



DEPARTMENT OF THE AIR FORCE  
AIR FORCE CIVIL ENGINEER CENTER  
JOINT BASE CHARLESTON SOUTH CAROLINA

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SCDHEC - Bureau of  
Land & Waste Management

08 June 2018

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Mr. William Britton, P.G.  
Bureau of Land and Waste Management  
South Carolina Dept. of Health and Environmental Control  
2600 Bull Street  
Columbia, SC 29201

RE: Responses to Comments and Final Site Inspection (SI) Report of Fire Fighting Foam Usage at Joint Base Charleston-Air, Charleston County, South Carolina and North Auxiliary Air Field, Orangeburg County, South Carolina

Dear Mr. Britton,

The purpose of this letter is to submit for your review and comment one hardcopy and one electronic (CD) copy of responses to SCDHEC comments on the Draft Final SI Report for the perfluorooctane sulfonate and perfluorooctanoic acid (PFOS/PFOA) sites at Joint Base Charleston-Air and North Auxiliary Airfield, South Carolina, as well as a complete Final SI Report, due to the extensive nature of the revisions to the draft final document. Please recall the Draft Final SI Report did not include recommendations, which have been added to this version along with adding updated EPA RSLs and edits to Section 3.0 (Field Activities and Findings). The purpose of this SI Report is to confirm whether there has been a release of PFOS/PFOA that warrants removal action and/or planning and budgeting for future year activities. Should you have any questions or comments regarding the attached, please contact me by telephone at (843) 963-2701 or by email at [dana.holsclaw@us.af.mil](mailto:dana.holsclaw@us.af.mil).

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. This document is signed and certified in accordance with R.61-79.270.11 and 270.30(K).

Sincerely,

*Dana T. Holsclaw*

DANA T. HOLSCLAW, R.E.M., GS-12, DAFC  
Remedial Project Manager

cc: Christi Pickett (SCDHEC; 1 Hardcopy and 1 CD)  
Brian D. Odom, P.G. (Aerostar)

50  
SIGNED  
6-12-18

# Comment and Response Worksheet (Version 3)

Date		Surveillance Activity Number					Contract/TO Number	
April-18							Draft Final Site Inspection Report of Fire Fighting Foam Usage at Joint Base Charleston-Air, Charleston County, South Carolina, December 2017	
Item	Source	Section	Page	Para	Line	Class	Comment	Response
1	AFCEC	Global						As requested by AFCEC, the EPA RSLs have been updated to reflect that the screening level for PFOS and PFOA in soil and sediment was calculated using EPA’s RSL calculator ( <a href="https://epaprgs.oml.gov/cgi-biA15:I52n/chemicals/csl_search">https://epaprgs.oml.gov/cgi-biA15:I52n/chemicals/csl_search</a> ) based on a hazard quotient of 0.1 (HQ = 0.1). PFOS and PFOA for soil and sediment were lowered to 126 micrograms per kilogram (µg/kg).  PFBS for soil and sediment was lowered to 130,000 µg/kg, and PFBS for groundwater and surface water was lowered to 40 micrograms per liter (µg/L).
2	Aerostar SES LLC	3.0						Section 3.0 Field Activities and Findings has been edited. 3.1 is now Field Activities and Sampling Procedures, and Section 3.2 PFAS Cross-Contamination Avoidance Procedures has been added to clarify procedures followed in the field to prevent cross-contamination. The remaining section numbers have been adjusted accordingly, beginning with AFFF Area 1 changing from Section 3.1 to Section 3.3 and ending with Investigation-Derived Waste changing from Section 3.10 to Section 3.12.
3	AFCEC	8.1 to 8.9						Subsequent to the submission of the draft final SI report, AFCEC requested that Section 8.0 and the Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances table in that section (Table 40 in this report) be revised to include recommendations.
3/5/2018 SCDHEC Comments - William Britton, Jr., P.G.								
4	SCDHEC-WB	3.2.5	18				Section 3.2.5, located on page 18 states that a new spill of aqueous film forming foam (AFFF) was discovered at SWMU 52 when staff arrived at the site on June 2, 2018 to set up a training exercise, after the SI activities at SWMU 52 were completed. According to the description of the event included ni the SI Report, approximately 1,100 gallons of AFFF were released to a grassy area and the AFFF flowed across the asphalt toward a propane tank at the approximate location shown in Figure 10. SWMUs 83, 109, and 110 are located within the SWMU 52 boundary at the approximate location of the spill area noted in Figure 10. JBC-Air has proposed an Interim Measure that would consist of excavation and offsite disposal of contaminated soils at SWMUs 83, 109, and 110. DHEC requests that additional soil and grounwater samples be collected in the new AFFF spill area prior to determine whether the recent spill has impacted the soils with per- and polyfluorinated alkyl substances (PFASs) prior to implementing the proposed IM at SWMUs 83, 109, and 110.	Based on communications with the AFCEC PFAS Team and developing Air Force-wide policy discussions, the Air Force cannot perform PFAS soil or groundwater sampling at SWMUs 83, 109 or 110 at this time, and will proceed with proposed interim measure soil removal actions for regulated contaminants at these sites (identified as petroleum-contaminated soils). Emerging contaminants are not included in the current performance-based remediation contract scope of work, and no regulatory standards have yet been promulgated by the EPA or State of South Carolina for PFAS constituents. In the absence of regulatory standards, the Air Force has utilized site inspections to proactively identify areas potentially impacted by PFAS releases. This information for JB Charleston-Air will be included in the Final SI Report. Recommendations not previously included in the Draft Final Site Investigation Report have been prepared and include conducting Remedial Investigation (RI) activities at sites identified as PFAS-impacted, once cleanup standards are published for PFAS constituents.



Date		Surveillance Activity Number					Contract/TO Number	
April-18							Draft Final Site Inspection Report of Fire Fighting Foam Usage at Joint Base Charleston-Air, Charleston County, South Carolina, December 2017	
Item	Source	Section	Page	Para	Line	Class	Comment	Response
5	SCDHEC-WB						The SI Report identified seven areas at which the groundwater contained concentrations of PFASs exceeding either the 0.070 ug/L USEPA Drinking Water Health Advisory (HA) for perfluorooctane sulfonate (PFOS), the 0.070 ug/L HA for perfluorooctanic acid (PFOA), or both HAs in groundwater samples. The SI Report also identified six sites at which the surface water contained concentrations of PFASs that exceeded either the HA for PFOA, the HA for PFOS, or both HAs in surface water samples. Although groundwater contamination and/or surface water contamination was confirmed at seven areas, the SI Report considered each potential exposure pathway at each site to be incomplete. Given that the objectives of the Site Investigation did not include determining the extent of contamination for the affected media at the AFFF areas or performing a well survey to determine whether private wells are present near the investigated areas, the SI does not include adequate information necessary to evaluate whether the potential exposure pathways are complete. Until the extent of the groundwater and surface water contamination is determined at each site and the potential groundwater and surface water usage is determined, DHEC considers the groundwater and surficial water exposure pathways to be potentially complete.	During the SI, available well records were reviewed to determine if private wells are present near the investigation areas, and this information was used to determine if pathways were complete or incomplete. A more detailed discussion of drinking water wells within 4 miles of JBCA and NAAF has been added to Sections 4.0 through 4.9. Sections 7.1 through 7.9 and 8.1 through 8.9 have been revised as needed. Lastly, Appendix G has been added to the report and contains a table and two maps summarizing the drinking water wells within 4 miles of JBCA and NAAF.
6	SCDHEC-WB						DHEC requests that JBC-Air determine the extent of contamination at each of the AFFF areas where the SI Report documented groundwater and/or surface water contamination at concentrations exceeding the HAs for PFOS and PFOA.	Recommendations have been provided in Section 8.0. RIs have been recommended for Areas 1 through 8, where PFAS exceedances were detected.

Column A:	Comment Identifier Number	<div>Comment Classifications</div> <div>(C) Critical: Critical comments will result in a critical issue. Provide convincing support.</div> <div>(M) Major: Major comments are significant concerns that may result in a major issue. This category may be used with a general statement of concern followed by a detailed comment on the specific entries in the document that, considered in total, constitute the concern.</div> <div>(S) Substantive: An entry in the document that appears to be or is potentially unnecessary, misleading, incorrect, or confusing.</div> <div>(A) Administrative: Administrative comments correct inconsistencies between different sections, typographical and grammatical errors.</div>
Column B:	Source (Commenter/Authority)	
Column C:	Section Number of Comment	
Column D:	Page Number of Comment (first page associated with	
Column E:	Paragraph number, on page, of Comment	
Column F:	Line Number (within Paragraph above) of Comment	
Column G:	Comment Classification	
Column H:	Comment	
Column I:	Response	
Notes:	Comments must be actionable ("add the following text:...", "delete...", "change text to:") Place only one comment per row. Classify comment as C, M, S, or A.	



**Final  
Site Inspections Report  
of Fire Fighting Foam Usage at  
Joint Base Charleston-Air,  
Charleston County, and North Auxiliary Airfield,  
Orangeburg County, South Carolina**

**June 2018**

**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  
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Contract No. W912HN-15-C-0022**

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Site Inspections Report  
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## Acronyms and Abbreviations

µg/L	micrograms per liter
µg/kg	micrograms per kilogram
AFFF	aqueous film forming foam
AFCEC	Air Force Civil Engineer Center
amsl	above mean sea level
AR	Air Force Record
AS	air-sparge
ASL	Aerostar SES LLC
AST	aboveground storage tank
bgs	below ground surface
btoc	below top of casing
CAS	Chemical Abstracts Service
CE	Civil Engineering
CHN	Charleston County
CHRTN	Joint Base Charleston
CL	clay
CO-NUM	County-Number ID
CSM	conceptual site model
DoD	Department of Defense
DOM	domestic
DOR	Dorchester County
DOT	Department of Transportation
DPT	direct push technology
dup	duplicate
EDR	Environmental Data Resources, Inc.
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
EZ	exclusion zone
FES	Fire Emergency Services
ft	foot/feet
FPTA	fire protection training area
FTA	fire training area
GW	groundwater
HA	health advisory
Halliburton	Halliburton NUS Corporation
HDPE	high-density polyethylene
HQ	hazard quotient
ID	identification
IRP	Installation Restoration Program
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
JBCA	Joint Base Charleston-Air
MDG	Medical Group
mg/kg	milligrams per kilogram
MW	monitoring well
N/A	not available
NAAF	North Auxiliary Airfield
ND	not detected at the Method Detection Limit
NL	not listed

NFRAP	No Further Response Action Planned
NM	not measured
No.	number
OH	open hole
ORG	Orange County
OSI	Office of Special Investigation
OWS	oil/water separator
PA	preliminary assessment
PFAS	per- and polyfluorinated alkyl substances
PFBS	perfluorobutane sulfonate
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
pH	potential of hydrogen
PS	public supply
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RFA	RCRA Facility Assessment
RI	remedial investigation
RSL	regional screening level
SAIC	Science Applications International Corporation
SC	clayey sands
SCDHEC	South Carolina Department of Health and Environmental Control
SD	sediment
SI	site inspection
SM	silty sands
SO	subsurface soil
SP	poorly graded or gravelly sands
SP-16	stainless steel screen point-16 sampler
SS	surface soil
SVE	soil vapor extraction
SW	surface water
SWMU	solid waste management unit
TOC	total organic carbon
TW	temporary well
U	The analyte was not detected above the reported sample quantification limit
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USCS	Unified Soil Classification System

## 1.0 INTRODUCTION

Aerostar SES LLC (ASL) under contract to the U.S. Army Corps of Engineers (USACE) Savannah District (Contract No. W912HN-15-C-0022) conducted screening-level site inspections (SIs) at nine known or suspected aqueous film forming foam (AFFF) release areas at Joint Base Charleston-Air (JBCA) in Charleston County, South Carolina, and the North Auxiliary Airfield (NAAF) in Orangeburg County, South Carolina (Figure 1, Appendix A). This work was performed in accordance with the approved quality assurance project plan (QAPP) (ASL, January 2017). The purpose of the inspections was to determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorobutane sulfonate (PFBS) in the environment at these areas. PFOA, PFOS, and PFBS are in 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 AFFF firefighting agents containing PFOS and PFOA to extinguish petroleum fires. Releases of AFFF to the environment routinely occur during fire training, equipment maintenance, storage, and use. Although manufacturers have reformulated AFFF to eliminate PFOS, the United States Environmental Protection Agency (EPA) continues to permit the use of PFOS-based AFFF, and 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.

Per Department of Defense (DoD) Instruction 4715.18, “Emerging Contaminants (ECs)” (DoD, June 2009); *Interim USAF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Realignment and Closure (BRAC) Installations* (USAF, August 2012); and the *USAF/IE Policy on Perfluorinated Compounds of Concern* (USAF, 2016), the USAF will

- identify locations where there is a reasonable expectation that PFOA/PFOS may have been released from USAF actions;
- determine if there is unacceptable risk to human health and the environment; and
- address releases that pose an unacceptable risk, including off-site migration.

The objectives of this study are to

- determine if PFOS and PFOA are present in groundwater or surface water at the inspection areas at concentrations exceeding the EPA lifetime health advisory (HA) for drinking water;
- determine if PFBS is present in soil, sediment, groundwater, or surface water at the inspection areas at concentrations exceeding generic Regional Screening Levels (RSLs);
- determine if PFOA and PFOS are present in soil or sediment at the inspection areas at concentrations exceeding calculated RSLs; and
- identify potential receptor pathways with immediate impacts to human health.

The objectives of the SIs were to identify any releases of AFFF that resulted in PFOS or PFOA contamination in the environment above the project screening levels and identify any possible human exposure to drinking water above the HA levels. 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.

Screening levels for this SI were determined for PFOS, PFOA, and PFBS. The screening level for PFOS and PFOA in soil and sediment was calculated using EPA’s RSL calculator ([https://epaprgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epaprgs.ornl.gov/cgi-bin/chemicals/csl_search)) using a residential scenario based on a hazard quotient 0.1 (HQ = 0.1)

(Appendix F). 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 Health Advisories for PFOS (EPA, May 2016b) and PFOA (EPA, May 2016a). Screening levels for PFOS and PFOA in groundwater and surface water are based on EPA lifetime drinking water HAs for PFOA (EPA, May 2016a) and PFOS (EPA, May 2016b). A PFAS release was considered confirmed when exceedances of the following concentrations were identified:

**PFOS:**

- 0.07 micrograms per liter (µg/L) in groundwater/surface water (combined with PFOA value).
- <sup>a</sup>126 micrograms per kilogram (µg/kg) in soil (calculated in the absence of RSL values).
- <sup>a</sup>126 µg/kg in sediment (calculated in the absence of RSL values).

**PFOA:**

- 0.07 µg/L in groundwater/surface water (combined with PFOS value).
- <sup>a</sup>126 µg/kg in soil (calculated in the absence of RSL values).
- <sup>a</sup>126 µg/kg in sediment (calculated in the absence of RSL values).

EPA has also derived RSL values for PFBS (EPA, November 2017). The USAF will also consider a release to be confirmed if the following concentrations are exceeded:

**PFBS:**

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

Note:

<sup>a</sup>Screening levels were calculated using the EPA RSL calculator ([https://epaprgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epaprgs.ornl.gov/cgi-bin/chemicals/csl_search))(updated November 2017). Published generic regional and calculated screening levels presented in the QAPP and QAPP addendum were based on an HQ of 1.0. The screening levels have subsequently been revised to reflect an HQ of 0.1. This change affects PFBS screening levels for all media and calculated PFOS and PFOA screening levels for soil and sediment. Screening levels for PFOA and PFOS in groundwater and surface water remain at 0.07 µg/L and are based on the EPA lifetime HA for drinking water.

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 Regulatory Screening Values**

Parameter	Chemical Abstracts Number	EPA Regional Screening Level Table (November 2017) <sup>a</sup>		Calculated RSL for Soil and Sediment <sup>b</sup> (µg/kg)	EPA Health Advisory for Drinking Water (Surface Water or Groundwater) (µg/L) <sup>c</sup>
		Residential Soil (µg/kg)	Tap 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 <sup>d</sup>
Perfluorooctane sulfonate (PFOS)	1763-23-1	NL	NL	126	

<sup>a</sup> EPA Regional Screening Levels (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

<sup>c</sup> EPA, May 2016a. “Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)” and EPA, May 2016b. “Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA).”

<sup>d</sup> Combined concentrations of PFOA and PFOS should be compared with the 0.07 µg/L health advisory level. Only groundwater and surface water were sampled during the SI, but analytical results have been compared to the tap water screening levels.

µg/kg = micrograms per kilogram

µg/L = micrograms per liter

EPA = Environmental Protection Agency

NL = not listed

RSL = regional screening level

## 2.0 AFFF AREA DESCRIPTIONS

JBCA is approximately 16 miles northwest of Charleston, South Carolina (Figure 1, Appendix A). It encompasses 3,731 acres in central Charleston County (Figure 2, Appendix A). JBCA is adjacent to Charleston International Airport, and runways on JBCA are used by Charleston County Aviation Authority and the USAF under a joint use agreement. JBCA has been an Air Mobility Command base since 1992. It is bordered by residential and commercial development. Interstate 26 and Interstate 526 are approximately 1.5 miles to the east, the Ashley River is approximately ½ mile to the southwest, and the Cooper River is approximately 5 miles to the east. The topography of the Base is nearly flat. Surface elevations range from 15 feet above mean sea level (amsl) along the southern edge of the Base to 45 feet amsl at the northern edge of the Base.

NAAF is in Orangeburg County, approximately 85 miles northwest of JBCA, and 2 miles east of North, South Carolina (Figure 1, Appendix A). NAAF encompasses 2,400 acres, of which 1,150 acres are undeveloped (Figure 3, Appendix A). NAAF is operated by JBCA for airdrop training and as a contingency training site for other JBCA units and other USAF and Army units. The airfield has a main runway 12,000 feet long and an assault runway 3,000 feet long. The only permanently assigned personnel at NAAF are roughly one dozen firefighters and one civilian groundskeeper.

### *Hydrological Setting at Joint Base Charleston-Air*

Surface water drainage from the approximately 3,500-acre watershed is controlled by unlined and concrete-lined ditches and buried concrete pipes. Three major channels drain the Base:

- Golf Course Creek, which discharges into Popperdam Creek, a tributary of the Ashley River;
- Runway Creek, near Runway 03/21, a tributary of the Ashley River; and
- A tributary of Turkey Creek near Runway 15/33, which discharges into Goose Creek, a tributary of the Cooper River.

The drainage divide on the Base is approximately parallel to Runway 15/33. Surface water east of Runway 15/33 flows toward the Goose Creek Reservoir and the Cooper River, and surface water west of Runway 15/33 flows toward Popperdam Creek and the Ashley River. Most of the small, unlined drainage ditches are above the water table and are influent or losing streams. Conversely, the large streams (Golf Course Creek and Runway Creek) intersect the water table and are probably effluent or gaining streams (Halliburton NUS Corporation [Halliburton], June 1995).

Other surface water bodies in the vicinity of JBCA include Goose Creek Reservoir and wetland areas. Goose Creek Reservoir is about 2 miles northeast of the Base and supplies potable water to the area. There are 25 isolated and/or adjacent, jurisdictional, freshwater wetlands at JBCA that cover 282 acres (Halliburton, June 1995).

### *Hydrological Setting at North Auxiliary Airfield*

NAAF is between the North Fork Edisto River and Bull Swamp Creek. The North Fork Edisto River flows along the southern edge of NAAF, which is within the 100-year floodplain. The river is used as the water supply source for the city of Orangeburg, downstream from NAAF. Bull Swamp Creek is more than 2,000 feet east of NAAF (Science Applications International Corporation [SAIC], March 1989).

### *Surficial Geology at Joint Base Charleston-Air*

JBCA is in the Lower Coastal Plain Physiographic Province. The area is immediately underlain by sedimentary rocks and unconsolidated sediments of Tertiary and Quaternary Age. A thin veneer of Holocene/ Pleistocene beach deposits overlies the deeper Tertiary Age rocks that are underlain in turn by the Cretaceous Age basement rocks of the Coastal Plain. High-energy depositional environments – such as barrier island, beach, or tidal facies – are characterized by coarse-grained or sand-dominated deposits.

Relatively lower-energy depositional environments, such as marshes or mud flats, are usually associated with fine-grained, clay-dominated deposits or lithologies. Because of the fluctuations in sea level in response to glaciation and interglacial melting, these depositional environments were periodically changing, resulting in interbedded sands and clays. The shallowest Tertiary unit underlying the area is the Cooper Formation, which is approximately 40 feet below ground surface (bgs) at JBCA and regionally serves as a confining unit in the Charleston area (Halliburton, June 1995).

The shallow subsurface geology consists of sand with some silt, intermittent clay, and clay stringers of the Ladson Formation. The clay stringers often contain silt and are discontinuous across the area of interest. Clay content increases with depth, especially near the contact with the underlying Cooper Marl. The Cooper Marl is characterized by olive silt and clay with some disseminated phosphate grains and is encountered in monitoring well borings between 35 and 43 feet bgs. Shallow groundwater exists at depths of less than 10 feet bgs over most of JBCA (Halliburton, June 1995).

#### *Surficial Geology at North Auxiliary Airfield*

NAAF is in the Upper Coastal Plain Physiographic Province. The area is immediately underlain by sedimentary rocks and unconsolidated sediments of Tertiary Age. The Tertiary Age sediments are underlain by Cretaceous Age basement rocks of the Coastal Plain. The surficial geology at NAAF consists of 200 feet of poorly drained unconsolidated sands with interbedded clays. Soils in the area have a tendency to erode. The water table in the area is 30 to 100 feet below the land surface, but interbedded clay units limit the vertical movement of infiltrating water and may cause perched water tables and semi-confining conditions within the surficial aquifer. There is good interconnection between groundwater and surface water in the area. Deeper aquifers can mix with the surficial aquifer because the hydraulic gradient is upward in the vicinity of NAAF. Groundwater flows to the southwest and discharges to surface water in the southern portion of the field (Air Force Record [AR] #108, March 1900).

#### *Climate*

Eastern South Carolina has a humid subtropical climate characterized by warm, humid summers and mild winters. Historical data for a 30-year period in the JBCA area indicates that the mean annual precipitation was 51.4 inches. The calculated net annual precipitation (precipitation minus evapotranspiration) for the JBCA area is approximately 14.5 inches, and the one-year, 24-hour rainfall event for this area is estimated to be 4 inches (Tetra Tech, Inc., April 2010).

#### *Preliminary Assessment Findings*

The Preliminary Assessment (PA) conducted at JBCA during the week of October 27, 2015, identified five sites that warranted an SI to determine the presence or absence of PFASs (CH2M Hill, January 2016). The five sites at JBCA (now identified as AFFF Areas 1 through 5) are listed in Table 2. These areas are discussed in Sections 2.1 through 2.5, and the area locations are shown on Figure 2 (Appendix A).

A PA for PFASs was not conducted for NAAF. ASL conducted a brief assessment for NAAF (provided as Appendix B in the JBCA site-specific addendum to the QAPP [ASL, January 2017]) and identified four sites that warranted initiation of an SI to determine the presence or absence of PFASs. The four sites (now identified as AFFF Areas 6 through 9) from NAAF selected for an SI are also listed in Table 2. These areas are discussed in Sections 2.6 through 2.9, and the area locations are shown on Figure 3 (Appendix A).

#### *Previous Investigations*

Environmental investigations have been conducted at SWMU 55 (FPTA 3) and the current FTA (SWMU 52); however, none of the past investigations targeted PFASs (CH2M Hill, January 2016).

**Table 2 AFFF Areas and Selection Rationale for Site Inspections at Joint Base Charleston-Air**

<b>AFFF Area</b>	<b>Location</b>	<b>Associated Existing IRP ID</b>	<b>Rationale</b>
1	SWMU 55 (FT003, Fire Protection Training Area 3)	SWMU 55	<ul style="list-style-type: none"> <li>Operational from 1981 to 1989.</li> <li>AFFF was used during training exercises, but quantities discharged are unknown.</li> </ul>
2	SWMU 52 (AT551, Current Fire Training Area)	SWMU 52	<ul style="list-style-type: none"> <li>The old FTA system was operational from 1986 to 1992, and sprayed water was contained and discharged to an intermittent stream near the area.</li> <li>AFFF likely has been used at the location from 1986 to 1992.</li> <li>The old FTA system was removed in 1996 and replaced with a propane-fueled FTA system.</li> <li>Up to 5 feet of soil were excavated at the FTA in 1994.</li> <li>AFFF has not been used during fire training at the propane-fueled FTA.</li> <li>Annual AFFF system spray testing for the fire department vehicles is performed at the current FTA. Quantities are unknown.</li> <li>Liquids from the lined FTA flow into the adjacent lined pond. The pond periodically overflows into the adjacent low area.</li> </ul>
3	Building 570 (No RCRA Permit ID)	None (new area)	<ul style="list-style-type: none"> <li>Currently has a high-expansion foam system.</li> <li>Formerly had an AFFF system.</li> <li>10 AFFF discharges are estimated to have occurred. Quantities of AFFF discharged are not known.</li> <li>Several discharges exited the hangar and possibly flowed to the storm drain in a grassy area south of the hangar.</li> <li>Storm drainage flows to Outfall 003.</li> </ul>
4	2005 Private Plane Crash Area (No RCRA Permit ID)	None (new area)	<ul style="list-style-type: none"> <li>20 gallons of AFFF were used to extinguish an aircraft fire.</li> </ul>
5	Outfall 003 (No RCRA Permit ID)	None (new area)	<ul style="list-style-type: none"> <li>Discharges from the Building 570 AFFF system flowed into the stormwater system and discharged at Outfall 003.</li> <li>Quantities of AFFF discharged are not known.</li> </ul>
6	NAAF Fire Station (No RCRA Permit ID)	None (new area)	<ul style="list-style-type: none"> <li>269 five-gallon jugs (1,345 gallons) of AFFF are stored at the station.</li> <li>Spills inside the building have gone into drains that empty to an OWS, which is connected to the sanitary sewer system.</li> <li>Equipment is rinsed in the paved area north of the bays, and small amounts may have flowed into a low-lying area with two drainage ditches/pits north of the building.</li> </ul>
7	NAAF Pump House – Foam Truck Flush Area (No RCRA Permit ID)	None (new area)	<ul style="list-style-type: none"> <li>A truck with a foam leak was flushed out at the pump house.</li> <li>Runoff flows into the drainage ditch east of the building and AST #7.</li> </ul>
8	NAAF Foam Test Area and Old C-141 (No RCRA Permit ID)	None (new area)	<ul style="list-style-type: none"> <li>The area consists of a newly constructed pond with a culvert that goes from the middle of the pond north under the runway to an infiltration point.</li> <li>The former pond was approximately 1,000 feet northwest of the new pond, just inside the current tree line.</li> <li>The C-141 was used for training.</li> </ul>



AFFF Area	Location	Associated Existing IRP ID	Rationale
9	FT010 (No RCRA Permit ID, NAAF Fire Training Area)	FT010	<ul style="list-style-type: none"> <li>Intermittently used from 1979 to 1986 for fire protection training exercises four to six times per month.</li> <li>Exact location uncertain; two areas were investigated in 1986 and 1987 (Site 10A and Site10B).</li> <li>Firefighting agents used may have included protein foam, chlorobromomethane, Purple K powder, and carbon dioxide.</li> </ul>

Note: Table modified from CH2M Hill, January 2016

AFFF = aqueous film forming foam

FTA = fire training area

IRP = Installation Restoration Program

NAAF = North Auxiliary Air Field

PFAS = per- and polyfluorinated alkyl substances

SWMU = Solid Waste Management Unit

AST = aboveground storage tank

ID = identification

JBCA = Joint Base Charleston

OWS = oil/water separator

RCRA = Resource Conservation and Recovery Act

## 2.1 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1

SWMU 55 (AFFF Area 1) is in the east corner of the Base, near the intersection of South Aviation Avenue and Fighter Drive. SWMU 55 operated from 1971 until 1983 and consisted of a pit with a crushed limestone base and a surrounding earthen berm. An average of two training exercises occurred per month using up to 300 gallons of JP-4 per fire per exercise. Firefighting agents used at SWMU 55 included AFFF, dry chemicals, and Halon (CH2M Hill, January 2016).

Four environmental investigations have been conducted at SWMU 55. Soil, sediment, and groundwater samples were collected and analyzed during

- the Stage I Installation Restoration Program (IRP),
- the Stage 2 IRP investigation/feasibility study,
- the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), and
- the Phase II RFI.

Media sampled at SWMU 55 were not analyzed for PFASs during any of these investigations. Currently, there is an inoperable air sparge (AS)/soil vapor extraction (SVE) system on site (CH2M Hill, January 2016).

## 2.2 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2

SWMU 52, the current FTA (AFFF Area 2), is on South Davis Avenue, west of its intersection with South Graves Avenue. Firefighting exercises were conducted from 1986 until 1992 using JP-4 as a fuel source. It consisted of a gravel area with a mock aircraft on an 85-foot diameter concrete pad that was surrounded by a concrete berm and a gravel area with no vegetation. Information regarding which extinguishing agents were used on the JP-4 fires is not available.

Eventually, the use of JP-4 to fuel fires ceased, and wooden pallets were used instead. SWMU 52 was used approximately once every six weeks. Water from the training exercises flowed from the pad to an oil/ water separator (OWS), which discharged to an intermittent stream south of SWMU 52. Because of its operational history, the site has undergone an array of RCRA environmental investigations and remediation efforts. None of the previous investigations targeted PFASs (CH2M Hill, January 2016).

A RCRA Facility Assessment (RFA) was conducted in 1990 followed by RFA Phase II sampling. In 1994, the original FTA was demolished, and soil was excavated to 5 feet across the entire containment area. An RFI recommending No Further Action for soil was completed in 1994 and included the FTA (SWMU 52), holding tanks (SWMU 102 and 103), and the OWS (SWMU 83). Additionally, the RFI included surface water and sediment sampling at the intermittent stream next to the FTA (SWMU 131) (CH2M Hill, January 2016).

Following the soil removal, the site was modified to include, among other features, a liquid propane burner. The new propane-fueled FTA has gravel over a liner with a mock aircraft and began operation in 1996. It is surrounded by asphalt-paved areas and forested land. During training exercises, propane-fueled fires are extinguished with high-pressure water, which collects in a high-density polyethylene-lined pond for reuse. Since the system modifications were completed in 1996, AFFF has not been used at the current FTA; however, annual testing of AFFF systems on the fire trucks is performed at the current FTA (CH2M Hill, January 2016).

At the time of the PA, 58 five-gallon buckets and 13 55-gallon drums of AFFF were stored in two sheds at SWMU 52. No AFFF spills at the storage sheds were identified (CH2M Hill, January 2016).

Because SWMU 52 is lined, PFASs are unlikely to exist in the environmental media surrounding the area; however, it is possible that PFASs migrated from the lined pond to an adjacent low area because of heavy rains. The pond was observed to be completely full during CH2M Hill's October 27, 2015, visit. Additional water entering the pond would overflow into adjacent lower areas (CH2M Hill, January 2016).

### **2.3 BUILDING 570 – AFFF AREA 3**

Building (Hangar) 570 (AFFF Area 3) is on North Graves Avenue, across from Building 610 (Base Supply). The hangar has a high-expansion foam system with a 55-gallon capacity bladder supply tank manufactured in 2011. This building previously had an AFFF system, but the supply tank size is unknown. The hangar has grate-covered trench drains that flow to an underground holding tank outside the south building wall. The holding tank is not connected to the sanitary sewer system and requires a pump to remove any liquid (CH2M Hill, January 2016).

An estimated 10 discharges from the AFFF system are known to have occurred at Building 570 since 1992. The quantities of AFFF released are unknown; however, several discharges flowed outside the hangar onto the apron, the adjacent grassy area, and likely into the single storm drain inlet south of the building. Once in the storm drain system, overflow liquids would have traveled through a series of underground pipes and concrete-lined ditches, eventually leaving the Base through Outfall 003. Outfall 003 flows into an unnamed tributary of Popperdam Creek, then into Popperdam Creek, and finally into the Ashley River (CH2M Hill, January 2016).

### **2.4 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4**

A small private plane crashed at the south end of the flightline in 2005 (AFFF Area 4). The Base fire department responded and extinguished the fire using approximately 20 gallons of AFFF. The area is grassed and maintained regularly because it is part of the airfield. A storm drain near the site conveys surface drainage to an open ditch, generally flowing south toward the commercial aircraft terminal (CH2M Hill, January 2016).

## **2.5   OUTFALL 003 – AFFF AREA 5**

Outfall 003 (AFFF Area 5) is in the southwest corner of the Wrenwoods Golf Course, near Rickenbacker Circle. Surface drainage flows through a ditch, portions of which are concrete-lined, into an unnamed tributary of Popperdam Creek, then into Popperdam Creek, which in turn flows into Ashley River (CH2M Hill, January 2016).

An estimated 10 AFFF releases are known to have occurred at Building 570 since 1992; however, the quantities of AFFF released are unknown. Any release likely would result in AFFF entering the stormwater system through the inlet at the south end of Building 570 and being conveyed to Outfall 003 (CH2M Hill, January 2016).

## **2.6   NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

NAAF Fire Station is in Building 20 (AFFF Area 6), which was constructed in the early 1990s. In 2016, 269 five-gallon jugs (1,345 gallons) of AFFF were stored in the fire station western bay. Five firefighting vehicles were at the station:

- One rapid intervention vehicle (Truck #10) with a 56-gallon AFFF capacity,
- Two P19Rs (Truck #7 and #30 [unmarked]) with 210-gallon AFFF capacities,
- One P23 (Truck #35) with a 500-gallon AFFF capacity, and
- One foam trailer with a 1,000-gallon AFFF capacity.

No spills, leaks, or accidental discharges of AFFF at the station have been reported. However, equipment is rinsed in the paved area north of the bays, and small amounts may have run off into a low-lying area with two drainage ditches/ pits north of the building. There have been no emergency responses involving the use of AFFF (ASL, January 2017).

## **2.7   NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7**

NAAF Pump House (AFFF Area 7) is in Building 10. Reportedly, a truck with a foam leak was flushed at the pump house on NAAF. Runoff would have flowed into the north-south drainage ditch east of the building and Aboveground Storage Tank (AST) #7. ASL inspected the area but could not find any evidence of the former activities and no additional information could be located for this area (ASL, January 2017).

## **2.8   NORTH AUXILIARY AIRFIELD FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8**

NAAF Foam Test Area and Old C-141 training area (AFFF Area 8) are in the southeast quadrant of the facility. The Foam Test Area and Old C-141 training area consist of a newly constructed pond at the woods' edge in the southern corner of NAAF. A culvert goes from the middle of the pond north under the runway to an infiltration point. Approximately 1,000 feet northwest of the new pond, ASL personnel observed a depression just inside the current line that appeared to be the old pond location (ASL, January 2017).

## **2.9   FT010 (NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

Former FTA Site FT010 (AFFF Area 9) was approximately 2,000 feet east of the main 230/50 runway for NAAF in the northeastern corner of the field and approximately 1,200 feet south of the installation

boundary. Site FT010 was a shallow depression (pit) in the ground and was intermittently used from 1979 to 1986 for fire protection training exercises. Exercises were performed four to six times per month. The pit was usually sprayed and saturated with water prior to placing JP-4 jet fuel in the pit to minimize infiltration of fuel into the ground. Firefighting agents may have included protein foam, chlorobromomethane, Purple K powder, and carbon dioxide. These compounds naturally decay and were not considered a hazard. The exact location of FT010 is uncertain, and in 1986 and 1987 two areas were investigated (Site 10A and Site 10B). Neither area showed obvious signs of fire training activities. Site 10A showed significant amounts of oil and grease in the soil. No cleanup was performed at the site because of its remote location, because no receptors were close, and because the observed contaminants were biodegrading. The area remains an open field (AR File No. 108USAF, December 2003).

### 3.0 FIELD ACTIVITIES AND FINDINGS

ASL conducted field activities at JBCA between January 10, 2017, and February 10, 2017. Fieldwork was conducted in accordance with the QAPP (ASL, January 2016) and the JBCA site-specific addendum to the QAPP (ASL, January 2017).

#### 3.1 FIELD ACTIVITIES AND SAMPLING PROCEDURES

Field activities included collecting groundwater samples from direct push technology (DPT) borings using a stainless-steel screen point-16 sampler (SP-16), installing and sampling temporary wells, or sampling existing monitoring wells; collecting surface soil and subsurface soil samples from hand auger or DPT soil borings, and collecting surface water and sediment samples. ASL selected sampling locations most likely to have detectable concentrations of the target compounds as a result of a known or suspected AFFF release. Field duplicate samples were collected at a frequency of one for every 10 samples for each sample media. Matrix spike/ matrix spike duplicate samples were collected at a frequency of one per every 20 samples for each media.

Tables summarizing analytical data are presented in the Analytical Results subsection for each AFFF area discussion. Field forms – including readiness review forms, boring logs, groundwater sampling and groundwater grab sampling logs, soil and sediment sampling logs, surface water sampling logs, and field instrument calibration logs – are presented in Appendix B. The validation report, chains of custody, and laboratory data are presented in Appendix C. Physiochemical sample results are presented in Appendix D. Groundwater level data is presented in Appendix E.

Soil, sediment, surface water, and groundwater samples were submitted via overnight courier to Maxxam Analytics International Corporation of Mississauga, Ontario, Canada, under chain of custody procedures and analyzed for PFAS compounds using modified EPA Method 537. All samples were analyzed for the following parameters.

<b>Analyte</b>	<b>*CAS Number</b>
• Perfluorooctanesulfonic acid (PFOS)	1763-23-1
• Perfluorohexanesulfonic acid (PFHxS)	355-46-4
• Perfluorooctanoic acid (PFOA)	335-67-1
• Perfluoroheptanoic acid (PFHpA)	375-85-9
• Perfluorononanoic acid (PFNA)	375-95-1
• Perfluorobutanesulfonic acid (PFBS)	29420-43-3
• Perfluorobutanoic acid (PFBA)	375-22-4
• Perfluoropentanoic acid (PFPA)	2706-90-3

- Perfluorohexanoic acid (PFHxA) 307-24-4
- Perfluorooctanesulfonamide (PFOSA) 754-91-6
- Perfluorodecanoic acid (PFDA) 335-76-2
- Perfluorodecanesulfonic acid (PFDS) 335-77-3
- Perfluoroundecanoic acid (PFUnA) 2058-94-8
- Perfluorododecanoic acid (PFDoA) 307-55-1
- Perfluorotridecanoic acid (PFTriA) 72629-94-8
- Perfluorotetradecanoic acid (PFTeA) 376-06-7
- 6:2 Fluorotelomer sulfonate (6:2 FTS) 27619-97-2
- 8:2 Fluorotelomer sulfonate (8:2 FTS) 39108-34-4

\*CAS = Chemical Abstracts Service

DataChek conducted third-party data validation on 100% of the analytical data. Overall, the quality of the data was acceptable. The precision and accuracy results were acceptable for the project. Other data quality indicators (i.e. precision, accuracy, representativeness, comparability, and completeness) also met the project objectives. Data validation qualifiers were applied as needed to the data. 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. Complete laboratory data for modified EPA Method 537 results and the data validation report are presented in Appendix C. To provide basic soil parameter information, ASL also collected representative composite surface soil samples and composite subsurface soil samples from each area, which were analyzed for potential of hydrogen (pH), particle size distribution, percent solids, and total organic carbon (TOC). The physiochemical sample results are presented in Appendix D.

Soil borings at the sites were advanced with a track-mounted DPT drill rig. Surface soil samples were collected with stainless steel hand augers from 6 inches bgs. Subsurface soil samples were collected immediately above the water saturated/unsaturated soil interface using a DPT Macro-core<sup>®</sup> sampler with an acetate liner. Soil samples were placed in sampling containers using stainless steel spoons.

Groundwater samples were collected from existing monitoring wells, temporary monitoring wells installed at DPT soil borings, or from an SP-16 sampler installed at DPT soil borings. Temporary wells were constructed with ¾-inch diameter polyvinyl chloride prepacked well screens and risers. Grab samples were collected through a reusable GeoProbe<sup>®</sup> SP-16 drive point groundwater sampler consisting of a sheathed 0.78-inch inside diameter by 41-inch long stainless steel screen. The drive point was advanced to the desired depth and the sheath retracted to expose the screen. Polyvinyl tubing was then inserted through the drill rods into the screen. Groundwater samples from AFFF Areas 1, 2, 3, 4, 5, 6, and 9 were collected using a peristaltic pump, and groundwater samples from AFFF Areas 7 and 8 were collected manually using a check valve attached to the end of sample tubing. In both situations disposable polyvinyl tubing was inserted to the approximate midpoint of the saturated portion of the screened interval at each location. Sediment samples were collected using stainless steel spoons. Surface water samples were collected by attaching the sample container to an extendable rod designed for sampling and dipping the container into the water.

Sample points were located by Ashley Land Surveying, Inc. of Summerville, South Carolina, on February 8 and 9, 2017. Northing and easting coordinates were recorded in the South Carolina State Plane Coordinate System based on the North American Datum 83 (2011). Elevations were referenced to North American Vertical Datum 1988.

Sample locations, area-specific lithology, groundwater flow direction, analytical results, and conclusions for each AFFF area are presented in Sections 3.3 through 3.11.

### **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<sup>®</sup>-containing materials (Teflon<sup>®</sup> tubing, bailers, tape, plumbing paste, or other Teflon<sup>®</sup> materials) were not used because Teflon<sup>®</sup> contains fluorinated compounds.
- High-density polyethylene (HDPE) and silicon materials were acceptable.
- Peristaltic pumps were used to sample groundwater at depths of 25 feet or shallower. Pumps with Teflon<sup>®</sup> impellers, such as Grundfos RediFlo pumps, were not used. 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<sup>®</sup> were not allowed on site.
- Only Sharpie<sup>®</sup> 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<sup>™</sup> was not allowed because it consists of a PFAS membrane.
- Tyvek<sup>®</sup> 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, HydraSleeve<sup>®</sup> bailer, etc.);
  - Insertion of silicon tubing into the peristaltic pump;
  - Completion of monitor 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 screw caps were not made of Teflon<sup>®</sup> 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 wet weather (such as rainfall or snowfall) wore appropriate clothing that did not pose a risk of cross-contamination. Sampling personnel avoided synthetic gear treated with water-repellant finishes containing PFAS. 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 PFAS.
- Because many manufactured sunblock and insect repellants contain PFAS, only sunblock and insect repellants that contain 100% natural ingredients were allowed.
- For restroom breaks, field personnel left the exclusion zone (EZ) before removing 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 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1**

#### **3.3.1 Sample Locations**

To assess possible releases of PFAS at AFFF Area 1, three borings were installed in the vicinity of the former AS/SVE system on February 2, 2017. Soil boring CHRTN01-001-001 was installed in the vicinity of the telephone pole (closest to the former system), and soil borings CHRTN01-001-002 and CHRTN01-001-003 were placed to form a triangle, so the groundwater flow direction could also be determined. Two surface and subsurface soil samples were collected from the borings closest to the former AS/SVE system, and groundwater samples were collected from all three locations from temporary wells. Reportedly, monitoring wells were just outside the area of investigation; however, ASL personnel could not locate the wells during the field event to collect groundwater elevation measurements. Three temporary wells were installed at the boring locations. The temporary wells were screened near the top of the uppermost saturated zone with total depths of 15.0 feet bgs and constructed with 10-foot long, prepacked screens. Sampling locations are shown on Figure 4 (Appendix A).

#### **3.3.2 Lithology**

The lithology at AFFF Area 1 (from ground surface) generally consists of clayey sand (Unified Soil Classification System [USCS] – SC), silty sand (USCS – SM), or silty clay (USCS – CL). The surficial water table was observed in the soil between approximately 5 and 6.5 feet bgs. All borings were terminated within the Quaternary Terrace Deposit of the surficial aquifer. Detailed boring logs are included in Appendix B.

#### **3.3.3 Groundwater Flow**

Based on water levels from the temporary wells gauged on February 3, 2017, the uppermost water-bearing zone in AFFF Area 1 was detected at elevations ranging from 27.29 feet to 29.16 feet amsl as summarized in Appendix E. Shallow groundwater flowed west/southwest as shown on Figure 4 (Appendix A).

#### **3.3.4 Analytical Results**

##### *Surface Soil*

Two primary surface soil samples (CHRTN01-001-SS-001 and CHRTN01-002-SS-001) and one field duplicate (CHRTN01-001-SS-901) were collected at AFFF Area 1 at 6 inches bgs. PFBS was detected in one sample and the duplicate at estimated concentrations of 0.55 µg/kg and 4.4 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all samples at concentrations ranging from an estimated 2.9 µg/kg to 70 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all samples at concentrations ranging from 71 µg/kg to 810 µg/kg, with the concentration in CHRTN01-002-SS-001 (810 µg/kg) above the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 3 and on Figure 5 (Appendix A).

##### *Subsurface Soil*

Two primary subsurface soil samples (CHRTN01-001-SO-004 and CHRTN01-002-SO-005) and one field duplicate (CHRTN01-001-SO-904) were collected at AFFF Area 1 at 3 and 5 feet bgs. PFBS was detected in all samples at estimated concentrations ranging from 0.90 µg/kg to 9.0 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all samples at concentrations ranging from 18 µg/kg to 46 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all samples at concentrations



ranging from 46 µg/kg to 130 µg/kg, with the concentration in CHRTN01-002-SO-005 (130 µg/kg) above the calculated RSL of 126 µg/kg. Subsurface soil analytical results are shown in Table 4 and on Figure 5 (Appendix A).

**Table 3 Solid Waste Management Unit 55 (FT003, Fire Protection Training Area 3)  
AFFF Area 1 Surface Soil Analytical Results**

	Sample ID	CHRTN01-001-SS-001	CHRTN01-001-SS-901 (dup)	CHRTN01-002-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/2/17	2/2/17	2/2/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.44 U	<b>0.55 J</b>	<b>4.4 J</b>
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>2.9 J</b>	<b>4.1 J</b>	<b>70</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>71</b>	<b>80</b>	<b>810</b>

Bold values indicate analyte was detected at the concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> Screening levels were calculated using the EPA Regional Screening Level Calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

SS = surface soil

U = The analyte was not detected above the reported sample quantification limit

**Table 4 Solid Waste Management Unit 55 (FT003, Fire Protection Training Area 3)  
AFFF Area 1 Subsurface Soil Analytical Results**

	Sample ID	CHRTN01-001-SO-004	CHRTN01-001-SO-904 (dup)	CHRTN01-002-SO-005
	Depth (feet)	3 - 4	3 - 4	4 - 5
	Sample Date	2/2/17	2/2/17	2/2/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	<b>6.0 J</b>	<b>9.0 J</b>	<b>0.90 J</b>
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>35 J</b>	<b>46</b>	<b>18</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>51 J</b>	<b>46</b>	<b>130</b>

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA Regional Screening Level Calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

SO = subsurface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

#### *Soil Physiochemical Analyses*

To provide basic soil parameter information, composite surface (CHRTN01-004-SS-001) and subsurface (CHRTN01-004-SO-006) soil samples were collected at AFFF Area 1. The samples were submitted for

analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.

#### Groundwater

Three primary groundwater samples (CHRTN01-001-GW-010, CHRTN01-002-GW-010, and CHRTN01-003-GW-010) and one field duplicate (CHRTN01-001-GW-910) were collected at AFFF Area 1. PFBS was detected in all samples at concentrations ranging from 2.8 µg/L to 34 µg/L, all below the RSL of 40 µg/L. PFOA was detected in all samples at concentrations ranging from 37 µg/L to 790 µg/L, all above the EPA HA of 0.07 µg/L. PFOS was detected in all samples at concentrations ranging from 54 µg/L to 360 µg/L, all above the EPA HA of 0.07 µg/L. Combined concentrations of PFOA plus PFOS ranged from 91 µg/L to 1,150 µg/L, above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 5 and on Figure 6 (Appendix A).

