044	0.090	0.10	ug/L	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.050	0.017	0.050	0.10	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	4.2	0.030	0.075	0.10	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	4.7	0.017	0.050	0.10	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.92	0.038	0.090	0.10	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.050	0.014	0.050	0.10	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.050	0.019	0.050	0.10	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.050	0.013	0.050	0.10	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-002-GW-018	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY552	Sample Date/Time:	2018-01-28 10:35	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.39	0.033	0.075	0.10	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.077	0.033	0.075	0.10	ug/L	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.30	0.027	0.075	0.10	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.34	0.028	0.075	0.10	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.075	0.030	0.075	0.10	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.075	0.031	0.075	0.10	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.050	0.025	0.050	0.10	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.51	0.037	0.075	0.10	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	16	0.28	0.75	1.0	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	5.8	0.18	0.50	1.0	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.053	0.044	0.090	0.10	ug/L	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.050	0.017	0.050	0.10	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	3.9	0.030	0.075	0.10	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	1.2	0.017	0.050	0.10	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	1.1	0.038	0.090	0.10	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.050	0.014	0.050	0.10	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.050	0.019	0.050	0.10	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.050	0.013	0.050	0.10	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-003-GW-015	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY534	Sample Date/Time:	2018-01-28 10:10	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.31	0.013	0.030	0.040	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.13	0.013	0.030	0.040	ug/L			
PERFLUOROBUTANE SULFONATE	29420-43-3	0.098	0.011	0.030	0.040	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.11	0.011	0.030	0.040	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.030	0.012	0.030	0.040	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.030	0.012	0.030	0.040	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.020	0.010	0.020	0.040	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.16	0.015	0.030	0.040	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	5.2	0.11	0.30	0.40	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	1.2	0.0070	0.020	0.040	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.024	0.017	0.036	0.040	ug/L	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.020	0.0068	0.020	0.040	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	7.9	0.12	0.30	0.40	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.60	0.0066	0.020	0.040	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.31	0.015	0.036	0.040	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.20	0.054	0.20	0.40	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.20	0.076	0.20	0.40	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.020	0.0050	0.020	0.040	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-003-SO-012	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY512	Sample Date/Time:	2018-01-26	12:15	Validation Level:	Stage 4			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.84	0.25	0.78	0.97	ug/kg	J	JB	06C
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.57	0.32	0.78	0.97	ug/kg	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.49	0.16	0.49	0.97	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.49	0.22	0.49	0.97	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.80	0.39	0.80	1.0	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	1.0	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	0.85	0.23	0.49	0.97	ug/kg	J	J	
PERFLUOROHXANOIC ACID	307-24-4	0.47	0.14	0.49	0.97	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	1.0	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.49	0.14	0.49	0.97	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	6.3	0.26	0.80	1.0	ug/kg			
PERFLUOROOCCTANOIC ACID	335-67-1	<0.78	0.24	0.78	0.97	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.78	0.30	0.78	0.97	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.78	0.32	0.78	0.97	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.78	0.33	0.78	0.97	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-004-SD-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY543	Sample Date/Time:	2018-01-27	12:04	Validation Level:	Stage 4			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	2.8	0.26	0.80	1.0	ug/kg		J	17
8:2 FLUOROTELOMER SULFONATE	39108-34-4	3.4	0.33	0.80	1.0	ug/kg		J	17
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	1.0	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	1.0	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	1.0	0.39	0.80	1.0	ug/kg		J	17
PERFLUORODECANOIC ACID	335-76-2	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	0.73	0.28	0.80	1.0	ug/kg	J	J	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	1.0	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	0.69	0.24	0.50	1.0	ug/kg	J	J	
PERFLUOROHXANOIC ACID	307-24-4	0.60	0.14	0.50	1.0	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	1.0	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	1.6	0.14	0.50	1.0	ug/kg		J	17
PERFLUOROOCTANE SULFONATE	1763-23-1	26	0.26	0.80	1.0	ug/kg		J	17
PERFLUOROOCTANOIC ACID	335-67-1	0.40	0.25	0.80	1.0	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.80	0.34	0.80	1.0	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-004-SD-901	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY544	Sample Date/Time:	2018-01-27	12:04	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	5.2	0.36	1.1	1.4	ug/kg		J	17
8:2 FLUOROTELOMER SULFONATE	39108-34-4	5.0	0.46	1.1	1.4	ug/kg		J	17
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.70	0.24	0.70	1.4	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.70	0.32	0.70	1.4	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	6.7	0.55	1.1	1.4	ug/kg		J	17
PERFLUORODECANOIC ACID	335-76-2	0.86	0.39	1.1	1.4	ug/kg	J	J	
PERFLUORODODECANOIC ACID	307-55-1	1.3	0.39	1.1	1.4	ug/kg	J	J	
PERFLUOROHEPTANOIC ACID	375-85-9	0.57	0.27	0.70	1.4	ug/kg	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	1.7	0.34	0.70	1.4	ug/kg			
PERFLUOROHEXANOIC ACID	307-24-4	1.7	0.20	0.70	1.4	ug/kg			
PERFLUORONONANOIC ACID	375-95-1	1.0	0.31	0.70	1.4	ug/kg	J	J	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	6.0	0.20	0.70	1.4	ug/kg		J	17
PERFLUOROOCCTANE SULFONATE	1763-23-1	67	3.6	11	14	ug/kg		J	17
PERFLUOROOCCTANOIC ACID	335-67-1	1.1	0.35	1.1	1.4	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	1.1	0.35	1.1	1.4	ug/kg	J	JB	06C
PERFLUOROTETRADECANOIC ACID	376-06-7	<1.1	0.43	1.1	1.4	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	0.66	0.46	1.1	1.4	ug/kg	J	J	
PERFLUOROUNDECANOIC ACID	2058-94-8	1.0	0.48	1.1	1.4	ug/kg	J	J	

Analysis Method: EPA 537 m

Sample Name	SHAW04-004-SW-001	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY545	Sample Date/Time:	2018-01-27 12:04	Validation Level:	Stage 4				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	1.2	0.066	0.15	0.20	ug/L		J	08A;08B
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.29	0.0066	0.015	0.020	ug/L			
PERFLUOROBUTANE SULFONATE	29420-43-3	0.045	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.23	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	0.016	0.0061	0.015	0.020	ug/L	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.19	0.0074	0.015	0.020	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	0.40	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.73	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.032	0.0087	0.018	0.020	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	0.011	0.0034	0.010	0.020	ug/L	J	J	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.67	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.18	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.84	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW04-004-SW-901	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY546	Sample Date/Time:	2018-01-27 12:04	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	1.3	0.066	0.15	0.20	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.29	0.0066	0.015	0.020	ug/L			
PERFLUOROBUTANE SULFONATE	29420-43-3	0.037	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.25	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	0.012	0.0061	0.015	0.020	ug/L	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.19	0.0074	0.015	0.020	ug/L			
PERFLUOROHXANE SULFONATE	108427-53-8	0.34	0.0056	0.015	0.020	ug/L			
PERFLUOROHXANOIC ACID	307-24-4	0.72	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.030	0.0087	0.018	0.020	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	0.0095	0.0034	0.010	0.020	ug/L	J	J	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.63	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.17	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.85	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-001-SO-024	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY540	Sample Date/Time:	2018-01-30 10:50	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	3.5	0.22	0.68	0.85	ug/kg			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	6.9	0.28	0.68	0.85	ug/kg			
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.43	0.14	0.43	0.85	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.43	0.20	0.43	0.85	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.68	0.33	0.68	0.85	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.68	0.24	0.68	0.85	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.68	0.24	0.68	0.85	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.31	0.16	0.43	0.85	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.43	0.20	0.43	0.85	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.43	0.12	0.43	0.85	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	0.92	0.19	0.43	0.85	ug/kg			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.43	0.12	0.43	0.85	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	20	0.22	0.68	0.85	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	0.76	0.21	0.68	0.85	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.68	0.21	0.68	0.85	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.68	0.26	0.68	0.85	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.68	0.28	0.68	0.85	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.68	0.29	0.68	0.85	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-001-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY542	Sample Date/Time:	2018-01-27 13:47	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.70	0.23	0.70	0.88	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	1.4	0.29	0.70	0.88	ug/kg			
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.44	0.15	0.44	0.88	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.44	0.20	0.44	0.88	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.70	0.34	0.70	0.88	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	2.3	0.25	0.70	0.88	ug/kg			
PERFLUORODODECANOIC ACID	307-55-1	1.2	0.25	0.70	0.88	ug/kg			
PERFLUOROHEPTANOIC ACID	375-85-9	0.76	0.17	0.44	0.88	ug/kg	J	J	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.44	0.21	0.44	0.88	ug/kg	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	0.64	0.12	0.44	0.88	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	1.5	0.19	0.44	0.88	ug/kg			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.44	0.12	0.44	0.88	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	1.7	0.23	0.70	0.88	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	1.0	0.22	0.70	0.88	ug/kg			
PERFLUOROPENTANOIC ACID	2706-90-3	1.2	0.22	0.70	0.88	ug/kg			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.69	0.27	0.69	0.86	ug/kg	U	UJ	10A
PERFLUOROTRIDECANOIC ACID	72629-94-8	0.54	0.28	0.69	0.86	ug/kg	J	J	10A
PERFLUOROUNDECANOIC ACID	2058-94-8	4.7	0.30	0.70	0.88	ug/kg			

Analysis Method: EPA 537 m

Sample Name	SHAW05-002-GW-033	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY548	Sample Date/Time:	2018-01-27 15:50	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	3.0	0.066	0.15	0.20	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	0.012	0.0083	0.019	0.025	ug/L	J	J	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.017	0.0068	0.019	0.025	ug/L	J	J	
PERFLUOROBUTANOIC ACID	375-22-4	0.22	0.0069	0.019	0.025	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.019	0.0075	0.019	0.025	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.019	0.0076	0.019	0.025	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.013	0.0063	0.013	0.025	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.21	0.0093	0.019	0.025	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	0.056	0.0070	0.019	0.025	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.44	0.0044	0.013	0.025	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.027	0.011	0.023	0.025	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.013	0.0043	0.013	0.025	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.18	0.0075	0.019	0.025	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.12	0.0041	0.013	0.025	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.84	0.0094	0.023	0.025	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.013	0.0034	0.013	0.025	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.013	0.0048	0.013	0.025	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.013	0.0031	0.013	0.025	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-002-SO-034	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY539	Sample Date/Time:	2018-01-27	13:05	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.63	0.23	0.70	0.88	ug/kg	J	JB	06C
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.70	0.29	0.70	0.88	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.44	0.15	0.44	0.88	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.44	0.20	0.44	0.88	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.70	0.34	0.70	0.88	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.70	0.25	0.70	0.88	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.70	0.25	0.70	0.88	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.44	0.17	0.44	0.88	ug/kg	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.44	0.21	0.44	0.88	ug/kg	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.44	0.12	0.44	0.88	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.44	0.19	0.44	0.88	ug/kg	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.44	0.12	0.44	0.88	ug/kg	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	<0.70	0.23	0.70	0.88	ug/kg	U	U	
PERFLUOROOCCTANOIC ACID	335-67-1	<0.70	0.22	0.70	0.88	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.70	0.22	0.70	0.88	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.70	0.27	0.70	0.88	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.70	0.29	0.70	0.88	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.70	0.30	0.70	0.88	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-002-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY531	Sample Date/Time:	2018-01-27	12:03	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.79	0.26	0.79	0.99	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.79	0.33	0.79	0.99	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	0.99	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	0.99	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.79	0.39	0.79	0.99	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.79	0.28	0.79	0.99	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.79	0.28	0.79	0.99	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	0.99	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.50	0.24	0.50	0.99	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.50	0.14	0.50	0.99	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	0.99	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.50	0.14	0.50	0.99	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	1.6	0.26	0.79	0.99	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	0.76	0.25	0.79	0.99	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	0.36	0.25	0.79	0.99	ug/kg	J	JB	06C
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.79	0.31	0.79	0.99	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.79	0.33	0.79	0.99	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	0.58	0.34	0.79	0.99	ug/kg	J	J	

Analysis Method: EPA 537 m

Sample Name	SHAW05-002-SS-901	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY532	Sample Date/Time:	2018-01-27 12:03	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.76	0.25	0.76	0.95	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.76	0.31	0.76	0.95	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.48	0.16	0.48	0.95	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.48	0.22	0.48	0.95	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.76	0.37	0.76	0.95	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	0.48	0.27	0.76	0.95	ug/kg	J	J	
PERFLUORODODECANOIC ACID	307-55-1	<0.76	0.27	0.76	0.95	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.50	0.18	0.48	0.95	ug/kg	J	J	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.48	0.23	0.48	0.95	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	0.43	0.13	0.48	0.95	ug/kg	J	JB	06C
PERFLUORONONANOIC ACID	375-95-1	0.68	0.21	0.48	0.95	ug/kg	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	0.68	0.13	0.48	0.95	ug/kg	J	J	
PERFLUOROOCTANE SULFONATE	1763-23-1	1.6	0.25	0.76	0.95	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	0.60	0.24	0.76	0.95	ug/kg	J	J	
PERFLUOROPENTANOIC ACID	2706-90-3	0.77	0.24	0.76	0.95	ug/kg	J	JB	06C
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.76	0.29	0.76	0.95	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.76	0.31	0.76	0.95	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	0.59	0.32	0.76	0.95	ug/kg	J	J	