**Table 5 Solid Waste Management Unit 55 (FT003, Fire Protection Training Area 3)  
AFFF Area 1 Groundwater Analytical Results**

	Sample ID	CHRTN01-001-GW-010	CHRTN01-001-GW-910 (dup)	CHRTN01-002-GW-010	CHRTN01-003-GW-010
	Depth (feet)	10	10	10	10
	Sample Date	2/3/17	2/3/17	2/3/17	2/3/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	34	28	2.8	34
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	280	290	37	790
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	160	150	54	360
PFOA + PFOS	0.07 <sup>c</sup>	440	440	91	1,150

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> EPA, May 2016a. “Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)” and EPA, May 2016b. “Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA).”

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

CHRTN = Joint Base Charleston

GW = groundwater

AFFF = aqueous film forming foam

dup = duplicate

ID = identification

### 3.3.5 Conclusions

Two primary surface soil samples, two primary subsurface soil samples, three primary groundwater samples, and one duplicate sample of these media were collected from AFFF Area 1. PFBS, PFOA, and PFOS were detected in the surface and subsurface soil samples; one surface soil sample and one subsurface soil sample showed a PFOS concentration above the calculated RSL. PFBS, PFOA, PFOS, and combined PFOA and PFOS were detected in the analyzed groundwater samples; the concentrations of PFOA, PFOS, and combined PFOA and PFOS in all three samples were above the EPA HA. Therefore, concentrations of PFAS above screening levels in the surface soil, subsurface soil, and groundwater have been confirmed at AFFF Area 1.

### **3.4 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2**

#### **3.4.1 Sample Locations**

To assess possible releases of PFAS at AFFF Area 2, three borings were installed in the grassy area west of the training pad and north and east of the lined drainage pond on February 8, 2017. Surface soil and subsurface soil samples were collected. Temporary wells were installed at two boring locations, and groundwater samples were collected. The temporary wells were screened near the top of the uppermost saturated zone with total depths of 15.0 feet bgs and constructed with 10-foot long, prepacked screens. Two existing monitor wells (17.5 feet bgs) south of the training pad were sampled, and a sediment sample and surface water sample were collected from the surface water runoff area south of the pond and southwest of the training area. The surface water runoff area is at lower elevation than the training pad. The sample locations are shown on Figure 7 (Appendix A).

#### **3.4.2 Lithology**

The lithology at AFFF Area 2 (from ground surface) generally consists of silt-silty clay (USCS – OL), clayey sand (USCS – SC), clay (USCS – CL), or silty sand (USCS – SM). The surficial water table was observed in the soil between approximately 6 and 8 feet bgs. All borings were terminated within the Quaternary Terrace Deposit of the surficial aquifer. Detailed boring logs are included in Appendix B.

#### **3.4.3 Groundwater Flow**

Water levels were gauged from the temporary wells on February 2, 2017, and monitoring wells on February 8, 2017. The uppermost water-bearing zone in AFFF Area 2 was at elevations ranging from 20.54 feet to 24.27 feet amsl as summarized in Appendix E. Historical groundwater flow direction has been determined to be to the south/southwest, as shown on Figure 7 (Appendix A).

#### **3.4.4 Analytical Results**

##### *Surface Soil*

Three surface soil samples (CHRTN02-001-SS-001, CHRTN02-002-SS-001, and CHRTN02-003-SS-001) were collected at AFFF Area 2 at 6 inches bgs. PFBS was detected in one sample at a concentration of 2.0 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all three samples at concentrations ranging from 1.6 µg/kg to 10 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all three samples at concentrations ranging from 77 µg/kg to 91 µg/kg, below the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 6 and on Figure 8 (Appendix A).

##### *Subsurface Soil*

Three subsurface soil samples (CHRTN02-001-SO-005, CHRTN02-002-SO-006, and CHRTN02-003-SO-006) were collected at AFFF Area 2 from 4 to 6 feet bgs. PFBS was detected in one sample at a concentration of 2.2 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all three samples at concentrations from an estimated 0.35 µg/kg to a 3.4 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all three samples at estimated concentrations ranging from 1.2 µg/kg to 33 µg/kg, below the calculated RSLs of 126 µg/kg. Subsurface soil analytical results are shown in Table 7 and on Figure 8 (Appendix A).

**Table 6 Solid Waste Management Unit 52 (AT551, Current Fire Training Area)**  
**AFFF Area 2 Surface Soil Analytical Results**

	Sample ID	CHRTN02-001-SS-001	CHRTN02-002-SS-001	CHRTN02-003-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/8/17	2/8/17	2/8/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	<b>2.0</b>	0.40 U	0.37 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>10</b>	<b>1.6</b>	<b>2.1</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>85</b>	<b>77</b>	<b>91</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> Screening levels were calculated using the EPA Regional Screening Level Calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SS = surface soil

U = The analyte was not detected above the reported sample quantification limit

**Table 7 Solid Waste Management Unit 52 (AT551, Current Fire Training Area)**  
**AFFF Area 2 Subsurface Soil Analytical Results**

	Sample ID	CHRTN02-001-SO-005	CHRTN02-002-SO-006	CHRTN02-003-SO-006
	Depth (feet)	4 - 5	5 - 6	5 - 6
	Sample Date	2/8/17	2/8/17	2/8/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.48 U	<b>2.2</b>	0.48 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>0.35 J</b>	<b>3.4</b>	<b>0.63 J</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>1.2 J</b>	<b>33 J</b>	<b>14</b>

Bold values indicate was analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SO = subsurface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

### *Soil Physiochemical Analyses*

To provide basic soil parameter information, composite surface (CHRTN02-005-SS-001) and subsurface (CHRTN02-005-SO-007) soil samples were collected at AFFF Area 2. The samples were submitted for analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.

### *Groundwater*

Four groundwater samples were collected at AFFF Area 2: two from temporary wells (CHRTN02-001-GW-010 and CHRTN02-002-GW-011) and two from existing monitoring wells (CHRTN02-52MW-02-

017.5 and CHRTN02-52MW-03-017.5). PFBS was detected in all four samples at concentrations ranging from 0.057 µg/L to 0.93 µg/L, all below the RSL of 40 µg/L. PFOA was detected in all four samples at concentrations ranging from 0.17 µg/L to 0.89 µg/L, above the EPA HA of 0.07 µg/L. PFOS was detected in all four samples at concentrations ranging from 0.18 µg/L to 24 µg/L, above the EPA HA of 0.07 µg/L. PFOA and PFOS were detected at combined concentrations ranging from 0.35 µg/L to 24.89 µg/L, above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 8 and on Figure 9 (Appendix A).

**Table 8 Solid Waste Management Unit 52 (AT551, Current Fire Training Area)  
AFFF Area 2 Groundwater Analytical Data**

	Sample ID	CHRTN02-001-GW-010	CHRTN02-002-GW-011	CHRTN02-52MW-02-017.5	CHRTN02-52MW-03-017.5
	Depth (feet)	10	11	17.5	17.5
	Sample Date	2/2/17	2/2/17	2/8/17	2/8/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.057</b>	<b>0.58</b>	<b>0.40</b>	<b>0.93</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.17</b>	<b>0.56</b>	<b>0.38</b>	<b>0.89</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.18</b>	<b>4.3</b>	<b>2.1</b>	<b>24</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.35</b>	<b>4.86</b>	<b>2.48</b>	<b>24.89</b>

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

GW = groundwater

ID = identification

### *Sediment*

One primary sediment sample (CHRTN02-004-SD-001) and one duplicate sample (CHRTN02-004-SD-901) were collected at AFFF Area 2. PFBS was detected in the primary and the duplicate sample at an estimated concentration of 0.49 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in the primary sample but not the duplicate, at an estimated concentration of 0.47 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in the primary and the duplicate samples at estimated concentrations of 2.9 µg/kg and 6.9 µg/kg, below the calculated RSL of 126 µg/kg. Sediment analytical results are shown in Table 9 and on Figure 8 (Appendix A).

### *Surface Water*

One primary surface water sample (CHRTN02-004-SW-001) and one duplicate sample (CHRTN02-004-SW-901) were collected at AFFF Area 2. PFBS was detected in both samples at concentrations of 0.044 µg/L and 0.050 µg/L, below the RSL of 40 µg/L. PFOA was detected in both samples at estimated concentrations of 0.031 µg/L and 0.057 µg/L, below the EPA HA of 0.07 µg/L. PFOS was detected in both samples at an estimated concentration of 0.34 µg/L and a concentration of 0.35 µg/L, above the EPA HA of 0.07 µg/L. The estimated combined PFOA and PFOS concentrations were 0.371 µg/L and 0.407

µg/L, above the EPA HA of 0.07 µg/L. Surface water analytical results are shown in Table 10 and on Figure 9 (Appendix A).

**Table 9 Solid Waste Management Unit 52 (AT551, Current Fire Training Area)  
AFFF Area 2 Sediment Analytical Results**

	Sample ID	CHRTN02-004-SD-001	CHRTN02-004-SD-901 (dup)
	Depth (feet)	0 - 0.5	0 - 0.5
	Sample Date	2/3/17	2/3/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	<b>0.49 J</b>	<b>0.49 J</b>
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>0.47 J</b>	0.24 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>6.9 J</b>	<b>2.9 J</b>

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilogram

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

SD = sediment

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

**Table 10 Solid Waste Management Unit 52 (AT551, Current Fire Training Area)  
AFFF Area 2 Surface Water Analytical Results**

	Sample ID	CHRTN02-004-SW-001	CHRTN02-004-SW-901 (dup)
	Sample Date	2/3/17	2/3/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.050</b>	<b>0.044</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.031 J</b>	<b>0.057 J</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.34 J</b>	<b>0.35</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.371 J</b>	<b>0.407 J</b>

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/kg = micrograms per kilogram

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

### **3.4.5 New AFFF Release**

Air Force Civil Engineer Center provided the following information regarding a new AFFF spill at AFFF Area 2 on JBCA. On June 2, 2017, the JBCA deputy fire chief reported that when staff arrived on site to set up a training exercise, they became aware vandalism had occurred at the FTA. Staff noted damage to the retention pond and fire prevention trailer, and AFFF agent was released from recycled totes. General materials and training devices were strewn around the training grounds. Security Forces Squadron (SFS) investigators and Office of Special Investigations (OSI) representatives responded to investigate and take statements from firefighters. Civil Engineering (CE) Environmental responded to look at the spills and ground/soil contamination. A photographer took multiple photos of the area. Medical Group (MDG)/Bioenvironmental also responded to support as needed. Fire Emergency Services (FES) conducted an assessment and determined that approximately 1,100 gallons of AFFF were released to a grassy area and flowed across the asphalt toward a propane tank, but did not reach the fence line or surface water ditch. The release area was dry upon discovery, and grass appeared dead. No soil was excavated. Figure 10 shows the approximate area of the June 2017 release of AFFF.

### **3.4.6 Conclusions**

Three surface soil samples, three subsurface soil samples, four groundwater samples, one primary and one duplicate sediment sample, and one primary and one duplicate surface water sample were collected from AFFF Area 2. PFBS, PFOA, and PFOS were detected in the surface soil, subsurface soil, and sediment samples; however, all concentrations were below RSLs. PFBS, PFOA, and PFOS were detected in the groundwater and surface water samples. PFOA, PFOS, and the combined PFOA and PFOS concentrations exceeded the EPA HA in the four groundwater samples. PFOS and the combined PFOA and PFOS concentrations exceeded the EPA HA in both surface water samples. Therefore, concentrations of PFAS above screening levels in the soil and sediment have not been confirmed at AFFF Area 2; however, concentrations of PFAS above screening levels in the groundwater and surface water have been confirmed at AFFF Area 2. The release that occurred in June 2017, after ASL's SI field events were completed, will likely increase PFAS impacts at AFFF Area 2.

## **3.5 BUILDING 570 – AFFF AREA 3**

### **3.5.1 Sample Locations**

To assess possible releases of PFAS at AFFF Area 3, three borings with temporary wells were installed south of Building 570 on February 7, 2017. Surface soil, subsurface soil, and groundwater samples were collected. A sediment and surface water sample were collected for AFFF Area 3 at the end of the concrete-lined drainage ditch leading from Building 570 to Outfall #3. The temporary wells were screened near the top of the uppermost saturated zone with total depths ranging from 15 to 20 feet bgs, and they were constructed with 10-foot long, prepacked screens. One surface water sample and one sediment sample were collected at the end of the concrete-lined drainage ditch leading from Building 570 to Outfall #3. The soil and groundwater sample locations are shown on Figure 11, and the surface water and sediment sample location are shown on Figure 12 (Appendix A).

### **3.5.2 Lithology**

The lithology at AFFF Area 3 (from ground surface) generally consists of silt-silty clay (USCS – OL), silty sand (USCS – SM), and clayey sand (USCS – SC). The surficial water table was observed in the soil between approximately 6.5 and 7.5 feet bgs. All borings were terminated within the Quaternary Terrace Deposit of the surficial aquifer. Detailed boring logs are included in Appendix B.

### 3.5.3 Groundwater Flow

Based on water levels from the temporary wells gauged on February 7, 2017, the uppermost water-bearing zone in AFFF Area 3 was at elevations ranging from 30.44 feet to 31.30 feet amsl as summarized in Appendix E. Shallow groundwater flowed west/southwest as shown on Figure 11 (Appendix A).

### 3.5.4 Analytical Results

#### *Surface Soil*

Three surface soil samples (CHRTN03-001-SS-001, CHRTN03-002-SS-001, and CHRTN03-003-SS-001) were collected at AFFF Area 3 at 6 inches bgs. PFBS and PFOA were not detected in any of the samples. PFOS was detected in all three samples at concentrations ranging from 3.5 µg/kg to 32 µg/kg, below the calculated RSL of 126 µg/kg. PFBS, PFOA, and PFOS surface soil analytical results are shown in Table 11 and on Figure 13 (Appendix A).

**Table 11 Building 570 AFFF Area 3 Surface Soil Analytical Results**

	Sample ID	CHRTN03-001-SS-001	CHRTN03-002-SS-001	CHRTN03-003-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/7/17	2/7/17	2/7/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.44 U	0.37 U	0.39 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.22 U	0.19 U	0.19 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>23</b>	<b>32</b>	<b>3.5</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

CHRTN = Joint Base Charleston

ID = identification

SS = surface soil

U = The analyte was not detected above the reported sample quantification limit

#### *Subsurface Soil*

Three subsurface soil samples (CHRTN03-001-SO-006, CHRTN03-002-SO-005, and CHRTN03-003-SO-006) were collected at AFFF Area 3 at 4 to 6 feet bgs. PFBS was not detected in any of the samples. PFOA was detected in one sample at an estimated concentration of 0.25 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all three samples at concentrations ranging from an estimated 0.48 µg/kg to 12 µg/kg, below the calculated RSL of 126 µg/kg. Subsurface soil analytical results are shown in Table 12 and on Figure 13 (Appendix A).

#### *Soil Physiochemical Analyses*

To provide basic soil parameter information, composite surface (CHRTN03-004-SS-001) and subsurface (CHRTN03-004-SO-007) soil samples were collected at AFFF Area 3. The samples were submitted for analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.



**Table 12 Building 570 AFFF Area 3 Subsurface Soil Analytical Results**

	Sample ID	CHRTN03-001-SO-006	CHRTN03-002-SO-005	CHRTN03-003-SO-006
	Depth (feet)	5 – 6	4 - 5	5 - 6
	Sample Date	2/7/17	2/7/17	2/7/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.44 U	0.44 U	0.40 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.22 U	<b>0.25 J</b>	0.20 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>0.48 J</b>	<b>12</b>	<b>0.60 J</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

### *Groundwater*

Three groundwater samples (CHRTN03-001-GW-010, CHRTN03-002-GW-015, and CHRTN03-003-GW-015) were collected from DPT borings at AFFF Area 3. Groundwater samples CHRTN03-002-GW-015 and CHRTN03-003-GW-015 were inadvertently labeled with a sample depth of 15 feet. However, the temporary wells were installed to a depth of 15 feet with a screen of 5 to 15 feet bgs, and depth to water was approximately 9 feet bgs. Therefore, these samples should have been labeled with a sample depth of 12 feet bgs. To avoid confusion, no changes have been made to the sample identifications or the groundwater logs.

PFBS was detected in all three samples at concentrations ranging from 0.020 µg/L to 0.22 µg/L, below the RSL of 40 µg/L. PFOA was detected in all samples at concentrations ranging from 0.020 µg/L to 0.24 µg/L; two of the three concentrations were above the EPA HA of 0.07 µg/L. PFOS was detected in all three samples at concentrations ranging from 0.49 µg/L to 6.7 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations ranged from 0.51 µg/L to 6.94 µg/L, above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 13 and on Figure 14 (Appendix A).

### *Sediment*

One sediment sample (CHRTN03-004-SD-001) was collected for AFFF Area 3 at the end of the concrete-lined drainage ditch leading from Building 570 to Outfall #3. PFBS and PFOA were not detected. PFOS was detected at an estimated concentration of 0.52 µg/kg, below the calculated RSL of 126 µg/kg. Sediment analytical results are shown in Table 14 and on Figure 15 (Appendix A).

### *Surface Water*

One surface water sample (CHRTN03-004-SW-001) was co-located with the sediment sample. PFBS was detected in the surface water sample at 0.12 µg/L, below the RSL of 40 µg/L. PFOA was detected at 0.081 µg/L, above the EPA HA of 0.07 µg/L. PFOS was detected at 1.9 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 1.981 µg/L, above the EPA HA of 0.07 µg/L. Surface water analytical results are shown in Table 15 and on Figure 16 (Appendix A).

**Table 13 Building 570 AFFF Area 3 Groundwater Analytical Results**

	Sample ID	CHRTN03-001-GW-010	CHRTN03-002-GW-015	CHRTN03-003-GW-015
	Depth (feet)	10	12	12
	Sample Date	2/7/17	2/7/17	2/7/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	0.020	0.22	0.043
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	0.020	0.24	0.091
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	0.49	6.7	2.0
PFOA + PFOS	0.07 <sup>c</sup>	0.51	6.94	2.091

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

CHRTN = Joint Base Charleston

ID = identification

AFFF = aqueous film forming foam

GW = groundwater

**Table 14 Building 570 AFFF Area 3 Sediment Analytical Results**

	Sample ID	CHRTN03-004-SD-001
	Depth (feet)	0.5
	Sample Date	2/7/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.48 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.24 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	0.52 J

Note: Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilogram

CHRTN = Joint Base Charleston

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

**Table 15 Building 570 AFFF Area 3 Surface Water Analytical Results**

	Sample ID	CHRTN03-004-SW-001
	Sample Date	2/7/17
Analyte	Screening Level (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.12</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.081</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>1.9</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>1.981</b>

Bold values indicate analyte detected at concentration indicated. Shaded cells indicate analyte detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> EPA, May 2016a. “Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)” and EPA, May 2016b. “Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA).”

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

CHRTN = Joint Base Charleston

SW = surface water

AFFF = aqueous film forming foam

ID = identification

### 3.5.5 Conclusions

Three surface soil samples, three subsurface soil samples, three groundwater samples, one sediment sample, and one surface water sample were collected from AFFF Area 3. PFOS was detected in the surface soil, subsurface soil, and sediment samples; however, all concentrations were below RSLs. PFBS, PFOA, and PFOS were detected in the groundwater and surface water samples. The concentrations of PFOA, PFOS, and combined PFOA and PFOS were above the EPA HA in groundwater and surface water samples. Therefore, concentrations of PFAS above screening levels in the soil and sediment have not been confirmed at AFFF Area 3; however, concentrations of PFAS above screening levels in the groundwater and surface water have been confirmed at AFFF Area 3.

## 3.6 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4

### 3.6.1 Sample Locations

To assess possible releases of PFAS at AFFF Area 4, three borings were installed in a triangle across the 2005 private plane crash area on February 9, 2017. Grab groundwater samples were collected from a SP-16 sampler screen set at the uppermost saturated zone of 11 to 15 feet bgs. Surface soil, subsurface soil, and groundwater samples were collected from each SP-16 location. One sediment sample and one surface water sample were collected from the drainage ditch east of the site. The sample locations are shown on Figure 17 (Appendix A).

### 3.6.2 Lithology

The lithology at AFFF Area 4 (from ground surface) generally consists of silt-silty clay (USCS – OL), silty sand (USCS – SM), and sandy clay (USCS – CL). The surficial water table was observed in the soil between 7 and 7.5 feet bgs approximately. All borings were terminated within the Quaternary Terrace Deposit of the surficial aquifer. Detailed boring logs are included in Appendix B.

### 3.6.3 Groundwater Flow

Airfield personnel requested that no temporary wells be installed near the runway. On February 9, 2017, groundwater samples were collected using an SP-16 sampler, so groundwater levels could not be obtained. Therefore, groundwater flow direction has not been determined for AFFF Area 4 although groundwater flow direction has historically been estimated to the southwest (Halliburton, June 1995). Groundwater was observed in the soil during drilling at approximately 7.5 feet bgs.

### 3.6.4 Analytical Results

#### *Surface Soil*

Three primary surface soil samples (CHRTN04-001-SS-001, CHRTN04-002-SS-001, and CHRTN04-003-SS-001) and one duplicate (CHRTN04-002-SS-901) were collected at AFFF Area 4 at 6 inches bgs. PFBS was not detected in any samples. PFOA was detected in one primary sample at an estimated concentration of 0.29 µg/kg and in the duplicate at an estimated concentration of 0.38 µg/kg. PFOS was detected in all samples at concentrations of an estimated 0.43 µg/kg to 1.3 µg/kg; all concentrations were below the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 16 and on Figure 18 (Appendix A).

**Table 16 2005 Private Plane Crash Area AFFF Area 4 Surface Soil Analytical Results**

	Sample ID	CHRTN04-001-SS-001	CHRTN04-002-SS-001	CHRTN04-002-SS-901 (dup)	CHRTN04-003-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5	0.5
	Sample Date	2/9/17	2/9/17	2/9/17	2/9/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.44 U	0.44 U	0.40 U	0.44 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>0.29 J</b>	0.22 U	<b>0.38 J</b>	0.22 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>1.3</b>	<b>0.69 J</b>	<b>0.75 J</b>	<b>0.43 J</b>

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

SS = surface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

#### *Subsurface Soil*

Three primary subsurface soil samples (CHRTN04-001-SO-006, CHRTN04-002-SO-006, and CHRTN04-003-SO-006) and one duplicate (CHRTN04-002-SO-906) were collected at AFFF Area 4 at 5 to 6 feet bgs. PFBS, PFOA, and PFOS were not detected in any of the samples. Subsurface soil analytical results are shown in Table 17 and on Figure 18 (Appendix A).

**Table 17 2005 Private Plane Crash Area AFFF Area 4 Subsurface Soil Analytical Results**

	Sample ID	CHRTN04-001-SO-006	CHRTN04-002-SO-006	CHRTN04-002-SO-906 (dup)	CHRTN04-003-SO-006
	Depth (feet)	5 - 6	5 - 6	5 - 6	5 - 6
	Sample Date	2/9/17	2/9/17	2/9/17	2/9/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.48 U	0.44 U	0.40 U	0.48 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.24 U	0.22 U	0.20 U	0.24 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	0.48 U	0.44 U	0.40 U	0.48 U

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

CHRTN = Joint Base Charleston

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

### *Soil Physiochemical Analyses*

To provide basic soil parameter information, composite surface (CHRTN04-005-SS-001) and subsurface (CHRTN04-005-SO-007) soil samples were collected at AFFF Area 4. The samples were submitted for analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.

### *Groundwater*

Three primary groundwater samples (CHRTN04-001-GW-013, CHRTN04-002-GW-013, and CHRTN04-003-GW-013) and one duplicate sample (CHRTN04-002-GW-913) were collected at AFFF Area 4. PFBS was detected in two primary samples and the duplicate at concentrations ranging from an estimated 0.013 µg/L to 0.032 µg/L, below the EPA RSL of 40 µg/L. PFOA was detected in two primary samples and the duplicate at concentrations ranging from an estimated 0.017 µg/L to 0.025 µg/L, below the EPA HA of 0.07 µg/L. PFOS was detected in two primary samples and the duplicate at concentrations ranging from 0.044 µg/L to 0.21 µg/L, with one primary sample and the duplicate at concentrations above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations ranged from an estimated 0.061 to 0.235, with one primary sample and the duplicate at concentrations above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 18 and on Figure 19 (Appendix A).

### *Sediment*

One sediment sample (CHRTN04-004-SD-001) was collected from AFFF Area 4. PFBS and PFOA were not detected. PFOS was detected at 7.0 µg/kg, below the calculated RSL of 126 µg/kg. The sediment analytical results are shown in Table 19 and on Figure 18 (Appendix A).

**Table 18 2005 Private Plane Crash Area AFFF Area 4 Groundwater Analytical Results**

	Sample ID	CHRTN04-001-GW-013	CHRTN04-002-GW-013	CHRTN04-002-GW-913 (dup)	CHRTN04-003-GW-013
	Depth (feet)	13	13	13	13
	Sample Date	2/9/17	2/9/17	2/9/17	2/9/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.013 J</b>	<b>0.032</b>	<b>0.029</b>	0.0070 U
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.017 J</b>	<b>0.025</b>	<b>0.024</b>	0.014 U
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.044</b>	<b>0.21</b>	<b>0.18</b>	0.010 U
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.061 J</b>	<b>0.235</b>	<b>0.204</b>	ND

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

GW = groundwater

ND = not detected

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

**Table 19 2005 Private Plane Crash Area AFFF Area 4 Sediment Analytical Results**

	Sample ID	CHRTN04-004-SD-001
	Depth (feet)	<b>0 - 0.5</b>
	Sample Date	2/9/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.92 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.46 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>7.0</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SD = sediment

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

### Surface Water

A surface water sample (CHRTN04-004-SW-001) was co-located with the sediment sample. PFBS was detected at an estimated concentration of 0.015 µg/L, below the RSL of 40 µg/L. PFOA was detected at a

concentration of 0.040 µg/L, below the EPA HA of 0.07 µg/L. PFOS was detected at a concentration of 0.30 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration detected was 0.34 µg/L, above the EPA HA of 0.07 µg/L. Surface water analytical results are shown in Table 20 and on Figure 19 (Appendix A).

**Table 20 2005 Private Plane Crash Area AFFF Area 4 Surface Water Analytical Results**

	Sample ID	CHRTN04-004-SW-001
	Sample Date	2/9/17
Analyte	Screening Level (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.015 J</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.040</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.30</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.34</b>

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup>EPA, May 2016a. “Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)” and EPA, May 2016b. “Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA).”

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SW = surface water

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

### 3.6.5 Conclusions

Three primary and one duplicate surface soil samples, three primary and one duplicate subsurface soil samples, three primary and one duplicate groundwater samples, one sediment sample, and one surface water sample were collected from AFFF Area 4. PFOA and PFOS were detected in the surface soil, and PFOS was detected in the sediment sample; however, all concentrations were below RSLs. PFBS, PFOA, and PFOS were detected in two primary and one duplicate groundwater samples and in the surface water sample. PFOS and the combined concentrations of PFOA and PFOS exceeded the EPA HA in one primary and the duplicate groundwater sample and in the surface water sample. Therefore, concentrations of PFAS above screening levels in the soil and sediment have not been confirmed at AFFF Area 4; however, concentrations of PFAS above screening levels in the groundwater and surface water have been confirmed at AFFF Area 4.

## 3.7 OUTFALL 003 – AFFF AREA 5

### 3.7.1 Sample Locations

To assess possible releases of PFAS at AFFF Area 5, one boring was installed south of the canal on February 7, 2017. A grab groundwater sample was collected from a SP-16 sampler screen set at the uppermost saturated zone of 6 to 10 feet bgs. A sediment sample and surface water sample were collected from Outfall 003. The sample locations are shown on Figure 12 (Appendix A).

### 3.7.2 Lithology

The lithology at the AFFF Area 5 (from ground surface) generally consists of silt-silty clay (USCS – OL), silty sand (USCS – SM), and sandy clay (USCS – CL). The surficial water table was observed in the soil

at approximately 3.5 feet bgs. The boring was terminated within the Quaternary Terrace deposit of the surficial aquifer. A detailed boring log is included in Appendix B.

### 3.7.3 Groundwater Flow

On February 7, 2017, one groundwater sample was collected using an SP-16 sampler; therefore, groundwater flow direction was not determined for AFFF Area 5. Historical groundwater flow direction was estimated to the southeast (Halliburton, June 1995). Groundwater was observed in the soil during drilling at approximately 3.5 feet bgs.

### 3.7.4 Analytical Results

#### *Groundwater*

One groundwater sample (CHRTN05-002-GW-008) was collected from AFFF Area 5. PFBS was estimated at 0.0052 µg/L, below the RSL of 40 µg/L. PFOA was detected at an estimated 0.0072 µg/L, and PFOS was detected at an estimated 0.014 µg/L. The estimated combined PFOA and PFOS concentration was 0.0212 µg/L. PFOA, PFOS, and combined PFOA and PFOS were below the EPA of HA 0.07 µg/L. Groundwater analytical results are shown in Table 21 and on Figure 16 (Appendix A).

**Table 21 Outfall 003 Area 5 Groundwater Analytical Results**

	<b>Sample ID</b>	<b>CHRTN05-002-GW-008</b>
	<b>Depth (feet)</b>	<b>8</b>
	<b>Sample Date</b>	<b>2/7/17</b>
<b>Analyte</b>	<b>Screening Level (µg/L)</b>	<b>Result (µg/L)</b>
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.0052 J</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.0072 J</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.014 J</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.0212 J</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

GW = groundwater

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

#### *Sediment*

One sediment sample (CHRTN05-001-SD-001) was collected from AFFF Area 5. PFBS and PFOA were not detected. PFOS was detected at an estimated 0.84 µg/kg, below the calculated RSL of 126 µg/kg. Sediment analytical results are shown in Table 22 and on Figure 15 (Appendix A).

#### *Surface Water*

One surface water sample (CHRTN05-001-SW-001) was co-located with the sediment sample. PFBS was detected at 0.065 µg/L, below the RSL of the 40 µg/L. PFOA was detected at 0.041 µg/L, below the EPA HA of 0.07 µg/L. PFOS was detected at 0.82 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.861 µg/L, above the EPA HA of 0.07 µg/L. Surface water analytical results are shown in Table 23 and on Figure 16 (Appendix A).



**Table 22 Outfall 003 AFFF Area 5 Sediment Analytical Results**

	Sample ID	CHRTN05-001-SD-001
	Depth (feet)	0 - 0.5
	Sample Date	2/7/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.48 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.24 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>0.84 J</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SD = sediment

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit.

**Table 23 Outfall 003 AFFF Area 5 Surface Water Analytical Results**

	Sample ID	CHRTN05-001-SW-001
	Sample Date	2/7/17
Analyte	Screening Level (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.065</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.041</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.82</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.861</b>

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Charleston

ID = identification

SW = surface water

### 3.7.5 Conclusions

One groundwater sample, one sediment sample, and one surface water sample were collected from AFFF Area 6. PFOS was detected below the calculated RSL in the sediment sample. PFBS, PFOA, and PFOS were detected in the groundwater sample and surface water sample. PFOS and the combined concentration of PFOA and PFOS were above the EPA HA of 0.07 µg/L in the surface water sample. Therefore, concentrations of PFAS above screening levels in the groundwater and sediment have not been confirmed at AFFF Area 5; however, concentrations of PFAS above screening levels in the surface water have been confirmed at AFFF Area 5.

### **3.8 NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

#### **3.8.1 Sample Locations**

To assess possible releases of PFAS at AFFF Area 6, two borings with temporary wells were installed in the low-lying area with stormwater swales northwest of the fire station; staining in the area showed that water pools during storms. A third boring and temporary well were installed in the grass southwest of the fire station apron, between the vehicle bays and the wash rack. The temporary wells were screened near the top of the uppermost saturated zone with total depths ranging from 30 to 35 feet bgs, and they were constructed with 10-foot long, prepacked screens. Surface soil, subsurface soil, and groundwater samples were collected from each location. One sediment and one surface water sample were collected from the drainage ditch northwest of the building. The sample locations are shown on Figure 20.

#### **3.8.2 Lithology**

The lithology at AFFF Area 6 (from ground surface) generally consists of silt-silty clay (USCS – OL), silty sand (USCS – SM), sandy clay (USCS – CL), and sand (USCS – SW). The surficial water table was observed in the soil between approximately 25.5 and 30.5 feet bgs. All borings were terminated within the Cretaceous age-Orangeburg Group aquifer. Detailed boring logs are included in Appendix B.

#### **3.8.3 Groundwater Flow**

Based on water levels from the temporary wells gauged on February 4, 2017, the uppermost water-bearing zone in AFFF Area 6 ranged from 272.39 feet to 272.73 feet amsl as summarized in Appendix E. Shallow groundwater flowed southeast as shown on Figure 20 (Appendix A).

#### **3.8.4 Analytical Results**

##### *Surface Soil*

Three surface soil samples (CHRTN06-001-SS-001, CHRTN06-002-SS-001, and CHRTN06-003-SS-001) were collected at AFFF Area 6 at 6 inches bgs. PFBS was detected in one sample at an estimated concentration of 0.44 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all three samples at concentrations ranging from an estimated 0.58 µg/kg to 1.8 µg/kg below the calculated RSL of 126 µg/kg. PFOS was detected in all three samples at concentrations ranging from 13 µg/kg to 200 µg/kg with the concentration in CHRTN06-003-SS-001 (200 µg/kg) above the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 24 and on Figure 21 (Appendix A).

##### *Subsurface Soil*

Three subsurface soil samples (CHRTN06-001-SO-025, CHRTN06-002-SO-024, and CHRTN06-003-SO-029) were collected at AFFF Area 6 from 24 feet to 29 feet bgs. PFBS was detected in two samples at concentrations of an estimated 0.42 µg/kg and 2.0 µg/kg, below the EPA RSL of 130,000 µg/kg. PFOA was detected in one sample at an estimated concentration of 0.64 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all three samples at concentrations ranging from 6.0 µg/kg to 17 µg/kg, below the calculated RSL of 126 µg/kg. Subsurface soil analytical results are shown in Table 25 and on Figure 21 (Appendix A).

**Table 24 North Auxiliary Airfield Fire Station AFFF Area 6 Surface Soil Analytical Results**

	Sample ID	CHRTN06-001-SS-001	CHRTN06-002-SS-001	CHRTN06-003-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/3/17	2/3/17	2/3/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	<b>0.44 J</b>	0.38 U	0.40 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>0.58 J</b>	<b>0.71 J</b>	<b>1.8</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>19</b>	<b>13</b>	<b>200</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SS = surface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

**Table 25 North Auxiliary Airfield Fire Station AFFF Area 6 Subsurface Soil Analytical Results**

	Sample ID	CHRTN06-001-SO-025	CHRTN06-002-SO-024	CHRTN06-003-SO-029
	Depth (feet)	24 - 25	23 - 24	28 - 29
	Sample Date	2/3/17	2/3/17	2/3/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	<b>2.0</b>	<b>0.42 J</b>	0.40 UJ
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>0.64 J</b>	0.20 U	0.20 UJ
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>17</b>	<b>6.0</b>	<b>6.4</b>

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup> EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SO = subsurface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

UJ = The analyte was not detected at the reported value. The reported value is approximate.

### Soil Physiochemical Analyses

To provide basic soil parameter information, composite surface (CHRTN06-005-SS-001) and subsurface (CHRTN06-005-SO-027) soil samples were collected at AFFF Area 6. The samples were submitted for analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.

### Groundwater

Three groundwater samples (CHRTN06-001-GW-025, CHRTN06-002-GW-025, and CHRTN06-003-GW-030) were collected from AFFF Area 6. PFBS was detected in all three samples at concentrations ranging from 0.13 µg/L to 13 µg/L, below the RSL of 40 µg/L. PFOA was detected in all three samples at concentrations ranging from 0.10 µg/L to 2.6 µg/L, above the EPA HA of 0.07 µg/L. PFOS was detected in all three samples at concentrations ranging from 1.7 µg/L to 85 µg/L, above the EPA HA of 0.07 µg/L.

The combined PFOA and PFOS concentration ranged from 1.84 µg/L to 87.6 µg/L, all above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 26 and on Figure 22 (Appendix A).

**Table 26 North Auxiliary Airfield Fire Station AFFF Area 6 Groundwater Analytical Results**

	Sample ID	CHRTN06-001-GW-025	CHRTN06-002-GW-025	CHRTN06-003-GW-030
	Depth (feet)	25	25	30
	Sample Date	2/4/17	2/4/17	2/4/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	13	0.60	0.13
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	2.6	0.14	0.10
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	85	1.7	3.5
PFOA + PFOS	0.07 <sup>c</sup>	87.6	1.84	3.6

Bold values indicate analyte detected at concentration indicated. Shaded cells indicate analyte detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> EPA, May 2016a. “Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)” and EPA, May 2016b. “Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA).”

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

GW = groundwater

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

#### *Sediment*

One sediment sample (CHRTN06-004-SD-001) was collected from AFFF Area 6. PFBS was detected at an estimated concentration of 0.46 µg/kg, below the RSL of 130,000 µg/kg. PFOA was not detected. PFOS was detected at a concentration of 7.4 µg/kg, below the calculated RSL of 126 µg/kg. Sediment analytical results are shown in Table 27 and on Figure 21 (Appendix A).

**Table 27 North Auxiliary Airfield Fire Station AFFF Area 6 Sediment Analytical Results**

	Sample ID	CHRTN06-004-SD-001
	Depth (feet)	0 - 0.5
	Sample Date	2/3/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.46 J
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.22 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	7.4

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA Regional Screening Level Calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SD = sediment

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

### Surface Water

One surface water sample (CHRTN06-004-SW-001) was co-located with the sediment sample. PFBS was detected at 0.021 µg/L, below the RSL of 40 µg/L. PFOA was detected at 0.023 µg/L, below the EPA HA of 0.07 µg/L. PFOS was detected at 0.43 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.453 µg/L, above the EPA HA of 0.07 µg/L. Surface water analytical results are shown in Table 28 and on Figure 22 (Appendix A).

**Table 28 North Auxiliary Airfield Fire Station AFFF Area 6 Surface Water Analytical Results**

	Sample ID	CHRTN06-004-SW-001
	Sample Date	2/3/17
Analyte	Screening Level (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.021</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.023</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.43</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.453</b>

Bold values indicate analyte was detected at concentration indicated.

Shaded cells indicate analyte was detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SW = surface water

### 3.8.5 Conclusions

Three surface soil samples, three subsurface soil samples, three groundwater samples, one sediment sample, and one surface water sample were collected from AFFF Area 6. PFBS, PFOA, and PFOS were detected in the surface soil and subsurface soil samples; the concentration of PFOS in one surface soil sample was above the calculated RSL. PFBS and PFOS were detected in the sediment sample at concentrations below the RSLs. PFBS, PFOA, and PFOS were detected in the groundwater and surface water samples. PFOA, PFOS, and the combined PFOA and PFOS concentrations were above the EPA HA in all groundwater samples. PFOS and the combined PFOA and PFOS concentrations were above the EPA HA in the surface water sample. Therefore, concentrations of PFAS above screening levels in the subsurface soil and sediment have not been confirmed at AFFF Area 6; however, concentrations of PFAS above screening levels in the surface soil, groundwater, and surface water have been confirmed at AFFF Area 6.

## 3.9 NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7

### 3.9.1 Sample Locations

To assess possible releases of PFAS at AFFF Area 7, two borings with temporary wells were installed north and south of the service road in the stormwater swale northeast of the pump house and AST #7 on February 3 and 4, 2017. A third boring and temporary well were installed south of the pump house on the north side of the service road. The temporary wells were screened near the top of the uppermost saturated zone with total depths of 55 feet bgs and constructed with 10-foot long, prepacked screens. Surface soil,

subsurface soil, and groundwater samples were collected from all three locations. No surface water bodies were in the immediate vicinity of the area. The sample locations are shown on Figure 23.

### 3.9.2 Lithology

The lithology at the AFFF Area 7 (from ground surface) generally consists of silty sand (USCS – SM), sandy clay (USCS – CL), and sand (USCS – SP and SW). The surficial water table was observed in the soil between approximately 38 and 39.5 feet bgs. All borings were terminated within the Cretaceous age-Orangeburg Group aquifer. Detailed boring logs are included in Appendix B.

### 3.9.3 Groundwater Flow

Based on water levels from the temporary wells gauged on February 4, 2017, the uppermost water-bearing zone in AFFF Area 7 ranged from 275.45 feet to 275.88 feet amsl as summarized in Appendix E. Shallow groundwater flowed southeast as shown on Figure 23 (Appendix A).

### 3.9.4 Analytical Results

#### *Surface Soil*

Three surface soil samples (CHRTN07-001-SS-001, CHRTN07-002-SS-001, and CHRTN07-003-SS-001) were collected at AFFF Area 7 at 6 inches bgs. PFBS was detected in one sample at an estimated concentration of 0.77 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all three samples at concentrations ranging from an estimated 0.75 µg/kg to 1.3 µg/kg. PFOS was detected in all three samples at concentrations ranging from 10 µg/kg to 100 µg/kg, below the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 29 and on Figure 25 (Appendix A).

**Table 29 North Auxiliary Airfield Pump House – Foam Truck Flush Area AFFF Area 7  
Surface Soil Analytical Results**

	Sample ID	CHRTN07-001-SS-001	CHRTN07-002-SS-001	CHRTN07-003-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/3/17	2/4/17	2/4/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.44 U	0.44 U	<b>0.77 J</b>
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>1.1</b>	<b>0.75 J</b>	<b>1.3 J</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>10</b>	<b>40</b>	<b>100</b>

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SS = surface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

### Subsurface Soil

Three subsurface soil samples (CHRTN07-001-SO-038, CHRTN07-002-SO-038, and CHRTN07-003-SO-037) were collected at AFFF Area 7 from 36 to 38 feet bgs. PFBS was detected in one sample at 1.7 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in all three samples at estimated concentrations ranging from 0.11 µg/kg to 0.85 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all samples at concentrations ranging from 1.6 µg/kg to 26 µg/kg, below the calculated RSL of 126 µg/kg. Subsurface soil analytical results are shown in Table 30 and on Figure 24 (Appendix A).

**Table 30 North Auxiliary Airfield Pump House – Foam Truck Flush Area AFFF Area 7  
Subsurface Soil Analytical Results**

	Sample ID	CHRTN07-001-SO-038	CHRTN07-002-SO-038	CHRTN07-003-SO-037
	Depth (feet)	37 – 38	37 - 38	36 – 37
	Sample Date	2/3/17	2/4/17	2/4/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.40 U	0.38 U	1.7
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	<b>0.28 J</b>	<b>0.11 J</b>	<b>0.85 J</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>26</b>	<b>1.6</b>	<b>25</b>

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA Regional Screening Level Calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SO = subsurface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

### Soil Physiochemical Analyses

To provide basic soil parameter information, composite surface (CHRTN07-004-SS-001) and subsurface (CHRTN07-004-SO-039) soil samples were collected at AFFF Area 7. The samples were submitted for analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.

### Groundwater

Three groundwater samples (CHRTN07-001-GW-040, CHRTN07-002-GW-040, and CHRTN07-003-GW-040) were collected from temporary wells at AFFF Area 7. PFBS was detected in all three samples at concentrations ranging from an estimated 0.014 µg/L to 1.2 µg/L, all below the RSL of 40 µg/L. PFOA was detected in all three samples at concentrations ranging from an estimated 0.012 µg/L to 0.50 µg/L; one sample was above the EPA HA of 0.07 µg/L. PFOS was detected in all three samples at concentrations ranging from 0.062 µg/L to 3.4 µg/L; two samples were above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations ranged from 0.074 µg/L to 3.9 µg/L, all above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 31 and on Figure 25 (Appendix A).

## 3.9.5 Conclusions

Three surface soil samples, three subsurface soil samples, and three groundwater samples were collected from AFFF Area 7. PFBS, PFOA, and PFOS were in the surface soil and subsurface soil samples; however, all concentrations were below RSLs. PFBS, PFOA, and PFOS were in the groundwater

samples. PFOA was above the EPA HA in one sample, and PFOS was above the EPA HA in two samples. The combined PFOA and PFOS concentrations exceeded the EPA HA in all three samples. Therefore, concentrations of PFAS above screening levels in the soil have not been confirmed at AFFF Area 7; however, concentrations of PFAS above screening levels in the groundwater have been confirmed at AFFF Area 7.

**Table 31 North Auxiliary Airfield Pump House – Foam Truck Flush Area AFFF Area 7  
Groundwater Analytical Results**

	Sample ID	CHRTN07-001-GW-040	CHRTN07-002-GW-040	CHRTN07-003-GW-040
	Depth (feet)	40	40	40
	Sample Date	2/4/17	2/5/17	2/4/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	0.11	0.014 J	1.2
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	0.012 J	0.027	0.50
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	0.062	0.13	3.4
PFOA + PFOS	0.07 <sup>c</sup>	0.074 J	0.157	3.9

Bold values indicate analyte detected at concentration indicated. Shaded cells indicate analyte detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> EPA, May 2016a. “Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)” and EPA, May 2016b. “Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA).”

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

GW = groundwater

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

### 3.10 NORTH AUXILIARY AIRFIELD FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8

#### 3.10.1 Sample Locations

To assess possible releases of PFAS at AFFF Area 8, three borings were installed on February 4 and 5, 2017. One was installed inside the tree line to the north in the location of the former pond, one was installed next to the stormwater pond to the south of the former runways, and the third was installed to the west of the former north/south runway, east of the first two borings. Surface soil, subsurface soil, and groundwater samples were collected from all three locations. A surface water sample and sediment sample were collected from the stormwater pond. Sample locations are shown on Figure 26 (Appendix A).

#### 3.10.2 Lithology

The lithology at AFFF Area 8 (from ground surface) generally consists of silty sand (USCS – SM), silty clay (USCS – CL), and sand (USCS – SP). The surficial water table was observed in the soil between approximately 51 and 56.5 feet bgs. All borings were terminated within the Cretaceous age-Orangeburg Group aquifer. Detailed boring logs are included in Appendix B.



### 3.10.3 Groundwater Flow

Based on water levels from the temporary wells gauged on February 5, 2017, the uppermost water-bearing zone in AFFF Area 8 ranged from 211.23 feet to 211.92 feet amsl as summarized in Appendix E. Shallow groundwater flowed southwest as shown on Figure 26 (Appendix A).

### 3.10.4 Analytical Results

#### *Surface Soil*

Three primary surface soil samples (CHRTN08-001-SS-001, CHRTN08-002-SS-001, and CHRTN08-003-SS-001) and one duplicate surface soil sample (CHRTN08-003-SS-901) were collected at AFFF Area 8 at 6 inches bgs. PFBS was not detected in any of the samples. PFOA was detected in one sample at 0.94 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all three primary samples and the duplicate at concentrations ranging from 2.6 µg/kg to 480 µg/kg, with the concentrations in CHRTN08-003-SS-001 (470 µg/kg) and the duplicate (480 µg/kg) above the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 32 and on Figure 27 (Appendix A).

**Table 32 North Auxiliary Airfield Foam Test Area and Old C-141 (Training) AFFF Area 8  
Surface Soil Analytical Results**

	Sample ID	CHRTN08-001-SS-001	CHRTN08-002-SS-001	CHRTN08-003-SS-001	CHRTN08-003-SS-901 (dup)
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/4/17	2/5/17	2/5/17	2/5/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.40 U	0.36 U	4.0 U	4.0 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.20 U	<b>0.94</b>	2.0 U	2.0 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>2.6</b>	<b>36</b>	<b>470</b>	<b>480</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

dup = duplicate

AFFF = aqueous film forming foam

ID = identification

CHRTN = Joint Base Charleston

SS = surface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit.

#### *Subsurface Soil*

Three primary subsurface soil samples (CHRTN08-001-OS-053, CHRTN08-002-SO-050, and CHRTN08-003-OS-055) and one duplicate subsurface soil sample (CHRTN08-003-SO-955) were collected at AFFF Area 8 from 50 to 55 feet bgs. PFBS was detected in two primary samples and the duplicate at estimated concentrations from 0.37 µg/kg to 3.6 µg/kg, below the RSL of 130,000 µg/kg. PFOA was detected in one primary sample and the duplicate at estimated concentrations of 0.29 µg/kg and 0.58 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in two primary samples and the duplicate at concentrations ranging from an estimated 1.7 µg/kg to 22 µg/kg, below the calculated

RSL of 126 µg/kg. Subsurface soil analytical results are shown in Table 33 and on Figure 27 (Appendix A).

**Table 33 North Auxiliary Airfield Foam Test Area and Old C-141 (Training) AFFF Area 8  
Subsurface Soil Analytical Results**

	Sample ID	CHRTN08-001-SO-053	CHRTN08-002-SO-050	CHRTN08-003-SO-055	CHRTN08-003-SO-955 (dup)
	Depth (feet)	52 - 53	49 - 50	54 - 55	54 - 55
	Sample Date	2/4/17	2/5/17	2/5/17	2/5/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.39 U	<b>0.37 J</b>	<b>3.6 J</b>	<b>2.0 J</b>
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.19 U	0.19 U	<b>0.58 J</b>	<b>0.29 J</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	0.39 U	<b>22</b>	<b>4.5 J</b>	<b>1.7 J</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

ID = identification

SO = subsurface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit.

### *Soil Physiochemical Analyses*

To provide basic soil parameter information, composite surface (CHRTN08-005-SS-001) and subsurface (CHRTN08-005-SO-053) soil samples were collected at AFFF Area 8. The samples were submitted for analysis of pH, TOC, percent solids, and grainsize. The physiochemical laboratory data sheets and summary table are included in Appendix D.

### *Groundwater*

Three primary groundwater samples (CHRTN08-001-GW-055, CHRTN08-002-GW-050, and CHRTN08-003-GW-055) and one duplicate sample (CHRTN08-002-GW-950) were collected at AFFF Area 8. PFBS was detected in all three primary samples and the duplicate at concentrations from 0.033 µg/L to 4.2 µg/L, all below the RSL of 40 µg/L. PFOA was detected in two primary samples and the duplicate at concentrations ranging from 0.21 µg/L to 0.96 µg/L, all above the EPA HA of 0.07 µg/L. PFOS was detected in all three primary samples and the duplicate at concentrations from an estimated 0.0064 µg/L to 6.8 µg/L; two primary samples and the duplicate were above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations ranged from 0.0064 µg/L to 7.02 µg/L; two primary samples and the duplicate were above the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 34 and on Figure 28 (Appendix A).

### *Sediment*

One sediment sample (CHRTN08-004-SD-001) was collected from AFFF Area 8. PFBS and PFOA were not detected. PFOS was detected at 5.7 µg/kg, below the calculated RSL of 126 µg/kg. Sediment analytical results are summarized in Table 35 and shown on Figure 27 (Appendix A).

**Table 34 North Auxiliary Airfield Foam Test Area and Old C-141 (Training) AFFF Area 8  
Groundwater Analytical Results**

	Sample ID	CHRTN08-001-GW-055	CHRTN08-002-GW-050	CHRTN08-002-GW-950 (dup)	CHRTN08-003-GW-055
	Depth (ft)	55	50	50	55
	Sample Date	2/5/17	2/5/17	2/5/17	2/5/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	0.033	0.75	0.68	4.2
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	0.014 U	0.22	0.21	0.96
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	0.0064 J	6.8	5.1	4.0
PFOA + PFOS	0.07 <sup>c</sup>	0.0064 J	7.02	5.31	4.96

Bold values indicate analyte detected at concentration indicated. Shaded cells indicate analyte detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

dup = duplicate

GW = groundwater

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

**Table 35 North Auxiliary Airfield Foam Test Area and Old C-141 (Training)  
AFFF Area 8 Sediment Analytical Results**

	Sample ID	CHRTN08-004-SD-001
	Depth (feet)	0 - 0.5
	Sample Date	2/3/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.48 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.24 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	5.7

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csI\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csI_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SD = sediment

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was not detected above the reported sample quantification limit.

### Surface Water

One surface water sample (CHRTN08-004-SW-001) was co-located with the sediment sample. PFBS was detected at an estimated 0.013 µg/L, below the RSL of 40 µg/L. PFOA was detected at 0.025 µg/L, below the EPA HA of 0.07 µg/L. PFOS was detected at 0.38 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.405 µg/L, above the EPA HA of 0.07 µg/L. Surface water analytical results are shown in Table 36 and on Figure 28 (Appendix A).

**Table 36 North Auxiliary Airfield Foam Test Area and Old C-141 (Training)  
AFFF Area 8 Surface Water Analytical Results**

	Sample ID	CHRTN08-004-SW-001
	Sample Date	2/3/17
Analyte	Screening Level (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.013 J</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	<b>0.025</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.38</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.405</b>

Bold values indicate analyte detected at concentration indicated. Shaded cells indicate analyte detected above screening level.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>).

<sup>b</sup>EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SW = surface water

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit.

### 3.10.5 Conclusions

Three primary and one duplicate surface soil samples, three primary and one duplicate subsurface soil samples, three primary and one duplicate groundwater samples, one sediment sample, and one surface water sample were collected from AFFF Area 8. PFBS was detected in the subsurface soil samples and PFOA was detected in surface and subsurface soil samples at concentrations below the RSLs. PFOS was detected in surface soil, subsurface soil, and sediment samples, with the concentrations in one surface soil sample and the duplicate above the calculated RSL of 126 µg/kg. PFBS, PFOA, and PFOS were detected in the groundwater and surface water samples. PFOA was above the EPA HA of 0.07 µg/L in two primary groundwater samples and the duplicate. PFOS was above the EPA HA of 0.07 µg/L in two primary groundwater samples, the duplicate sample, and the surface water sample. The combined PFOA and PFOS concentration was above the EPA HA of 0.07 µg/L in two primary groundwater samples, the duplicate, and the surface water sample. Therefore, concentrations of PFAS above screening levels in the subsurface soil and sediment have not been confirmed at AFFF Area 8; however, concentrations of PFAS above screening levels in the surface soil, groundwater, and surface water have been confirmed at AFFF Area 8.

### **3.11 FT010 (NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

#### **3.11.1 Sample Locations**

To assess possible releases of PFAS at Area 9, three borings were installed in a triangle within the footprint of the former FTA on February 5 and 6, 2017. Surface soil, subsurface soil, and groundwater samples were collected from all three locations. No surface water bodies were in the immediate vicinity of the site. The sample locations are shown on Figure 29 (Appendix A).

#### **3.11.2 Lithology**

The lithology at AFFF Area 9 (from ground surface) generally consists of silt (USCS – OL), silty sand (USCS – SM), sand (USCS – SP), sandy clay (USCS – CL), and clayey sand (USCS – SC). The surficial water table was observed in the soil between approximately 19.5 and 26 feet bgs. All borings were terminated within the Cretaceous age-Orangeburg Group aquifer. Detailed boring logs are included in Appendix B.

#### **3.11.3 Groundwater Flow**

Based on water levels from the temporary wells gauged on February 6, 2017, the uppermost water-bearing zone in AFFF Area 9 was detected at elevations ranging from 275.64 feet to 269.39 feet amsl as summarized in Appendix E. Shallow groundwater flowed northeast as shown on Figure 29 (Appendix A).

#### **3.11.4 Analytical Results**

##### *Surface Soil*

Three surface soil samples (CHRTN09-001-SS-001, CHRTN09-002-SS-001, and CHRTN09-003-SS-001) were collected from AFFF Area 9 at 6 inches bgs. PFBS was not detected in any samples. PFOA was detected in one sample at an estimated concentration of 0.18 µg/kg, below the calculated RSL of 126 µg/kg. PFOS was detected in all three samples at concentrations ranging from an estimated 0.32 µg/kg to 1.8 µg/kg, below the calculated RSL of 126 µg/kg. Surface soil analytical results are shown in Table 37 and on Figure 30 (Appendix A).

##### *Subsurface Soil*

Three subsurface soil samples (CHRTN09-001-SO-025, CHRTN09-002-SO-020, and CHRTN09-003-SO-018) were collected from AFFF Area 9 from 17 to 25 feet bgs. PFBS, PFOA, and PFOS were not detected. Subsurface soil analytical results are shown in Table 38 and on Figure 30 (Appendix A).

##### *Soil Physiochemical Analyses*

To provide basic soil parameter information, composite surface (CHRTN09-004-SS-001) and subsurface (CHRTN09-004-SO-023) soil samples were collected at AFFF Area 9. The samples were submitted for analysis of pH, TOC, percent solids, and grain size. The physiochemical laboratory data sheets and summary table are included in Appendix D.

**Table 37 FT010 (North Auxiliary Airfield Fire Training Area) AFFF Area 9  
Surface Soil Analytical Results**

	Sample ID	CHRTN09-001-SS-001	CHRTN09-002-SS-001	CHRTN09-003-SS-001
	Depth (feet)	0 - 0.5	0 - 0.5	0 - 0.5
	Sample Date	2/5/17	2/6/17	2/6/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.37 U	0.35 U	0.35 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.19 U	0.17 U	<b>0.18 J</b>
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	<b>1.8</b>	<b>0.32 J</b>	<b>1.0</b>

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SS = surface soil

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

**Table 38 FT010 (North Auxiliary Airfield Fire Training Area) AFFF Area 9  
Subsurface Soil Analytical Results**

	Sample ID	CHRTN09-001-SO-025	CHRTN09-002-SO-020	CHRTN09-003-SO-018
	Depth (feet)	24 - 25	19 - 20	17 - 18
	Sample Date	2/6/17	2/6/17	2/6/17
Analyte	Screening Level (µg/kg)	Result (µg/kg)	Result (µg/kg)	Result (µg/kg)
Perfluorobutane sulfonate (PFBS)	130,000 <sup>a</sup>	0.40 U	0.44 U	0.48 U
Perfluorooctanoic acid (PFOA)	126 <sup>b</sup>	0.20 U	0.22 U	0.24 U
Perfluorooctane sulfonate (PFOS)	126 <sup>b</sup>	0.40 U	0.44 U	0.48 U

Bold values indicate analyte was detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Levels for Residential Soil (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> Screening levels were calculated using the EPA regional screening level Calculator ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)). The RSL calculations are presented in Appendix F.

µg/kg = micrograms per kilograms

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

ID = identification

SO = subsurface soil

U = The analyte was not detected above the reported sample quantification limit.

### Groundwater

Three groundwater samples (CHRTN09-001-GW-025, CHRTN09-002-GW-023, and CHRTN09-003-GW-025) were collected from AFFF Area 9. PFBS was in two samples at estimated concentrations of 0.0071 µg/L and 0.0073 µg/L, both below the RSL of 40 µg/L. PFOA was in one sample at an estimated concentration of 0.013 µg/L, below the EPA HA of 0.07 µg/L. PFOS was in all samples at concentrations ranging from an estimated 0.0052 µg/L to 0.043 µg/L, all below the EPA HA of 0.07 µg/L. The combined estimated PFOA and PFOS concentration ranged from an 0.0052 µg/L to 0.056 µg/L, all below the EPA HA of 0.07 µg/L. Groundwater analytical results are shown in Table 39 and on Figure 31 (Appendix A).

**Table 39 FT010 (North Auxiliary Airfield Fire Training Area) AFFF Area 9  
Groundwater Analytical Results**

	Sample ID	CHRTN09-001-GW-025	CHRTN09-002-GW-023	CHRTN09-003-GW-025
	Depth (feet)	25	23	25
	Sample Date	2/6/17	2/6/17	2/6/17
Analyte	Screening Level (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)
Perfluorobutane sulfonate (PFBS)	40 <sup>a</sup>	<b>0.0073 J</b>	0.0070 U	<b>0.0071 J</b>
Perfluorooctanoic acid (PFOA)	0.07 <sup>b</sup>	0.014 U	0.014 U	<b>0.013 J</b>
Perfluorooctane sulfonate (PFOS)	0.07 <sup>b</sup>	<b>0.0052 J</b>	<b>0.0099 J</b>	<b>0.043</b>
PFOA + PFOS	0.07 <sup>c</sup>	<b>0.0052 J</b>	<b>0.0099 J</b>	<b>0.056 J</b>

Bold values indicate analyte detected at concentration indicated.

<sup>a</sup>EPA Regional Screening Level for tap water (November 2017) (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-November-2017>)

<sup>b</sup> EPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and EPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

<sup>c</sup>EPA recommends comparing the combined analytical results for PFOA and PFOS when both are present.

µg/L = micrograms per liter

AFFF = aqueous film forming foam

CHRTN = Joint Base Charleston

GW = groundwater

ID = identification

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

U = The analyte was not detected above the reported sample quantification limit

### 3.11.5 Conclusions

Three surface soil samples, three subsurface soil samples, and three groundwater samples were collected from AFFF Area 9. PFBS was not in any of the soil samples. PFOA and PFOS were in the surface soil samples at concentrations below RSLs. Subsurface soil did not show any concentrations above laboratory detection limits. PFBS, PFOA, PFOS, and combined PFOA and PFOS were in the groundwater samples at concentrations below screening levels. Therefore, concentrations of PFAS above screening levels in the soil and groundwater have not been confirmed at AFFF Area 9.

### 3.12 INVESTIGATION-DERIVED WASTE

The USAF has awarded a separate contract to others for the removal and proper disposal of soil and water investigation-derived waste generated during this SI. Waste soil and water were placed in Department of Transportation-approved steel drums (three drums of soil and two drums of water). The drums at JBCA are staged near Buildings B692 and B697, and drums at NAAF are staged near the Fire Station. A representative sample was collected from each media, submitted to CT Laboratories, and analyzed for PFAS, total petroleum hydrocarbons, toxicity (using the Toxicity Characteristic Leaching Procedure [TCLP] for the full TCLP list of analytes), flashpoint, pH, cyanide, and sulfide. These analytical results have been submitted to the USAF electronically.

Construction waste – such as paper, plastic, trash, and personal protective equipment – was placed in plastic garbage bags and placed in an on-site dumpster for disposal

#### 4.0 GROUNDWATER PATHWAY

JBCA is approximately 16 miles northwest of Charleston Harbor and the Atlantic Ocean in the Lower Atlantic Coastal Plain physiographic province. NAAF is approximately 85 miles northwest of JBCA in the Upper Atlantic Coastal Plain physiographic province. The Coastal Plain physiographic province of South Carolina consists of a wedge of sediments that thicken from the Fall Line (a geomorphic region commonly found along the eastern coast of the United States, where an abrupt change in stream gradient results in waterfalls and/or rapids), near the middle of the state, to the coast. Near Charleston, the sediment is more than 3,000 feet thick. The topography of the Base is nearly flat. Surface elevations range from 15 feet amsl along the southern edge of the Base to 45 feet amsl at the northern edge of the Base (Halliburton, June 1995).

The underlying sedimentary rocks and unconsolidated sediments are of Tertiary and Quaternary Age. A thin veneer of Holocene/ Pleistocene beach deposits overlies the deeper Tertiary Age rocks that are underlain in turn by the Cretaceous Age basement rocks of the Coastal Plain. High-energy depositional environments – such as barrier island, beach, or tidal facies – are characterized by coarse-grained or sand-dominated deposits. Relatively lower-energy depositional environments, such as marshes or mud flats, are usually associated with fine-grained, clay-dominated deposits or lithologies. Because of the fluctuations in sea level in response to glaciation and interglacial melting, these depositional environments were periodically changing, resulting in interbedded sands and clays. The shallowest Tertiary unit underlying the area is the Cooper Formation, which is approximately 40 feet bgs at JBCA and regionally serves as a confining unit in the Charleston area (Halliburton, June 1995). Figure 32 (Appendix A) presents a generalized hydrogeologic column of the JBCA area.

The shallow subsurface geology consists of sand with some silt, intermittent clay, and clay stringers of the Ladson Formation. The clay stringers often contain silt and are discontinuous across the area of interest. Clay content increases with depth, especially near the contact with the underlying Cooper Marl. The Cooper Marl is characterized by olive silt and clay with some disseminated phosphate grains and is encountered in monitoring well borings between 35 and 43 feet bgs. Shallow groundwater exists at depths of less than 10 feet bgs over most of JBCA (Halliburton, June 1995).

Joint Base Charleston has no drinking water wells. JBCA and most of Charleston County obtain their public water supply from the Charleston Commission of Public Works. The water supply system contains three upstream water intakes that are on the Edisto River (approximately 25 miles northwest of JBCA), on Goose Creek Reservoir (approximately 2 miles northeast of JBCA), and on Foster Creek (approximately 8 miles north of JBCA).

During the SI, groundwater flow at JBCA was to the west/southwest and groundwater flow at NAAF was to the southeast. As part of the SI, available well records were reviewed to determine if drinking water wells (domestic or public supply) were within 4 miles of JBCA and to determine if any of the wells are downgradient from each AFFF area. Resources used were

- the Environmental Data Resources, Inc. (EDR) report dated November 5, 2015 (included in the PA only for JBCA, not NAAF),
- the South Carolina Watershed Atlas (<https://gis.dhec.sc.gov/watersheds>),
- the South Carolina Department of Health and Environmental Control (SCDHEC) Well Inventory (<http://dnr.sc.gov/water/hydro/WellRecords/locatewells/index.html>),
- the city of Orangeburg, South Carolina, Department of Public Utilities, and
- the town of North, South Carolina, Department of Public Utilities.



SCDHEC issued the wells an identification code (County-Number ID [CO-NUM]), which has been used to identify the wells in the following discussion. The wells are in Charleston County (CHN), Dorchester County (DOR), and Orange County (ORG).

- The PA previously reported that 13 water wells were identified in the EDR report to the west/southwest (downgradient) of JBCA within 4 miles. Upon further evaluation, only six wells are used for drinking water purposes within 4 miles of JBCA. They are CHN-213, CHN-298, CHN-912, and CHN-96 to the north/northwest; DOR-366 to the west; and CHN-503 to the southwest. These permitted water wells range from 300 to 610 feet bgs, below the Cooper Formation (approximately 40 feet bgs), the confining unit in the area (CH2M Hill, January 2016).
- The city of Orangeburg, South Carolina, confirmed its main water supply is obtained from the Edisto River from intakes approximately 1.5 miles north of the water treatment plant. Orangeburg also confirmed there are two public supply wells that are used infrequently. One public water supply well is near the intersection of Neese Highway and Rivers Turn Road, and one is southeast of the intersection of Calvary Church Road and Willard Road; both are more than 7 miles southeast or southwest of NAAF.
- The town of North, South Carolina, confirmed its drinking water is obtained from public supply wells (groundwater sources) approximately 2 miles northeast (ORG-373 [Bull Swamp Rural Water Well 1]) and 2 miles northwest (ORG-252 [Town of North Well 1], ORG-359 [Town of North Well 2], and ORG-374 [Bull Swamp Rural Water Well 2]) from NAAF ranging in depth from 255 to 267 feet bgs and set within a confined aquifer. Additional wells within 4 miles of NAAF are ORG-24 to the southwest; ORG-37 and ORG-78 to the west; ORG-488 to the north; and ORG-36, ORG-39, ORG-46, ORG-86, and ORG-523 to the east. These wells range in depth from 121 to 206 feet bgs. They are also below a confining unit approximately 50 to 70 feet bgs in the area and within a confined aquifer (Gordon Aquifer).

A table summarizing the well information and maps showing the well locations is included in Appendix G. Specific groundwater pathways for each AFFF area are discussed in Sections 4.1 through 4.9. PFBS was not detected above screening levels in any groundwater samples and will not be discussed. PFOA, PFOS, and combined PFOA and PFOS were detected in the groundwater above screening levels and are discussed in Sections 4.1 through 4.9.

#### **4.1 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1**

Shallow groundwater has been impacted by use of AFFF during training exercises at AFFF Area 1. PFOA was in all three primary samples and the duplicate sample at concentrations ranging from 37 µg/L to 790 µg/L, above the EPA HA of 0.07 µg/L. PFOS was in all three primary samples and the duplicate at concentrations ranging from 54 µg/L to 360 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations in the primary samples and the duplicate ranged from 91 µg/L to 1,150 µg/L, above the EPA HA of 0.07 µg/L.

Based on water levels gauged on February 3, 2017, shallow groundwater elevations ranged from 27.29 feet to 29.16 feet amsl, and groundwater flowed to the west/southwest. However, historical groundwater flow at this AFFF area has been to the south/southwest toward the residential area.

There is no immediate threat to public water supply wells or private drinking water sources from PFOA-, PFOS-, or combined PFOA and PFOS-impacted groundwater at AFFF Area 1. JBCA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 2.5 miles north (upgradient) of AFFF Area 1. The area is a mostly wooded lot in the eastern corner of JBCA. A residential area is approximately 0.1 mile to the south and downgradient to

crossgradient from the investigation area. One drinking water supply well (CHN-503 for domestic use at 380 feet bgs) is approximately 2.75 miles southwest (down gradient) and set below a confining unit.

Although groundwater results showed concentrations of PFOS and PFOA above the EPA HAs at AFFF Area 1, the groundwater pathway is incomplete. There is one potable well within 4 miles downgradient; however, the well is set below a confining unit

#### **4.2 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2**

Shallow groundwater has been impacted by use of AFFF during training exercises at AFFF Area 2. PFOA was in all four samples at concentrations ranging from 0.17 µg/L to 0.89 µg/L, above the EPA HA of 0.07 µg/L. PFOS was in all four samples at concentrations ranging from 0.18 µg/L to 24 µg/L, which were above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations exceeded the EPA HA of 0.07 µg/L and ranged from 0.35 µg/L to 24.89 µg/L.

Temporary wells were gauged on February 2, 2017, and monitoring wells were gauged on February 8, 2017. Shallow groundwater elevations ranged from 20.54 feet to 24.27 feet amsl. Shallow groundwater flow direction was not determined; however, historical flow direction has been to the south/southwest.

There is no immediate threat to public water supply wells or private drinking water sources from PFOA-, PFOS-, or combined PFOA- and PFOS-impacted groundwater at AFFF Area 2. The area is surrounded by woods to the west, east, and south and bordered by South Davis Road to the north. JBCA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 3.3 miles northeast (upgradient) of AFFF Area 2. One drinking water well (CHN-503 for domestic use at 380 feet bgs) is approximately 1.5 miles southwest (downgradient) and set below a confining unit. The closest residential area is upgradient to crossgradient from AFFF Area 2. A JBCA housing area is approximately 0.3 mile to the west (CH2M Hill, January 2016).

Although groundwater results showed concentrations of PFOS and PFOA above the EPA HAs at AFFF Area 2, the groundwater pathway is incomplete. There is one potable well within 4 miles downgradient; however, the well is set below a confining unit

#### **4.3 BUILDING 570 – AFFF AREA 3**

Shallow groundwater has been impacted by use of AFFF at AFFF Area 3. PFOA was in all three samples at concentrations from 0.020 µg/L to 0.24 µg/L, and two of the three samples were above the EPA HA of 0.07 µg/L. PFOS was in all three samples at concentrations from 0.49 µg/L to 6.7 µg/L, all above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations ranged from 0.51 µg/L to 6.94 µg/L, all above the EPA HA of 0.07 µg/L.

Based on water levels gauged on February 7, 2017, shallow groundwater elevations ranged from 30.44 feet to 31.30 feet amsl, and groundwater flowed west/southwest.

There is no immediate threat to public water supply wells from PFOA- or PFOS- impacted groundwater at AFFF Area 3. JBCA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 2.6 miles northeast (upgradient) of AFFF Area 3. The closest drinking water well to AFFF Area 3 (CHN-213 for domestic use at 300 feet bgs) is approximately 1.1 miles to the northeast. The closest downgradient drinking water well (CHN-503 for domestic use at 380 feet bgs) is approximately 2.45 miles southwest and set below a confining unit. A

second drinking water well (DOR-366 for domestic use and screened at 139 to 360 feet bgs) is approximately 4.1 miles west (downgradient) and set below a confining unit. The closest residential area is upgradient to crossgradient from AFFF Area 3, approximately 0.8 mile to the east (CH2M Hill, January 2016).

Although groundwater results showed concentrations of PFOS and PFOA above the EPA HAs at AFFF Area 3, the groundwater pathway is incomplete. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit.

#### **4.4 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4**

Shallow groundwater has been impacted by use of AFFF at the 2005 plane crash location at AFFF Area 4. PFOA was in two primary samples and the duplicate at concentrations ranging from an estimated 0.017 µg/L to 0.025 µg/L, below the EPA HA of 0.07 µg /L. PFOS was in two primary samples and the duplicate at concentrations ranging from 0.044 µg/L to 0.21 µg/L ; one primary sample and the duplicate were above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration in two primary samples and the duplicate ranged from an estimated 0.061 µg/L to 0.235 µg/L ; one primary sample and the duplicate were above the EPA HA of 0.07 µg/L.

Groundwater samples were collected using an SP-16 sampler, so groundwater levels could not be obtained. Therefore, current groundwater flow direction has not been determined for AFFF Area 4 although historical groundwater flow direction has been estimated to the southwest. Groundwater was observed in the soil during drilling at approximately 7.5 feet bgs.

There is no immediate threat to public water supply wells from PFOS- or PFOA-impacted groundwater at AFFF Area 4. JBCA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 3 miles northeast (upgradient) of AFFF Area 4. One downgradient drinking water well (CHN-503 for domestic use at 380 feet bgs) is approximately 2 miles southwest and set below a confining unit. The closest residential area is upgradient from AFFF Area 4, approximately 0.9 mile east (CH2M Hill, January 2016).

Although groundwater results showed concentrations of PFOS and PFOA above the EPA HAs at AFFF Area 4, the groundwater pathway is incomplete. There is one potable well within 4 miles downgradient; however, the well is set below a confining unit.

#### **4.5 OUTFALL 003 – AFFF AREA 5**

Shallow groundwater has not been impacted by AFFF entering Outfall 003 at AFFF Area 5. Estimated concentrations of PFOA, PFOS, and combined PFOA and PFOS were below the EPA HA of 0.07 µg/L.

Groundwater samples were collected using an SP-16 sampler, so groundwater levels could not be obtained. Therefore, groundwater flow direction was not determined for AFFF Area 5 although the historical groundwater flow direction has been estimated to the southeast. Groundwater was observed in the soil during drilling at approximately 3.5 feet bgs. There are no downgradient drinking water wells.

Based on shallow groundwater results for AFFF Area 5, the groundwater pathway is incomplete.

#### **4.6 NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

Shallow groundwater has been impacted by use of AFFF at AFFF Area 6. PFOA was in all three samples at concentrations ranging from 0.10 µg/L to 2.6 µg/L, all above the EPA HA of 0.07 µg/L. PFOS was in all three samples at concentrations ranging from 1.7 µg/L to 85 µg/L, all above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration in the three samples ranged from 1.84 µg/L to 87.6 µg/L, all above the EPA HA of 0.07 µg/L.

Based on water levels from the temporary wells gauged on February 4, 2017, shallow groundwater elevations ranged from 272.39 feet to 272.73 feet amsl, and groundwater flowed southeast toward the North Fork Edisto River.

The potential threat to public water supply wells from PFOA- or PFOS-impacted groundwater at AFFF Area 6 is low. The closest drinking water well to AFFF Area 6 (public supply well ORG-36 at 174 feet bgs) is approximately 1 mile to the northeast (sidegradient) and set within a confined aquifer. There are two public supply wells (ORG-39 at 130 feet bgs and ORG-46 at 206 feet bgs) approximately 1.2 miles southeast (downgradient) of AFFF Area 6 and set within a confined aquifer. The town of North, South Carolina, is to the northwest (upgradient) and obtains drinking water from public supply wells (groundwater sources) approximately 2.5 miles northeast (upgradient) and 2 to 3 miles northwest (upgradient) of AFFF Area 6. According to SCDHEC and the South Carolina Watershed Atlas database, these wells range in depth from 255 to 267 feet bgs and are within a confined aquifer. JBCA Bioenvironmental office has sampled the drinking water at NAAF Fire Station for AFFF compounds, and results have not shown any concentrations above the EPA HA.

The North Fork Edisto River, approximately 1.3 miles south of AFFF Area 6 (crossgradient to downgradient) forms the southern border of NAAF. Bull Swamp Creek is approximately 1.5 miles east (crossgradient) of AFFF Area 6 (associated wetlands begin approximately 1.4 miles east of the area). Both of these water bodies are part of the North Edisto River System, the potable water supply for the town of Orangeburg, South Carolina, approximately 15 miles southeast. The water intake for Orangeburg from the river is approximately 19 river miles downstream to the southeast of AFFF Area 6.

Based on shallow groundwater results, PFOS and PFOA are above EPA HAs in the groundwater around the fire station. The North Fork Edisto River is approximately 1.3 miles south (downgradient) of AFFF Area 6, is a drinking water source for Orangeburg, South Carolina, and the water intake from the river is approximately 19 river miles downstream. Although groundwater could release to the river, it is unlikely that human receptors could be impacted by groundwater from AFFF Area 6 because the distance to the water intake is more than 15 river miles downstream. Therefore, the groundwater pathway is incomplete.

#### **4.7 NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7**

Shallow groundwater has been impacted by use of AFFF during flushing exercises at AFFF Area 7. PFOA was in all three samples at concentrations ranging from an estimated 0.012 µg/L to 0.50 µg/L; one sample was above the EPA HA of 0.07 µg/L. PFOS was in all three samples at concentrations ranging from 0.062 µg/L to 3.4 µg/L; two samples were above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration ranged from an estimated 0.074 µg/L to 3.9 µg/L; all three were above the EPA HA of 0.07 µg/L.

Based on water levels from the temporary wells gauged on February 4, 2017, shallow groundwater elevations ranged from 275.45 feet to 275.88 feet amsl, and groundwater flowed southeast toward the North Fork Edisto River.

The potential threat to public water supply wells from PFOA-, PFOS-, or combined PFOA and PFOS-impacted groundwater at AFFF Area 7 is low. The closest drinking water well to AFFF Area 7 (public supply well ORG-36 at 174 feet bgs) is approximately 0.7 mile northeast (sidegradient) and set within a confined aquifer. There are two public supply wells (ORG-39 at 130 feet bgs and ORG-46 at 206 feet bgs) owned by the USAF approximately 1.1 miles southeast (downgradient) of AFFF Area 7 and set within a confined aquifer. The town of North, South Carolina, is northwest (upgradient) and obtains drinking water from public supply wells (groundwater sources) ranging in depth from 172 to 481 feet bgs within a confined aquifer. These wells are approximately 2 miles northeast (crossgradient) and 2 miles northwest (upgradient) of AFFF Area 7.

The North Fork Edisto River, approximately 1.6 miles south (crossgradient to downgradient) of AFFF Area 7 (associated wetlands begin approximately 1.3 miles south of the area), forms the southern border of NAAF. Bull Swamp Creek is approximately 1.25 miles east (crossgradient) of AFFF Area 7 (associated wetlands begin approximately 1.15 miles east of the area). Both of these water bodies are part of the North Edisto River System, the potable water supply for the town of Orangeburg, South Carolina, approximately 14.5 miles southeast (downgradient) of AFFF Area 7. The water intake for Orangeburg from the river is approximately 19.5 miles downstream to the southeast of AFFF Area 7.

Based on shallow groundwater results, AFFF constituents are in the groundwater around the pump house. The North Fork Edisto River, approximately 1.6 miles to the south (crossgradient to downgradient) of AFFF Area 7, is a drinking water source for Orangeburg, South Carolina, and the water intake from the river is approximately 19.5 river miles downstream. Although impacted groundwater could release to the river, it is unlikely that human receptors could be impacted by groundwater from AFFF Area 7 because the distance to the water intake is more than 15 river miles downstream. Therefore, the groundwater pathway is incomplete.

#### **4.8 NORTH AUXILIARY AIRFIELD FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8**

Shallow groundwater has been impacted by use of AFFF during testing exercises at AFFF Area 8. PFOA was in two primary samples and the duplicate at concentrations ranging from 0.21 µg/L to 0.96 µg/L, all above the EPA HA of 0.07 µg/L. PFOS was in all three primary samples and the duplicate at concentrations ranging from an estimated 0.0064 µg/L to 6.8 µg/L; two primary samples and the duplicate were above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations ranged from an estimated 0.0064 µg/L to 7.02 µg/L; two primary samples and the duplicate were above the EPA HA of 0.07 µg/L.

Based on water levels from the temporary wells gauged on February 5, 2017, shallow groundwater elevations ranged from 211.23 feet to 211.92 feet amsl, and groundwater flowed southwest toward the North Fork Edisto River.

The potential threat to public water supply wells from PFOA- or PFOS-impacted groundwater at AFFF Area 8 is low. The closest drinking water wells to AFFF Area 8 (public supply well ORG-39 at 130 feet bgs and public supply well ORG-46 at 206 feet bgs) are approximately 1.0 miles northeast (sidegradient) of AFFF Area 8 and set within a confined aquifer. There are no downgradient drinking water wells. The town of North, South Carolina, is northwest (crossgradient) and obtains drinking water from public supply wells (groundwater sources) ranging from 172 to 481 feet bgs within a confined aquifer. The aquifer is approximately 2.8 miles northeast (upgradient) and 2.7 miles northwest (crossgradient to upgradient) of AFFF Area 8.

The North Fork Edisto River, approximately 0.7 miles south (crossgradient to downgradient) of AFFF Area 8 (associated wetlands begin approximately 0.4 miles south of the area), forms the southern border of NAAF. Bull Swamp Creek is approximately 1.6 miles east (upgradient) of AFFF Area 8 (associated wetlands begin approximately 1.5 miles east of the area). Both of these water bodies are part of the North Edisto River System, the potable water supply for the town of Orangeburg, South Carolina, approximately 14 miles southeast from AFFF Area 8. The water intake for Orangeburg from the river is approximately 18.5 river miles downstream to the southeast of AFFF Area 8.

Based on shallow groundwater results, PFOS and PFOA are present at concentrations above EPA HAs in the groundwater around the old foam test area. The North Fork Edisto River, approximately 0.7 miles south (crossgradient to downgradient) of AFFF Area 8, is a drinking water source for Orangeburg, South Carolina, and the water intake from the river is approximately 18.5 river miles downstream. Although groundwater could release to the river, it is unlikely that human receptors could be impacted by groundwater from AFFF Area 8 because the distance to the water intake is more than 15 river miles downstream. Therefore, the groundwater pathway is incomplete.

#### **4.9 FT010 (NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

Shallow groundwater has not been impacted by use of AFFF during training exercises at AFFF Area 9. The analytical results showed concentrations of PFOA, PFOS, and combined concentrations of PFOA and PFOS were below the EPA HA of 0.07 µg/L.

Based on water levels from the temporary wells gauged on February 6, 2017, shallow groundwater elevations ranged from 275.64 feet to 269.39 feet amsl, and groundwater flowed northeast toward Bull Swamp Creek, approximately 1 mile east of AFFF Area 9.

The closest drinking water well to AFFF Area 9 (public supply well ORG-36 at 174 feet bgs) is approximately 0.5 mile to the east (sidegradient/downgradient) and set within a confined aquifer. Two public supply wells (ORG-86 at 168 feet bgs and ORG-373 at 255 feet bgs) are downgradient approximately 1.6 and 1.9 miles northeast, respectively, of AFFF Area 9 and set within a confined aquifer.

Based on shallow groundwater results, no AFFF constituents in the groundwater around the FTA are above screening levels at AFFF Area 9. Therefore, the groundwater pathway for human receptors is incomplete.

### **5.0 SURFACE WATER PATHWAY**

#### *JBCA*

Surface water drainage at JBCA from the approximately 3,500-acre watershed is controlled by unlined and concrete-lined ditches and buried concrete pipes. Three major channels drain the Base:

- Golf Course Creek, which discharges into Popperdam Creek, a tributary of the Ashley River;
- Runway Creek, near Runway 03/21, a tributary of the Ashley River; and
- A tributary of Turkey Creek near Runway 15/33, which discharges into Goose Creek, a tributary of the Cooper River.

The drainage divide on the Base is approximately parallel to Runway 15/33. Surface water east of Runway 15/33 flows toward the Goose Creek Reservoir and the Cooper River, and surface water west of Runway 15/33 flows toward Popperdam Creek and the Ashley River. Most of the small, unlined drainage ditches are above the water table and are influent or losing streams. Conversely, the large streams (Golf

Course Creek and Runway Creek) intersect the water table and are probably effluent or gaining streams (Halliburton, June 1995).

Other surface water bodies in the vicinity of JBCA include Goose Creek Reservoir and wetland areas. Goose Creek Reservoir is about 2 miles northeast of the Base and supplies potable water to the area. There are 25 isolated and/or adjacent, jurisdictional, freshwater wetlands at JBCA that cover 282 acres (Halliburton, June 1995).

Specific surface water pathways for each AFFF area are discussed in Section 5.1 through Section 5.9. PFBS was detected at AFFF Area 2, AFFF Area 3, AFFF Area 4, AFFF Area 5, AFFF Area 6, and AFFF Area 8. However, it did not exceed the RSL at any of these areas and will not be discussed. PFOA, PFOS, or combined PFOA and PFOS were in the surface water above screening levels and are discussed in Section 5.1 through Section 5.9.

#### *NAAF*

NAAF is between the North Fork Edisto River and Bull Swamp Creek. The North Fork Edisto River flows southeast along the southern edge of NAAF, which is within the 100-year floodplain. Bull Swamp Creek is more than 2,000 feet east of NAAF and flows south. The North Fork Edisto River and Bull Swamp Creek converge southeast of NAAF to form the North Edisto River, which is used as the water supply source for the city of Orangeburg, approximately 15 miles southeast of NAAF (SAIC, March 1989). According to the director of the Drinking Water Division of Orangeburg, the water intake from the river is approximately 1 mile north of the water treatment plant in Orangeburg, which is approximately 18 river miles southeast of NAAF (Odom, Eric, personal communication, October 2017).

### **5.1 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1**

SWMU 55 is at the east corner of the Base near South Aviation Avenue. Residential areas exist approximately 0.1 mile to the south. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water is not typically present at SWMU 55, and no surface water samples were collected during the SI. No on-Base storm drains or ditches are within the vicinity of SWMU 55. However, a surface water drainage ditch is on private property approximately 400 feet due south of SWMU 55 adjacent to the Base boundary, and previous investigations have indicated that on-Base groundwater discharges to the ditch. Goose Creek Reservoir is approximately 2.5 miles north (upgradient) of AFFF Area 1. No surface water intakes are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and local waterways can be used for recreational fishing by residents of nearby communities (CH2M Hill, January 2016).

### **5.2 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2**

SWMU 52 is west of the runway and south of South Davis Drive. Residential areas exist approximately 0.3 miles west. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water at SWMU 52 is directed to the lined pond adjacent to the area, and overflow goes to the lower-lying area to the south. Surface water at SWMU 52 flows to the south/southwest, toward Outfall 001, a stormwater feature that flows off-Base to the south. No storm drains or ditches are within the vicinity of SWMU 52, and surface water drains to the surrounding subsurface or evaporates. The nearest water body is Ashley River, 1.2 miles southwest (downgradient). Goose Creek Reservoir is approximately 3.3 miles northeast (upgradient). No surface water intakes are adjacent to the surface water migration path within 15 miles

downstream of the location; however, several wetlands may be present, and residents of nearby communities can fish in local waterways (CH2M Hill, January 2016).

One primary surface water sample and one duplicate sample were collected from the lower-lying area at CHRTN02-004. PFOA was detected in both samples at estimated concentrations below the EPA HA of 0.07 µg/L. PFOS was detected in both samples at an estimated 0.34 µg/L and 0.35 µg/L, above the EPA HA of 0.07 µg/L. The estimated combined PFOA and PFOS concentrations were 0.371 µg/L and 0.407 µg/L, above the EPA HA of 0.07 µg/L.

Although PFOS and combined PFOS and PFOA are present at concentrations above EPA HAs in the surface water at AFFF Area 2, the human exposure pathway is incomplete. No surface water intakes were identified within 15 miles downstream.

### **5.3 BUILDING 570 – AFFF AREA 3**

Building 570 is a hangar in the north part of the Base east of Building 610 (Base Supply). This portion of the Base is developed with buildings, parking lots, and open grassy areas. Residential areas exist approximately 0.8 mile east. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water flows into a storm drain inlet south of Building 570. The drain discharges into underground piping that connects to a concrete-lined ditch. Water from the ditch discharges at Outfall 003 (AFFF Area 5) into an unnamed tributary of Popperdam Creek, then into Popperdam Creek, which flows into Ashley River. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and residents of nearby communities can fish in local waterways (CH2M Hill, January 2016).

One surface water sample was taken. PFOA was detected in the sample at 0.081 µg/L, slightly above the EPA HA of 0.07 µg/L. PFOS was detected in the sample at 1.9 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 1.981 µg/L, above the EPA HA of 0.07 µg/L. In addition, the combined PFOA and PFOS concentration in the surface water sample collected at Outfall 003 (AFFF Area 5) exceeded the EPA HA at a concentration of 0.861 µg/L (as discussed in Section 5.5).

Although PFOS and PFOA are present at concentrations above EPA HAs in the surface water at AFFF Area 3, the human exposure pathway is incomplete. No surface water intakes were identified within 15 miles downstream.

### **5.4 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4**

A small private plane crashed at the south end of the flightline in 2005. The area is covered in maintained grass and is near a stormwater drain. Residential areas exist approximately 0.9 mile east. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water at the 2005 plane crash area flows primarily to the east/southeast. The storm ditches sampled are to the east and southeast of the crash area. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and residents of nearby communities use local waterways for recreational fishing (CH2M Hill, January 2016).

PFOA was below the EPA HA of 0.07 µg/L. PFOS was detected at a concentration of 0.30 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.340 µg/L, above the EPA HA of 0.07 µg/L.



Although PFOS and combined PFOS and PFOA are present at concentrations above EPA HAs in the surface water at AFFF Area 4, the human exposure pathway is incomplete. No surface water intakes were identified within 15 miles downstream.

### **5.5    OUTFALL 003 – AFFF AREA 5**

Outfall 003 is at the western portion of the Base. Residential areas exist approximately 0.1 mile east. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water flows into a storm drain south of Building 570 (AFFF Area 3). The drain discharges into underground piping that connects to a concrete-lined ditch. Water from the ditch discharges at Outfall 003 into an unnamed tributary of Popperdam Creek, then into Popperdam Creek, which in turn flows into Ashley River. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and nearby residents can use local waterways for recreational fishing (CH2M Hill, January 2016).

PFOA was below the EPA HA of 0.07 µg/L. The PFOS concentration was 0.82 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.861 µg/L, above the EPA HA of 0.07 µg/L.

Although PFOS and combined PFOS and PFOA are present at concentrations above EPA HAs in the surface water at AFFF Area 5, the human exposure pathway is incomplete. No surface water intakes were identified within 15 miles downstream.

### **5.6    NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

Surface water at the NAAF Fire Station flows primarily to the northwest into a low-lying area with two drainage ditches/pits northwest of the building. The drainage ditches do not appear to tie directly into any other surface water bodies. Workers and wetlands are within 1 mile of the location. NAAF is between the North Fork Edisto River and Bull Swamp Creek. The North Fork Edisto River is approximately 1.3 miles south of AFFF Area 6 (crossgradient to downgradient) and forms the southern edge of NAAF, which is within the 100-year floodplain. Bull Swamp Creek is approximately 1.5 miles east (crossgradient) of AFFF Area 6. Both of these water bodies are part of the North Edisto River System, the potable water supply for the town of Orangeburg, South Carolina, approximately 15 miles southeast (downgradient) from AFFF Area 6. The water intake from the river for Orangeburg is approximately 19 river miles downstream to the southeast (ASL, January 2017).

PFOA was below the EPA HA of 0.07 µg/L. The PFOS concentration was 0.43 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.453 µg/L, above the EPA HA of 0.07 µg/L.

The potential for human exposure to PFOS or combined PFOA and PFOS from impacted surface water from the NAAF Fire Station is low. The water intake from the North Edisto River System for Orangeburg, South Carolina, is more than 15 river miles downstream. Therefore, the surface water pathway is incomplete.

## **5.7 NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7**

Surface water at the NAAF pump house flows into the drainage ditch east of the building and AST #7. Surface water is not typically present at NAAF Pump House, and no surface water samples were collected during the SI.

## **5.8 NORTH AUXILIARY AIRFIELD FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8**

Surface water at the NAAF foam test area flows toward the stormwater pond. A culvert goes from the middle of the pond north under the runway to an infiltration point. Workers and wetlands are within 1 mile of the location. NAAF is between the North Fork Edisto River and Bull Swamp Creek. Bull Swamp Creek is approximately 1.6 miles east (upgradient) of AFFF Area 8 (associated wetlands begin approximately 1.5 miles east of the area). The North Fork Edisto River is approximately 0.7 miles south (crossgradient to downgradient) of Area 8 and forms the southern edge of NAAF, which is within the 100-year floodplain. Both of these water bodies are part of the North Edisto River System, the potable water supply for the town of Orangeburg, South Carolina, approximately 14 miles southeast (downgradient) from AFFF Area 8. The water intake for Orangeburg from the river is approximately 18.5 river miles downstream to the southeast (ASL, January 2017).

PFOA was below the EPA HA of 0.07 µg/L. The PFOS concentration was 0.38 µg/L, above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was 0.405 µg/L, above the EPA HA of 0.07 µg/L.

The potential for human exposure to PFOS or combined PFOA and PFOS from impacted surface water from the NAAF foam test area is low. The water intake from the North Edisto River System for Orangeburg is more than 15 river miles downstream. Therefore, the surface water pathway is incomplete.

## **5.9 FT010 (NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

Surface water is not typically present at FT010, and no surface water samples were collected during the SI.

## **6.0 SOIL AND SEDIMENT EXPOSURE AND AIR PATHWAYS**

### **6.1 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1**

Sediment was not identified as a media of concern at SWMU 55 and was not sampled. PFBS and PFOA concentrations in surface and subsurface soil samples collected at AFFF Area 1 during this SI were below screening levels. PFOS concentrations in one surface soil sample and one subsurface soil sample were above the calculated RSL. The soil could act as continuing source of PFAS impacts to groundwater. However, exposure to impacted soil is unlikely because the area is heavily wooded and fenced with a locked gate. Therefore, the soil and air pathways are incomplete at AFFF Area 1.

## **6.2 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2**

PFBS, PFOA, and PFOS concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 2 during this SI were below screening levels. Lacking concentrations of PFBS, PFOA, or PFOS above screening levels, the soil and air pathways are incomplete at AFFF Area 2.

## **6.3 BUILDING 570 – AFFF AREA 3**

PFBS, PFOA, and PFOS concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 3 during this SI were below screening levels. Lacking concentrations of PFBS, PFOA, or PFOS above screening levels, the soil and air pathways are incomplete at AFFF Area 3.

## **6.4 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4**

PFBS, PFOA, and PFOS concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 4 during this SI were below screening levels. Lacking concentrations of PFBS, PFOA, or PFOS above screening levels, the soil and air pathways are incomplete at AFFF Area 4.

## **6.5 OUTFALL 003 – AFFF AREA 5**

Soil was not identified as a media of concern at Outfall 003 and was not sampled. PFBS, PFOA, and PFOS in sediment samples collected at AFFF Area 5 during this SI were below screening levels. Lacking concentrations of PFBS, PFOA, or PFOS above screening levels, the soil and air pathways are incomplete at AFFF Area 5.

## **6.6 NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

PFBS and PFOA concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 6 during this SI were below screening levels. The PFOS concentration in one surface soil sample was above the calculated RSL. Exposure to impacted soil would be low because the area is covered in mature vegetation. Therefore, the soil and air pathways are incomplete at AFFF Area 6.

## **6.7 NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7**

Sediment was not identified as a media of concern at the Pump House and was not sampled. PFBS, PFOA, and PFOS concentrations in surface soil and subsurface soil samples collected at AFFF Area 7 during this SI were below screening levels. Lacking concentrations of PFBS, PFOA, or PFOS above screening levels, the soil and air pathways are incomplete at AFFF Area 7.

## **6.8 NORTH AUXILIARY AIRFIELD FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8**

PFBS and PFOA concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 8 during this SI were below screening levels. The PFOS concentration in one surface soil sample was above the calculated RSL. Exposure to impacted soil would be low because the area is covered in mature vegetation and is in a remote area on NAAF. Therefore, the soil and air pathways are incomplete at AFFF Area 8.