Analysis Method: EPA 537 m

Sample Name	SHAW05-003-GW-032	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY537	Sample Date/Time:	2018-01-28 13:54	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.78	0.0066	0.015	0.020	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.058	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.13	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.099	0.0074	0.015	0.020	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	0.29	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.34	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.020	0.0087	0.018	0.020	ug/L			
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.51	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.076	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.44	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-003-SO-027	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY530	Sample Date/Time:	2018-01-27	11:17	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.68	0.22	0.68	0.85	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.68	0.28	0.68	0.85	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.43	0.14	0.43	0.85	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.43	0.20	0.43	0.85	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.68	0.33	0.68	0.85	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.68	0.24	0.68	0.85	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.68	0.24	0.68	0.85	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.43	0.16	0.43	0.85	ug/kg	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.43	0.20	0.43	0.85	ug/kg	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.43	0.12	0.43	0.85	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.43	0.19	0.43	0.85	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.43	0.12	0.43	0.85	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.26	0.22	0.68	0.85	ug/kg	J	J	
PERFLUOROOCTANOIC ACID	335-67-1	<0.68	0.21	0.68	0.85	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.68	0.21	0.68	0.85	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.68	0.26	0.68	0.85	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.68	0.28	0.68	0.85	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.68	0.29	0.68	0.85	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-003-SS-001	Matrix Type:	S	Result Type:	TRG					
Lab Sample Name:	FZY529	Sample Date/Time:	2018-01-27	10:42	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.80	0.26	0.80	1.0	ug/kg	U	U		
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.80	0.33	0.80	1.0	ug/kg	U	U		
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	1.0	ug/kg	U	U		
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	1.0	ug/kg	U	U		
PERFLUORODECANE SULFONATE	335-77-3	<0.80	0.39	0.80	1.0	ug/kg	U	U		
PERFLUORODECANOIC ACID	335-76-2	<0.80	0.28	0.80	1.0	ug/kg	U	U		
PERFLUORODODECANOIC ACID	307-55-1	<0.80	0.28	0.80	1.0	ug/kg	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	1.0	ug/kg	U	U		
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.50	0.24	0.50	1.0	ug/kg	U	U		
PERFLUOROHEXANOIC ACID	307-24-4	<0.50	0.14	0.50	1.0	ug/kg	U	U		
PERFLUORONONANOIC ACID	375-95-1	0.41	0.22	0.50	1.0	ug/kg	J	J		
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.50	0.14	0.50	1.0	ug/kg	U	U		
PERFLUOROOCTANE SULFONATE	1763-23-1	6.2	0.26	0.80	1.0	ug/kg				
PERFLUOROOCTANOIC ACID	335-67-1	<0.80	0.25	0.80	1.0	ug/kg	U	U		
PERFLUOROPENTANOIC ACID	2706-90-3	0.30	0.25	0.80	1.0	ug/kg	J	JB	06C	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.80	0.33	0.80	1.0	ug/kg	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.80	0.34	0.80	1.0	ug/kg	U	U		

Analysis Method: EPA 537 m

Sample Name	SHAW05-004-GW-031	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY538	Sample Date/Time:	2018-01-28 14:42	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.036	0.0066	0.015	0.020	ug/L			
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	0.021	0.0054	0.015	0.020	ug/L			
PERFLUOROBUTANOIC ACID	375-22-4	0.049	0.0055	0.015	0.020	ug/L			
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	0.083	0.0074	0.015	0.020	ug/L			
PERFLUOROHEXANE SULFONATE	108427-53-8	0.23	0.0056	0.015	0.020	ug/L			
PERFLUOROHEXANOIC ACID	307-24-4	0.12	0.0035	0.010	0.020	ug/L			
PERFLUORONONANOIC ACID	375-95-1	0.014	0.0087	0.018	0.020	ug/L	J	J	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.080	0.0060	0.015	0.020	ug/L			
PERFLUOROOCTANOIC ACID	335-67-1	0.082	0.0033	0.010	0.020	ug/L			
PERFLUOROPENTANOIC ACID	2706-90-3	0.13	0.0075	0.018	0.020	ug/L			
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.009	0.0024	0.009	0.018	ug/L	U	UJ	10A
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.009	0.0034	0.009	0.018	ug/L	U	UJ	10A
PERFLUOROUNDÉCANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-004-SO-028	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY528	Sample Date/Time:	2018-01-27 10:08	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.80	0.26	0.80	1.0	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.50	0.17	0.50	1.0	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.50	0.23	0.50	1.0	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.80	0.39	0.80	1.0	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.80	0.28	0.80	1.0	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.50	0.19	0.50	1.0	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.50	0.24	0.50	1.0	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.50	0.14	0.50	1.0	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.50	0.22	0.50	1.0	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.50	0.14	0.50	1.0	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	0.78	0.26	0.80	1.0	ug/kg	J	J	
PERFLUOROOCTANOIC ACID	335-67-1	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.80	0.25	0.80	1.0	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.80	0.31	0.80	1.0	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.80	0.33	0.80	1.0	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.80	0.34	0.80	1.0	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW05-004-SS-001	Matrix Type:	S	Result Type:	TRG				
Lab Sample Name:	FZY527	Sample Date/Time:	2018-01-27 09:28	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.88	0.29	0.88	1.1	ug/kg	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.55	0.19	0.55	1.1	ug/kg	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.55	0.25	0.55	1.1	ug/kg	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.88	0.43	0.88	1.1	ug/kg	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.88	0.31	0.88	1.1	ug/kg	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.55	0.21	0.55	1.1	ug/kg	U	U	
PERFLUOROHXANE SULFONATE	108427-53-8	<0.55	0.26	0.55	1.1	ug/kg	U	U	
PERFLUOROHXANOIC ACID	307-24-4	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.55	0.24	0.55	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.55	0.15	0.55	1.1	ug/kg	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	5.1	0.29	0.88	1.1	ug/kg			
PERFLUOROOCTANOIC ACID	335-67-1	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.88	0.28	0.88	1.1	ug/kg	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.88	0.34	0.88	1.1	ug/kg	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.88	0.36	0.88	1.1	ug/kg	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.88	0.37	0.88	1.1	ug/kg	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-005	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY547	Sample Date/Time:	2018-01-27 15:40	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	<0.010	0.0035	0.010	0.020	ug/L	U	U	
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUOROOCCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-006	Matrix Type:	W	Result Type:	TRG					
Lab Sample Name:	FZY533	Sample Date/Time:	2018-01-28	08:45	Validation Level:	Stage 2B				
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code	
6:2 FLUOROTELOMER SULFONATE	27619-97-2	<0.015	0.0066	0.015	0.020	ug/L	U	U		
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U		
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U		
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U		
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U		
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U		
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U		
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U		
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U		
PERFLUOROHEXANOIC ACID	307-24-4	<0.010	0.0035	0.010	0.020	ug/L	U	U		
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U		
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U		
PERFLUOROOCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U		
PERFLUOROOCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U		
PERFLUOROPENTANOIC ACID	2706-90-3	<0.018	0.0075	0.018	0.020	ug/L	U	U		
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U		
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U		
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U		

Analysis Method: EPA 537 m

Sample Name	SHAW-RS-007	Matrix Type:	W	Result Type:	TRG				
Lab Sample Name:	FZY541	Sample Date/Time:	2018-01-30	10:00	Validation Level:	Stage 2B			
Analyte	CAS No	Result Value	DL	LOD	LOQ	Result Units	Lab Qualifier	Validation Qualifier	Validation Reason Code
6:2 FLUOROTELOMER SULFONATE	27619-97-2	0.016	0.0066	0.015	0.020	ug/L	J	J	
8:2 FLUOROTELOMER SULFONATE	39108-34-4	<0.015	0.0066	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANE SULFONATE	29420-43-3	<0.015	0.0054	0.015	0.020	ug/L	U	U	
PERFLUOROBUTANOIC ACID	375-22-4	<0.015	0.0055	0.015	0.020	ug/L	U	U	
PERFLUORODECANE SULFONATE	335-77-3	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUORODECANOIC ACID	335-76-2	<0.015	0.0061	0.015	0.020	ug/L	U	U	
PERFLUORODODECANOIC ACID	307-55-1	<0.010	0.0050	0.010	0.020	ug/L	U	U	
PERFLUOROHEPTANOIC ACID	375-85-9	<0.015	0.0074	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANE SULFONATE	108427-53-8	<0.015	0.0056	0.015	0.020	ug/L	U	U	
PERFLUOROHEXANOIC ACID	307-24-4	0.0091	0.0035	0.010	0.020	ug/L	J	J	
PERFLUORONONANOIC ACID	375-95-1	<0.018	0.0087	0.018	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONAMIDE	754-91-6	<0.010	0.0034	0.010	0.020	ug/L	U	U	
PERFLUOROOCTANE SULFONATE	1763-23-1	<0.015	0.0060	0.015	0.020	ug/L	U	U	
PERFLUOROOCTANOIC ACID	335-67-1	<0.010	0.0033	0.010	0.020	ug/L	U	U	
PERFLUOROPENTANOIC ACID	2706-90-3	0.013	0.0075	0.018	0.020	ug/L	J	J	
PERFLUOROTETRADECANOIC ACID	376-06-7	<0.010	0.0027	0.010	0.020	ug/L	U	U	
PERFLUOROTRIDECANOIC ACID	72629-94-8	<0.010	0.0038	0.010	0.020	ug/L	U	U	
PERFLUOROUNDECANOIC ACID	2058-94-8	<0.010	0.0025	0.010	0.020	ug/L	U	U	



1826 Floyd Coker Court
Oak Ridge, TN 37826
865-481-7527

Chain of Custody Record/
Analysis Request Number:

Page ⁴³⁷ 2 of 4

Project Name: Site Inspections of Fire Fighting Foam Usage at Various Air Force Bases in the Eastern United States
Job No.: M2032.0001 (Sawgrass)
Installation: SHAW AFB

Aerostar Project Manager: Brian Odum | BDOdum@aerostar.com | (478) 281-4806
Send Data To: Jerry Krick | jkrick@aerostar.com | (865) 483-7584

Sampler(s): J. Klein

Laboratory Name/Address: Maxxim Analytics, Inc. | 6758 Campobello Rd. | Charlotte, NC 28203
Laboratory Shipping Address: Maxxim Analytics | c/o FedEx Dept. | 226 Cayuga Rd. | Cheektowake, NY 14224
Contact: Melissa DiGesto | Phone: (905) 817-6706, ext. 5794 | email: MDDiGesto@maxxim.com

Matrix:
WG = Groundwater
SO = Soil
WF = Portable Water
SE = Sediment
WS = Surface Water
WO = Field QC (AD, EB)

Medium	Sample ID	Date Collected	Time Collected	Sample Type	Matrix	Notes
	SHAW05-00453-001	1/27/18	0928	N	SO	1
	SHAW05-00450-028	1/27/18	1008	N	SO	1
	SHAW05-00353-001	1/27/18	1046	N	SO	1
	SHAW05-00340-027	1/27/18	1117	N	SO	1
	SHAW05-00238-001	1/27/18	1203	N	SO	1
	SHAW05-00235-901	1/27/18	1203	FD	SO	1
	SHAW05-00250	1/27/18		N	SO	1
	SHAW-RS-006	1/28/18	0845	EB	WG	2
	SHAW04003-LW-015	1/28/18	1010	N	WG	2
	SHAW03-002-6W-017	1/28/18	1122	N	WG	2
	SHAW03-001-6W-018	1/28/18	1204	N	WG	2
	SHAW05-003-6W-032	1/28/18	1354	N	WG	2
	SHAW05-004-6W-031	1/28/18	1442	N	WG	2
	SHAW05-002-50-074	1/27/18	1305	N	SO	1

Total # of Containers: 17

RECEIVED BY:	DATE/TIME:	RECEIVED BY:	DATE/TIME:
<u>Jerry Krick</u>	<u>1/30/18 1845</u>	<u>Maxxim</u>	<u>2/8/18 14:28</u>
<u>Jerry Krick</u>	<u>ASL</u>	<u>Maxxim</u>	<u>3.5/28/26 34/24/23</u>
			<u>custody intact</u>



1885 Floyd Collier Court
Oak Ridge, TN 37830
865-481-7837

Chain of Custody Record/
Analysis Request Number:

500
Page 3 of 4

Project Name: Site Inspections of Fire Fighting Foam Usage at Various Air Force Bases in the Eastern United States

Job No: M2032-0001 (Sawtooth)

Initiative: SHAW AFB

Aerostar Project Manager: Brian O'Brien, (478) 287-4000
Send Data to: Jeremy Kline, (865) 483-7804

Completed: J. Klein

Laboratory Name/Address:
Mexcen Analytica, Inc.
6746 Campbell Rd.
Mississauga, Ontario
L5M2L3

Laboratory Shipping Address:
Mexcen Analytica
c/o FedEx Depot
290 Cayuga Rd.
Clarksburg, NY 14225

Contact: Melissa DiStasio
Phone: (805) 817-5780 ext. 5784
email: MDiStasio@mexcen.ca

Please indicate "HOLD FOR PICKUP"

Sample Types:
N - Norend
FD - Field Duplicate
AB - Ambient Blank or Field Reagent Blank
EB - Equipment Blank

Metric:
WG - Groundwater
SO - Soil
WP - Potable Water
SE - Sediment
WB - Surface Water
WQ - Field QC (AR, ER)

Sample ID	Date Collected	Time Collected	Sample Type	Metric	Notes
SHAWDS-001-SO-004	1/30/18	1050	N	SO	1
SHAW-R3-007	1/20/18	1020	EB	WQR	2
SHAWDS-001-SO-001	1/27/2018	1747	N	SO	1

DELIVERED BY: J. Klein
Date: 1/20/18 1845
Signature: ASL

RECEIVED BY: Mraz
Date: 2/17/2018 14:28
Signature: Mraz

ANALYSIS	DATE	LAB	COMMENTS	STATUS	LAB
...



1006 Floyd Carter Court
Oak Ridge, TN 37830
865-461-7837

Chain of Custody Record/
Analysis Request Number:

Page 4 of 4

Project Name: Site Inspections of Fire Fighting Foam Usage at Various Air Force Bases in the Eastern United States

Job No.: M2032.0001 (Standard)

Installation: Shaw AFB

Aerostar Project Manager: Brian Odon, 800don@aerostar.com (418) 287-4888
Send Date to: Jerry Vance, jvance@aerostar.com (865) 461-7864

Sampler(s):
A. Willis, J. Vance

Laboratory Name/Address:
Maxxim Analytics, Inc.
6740 Comptons Rd.
Mississauga, Ontario
L5N2L8

Laboratory Shipping Address:
Maxxim Analytics
c/o FedEx Depot
298 Cayuga Pl.
Cheektowaga, NY 14225

Contact: Melissa DiGirola

Phone: (866) 617-0708, ext. 5784
email: MDiGirola@maxxim.com

Please indicate "HOLD FOR PICKUP"

MAXIM Lab only	Sample ID	Date Collected	Time Collected	Sample Type	Matrix	Notes
	SHAW04-004-SO-001	01/27/18	1204	N	SE	2
	SHAW04-004-SB-901	01/27/18	1204	FD	SE	1
	SHAW04-004-SW-001	01/27/18	1204	N	WS	6
	SHAW04-004-SW-901	01/27/18	1204	FD	WS	2
	SHAW-RS-005	01/27/18	1540	EB	WG	2
	SHAW05-002-GW-023	01/27/18	1550	N	WG	3
	SHAW02-003-GW-020	01/27/18	1725	N	WG	2
	SHAW02-001-GW-021	01/27/18	1738	N	WG	2
	SHAW02-002-GW-022	01/27/18	1810	N	WG	2
	SHAW04-002-GW-019	01/28/18	1035	N	WG	2
	SHAW03-003-GW-018	01/28/18	1145	N	WG	2
	SHAW04-001-GW-017	01/28/18	1510	N	WG	2

Sample Types:
N = Normal
FD = Field Duplicate
AD = Ambient Blank or Field Reagent Blank
EB = Equipment Residue

Matrix:
WG = Groundwater
SO = Soil
WF = Potable Water
SE = Sediment
WS = Surface Water
WD = Field OC (AR, SR)

NOTES
MS/MSD

MS/MSD

off of check valve associated with SHAW05-002-GW-023
Dark color sample - high turbidity

Total # of Containers: 18

RECEIVED BY: [Signature] Date: 1/30/18 1845
ASL

ANALYSIS BY: [Signature] Date: 2/8/18 14:28
METER/GWA 2012-02-6 3.4/134/133

ANALYSIS	DATE	TIME	ANALYST	LABORATORY	STATUS
...



1888 Floyd Collier Court
Oak Ridge, TN 37838
800-451-7837

Chain of Custody Records
Analysis Request Number:

484
Page 1 of 3

Project Name: Site Investigation of Fire Fighting Foam Usage at Various Air Force Bases in the Eastern United States
Job No.: M2032.0001 (20180801)
Installation: Shaw AFB

Analyst: [Blank]

Ammer Project Manager: Giles Olson, golson@awp.com (478) 387-4306
Send Data to: Jenny Vance, jvance@awp.com (800) 451-7884

Client: J. Klein

Laboratory Shipping Address: Maxxim Analytica, 6742 Campbell Rd., Mississauga, Ontario L4N2L6
Lab Contact: Melissa DiGrasso, Phone: (905) 817-6700, ext. 4784, email: MDiGrasso@maxxim.ca

Please indicate "HOLD FOR PICKUP"

MAZAM use only	Sample ID	Date Collected	Time Collected	Sample Type	Matrix	Notes
	SHAW06-003-SS-001	1/27/18	1455	N	SO	1
	SHAW-RS-001	1/22/18	1545	EB	WQ	2
	SHAW06-007-30-026	1/23/18	1605	N	SO	1
	SHAW06-003-SS-001	1/23/18	1670	N	SO	1
	SHAW06-007-30-026	1/23/18	1720	N	SO	1
	SHAW06-001-SS-002	1/24/18	0810	EB	WQ	2
	SHAW06-001-SS-001	1/24/18	0825	N	SO	1
	SHAW06-001-30-026	1/24/18	0910	N	SO	1
	SHAW-SF-001	1/24/18	0855	AB	WQ	2
	SHAW-RS-003	1/25/18	0855	EB	WQ	2
	SHAW02-001-30-018	1/25/18	1545	N	SO	1
	SHAW02-003-30-019	1/25/18	1620	N	SO	1
	SHAW02-007-30-021	1/25/18	1730	N	SO	1
	SHAW-SHAW-R1-004	1/26/18	0855	EB	WQ	2
	SHAW04-001-30-001	1/26/18	0910	N	SO	1

Total # of Containers: 20

REQUIREMENTS: [Signature] 1/26/18 1500
RECEIVED BY: [Signature] 1/27/18 13:00
[Signature] 1/4/18

Analysis Sub: [Table with columns: SAMPLE, METHOD, DATE, COMMENTS, QUANTITY, UNIT]

Notes: [Handwritten notes in right margin, including "Taken off spec in laboratory w/ SHAW06-003-SS-001", "Taken off spec in laboratory w/ SHAW06-001-SS-001", "Some blank tubes from sent over with spec", "Taken off the tubes in laboratory w/ SHAW06-001-SS-001", "Taken spec from in laboratory w/ SHAW06-001-SS-001"]

Vertical text: LIRE ENV-878, Stephanie Pullen, BR20260, 27-Jan-18 13:00

International Solid Sample Heat Treat Required High Risk material Committed Storage and Disposal

Project Name: Site Inspection of Fire Fighting Foam Usage of Various Air Force Bases in the Eastern United States
Job No.: M2032.0001 (Successor)
Installation: SHAW AFB

Aerostar Project Manager: Brian O'Brien, BO'Brien@percorm.com (478) 287-6996
Send Data To: Jerry Varica, jvarica@percorm.com (888) 483-7904

Sampler(s): J. Klein

Laboratory Name/Address: Maxxim Analytica, Inc. 5740 Conestoga Rd. Manassas, Ontario L9N2L4
Laboratory Shipping Address: Maxxim Analytica c/o FedEx Depot 200 Cayuga Rd. Cheektowaga, NY 14226
Contact: Melissa B. Greco
Phone: (985) 817-0708, ext. 6704
Email: MBSgreco@maxxim.ca
Please indicate "HOLD FOR PICKUP"

Matrix Legend:
M = Matrix
FD = Field Duplicate
AB = Ambient Blank or Field Reagent Blank
EB = Equipment Rinse
WG = Groundwater
SO = Soil
WP = Potable Water
SE = Sediment
WS = Surface Water
WQ = Field QC (AB, EB)

MAXXIM use only	Sample ID	Date Collected	Time Collected	Sample Type	Matrix	Notes
	SHAW 04-002-SO-013	1/26/18	0940	M	SO	
	SHAW 04-002-SO-913	1/26/18	0940	FD	SO	
	SHAW 04-001-SS-001	1/26/18	1000	M	SO	
	SHAW 04-001-SO-013	1/26/18	1035	M	SO	
	SHAW 04-002-SS-001	1/26/18	1105	M	SO	

Total # of Containers: 5

RELINQUISHED BY: [Signature] Date: 1/26/18 Time: 1500

RECEIVED BY: [Signature] Date: 2/6/18 Time: 1320
[Signature] Date: 2/6/18 Time: 1338

ANALYZE LAB	ANALYZE LAB CODE	DATE	OPERATOR	ANALYZE LAB PHONE	FAX
PERCORM	0101	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0102	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0103	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0104	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0105	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0106	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0107	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0108	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0109	01/27/18	PERCORM	773-233-1111	773-233-1111
PERCORM	0110	01/27/18	PERCORM	773-233-1111	773-233-1111

CUSTOMER SEAL HERE

Project Name: Site Inspection of Five Fighting Force (MAGP at Various Air Force Bases in the Eastern United States) Job No.: M2032.0001 (Barcode)

Aerostar Project Manager: Brian Odick, BOdick@Aerostar.com (478) 282-4988 Installation: SHAW AFB
Send Data To: Jerry Vance, jvance@Aerostar.net (865) 481-7804

Sample(s): A. Willis, J. Vance

Laboratory Name/Address: Maxxim Analytic, Inc. 6740 Caspary Rd. Maximsaga, Ontario L3K2L8
Laboratory Shipping Address: Maxxim Analytic via FedEx Depot 289 Cayuga Rd. Cayuga, NY 14225
Contact: Melissa (E)Gytle
Phone: (800) 817-8760, ext. 8784 email: M(G)Gytle@maxxim.com

Please indicate "HOLD FOR PICKUP"

MAXIM (see only)	Sample ID	Date Collected	Time Collected	Sample Type	Notes
------------------	-----------	----------------	----------------	-------------	-------

MAXIM (see only)	Sample ID	Date Collected	Time Collected	Sample Type	Notes
	SHAW01-MW131A-GW-012	01/24/2018	1730	N	WG 2
	SHAW01-MW22A-GW-026	01/24/2018	1745	N	WG 2
	SHAW06-MW15-GW-019	01/25/2018	0956	N	WG 6
	SHAW01-MW05-GW-719	01/25/2018	0956	FD	WG 2
	SHAW06-003-GW-027	01/25/2018	1355	N	WG 2
	SHAW06-002-GW-028	01/25/2018	1409	N	WG 2
	SHAW06-001-GW-033	01/25/2018	1615	N	WG 2
	SHAW03-FI3MWS-GW-016	01/25/2018	1740	N	WG 2
	SHAW09-FI3MWS-GW-914	01/25/2018	1740	FD	WG 2

ANALYSIS

ANALYSIS	STATUS	DATE	TIME	LAB	ANALYST	REMARKS

Sample Types:
N - Normal
FD - Field Duplicate
AB - Ambient Blank or Field Reagent Blank
EB - Equipment Blank

Matrix:
WG - Groundwater
SD - Soil
WP - Pore Water
SE - Sediment
WS - Surface Water
WG - Field OC (WG, EB)

NOTES

AS/MSS

8/2

RELEASUED BY: [Signature] Date: 1/26/18 Time: 1500

RECEIVED BY: [Signature] Date: 2018/01/27 Time: 11:00
Signature: SCARLETT Date: 3/6/4/1/2.8

Total # of Containers: 11

ANALYSIS	STATUS	DATE	TIME	LAB	ANALYST	REMARKS

Collected and Preserved

Appendix E
Physiochemical Sample Results

Table E-1 Physiochemical Sample Results

AFFF Area	Sample No.	Percent Passing No. 4 Screen	Percent Passing No. 200 Screen	USCS Class	TOC (mg/kg)	pH (units)	Percent Solid
AFFF Area 1 Former FTA 1	SHAW01-004-SS-001	100	8.7	SP-SM	2,800	5.11	96.7
	SHAW01-004-SO-004	100	19.4	SM	1,230	5.53	89.4
AFFF Area 2 Former FTA 2	SHAW02-004-SO-018	99.5	2.8	SW	156 J	5.21	95.9
AFFF Area 3 Former FTA 3 / EOD Area	SHAW03-004-SS-001	90.4	18.7	SM	7,390	6.21	91.6
	SHAW03-004-SO-016	99.3	12.7	SM	361	5.69	88.5
AFFF Area 4 Current FTA	SHAW04-005-SS-001	100	18.9	SM	2,000	5.28	93.7
	SHAW04-005-SO-013	100	4.1	SW	267	5.56	95.4
AFFF Area 5 Building 1511	SHAW05-005-SS-001	98.6	26.8	SM	5,590	6.06	90.5
	SHAW05-005-SO-031	100	10.4	SP-SM	128 J	5.99	94.8
AFFF Area 6 Wastewater Treatment Plant	SHAW06-004-SS-001	98.3	21.3	SM	3,580	5.40	84.5
	SHAW06-004-SO-027	99.3	46.0	SM	112 J	4.67	80.9

AFFF = aqueous film forming foam
 mg/kg = milligrams per kilogram
 pH = potential of hydrogen
 SM = silty sand
 SP = poorly graded or gravelly sands
 SW = well-graded sands
 USCS = Unified Soil Classification System

J = estimated value
 No. = number
 SHAW = Shaw Air Force Base
 SO = subsurface soil
 SS = surface soil
 TOC = total organic carbon

Case Narrative

Client: MAXXAM/Aerostar SES LLC
Project: Shaw AFB, SC
Sample Receipt Date(s): 01-31-2018
SDG #: 133832

Eleven samples were analyzed for (GSA)/hydrometer, pH, and TOC. GSA/hydrometer analyses were sub-contracted to Mi-Tech, Weston, WI. The assigned sample ID numbers, date sampled, and date received are indicated in the attached Project Summary. The samples were received intact and at a temperature within method specified acceptance limits. Any exceptions are noted below. The analyses were performed, where applicable, following QSM 5.0 requirements.