## **6.9 FT010 (NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

Sediment was not identified as a media of concern at FT010 and was not sampled. PFBS, PFOA, and PFOS in surface soil and subsurface soil samples collected at AFFF Area 9 during this SI were below screening levels. Lacking concentrations of PFBS, PFOA, or PFOS above screening levels, the soil and air pathways are incomplete at AFFF Area 9.

## **7.0 UPDATES TO CONCEPTUAL SITE MODELS**

### **7.1 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1**

The conceptual site model (CSM) for SWMU 55 presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, and groundwater as media impacted by release of AFFF at the site.

Based on the findings discussed in Sections 3.3 and 4.1, groundwater at SWMU 55 had concentrations of PFOA, PFOS, or combined PFOA and PFOS above screening levels. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit, and there are no surface water intakes downstream within 15 miles. Therefore, the groundwater pathway is incomplete.

There was no surface water on Base at FT003 as indicated in Section 5.1. However, a surface water drainage ditch is on private property approximately 400 feet due south of SWMU 55 and adjacent to the Base boundary. Previous investigations have indicated on-Base groundwater discharges to the ditch.

Based on the findings discussed in Sections 3.3 and 6.1, surface soil and subsurface soil at SWMU 55 showed PFAS compounds above screening levels. However, exposure to impacted soil would be low because the area is heavily wooded and surrounded by a locked gate.

### **7.2 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2**

The CSM for SWMU 52 presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, surface water, sediment, and groundwater as media impacted by previous releases of AFFF at Area 2.

Based on the findings discussed in Sections 3.4 and 4.2, groundwater at the FTA showed concentrations of PFOA, PFOS, or combined PFOA and PFOS above screening levels. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit, and there are no surface water intakes downstream within 15 miles. Therefore, the groundwater pathway is incomplete.

Based on the findings discussed in Sections 3.4 and 5.2, surface water at the FTA showed PFOS or combined PFOA and PFOS at concentrations above screening levels. There are no surface water intakes downstream within 15 miles. Therefore, the surface water pathway is incomplete.

Based on the findings discussed in Sections 3.4 and 6.2, surface soil, subsurface soil, and sediment at the FTA did not show PFAS compounds above screening levels.

### **7.3 BUILDING 570 – AFFF AREA 3**

The CSM for Building 570 presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, surface water, sediment, and groundwater as media impacted by previous releases of AFFF at Area 3.

Based on the findings discussed in Sections 3.5 and 4.3, groundwater at Building 570 had PFOA, PFOS, or combined PFOA and PFOS at concentrations above screening levels. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit, and there are no water uptakes within 15 miles. Therefore, the groundwater pathway is incomplete.

Based on the findings discussed in Sections 3.5 and 5.3, surface water at Building 570 showed PFOA, PFOS, or combined PFOA and PFOS at concentrations above screening levels. There are no surface water intakes downstream within 15 miles. Therefore, the surface water pathway is incomplete.

Based on the findings discussed in Sections 3.5 and 6.3, surface soil, subsurface soil, and sediment did not show PFAS compounds above screening levels.

### **7.4 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4**

The CSM for the 2005 Private Plane Crash Area presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, surface water, sediment, and groundwater as media impacted by previous releases of AFFF at Area 4.

Based on the findings discussed in Sections 3.6 and 4.4, groundwater at the plane crash area had PFOS or combined PFOA and PFOS at concentrations above screening levels. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit, and there are no water uptakes within 15 miles. Therefore, the groundwater pathway is incomplete.

Based on the findings discussed in Sections 3.6 and 5.4, surface water at the plane crash area had PFOS or combined PFOA and PFOS at concentrations above screening levels. There are no surface water intakes downstream within 15 miles. Therefore, the surface water pathway is incomplete.

Based on the findings discussed in Sections 3.6 and 6.4, surface soil, subsurface soil, and sediment at the plane crash area did not show PFAS compounds above screening levels.

### **7.5 OUTFALL 003 – AFFF AREA 5**

The CSM for Outfall 003 presented in the QAPP addendum (ASL, January 2017) identified surface water, sediment, and groundwater as media impacted by previous releases of AFFF at Area 5.

Based on the findings discussed in Sections 3.7 and 4.5, groundwater at Outfall 003 did not show PFAS compounds at concentrations above screening levels. Based on shallow groundwater results for AFFF Area 5, the groundwater pathway is incomplete.

Based on the findings discussed in Sections 3.7 and 5.5, surface water at Outfall 003 showed PFOS or combined PFOA and PFOS at concentrations above screening levels. There are no surface water intakes downstream within 15 miles. Therefore, the surface water pathway is incomplete.

Based on the findings discussed in Sections 3.7 and 6.5, sediment at Outfall 003 did not show PFAS compounds above screening levels.

#### **7.6 NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

The CSM for the NAAF Fire Station presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, surface water, sediment, and groundwater as media impacted by previous releases of AFFF at Area 6.

Based on the findings discussed in Sections 3.8, 4.6, and 5.6, groundwater and surface water at the NAAF Fire Station have been impacted by PFOA and PFOS at concentrations above screening levels. Although the North Edisto River to the southeast is used as a drinking water source for Orangeburg, South Carolina, the water intake is more than 15 river miles downstream. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit. Therefore, the groundwater and surface water pathways are incomplete.

Based on the findings discussed in Sections 3.8 and 6.6, surface soil at the NAAF Fire Station showed PFAS compounds above screening levels. Subsurface soil and sediment did not show PFAS compounds above screening levels. Exposure to impacted soil would be low because the area is covered in mature vegetation.

#### **7.7 NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7**

The CSM for the NAAF Pump House presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, and groundwater as media potentially impacted by previous releases of AFFF at Area 7.

Based on the findings discussed in Sections 3.9 and 4.7, groundwater at the NAAF Pump House had PFOA, PFOS, or combined PFOA and PFOS at concentrations above screening levels. Although the North Edisto River to the southeast is used as a drinking water source for Orangeburg, South Carolina, the water intake is more than 15 river miles downstream. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit. Therefore, the groundwater pathway is incomplete.

There is no surface water on Base at the NAAF Pump House as indicated in Section 5.7.

Based on the findings discussed in Sections 3.9 and 6.7, surface soil and subsurface soil at the NAAF Pump House did not show PFAS compounds above screening levels.

#### **7.8 NAAF FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8**

The CSM for the NAAF Foam Test Area and Old C-141 presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, groundwater, surface water, and sediment as media potentially impacted by previous releases of AFFF at Area 8.

Based on the findings discussed in Sections 3.10, 4.8, and 5.8, groundwater and surface water at the NAAF foam test area had PFOA and PFOS at concentrations above screening levels. Although the North Edisto River to the southeast is used as a drinking water source for Orangeburg, South Carolina, the water

intake is more than 15 river miles downstream. Potable water sources upgradient are below a confining unit. Therefore, the groundwater and surface water pathways are incomplete.

Based on the findings discussed in Sections 3.10 and 6.8, surface soil at the NAAF Foam Test Area and old C-141 showed PFAS compounds above screening levels. Subsurface soil and sediment did not show PFAS compounds above screening levels. Exposure to impacted soil would be low because the area is covered in mature vegetation and is in a remote area on NAAF.

## **7.9 FT010 (NO RCRA PERMIT ID, NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

The CSM for FT010 presented in the QAPP addendum (ASL, January 2017) identified surface soil, subsurface soil, and groundwater as media potentially impacted by previous releases of AFFF at Area 9.

Based on the findings discussed in Sections 3.11 and 4.9, groundwater at the FTA did not show PFAS compounds at concentrations above screening levels. There are potable wells within 4 miles downgradient; however, the wells are set below a confining unit. Therefore, the groundwater pathway for AFFF Area 9 is incomplete.

Based on the findings discussed in Sections 3.9 and 6.9, surface soil and subsurface soil at the FTA did not show PFAS compounds above screening levels.

## **8.0 SUMMARY AND CONCLUSIONS**

ASL completed SIs at five known or suspected areas of AFFF releases at JBCA documented in the PA (CH2M Hill, January 2016) and at four known or suspected areas of AFFF releases at NAAF documented in the site-specific QAPP addendum (ASL, January 2017). Sampling was conducted during this SI at AFFF Areas 1 through 9:

- SWMU 55 (FT003, Fire Protection Training Area 3) (AFFF Area 1);
- SWMU 52 (AT551, Current Fire Training Area) (AFFF Area 2);
- Building 570 (AFFF Area 3);
- 2005 Private Plane Crash Area (AFFF Area 4);
- Outfall 003 (AFFF Area 5);
- NAAF Fire Station (AFFF Area 6);
- NAAF Pump House – Foam Truck Flush Area (AFFF Area 7);
- NAAF Foam Test Area and Old C-141 (AFFF Area 8);
- FT010 (NAAF Fire Training Area) (AFFF Area 9);

The objectives of this study were to

- determine if PFOS and PFOA are present in groundwater or surface water at the inspection areas at concentrations exceeding the EPA lifetime HA for drinking water,
- determine if PFBS is present in soil, sediment, groundwater, or surface water at the inspection areas at concentrations exceeding generic RSLs;
- determine if PFOA and PFOS are present in soil or sediment at the inspection areas at concentrations exceeding calculated RSLs; and
- identify potential receptor pathways with immediate impacts to human health.

Selected sample media were different for the nine areas but included surface soil, subsurface soil, groundwater, sediment, and surface water. Sampling was primarily limited to the immediate release areas and biased toward locations most likely to have been impacted by releases of AFFF.

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. PFOA and PFOS soil and sediment 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; PFOA and PFOS analytical results were compared to the EPA HA of 0.07 µg/L for the individual and combined concentrations of PFOA and PFOS.

PFBS was not detected in any sampled media above screening levels at the nine AFFF areas. Where sampled, PFOS concentrations in surface soil in three areas and subsurface soil samples in one area exceeded the calculated RSL. PFOA in surface soil and subsurface soil and PFOA and PFOS in sediment were below calculated RSLs in samples collected at the nine areas during this SI.

The QAPP addendum identified groundwater as a known or potentially impacted media of concern at each of nine AFFF areas. Groundwater was sampled at all nine AFFF areas during the SI. Combined PFOA and PFOS concentrations in groundwater at each AFFF area exceeded the EPA HA except at AFFF Area 5 (Outfall 003) and AFFF Area 9 (FT010 NAAF FTA).

The QAPP addendum also identified surface water as a known or potentially impacted media of concern at AFFF Areas 2, 3, 4, 5, 6, and 8. Combined PFOA and PFOS concentrations in surface water at each of these AFFF areas exceeded the EPA HA.

Table 40 summarizes detected concentrations of PFBS, PFOA, and PFOS for each media sampled at each area. A brief summary of key findings and conclusions for each area (focusing on PFOA and PFOS exceedances) is included after the table.

## **8.1 SOLID WASTE MANAGEMENT UNIT 55 (FT003, FIRE PROTECTION TRAINING AREA 3) – AFFF AREA 1**

PFAS compounds were in groundwater above screening levels at SWMU 55 (AFFF Area 1). PFOA was in all three primary samples and the duplicate at concentrations above the EPA HA of 0.07 µg/L. PFOS was in all three primary samples and the duplicate at concentrations above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was above the EPA HA of 0.07 µg/L in all three primary samples and the duplicate. On February 3, 2017, groundwater elevations ranged from 27.29 feet to 29.16 feet amsl, and groundwater flowed to the west/southwest. Historical groundwater flow has been to the south/southwest.

There was no surface water at SWMU 55, as indicated in Section 5.1. No on-Base storm drains or ditches are within the vicinity of SWMU 55. However, a surface water drainage ditch is on private property approximately 400 feet due south of SWMU 55 and adjacent to the Base boundary. Previous investigations have indicated that on-Base groundwater discharges to the ditch. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and local waterways can be used for recreational fishing by residents of nearby communities. Goose Creek Reservoir is approximately 2.5 miles north (upgradient) of AFFF Area 1.



**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 1 SWMU 55 (FT003, Fire Protection Training Area 3)</b>	<b>SWMU 55</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	4.4 J	130,000	2/0	No		
		PFOA	70	126	2/0	No		
		PFOS	<b>810</b>	126	<b>2/1</b>	<b>Yes</b>		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	9.0 J	130,000	2/0	No		
		PFOA	46	126	2/0	No		
		PFOS	<b>130</b>	126	<b>2/1</b>	<b>Yes</b>		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	34	40	3/0	No		
		PFOA	<b>790</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		PFOS	<b>360</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		PFOA + PFOS	<b>1,150</b>	0.07	<b>3/3</b>	<b>Yes</b>		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 2 SWMU 52 (AT551, Current Fire Training Area)</b>	<b>SWMU 52</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	2.0	130,000	3/0	No		
		PFOA	10	126	3/0	No		
		PFOS	91	126	3/0	No		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	2.2	130,000	3/0	No		
		PFOA	3.4	126	3/0	No		
		PFOS	33 J	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	0.93	40	4/0	No		
		PFOA	<b>0.89</b>	0.07	<b>4/4</b>	<b>Yes</b>		
		PFOS	<b>24</b>	0.07	<b>4/4</b>	<b>Yes</b>		
		PFOA + PFOS	<b>24.89</b>	0.07	<b>4/4</b>	<b>Yes</b>		
		<b>Surface Water</b>	<b>(µg/L)</b>	<b>(µg/kg)</b>				
		PFBS	0.050	40	1/0	No		
		PFOA	0.057 J	0.07	1/0	No		
		PFOS	<b>0.35</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>0.407 J</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		<b>Sediment</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	0.49 J	130,000	1/0	No		
		PFOA	0.47 J	126	1/0	No		
		PFOS	6.9 J	126	1/0	No		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 3 Building 570 (No RCRA Permit ID)</b>	<b>None (new area)</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	ND	130,000	3/0	No		
		PFOA	ND	126	3/0	No		
		PFOS	32	126	3/0	No		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	3/0	No		
		PFOA	0.25 J	126	3/0	No		
		PFOS	12	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	0.22	40	3/0	No		
		PFOA	<b>0.24</b>	0.07	<b>3/2</b>	<b>Yes</b>		
		PFOS	<b>6.7</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		PFOA + PFOS	<b>6.94</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		<b>Surface Water</b>	<b>(µg/L)</b>	<b>(µg/kg)</b>				
		PFBS	0.12	40	1/0	No		
		PFOA	<b>0.081</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOS	<b>1.9</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>1.981</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		<b>Sediment</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	1/0	No		
		PFOA	ND	126	1/0	No		
		PFOS	0.52 J	126	1/0	No		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 4 2005 Private Plane Crash Area (No RCRA Permit ID)</b>	<b>None (new area)</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	ND	130,000	3/0	No		
		PFOA	0.38 J	126	3/0	No		
		PFOS	1.3	126	3/0	No		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	3/0	No		
		PFOA	ND	126	3/0	No		
		PFOS	ND	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	0.032	40	3/0	No		
		PFOA	0.025	0.07	3/0	No		
		PFOS	<b>0.21</b>	0.07	<b>3/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>0.235</b>	0.07	<b>3/1</b>	<b>Yes</b>		
		<b>Surface Water</b>	<b>(µg/L)</b>	<b>(µg/kg)</b>				
		PFBS	0.015 J	40	1/0	No		
		PFOA	0.040	0.07	1/0	No		
		PFOS	<b>0.30</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>0.340</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		<b>Sediment</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	1/0	No		
		PFOA	ND	126	1/0	No		
		PFOS	7.0	126	1/0	No		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 5 Outfall 003 (No RCRA Permit ID)</b>	<b>None (new area)</b>	<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	0.0052 J	40	1/0	No		
		PFOA	0.0072 J	0.07	1/0	No		
		PFOS	0.014 J	0.07	1/0	No		
		PFOA + PFOS	0.0212 J	0.07	1/0	No		
		<b>Surface Water</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	0.065	40	1/0	No		
		PFOA	0.041	0.07	1/0	No		
		PFOS	<b>0.82</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>0.861</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		<b>Sediment</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	1/0	No		
		PFOA	ND	126	1/0	No		
		PFOS	0.84 J	126	1/0	No		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 6 NAAF Fire Station (No RCRA Permit ID)</b>	<b>None (New Area)</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	0.44 J	130,000	3/0	No		
		PFOA	1.8	126	3/0	No		
		PFOS	<b>200</b>	126	<b>3/1</b>	<b>Yes</b>		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	2.0	130,000	3/0	No		
		PFOA	0.64 J	126	3/0	No		
		PFOS	17	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	13	40	3/0	No		
		PFOA	<b>2.6</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		PFOS	<b>85</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		PFOA + PFOS	<b>87.6</b>	0.07	<b>3/3</b>	<b>Yes</b>		
		<b>Surface Water</b>	<b>(µg/L)</b>	<b>(µg/kg)</b>				
		PFBS	0.021	40	1/0	No		
		PFOA	0.023	0.07	1/0	No		
		PFOS	<b>0.43</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>0.453</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		<b>Sediment</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	0.46 J	130,000	1/0	No		
		PFOA	ND	126	1/0	No		
		PFOS	7.4	126	1/0	No		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 7 NAAF Pump House – Foam Truck Flush Area (No RCRA Permit ID)</b>	<b>None (New Area)</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	0.77 J	130,000	3/0	No		
		PFOA	1.3 J	126	3/0	No		
		PFOS	100	126	3/0	No		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	1.7	130,000	3/0	No		
		PFOA	0.85 J	126	3/0	No		
		PFOS	26	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	1.2	40	3/0	No		
		PFOA	<b>0.50</b>	0.07	<b>3/1</b>	<b>Yes</b>		
		PFOS	<b>3.4</b>	0.07	<b>3/2</b>	<b>Yes</b>		
		PFOA + PFOS	<b>3.9</b>	0.07	<b>3/3</b>	<b>Yes</b>		

**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

<b>AFFF Area</b>	<b>IRP ID</b>	<b>Parameter</b>	<b>Maximum Detected Concentration</b>	<b>Screening Value</b>	<b>Number of Samples / Number of Exceedances*</b>	<b>Exceeds Screening Value</b>	<b>Potentially Complete DW Exposure Pathway</b>	<b>Recommendation</b>
<b>AFFF Area 8 NAAF Foam Test Area and Old C-141 (No RCRA Permit ID)</b>	<b>None (New Area)</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>Advance area to RI</b>
		PFBS	ND	130,000	3/0	No		
		PFOA	0.94	126	3/0	No		
		PFOS	<b>480</b>	126	<b>3/1</b>	<b>Yes</b>		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	3.6 J	130,000	3/0	No		
		PFOA	0.58 J	126	3/0	No		
		PFOS	22	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	4.2	40	3/0	No		
		PFOA	<b>0.96</b>	0.07	<b>3/2</b>	<b>Yes</b>		
		PFOS	<b>6.8</b>	0.07	<b>3/2</b>	<b>Yes</b>		
		PFOA + PFOS	<b>7.02</b>	0.07	<b>3/2</b>	<b>Yes</b>		
		<b>Surface Water</b>	<b>(µg/L)</b>	<b>(µg/kg)</b>				
		PFBS	0.013 J	40	1/0	No		
		PFOA	0.025	0.07	1/0	No		
		PFOS	<b>0.38</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		PFOA + PFOS	<b>0.405</b>	0.07	<b>1/1</b>	<b>Yes</b>		
		<b>Sediment</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	1/0	No		
		PFOA	ND	126	1/0	No		
		PFOS	5.7	126	1/0	No		



**Table 40 Summary of PFBS, PFOA, and PFOS Detections and Screening Level Exceedances (continued)**

AFFF Area	IRP ID	Parameter	Maximum Detected Concentration	Screening Value	Number of Samples / Number of Exceedances*	Exceeds Screening Value	Potentially Complete DW Exposure Pathway	Recommendation
<b>AFFF Area 9 FT010 (No RCRA Permit ID, NAAF Fire Training Area)</b>	<b>None (New Area) FT010</b>	<b>Surface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>			<b>No</b>	<b>NFRAP</b>
		PFBS	ND	130,000	3/0	No		
		PFOA	0.18 J	126	3/0	No		
		PFOS	1.8	126	3/0	No		
		<b>Subsurface Soil</b>	<b>(µg/kg)</b>	<b>(µg/kg)</b>				
		PFBS	ND	130,000	3/0	No		
		PFOA	ND	126	3/0	No		
		PFOS	ND	126	3/0	No		
		<b>Groundwater</b>	<b>(µg/L)</b>	<b>(µg/L)</b>				
		PFBS	0.0073 J	40	3/0	No		
		PFOA	0.013 J	0.07	3/0	No		
		PFOS	0.043	0.07	3/0	No		
		PFOA + PFOS	0.056 J	0.07	3/0	No		

\*The number of samples does not include the field duplicate unless the field duplicate has a higher result than the primary sample; if the field duplicate is higher, then that result is used.

**Bold** concentrations exceeded screening levels.

AFFF = aqueous film forming foam

ID = identification

NAAF = North Auxiliary Airfield

ND = not detected

PFBS = perfluorobutane sulfonate

PFOA = perfluorooctanoic acid

RCRA = Resource Conservation and Recovery Act

SWMU = solid waste management unit

µg/L = micrograms per liter

µg/kg = micrograms per kilogram

µg/L = micrograms per liter

IRP = Installation Restoration Program

J = estimated concentration

NFRAP = No Further Response Action Planned

PFOS = perfluorooctane sulfonate

RI = remedial action

µg/kg = micrograms per kilogram

There is no immediate threat to public water supply wells or private drinking water sources from PFAS compounds in groundwater at AFFF Area 1. JBCA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 2.5 miles north (upgradient) of AFFF Area 1. The area is a mostly wooded lot in the eastern corner of JBCA. A residential area is approximately 0.1 mile to the south and downgradient to crossgradient from the investigation area. The closest drinking water supply well is approximately 2.75 miles southeast (downgradient) and set below a confining unit. Therefore, the groundwater pathway is incomplete at AFFF Area 1.

Sediment was not identified as a media of concern at SWMU 55 and was not sampled. PFBS and PFOA concentrations in surface and subsurface soil samples collected at AFFF Area 1 during this SI were below screening levels; however, PFOS concentrations in one surface soil sample and one subsurface soil sample were above screening levels. The soil could act as a continuing source of PFAS impacts to groundwater. However, exposure to impacted soil would be low because the area is heavily wooded and surrounded by a locked gate. Therefore, the soil and air pathways are incomplete at AFFF Area 1.

Based on PFAS impacts to groundwater and soil above screening levels, AFFF Area 1 is recommended for a remedial investigation (RI).

## **8.2 SOLID WASTE MANAGEMENT UNIT 52 (AT551, CURRENT FIRE TRAINING AREA) – AFFF AREA 2**

PFAS compounds were detected in groundwater and surface water above screening levels at SWMU 52 (AFFF Area 2). PFOA was in all four groundwater samples at concentrations above the EPA HA of 0.07 µg/L. PFOS was in all four groundwater samples at concentrations above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations exceeded the EPA HA of 0.07 µg/L in all four groundwater samples. On February 2, 2017, water levels were gauged in temporary wells, and monitoring wells were gauged on February 8, 2017. Groundwater elevations ranged from 20.54 feet to 24.27 feet amsl. Groundwater flow direction was not determined; however, flow generally appears to the south/southeast.

PFOS was in one surface water sample and one duplicate sample above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations exceeded the EPA HA of 0.07 µg/L in both samples. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water at AFFF Area 2 is directed to the lined pond adjacent to the area, and overflow goes to the lower-lying area to the south. Surface water at AFFF Area 2 flows to the south/southwest, toward Outfall 001, a stormwater feature that flows off-Base to the south. No storm drains or ditches are within the vicinity of SWMU 52, and surface water drains to the surrounding subsurface or evaporates. The nearest water body is Ashley River, 1.2 miles southwest of SWMU 52. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and residents of nearby communities can use local waterways for recreational fishing. Also, Goose Creek Reservoir is approximately 3.3 miles northeast (upgradient) of AFFF Area 2.

There is no immediate threat to public water supply wells or private drinking water sources from PFAS compounds in groundwater at AFFF Area 2. JBCA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 3.3 miles northeast (upgradient) of AFFF Area 2. The closest drinking water well is approximately 1.5 miles southwest (downgradient) and set below a confining unit. The closest residential area is upgradient to crossgradient from AFFF Area 2. A JBCA housing area is approximately 0.3 mile to the west.

PFBS, PFOA, and PFOS concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 2 during this SI were below screening levels. Lacking concentrations of PFAS compounds above screening levels, the soil and air pathways are incomplete at AFFF Area 2.

Based on PFAS impacts to groundwater and surface water above screening levels, AFFF Area 2 is recommended for an RI.

### **8.3 BUILDING 570 – AFFF AREA 3**

PFAS compounds were in groundwater and surface water above screening levels at Building 570 (AFFF Area 3). PFOA was in two of the three groundwater samples above the EPA HA of 0.07 µg/L. PFOS was in all three groundwater samples above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was above the EPA HA of 0.07 µg/L in all three samples. Based on water levels from the temporary wells gauged on February 7, 2017, shallow groundwater elevations ranged from 30.44 feet to 31.30 feet amsl and flowed west/southwest.

PFOA was in the surface water sample above the EPA HA of 0.07 µg/L. PFOS was in the surface water sample above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was above the EPA HA of 0.07 µg/L. Workers are within 1 mile, and wetlands are within 4 miles of the location. Surface water flows into a storm drain inlet south of Building 570. The drain discharges into underground piping that connects to a concrete-lined ditch. Water from the ditch discharges at Outfall 003 (AFFF Area 5) into an unnamed tributary of Popperdam Creek, then into Popperdam Creek, which flows into Ashley River. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and residents of nearby communities can use local waterways for recreational fishing. Also, Goose Creek Reservoir is approximately 2.6 miles northeast (upgradient) to AFFF Area 3.

There is no immediate threat to public water supply wells from PFAS compounds in groundwater at AFFF Area 3. JBICA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 2.6 miles northeast (upgradient) of AFFF Area 3. The closest drinking water well to AFFF Area 3 is approximately 1.1 miles to the northeast. The closest downgradient drinking water well is approximately 2.45 miles southwest and set below a confining unit. The closest residential area is upgradient to crossgradient from AFFF Area 3, approximately 0.8 mile east.

PFBS, PFOA, and PFOS concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 3 during this SI were below screening levels. Lacking concentrations of PFAS compounds above screening levels, the soil and air pathways are incomplete at AFFF Area 3.

Based on PFAS impacts to groundwater and surface water above screening levels, AFFF Area 3 is recommended for an RI.

### **8.4 2005 PRIVATE PLANE CRASH AREA – AFFF AREA 4**

PFAS compounds were in groundwater and surface water above screening levels at the plane crash area (AFFF Area 4). PFOS was in one primary groundwater sample and the duplicate above the EPA HA of 0.07 µg/L. Combined PFOA and PFOS was above the EPA HA of 0.07 µg/L in one primary sample and the duplicate.

PFOS was in the surface water sample above the EPA HA of 0.07 µg/L. Combined PFOA and PFOS was above the EPA HA of 0.07 µg/L. Workers are within 1 mile, and wetlands are within 4 miles of the

location. Surface water at the 2005 plane crash area flows primarily to the east/southeast. The storm ditches sampled are to the east and southeast of the crash area. No surface water intakes, downstream fisheries, or sensitive environments are adjacent to the surface water migration path within 15 miles downstream of the location; however, several wetlands may be present, and local waterways can be used for recreational fishing by residents of nearby communities.

Groundwater samples were collected using an SP-16 sampler, so groundwater levels could not be obtained. Therefore, groundwater flow direction has not been determined for AFFF Area 4 although groundwater flow direction is estimated to the southwest. Groundwater was observed in the soil during drilling at approximately 7.5 feet bgs.

There is no immediate threat to public water supply wells from PFAS compounds in groundwater at AFFF Area 4. JBICA has no drinking water wells; water is obtained from the Charleston Commission of Public Works. Goose Creek Reservoir is approximately 3 miles northeast (upgradient) of AFFF Area 4. The closest downgradient drinking water well is approximately 2 miles southwest and set below a confining unit. The closest residential area is upgradient from AFFF Area 4, approximately 0.9 mile east.

PFBS, PFOA, and PFOS concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 4 during this SI were below screening levels. Lacking concentrations of PFAS compounds above screening levels, the soil and air pathways are incomplete at AFFF Area 4.

Based on PFAS impacts to groundwater and surface water above screening levels, AFFF Area 4 is recommended for an RI.

## **8.5    OUTFALL 003 – AFFF AREA 5**

PFAS compounds were in surface water at concentrations above screening levels at Outfall 003 (AFFF Area 5). Shallow groundwater has not been impacted by AFFF entering Outfall 003 at AFFF Area 5. PFOA, PFOS, and combined PFOA and PFOS detections were below the EPA HA 0.07 µg/L. Based on shallow groundwater results for AFFF Area 5, the groundwater pathway is incomplete.

PFOS was in the surface water sample above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS result was above the EPA HA of 0.07 µg/L. No surface water intakes were identified within 15 miles downstream.

One groundwater sample was collected using an SP-16 sampler; therefore, groundwater flow direction has not been determined for AFFF Area 5. Historical groundwater flow direction was estimated to the southeast. Groundwater was observed in the soil during drilling at approximately 3.5 feet bgs. Soil was not identified as a media of concern at Outfall 003 and was not sampled. PFBS, PFOA, and PFOS concentrations in sediment samples collected at AFFF Area 5 during this SI were below screening levels. Lacking concentrations of PFAS compounds above screening levels, the soil and air pathways are incomplete at AFFF Area 5. Although PFOS and PFOA are present at concentrations above EPA HAs in the surface water at AFFF Area 5, no surface water intakes were identified within 15 miles downstream; therefore, the human exposure pathway is incomplete.

Based on PFAS impacts to surface water above screening levels, AFFF Area 5 is recommended for an RI.

## **8.6 NORTH AUXILIARY AIRFIELD FIRE STATION – AFFF AREA 6**

PFAS compounds were in groundwater and surface water above screening levels at NAAF Fire Station (AFFF Area 6). PFOA, PFOS, and combined PFOA and PFOS were in all three groundwater samples above the EPA HA of 0.07 µg/L. PFOS and combined PFOA and PFOS were detected in the surface water sample above the EPA HA of 0.07 µg/L. Based on water levels from the temporary wells gauged on February 4, 2017, shallow elevations ranged from 272.39 feet to 272.73 feet amsl, and groundwater flowed southeast.

Although the North Edisto River to the southeast is used as a drinking water source for Orangeburg, South Carolina, the water intake is more than 15 river miles downstream. The closest drinking water well to AFFF Area 6 is approximately 1 mile northeast (sidegradient) and set within a confined aquifer. Two public supply wells are approximately 1.2 miles southeast (downgradient) of AFFF Area 6 and set within a confined aquifer. The town of North, South Carolina, is to the northwest (upgradient) and obtains drinking water from public supply wells (groundwater sources) approximately 2.5 miles northeast (upgradient) and 2 to 3 miles northwest (upgradient) of AFFF Area 6 that range in depth from 255 to 267 feet bgs and are set within a confined aquifer. Therefore, the groundwater and surface water pathways are incomplete.

PFBS and PFOA concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 6 during this SI were below screening levels. The PFOS concentration in one surface soil sample was above the calculated RSL. Exposure to impacted soil would be low because the area is covered in mature vegetation. Therefore, the soil and air pathways are incomplete at AFFF Area 6.

Based on PFAS impacts to surface soil, groundwater, and surface water above screening levels, AFFF Area 6 is recommended for an RI.

## **8.7 NORTH AUXILIARY AIRFIELD PUMP HOUSE – FOAM TRUCK FLUSH AREA – AFFF AREA 7**

PFAS compounds were in groundwater above screening levels at the NAAF Pump House (AFFF Area 7). PFOA was in one groundwater sample above the EPA HA of 0.07 µg/L. PFOS was in two groundwater samples above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations were above the EPA HA of 0.07 µg/L. Based on water levels from the temporary wells gauged on February 4, 2017, shallow groundwater elevations ranged from 275.45 feet to 275.88 feet amsl and flowed southeast.

There was no surface water at the NAAF Pump House, as indicated in Section 5.7. No storm drains or ditches are within the vicinity of the pump house, and surface water drains to the surrounding subsurface or evaporates; therefore, it is unlikely that any AFFF has migrated into surface water.

Although the North Edisto River to the southeast is used as a drinking water source for Orangeburg, South Carolina, the water intake is more than 15 river miles downstream. The closest drinking water well to AFFF Area 7 is approximately 0.7 mile to the northeast (sidegradient) and set within a confined aquifer. Two public supply wells owned by the USAF are approximately 1.1 miles southeast (downgradient) of AFFF Area 7 and set within a confined aquifer. The town of North, South Carolina, is northwest (upgradient) and obtains drinking water from public supply wells (groundwater sources) ranging in depth from 172 to 481 feet bgs within a confined aquifer. These wells are approximately 2 miles northeast (crossgradient) and 2 miles northwest (upgradient) of AFFF Area 7. Therefore, the groundwater pathway is incomplete.

Sediment was not identified as a media of concern at the Pump House and was not sampled. PFBS, PFOA, and PFOS concentrations in surface soil and subsurface soil samples collected at AFFF Area 7 during this SI were below screening levels. Lacking concentrations of PFAS compounds above screening levels, the soil and air pathways are incomplete at AFFF Area 7.

Based on PFAS impacts to groundwater above screening levels, AFFF Area 7 is recommended for an RI.

## **8.8 NORTH AUXILIARY AIRFIELD FOAM TEST AREA AND OLD C-141 (TRAINING) – AFFF AREA 8**

PFAS compounds were in groundwater and surface water above screening levels at the NAAF Foam Test Area and Old C-141 (Training) (AFFF Area 8). PFOA was in two primary groundwater samples and the duplicate above the EPA HA of 0.07 µg/L. PFOS was in two primary groundwater samples and the duplicate above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentrations were above the EPA HA of 0.07 µg/L in two primary groundwater samples and the duplicate. Based on water levels from the temporary wells gauged on February 5, 2017, shallow groundwater elevations ranged from 211.23 feet to 211.92 feet amsl, and groundwater flowed southwest.

PFOS was in the surface water sample above the EPA HA of 0.07 µg/L. The combined PFOA and PFOS concentration was above the EPA HA of 0.07 µg/L.

Although the North Edisto River to the southeast is used as a drinking water source for Orangeburg, South Carolina, the water intake is more than 14 river miles downstream. The closest drinking water wells to AFFF Area 8 are approximately 1.0 mile northeast (sidegradient) and set within a confined aquifer. There are no downgradient drinking water wells. The town of North, South Carolina, is northwest (crossgradient) and obtains drinking water from public supply wells (groundwater sources) ranging from 172 to 481 feet bgs within a confined aquifer. The aquifer is approximately 2.8 miles northeast (upgradient) and 2.7 miles northwest (crossgradient to upgradient) of AFFF Area 8. Therefore, the groundwater and surface water pathways are incomplete.

PFBS and PFOA concentrations in surface soil, subsurface soil, and sediment samples collected at AFFF Area 8 during this SI were below screening levels. The PFOS concentration in one surface soil sample was above the calculated RSL. Exposure to impacted soil would be low because the area is covered in mature vegetation and is in a remote area on NAAF. Therefore, the soil and air pathways are incomplete at AFFF Area 8.

Based on PFAS impacts to surface soil, groundwater, and surface water above screening levels, AFFF Area 8 is recommended for an RI.

## **8.9 FT010 (NORTH AUXILIARY AIRFIELD FIRE TRAINING AREA) – AFFF AREA 9**

PFAS compounds were not detected in soil or groundwater above screening levels at FT010 (AFFF Area 9). The analytical results for groundwater samples showed concentrations of PFOA and PFOS, and combined concentrations of PFOA and PFOS were detected in samples at concentrations below the EPA HA of 0.07 µg/L.

Based on water levels from the temporary wells gauged on February 6, 2017, shallow groundwater elevations ranged from 275.64 feet to 269.39 feet amsl, and groundwater flowed northeast.

The closest drinking water well to AFFF Area 9 is approximately 0.5 mile east (sidegradient/downgradient) and set within a confined aquifer. Two public supply wells are downgradient

approximately 1.6 and 1.9 miles northeast of AFFF Area 9 and set within a confined aquifer. There is no potential threat to public water supply wells from PFAS compounds in groundwater at AFFF Area 9.

Sediment was not identified as a media of concern at FT010 and was not sampled. PFBS, PFOA, and PFOS concentrations in surface soil and subsurface soil samples collected at AFFF Area 9 during this SI were below screening levels. Lacking concentrations of PFAS compounds above screening levels, the soil and air pathways are incomplete at AFFF Area 9.

PFAS concentrations in soil and groundwater at AFFF Area 9 were below screening levels. Therefore, AFFF Area 9 is recommended for no further response action planned.

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## **Appendix A**

### **Figures**

\\or-file01.sesllc.priv\GIS\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 1\_Location of Charleston AFB and NAAF\_SI.mxd; Date: 7/19/2017

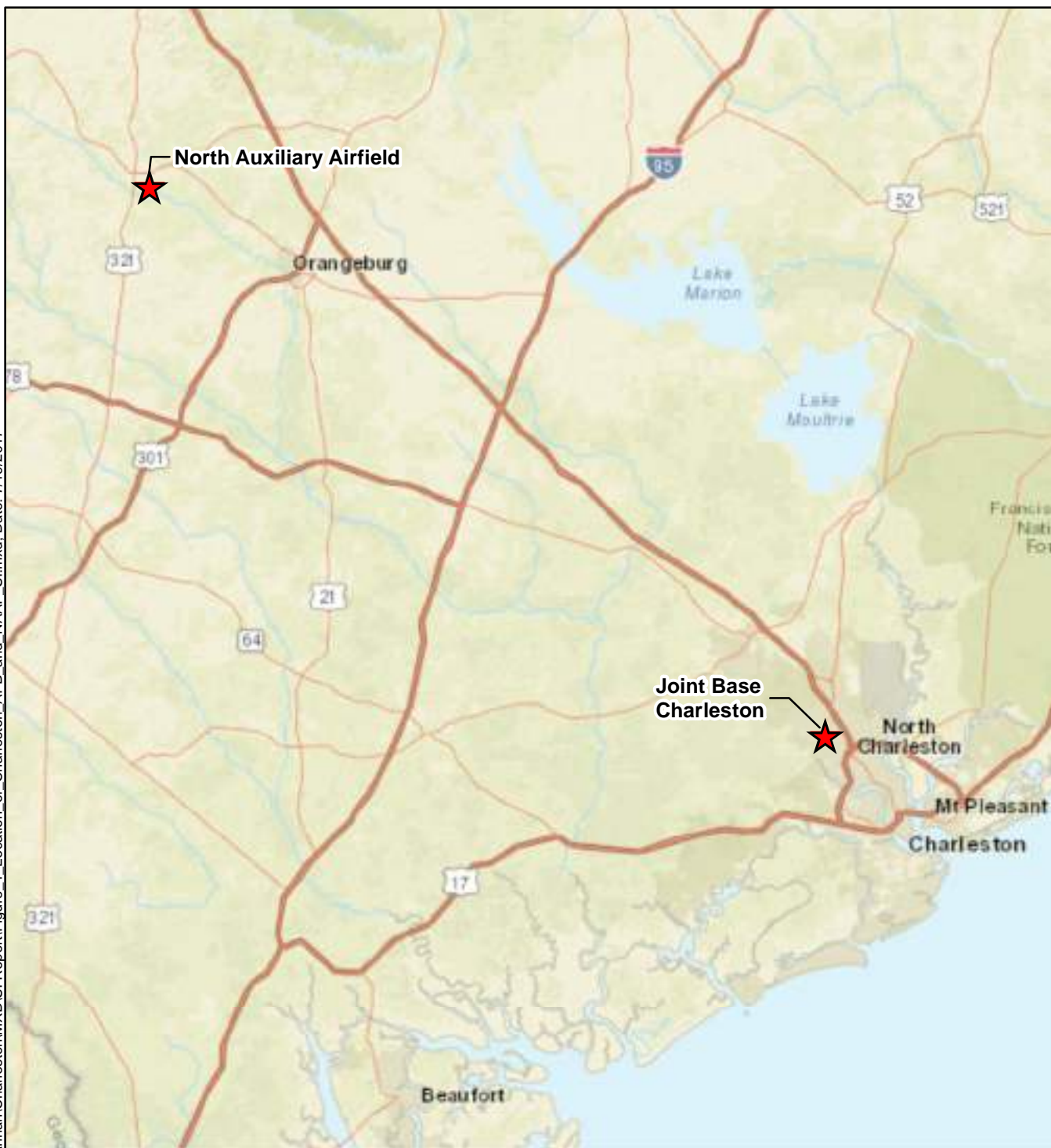


Figure 1 Location of Joint Base Charleston-Air and North Auxiliary Airfield, South Carolina

**Legend**

Service Layer Credits: Esri StreetMap North America

Drawn: B Baxter

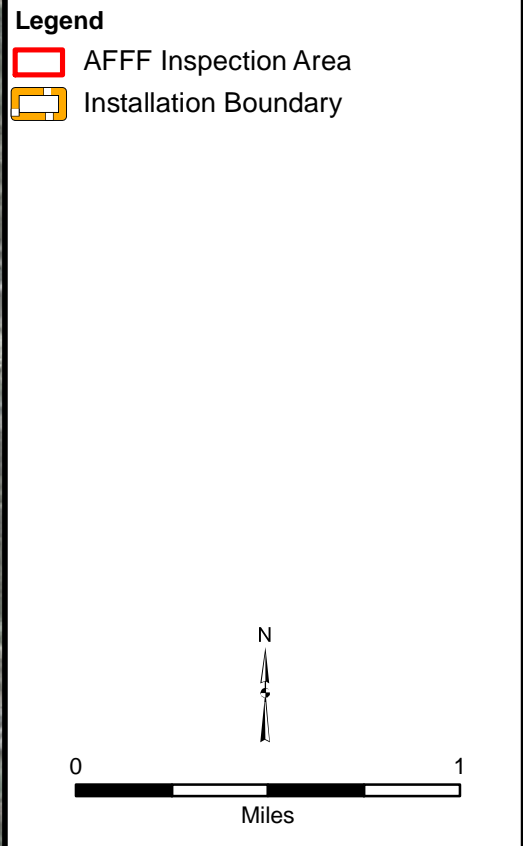
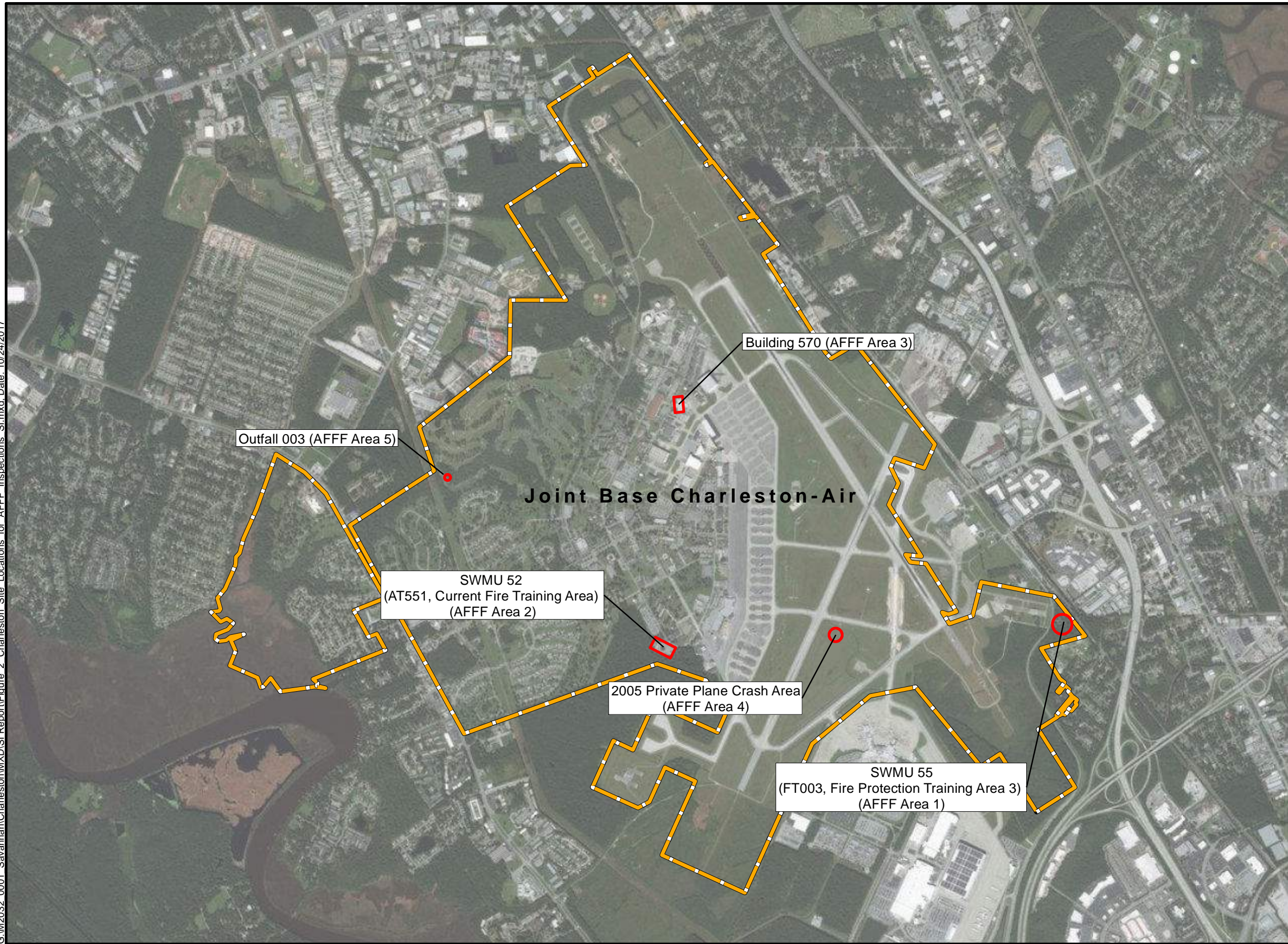
Date: 7/19/2017

0 15 Miles





G:\M2032.0001 Savannah\Charleston\MXD\SI Report\Figure 2 Charleston Site Locations for AFFF Inspections SI.mxd Date: 10/24/2017



Joint Base Charleston-Air  
Charleston County, South Carolina

**Figure 2**  
**Joint Base Charleston-Air AFFF Area**  
**Site Inspection Locations**

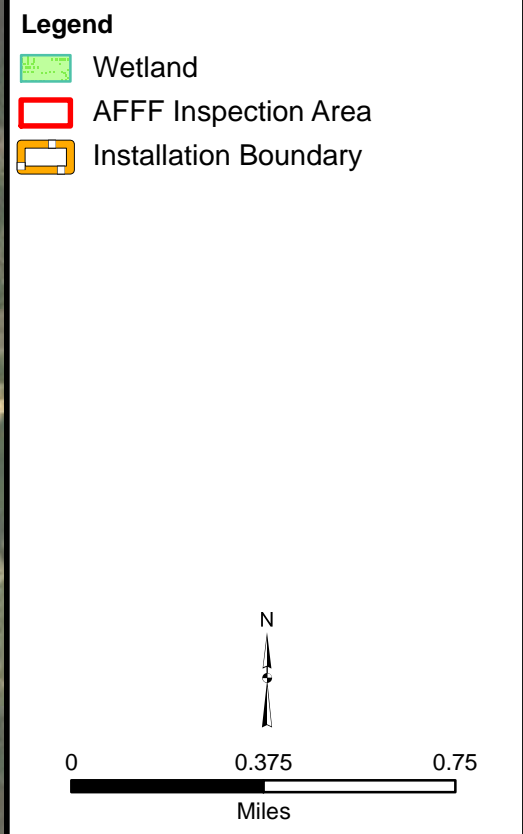


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G:\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 3 NAAF Site Locations for AFFF Inspections\_SI.mxd Date: 8/18/2017