Sample Analysis and Quality Control

Inorganics:

The samples were analyzed using US EPA Method 9045D (pH) and the Llyod-Kahn method (total organic carbon, TOC). All samples were analyzed within the holding time. The following summaries of quality control procedures are included:

- Initial and Continuing Calibration Verification
- Blanks Summary
- ICP Interference Check Data
- Spike Sample Recovery
- Duplicates Data
- Laboratory Control Sample Data
- Analysis Run Log

All analysis results met the method specified quality control criteria with the following exceptions:

pH (9045D) Solid Analyses

Analytical Run # 146373

All analysis results for this analytical run met the method/project specified quality control criteria.

TOC (Lloyd-Kahn) Solid Analyses

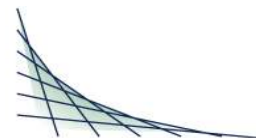
Analytical Run # 146428

All analysis results for this analytical run met the method/project specified quality control criteria.



Data Qualifiers

Code	Description
A	Analyte averaged calibration criteria within acceptable limits.
B	Analyte detected in associated Method Blank.
C	Toxicity present in BOD sample.
D	Diluted Out.
E	Safe, No Total Coliform detected.
F	Unsafe, Total Coliform detected, no E. Coli detected.
G	Unsafe, Total Coliform detected and E. Coli detected.
H	Holding time exceeded.
J	Estimated value.
L	Significant peaks were detected outside the chromatographic window.
M	Matrix spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
N	Insufficient BOD oxygen depletion.
O	Complete BOD oxygen depletion.
P	Concentration of analyte differs more than 40% between primary and confirmation analysis.
Q	Laboratory Control Sample outside acceptance limits.
R	See Narrative at end of report.
S	Surrogate standard recovery outside acceptance limits due to apparent matrix effects.
T	Sample received with improper preservation or temperature.
U	Analyte concentration was not above the detection level.
V	Raised Quantitation or Reporting Limit due to limited sample amount or dilution for matrix background interference.
W	Sample amount received was below program minimum.
X	Analyte exceeded calibration range.
Y	Replicate/Duplicate precision outside acceptance limits.
Z	Calibration criteria exceeded.



MANUAL INTEGRATION REASON CODES

CTLaboratories has identified four general cases with valid reasons supporting the use of manual integration techniques. These codes are used on chromatograms in this data package to document the reasons for manual integrations per CTLaboratories' SOP SS-10 current revision.

#1: Data system failed to select the correct peak or missed the peak entirely.

In some cases the chromatography system selects and integrates the "wrong peak". In this case the analyst must correct the selection and force the system to integrate the proper peak. In other instances the system may miss the peak completely. In this case the analyst manually integrated the peak

#2: Data System Splits the Peak Incorrectly or Integrates a False Peak as a Rider Peak.

This phenomenon is common at low concentrations where the signal to noise ratio is low. A single compound (peak) is incorrectly split into multiple peaks or integrated as a main peak with one or more rider peaks resulting in low or high area counts for the target compound.

#3: Improperly Integrated Isomers and/or coeluting compounds.

For when the system fails to distinguish coeluting compounds and or isomers. The integration areas and concentrations may be inaccurate, and they must be corrected by manual integration. Prime examples are compounds that are unresolved and integrated improperly when present at low concentrations in standards or samples.

#4: System Established Incorrect Baseline.

There are numerous situations in chromatography where the system establishes the baseline incorrectly. Some baseline errors will be obvious to the analyst and may be corrected via manual procedures.

#5: Miscellaneous.

Some situations involving integration errors may require in-depth review and technical judgment. These cases should be brought to the attention of the group supervisor. If the form of manual integration is not clearly covered by these four cases, then review and approval by the group supervisor or the QA/QC Supervisor will be required.

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW01-004-SO-004

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>89.4</u>	Lab Sample ID:	<u>979019</u>	
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	<u></u>	
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018</u>	<u>12:27</u>
Analytical Prep Batch #:	<u></u>	Prep. Date/Time:	<u></u>	
ICAL Calibration #:	<u></u>	Concentration Units:	<u>S.U.</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.53		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW01-004-SO-004

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>89.4</u>	Lab Sample ID:	<u>979019</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>13:53</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	1230		40	84	170	170

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW02-004-SO-018

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>95.9</u>	Lab Sample ID:	<u>979020</u>	
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018</u>	<u>12:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	_____	Concentration Units:	<u>S.U.</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.21		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW02-004-SO-018

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>		
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>		
% Solids:	<u>95.9</u>	Lab Sample ID:	<u>979020</u>		
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>		
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	<u></u>		
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>14:04</u>	
Analytical Prep Batch #:	<u></u>	Prep. Date/Time:	<u></u>		
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>		

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	156	J	38	78	160	160

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW03-004-SO-016

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>88.5</u>	Lab Sample ID:	<u>979022</u>	
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018</u>	<u>12:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	_____	Concentration Units:	<u>S.U.</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.69		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW03-004-SO-016

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>88.5</u>	Lab Sample ID:	<u>979022</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>14:23</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	361		41	85	170	170

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW03-004-SS-001

Lab Name:	CT Laboratories	Contract:	MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES
Matrix (soil/water):	SOIL	SDG No.:	133832
% Solids:	91.6	Lab Sample ID:	979021
Analytical Method:	EPA 9045D	Date Received:	01/31/2018
Dilution Factor:	1	TCLP/SPLP Extraction Date/time:	
Analytical Run #:	146373	Analysis Date/Time	02/02/2018 12:27
Analytical Prep Batch #:		Prep. Date/Time:	
ICAL Calibration #:		Concentration Units:	S.U.

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	6.21		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW03-004-SS-001

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>91.6</u>	Lab Sample ID:	<u>979021</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>14:12</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	7390		39	82	160	160

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW04-005-SO-013

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>
% Solids:	<u>95.4</u>	Lab Sample ID:	<u>979024</u>
Analytical Method:	<u>EPA 8000C</u>	Date Received:	<u>01/31/2018</u>
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	<u></u>
Analytical Run #:	<u>146330</u>	Analysis Date/Time	<u>02/01/2018 12:00</u>
Analytical Prep Batch #:	<u></u>	Prep. Date/Time:	<u></u>
ICAL Calibration #:	<u></u>	Concentration Units:	<u>%</u>

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
SOLID	Solids, Percent	95.4		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW04-005-SO-013

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>95.4</u>	Lab Sample ID:	<u>979024</u>	
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018</u>	<u>12:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	_____	Concentration Units:	<u>S.U.</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.56		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW04-005-SO-013

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>95.4</u>	Lab Sample ID:	<u>979024</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>15:10</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	267		38	79	160	160



INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW04-005-SS-001

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>93.7</u>	Lab Sample ID:	<u>979023</u>	
Analytical Method:	<u>EPA 8000C</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146330</u>	Analysis Date/Time	<u>02/01/2018</u>	<u>12:00</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	_____	Concentration Units:	<u>%</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
SOLID	Solids, Percent	93.7		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW04-005-SS-001

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>
% Solids:	<u>93.7</u>	Lab Sample ID:	<u>979023</u>
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	_____
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018 12:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____
ICAL Calibration #:	_____	Concentration Units:	<u>S.U.</u>

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.28		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW04-005-SS-001

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>93.7</u>	Lab Sample ID:	<u>979023</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>14:52</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	2000		38	80	160	160



INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW05-005-SO-031

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>
% Solids:	<u>94.8</u>	Lab Sample ID:	<u>979026</u>
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	<u></u>
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018 12:27</u>
Analytical Prep Batch #:	<u></u>	Prep. Date/Time:	<u></u>
ICAL Calibration #:	<u></u>	Concentration Units:	<u>S.U.</u>

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.99		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW05-005-SO-031

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>94.8</u>	Lab Sample ID:	<u>979026</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>15:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	128	J	38	79	160	160

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW06-004-SO-027

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>80.9</u>	Lab Sample ID:	<u>979028</u>	
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018</u>	<u>12:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	_____	Concentration Units:	<u>S.U.</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	4.67		0.1	0.1	0.1	0.1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW06-004-SO-027

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>80.9</u>	Lab Sample ID:	<u>979028</u>	
Analytical Method:	<u>L-Kahn/9060A</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1.00</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146428</u>	Analysis Date/Time	<u>02/07/2018</u>	<u>16:10</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	<u>TOCS ICA</u>	Concentration Units:	<u>mg/kg</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
TOC	Total Organic Carbon	112	J	44	93	190	190

INORGANIC ANALYSIS DATA SHEET

Sample Description

SHAW06-004-SS-001

Lab Name: CT Laboratories Contract: MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES
 Matrix (soil/water): SOIL SDG No.: 133832
 % Solids: 84.5 Lab Sample ID: 979027
 Analytical Method: EPA 8000C Date Received: 01/31/2018
 Dilution Factor: 1.00 TCLP/SPLP Extraction Date/time: _____
 Analytical Run #: 146330 Analysis Date/Time 02/01/2018 12:00
 Analytical Prep Batch #: _____ Prep. Date/Time: _____
 ICAL Calibration #: _____ Concentration Units: %

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
SOLID	Solids, Percent	84.5		0.1	0.1	0.1	0.1



1

INORGANIC ANALYSIS DATA SHEET

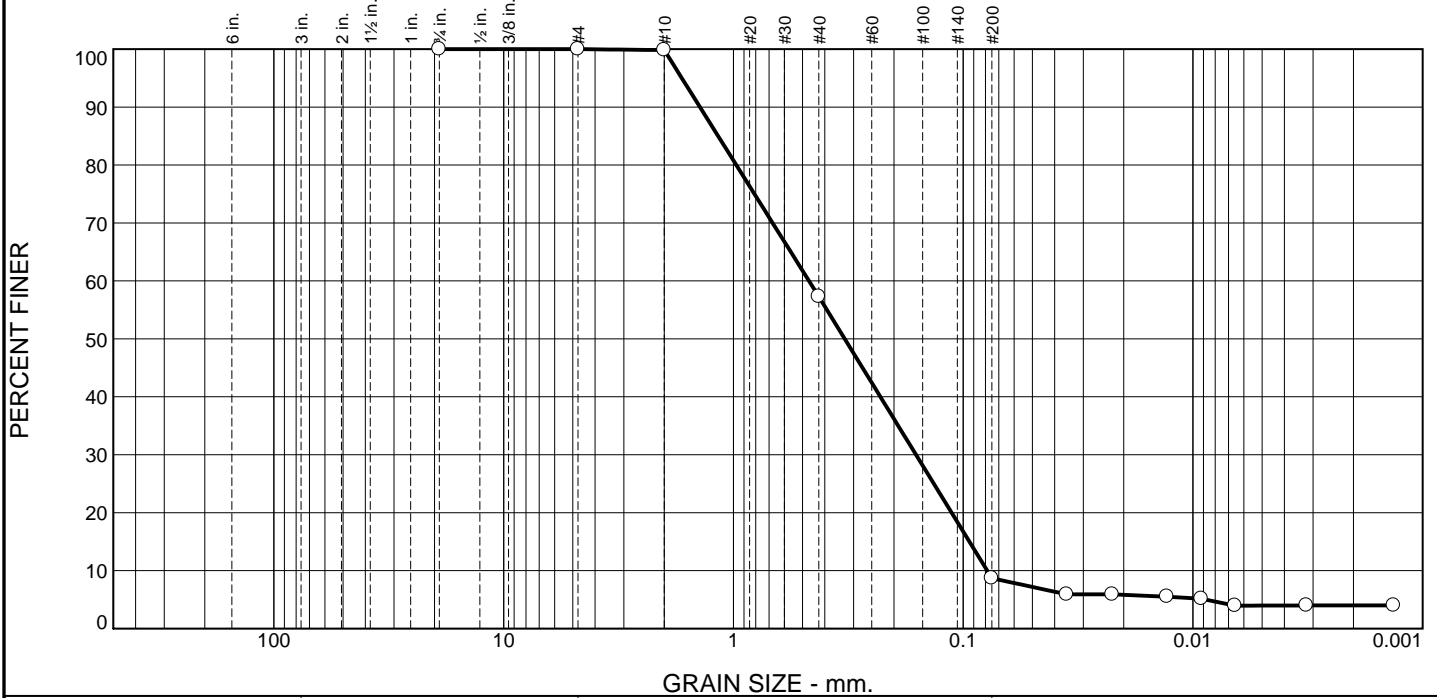
Sample Description

SHAW06-004-SS-001

Lab Name:	<u>CT Laboratories</u>	Contract:	<u>MAXXAM ANALYTICS-SI MULTIPLE AFFF SITES</u>	
Matrix (soil/water):	<u>SOIL</u>	SDG No.:	<u>133832</u>	
% Solids:	<u>84.5</u>	Lab Sample ID:	<u>979027</u>	
Analytical Method:	<u>EPA 9045D</u>	Date Received:	<u>01/31/2018</u>	
Dilution Factor:	<u>1</u>	TCLP/SPLP Extraction Date/time:	_____	
Analytical Run #:	<u>146373</u>	Analysis Date/Time	<u>02/02/2018</u>	<u>12:27</u>
Analytical Prep Batch #:	_____	Prep. Date/Time:	_____	
ICAL Calibration #:	_____	Concentration Units:	<u>S.U.</u>	

CAS #	Analyte	Concentration	Qualifiers	DL	LOD	LOQ	RL
PH	pH	5.40		0.1	0.1	0.1	0.1

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	42.5	48.6	4.7	4.0

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	100.0		
#10	99.8		
#40	57.3		
#200	8.7		
0.0354 mm.	5.9		
0.0224 mm.	5.9		
0.0130 mm.	5.5		
0.0092 mm.	5.1		
0.0066 mm.	3.9		
0.0032 mm.	4.0		
0.0013 mm.	4.0		

* (no specification provided)

Client Sample Description

SHAW01-004-SS-001

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= A-3

Coefficients

D₉₀= 1.3979 D₈₅= 1.1653 D₆₀= 0.4690
D₅₀= 0.3276 D₃₀= 0.1605 D₁₅= 0.0940
D₁₀= 0.0786 C_u= 5.97 C_c= 0.70

Remarks

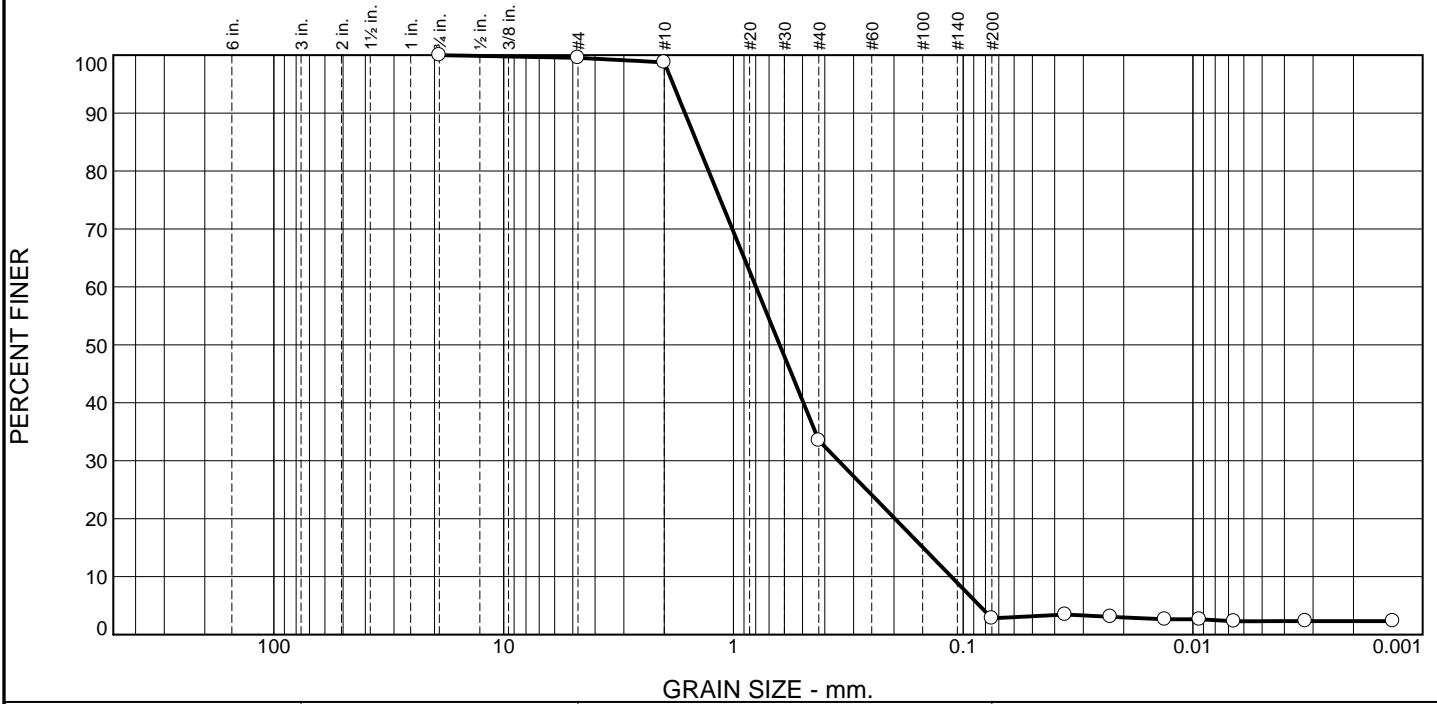
Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979017

Date Sampled: 1-26-2018

Mi-Tech Services, Inc. Weston, WI	Client: CT LABORATORIES Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC Project No: 10838 (CTL #133832) Figure 1
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Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.7	65.3	30.7	0.5	2.3

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	99.5		
#10	98.8		
#40	33.5		
#200	2.8		
0.0360 mm.	3.4		
0.0228 mm.	3.1		
0.0132 mm.	2.6		
0.0094 mm.	2.6		
0.0066 mm.	2.3		
0.0032 mm.	2.3		
0.0013 mm.	2.3		

* (no specification provided)

Client Sample Description

SHAW02-004-SO-018

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SW AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 1.6247 D₈₅= 1.4430 D₆₀= 0.7973
D₅₀= 0.6289 D₃₀= 0.3489 D₁₅= 0.1495
D₁₀= 0.1127 C_u= 7.08 C_c= 1.36

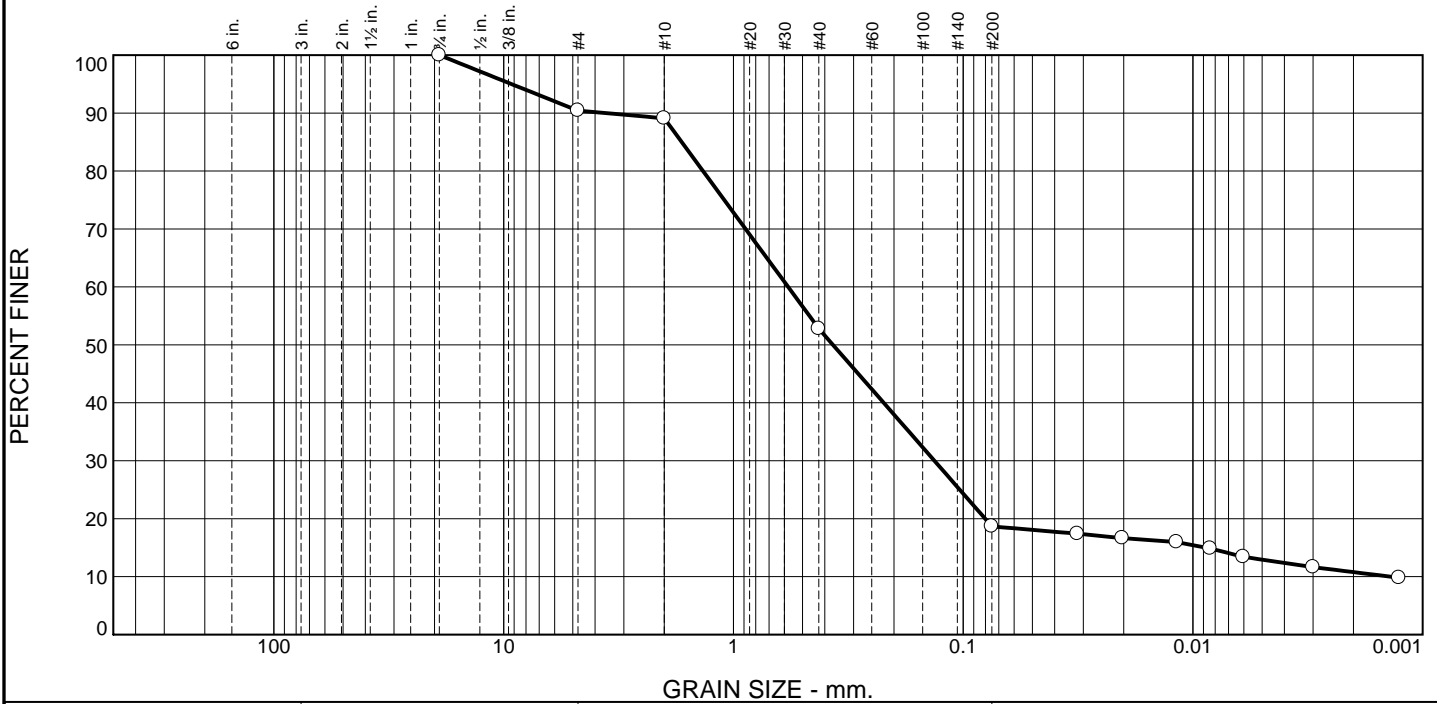
Remarks

Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979020 Date Sampled: 1-26-2018

Mi-Tech Services, Inc. Weston, WI	Client: CT LABORATORIES Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC Project No: 10838 (CTL #133832) Figure 3
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Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.6	1.3	36.3	34.1	5.8	12.9

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	90.4		
#10	89.1		
#40	52.8		
#200	18.7		
0.0318 mm.	17.4		
0.0203 mm.	16.6		
0.0118 mm.	16.0		
0.0084 mm.	14.9		
0.0060 mm.	13.4		
0.0030 mm.	11.6		
0.0013 mm.	9.8		

* (no specification provided)

Client Sample Description

SHAW03-004-SS-001

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 3.6119 D₈₅= 1.6786 D₆₀= 0.5779
D₅₀= 0.3687 D₃₀= 0.1334 D₁₅= 0.0088
D₁₀= 0.0014 C_u= 416.90 C_c= 22.23