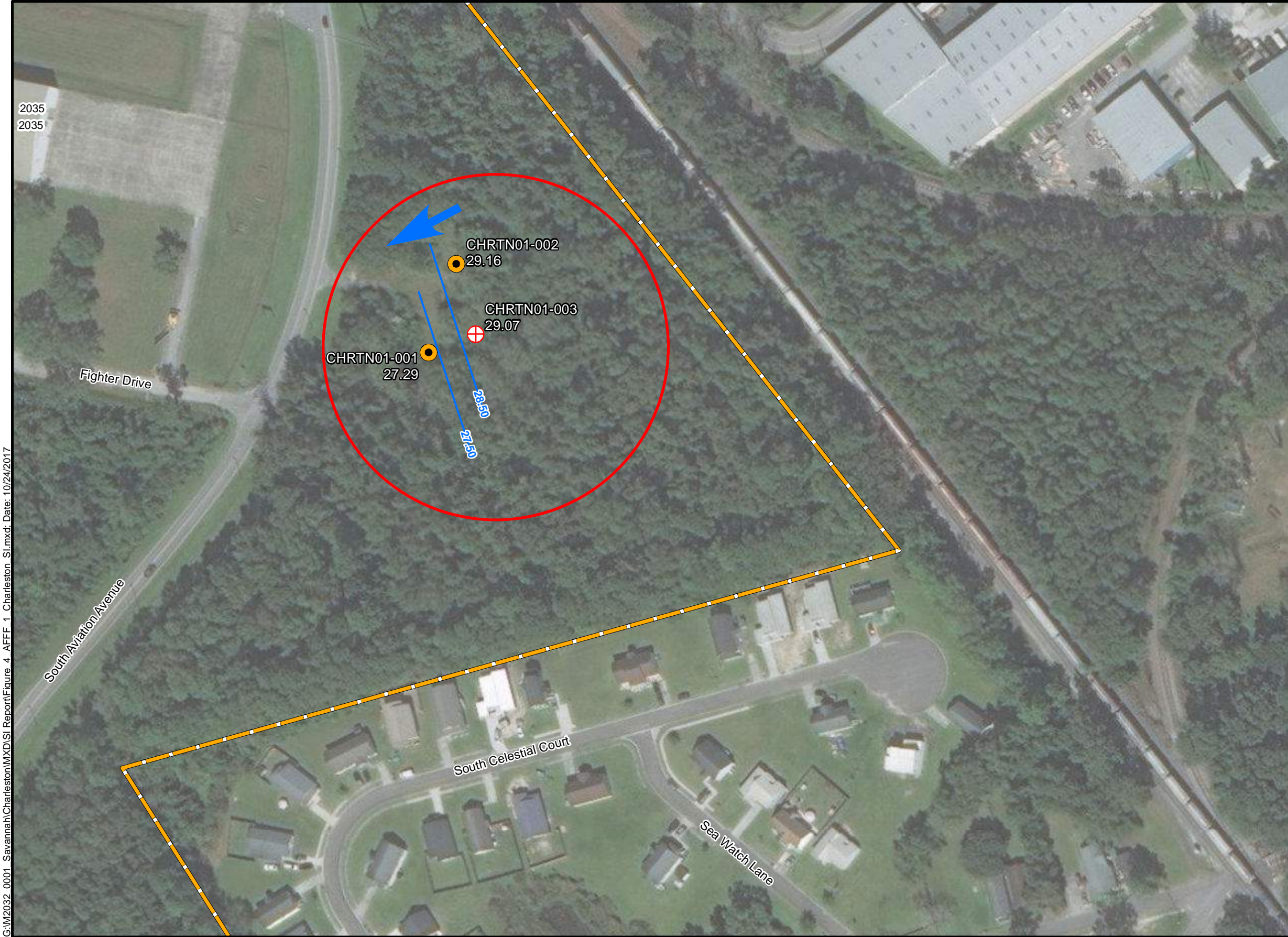
North Auxiliary Airfield  
Orangeburg County, South Carolina

**Figure 3**  
**North Auxiliary Airfield AFFF**  
**Area Site Inspection Locations**

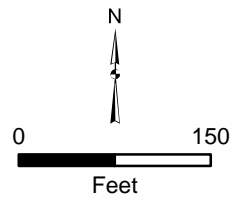


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Service Layer Credits: Esri ArcGIS Online Aerial Photography





- Legend**
- DPT Boring Location for Collecting Surface Soil, Subsurface Soil, and Groundwater Samples
  - DPT Boring Location for Collecting Groundwater Sample
  - Groundwater Flow Direction
  - AFFF Inspection Area
  - Installation Boundary
  - Groundwater Elevation Contour
- CHRTN01-001  
27.29 = Groundwater Elevation (ft)  
measured on February 3, 2017



Joint Base Charleston-Air  
Charleston County, South Carolina

**Figure 4**  
**SWMU 55 (FT003, Fire Protection Training Area 3) (AFFF Area 1) Sample Locations and Potentiometric Contours**



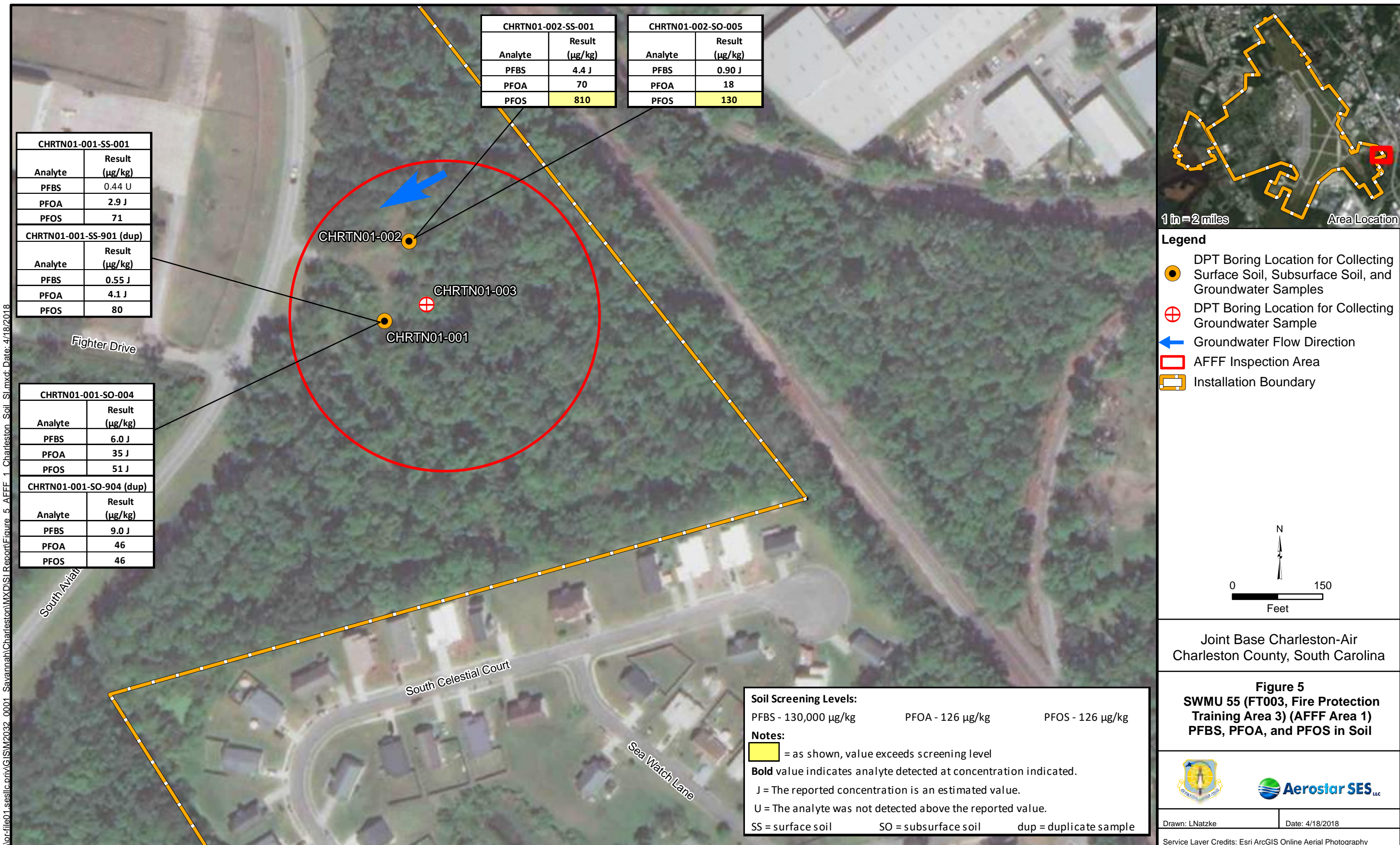
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Date: 10/24/2017

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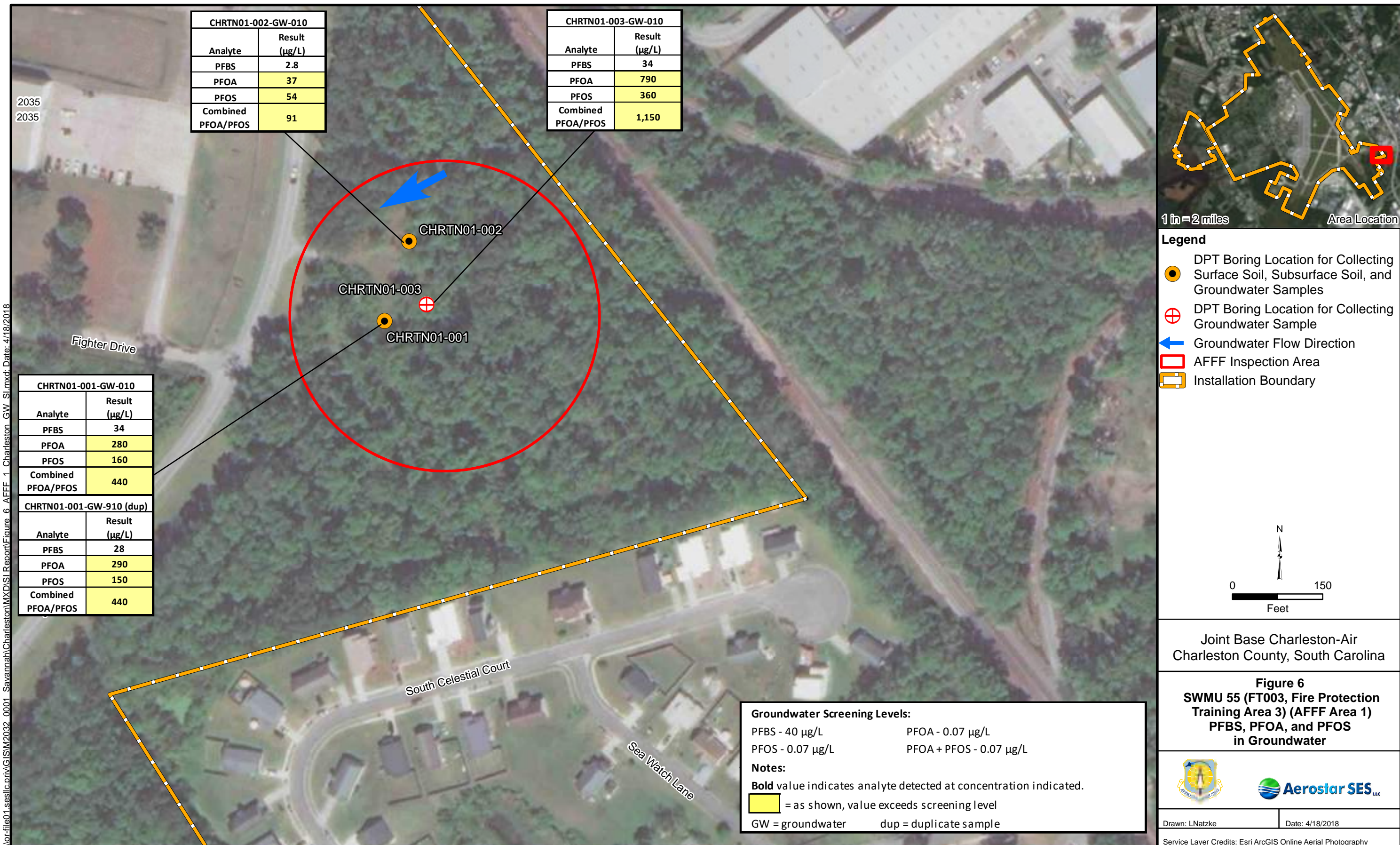


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\\orfile01.sesllc.priv\GIS\2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 6 AFFF 1 Charleston GW SI.mxd; Date: 4/18/2018



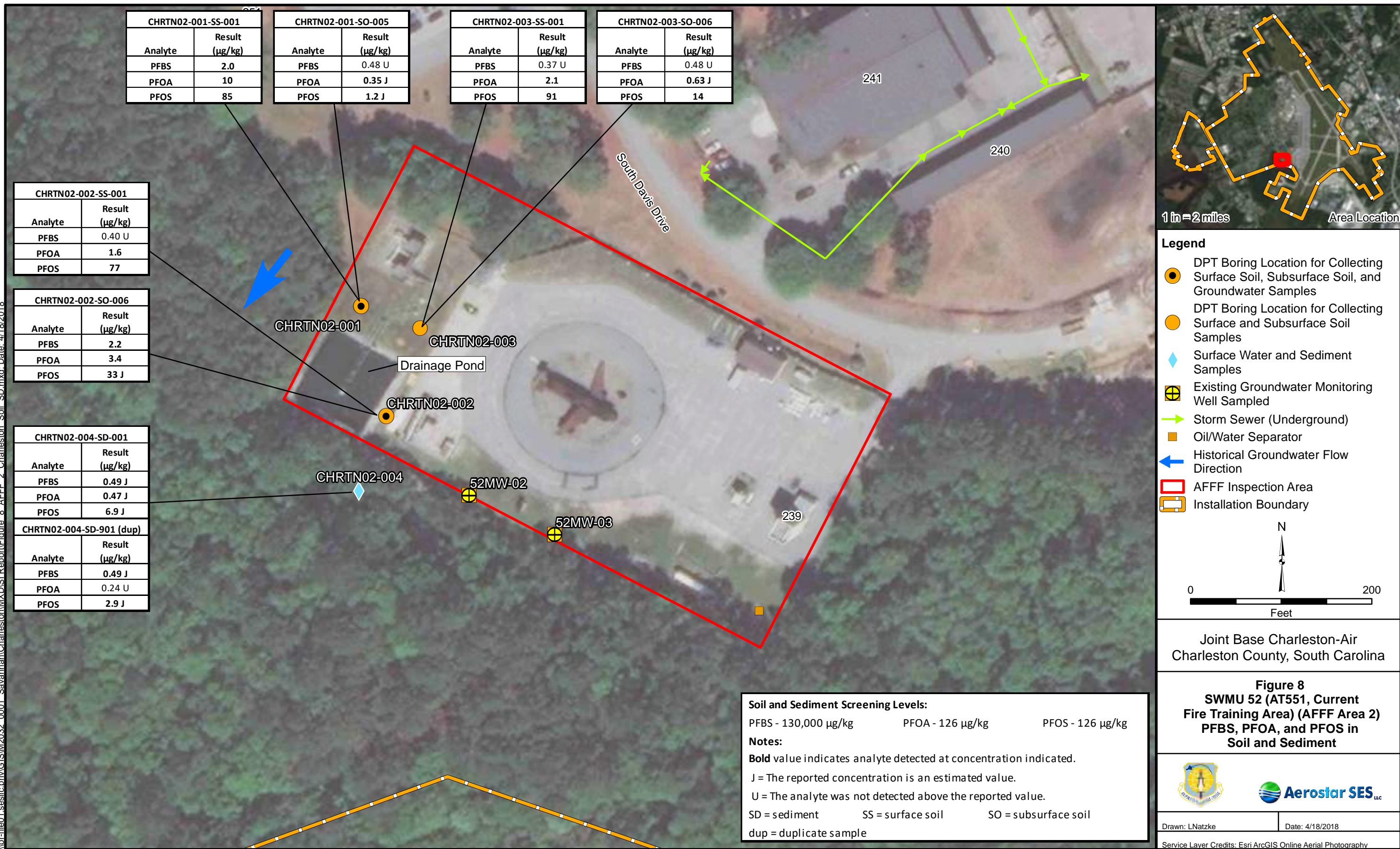


G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 7 AFFF 2 Charleston\_SI.mxd Date: 10/24/2017



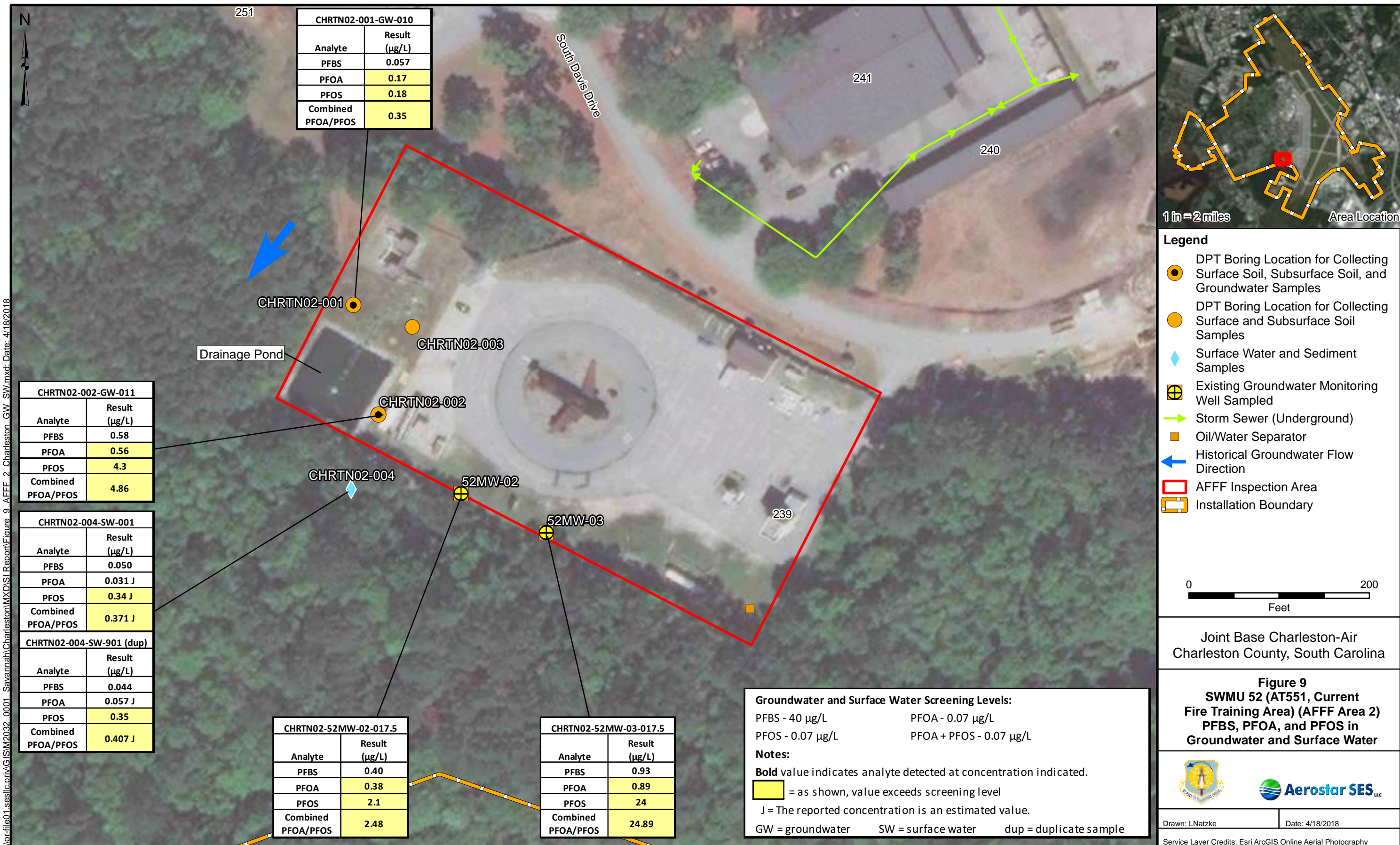


\\or-file01.sesllc.priv\GIS\ISM2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 8 AFFF 2 Charleston\_Soil\_SD.mxd; Date: 4/18/2018





\\or-file01.sesllc.priv\GIS\2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 9\_AFFF 2 Charleston\_GW\_SW.mxd: Date: 4/18/2018





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G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 11\_AFFF\_3 Charleston\_SI.mxd; Date: 8/18/2017





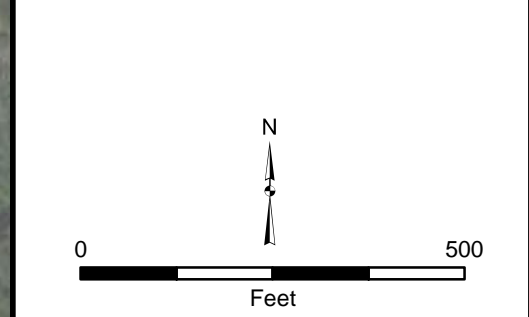
G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 12\_AFFF\_5\_Charleston\_SI.mxd; Date: 8/18/2017



**Legend**

- DPT Boring Location for Collecting Groundwater Sample
- Surface Water and Sediment Samples
- Storm Sewer (Underground)
- Approximate Groundwater Flow Direction, November 1994 (Haliburton NUS Corporation, June 1995)
- AFFF Inspection Area
- Installation Boundary

\* Hydropunch sample at this location.



Joint Base Charleston-Air  
Charleston County, South Carolina

**Figure 12**  
**Building 570 (AFFF Area 3)**  
**Surface Water and Sediment Sample**  
**Locations and Outfall 003**  
**(AFFF Area 5) Sample Locations**



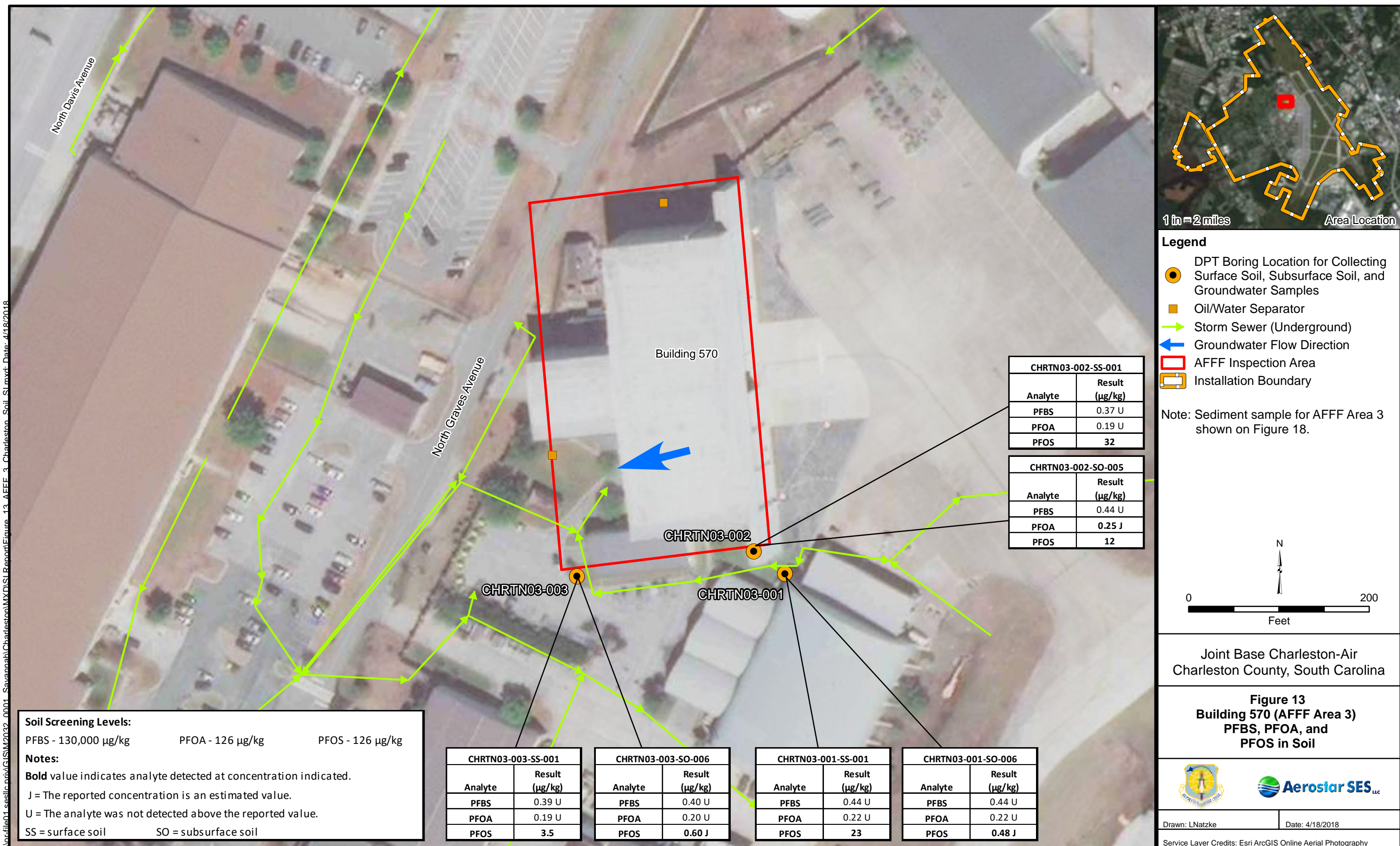
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Date: 8/18/2017

Service Layer Credits: Esri ArcGIS Online Aerial Photography

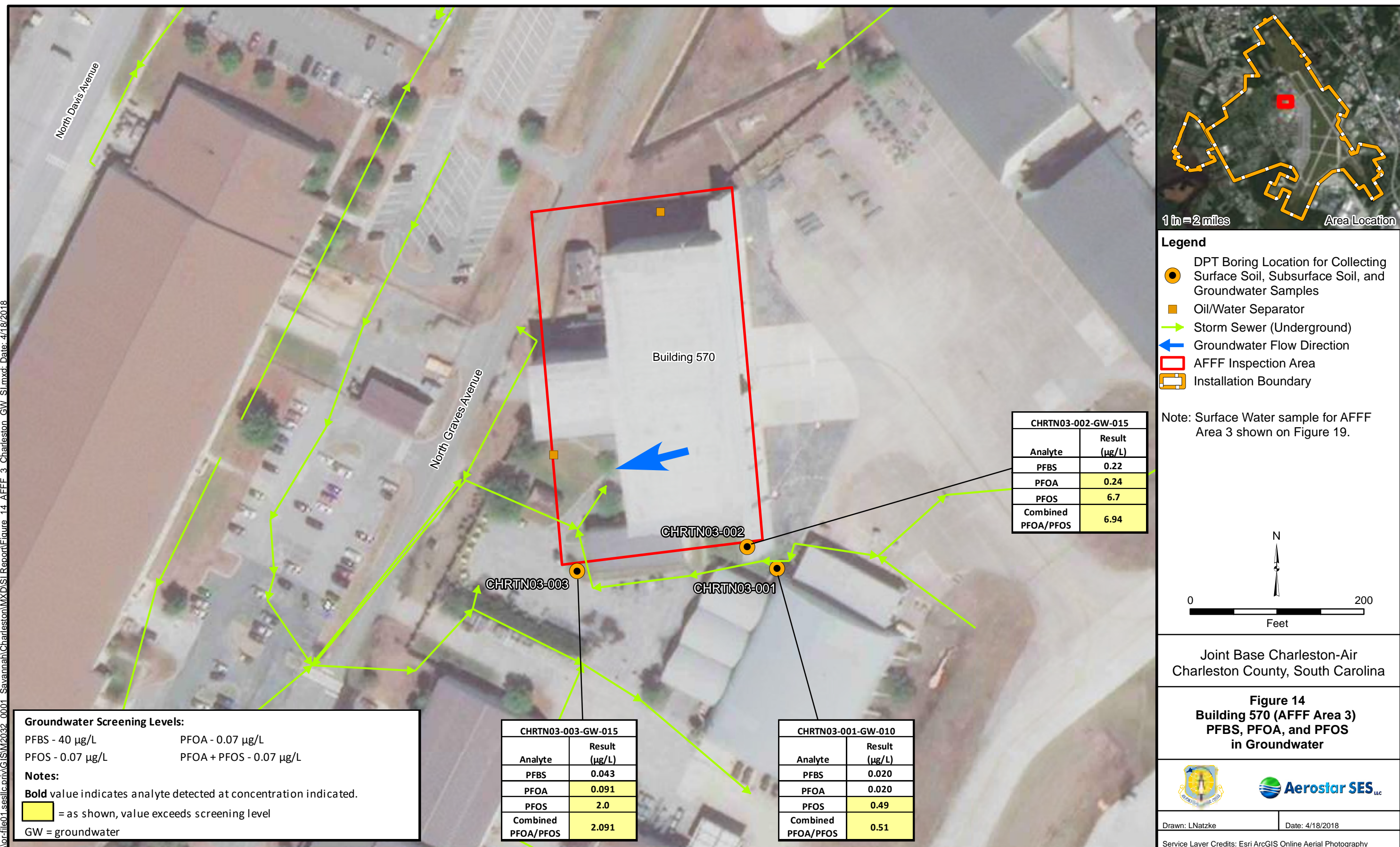


\\jc01-ses\proj\GIS\2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 13\_AFFF\_3\_Charleston\_Soil\_SLM\rd Date: 4/18/2018





\\orfile01.sesllc.prn\GIS\2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 14\_AFFF\_3 Charleston\_GW\_SI.mxd: Date: 4/18/2018





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CHRTN05-001-SD-001	
Analyte	Result (µg/kg)
PFBS	0.48 U
PFOA	0.24 U
PFOS	0.84 J

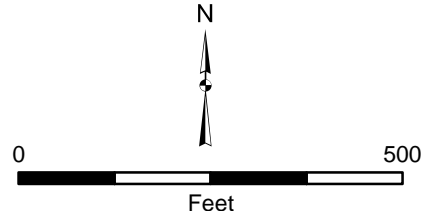
CHRTN03-004-SD-001	
Analyte	Result (µg/kg)
PFBS	0.48 U
PFOA	0.24 U
PFOS	0.52 J

**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



- Legend**
- ⊕ DPT Boring Location for Collecting Groundwater Sample
  - ◆ Surface Water and Sediment Samples
  - Storm Sewer (Underground)
  - ← Approximate Groundwater Flow Direction
  - AFFF Inspection Area
  - ▭ Installation Boundary



Joint Base Charleston-Air  
Charleston County, South Carolina

**Figure 15**  
**Building 570 (AFFF Area 3) and**  
**Outfall 003 (AFFF Area 5)**  
**Sample Locations**  
**PFBS, PFOA, and PFOS in Sediment**

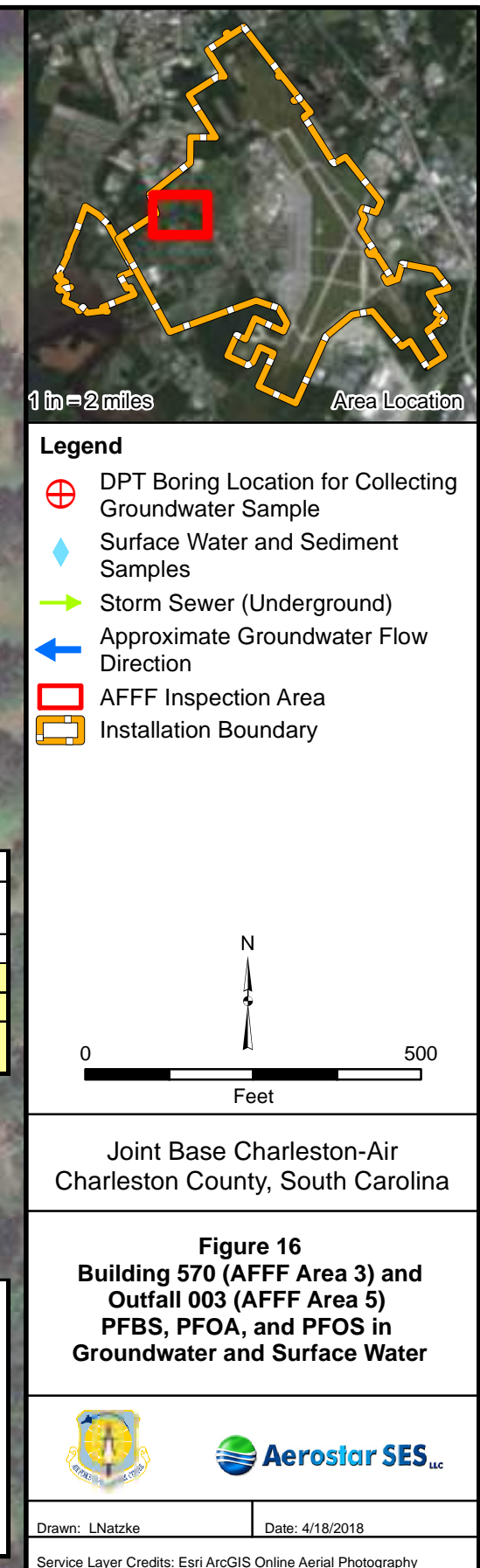


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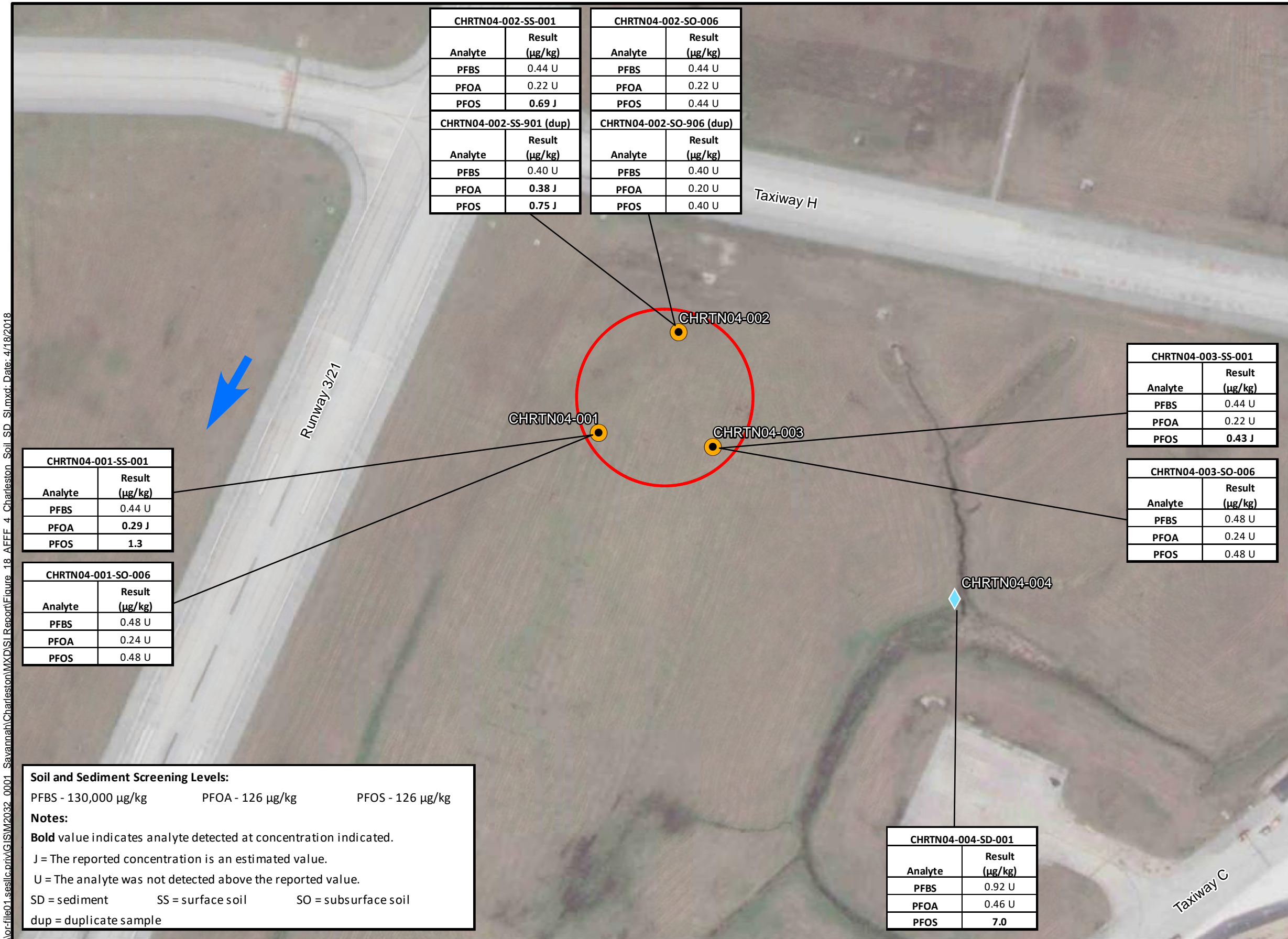


G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 17 AFFF 4 Charleston\_SI.mxd: Date: 8/18/2017





\\or-file01.sesllc.priv\GIS\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 18\_AFFF 4 Charleston\_Soil\_SD\_SI.mxd: Date: 4/18/2018



1 in = 2 miles

Area Location

**Legend**

- DPT Boring Location for Collecting Surface Soil, Subsurface Soil, and Groundwater Samples
- Surface Water and Sediment Samples
- Groundwater Flow Direction
- AFFF Inspection Area
- Installation Boundary

0 200 Feet

Joint Base Charleston-Air  
Charleston County, South Carolina

**Figure 18**  
**2005 Private Plane Crash Area (AFFF Area 4)**  
**PFBS, PFOA, and PFOS**  
**in Soil and Sediment**

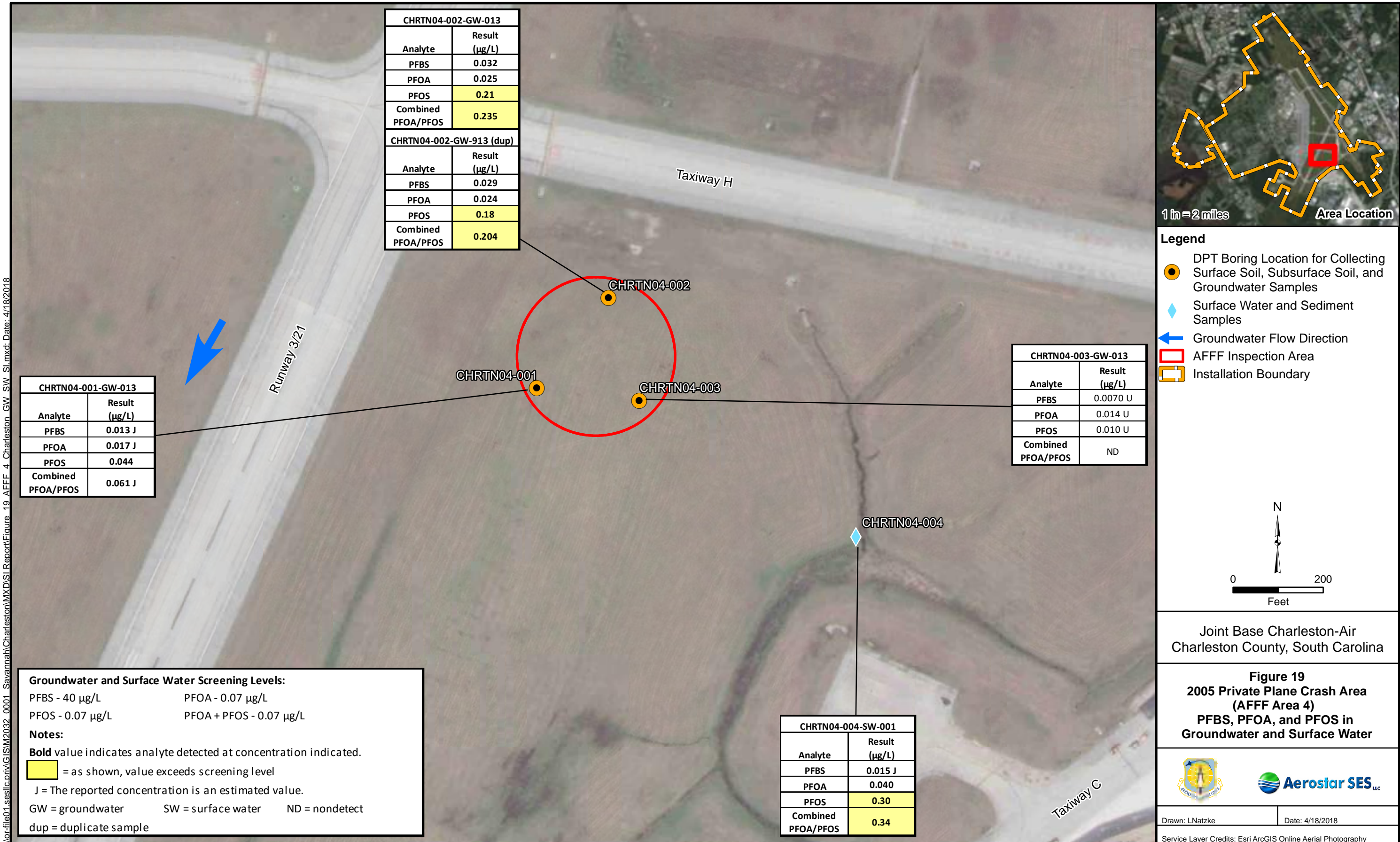
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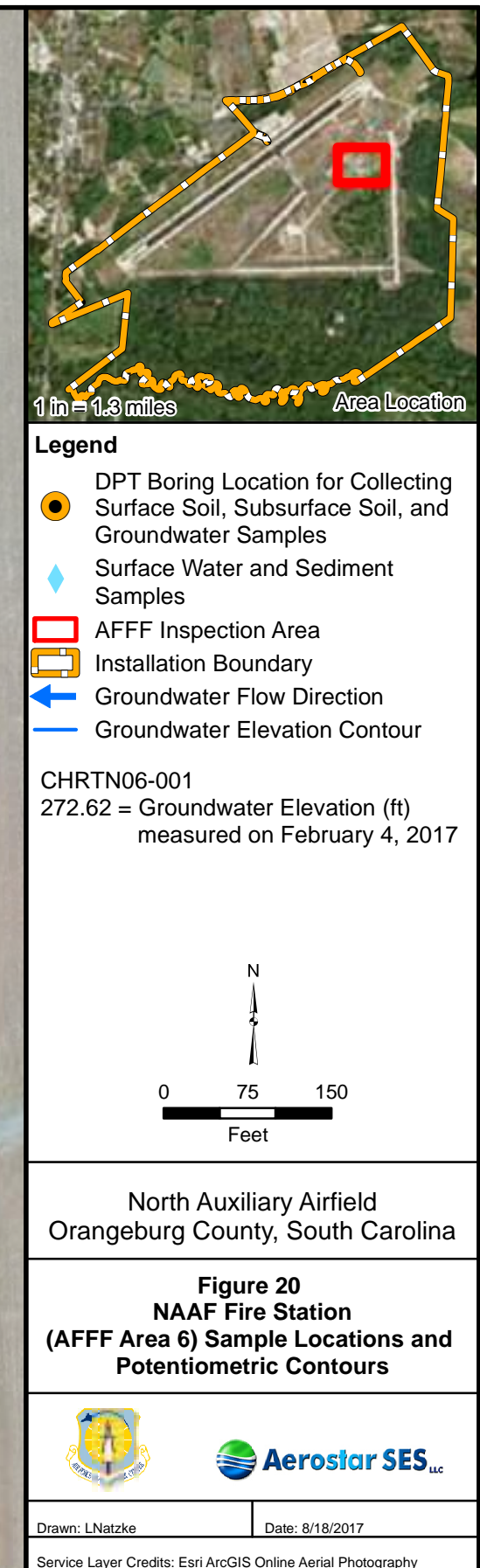
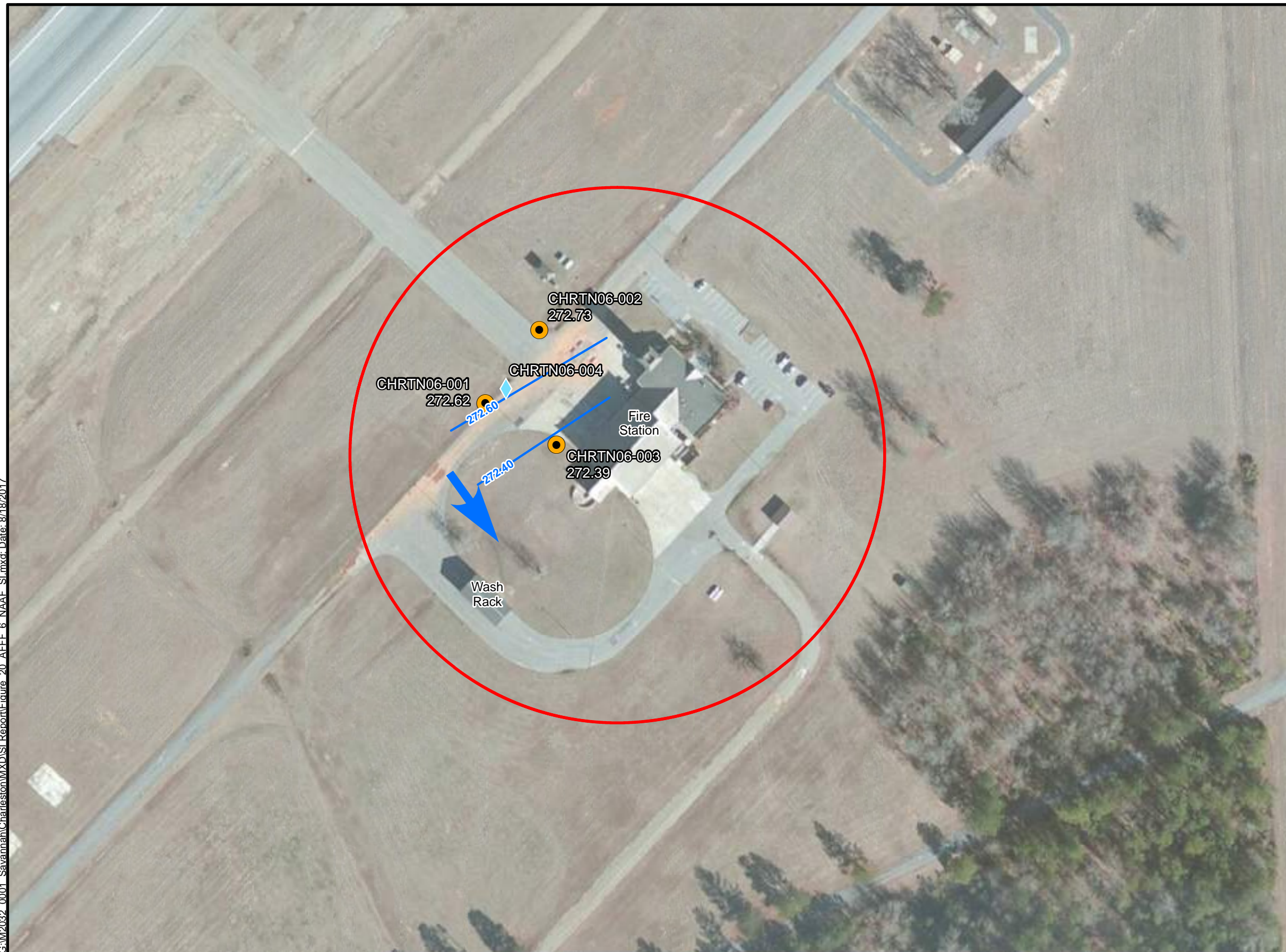