Remarks

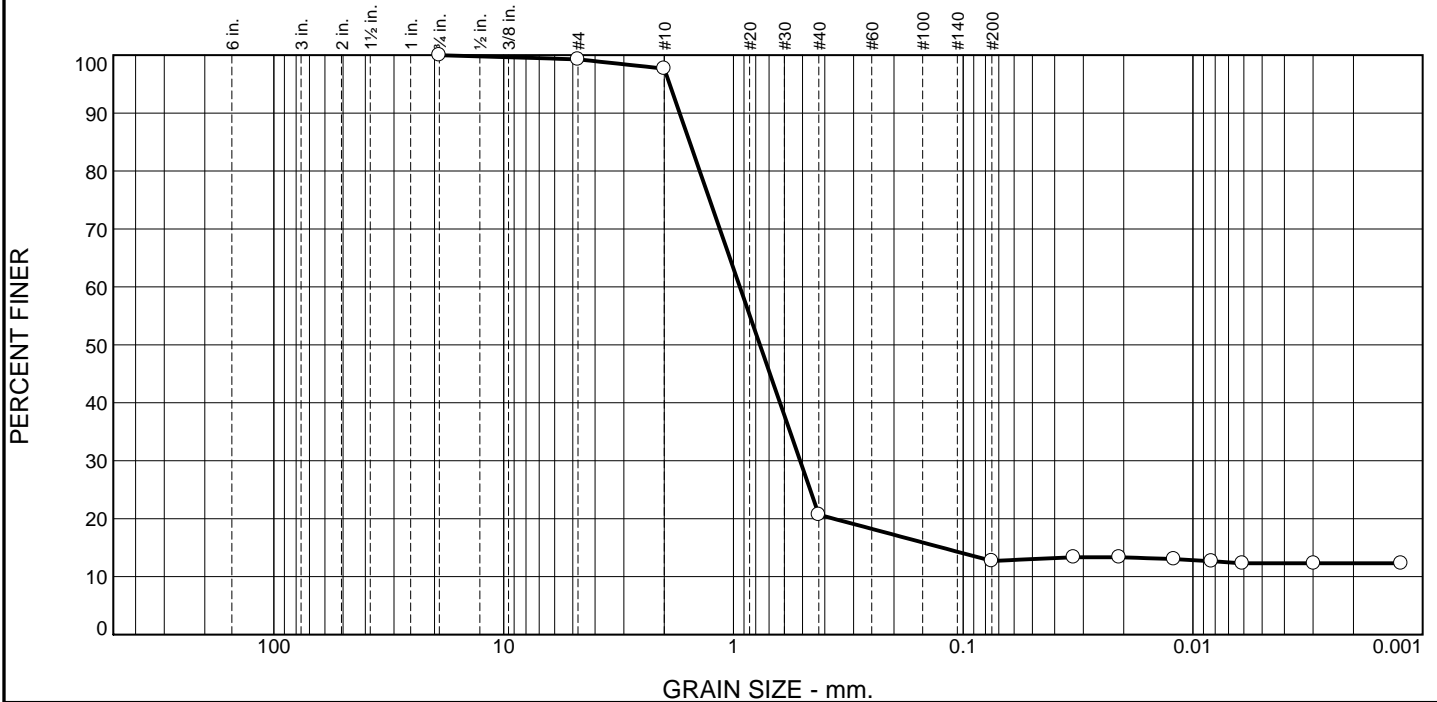
Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979021

Date Sampled: 1-26-2018

<p>Mi-Tech Services, Inc.</p> <p>Weston, WI</p>	<p>Client: CT LABORATORIES</p> <p>Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC</p> <p>Project No: 10838 (CTL #133832) Figure 4</p>
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Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	1.6	77.0	8.0	0.4	12.3

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	99.3		
#10	97.7		
#40	20.7		
#200	12.7		
0.0330 mm.	13.3		
0.0209 mm.	13.3		
0.0121 mm.	13.0		
0.0083 mm.	12.7		
0.0061 mm.	12.3		
0.0030 mm.	12.3		
0.0012 mm.	12.3		

* (no specification provided)

Client Sample Description

SHAW03-004-SO-016

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 1.7138 D₈₅= 1.5498 D₆₀= 0.9373
 D₅₀= 0.7665 D₃₀= 0.5126 D₁₅= 0.1236
 D₁₀= C_u= C_c=

Remarks

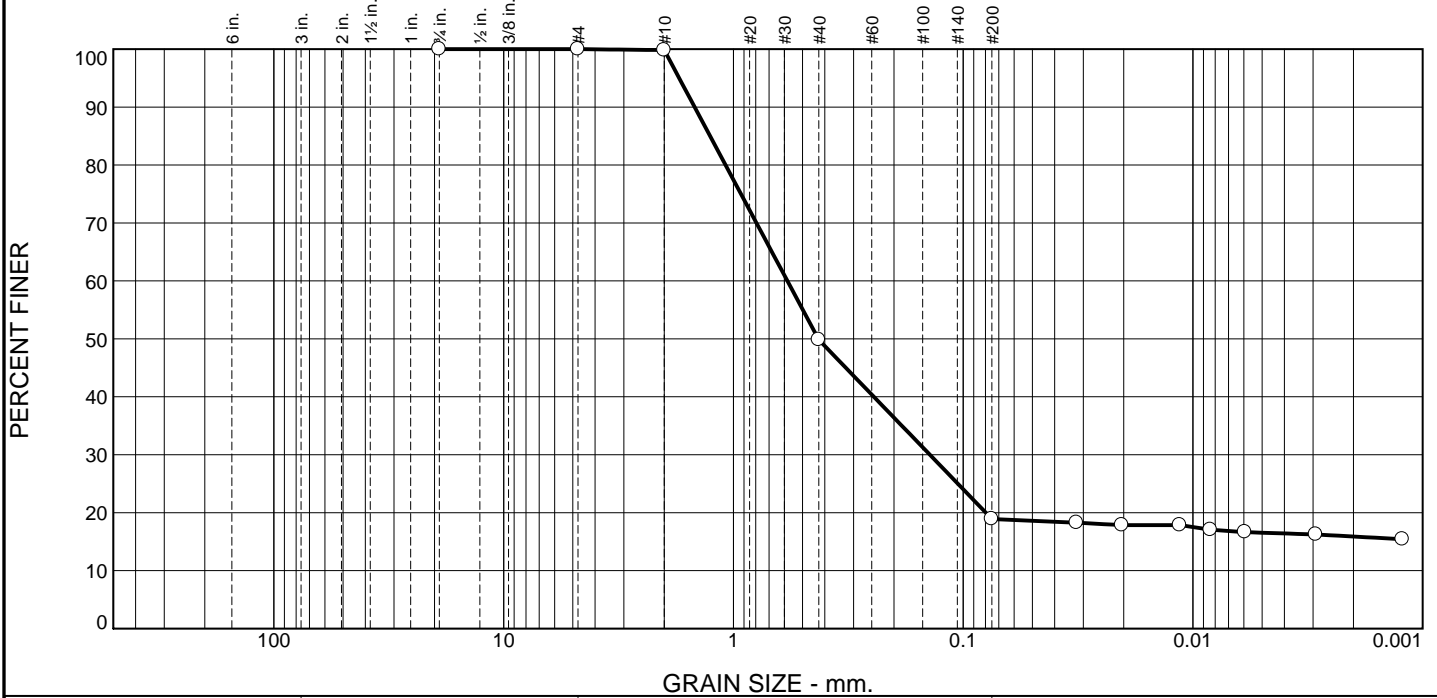
Date Received: 2-02-2018 Date Tested: 2-02-2018
 Tested By: CLZ - ENV. SPECIALIST
 Checked By: SMF
 Title: ENVIRONMENTAL MANAGER

Sample Number: 979022

Date Sampled: 1-26-2018

Mi-Tech Services, Inc.	Client: CT LABORATORIES
Weston, WI	Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC
	Project No: 10838 (CTL #133832) Figure 5

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	50.0	30.9	2.4	16.5

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	100.0		
#10	99.8		
#40	49.8		
#200	18.9		
0.0321 mm.	18.3		
0.0204 mm.	17.9		
0.0114 mm.	17.9		
0.0084 mm.	17.0		
0.0059 mm.	16.6		
0.0029 mm.	16.2		
0.0012 mm.	15.4		

Client Sample Description

SHAW04-005-SS-001

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 1.4746 D₈₅= 1.2631 D₆₀= 0.5822
D₅₀= 0.4271 D₃₀= 0.1397 D₁₅=
D₁₀= C_u= C_c=

Remarks

Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

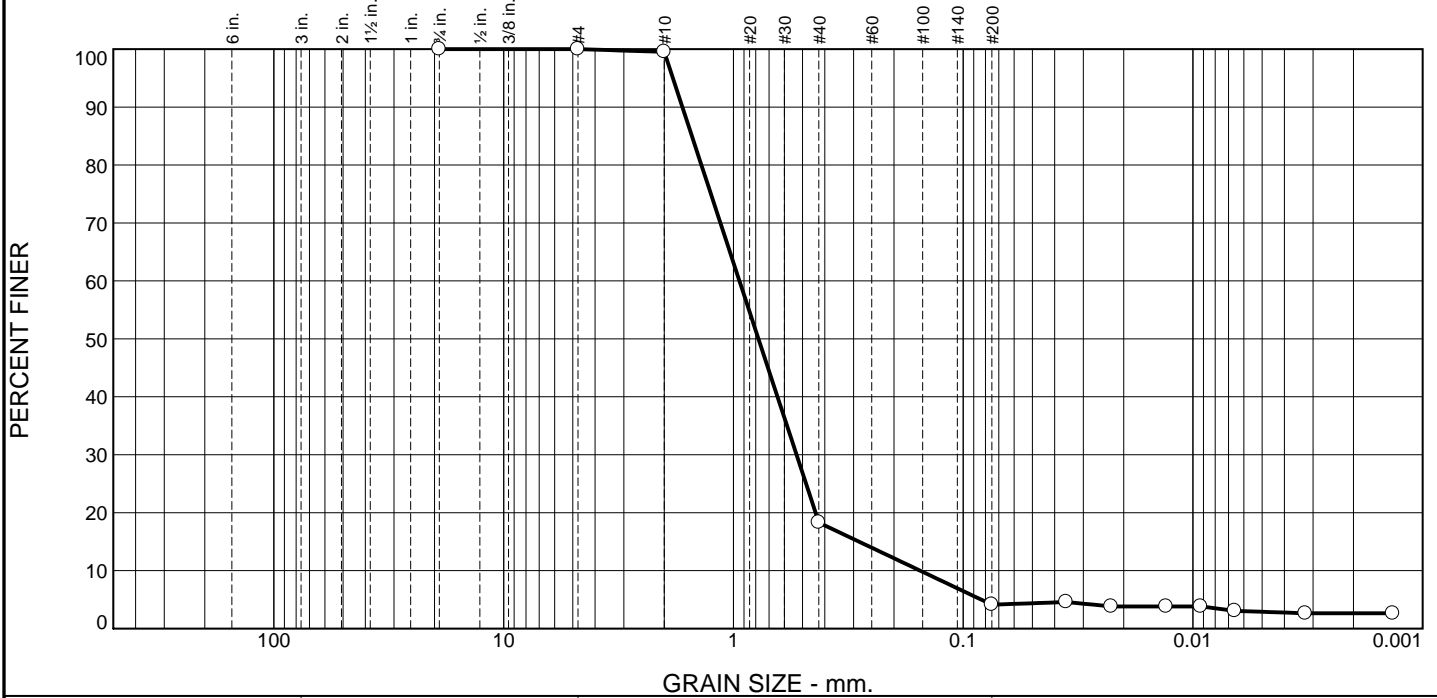
* (no specification provided)

Sample Number: 979023

Date Sampled: 1-26-2018

<p>Mi-Tech Services, Inc.</p> <p>Weston, WI</p>	<p>Client: CT LABORATORIES Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC Project No: 10838 (CTL #133832) Figure 6</p>
---	---

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	81.2	14.2	1.2	2.9

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75	100.0		
#4	100.0		
#10	99.5		
#40	18.3		
#200	4.1		
0.0356 mm.	4.6		
0.0226 mm.	3.8		
0.0131 mm.	3.8		
0.0092 mm.	3.8		
0.0066 mm.	3.1		
0.0032 mm.	2.6		
0.0013 mm.	2.6		

* (no specification provided)

Client Sample Description

SHAW04-005-SO-013

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SW AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 1.6674 D₈₅= 1.5158 D₆₀= 0.9412
D₅₀= 0.7778 D₃₀= 0.5313 D₁₅= 0.2841
D₁₀= 0.1541 C_u= 6.11 C_c= 1.95

Remarks

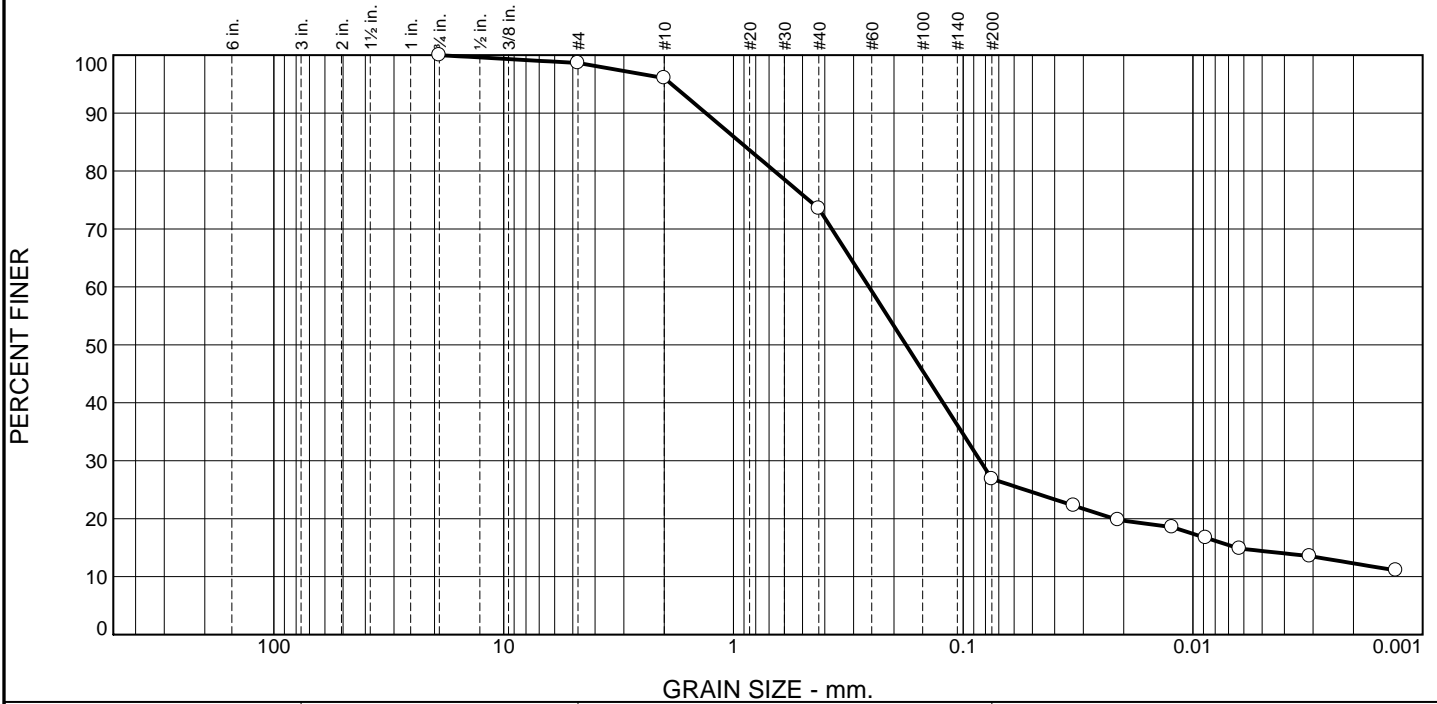
Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979024

Date Sampled: 1-26-2018

<p>Mi-Tech Services, Inc.</p> <p>Weston, WI</p>	<p>Client: CT LABORATORIES</p> <p>Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC</p> <p>Project No: 10838 (CTL #133832) Figure 7</p>
---	---

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.4	2.5	22.6	46.7	12.4	14.4

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	98.6		
#10	96.1		
#40	73.5		
#200	26.8		
0.0331 mm.	22.3		
0.0212 mm.	19.8		
0.0123 mm.	18.5		
0.0088 mm.	16.7		
0.0063 mm.	14.8		
0.0031 mm.	13.5		
0.0013 mm.	11.1		

* (no specification provided)

Client Sample Description

SHAW05-005-SS-001

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 1.3188 D₈₅= 0.9353 D₆₀= 0.2571
D₅₀= 0.1773 D₃₀= 0.0843 D₁₅= 0.0065
D₁₀= C_u= C_c=

Remarks

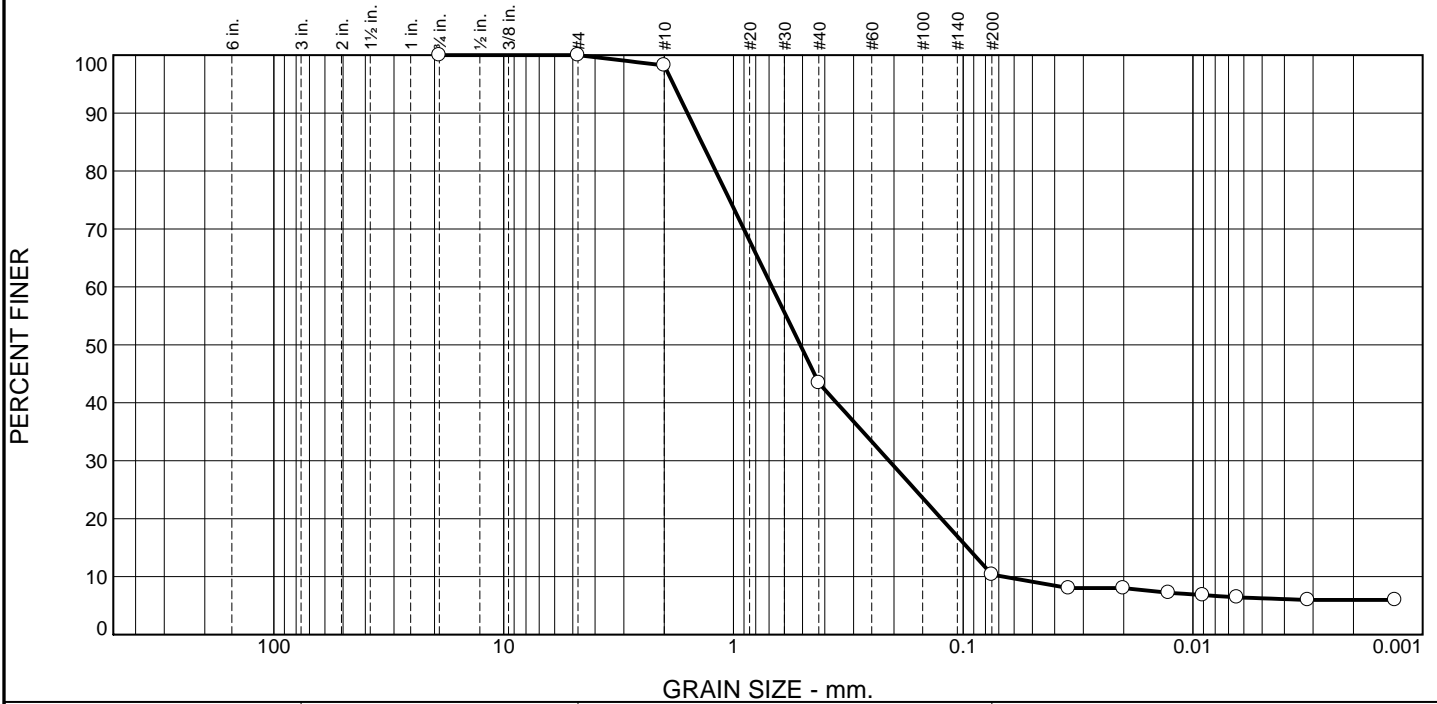
Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979025

Date Sampled: 1-27-2018

Mi-Tech Services, Inc. Weston, WI	Client: CT LABORATORIES Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC Project No: 10838 (CTL #133832) Figure 8
--	---

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.8	54.8	33.0	4.1	6.3

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	100.0		
#10	98.2		
#40	43.4		
#200	10.4		
0.0348 mm.	8.0		
0.0201 mm.	8.0		
0.0128 mm.	7.2		
0.0091 mm.	6.8		
0.0064 mm.	6.4		
0.0032 mm.	6.0		
0.0013 mm.	6.0		

* (no specification provided)

Client Sample Description

SHAW05-005-SO-031

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 1.5848 D₈₅= 1.3760 D₆₀= 0.6790
D₅₀= 0.5119 D₃₀= 0.2102 D₁₅= 0.0957
D₁₀= 0.0668 C_u= 10.17 C_c= 0.97

Remarks

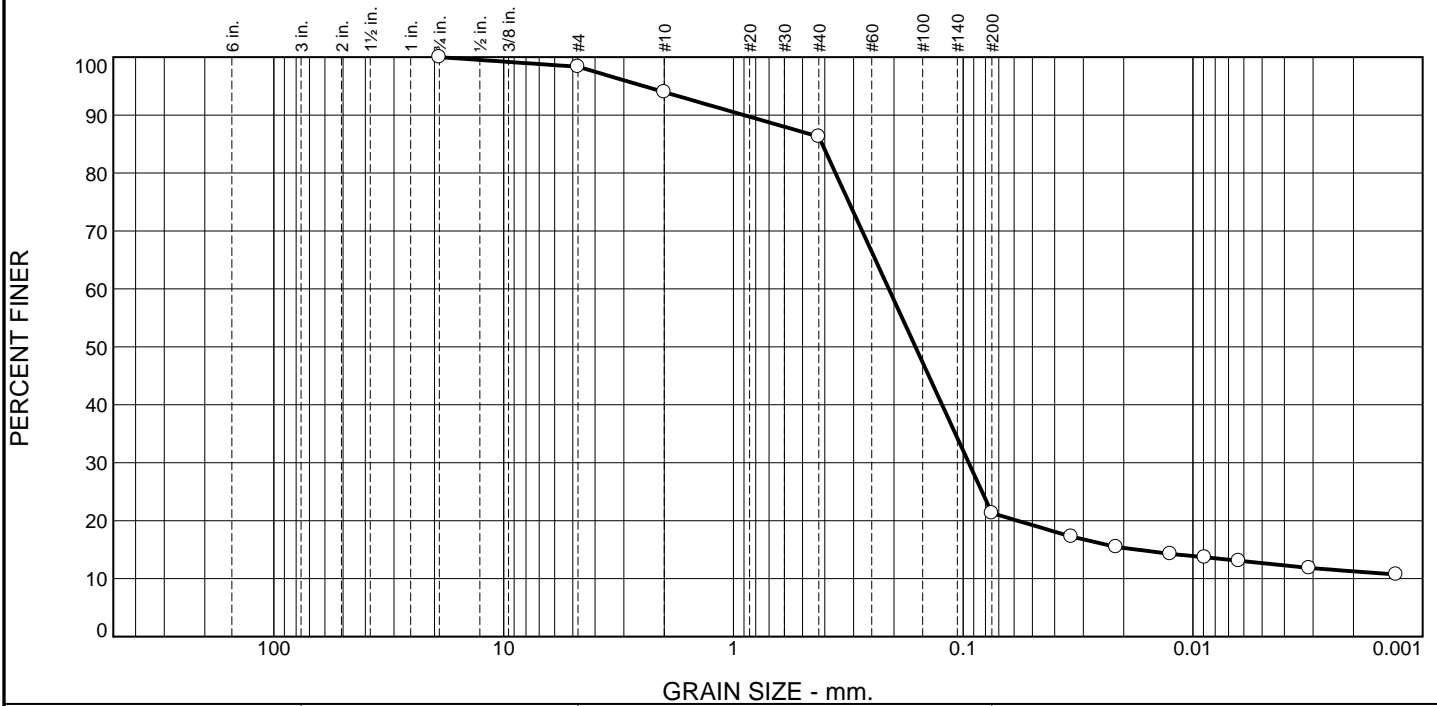
Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ-ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979026

Date Sampled: 1-27-2018

Mi-Tech Services, Inc. Weston, WI	Client: CT LABORATORIES Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC Project No: 10838 (CTL #133832) Figure 9
--	---

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	4.3	7.7	65.0	8.6	12.7

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	98.3		
#10	94.0		
#40	86.3		
#200	21.3		
0.0338 mm.	17.2		
0.0216 mm.	15.5		
0.0125 mm.	14.3		
0.0089 mm.	13.7		
0.0063 mm.	13.1		
0.0031 mm.	11.8		
0.0013 mm.	10.7		

* (no specification provided)

Client Sample Description

SHAW06-004-SS-001

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 0.9002 D₈₅= 0.4108 D₆₀= 0.2107
D₅₀= 0.1614 D₃₀= 0.0946 D₁₅= 0.0175
D₁₀= C_u= C_c=