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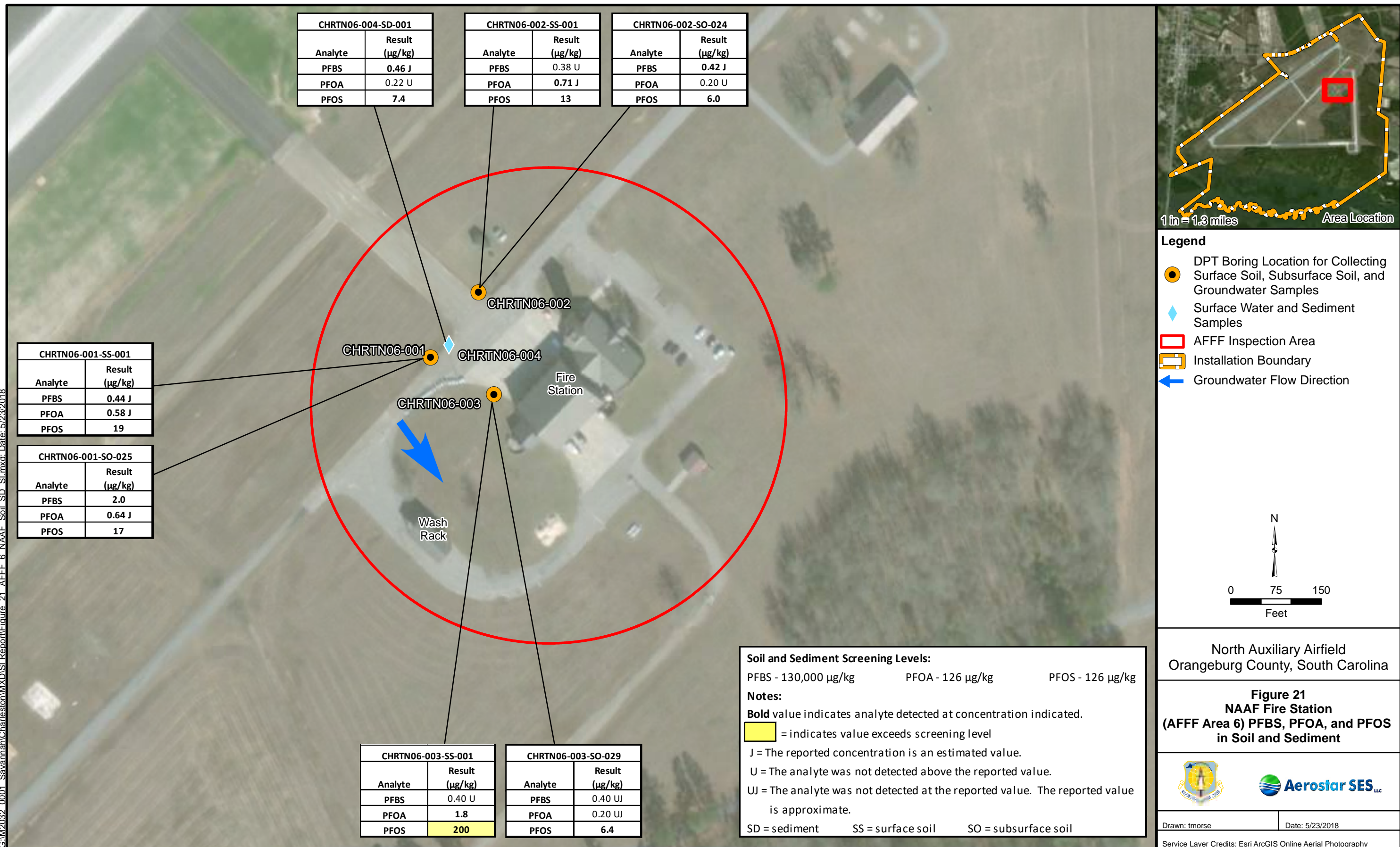


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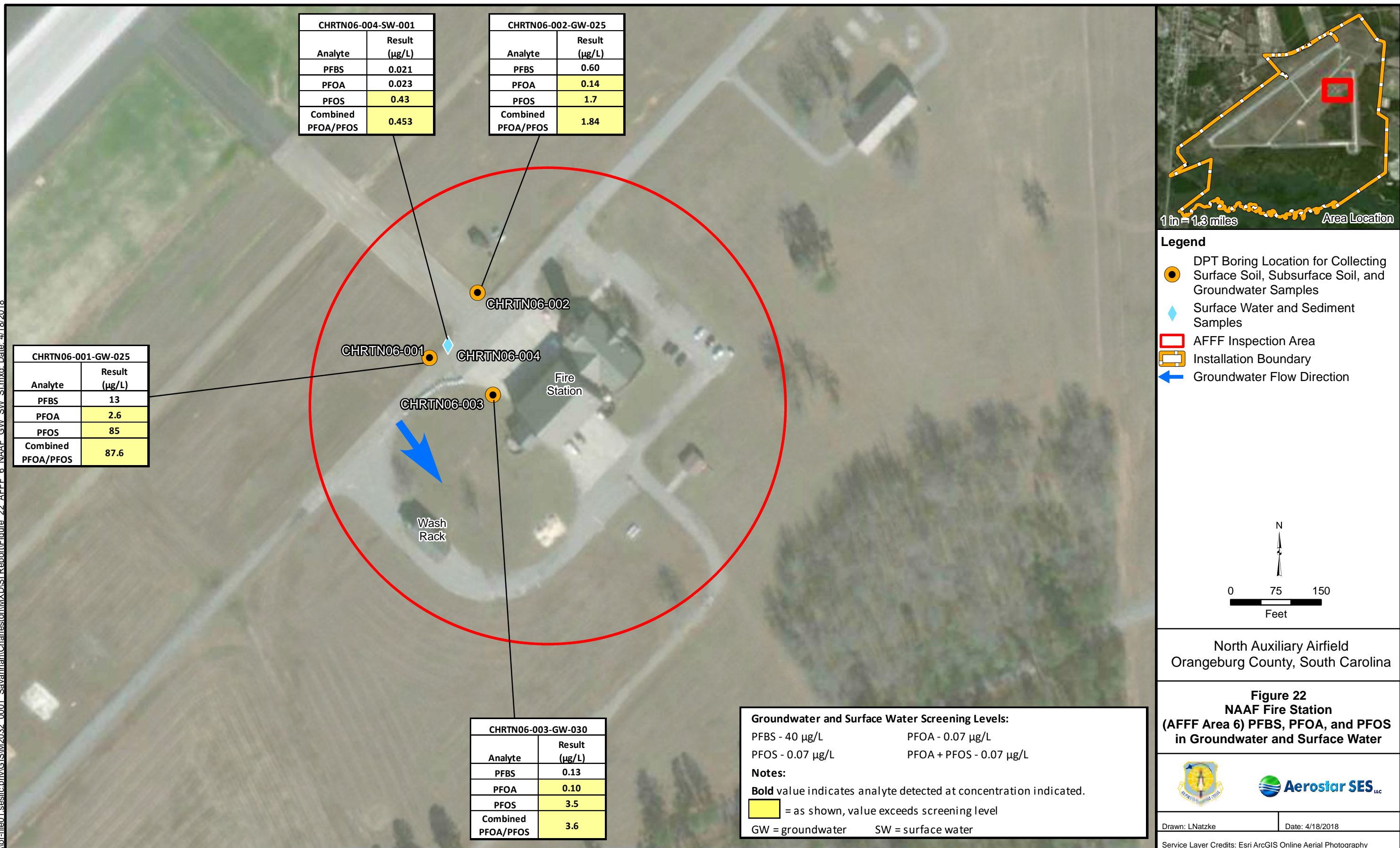


G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 21\_AFFF 6\_NAAF\_Soil\_SD\_SI.mxd; Date: 5/23/2018





\\or-file01.sesllc.priv\GIS\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 22\_AFFF\_6\_NAAF\_GW\_SW\_SI.mxd: Date: 4/18/2018





G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 23\_AFFE 7 NAAF\_SI.mxd; Date: 8/18/2017



1 in = 1.3 miles      Area Location

**Legend**

- DPT Boring Location for Collecting Surface Soil, Subsurface Soil, and Groundwater Samples
- AFFE Inspection Area
- Installation Boundary
- Groundwater Flow Direction

CHRTN07-001  
275.69 = Groundwater Elevation (ft)  
measured on February 4, 2017.

0      100      200  
Feet

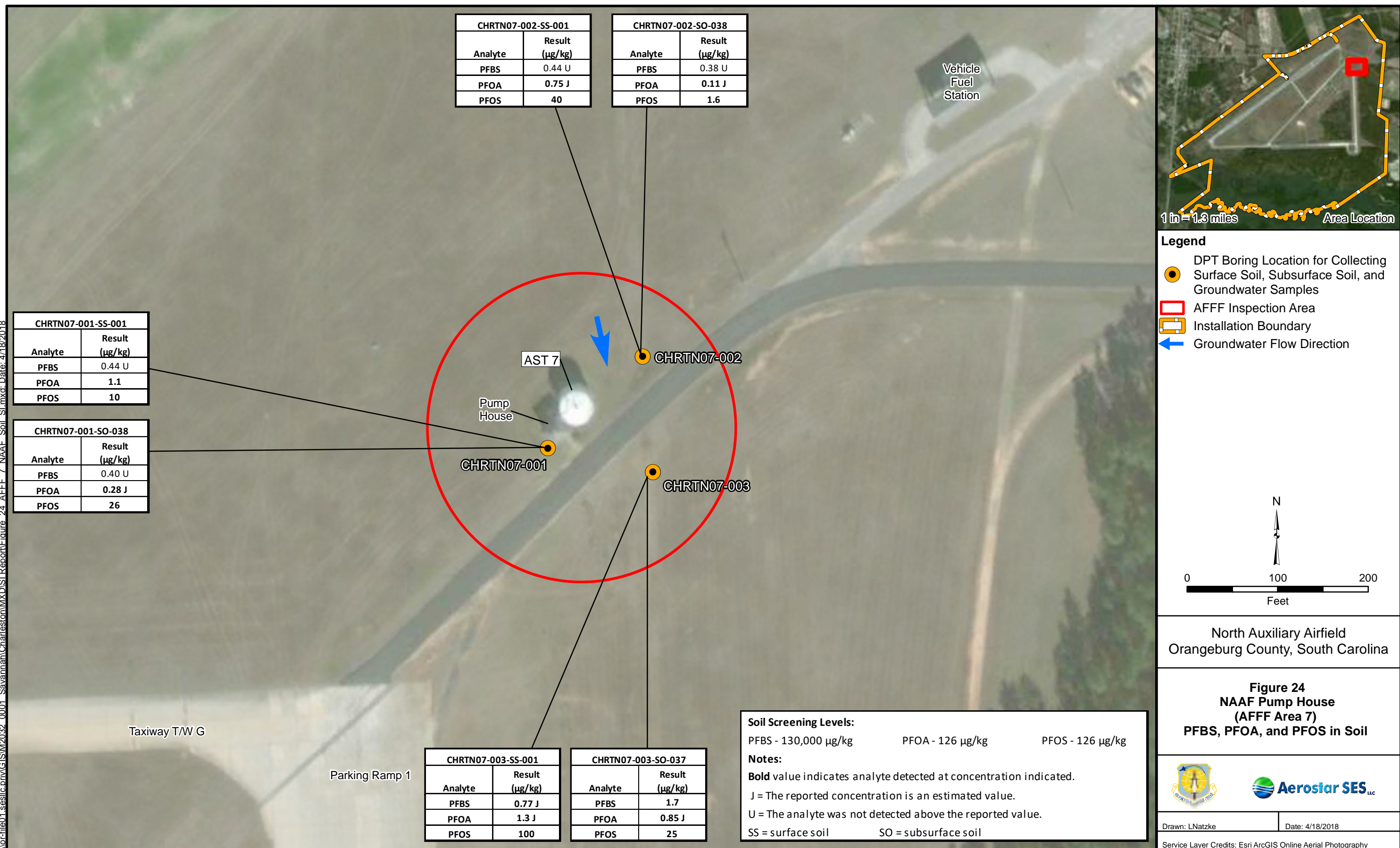
North Auxiliary Airfield  
Orangeburg County, South Carolina

**Figure 23**  
**NAAF Pump House**  
**(AFFE Area 7) Sample**  
**Locations and Potentiometric Contours**

Drawn: LNatzke	Date: 8/18/2017
Service Layer Credits: Esri ArcGIS Online Aerial Photography	

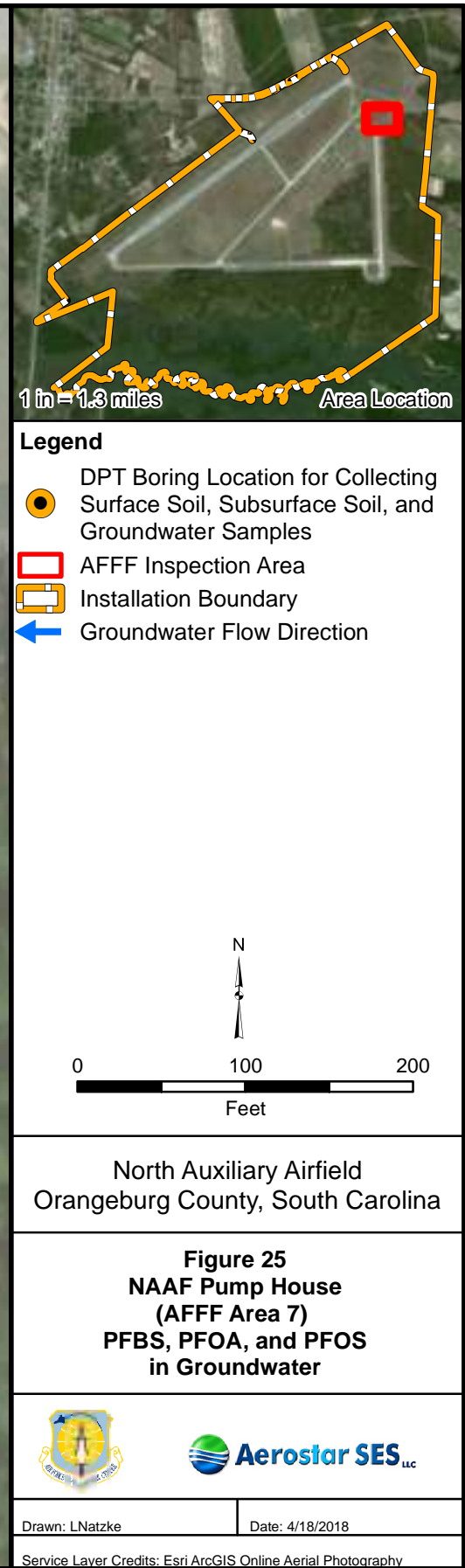
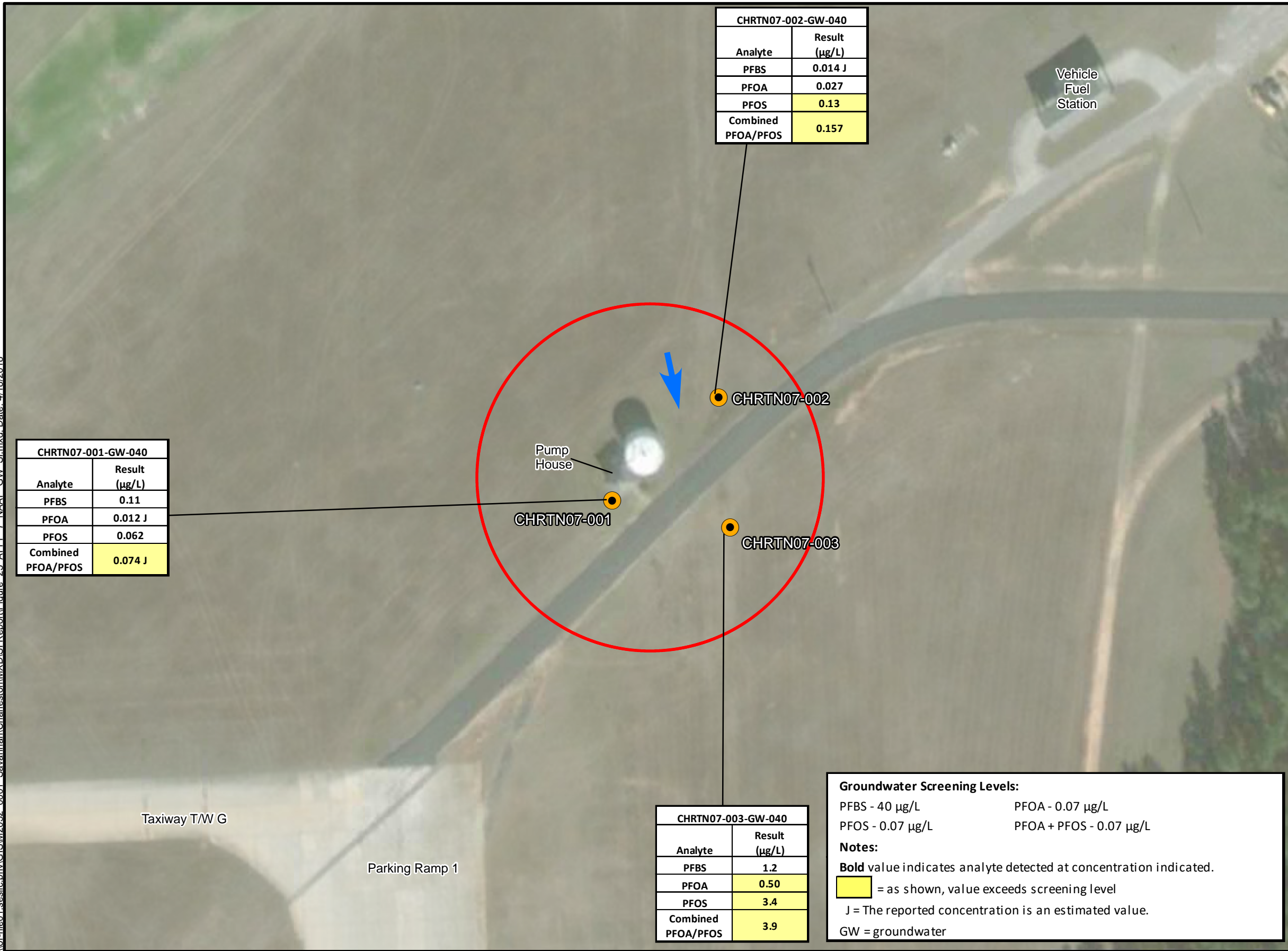


\\or-file01.sesllc.priv\GIS\W2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 24\_AFFF 7\_NAAF\_Soil\_Sl.mxd; Date: 4/18/2018



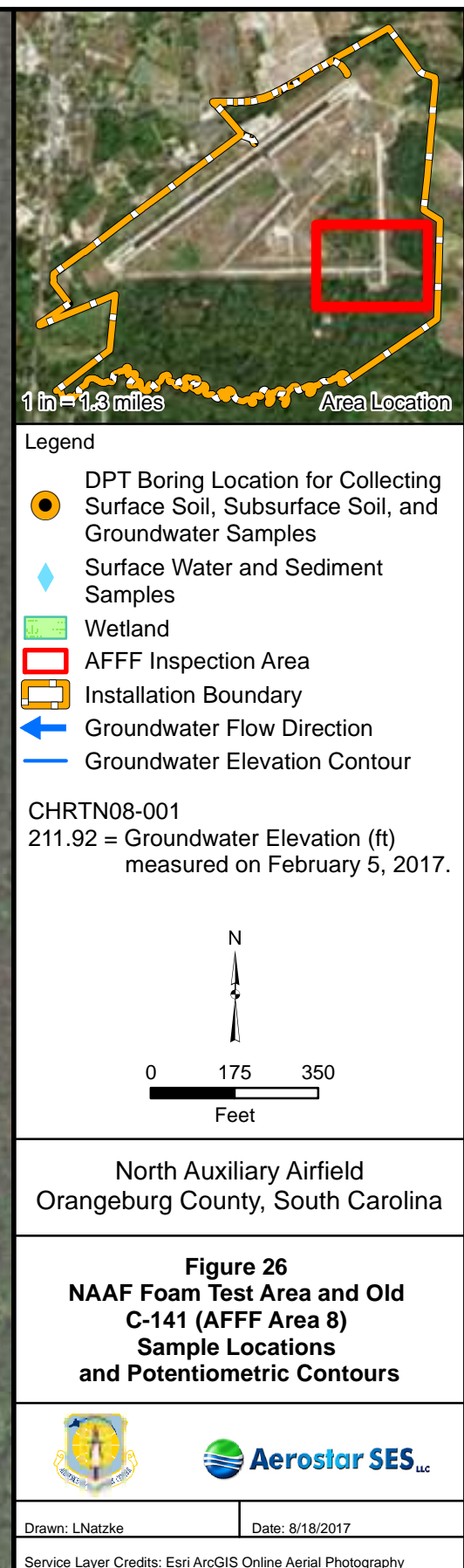


\\or-file01.sesllc.priv\GIS\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 25\_AFFF 7\_NAAF\_GW\_SI.mxd; Date: 4/18/2018



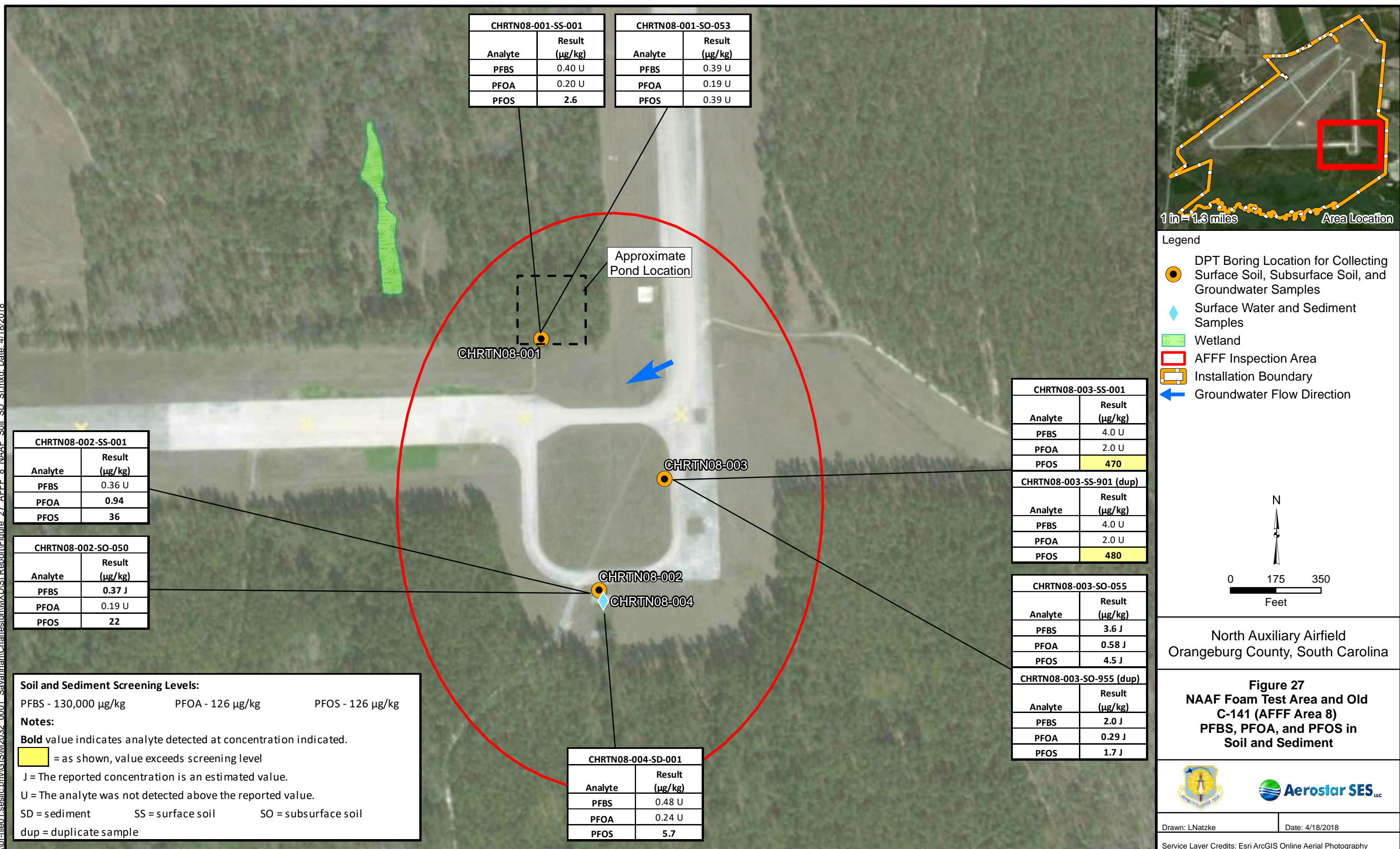


G:\M2032\_0001 Savannah\Charleston\MXD\SI Report\Figure 26 AFFF 8 NAAF SI.mxd: Date: 8/18/2017



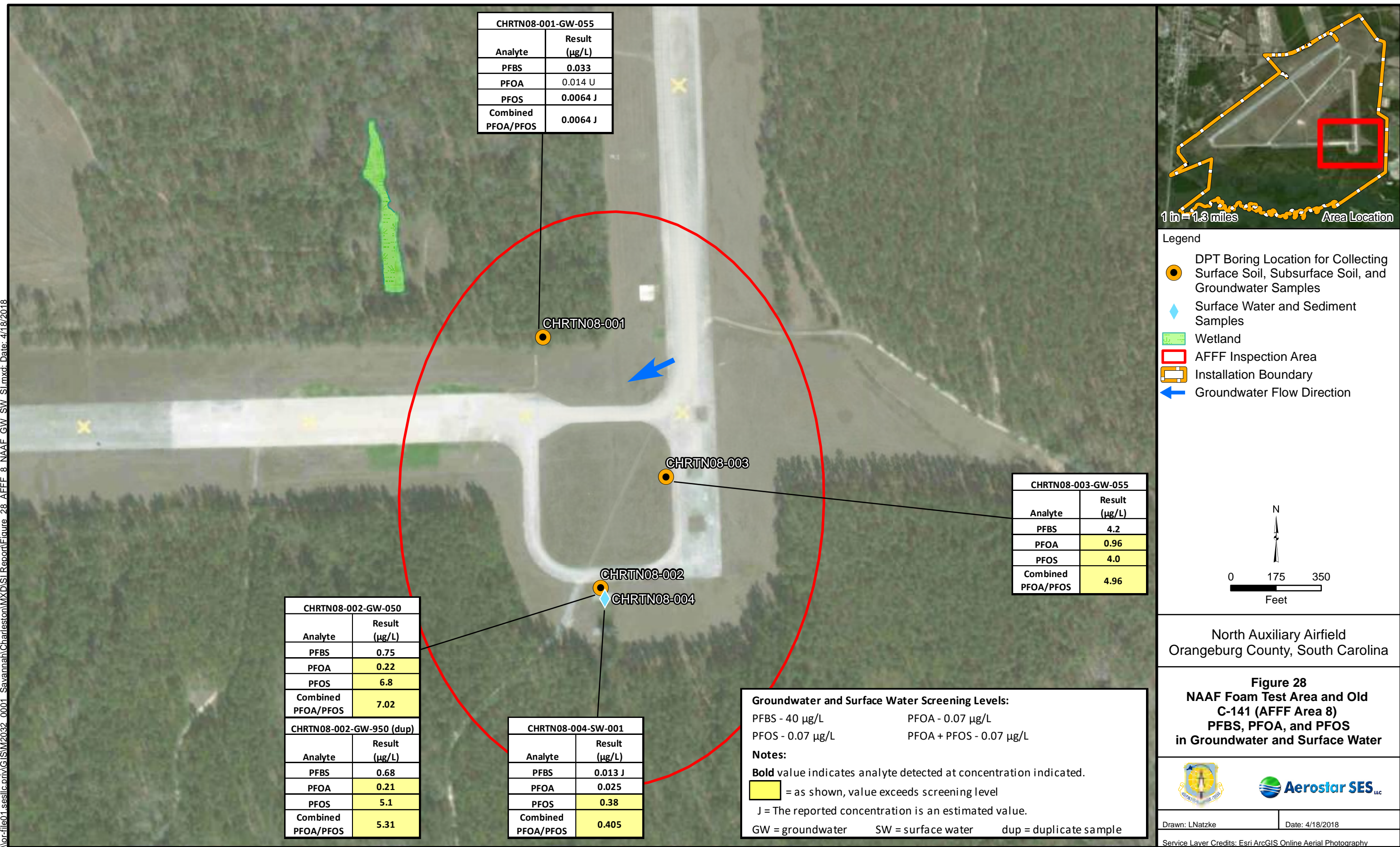


\\orfile01.sesllc.priv\GIS\2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 27\_AFFF\_8\_NAAF\_Soil\_SD\_SI.mxd; Date: 4/18/2018





\\or-file01.sesllc.priv\GIS\2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 28\_AFFF\_8\_NAAF\_GW\_SW\_SI.mxd: Date: 4/18/2018

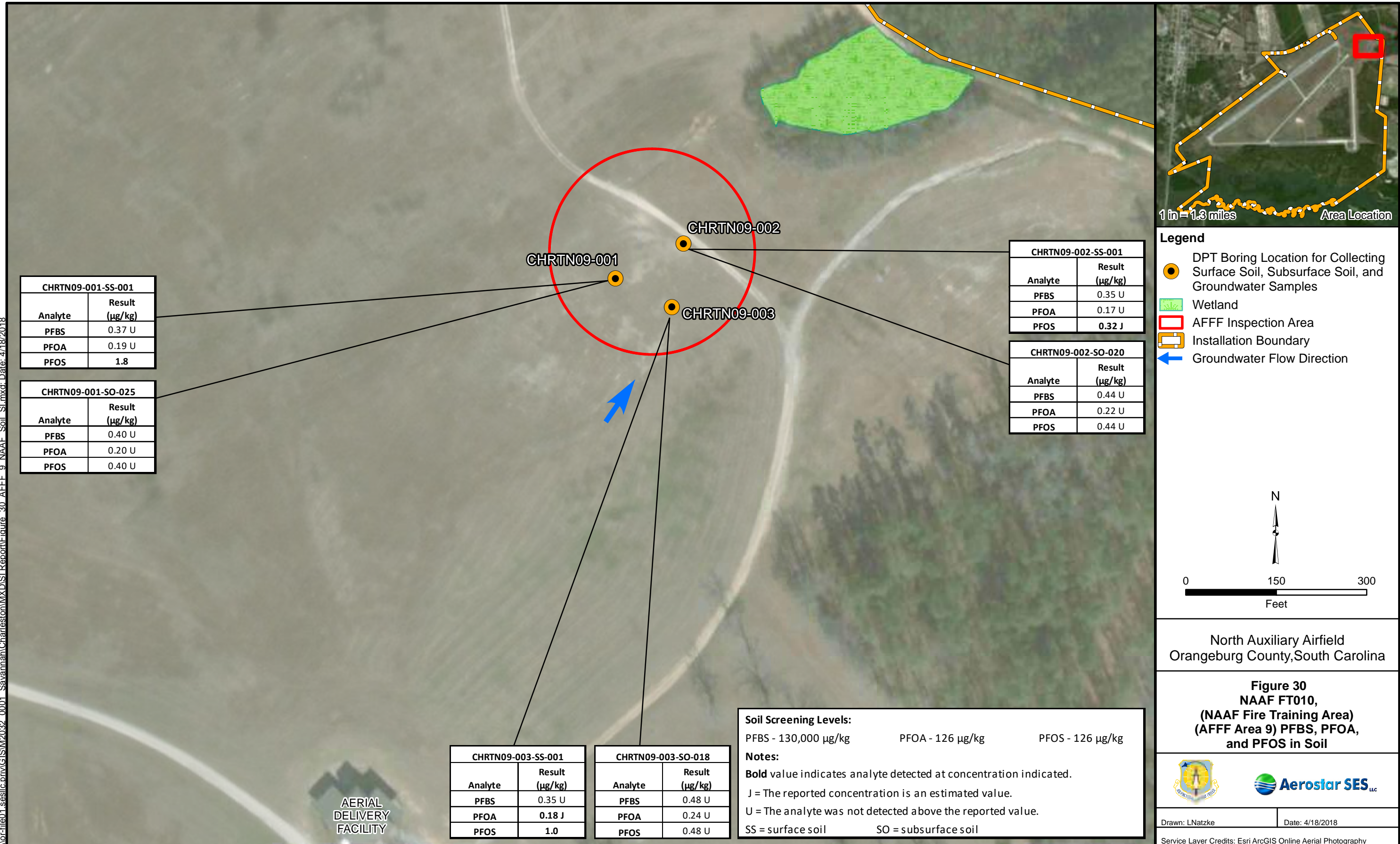






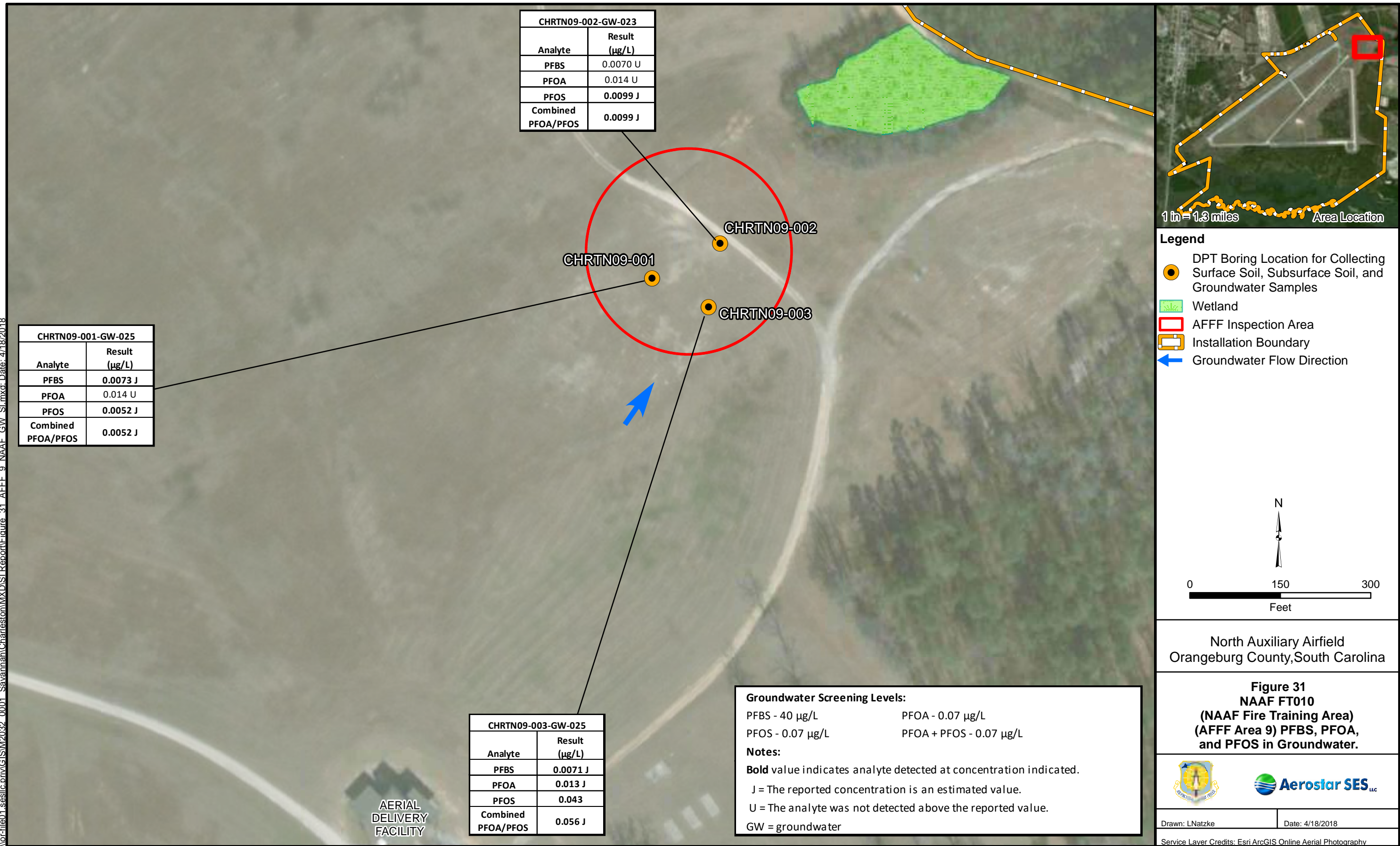


\\or-file01.seslic.pnVA\GIS\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure 30\_AFFF 9\_NAAF\_Soil\_SI.mxd; Date: 4/18/2018

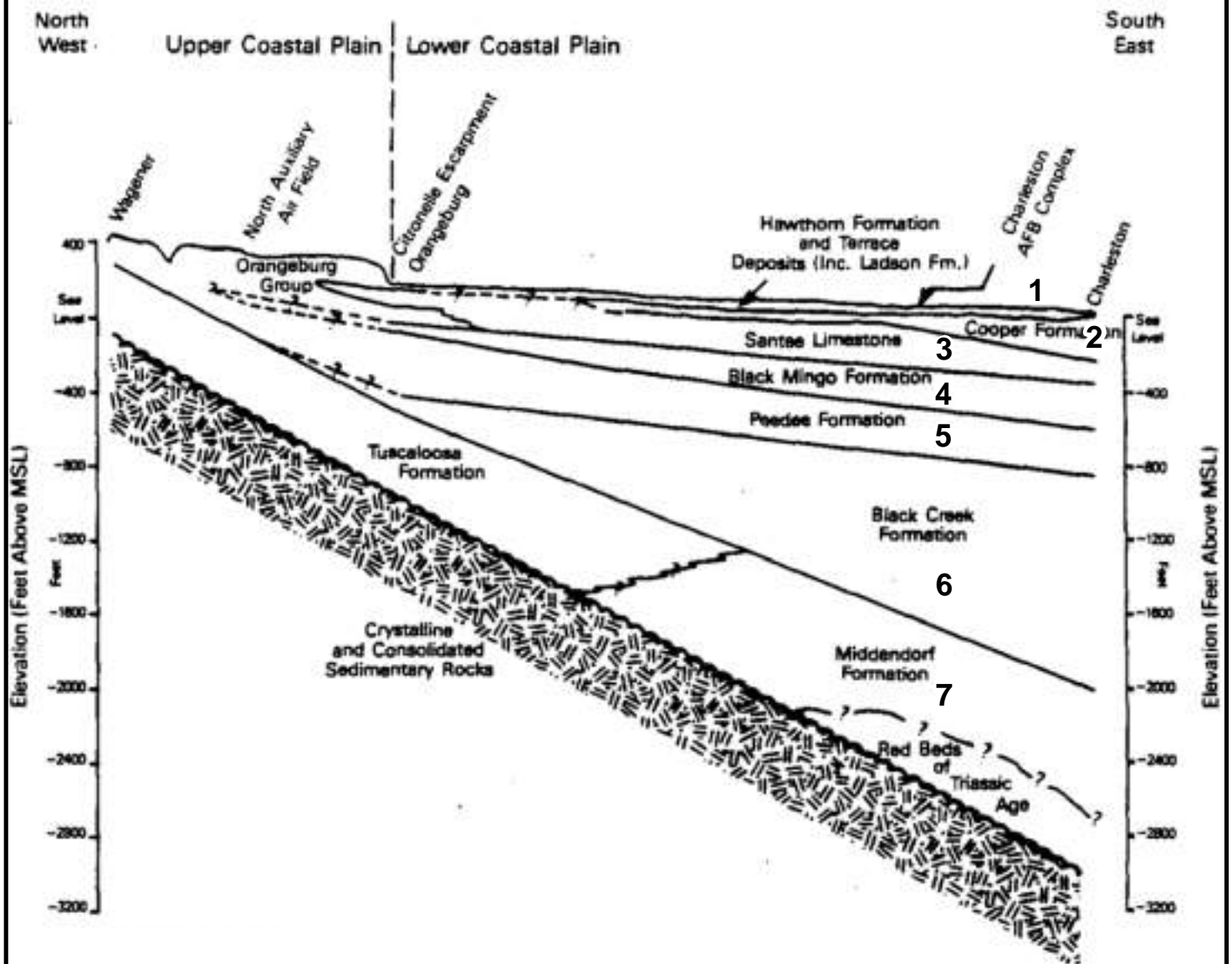




\\or-file01.seslic.pnva\GIS\M2032\_0001\_Savannah\Charleston\MXD\SI Report\Figure\_31\_AFFF\_9\_NAAF\_GW\_SI.mxd; Date: 4/18/2018







### Legend

- 1 - Surficial Aquifer, up to 2,000 gpm
- 2 - Confining Unit, 300 gpm
- 3 - Artesian Aquifer, <300 gpm
- 4 - Artesian Aquifer, 300 to 500 gpm

- 5 - Artesian Aquifer, <300 gpm
- 6 - Artesian Aquifer, up to 1,000 gpm
- 7 - Artesian Aquifer, up to 2,000 gpm

0 10 20 30  
Scale in Miles

Geology Figures Reference: Science Applications International Corporation (SAIC), March 1989.  
Installation Restoration Program Phase II – Stage I Confirmation Quantifications, Charleston Air Force Base,  
Charleston, South Carolina 29404. .

Figure 32 Generalized Hydrogeologic Column, JBCA and NAAF, South Carolina

**Appendix B**  
**Field Forms and Boring Logs**

**SES FIELD READINESS REVIEW FORM**

**Employee Name:** Ash Willis

**Employee Number:** 130276

**Job Number:** M2032.0001

**Job Location:** Joint Base Charleston

**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

**Significant training conducted prior to departure:**

Airfield drivers training, airfield work to be conducted on Feb 9.

**Equipment Packed for travel on: Jan 31, 2017**

**Travel Dates:** 02-01-17 thru 02-11-17

**Site Supervisor Signature**



## SES FIELD READINESS REVIEW FORM

**Employee Name:** Franklin Johnson

**Employee Number:** 130253

**Job Number:** M2032.0001

**Job Location:** Joint Base Charleston

**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

**Significant training conducted prior to departure:**

Airfield drivers training, airfield work to be conducted on Feb 9.

**Equipment Packed for travel on: Jan 31, 2017**

**Travel Dates:** 02-01-17 thru 02-11-17

**Site Supervisor Signature**



## SES FIELD READINESS REVIEW FORM

**Employee Name:** Jeremy Klein

**Employee Number:** 130286

**Job Number:** M2032.0001

**Job Location:** Joint Base Charleston

**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

**Significant training conducted prior to departure:**

Airfield drivers training, airfield work to be conducted on Feb 9.

**Equipment Packed for travel on: Jan 31, 2017**

**Travel Dates:** 02-01-17 thru 02-11-17

**Site Supervisor Signature**





# GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Well ID: 02
Well Name: CHRTN01-001	Sample ID: CHRTN01-001-SW-910 Date: 02/03/2017

Well Type: Monitoring	Well Depth: 1/4	Well Diameter: 5.0	Well Capacity: 15.0	Well Material: 6.23	Well Status: PP
Well Volume Purge: 1 Well Volume - (Total Well Depth - Static Depth) x Well Capacity					
Well Volume Purge: 1 Well Volume - (Total Well Depth - Static Depth) x Well Capacity					

Time	Volume Purged (L)	Well Depth (m)	Well Capacity (L/m)	Well Diameter (mm)	Well Material	Well Status	Well Capacity (L)	Well Material	Well Status	Well Capacity (L)	Well Material	Well Status
1400	0	0	—	6.23	Pump Started	—	—	—	—	—	—	—
1410	2.5	2.5	250	6.23	5.04	18.14	0.876	5.03	212.4	2.95	clear	—
1420	2.5	5.0	250	6.23	5.53	18.21	0.829	3.54	360.7	16.0	clear	—
1425	1.25	6.25	450	6.23	5.58	18.22	0.808	3.47	315.2	53.5	clear	—
1430	1.25	7.50	230	6.23	5.59	18.23	0.786	3.45	314.0	54.7	clear	—
1432	0.5	8.00	250	6.23	5.60	18.27	0.791	3.51	319.2	37.3	clear	—
1434	0.5	8.50	250	6.23	5.62	18.27	0.773	3.63	320.0	23.4	clear	—
1436	0.5	9.00	250	6.23	5.63	18.26	0.751	3.69	310.3	23.1	clear	—
FF 02/03/2017												

Well Capacity (Gallons Per Foot): 0.76' ± 0.02, 1' ± 0.04, 1.25' ± 0.06, 2' ± 0.15, 3' ± 0.26, 4' ± 0.36, 5' ± 1.02, 6' ± 1.41, 7' ± 2.08
Well Capacity (Gallons Per Foot): 0.76' ± 0.02, 1' ± 0.04, 1.25' ± 0.06, 2' ± 0.15, 3' ± 0.26, 4' ± 0.36, 5' ± 1.02, 6' ± 1.41, 7' ± 2.08

Sample ID	Sample Type	Sample Volume (L)	Sample Depth (m)	Sample Material	Sample Status	Sample Capacity (L)	Sample Material	Sample Status	Sample Capacity (L)	Sample Material	Sample Status
CHRTN01-010	FE	3	FE	250	—	—	—	—	—	—	—
CHRTN01-010	FE	1	FE	250	—	—	—	—	—	—	—
FF 02/03/2017											

Notes: Normal, ma/mc, and duplicate sample, 4 bottles total
Material Codes: AG = Aggregate, CG = Gravel, FE = Polyethylene, PP = Polypropylene, G = Glass, T = Teflon, J = Other (Specify)
Sample Identification Codes: AG = Aggregate, CG = Gravel, FE = Polyethylene, PP = Polypropylene, G = Glass, T = Teflon, J = Other (Specify)

Notes: 2.5% Non-Calcium Chloride (CCl<sub>4</sub>) in all samples for analysis.

PH ± 0.2 units, Temperature ± 0.2 °C, Specific Conductance ± 1 µmhos/cm, Dissolved Oxygen ± 0.1 mg/L, Turbidity ± 0.1 NTU, Total Solids ± 1 mg/L.