Remarks

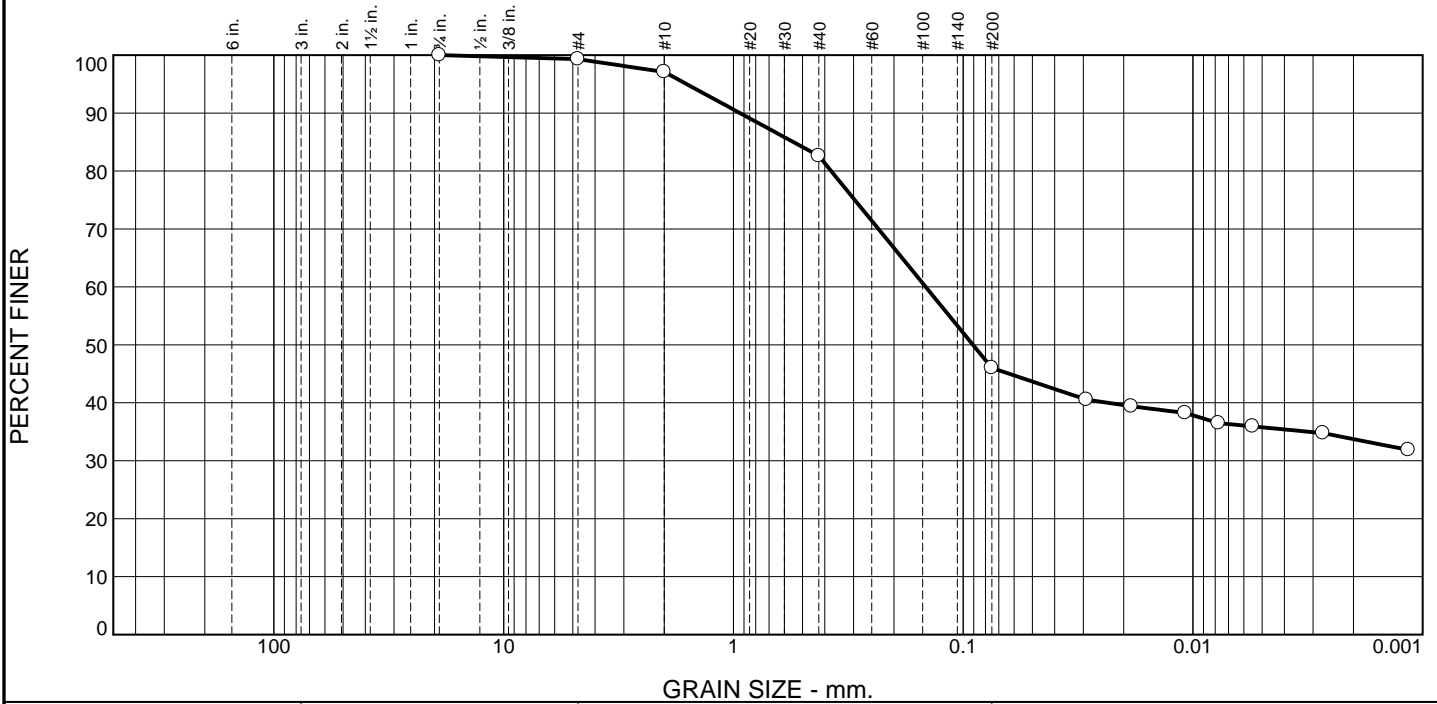
Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. TECHNICIAN
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979027

Date Sampled: 1-23-2018

Mi-Tech Services, Inc. Weston, WI	Client: CT LABORATORIES Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC Project No: 10838 (CTL #133832) Figure 10
--	--

Particle Size Distribution Report - Hydrometer Method



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	2.2	14.5	36.6	10.2	35.8

Test Results (ASTM D 422-63 & ASTM D 2217)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
#4	99.3		
#10	97.1		
#40	82.6		
#200	46.0		
0.0291 mm.	40.6		
0.0186 mm.	39.4		
0.0108 mm.	38.2		
0.0077 mm.	36.5		
0.0055 mm.	35.9		
0.0027 mm.	34.8		
0.0012 mm.	31.9		

* (no specification provided)

Client Sample Description

SHAW06-004-SO-027

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients

D₉₀= 0.9358 D₈₅= 0.5482 D₆₀= 0.1456
D₅₀= 0.0906 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks

Date Received: 2-02-2018 Date Tested: 2-02-2018
Tested By: CLZ - ENV. SPECIALIST
Checked By: SMF
Title: ENVIRONMENTAL MANAGER

Sample Number: 979028

Date Sampled: 1-23-2018

Mi-Tech Services, Inc.

Weston, WI

Client: CT LABORATORIES

Project: SI MULTIPLE AFFF SITES - SHAW AFB, SC

Project No: 10838 (CTL #133832)

Figure 11



Sub-Contract Laboratory Chain-of-Custody and Purchase Order

PURCHASE ORDER # 133832 MITECH

The PO# must appear on all invoice and reports!

Upon Receipt of Samples, please verify that samples were received in acceptable condition then sign this form and fax to (608)356-2766 or email to the project manager. Sample temperature, upon receipt, must be recorded on this document unless thermal preservation is not a method requirement.

Ship to: **Mi-Tech**
5707 SCHOFIELD AVE
WESTON WI 54476

Return Invoice and Results to: **ekorthals@ctlaboratories.com**

Government UPS Shipping Acct? Y N

CTLaboratories
Eric Korthals
1230 Lange Court
Baraboo WI 53913

Ship by: Speedee UPS Grnd UPS 2nd UPS NDA

Date Due: 2 WEEKS RUSH TURNAROUND NEEDED? Y or **N** (Circle One)

Project Name: SI MULTIPLE AFF SITES - SHAW AFB Project State: SC

Analytical/QC Criteria: **NONE INDICATE** STATE DOD QSM MELAP (Circle one) OTHER _____

Report results as EDD? **N** Y (Circle one and indicate type _____) Data Deliverable Package LEVEL sld

CTLabs ID#	Sample Date/Time	Matrix	Sample Description	Analyses / Method	Cost
979017	01/26/2018 1520	SOIL	SHAW01-004-S3-001	HYDROMETER / CSA	_____
979019	01/26/2018 1630	SOIL	SHAW01-004-S01-004	HYDROMETER	_____
979020	01/26/2018 1545	SOIL	SHAW02-004-S0-018	HYDROMETER	_____
979021	01/26/2018 1345	SOIL	SHAW03-004-S5-001	HYDROMETER	_____
979022	01/26/2018 1420	SOIL	SHAW03-004-S0-016	HYDROMETER	_____
979023	01/26/2018 0910	SOIL	SHAW04-005-S5-001	HYDROMETER	_____
979024	01/26/2018 1030	SOIL	SHAW04-005-S0-013	HYDROMETER	_____
979025	01/27/2018 0950	SOIL	SHAW05-005-S5-001	HYDROMETER	_____
979026	01/27/2018 1010	SOIL	SHAW05-005-S0-021	HYDROMETER	_____
979027	01/23/2018 1430	SOIL	SHAW05-004-S5-001	HYDROMETER	_____
979028	01/23/2018 1500	SOIL	SHAW06-004-S0-027	HYDROMETER	_____

Relinquished by: [Signature] Date/Time: 02-01-2018 / 0900h

Received by: Cindy Zelenka Date/Time: 2/2/18 Receipt Temperature (C) 12.20pm

Page 120

Company: *Aerostar SES LLC*
 Project Contact: *Brian Odom*
 Telephone: *478-397-4906*
 Project Name: *SI Multiple AFFF Sites*
 Project #: *M2032.0001*
 Location: *Shaw AFB Sumter, SC*
 Sampled By: *J. Klein*

(CT LABORATORIES)

1230 Lange Court, Baraboo, WI 53913
 608-356-2760 Fax 608-356-2766
 www.ctlaboratories.com

Report To: *Jenny Vance*
 EMAIL: *jvance@aerostar.net*
 Company: *Aerostar SES LLC*
 Address: *1006 Floyd Culler Ct Oak Ridge, TN 37830*
 Invoice To: **Brian Odom*
 EMAIL: *bodom@specproenv.com*
 Company: *Aerostar SES LLC*
 Address: *See above*

Folder #: *133832*
 Company: *MAXXAM ANALYTIC*
 Project: *SI MULTIPLE AFFF SITE*
 Logged By: *DRT PM: ET*

Program:
 QSM RCRA SDWA NPDES
 Solid Waste Other _____
 PO #
M2032.0001

*Party listed is responsible for payment of invoice as per CT Laboratories' terms and conditions

Client Special Instructions

ANALYSES REQUESTED

Turnaround Time

Normal RUSH*

Date Needed: _____

Rush analysis requires prior CT Laboratories' approval

Surcharges:

24 hr 200%

2-3 days 100%

4-9 days 50%

Matrix:

GW - groundwater SW - surface water WW - wastewater DW - drinking water
 S - soil/sediment SL - sludge A - air M - misc/waste

Filtered? Y/N

Subchronetic, pH, TOC

GRAIN

Total # Containers

Designated MS/MSD

Collection		Matrix	Grab/Comp	Sample #	Sample ID Description	Filtered? Y/N	Fill in Spaces with Bottles per Test										Total # Containers	Designated MS/MSD	CT Lab ID # <i>Lab use only</i>
Date	Time																		
1/26/18	1620	S	Comp	1	SHAW01-004-SS-001	N	X	X									2	979017	
1/26/18	1630	S	Comp	1	SHAW01-004-SO-004		X	X									2	979019	
1/25/18	1545	S	Comp	1	SHAW02-004-SO-018		X	X									2	979020	
1/26/18	1345	S	Comp	1	SHAW03-004-SS-001		X	X									2	979021	
1/26/18	1420	S	Comp	1	SHAW03-004-SO-016		X	X									2	979022	
1/26/18	0910	S	Comp	1	SHAW04-005-SS-001		X	X									2	979023	
1/26/18	1030	S	Comp	1	SHAW04-005-SO-003		X	X									2	979024	
1/27/18	0950	S	Comp	1	SHAW05-005-SS-001		X	X									2	979025	
1/27/18	1010	S	Comp	1	SHAW05-005-SO-031		X	X									2	979026	
1/23/18	1430	S	Comp	1	SHAW06-004-SS-001		X	X									2	979027	
1/23/18	1500	S	Comp	1	SHAW06-004-SO-027		X	X									2	979028	

Relinquished By: *ASH Willis*
 Received by: _____

Date/Time: *1/30/18 1300*
 Date/Time: _____

Received By: *[Signature]*
 Received for Laboratory by: _____

Date/Time: *1/31/18 1015*
 Date/Time: *1/31/18 1132*

Lab Use Only
 Ice Present Yes No
 Temp *0.1* IR Gun *20*
 Cooler # *XXX X*

Appendix F
Groundwater Level Measurements

Table F-1 Groundwater Level Measurements

AFFF Area Name	Location Number	^a Northing (feet)	^a Easting (feet)	^b Measuring Point Elevation (feet/NAVD88)	Screened Interval (feet/bgs)	Measurement Date	Depth to Groundwater (feet/btoc)	Depth to Groundwater (feet/bgs)	Groundwater Surface Elevation (feet/NAVD88)
AFFF Area 1 Former FTA 1	MW-105	782128.64	2166711.42	214.22	30.2-40.0	1/29/2018	13.63	11.97	200.59
	MW-121A	782037.40	2166440.31	217.92	12.0-22.0	1/29/2018	15.82	13.00	202.10
	MW-122A	781993.04	2166558.77	217.55	14.7-24.7	1/29/2018	16.18	13.85	201.37
AFFF Area 2 Former FTA 2	SHAW02-MW001	778794.81	2163433.83	223.16	14.8-24.8	1/29/2018	18.36	18.08	204.80
	SHAW02-MW002	778843.56	2163512.41	222.74	14.8-24.8	1/29/2018	17.87	17.66	204.87
	SHAW02-MW003	778735.26	2163484.49	222.72	14.8-24.8	1/29/2018	17.91	17.78	204.81
AFFF Area 3 Former FTA 3/ Current EOD Area	SHAW03-MW001	778989.58	2164878.30	218.40	9.8-19.8	1/29/2018	15.52	13.78	202.88
	SHAW03-MW002	779001.65	2164790.81	217.93	9.8-19.8	1/29/2018	14.52	12.96	203.41
	SHAW03-MW003	779032.18	2164854.95	218.25	9.8-19.8	1/29/2018	15.18	13.43	203.07
	FT3MW-5	778878.07	2164845.00	218.05	5.15-14.9	1/29/2018	15.14	12.30	202.91
AFFF Area 4 Current FTA	SHAW04-MW001	777900.03	2164211.39	217.42	9.8-19.8	1/29/2018	14.14	11.35	203.28
	SHAW04-MW002	777997.28	2164264.51	217.14	9.8-19.8	1/29/2018	13.65	11.23	203.49
	SHAW04-MW003	777929.60	2164311.15	215.60	9.8-19.8	1/29/2018	12.53	11.10	203.07
AFFF Area 5 Building 1511	SHAW05-MW001	780959.39	2159616.48	252.90	10.3-25.3	1/31/2018	DRY	DRY	DRY
	SHAW05-MW002	781102.62	2159828.91	252.57	19.8-34.8	1/31/2018	25.57	25.39	227.00
	SHAW05-MW003	780574.38	2160392.04	246.01	24.8-34.8	1/31/2018	28.46	28.10	217.55
	SHAW05-MW004	780489.45	2160336.72	245.64	24.8-34.8	1/31/2018	28.02	27.98	217.62
AFFF Area 6 WWTP	SHAW06-MW001	776549.45	2154067.92	310.44	22.8-32.8	1/29/2018	30.14	27.17	280.30
	SHAW06-MW002	776416.42	2154043.84	305.40	19.8-29.8	1/29/2018	25.14	25.36	280.26
	SHAW06-MW003	776492.32	2153941.24	307.09	17.8-27.8	1/29/2018	26.94	24.00	280.15

^aNote: Northing and Easting coordinates are in South Carolina State Plane Coordinates based on the North American Datum of 1983 (NAD83) and measured in International Feet. Elevations are referenced to the North American Vertical Datum 1988 (NAVD88).

^bMeasuring point at top of well casing.

AFFF = aqueous film forming foam

btoc = below top of casing

FTA = fire training area

WWTP = Wastewater Treatment Plant

bgs = below ground surface

EOD = explosive ordnance disposal

SHAW = Shaw Air Force Base