Revision Date: 02/14/2010



### PLINCHING DATA

WELL VOLUME PURGE	1 WELL VOLUME = (TOTAL WELL DEPTH WTCO - STATIC DEPTH TO WATER) X WELL CAPACITY
(feet ft well capacity)	x ft. = ft. = gal. = gal.

$$\text{EQUIPMENT VOLUME (PUMP)} = \text{EQUIPMENT VOL.} = \text{PUMP VOLUME} + (\text{TUBING CAPACITY} \times \text{TUBING LENGTH}) + \text{FLOW COLL. VOLUME}$$

INITIAL PUMP ON (TURNS)	FINAL PUMP ON (TURNS)	PURPOSE	PURPOSE	TOTAL VOLUME
DEPTH (meters) 10	DEPTH (meters) 10	INTAKE (L) 1350	DISCH (L) 1415	FLOW (gallons) 4503

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02, 1" = 0.04, 1.5" = 0.06, 2" = 0.16, 3" = 0.32, 4" = 0.48, 5" = 1.02, 6" = 1.47, 12" = 8.96  
 TURNING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0005, 3/16" = 0.0014, 1/4" = 0.0020, 5/16" = 0.004, 3/8" = 0.006, 1/2" = 0.011, 5/8" = 0.016  
 PUMPING EQUIPMENT CODES: B = Solar, SP = Surface Pump, ESP = Electric Submersible Pump, PP = Peristaltic Pump, O = Other (Specify)

SAMPLING DATA					
SAMPLE NO.	DATE	TIME	LOCATION	DEPTH	REMARKS
101	1978-10-15	10:00	Station 1	0.5m	Water sample collected

PRINT OR TYPE (DO NOT WRITE)		NAME (DO NOT WRITE)		FIELD FILLED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10		10		YES	

FOLD DISCONTINUATION:		PLANT	Y	5	10000	Y	100000	DUPLICATE:		Y	5	
SAMPLE CONTAINER SPECIFICATION:				SAMPLE PRESERVATION:								SAMPLE RUN#

[illegible]

**William A. Anderson**

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

**SAMPLING EQUIPMENT CODES:** APF = After Primary Pump; D = Dredge; BP = Bypass Pump; ESP = Electric Submersible Pump;  
RPP = Reverse Flow Portable Pump; SM = Suction Method (Taking Gravity Grab); O = Other (Specify)

## more.

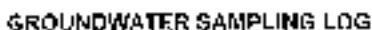
**Classification Criteria:** for range of indicators of least from conservative, midrange

pH:  $\pm 0.2$  units Temperature:  $\pm 0.2^\circ\text{C}$  Specific Conductance:  $\pm 5\%$  Dissolved Oxygen: all readings  $\geq 20\%$  saturation; optionally,  $\pm 0.2$  mg/L or  $\pm 10\%$  (whichever is greater) Turbidity: all readings  $\leq$

Revision Date: March 14, 2016





PURGING DATA

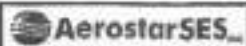
Well (APAR) 5 (Borehole) Area: 2.75 - 3.07  $\gamma = 0.04$   $1.57 = 0.06$   $2 = 0.16$   $3 = 0.27$   $4 = 0.31$   $5 = 0.34$   $6 = 0.47$   $7 = 0.60$

DTW = 3.48 ft BGS

Notes:

MP/EA/BA/CONFS	AG = Aramid Glass	CG = Carbon Glass	PE = Polyethylene	PP = Polypropylene	S = Stainless Steel	T = Titanium	U = Other (Specify)
MP/EA/BA/CONFS/PL/CO/CS	AGP = Aramid Glass Pump	CGP = Carbon Glass Pump	PEP = Polyethylene Pump	PPP = Polypropylene Pump	SSP = Stainless Steel Pump	TTP = Titanium Pump	UPP = Other (Specify)

புதுப்பாட்டு: 24.75%



## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Site: 02	
Well ID: CHRTN02-002	SAMPLE ID: CHRTN02-002-GW-011	DATE: 02/08/2017

## PURGING DATA

WELL DIAMETER (inches): 6.75	PUMP DIAMETER (inches): 1/4	WELL SCREEN INTERNAL DEPTH (feet): 7.92	STATIC DEPTH TO WATER (feet): 9.12	PURGE PUMP TYPE OR BAILER: PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (see B-1 and B-2 equations)				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (see B-1 and B-2 equations)				

TIME	VOLUME PUMPED (gallons) L	CUMULATIVE VOLUME PUMPED (gallons) L	PURGE RATE (gpm) L/min	DEPTH TO WATER (feet) (meters)	pH (rounded whole)	TEMP. (°C)	COND. µmS/cm	DISSOLVED OXYGEN mg/L	ORP mV	TURBIDITY (NTU)	CLOR (mg/L)	DOCR (mg/L)
12:55	0	0	—	9.12	—	Pump Started	—	—	—	—	—	—
13:10	3.75	3.75	250	11	6.00	19.4	0.377	1.29	35.7	3.15	slight cloud	—
13:15	1.25	5.00	250	11	5.94	19.4	0.364	1.17	1.0	1.94	slight cloud	—
13:20	1.25	6.25	250	11	6.03	19.4	0.349	1.14	-19.1	1.74	11	11
13:25	1.25	7.50	250	11	6.03	19.3	0.340	1.16	-26.4	94.5	11	11
13:30	1.25	8.75	250	11	6.01	19.4	0.333	1.12	-31.7	71.9	11	11
13:35	1.25	10.00	250	11	6.00	19.5	0.324	1.13	-37.8	51.7	11	11
13:40	1.25	11.25	250	11	6.00	19.4	0.318	1.13	-41.5	39.8	clear	—
13:45	1.25	12.50	250	11	5.99	19.4	0.316	1.10	-45.2	24.0	clear	—
13:50	1.25	13.75	250	11	5.99	19.6	0.311	1.10	-47.5	20.1	clear	—
13:55	1.25	15.00	250	11	5.98	19.6	0.306	1.11	-49.1	14.1	clear	—

WELL CAPACITY (Gallons Per Foot): 0.79" = 0.02; 1" = 0.04; 1.31" = 0.06; 2" = 0.10; 3" = 0.15; 4" = 0.25; 6" = 0.40; 8" = 0.60; 10" = 0.80; 12" = 1.00

TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0028; 5/16" = 0.0045; 3/8" = 0.0066; 1/2" = 0.013; 5/8" = 0.018

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

## SAMPLING DATA

SAMPLED BY (PRINT) (SIGNATURE): Franklin Johnson / ASL	SAMPLER (SIGNATURE): Franklin Johnson	SAMPLED STARTED AT: 1400	SAMPLED ENDED AT: 1401
PUMP ON TUBING	TUBING	FIELD FILTERED: Y	Filter Size: n/a
DEPTH IN WELL (feet): 13.0	NATURAL ORBITALITY	Filter Element Type	

SAMPLE IDENTIFICATION				SAMPLE PRESERVATION			ANALYSIS		
WELL CODE	WELL DEPTH	WELL DIA.	WELL VOL.	PRESERVATION	TOTAL VOL.	TOTAL pH (Reagent Water)	ENTERED ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (gpm)
CHRTN02-002-GW-011	13.0	PE	250	—	—	—	537M	APP	250
BT 02/08/2017									

DTW = 6.28 ft BGS

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 = Bubbler Pump; ESP = Electric Submersible Pump;

RSP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Gravity Drain); O = Other (Specify)

## NOTES

Standard Criteria for review of results of test data considered readings.

pH  $\pm 0.2$  units; Temperature:  $\pm 0.2^\circ\text{C}$ ; Specific Conductance:  $\pm 5\%$ ; Dissolved Oxygen: all readings  $\pm 20\%$  saturation; optionally,  $\pm 0.2\text{ mg/L}$  or  $\pm 1\%$  (whichever is greater); Turbidity: all readings  $\leq$ 

Revision Date: March 14, 2010









## GROUNDWATER SAMPLING LOG

Investigator: JB CHARLESTON		Site: SITE 3										
Well ID: CHATN03-001-		Sample ID: CHATN03-001-GW-d0										
DATE: 2-7-16 10:00 AM												
PURGING DATA												
WELL DIAMETER (inches): 0.75"	TUBING DIAMETER (inches): 1/4"	WELL SCREEN INTERVAL DEPTH (ft): 5 ft - 15 ft	STATIC DEPTH TO WATER (ft): 7.46									
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY			PUMP TYPE: PP									
(only if not applicable) 17.30												
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME												
(only if not applicable)												
WELL PUMP OR TURBO DEPTH IN WELL (ft): 10'	WELL PUMP OR TURBO DEPTH IN WELL (ft): 10'	PURGING INTERVAL (min): 1055	PURGING VOLUME (gallons): 1132									
TOTAL VOLUME PURGED (gallons): 1.95 gal												
TIME	VOLUME PURGED (gallons)	CORRECTION VOLUME PURGED (gallons)	DATE	DEPTH TO WATER (ft)	pH (standard unit)	TEMP (°C)	COND (µmhos/cm)	DO (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (describable)
11:04	1800	1800	200	7.20	6.00	14.8	140.0	1.61	-201.2	475	Cloudy	105
11:22	4900	6600	200	7.20	5.94	14.9	141.6	0.52	-201.2	19.1	Cloud	1
11:30	400	3000	200	7.20	5.92	14.8	150.9	0.52	-201.2	33	1	1
11:32	400	7400	200	7.20	5.91	14.5	154.5	0.71	-202.2	83	1	1
WELL CAPACITY (Gallons Per Foot): 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" = 0.92; 12.25" = 0.94; 12.5" = 0.96; 12.75" = 0.98; 13" = 1.00; 13.25" = 1.02; 13.5" = 1.04; 13.75" = 1.06; 14" = 1.08; 14.25" = 1.10; 14.5" = 1.12; 14.75" = 1.14; 15" = 1.16; 15.25" = 1.18; 15.5" = 1.20; 15.75" = 1.22; 16" = 1.24; 16.25" = 1.26; 16.5" = 1.28; 16.75" = 1.30; 17" = 1.32; 17.25" = 1.34; 17.5" = 1.36; 17.75" = 1.38; 18" = 1.40; 18.25" = 1.42; 18.5" = 1.44; 18.75" = 1.46; 19" = 1.48; 19.25" = 1.50; 19.5" = 1.52; 19.75" = 1.54; 20" = 1.56; 20.25" = 1.58; 20.5" = 1.60; 20.75" = 1.62; 21" = 1.64; 21.25" = 1.66; 21.5" = 1.68; 21.75" = 1.70; 22" = 1.72; 22.25" = 1.74; 22.5" = 1.76; 22.75" = 1.78; 23" = 1.80; 23.25" = 1.82; 23.5" = 1.84; 23.75" = 1.86; 24" = 1.88; 24.25" = 1.90; 24.5" = 1.92; 24.75" = 1.94; 25" = 1.96; 25.25" = 1.98; 25.5" = 2.00; 25.75" = 2.02; 26" = 2.04; 26.25" = 2.06; 26.5" = 2.08; 26.75" = 2.10; 27" = 2.12; 27.25" = 2.14; 27.5" = 2.16; 27.75" = 2.18; 28" = 2.20; 28.25" = 2.22; 28.5" = 2.24; 28.75" = 2.26; 29" = 2.28; 29.25" = 2.30; 29.5" = 2.32; 29.75" = 2.34; 30" = 2.36; 30.25" = 2.38; 30.5" = 2.40; 30.75" = 2.42; 31" = 2.44; 31.25" = 2.46; 31.5" = 2.48; 31.75" = 2.50; 32" = 2.52; 32.25" = 2.54; 32.5" = 2.56; 32.75" = 2.58; 33" = 2.60; 33.25" = 2.62; 33.5" = 2.64; 33.75" = 2.66; 34" = 2.68; 34.25" = 2.70; 34.5" = 2.72; 34.75" = 2.74; 35" = 2.76; 35.25" = 2.78; 35.5" = 2.80; 35.75" = 2.82; 36" = 2.84; 36.25" = 2.86; 36.5" = 2.88; 36.75" = 2.90; 37" = 2.92; 37.25" = 2.94; 37.5" = 2.96; 37.75" = 2.98; 38" = 3.00; 38.25" = 3.02; 38.5" = 3.04; 38.75" = 3.06; 39" = 3.08; 39.25" = 3.10; 39.5" = 3.12; 39.75" = 3.14; 40" = 3.16; 40.25" = 3.18; 40.5" = 3.20; 40.75" = 3.22; 41" = 3.24; 41.25" = 3.26; 41.5" = 3.28; 41.75" = 3.30; 42" = 3.32; 42.25" = 3.34; 42.5" = 3.36; 42.75" = 3.38; 43" = 3.40; 43.25" = 3.42; 43.5" = 3.44; 43.75" = 3.46; 44" = 3.48; 44.25" = 3.50; 44.5" = 3.52; 44.75" = 3.54; 45" = 3.56; 45.25" = 3.58; 45.5" = 3.60; 45.75" = 3.62; 46" = 3.64; 46.25" = 3.66; 46.5" = 3.68; 46.75" = 3.70; 47" = 3.72; 47.25" = 3.74; 47.5" = 3.76; 47.75" = 3.78; 48" = 3.80; 48.25" = 3.82; 48.5" = 3.84; 48.75" = 3.86; 49" = 3.88; 49.25" = 3.90; 49.5" = 3.92; 49.75" = 3.94; 50" = 3.96; 50.25" = 3.98; 50.5" = 4.00; 50.75" = 4.02; 51" = 4.04; 51.25" = 4.06; 51.5" = 4.08; 51.75" = 4.10; 52" = 4.12; 52.25" = 4.14; 52.5" = 4.16; 52.75" = 4.18; 53" = 4.20; 53.25" = 4.22; 53.5" = 4.24; 53.75" = 4.26; 54" = 4.28; 54.25" = 4.30; 54.5" = 4.32; 54.75" = 4.34; 55" = 4.36; 55.25" = 4.38; 55.5" = 4.40; 55.75" = 4.42; 56" = 4.44; 56.25" = 4.46; 56.5" = 4.48; 56.75" = 4.50; 57" = 4.52; 57.25" = 4.54; 57.5" = 4.56; 57.75" = 4.58; 58" = 4.60; 58.25" = 4.62; 58.5" = 4.64; 58.75" = 4.66; 59" = 4.68; 59.25" = 4.70; 59.5" = 4.72; 59.75" = 4.74; 60" = 4.76; 60.25" = 4.78; 60.5" = 4.80; 60.75" = 4.82; 61" = 4.84; 61.25" = 4.86; 61.5" = 4.88; 61.75" = 4.90; 62" = 4.92; 62.25" = 4.94; 62.5" = 4.96; 62.75" = 4.98; 63" = 5.00; 63.25" = 5.02; 63.5" = 5.04; 63.75" = 5.06; 64" = 5.08; 64.25" = 5.10; 64.5" = 5.12; 64.75" = 5.14; 65" = 5.16; 65.25" = 5.18; 65.5" = 5.20; 65.75" = 5.22; 66" = 5.24; 66.25" = 5.26; 66.5" = 5.28; 66.75" = 5.30; 67" = 5.32; 67.25" = 5.34; 67.5" = 5.36; 67.75" = 5.38; 68" = 5.40; 68.25" = 5.42; 68.5" = 5.44; 68.75" = 5.46; 69" = 5.48; 69.25" = 5.50; 69.5" = 5.52; 69.75" = 5.54; 70" = 5.56; 70.25" = 5.58; 70.5" = 5.60; 70.75" = 5.62; 71" = 5.64; 71.25" = 5.66; 71.5" = 5.68; 71.75" = 5.70; 72" = 5.72; 72.25" = 5.74; 72.5" = 5.76; 72.75" = 5.78; 73" = 5.80; 73.25" = 5.82; 73.5" = 5.84; 73.75" = 5.86; 74" = 5.88; 74.25" = 5.90; 74.5" = 5.92; 74.75" = 5.94; 75" = 5.96; 75.25" = 5.98; 75.5" = 6.00; 75.75" = 6.02; 76" = 6.04; 76.25" = 6.06; 76.5" = 6.08; 76.75" = 6.10; 77" = 6.12; 77.25" = 6.14; 77.5" = 6.16; 77.75" = 6.18; 78" = 6.20; 78.25" = 6.22; 78.5" = 6.24; 78.75" = 6.26; 79" = 6.28; 79.25" = 6.30; 79.5" = 6.32; 79.75" = 6.34; 80" = 6.36; 80.25" = 6.38; 80.5" = 6.40; 80.75" = 6.42; 81" = 6.44; 81.25" = 6.46; 81.5" = 6.48; 81.75" = 6.50; 82" = 6.52; 82.25" = 6.54; 82.5" = 6.56; 82.75" = 6.58; 83" = 6.60; 83.25" = 6.62; 83.5" = 6.64; 83.75" = 6.66; 84" = 6.68; 84.25" = 6.70; 84.5" = 6.72; 84.75" = 6.74; 85" = 6.76; 85.25" = 6.78; 85.5" = 6.80; 85.75" = 6.82; 86" = 6.84; 86.25" = 6.86; 86.5" = 6.88; 86.75" = 6.90; 87" = 6.92; 87.25" = 6.94; 87.5" = 6.96; 87.75" = 6.98; 88" = 7.00; 88.25" = 7.02; 88.5" = 7.04; 88.75" = 7.06; 89" = 7.08; 89.25" = 7.10; 89.5" = 7.12; 89.75" = 7.14; 90" = 7.16; 90.25" = 7.18; 90.5" = 7.20; 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125" = 9.96; 125.25" = 9.98; 125.5" = 10.00; 125.75" = 10.02; 126" = 10.04; 126.25" = 10.06; 126.5" = 10.08; 126.75" = 10.10; 127" = 10.12; 127.25" = 10.14; 127.5" = 10.16; 127.75" = 10.18; 128" = 10.20; 128.25" = 10.22; 128.5" = 10.24; 128.75" = 10.26; 129" = 10.28; 129.25" = 10.30; 129.5" = 10.32; 129.75" = 10.34; 130" = 10.36; 130.25" = 10.38; 130.5" = 10.40; 130.75" = 10.42; 131" = 10.44; 131.25" = 10.46; 131.5" = 10.48; 131.75" = 10.50; 132" = 10.52; 132.25" = 10.54; 132.5" = 10.56; 132.75" = 10.58; 133" = 10.60; 133.25" = 10.62; 133.5" = 10.64; 133.75" = 10.66; 134" = 10.68; 134.25" = 10.70; 134.5" = 10.72; 134.75" = 10.74; 135" = 10.76; 135.25" = 10.78; 135.5" = 10.80; 135.75" = 10.82; 136" = 10.84; 136.25" = 10.86; 136.5" = 10.88; 136.75" = 10.90; 137" = 10.92; 137.25" = 10.94; 137.5" = 10.96; 137.75" = 10.98; 138" = 11.00; 138.25" = 11.02; 138.5" = 11.04; 138.75" = 11.06; 139" = 11.08; 139.25" = 11.10; 139.5" = 11.12; 139.75" = 11.14; 140" = 11.16; 140.25" = 11.18; 140.5" = 11.20; 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188" = 15.00; 188.25" = 15.02; 188.5" = 15.04; 188.75" = 15.06; 189" = 15.08; 189.25" = 15.10; 189.5" = 15.12; 189.75" = 15.14; 190" = 15.16; 190.25" = 15.18; 190.5" = 15.20; 190.75" = 15.22; 191" = 15.24; 191.25" = 15.26; 191.5" = 15.28; 191.75" = 15.30; 192" = 15.32; 192.25" = 15.34; 192.5" = 15.36; 192.75" = 15.38; 193" = 15.40; 193.25" = 15.42; 193.5" = 15.44; 193.75" = 15.46; 194" = 15.48; 194.25" = 15.50; 194.5" = 15.52; 194.75" = 15.54; 195" = 15.56; 195.25" = 15.58; 195.5" = 15.60; 195.75" = 15.62; 196" = 15.64; 196.25" = 15.66; 196.5" = 15.68; 196.75" = 15.70; 197" = 15.72; 197.25" = 15.74; 197.5" = 15.76; 197.75" = 15.78; 198" = 15.80; 198.25" = 15.82; 198.5" = 15.84; 198.75" = 15.86; 199" = 15.88; 199.25" = 15.90; 199.5" = 15.92; 199.75" = 15.94; 200" = 15.96; 200.25" = 15.98; 200.5" = 16.00; 200.75" = 16.02; 201" = 16.04; 201.25" = 16.06; 201.5" = 16.08; 201.75" = 16.10; 202" = 16.12; 202.25" = 16.14; 202.5" = 16.16; 202.75" = 16.18; 203"												



## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Site: SITE 3	Date: 02/07/2017
Well No: CHRTN03-002	Sample ID: CHRTN03-002-GW-015	Date: 02-7-16

PURGING DATA		DATE: 02/07/2017	
WELL DIAMETER (inches): 0.75	TUBING DIAMETER (inches): 1/4	WELL SCREEN INTERVAL (feet): 10 ft - 20 ft	SCREEN SIZE (inches): 9.00
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH (ft) - STATIC DEPTH TO WATER) X WELL CAPACITY		PURGE PUMP TYPE: PP	

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME	
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WELL PUMP OR TUBING DEPTH IN FEET: 15	FINAL PUMP OR TUBING DEPTH IN FEET: 15	PURGE VOLUME (gallons): 1140	PURGE RATE (gpm): 12/15	TOTAL VOLUME PURGED (gallons): 1.57 gal
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TIME	VOLUME PURGED (gallons)	CONC. VOLUME PURGED (gallons)	PURGE GATS GPM	DEPTH TO BOTTOM (FEET)	PH (measured water)	TEMP. °C	COND. µmhos	DISSOLVED OXYGEN mg/L	DOF MW	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (described)
1210	5250	5250	175	8.70	6.34	21.3	300.7	0.83	210.3	19.1	clear	none
1212	350	5600	1	8.70	6.34	21.3	308.3	0.77	217.4	2.82	1	1
1214	350	5950	1	8.70	6.35	21.2	300.4	0.66	221.4	5.71	1	1
<div>70</div>												

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.315" = 0.05; 2" = 0.10; 3" = 0.15; 4" = 0.20; 5" = 0.25; 6" = 0.30; 8" = 0.40; 10" = 0.50	
TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.019	
PURGING EQUIPMENT CODES: B = Bailor; BP = Booster Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)	

SAMPLED BY (PRINT) AFFILIATION: AS Williams, Franklin Johnson		SAMPLED (SIGNATURE): [Signature]		SAMPLED DATE: 12/14		SAMPLED TIME: 12/14	
PUMP OR TUBING DEPTH IN WELL (ft): 15		TUBING CODE: PE		FIELD FILTERS: Y ( ) N ( )		Filter Size: mm	

ANALYSIS CONTAINER INFORMATION				ANALYSIS INFORMATION				ANALYSIS RESULTS	
SAMPLE CODE	ANALYSIS	REF. CODE	VOLUME (mL)	PREPARATION	TOTAL VOL. (mL)	ANALYSIS (mL)	ANALYSIS (mL)	ANALYSIS (mL)	ANALYSIS (mL)
CHRTN03-002-GW	1	PE	250						

DTW = 6.18 ft BGS
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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 = Bailor; BP = Booster Pump; ESP = Electric Submersible Pump; RPP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Gravity Feed); O = Other (Specify)	

NOTES:
Standardize Cella for each set of readings of test data across all readings.
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ± 20% saturation, typically ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ±

Revision Date: March 14, 2010



## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	SITE 3	
WELL NO: CHRTN03-003	SAMPLE ID: CHRTN03-003-6W-015	DATE: 2/26/17

## PURGING DATA

WELL DIAMETER (inches) 0.75	TUBING DIAMETER (inches) 1/4	WELL SCREEN/STAGNANT DEPTH (ft) 10 ft	STATIC DEPTH TO WATER (ft) 9.78	PURGE PUMP TYPE PERISTALTIC PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY				
17.44 ft x 0.80 c = 13.95 c				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME				
13.95 c + (0.80 c x 10 ft) + 0.1 c = 17.95 c				

TOTAL FLUSH OF TUBING DEPTH IN WELL (ft) 15	FINAL PUMP DE TUBING DEPTH IN WELL (ft) 15	PURGING METHOD AT: 1236	PURGING SPEED AT: 1300	TOTAL VOLUME PURGED (gallons) 1.16 gal
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TIME	VOLUME PURGED (gallons)	CONC. PURGED (mg/L)	DEPTH TO WATER (ft)	PH (estimated only)	TEMP. (°C)	COND. (µS/cm)	DO (mg/L)	SP. COND. (µS/cm)	SP. DO (mg/L)	SP. COND. (µS/cm)	SP. DO (mg/L)	SP. COND. (µS/cm)	SP. DO (mg/L)
1256	4000	4000	200	9.60	22.2	14.0	0.70	234.1	5.87	1.00	1.00	1.00	1.00
1258	200	4200	1	9.50	5.72	23.0	10.2	0.41	311.2	5.07	1	1	1
1200	200	4400	1	9.52	5.69	22.4	109.5	0.39	310.7	4.01	1	1	1

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.002; 1" = 0.004; 1.25" = 0.006; 1.5" = 0.008; 1.75" = 0.010; 2" = 0.012; 2.25" = 0.014; 2.5" = 0.016; 2.75" = 0.018; 3" = 0.020

TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0005; 1/4" = 0.001; 3/8" = 0.0015; 1/2" = 0.002; 5/8" = 0.0025; 3/4" = 0.003; 7/8" = 0.0035; 1" = 0.004

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

## SAMPLING DATA

SAMPLED BY (PRINT) / APPROVED: Ash with Franklin Johnson	SAMPLER SIGNATURE: [Signature]	SAMPLE ID: CHRTN03-003-6W-015	SAMPLE NO: 1300
PUMP ON TUBING: 15	TUBING: 15	FIELD FILTERED: Y	FIELD FILTERED: Y
DEPTH IN WELL (ft): 15	WATER CODE: PE	Filter Equipment Type: [ ]	Filter Size: [ ]

FIELD IDENTIFICATION				SAMPLE PRESERVATION				ANALYSIS			
SAMPLE CODE	CONC. CODE	WATER CODE	VOLUME (mL)	PRESERVATIVE	TOTAL VOL.	ANALYSIS IN FIELD (mL)	FINAL PH (estimated only)	ANALYSIS ANALYSIS ABOVE (mL)	SAMPLE EQUIPMENT CODE	SAMPLE FLOW RATE (mL/min)	SAMPLE FLOW RATE (mL/min)
CHRTN03-003-6W-015	1	PE	250					NOV 15 6 PM '17	APP	206	206

OTW = 7.31 BGS

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silica; T = Teflon; O = Other (Specify)
SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bailer Pump; ESP = Electric Submersible Pump; RPP = Reverse Flow Peristaltic Pump; SM = Show Method (Tubing Clearly Marked); O = Other (Specify)

## NOTES

Statistical data for use of statistical tests on sample results.

pH  $\pm 0.2$  units; Temperature  $\pm 0.2^\circ\text{C}$ ; Specific Conductance:  $\pm 5\%$ ; Dissolved Oxygen: all readings  $\pm 20\%$  saturation; optionally,  $\pm 0.2\text{ mg/L}$  or  $\pm 10\%$  (whichever is greater); Turbidity: all readings  $\pm 10\%$ 

Revision Date: March 14, 2018



## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Site: SITE 6	DATE: 2-4-16 02/04/2017
WELL NO: CHRTN06-001	SAMPLES: CHRTN06-001-GW-025	

## PURGING DATA

WELL DIAMETER (inches): 0.75"	TUBING DIAMETER (inches): 1/4"	WELL SCREEN INTERVAL (ft): +5.20 - 25.30	SCREEN DEPTH TO WATER (ft): 23.2'	PURGE PUMP TYPE OR NAME: PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY				

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

WATER PUMP OR TUBING DEPTH IN FEET (ft): 20'	FINAL PUMP OR TUBING DEPTH IN FEET (ft): 20'	PURGE VOLUME (gallons): 1035	PURGE RATE (gallons per minute): 1.24	TOTAL VOLUME (gallons): 10143
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TIME	WELL CAPACITY (gallons per foot)	CORREL. VOLUME (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (ft)	pH (standard units)	TEMP. (°C)	DISS. O <sub>2</sub> (mg/L)	DISS. O <sub>2</sub> (mg/L)	WELL DEPTH (ft)	WELL VOLUME (gallons)	WELL VOLUME (gallons)	WELL VOLUME (gallons)	WELL VOLUME (gallons)
1100	5175	5175	207	23.2	5.69	19.27	0.066	25.25	-2423	173	173	173	173
1110	2070	7245	207	23.2	5.56	19.74	0.057	4.52	-225	40.8	40.8	40.8	40.8
1120	2070	9315	207	23.2	5.51	20.14	0.057	3.59	-210	12.9	12.9	12.9	12.9
1122	414	9729	207	23.2	5.49	20.20	0.055	3.42	-2034	8.47	8.47	8.47	8.47
1124	414	10143	207	23.2	5.46	20.23	0.054	3.38	-1912	6.03	6.03	6.03	6.03

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 1.5" = 0.06; 1.75" = 0.07; 2" = 0.08; 2.25" = 0.09; 2.5" = 0.10; 2.75" = 0.11; 3" = 0.12; 3.25" = 0.13; 3.5" = 0.14; 3.75" = 0.15; 4" = 0.16; 4.25" = 0.17; 4.5" = 0.18; 4.75" = 0.19; 5" = 0.20; 5.25" = 0.21; 5.5" = 0.22; 5.75" = 0.23; 6" = 0.24; 6.25" = 0.25; 6.5" = 0.26; 6.75" = 0.27; 7" = 0.28; 7.25" = 0.29; 7.5" = 0.30; 7.75" = 0.31; 8" = 0.32; 8.25" = 0.33; 8.5" = 0.34; 8.75" = 0.35; 9" = 0.36; 9.25" = 0.37; 9.5" = 0.38; 9.75" = 0.39; 10" = 0.40; 10.25" = 0.41; 10.5" = 0.42; 10.75" = 0.43; 11" = 0.44; 11.25" = 0.45; 11.5" = 0.46; 11.75" = 0.47; 12" = 0.48; 12.25" = 0.49; 12.5" = 0.50; 12.75" = 0.51; 13" = 0.52; 13.25" = 0.53; 13.5" = 0.54; 13.75" = 0.55; 14" = 0.56; 14.25" = 0.57; 14.5" = 0.58; 14.75" = 0.59; 15" = 0.60; 15.25" = 0.61; 15.5" = 0.62; 15.75" = 0.63; 16" = 0.64; 16.25" = 0.65; 16.5" = 0.66; 16.75" = 0.67; 17" = 0.68; 17.25" = 0.69; 17.5" = 0.70; 17.75" = 0.71; 18" = 0.72; 18.25" = 0.73; 18.5" = 0.74; 18.75" = 0.75; 19" = 0.76; 19.25" = 0.77; 19.5" = 0.78; 19.75" = 0.79; 20" = 0.80; 20.25" = 0.81; 20.5" = 0.82; 20.75" = 0.83; 21" = 0.84; 21.25" = 0.85; 21.5" = 0.86; 21.75" = 0.87; 22" = 0.88; 22.25" = 0.89; 22.5" = 0.90; 22.75" = 0.91; 23" = 0.92; 23.25" = 0.93; 23.5" = 0.94; 23.75" = 0.95; 24" = 0.96; 24.25" = 0.97; 24.5" = 0.98; 24.75" = 0.99; 25" = 1.00; 25.25" = 1.01; 25.5" = 1.02; 25.75" = 1.03; 26" = 1.04; 26.25" = 1.05; 26.5" = 1.06; 26.75" = 1.07; 27" = 1.08; 27.25" = 1.09; 27.5" = 1.10; 27.75" = 1.11; 28" = 1.12; 28.25" = 1.13; 28.5" = 1.14; 28.75" = 1.15; 29" = 1.16; 29.25" = 1.17; 29.5" = 1.18; 29.75" = 1.19; 30" = 1.20; 30.25" = 1.21; 30.5" = 1.22; 30.75" = 1.23; 31" = 1.24; 31.25" = 1.25; 31.5" = 1.26; 31.75" = 1.27; 32" = 1.28; 32.25" = 1.29; 32.5" = 1.30; 32.75" = 1.31; 33" = 1.32; 33.25" = 1.33; 33.5" = 1.34; 33.75" = 1.35; 34" = 1.36; 34.25" = 1.37; 34.5" = 1.38; 34.75" = 1.39; 35" = 1.40; 35.25" = 1.41; 35.5" = 1.42; 35.75" = 1.43; 36" = 1.44; 36.25" = 1.45; 36.5" = 1.46; 36.75" = 1.47; 37" = 1.48; 37.25" = 1.49; 37.5" = 1.50; 37.75" = 1.51; 38" = 1.52; 38.25" = 1.53; 38.5" = 1.54; 38.75" = 1.55; 39" = 1.56; 39.25" = 1.57; 39.5" = 1.58; 39.75" = 1.59; 40" = 1.60; 40.25" = 1.61; 40.5" = 1.62; 40.75" = 1.63; 41" = 1.64; 41.25" = 1.65; 41.5" = 1.66; 41.75" = 1.67; 42" = 1.68; 42.25" = 1.69; 42.5" = 1.70; 42.75" = 1.71; 43" = 1.72; 43.25" = 1.73; 43.5" = 1.74; 43.75" = 1.75; 44" = 1.76; 44.25" = 1.77; 44.5" = 1.78; 44.75" = 1.79; 45" = 1.80; 45.25" = 1.81; 45.5" = 1.82; 45.75" = 1.83; 46" = 1.84; 46.25" = 1.85; 46.5" = 1.86; 46.75" = 1.87; 47" = 1.88; 47.25" = 1.89; 47.5" = 1.90; 47.75" = 1.91; 48" = 1.92; 48.25" = 1.93; 48.5" = 1.94; 48.75" = 1.95; 49" = 1.96; 49.25" = 1.97; 49.5" = 1.98; 49.75" = 1.99; 50" = 2.00; 50.25" = 2.01; 50.5" = 2.02; 50.75" = 2.03; 51" = 2.04; 51.25" = 2.05; 51.5" = 2.06; 51.75" = 2.07; 52" = 2.08; 52.25" = 2.09; 52.5" = 2.10; 52.75" = 2.11; 53" = 2.12; 53.25" = 2.13; 53.5" = 2.14; 53.75" = 2.15; 54" = 2.16; 54.25" = 2.17; 54.5" = 2.18; 54.75" = 2.19; 55" = 2.20; 55.25" = 2.21; 55.5" = 2.22; 55.75" = 2.23; 56" = 2.24; 56.25" = 2.25; 56.5" = 2.26; 56.75" = 2.27; 57" = 2.28; 57.25" = 2.29; 57.5" = 2.30; 57.75" = 2.31; 58" = 2.32; 58.25" = 2.33; 58.5" = 2.34; 58.75" = 2.35; 59" = 2.36; 59.25" = 2.37; 59.5" = 2.38; 59.75" = 2.39; 60" = 2.40; 60.25" = 2.41; 60.5" = 2.42; 60.75" = 2.43; 61" = 2.44; 61.25" = 2.45; 61.5" = 2.46; 61.75" = 2.47; 62" = 2.48; 62.25" = 2.49; 62.5" = 2.50; 62.75" = 2.51; 63" = 2.52; 63.25" = 2.53; 63.5" = 2.54; 63.75" = 2.55; 64" = 2.56; 64.25" = 2.57; 64.5" = 2.58; 64.75" = 2.59; 65" = 2.60; 65.25" = 2.61; 65.5" = 2.62; 65.75" = 2.63; 66" = 2.64; 66.25" = 2.65; 66.5" = 2.66; 66.75" = 2.67; 67" = 2.68; 67.25" = 2.69; 67.5" = 2.70; 67.75" = 2.71; 68" = 2.72; 68.25" = 2.73; 68.5" = 2.74; 68.75" = 2.75; 69" = 2.76; 69.25" = 2.77; 69.5" = 2.78; 69.75" = 2.79; 70" = 2.80; 70.25" = 2.81; 70.5" = 2.82; 70.75" = 2.83; 71" = 2.84; 71.25" = 2.85; 71.5" = 2.86; 71.75" = 2.87; 72" = 2.88; 72.25" = 2.89; 72.5" = 2.90; 72.75" = 2.91; 73" = 2.92; 73.25" = 2.93; 73.5" = 2.94; 73.75" = 2.95; 74" = 2.96; 74.25" = 2.97; 74.5" = 2.98; 74.75" = 2.99; 75" = 3.00; 75.25" = 3.01; 75.5" = 3.02; 75.75" = 3.03; 76" = 3.04; 76.25" = 3.05; 76.5" = 3.06; 76.75" = 3.07; 77" = 3.08; 77.25" = 3.09; 77.5" = 3.10; 77.75" = 3.11; 78" = 3.12; 78.25" = 3.13; 78.5" = 3.14; 78.75" = 3.15; 79" = 3.16; 79.25" = 3.17; 79.5" = 3.18; 79.75" = 3.19; 80" = 3.20; 80.25" = 3.21; 80.5" = 3.22; 80.75" = 3.23; 81" = 3.24; 81.25" = 3.25; 81.5" = 3.26; 81.75" = 3.27; 82" = 3.28; 82.25" = 3.29; 82.5" = 3.30; 82.75" = 3.31; 83" = 3.32; 83.25" = 3.33; 83.5" = 3.34; 83.75" = 3.35; 84" = 3.36; 84.25" = 3.37; 84.5" = 3.38; 84.75" = 3.39; 85" = 3.40; 85.25" = 3.41; 85.5" = 3.42; 85.75" = 3.43; 86" = 3.44; 86.25" = 3.45; 86.5" = 3.46; 86.75" = 3.47; 87" = 3.48; 87.25" = 3.49; 87.5" = 3.50; 87.75" = 3.51; 88" = 3.52; 88.25" = 3.53; 88.5" = 3.54; 88.75" = 3.55; 89" = 3.56; 89.25" = 3.57; 89.5" = 3.58; 89.75" = 3.59; 90" = 3.60; 90.25" = 3.61; 90.5" = 3.62; 90.75" = 3.63; 91" = 3.64; 91.25" = 3.65; 91.5" = 3.66; 91.75" = 3.67; 92" = 3.68; 92.25" = 3.69; 92.5" = 3.70; 92.75" = 3.71; 93" = 3.72; 93.25" = 3.73; 93.5" = 3.74; 93.75" = 3.75; 94" = 3.76; 94.25" = 3.77; 94.5" = 3.78; 94.75" = 3.79; 95" = 3.80; 95.25" = 3.81; 95.5" = 3.82; 95.75" = 3.83; 96" = 3.84; 96.25" = 3.85; 96.5" = 3.86; 96.75" = 3.87; 97" = 3.88; 97.25" = 3.89; 97.5" = 3.90; 97.75" = 3.91; 98" = 3.92; 98.25" = 3.93; 98.5" = 3.94; 98.75" = 3.95; 99" = 3.96; 99.25" = 3.97; 99.5" = 3.98; 99.75" = 3.99; 100" = 4.00; 100.25" = 4.01; 100.5" = 4.02; 100.75" = 4.03; 101" = 4.04; 101.25" = 4.05; 101.5" = 4.06; 101.75" = 4.07; 102" = 4.08; 102.25" = 4.09; 102.5" = 4.10; 102.75" = 4.11; 103" = 4.12; 103.25" = 4.13; 103.5" = 4.14; 103.75" = 4.15; 104" = 4.16; 104.25" = 4.17; 104.5" = 4.18; 104.75" = 4.19; 105" = 4.20; 105.25" = 4.21; 105.5" = 4.22; 105.75" = 4.23; 106" = 4.24; 106.25" = 4.25; 106.5" = 4.26; 106.75" = 4.27; 107" = 4.28; 107.25" = 4.29; 107.5" = 4.30; 107.75" = 4.31; 108" = 4.32; 108.25" = 4.33; 108.5" = 4.34; 108.75" = 4.35; 109" = 4.36; 109.25" = 4.37; 109.5" = 4.38; 109.75" = 4.39; 110" = 4.40; 110.25" = 4.41; 110.5" = 4.42; 110.75" = 4.43; 111" = 4.44; 111.25" = 4.45; 111.5" = 4.46; 111.75" = 4.47; 112" = 4.48; 112.25" = 4.49; 112.5" = 4.50; 112.75" = 4.51; 113" = 4.52; 113.25" = 4.53; 113.5" = 4.54; 113.75" = 4.55; 114" = 4.56; 114.25" = 4.57; 114.5" = 4.58; 114.75" = 4.59; 115" = 4.60; 115.25" = 4.61; 115.5" = 4.62; 115.75" = 4.63; 116" = 4.64; 116.25" = 4.65; 116.5" = 4.66; 116.75" = 4.67; 117" = 4.68; 117.25" = 4.69; 117.5" = 4.70; 117.75" = 4.71; 118" = 4.72; 118.25" = 4.73; 118.5" = 4.74; 118.75" = 4.75; 119" = 4.76; 119.25" = 4.77; 119.5" = 4.78; 119.75" = 4.79; 120" = 4.80; 120.25" = 4.81; 120.5" = 4.82; 120.75" = 4.83; 121" = 4.84; 121.25" = 4.85; 121.5" = 4.86; 121.75" = 4.87; 122" = 4.88; 122.25" = 4.89; 122.5" = 4.90; 122.75" = 4.91; 123" = 4.92; 123.25" = 4.93; 123.5" = 4.94; 123.75" = 4.95; 124" = 4.96; 124.25" = 4.97; 124.5" = 4.98; 124.75" = 4.99; 125" = 5.00; 125.25" = 5.01; 125.5" = 5.02; 125.75" = 5.03; 126" = 5.04; 126.25" = 5.05; 126.5" = 5.06; 126.75" = 5.07; 127" = 5.08; 127.25" = 5.09; 127.5" = 5.10; 127.75" = 5.11; 128" = 5.12; 128.25" = 5.13; 128.5" = 5.14; 128.75" = 5.15; 129" = 5.16; 129.25" = 5.17; 129.5" = 5.18; 129.75" = 5.19; 130" = 5.20; 130.25" = 5.21; 130.5" = 5.22; 130.75" = 5.23; 131" = 5.24; 131.25" = 5.25; 131.5" = 5.26; 131.75" = 5.27; 132" = 5.28; 132.25" = 5.29; 132.5" = 5.30; 132.75" = 5.31; 133" = 5.32; 133.25" = 5.33; 133.5" = 5.34; 133.75" = 5.35; 134" = 5.36; 134.25" = 5.37; 134.5" = 5.38; 134.75" = 5.39; 135" = 5.40; 135.25" = 5.41; 135.5" = 5.42; 135.75" = 5.43; 136" = 5.44; 136.25" = 5.45; 136.5" = 5.46; 136.75" = 5.47; 137" = 5.48; 137.25" = 5.49; 137.5" = 5.50; 137.75" = 5.51; 138" = 5.52; 138.25" = 5.53; 138.5" = 5.54; 138.75" = 5.55; 139" = 5.56; 139.25" = 5.57; 139.5" = 5.58; 139.75" = 5.59; 140" = 5.60; 140.25" = 5.61; 140.5" = 5.62; 140.75" = 5.63; 141" = 5.64; 141.25" = 5.65; 141.5" = 5.66; 141.75" = 5.67; 142" = 5.68; 142.25" = 5.69; 142.5" = 5.70; 142.75" = 5.71; 143" = 5.72; 143.25" = 5.73; 143.5" = 5.74; 143.75" = 5.75; 144" = 5.76; 144.25" = 5.77; 144.5" = 5.78; 144.75" = 5.79; 145" = 5.80; 145.25" = 5.81; 145.5" = 5.82; 145.75" = 5.83; 146" = 5.84; 146.25" = 5.85; 146.5" = 5.86; 146.75" = 5.87; 147" = 5.88; 147.25" = 5.89; 147.5" = 5.90; 147.75" = 5.91; 148" = 5.92; 148.25" = 5.93; 148.5" = 5.94; 148.75" = 5.95; 149" = 5.96; 149.25" = 5.97; 149.5" = 5.98; 149.75" = 5.99; 150" = 6.00; 150.25" = 6.01; 150.5" = 6.02; 150.75" = 6.03; 151" = 6.04; 151.25" = 6.05; 151.5" = 6.06; 151.75" = 6.07; 152" = 6.08; 152.25" = 6.09; 152.5" = 6.10; 152.75" = 6.11; 153" = 6.12; 153.25" = 6.13; 153.5" = 6.14; 153.75" = 6.15; 154" = 6.16; 154.25" = 6.17; 154.5" = 6.18; 154.75" = 6.19; 155" = 6.20; 155.25" = 6.21; 155.5" = 6.22; 155.75" = 6.23; 156" = 6.24; 156.25" = 6.25; 156.5" = 6.26; 156.75" = 6.27; 157" = 6.28; 157.25" = 6.29; 157.5" = 6.30; 157.75" = 6.31; 158" = 6.32; 158.25" = 6.33; 158.5" = 6.34; 158.75" = 6.35; 159" = 6.36; 159.25" = 6.37; 159.5" = 6.38; 159.75" = 6.39; 160" = 6.40; 160.25" = 6.41; 160.5" = 6.42; 160.75" = 6.43; 161" = 6.44; 161.25" = 6.45; 161.5" = 6.46; 161.75" = 6.47; 162" = 6.48; 162.25" = 6.49; 162.5" = 6.50; 162.75" = 6.51; 163" = 6.52; 163.25" = 6.53; 163.5" = 6.54; 163.75" = 6.55; 164" = 6.56; 164.25" = 6.57; 164.5" = 6.58; 164.75" = 6.59; 165" = 6.60; 165.25" = 6.61; 165.5" = 6.62; 165.75" = 6.63; 166" = 6.64; 166.25" = 6.65; 166.5" = 6.66; 166.75" = 6.67; 167" = 6.68; 167.25" = 6.69; 167.5" = 6.70; 167.75" = 6.71; 168" = 6.72; 168.25" = 6.73; 168.5" = 6.74; 168.75" = 6.75; 169" = 6.76; 169.25" = 6.77; 169.5" = 6.78; 169.75" = 6.79; 170" = 6.80; 170.25" = 6.81; 170.5" = 6.82; 170.75" = 6.83; 171" = 6.84; 171.25" = 6.85; 171.5" = 6.86; 171.75" = 6.87; 172" = 6.88; 172.25" = 6.89; 172.5" = 6.90; 172.75" = 6.91; 173" = 6.92; 173.25" = 6.93; 173.5" = 6.94; 173.75" = 6.95; 174" = 6.96; 174.25" = 6.97; 174.5" = 6.98; 174.75" = 6.99; 175" = 7.00; 175.25" = 7.01; 175.5" = 7.02; 175.75" = 7.03; 176" = 7.04; 176.25" = 7.05; 176.5" = 7.06; 176.75" = 7.07; 177" = 7.08; 177.25" = 7.09; 177.5" = 7.10; 177.75" = 7.11; 178" = 7.12; 178.25" = 7.13; 178.5" = 7.14; 178.75" = 7.15; 179" = 7.16; 179.25" = 7.17; 179.5" = 7.18; 179.75" = 7.19; 180" = 7.20; 180.25" = 7.21; 180.5" = 7.22; 180.75" = 7.23; 181" = 7.24; 181.25" = 7.25; 181.5" = 7.26; 181.75" = 7.27; 182" = 7.28; 182.25" = 7.29; 182.5" = 7.30; 182.75" = 7.31; 183" = 7.32; 183.25" = 7.33; 183.5" = 7.34; 183.75" = 7.35; 184" = 7.36; 184.25" = 7.37; 184.5" = 7.38; 184.75" = 7.39; 185" = 7.40; 185.25" = 7.41; 185.5" = 7.42; 185.75" = 7.43; 186" = 7.44; 186.25" = 7.45; 186.5" = 7.46; 186.75" = 7.47; 187" = 7.48; 187.25" = 7.49; 187.5" = 7.50; 187.75" = 7.51; 188" = 7.52; 188.25" = 7.53; 188.5" = 7.54; 188.75" = 7.55; 189" = 7.56; 189.25" = 7.57; 189.5" = 7.58; 189.75" = 7.59; 190" = 7.60; 190.25" = 7.61; 190.5" = 7.62; 190.75" = 7.63; 191" = 7.64; 191.25" = 7.65; 191.5" = 7.66; 191.75" = 7.67; 192" = 7.68; 192.25" = 7.69; 192.5" = 7.70; 192.75" = 7.71; 193" = 7.72; 193.25" = 7.73; 193.5" = 7.74; 193.75" = 7.75; 194" = 7.76; 194.25" = 7.77; 194.5" = 7.78; 194.75" = 7.79; 195" = 7.80; 195.25" = 7.81; 195.5" = 7.82; 195.75" = 7.83; 196" = 7.84; 196.25" = 7.85; 196.5" = 7.86; 196.75" = 7.87; 197" = 7.88; 197.25" = 7.89; 197.5" = 7.90; 197.75" = 7.91; 198" = 7.92; 198.25" = 7.93; 198.5" = 7.94; 198.75" = 7.95; 199" = 7.96; 199.25" = 7.97; 199.5" = 7.98; 199.75" = 7.99; 200" = 8.00; 200.25" = 8.01; 200.5" = 8.02; 200.75" = 8.03; 201" = 8.04; 201.25" = 8.05; 201.5" = 8.06; 201.75" = 8.07; 202" = 8.08; 202.25" = 8.09







## GROUNDWATER SAMPLING LOG

LOCATION: ID CHARLESTON	SITE ID: WMP	
WELL NO: CHRTN06-003	WELL ID: CHRTN06-003-00W-030	DATE: 2-4-17

## PUMPING DATA

WELL ID: CHRTN06-003	WELL NO: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003
WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003

TIME	WELL ID	WELL NO	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID
0845	0.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0855	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0905	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0915	0.8	4.30	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0920	1.75	6.05	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0930	1.75	7.80	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0940	1.75	9.55	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
0950	1.75	11.3	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75

WELL ID: CHRTN06-003	WELL NO: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003
WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003

## SAMPLING DATA

WELL ID: CHRTN06-003	WELL NO: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003
WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003

WELL ID: CHRTN06-003	WELL NO: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003
WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003

WELL ID: CHRTN06-003	WELL NO: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003
WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003	WELL ID: CHRTN06-003







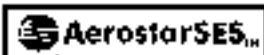












## GROUNDWATER SAMPLING LOG

WELL NO. JICHAPESTON	Site 9
WELL ID CHRTN09-001	WELL ID CHRTN09-001-GW-025

## PURGING DATA

WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001
WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001

TIME OF OBSERVATION		WELL NUMBER AND NAME		DEPTH		WELL TYPE		WELL ID		WELL STATUS		WELL LOCATION		WELL OWNER	
DATE	TIME	WELL NO.	WELL NAME	DEPTH (ft)	WELL TYPE	WELL ID	WELL STATUS	WELL ID	WELL STATUS	WELL ID	WELL STATUS	WELL ID	WELL STATUS	WELL ID	WELL STATUS
1212	3gal	3gal	177	23.5	6.28	24.0	24.6	6.39	19.3	0-100 Range	Brown	1100	5.43 gal		
1212	1.71 gal	13.12 gal	1	23.5	5.63	24.3	15.8	6.27	24.1	0-100 Range	1	1			
1300	6.72 gal	13.95 gal	1	23.5	5.69	24.6	14.3	6.35	24.0		1	1			
1302	354	20.20 gal	1	23.5	5.59	21.4	14.3	5.83	3.3		1	1			
1304	354	20.56 gal	1	23.5	5.59	24.3	14.3	5.31	6.8		1	1			
		5.49 gal													

WELL CAPACITY (BASED ON WELL ID CHRTN09-001) 1" DIA. 120' DEEP. 2" DIA. 2' DIA. 4" DIA. 6" DIA. 8" DIA. 10" DIA. 12" DIA.

PUMPING EQUIPMENT CODES: B - Bailer, GP - Gasoline Pump, ESP - Electric Submersible Pump, PF - Peristaltic Pump, Q - Other (Specify)

## SAMPLING DATA

WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001
WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001	WELL ID CHRTN09-001

NOTES:

Subsidence/Drawdown/Leveling/Seepage/Leakage/Contamination/Seepage

pH  $\pm 0.2$  units; Temperature  $\pm 0.2^\circ\text{C}$ ; Specific Conductance  $\pm 1\%$ ; Dissolved Oxygen (all readings)  $\pm 20\%$  saturation, generally  $\pm 0.2\text{ mg/L}$  or  $\pm 10\%$  (whichever is greater); Turbidity: all readings  $\pm 10\%$

Revised Date: March 14, 2012



## GROUNDWATER SAMPLING LOG

Author	JB CHARLESTON	~ 09
ATTN	CHRTN09-003	DATE IN CHRTN09-003-6W-025 02/06/2017

PURCHASER DATA				
ALJ	0.75	1.00	22.09	PR

WELL NUMBER: 09-08E						WELL VOLUME: 5 TOTAL WELL BOTTOM DEPTH = 57.00M						STATION DEPTH FROM WATER: X						WELL CAPACITY:					
(see Note Appendix)						52.40																	

$\text{Pico Farad (pF)} = \frac{\text{Equivalent Volume} \times \text{Surface Tension} \times \text{Density}}{1000}$ <p>and <math>N = \text{cell capacity}</math></p>	$A = \frac{\text{Surface Tension} \times \text{Flow Cell Volume}}{1000}$
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DATE: 08/14/2016	TIME: 10:00 AM	LOCATION: 1520	STATUS: 1615	TOTAL: 17.5
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TIME	WATER PUMPED GALLONS L	WATER CONSUMED GALLONS L	PUMP RATE GPM L/Hr	PUMP IN HOURS MIN:SEC	PH TEST/PH METER	TEMP °F	COND CMH	CHLORINE APPLIED GAL	CHLORINE PPM	CHLORINE M/L	CHLORINE PPM	CHLORINE PPM
1520				22.00		Fluorid started						
1530	1.0	1.0	100	11 11	5.44	20.7	0.047	4.06	84.5	0.8	brn	
1540	1.0	2.0	100	11 11	4.90	20.7	0.042	4.37	85.1	0.8	brn	
1550	1.0	3.0	100	11 11	4.92	20.7	0.040	4.42	82.9	0.8	brn	
1600	1.0	4.0	100	11 11	4.96	20.4	0.036	5.16	93.7	0.8	brn	
1605	0.5	4.5	100	11 11	4.78	20.4	0.030	6.07	103.4	0.8	brn	
1608	0.3	4.8	100	11 11	4.72	20.3	0.029	6.04	115.0	0.8	brn	
1613	0.5	5.3	100	11 11	4.73	20.7	0.029	6.08	120.1	0.8	brn	
1615	0.2	5.5	100	11 11	4.74	20.7	0.030	6.93	120.7	0.8	brn	
						02/06/2017						

[illegible][illegible][illegible]

SAMPLING DATA			
DATE AND TIME OF COLLECTION	NAME OF PERSON(S) COLLECTING	TEMPERATURE	WIND DIRECTION
1-10-1968 4:52	Franklin Johnson	16.5	16.6

STATION NAME	25.0	TIME	10:00	DATE	10/10/10
STATION NO.		WATER TEMP (C)		WIND DIRECTION	h/a

[illegible][illegible]

RTW = 19.48 BE.S High turbidity due to algae in portions of the screen interval  
T.D = 24.64 BE.S

MATERIAL CODES	AG - Anti-Burn Glove	OR - Fire Glove	PC - Polyethylene Glove	PD - Polypropylene Glove	SA - Safety Glove	T - Trench Glove	W - Work Glove
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SAMPLING POINTS	DATE	TIME	WIND DIRECTION	WIND SPEED	TEMPERATURE	HUMIDITY	SEA STATE	REMARKS
SAMPLING POSITION: EX-104								

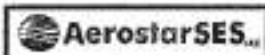
WSP = Weight of the Pile (kg)      SM = Shore Metal Lifting Capacity (kg)      C = Chain Capacity

## 43152

**Elbowgreen Cinema** for range of viewings of six great contemporary Canadian

pH = 6.2 ± 0.2; Temperature = 0.2 °C; Specific Conductivity = ± 5%; Dissolved Oxygen = 0.6 mg/l ± 0.05; Salinity = 0.2 mg/l ± 0.05; Turbidity = 1.0 mg/l ± 0.05.

ResMed Corp. U.S. Pat. # 5,806,000



## GROUNDWATER SAMPLING LOG

LOCATOR: JB CHARLESTON	WELL NO: 01
WELL ID: CHRTN01-001	SAMPLE ID: CHRTN01-001-GW-910 DATE: 02/03/2017

WELL	TUBING	WELL SCREEN INTERVAL DEPTH	STATIC DEPTH TO WATER (bwtoc)	PERME PUMP TYPE
CHARTN01-001	1/4	5 ft - 15 ft	6.23	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - BTOC - STATIC DEPTH TO WATER) X WELL CAPACITY
Only if well is applicable: = 1 ft x 0.0005 = 0.0005 gal

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
Only if well is applicable: = 0.0005 + (0.0005 x 10) + 0.0005 = 0.0055 gal

WELL PUMP ON TUBING DEPTH IN WELL (ft): 10.0	FINAL PUMP ON TUBING DEPTH IN WELL (ft): 10.0	PURGE VOLUME (GALLONS): 1400	PURGE RATE (GPM): 1.0	TOTAL VOLUME PURGED (GALLONS): 1400
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TIME	VOLUME PURGED (L)	CUMULATIVE VOLUME PURGED (L)	PURGE RATE (L/min)	DEPTH TO WATER (bwtoc)	pH (standard unit)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOUR (PCU/CO)	ODOR (detectable)
1400	0	0	—	6.23	Pump started	—	—	—	—	—	—	—
1410	2.5	2.5	250	6.23	5.04	18.84	0.876	5.03	-292.4	2.95	clear	—
1420	2.5	5.0	250	6.23	5.53	18.21	0.829	3.54	-360.2	16.0	clear	—
1425	1.25	6.25	250	6.23	5.58	18.22	0.808	3.47	-375.2	52.5	clear	—
1430	1.25	7.50	250	6.23	5.59	18.23	0.796	3.45	-364.0	59.7	clear	—
1432	0.5	8.00	250	6.23	5.60	18.27	0.791	3.51	-359.2	37.3	clear	—
1434	0.5	8.50	250	6.23	5.62	18.27	0.773	3.63	-353.0	23.9	clear	—
1436	0.5	9.00	250	6.23	5.63	18.26	0.751	3.69	-360.3	23.1	clear	—
F+J 02/03/2017												

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.69; 5" = 1.02; 6" = 1.47; 12" = 6.06
TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/4" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.0034; 3/8" = 0.005; 1/2" = 0.010; 5/8" = 0.019
PURGING EQUIPMENT CODES: B = Baller; BP = Baller Pump; ESP = Electric Submersible Pump; SP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA	
WELL ID: CHRTN01-001	WELL NO: 01
PUMP ON TUBING DEPTH IN WELL (ft): 10.0	TUBING MATERIAL CODE: PE
FIELD OCCUPANCY: PUMP V 0	TUBING F N 0.0005
SAMPLE CONTAINER OPERATOR: Franklin Johnson / ASL	SAMPLE NO: 1440
WELL ID: CHRTN01-001	WELL NO: 01
PUMP ON TUBING DEPTH IN WELL (ft): 10.0	TUBING MATERIAL CODE: PE
FIELD OCCUPANCY: PUMP V 0	TUBING F N 0.0005
SAMPLE CONTAINER OPERATOR: Franklin Johnson / ASL	SAMPLE NO: 1440
WELL ID: CHRTN01-001	WELL NO: 01
PUMP ON TUBING DEPTH IN WELL (ft): 10.0	TUBING MATERIAL CODE: PE
FIELD OCCUPANCY: PUMP V 0	TUBING F N 0.0005
SAMPLE CONTAINER OPERATOR: Franklin Johnson / ASL	SAMPLE NO: 1440

WELL ID: CHRTN01-001	WELL NO: 01
PUMP ON TUBING DEPTH IN WELL (ft): 10.0	TUBING MATERIAL CODE: PE
FIELD OCCUPANCY: PUMP V 0	TUBING F N 0.0005
SAMPLE CONTAINER OPERATOR: Franklin Johnson / ASL	SAMPLE NO: 1440
WELL ID: CHRTN01-001	WELL NO: 01
PUMP ON TUBING DEPTH IN WELL (ft): 10.0	TUBING MATERIAL CODE: PE
FIELD OCCUPANCY: PUMP V 0	TUBING F N 0.0005
SAMPLE CONTAINER OPERATOR: Franklin Johnson / ASL	SAMPLE NO: 1440

REMARKS: Normal, ms/msd, and Duplicate sample, 4 bottles total
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; RPPP = Reverse Flow Peristaltic Pump; SM = Slow Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 0.0005 Gal/ft for range of solution of test lines appropriate reading
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 ≤ 10 NTU

Revision Date: March 14, 2019
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## GROUNDWATER SAMPLING LOG

NAME: JB CHARLESTON	Site 1		
WELL ID: CH RTND1-002	SAMPLE ID: CHRTND1-002-GW-000	DATE: 2-3-16	TIME: 02:03/2016

WELL DRAINAGE ZONE <b>2"</b>	WELL DRAINAGE ZONE <b>7/4"</b>	WELL SCREEN BEING DEPTH <b>5</b> <small>(ft)</small> - <b>15</b> <small>(ft)</small>	STATIC DEPTH TO WATER IN WELL <b>5.64</b>	PUMP FLUMP OR MOUNT <b>PP</b>
WELL VOLUME PURGE = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY				
<small>(avg. flow rate) x (time)</small>	<small>(ft) x (ft) x (ft)</small>	<small>(ft) x (ft) x (ft)</small>	<small>(ft) x (ft) x (ft)</small>	<small>(ft) x (ft) x (ft)</small>

EQUIPMENT VOLUME PUMP: EQUIPMENT VOL. = PUMP VOLUME + (TURBINE CAPACITY      3      TURBINE LENGTH) + FLOW CELL VOLUME									
any fixed equipment	=	gal	+	ft	ft	=	gal	+	gal

TOTAL PLANT (K15000)	TOTAL PLANT (K15000)	PLANT NO	PLANT NO	PLANT NO	PLANT NO
10	10	1350	1415	4503	

[illegible][illegible]

SAMPLING DATA			
DATA FILED BY (PRINT NAME) Ash Willis (ASA)	DATA FILED BY (PRINT NAME) 	SAFETY NO. 1415	SAFETY NO. 1415
PLANT OR FURNACE	UNIT NO.	FIELD FILTERED <input checked="" type="checkbox"/>	FIELD FILTERED <input type="checkbox"/>
CONTROL NO. (SEE PAGE 10)	WATER SAM. CONTROL	WATER SAM. CONTROL	

[illegible]

2007年1月1日

RAW MATERIAL CODES:	AD = Asbest Glass	CG = Clear Glass	PE = Polyethylene	PP = Polypropylene	S = Stone	T = Teflon	G = Other (Specify)
SAMPLING EQUIPMENT CODES:	AMP = Air-Particulate Pump	B = Bales	BP = Bagging Pump	ESP = Electrostatic Precipitator Pump	HTP = Hydraulic Particulate Pump	SB = Shovel Method (Telling Gravity Dumps)	Q = Other (Specify)

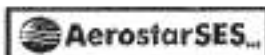
WGETS:

*Malabaricus Cichlasoma*. Not a result of separation of backbones. *Acrossocheilus* (two types)

pH:  $\pm 0.2$  units; Temperature:  $\pm 0.1^\circ\text{C}$ ; Specific Conductance:  $\pm 1\%$ ; Dissolved Oxygen: all readings  $\geq 50\%$  saturation (naturally,  $\pm 0.2$  mg/L if  $\geq 10\%$  saturation is present); Turbidity: all readings  $\leq$

Revision Date: March 14, 2016





## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Site: 02	
Well No: CHRTN02-001	Sample ID: CHRTN02-001-GW-010	Date: 02/08/2017

## PURGING DATA

Well Character (diameter): 0.75	Tubing Diameter (inch): 1/4	Well Screen Interval Depth: 8GS	Static Depth to Water: 6.04	Purge Pump Type: PP
Well Volume Purge: 1 Well Volume = (TOTAL WELL DEPTH BTDC - STATIC DEPTH TO WATER) X WELL CAPACITY				
only fill out if applicable: 16.83				
Equipment Volume Purge: 1 Equipment Vol. = PUMP VOLUME X (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME				
only fill out if applicable: 0				

INITIAL PUMP-ON TURNING			FINAL PUMP-ON TURNING			PUMPING SPEED AT:			TOTAL VOLUME PURGED (gallons) L =			
DEPTH IN WELL (ft): BTDC 12.0			DEPTH IN WELL (ft): BTDC 12.0			ROTATED AT: 1130			SPD: 1220			
TIME	VOLUME PUMPED (gallons) L	CORREL. VOLUME PUMPED (gallons) L	PURGE RATE (gpm)	DO (mg/L)	PH (standard)	TEMP. (°C)	COND. (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	SPD (gpm)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (describe)
1130	0	0	—	6.04	—	Pump	Stalled	—	—	—	—	—
1150	4.0	4.0	200	11	11	5.30	20.2	0.174	1.23	3.9	832	brown
1200	2.0	6.0	200	11	11	5.27	20.1	0.171	1.12	-37.3	582	brown
1205	1.0	7.0	200	11	11	5.25	20.2	0.167	1.18	-56.9	383	light brown
1210	1.0	8.0	200	11	11	5.26	20.4	0.166	1.11	-60.3	301	light brown
1215	1.0	9.0	200	11	11	5.25	20.0	0.164	1.11	-61.3	269	light brown
1220	1.0	10.0	200	11	11	5.24	20.2	0.163	1.12	-61.4	220	light brown
FET 02/08/2017												

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.03; 1" = 0.04; 1.25" = 0.05; 1.5" = 0.06; 1.75" = 0.07; 2" = 0.08; 2.25" = 0.09; 2.5" = 0.10; 2.75" = 0.11; 3" = 0.12

TUBING INSIDE DIA. CAPACITY (Gallons Per Foot): 1/8" = 0.0008; 3/16" = 0.0014; 1/4" = 0.0020; 5/16" = 0.0026; 3/8" = 0.0032; 1/2" = 0.0048; 5/8" = 0.0064

PURGING EQUIPMENT CODES: S = Sucker; RP = Rodless Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

## SAMPLING DATA

SAMPLED BY (PRINT NAME): Franklin Johnson	ASL	SAMPLER DISBURSER: Franklin Johnson	SAMPLING METHOD AT: 1225	SAMPLING DEPTH AT: 1226					
PUMP-ON TURNING: 1130	DEPTH IN WELL (ft): BTDC 12.0	TUBING: 1/4	FIELD FILTERED: Y	FIELD RINSE: n/a					
FIELD LOG INFORMATION: PUMP Y (0)		TUBING Y (0)	DUPLICATE Y (0)						
SAMPLE CONTAINER SPECIFICATION		SAMPLE PRESERVATION							
BOTTLE CODE	# CONTAINERS	UNIVERSAL CODE	VOLUME (mL)	PURGE/DATE	TOTAL VOL. (mL)	FINAL PH (BATCH USE)	MIXED ANALYSIS AND/OR METHOD	SAMPLE INSTRUCTIONS CODE	SAMPLE PUMP FLOW RATE (mL per minute)
CHRTN02-001-GW-010	1	PE	250	—	—	—	537M	APP	200
FET 02/08/2017									

DTW = 3.48 ft 8GS

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; S = Sucker; RP = Rodless Pump; ESP = Electric Submersible Pump;

RFP = Reverse Flow Peristaltic Pump; SM = Sucker Method (Tubing Gravity Drain); O = Other (Specify)

## NOTES:

Stabilization Criteria for range of readings of last three consecutive readings.

pH: ± 0.2 units; Temperature: ± 0.2 °C; Specific Conductance: ± 5%; Dissolved Oxygen: all readings ± 20% saturation; alkalinity: ± 0.2 mg/L or ± 12% (whichever is greater); Turbidity: all readings ≤

Revision Date: March 14, 2016



## GROUNDWATER SAMPLING LOG

NAME: JB CHARLESTON	IN: 02
CALL NO: CHRTN02-002	REF ID: CHRTN02-002-GW-011 DATE: 02/08/2017

WELL Diameter (inches) <b>6.75</b>	Tubing Diameter (inches) <b>1/4</b>	Well Number Interval Depth <b>7.92 - 17.92</b>	Drate Depth To Water (see #140) <b>9.12</b>	Drate Time (hrs) On Scale <b>PP</b>
Well Volume Fudge = 1 Well Volume = (Total Well Depth - Static Depth To Water) X Well Capacity (see #140 & Appendix) <b>17.92</b> ft - 9.12 ft = 8.80 ft X 100 = 880				

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

DATE: 09-07-13	FINAL PLANT CUBIN	PURCHASER:	PLANT NO.	TOTAL VOLUME
CITY OF OAKLAND, CALIF. 13.0	13.0	12.5-5	1355	13

[illegible]

WELL CAPACITY (Dahua Per Foot): 2.12" = 0.02; 1" = 0.04; 1.30" = 0.04; 2" = 0.08; 2" = 0.07; 4" = 0.08; 3" = 0.02; 5" = 1.47; 12" = 6.00

FLUSHING INSIDE DIA. CAPACITY (GAL./FT.): 1/8" = 0.0036, 3/16" = 0.0014, 1/4" = 0.0006, 5/16" = 0.004, 3/8" = 0.006, 1/2" = 0.010, 5/8" = 0.016

PUMP/EQUIPMENT CODES: S = Solar; HP = Electric Pump; HSP = Electric Heated Water Pump; FHP = Fuel Oil Pump; O = Other Source

### SAMPLING DATA

UNCLASSIFIED//FOR OFFICIAL USE ONLY	DATE OF REVIEW: 9/16/08	REVIEWED BY: [Signature]	APPROVED BY: [Signature]	REVIEWED BY: [Signature]	APPROVED BY: [Signature]
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[illegible]

SAMPLE IDENTIFICATION		ANALYSIS		REMARKS	
SAMPLE NO.	SAMPLE DESCRIPTION	ANALYST	DATE	TIME	REMARKS
1	...	...	...	...	...

ARTICLE NUMBER	DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL AMOUNT	TAXES	NET TOTAL	GRAND TOTAL

02-002-00-001	1	95	250	---	---	---	557M	APP	250
---------------	---	----	-----	-----	-----	-----	------	-----	-----

ET 02/18/2017

$\frac{1}{\sqrt{2}}$

[illegible]
$$DTW = 6.28 \text{ NRG's}$$
[illegible]

APR = Air Purge Recirculation Pump; B = Bore; BP = Ballast Pump; BSP = Electric Submersible Pump;  
 RPP = Reverse Flow Recirculation Pump; SM = Sump Motor (Submersible Motor); O = Other (Specify)

NOTES: \*

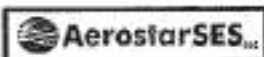
5078 • J. Neurosci., September 24, 2008 • 28(39):5072–5080

Classification Effects: for series of models at least three covariates, read from

pH  $\pm 0.2$  units, Temperature  $\pm 0.2$  °C, Specific Conductance:  $\pm 8\%$ , Dissolved Oxygen at readings  $\geq 20\%$  saturation, accuracy  $\pm 0.3$  mg/L or  $\pm 12\%$  whichever is greater. Turbidity at readings  $\geq$

Revision Date: March 14, 2018





## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Site: Site 02	
Well No: CHRTN02-S2MW-02	Sample: CHRTN02-S2MW-02-017.5	Date: 02/02/2017

## PURGING DATA

WELL DIAMETER (inches) 2.0	TUBING CAPACITY (gallons) 1/4	WELL SCREEN INTERVAL DEPTH 7.5 ft - 11.5 ft	STATIC DEPTH TO WATER (feet BTOG) 10.16	PURGE PUMP TYPE OR METER PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTOG - STATIC DEPTH TO WATER) X WELL CAPACITY (only if not applicable) = 11.5 ft X 0.25 gal/ft = 2.875 gal				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only if not applicable) = 0.25 gal + (0.25 gal/ft X 12.5 ft) + 0.25 gal = 3.25 gal				

DATE, PUMP OR TUBING DEPTH IN WELL (ft)	DATE, PUMP OR TUBING DEPTH IN WELL (ft)	PURGING INTERVAL AT	FLOW RATE THROUGHT AT	TOTAL VOLUME PUMPED (gallons) L = 4.25	TIME	VOLUME PUMPED (gallons) L	OVERALL VOLUME PUMPED (gallons) L	PURGE RATE (gpm)	DEPTH TO WATER (feet BTOG)	pH (standard unit)	TEMP. (°C)	COND. (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	OPP (ppm)	TURBIDITY (NTU)	COLOR (Pt-Co Unit)	ODOR (ppm)
12.5	12.5	1528	15.35		1518	0	0		10.16								
					1528	2.5	2.5	250	10.86	5.40	20.35	0.276	2.69	267.3	1.58	clear	
					1533	1.25	3.75	250	10.91	5.44	20.31	0.262	2.53	259.7	2.36	clear	
					1535	0.50	4.25	250	10.91	5.49	20.34	0.254	2.52	250.3	2.20	clear	
02/02/2017																	

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.69; 5" = 1.02; 6" = 1.47; 12" = 5.98  
TUBING INSIDE DIA. CAPACITY (GAL/FT): 1/8" = 0.0006; 5/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 3/4" = 0.018  
PURGING EQUIPMENT CODES: B = Bailor; BP = Backsaver Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

## SAMPLING DATA

SAMPLED BY (PRINT) / SIGNATURE: Franklin Johnson / AJ	SAMPLER SIGNATURE: Franklin Johnson	SAMPLED STARTED AT: 1535	SAMPLED ENDED AT: 1536					
PUMP OR TUBING DEPTH IN WELL (ft): 12.5	TUBING NOMINAL CODE PE	WELL FILTERED: Y (0)	Flow Rate: n/a					
FIELD OCCURRENCE FOR: PUMP Y (0)	TURBID. Y (0)	DUPLICATE: Y (0)						
SAMPLE CONTAINER INFO (REACTOR)	SAMPLE PRESERVATION	EXTENDED ANALYSIS AMEND DATE(S)	SAMPLE PUMP FLOW RATE (GAL PER MINUTE)					
SAMPLE ID CODE: 3	ANALYST: PE	VOLUME (L): 250	PHOSPHORIC ACID	LOCAL VOL ADDED IN FIELD (L)	FINAL pH (Standard Unit)	537M	APP	250
CHRTN02-S2MW-02-017.5								
L.T.								
02/02/2017								

## REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicom; T = Teflon; O = Other (Specify)  
SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Backsaver Pump; ESP = Electric Submersible Pump;  
RSP = Reverse Flow Peristaltic Pump; SN = Squeeze Method (Using Gravity Drain); O = Other (Specify)

## NOTES:

Standard Cite for non-chemical analysis: standard.

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 ≤

Revision Date: March 14, 2010





$C_6H_5F_{10}O_8-0.04-(C_{10}H_8O)_2$

NOTES

Washington: College. An array of activities of just these institutions continue.

pH:  $\pm 0.2$  units Temperature:  $\pm 0.2^\circ\text{C}$  Specific Conductance:  $\pm 5\%$  Dissolved Oxygen: all readings  $\leq 30\%$  saturation (typically  $\pm 0.2$  mg/L or  $\pm 5\%$  whichever is greater) Turbidity: all readings  $\leq 1$  NTU

Revised Date: March 04, 2008

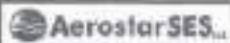




## GROUNDWATER SAMPLING LOG

Investigator: JB CHARLSTON		Site: SITE 3		Date: 02/07/2017							
Well No: CHSTN03-002		Sample ID: CHSTN03-002-GW-015		Date: 02-7-16							
PURGING DATA											
Well Diameter: 0.75"	Well Screen Interval: 1/4"	Well Screen Interval Depth: 10' to 20'	Static Depth: 9.00'	Purge Pump Type: PP							
Well Volume Purge: 1 Well Volume = (Total Well Depth - Static Depth) x Well Capacity = 17.50'											
Equipment Volume Purge: 1 Equipment Volume = Pump Volume + (Tubing Capacity) x (Tubing Length) + Flow Cell Volume = 17.50'											
Well Pump or Tubing: 15'	Pump or Tubing: 15'	Pumping Rate: 1140	Pumping Time: 12/5	Total Volume Pumped: 1.57 gal							
TIME	VOLUME PURGED (gallons)	DEPTH (ft)	WT (lb)	TEMP (°F)	COND (µmhos/cm)	PH	DO (mg/L)	ORP (mV)	RED (mg/L)	CO2 (mg/L)	Notes
1410	5250	5250	175	7.70	6.04	21.3	300.7	0.88	210.3	19.1	Clear
1212	350	5600	1	3.90	6.34	21.3	302.3	0.97	210.9	2.82	1
1214	350	5950	1	3.70	6.35	21.2	300.4	0.66	211.1	5.71	1
WELL CAPACITY (Gallons Per Foot): 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" = 0.92, 12.25" = 0.94, 12.5" = 0.96, 12.75" = 0.98, 13" = 1.00, 13.25" = 1.02, 13.5" = 1.04, 13.75" = 1.06, 14" = 1.08, 14.25" = 1.10, 14.5" = 1.12, 14.75" = 1.14, 15" = 1.16, 15.25" = 1.18, 15.5" = 1.20, 15.75" = 1.22, 16" = 1.24, 16.25" = 1.26, 16.5" = 1.28, 16.75" = 1.30, 17" = 1.32, 17.25" = 1.34, 17.5" = 1.36, 17.75" = 1.38, 18" = 1.40, 18.25" = 1.42, 18.5" = 1.44, 18.75" = 1.46, 19" = 1.48, 19.25" = 1.50, 19.5" = 1.52, 19.75" = 1.54, 20" = 1.56, 20.25" = 1.58, 20.5" = 1.60, 20.75" = 1.62, 21" = 1.64, 21.25" = 1.66, 21.5" = 1.68, 21.75" = 1.70, 22" = 1.72, 22.25" = 1.74, 22.5" = 1.76, 22.75" = 1.78, 23" = 1.80, 23.25" = 1.82, 23.5" = 1.84, 23.75" = 1.86, 24" = 1.88, 24.25" = 1.90, 24.5" = 1.92, 24.75" = 1.94, 25" = 1.96, 25.25" = 1.98, 25.5" = 2.00, 25.75" = 2.02, 26" = 2.04, 26.25" = 2.06, 26.5" = 2.08, 26.75" = 2.10, 27" = 2.12, 27.25" = 2.14, 27.5" = 2.16, 27.75" = 2.18, 28" = 2.20, 28.25" = 2.22, 28.5" = 2.24, 28.75" = 2.26, 29" = 2.28, 29.25" = 2.30, 29.5" = 2.32, 29.75" = 2.34, 30" = 2.36, 30.25" = 2.38, 30.5" = 2.40, 30.75" = 2.42, 31" = 2.44, 31.25" = 2.46, 31.5" = 2.48, 31.75" = 2.50, 32" = 2.52, 32.25" = 2.54, 32.5" = 2.56, 32.75" = 2.58, 33" = 2.60, 33.25" = 2.62, 33.5" = 2.64, 33.75" = 2.66, 34" = 2.68, 34.25" = 2.70, 34.5" = 2.72, 34.75" = 2.74, 35" = 2.76, 35.25" = 2.78, 35.5" = 2.80, 35.75" = 2.82, 36" = 2.84, 36.25" = 2.86, 36.5" = 2.88, 36.75" = 2.90, 37" = 2.92, 37.25" = 2.94, 37.5" = 2.96, 37.75" = 2.98, 38" = 3.00, 38.25" = 3.02, 38.5" = 3.04, 38.75" = 3.06, 39" = 3.08, 39.25" = 3.10, 39.5" = 3.12, 39.75" = 3.14, 40" = 3.16, 40.25" = 3.18, 40.5" = 3.20, 40.75" = 3.22, 41" = 3.24, 41.25" = 3.26, 41.5" = 3.28, 41.75" = 3.30, 42" = 3.32, 42.25" = 3.34, 42.5" = 3.36, 42.75" = 3.38, 43" = 3.40, 43.25" = 3.42, 43.5" = 3.44, 43.75" = 3.46, 44" = 3.48, 44.25" = 3.50, 44.5" = 3.52, 44.75" = 3.54, 45" = 3.56, 45.25" = 3.58, 45.5" = 3.60, 45.75" = 3.62, 46" = 3.64, 46.25" = 3.66, 46.5" = 3.68, 46.75" = 3.70, 47" = 3.72, 47.25" = 3.74, 47.5" = 3.76, 47.75" = 3.78, 48" = 3.80, 48.25" = 3.82, 48.5" = 3.84, 48.75" = 3.86, 49" = 3.88, 49.25" = 3.90, 49.5" = 3.92, 49.75" = 3.94, 50" = 3.96, 50.25" = 3.98, 50.5" = 4.00, 50.75" = 4.02, 51" = 4.04, 51.25" = 4.06, 51.5" = 4.08, 51.75" = 4.10, 52" = 4.12, 52.25" = 4.14, 52.5" = 4.16, 52.75" = 4.18, 53" = 4.20, 53.25" = 4.22, 53.5" = 4.24, 53.75" = 4.26, 54" = 4.28, 54.25" = 4.30, 54.5" = 4.32, 54.75" = 4.34, 55" = 4.36, 55.25" = 4.38, 55.5" = 4.40, 55.75" = 4.42, 56" = 4.44, 56.25" = 4.46, 56.5" = 4.48, 56.75" = 4.50, 57" = 4.52, 57.25" = 4.54, 57.5" = 4.56, 57.75" = 4.58, 58" = 4.60, 58.25" = 4.62, 58.5" = 4.64, 58.75" = 4.66, 59" = 4.68, 59.25" = 4.70, 59.5" = 4.72, 59.75" = 4.74, 60" = 4.76, 60.25" = 4.78, 60.5" = 4.80, 60.75" = 4.82, 61" = 4.84, 61.25" = 4.86, 61.5" = 4.88, 61.75" = 4.90, 62" = 4.92, 62.25" = 4.94, 62.5" = 4.96, 62.75" = 4.98, 63" = 5.00, 63.25" = 5.02, 63.5" = 5.04, 63.75" = 5.06, 64" = 5.08, 64.25" = 5.10, 64.5" = 5.12, 64.75" = 5.14, 65" = 5.16, 65.25" = 5.18, 65.5" = 5.20, 65.75" = 5.22, 66" = 5.24, 66.25" = 5.26, 66.5" = 5.28, 66.75" = 5.30, 67" = 5.32, 67.25" = 5.34, 67.5" = 5.36, 67.75" = 5.38, 68" = 5.40, 68.25" = 5.42, 68.5" = 5.44, 68.75" = 5.46, 69" = 5.48, 69.25" = 5.50, 69.5" = 5.52, 69.75" = 5.54, 70" = 5.56, 70.25" = 5.58, 70.5" = 5.60, 70.75" = 5.62, 71" = 5.64, 71.25" = 5.66, 71.5" = 5.68, 71.75" = 5.70, 72" = 5.72, 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= 7.16, 90.25" = 7.18, 90.5" = 7.20, 90.75" = 7.22, 91" = 7.24, 91.25" = 7.26, 91.5" = 7.28, 91.75" = 7.30, 92" = 7.32, 92.25" = 7.34, 92.5" = 7.36, 92.75" = 7.38, 93" = 7.40, 93.25" = 7.42, 93.5" = 7.44, 93.75" = 7.46, 94" = 7.48, 94.25" = 7.50, 94.5" = 7.52, 94.75" = 7.54, 95" = 7.56, 95.25" = 7.58, 95.5" = 7.60, 95.75" = 7.62, 96" = 7.64, 96.25" = 7.66, 96.5" = 7.68, 96.75" = 7.70, 97" = 7.72, 97.25" = 7.74, 97.5" = 7.76, 97.75" = 7.78, 98" = 7.80, 98.25" = 7.82, 98.5" = 7.84, 98.75" = 7.86, 99" = 7.88, 99.25" = 7.90, 99.5" = 7.92, 99.75" = 7.94, 100" = 7.96, 100.25" = 7.98, 100.5" = 8.00, 100.75" = 8.02, 101" = 8.04, 101.25" = 8.06, 101.5" = 8.08, 101.75" = 8.10, 102" = 8.12, 102.25" = 8.14, 102.5" = 8.16, 102.75" = 8.18, 103" = 8.20, 103.25" = 8.22, 103.5" = 8.24, 103.75" = 8.26, 104" = 8.28, 104.25" = 8.30, 104.5" = 8.32, 104.75" = 8.34, 105" = 8.36, 105.25" = 8.38, 105.5" = 8.40, 105.75" = 8.42, 106" = 8.44, 106.25" = 8.46, 106.5" = 8.48, 106.75" = 8.50, 107" = 8.52, 107.25" = 8.54, 107.5" = 8.56, 107.75" = 8.58, 108" = 8.60, 108.25" = 8.62, 108.5" = 8.64, 108.75" = 8.66, 109" = 8.68, 109.25" = 8.70, 109.5" = 8.72, 109.75" = 8.74, 110" = 8.76, 110.25" = 8.78, 110.5" = 8.80, 110.75" = 8.82, 111" = 8.84, 111.25" = 8.86, 111.5" = 8.88, 111.75" = 8.90, 112" = 8.92, 112.25" = 8.94, 112.5" = 8.96, 112.75" = 8.98, 113" = 9.00, 113.25" = 9.02, 113.5" = 9.04, 113.75" = 9.06, 114" = 9.08, 114.25" = 9.10, 114.5" = 9.12, 114.75" = 9.14, 115" = 9.16, 115.25" = 9.18, 115.5" = 9.20, 115.75" = 9.22, 116" = 9.24, 116.25" = 9.26, 116.5" = 9.28, 116.75" = 9.30, 117" = 9.32, 117.25" = 9.34, 117.5" = 9.36, 117.75" = 9.38, 118" = 9.40, 118.25" = 9.42, 118.5" = 9.44, 118.75" = 9.46, 119" = 9.48, 119.25" = 9.50, 119.5" = 9.52, 119.75" = 9.54, 120" = 9.56, 120.25" = 9.58, 120.5" = 9.60, 120.75" = 9.62, 121" = 9.64, 121.25" = 9.66, 121.5" = 9.68, 121.75" = 9.70, 122" = 9.72, 122.25" = 9.74, 122.5" = 9.76, 122.75" = 9.78, 123" = 9.80, 123.25" = 9.82, 123.5" = 9.84, 123.75" = 9.86, 124" = 9.88, 124.25" = 9.90, 124.5" = 9.92, 124.75" = 9.94, 125" = 9.96, 125.25" = 9.98, 125.5" = 10.00, 125.75" = 10.02, 126" = 10.04, 126.25" = 10.06, 126.5" = 10.08, 126.75" = 10.10, 127" = 10.12, 127.25" = 10.14, 127.5" = 10.16, 127.75" = 10.18, 128" = 10.20, 128.25" = 10.22, 128.5" = 10.24, 128.75" = 10.26, 129" = 10.28, 129.25" = 10.30, 129.5" = 10.32, 129.75" = 10.34, 130" = 10.36, 130.25" = 10.38, 130.5" = 10.40, 130.75" = 10.42, 131" = 10.44, 131.25" = 10.46, 131.5" = 10.48, 131.75" = 10.50, 132" = 10.52, 132.25" = 10.54, 132.5" = 10.56, 132.75" = 10.58, 133" = 10.60, 133.25" = 10.62, 133.5" = 10.64, 133.75" = 10.66, 134" = 10.68, 134.25" = 10.70, 134.5" = 10.72, 134.75" = 10.74, 135" = 10.76, 135.25" = 10.78, 135.5" = 10.80, 135.75" = 10.82, 136" = 10.84, 136.25" = 10.86, 136.5" = 10.88, 136.75" = 10.90, 137" = 10.92, 137.25" = 10.94, 137.5" = 10.96, 137.75" = 10.98, 138" = 11.00, 138.25" = 11.02, 138.5" = 11.04, 138.75" = 11.06, 139" = 11.08, 139.25" = 11.10, 139.5" = 11.12, 139.75" = 11.14, 140" = 11.16, 140.25" = 11.18, 140.5" = 11.20, 140.75" = 11.22, 141" = 11.24, 141.25" = 11.26, 141.5" = 11.28, 141.75" = 11.30, 142" = 11.32, 142.25" = 11.34, 142.5" = 11.36, 142.75" = 11.38, 143" = 11.40, 143.25" = 11.42, 143.5" = 11.44, 143.75" = 11.46, 144" = 11.48, 144.25" = 11.50, 144.5" = 11.52, 144.75" = 11.54, 145" = 11.56, 145.25" = 11.58, 145.5" = 11.60, 145.75" = 11.62, 146" = 11.64, 146.25" = 11.66, 146.5" = 11.68, 146.75" = 11.70, 147" = 11.72, 147.25" = 11.74, 147.5" = 11.76, 147.75" = 11.78, 148" = 11.80, 148.25" = 11.82, 148.5" = 11.84, 148.75" = 11.86, 149" = 11.88, 149.25" = 11.90, 149.5" = 11.92, 149.75" = 11.94, 150" = 11.96, 150.25" = 11.98, 150.5" = 12.00, 150.75" = 12.02, 151" = 12.04, 151.25" = 12.06, 151.5" = 12.08, 151.75" = 12.10, 152" = 12.12, 152.25" = 12.14, 152.5" = 12.16, 152.75" = 12.18, 153" = 12.20, 153.25" = 12.22, 153.5" = 12.24, 153.75" = 12.26, 154" = 12.28, 154.25" = 12.30, 154.5" = 12.32, 154.75" = 12.34, 155" = 12.36, 155.25" = 12.38, 155.5" = 12.40, 155.75" = 12.42, 156" = 12.44, 156.25" = 12.46, 156.5" = 12.48, 156.75" = 12.50, 157" = 12.52, 157.25" = 12.54, 157.5" = 12.56, 157.75" = 12.58, 158" = 12.60, 158.25" = 12.62, 158.5" = 12.64, 158.75" = 12.66, 159" = 12.68, 159.25" = 12.70, 159.5" = 12.72, 159.75" = 12.74, 160" = 12.76, 160.25" = 12.78, 160.5" = 12.80, 160.75" = 12.82, 161" = 12.84, 161.25" = 12.86, 161.5" = 12.88, 161.75" = 12.90, 162" = 12.92, 162.25" = 12.94, 162.5" = 12.96, 162.75" = 12.98, 163" = 13.00, 163.25" = 13.02, 163.5" = 13.04, 163.75" = 13.06, 164" = 13.08, 164.25" = 13.10, 164.5" = 13.12, 164.75" = 13.14, 165" = 13.16, 165.25" = 13.18, 165.5" = 13.20, 165.75" = 13.22, 166" = 13.24, 166.25" = 13.26, 166.5" = 13.28, 166.75" = 13.30, 167" = 13.32, 167.25" = 13.34, 167.5" = 13.36, 167.75" = 13.38, 168" = 13.40, 168.25" = 13.42, 168.5" = 13.44, 168.75" = 13.46, 169" = 13.48, 169.25" = 13.50, 169.5" = 13.52, 169.75" = 13.54, 170" = 13.56, 170.25" = 13.58, 170.5" = 13.60, 170.75" = 13.62, 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202.25" = 16.14, 202.5" = 16.16, 202.75" = 16.18, 203" = 16.20, 203.25" = 16.22, 203.5" = 16.24, 203.75" = 16.26, 204" = 16.28, 204.25" = 16.30, 204.5" = 16.32, 204.75" = 16.34, 205" = 16.36, 205.25" = 16.38, 205.5" = 16.40, 205.75" = 16.42, 206" = 16.44, 206.25" = 16.46, 206.5" = 16.48, 206.75" = 16.50, 207											





## GROUNDWATER SAMPLING LOG

Investigator: JR CHARLSTON	Site: SITE 3	
Well ID: CHRTN03-003	Sample ID: CHRTN03-003-GW-015	Date: 02/07/2017

Well Diameter (inches): 0.75"	Screen Diameter (inches): 1/4"	Well Screen Starting Depth (ft): 10 ft	Well Screen Ending Depth (ft): 20 ft	Well Capacity (gallons per foot): 9.78	Well Capacity (gallons): PP
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Well Volume (gallons): 17.44 + 0.90 = 18.34
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Equipment Volume (gallons): 1.16
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Well Capacity (gallons per foot): 15	Well Capacity (gallons): 15	Well Capacity (gallons): 1236	Well Capacity (gallons): 1310	Well Capacity (gallons): 1.16
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TIME	VOLUME (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)	WELL CAPACITY (gallons)
1256	4000	4000	200	9.50	5.72	22.2	14.0	0.70	284.1	5.87	1.00	1.00	1.00
1258	200	4200	1	9.50	5.72	22.2	14.0	0.70	284.1	5.87	1.00	1.00	1.00
1300	200	4400	1	9.52	5.69	22.4	14.5	0.84	280.7	4.81	1.00	1.00	1.00

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02, 1" = 0.04, 1.5" = 0.06, 2" = 0.08, 3" = 0.12, 4" = 0.16, 5" = 0.20, 6" = 0.24, 8" = 0.32, 10" = 0.40, 12" = 0.48
FURNISHING INSIDE DIA. CAPACITY (GALLONS): 1/8" = 0.0006, 3/16" = 0.0014, 1/4" = 0.0028, 5/16" = 0.0042, 3/8" = 0.0060, 1/2" = 0.010, 5/8" = 0.016
EQUIPMENT CODES: H = Hand, EP = Electric Pump, SP = Electric Submersible Pump, PP = Peristaltic Pump, O = Other (Specify)

SAMPLED BY (PRINT NAME): Ash Withers	SAMPLED BY (PRINT NAME): Ash Withers	SAMPLED BY (PRINT NAME): Ash Withers	SAMPLED BY (PRINT NAME): Ash Withers
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PUMP DEPTH (ft): 15	PUMP DEPTH (ft): 15	PUMP DEPTH (ft): 15	PUMP DEPTH (ft): 15
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FIELD OPERATOR (PRINT NAME): Ash Withers	FIELD OPERATOR (PRINT NAME): Ash Withers	FIELD OPERATOR (PRINT NAME): Ash Withers	FIELD OPERATOR (PRINT NAME): Ash Withers
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID	WELL ID
CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003	CHRTN03-003

WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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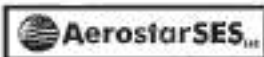
WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003	WELL ID: CHRTN03-003
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## GROUNDWATER SAMPLING LOG

Investigator: J.D. CHARLESTON		Site: SITE 6		For: 6/20/13	
Well No: CHRTN06-001		Sample: CHRTN06-001-GW-025		Date: 2-4-14 02/04/2017	
PURGING DATA					
Well Diameter (inches): 0.75"	Tubing Diameter (inches): 1/4"	Well Total Depth (ft): 15.20	Static Depth (ft): 23.2'	Purge Pump Type: PP	
Well Volume (Purge): 1 Well Volume = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY					
Equipment Volume (Purge): 1 Equipment Vol. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME					
Total Purge Volume (gallons): 20'		Total Flow (gallons): 20'		Total Volume (gallons): 1035	
Depth in Well (ft): 20'		Depth in Well (ft): 20'		Total Volume (gallons): 10143	
Time	Volume Pumped (gallons)	Conc. Volume Pumped (gallons)	Purge Rate (gallons/min)	Depth (ft)	PH
11:00	5175	5175	207	23.2	5.49
11:10	2070	7245	207	23.2	5.56
11:20	2070	9315	207	23.2	5.51
11:22	414	9729	207	23.2	5.49
11:24	414	10143	207	23.2	5.46
WELL CAPACITY (Gallons Per Foot): 0.75" = 0.03; 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" = 0.92; 12.25" = 0.94; 12.5" = 0.96; 12.75" = 0.98; 13" = 1.00; 13.25" = 1.02; 13.5" = 1.04; 13.75" = 1.06; 14" = 1.08; 14.25" = 1.10; 14.5" = 1.12; 14.75" = 1.14; 15" = 1.16; 15.25" = 1.18; 15.5" = 1.20; 15.75" = 1.22; 16" = 1.24; 16.25" = 1.26; 16.5" = 1.28; 16.75" = 1.30; 17" = 1.32; 17.25" = 1.34; 17.5" = 1.36; 17.75" = 1.38; 18" = 1.40; 18.25" = 1.42; 18.5" = 1.44; 18.75" = 1.46; 19" = 1.48; 19.25" = 1.50; 19.5" = 1.52; 19.75" = 1.54; 20" = 1.56; 20.25" = 1.58; 20.5" = 1.60; 20.75" = 1.62; 21" = 1.64; 21.25" = 1.66; 21.5" = 1.68; 21.75" = 1.70; 22" = 1.72; 22.25" = 1.74; 22.5" = 1.76; 22.75" = 1.78; 23" = 1.80; 23.25" = 1.82; 23.5" = 1.84; 23.75" = 1.86; 24" = 1.88; 24.25" = 1.90; 24.5" = 1.92; 24.75" = 1.94; 25" = 1.96; 25.25" = 1.98; 25.5" = 2.00; 25.75" = 2.02; 26" = 2.04; 26.25" = 2.06; 26.5" = 2.08; 26.75" = 2.10; 27" = 2.12; 27.25" = 2.14; 27.5" = 2.16; 27.75" = 2.18; 28" = 2.20; 28.25" = 2.22; 28.5" = 2.24; 28.75" = 2.26; 29" = 2.28; 29.25" = 2.30; 29.5" = 2.32; 29.75" = 2.34; 30" = 2.36; 30.25" = 2.38; 30.5" = 2.40; 30.75" = 2.42; 31" = 2.44; 31.25" = 2.46; 31.5" = 2.48; 31.75" = 2.50; 32" = 2.52; 32.25" = 2.54; 32.5" = 2.56; 32.75" = 2.58; 33" = 2.60; 33.25" = 2.62; 33.5" = 2.64; 33.75" = 2.66; 34" = 2.68; 34.25" = 2.70; 34.5" = 2.72; 34.75" = 2.74; 35" = 2.76; 35.25" = 2.78; 35.5" = 2.80; 35.75" = 2.82; 36" = 2.84; 36.25" = 2.86; 36.5" = 2.88; 36.75" = 2.90; 37" = 2.92; 37.25" = 2.94; 37.5" = 2.96; 37.75" = 2.98; 38" = 3.00; 38.25" = 3.02; 38.5" = 3.04; 38.75" = 3.06; 39" = 3.08; 39.25" = 3.10; 39.5" = 3.12; 39.75" = 3.14; 40" = 3.16; 40.25" = 3.18; 40.5" = 3.20; 40.75" = 3.22; 41" = 3.24; 41.25" = 3.26; 41.5" = 3.28; 41.75" = 3.30; 42" = 3.32; 42.25" = 3.34; 42.5" = 3.36; 42.75" = 3.38; 43" = 3.40; 43.25" = 3.42; 43.5" = 3.44; 43.75" = 3.46; 44" = 3.48; 44.25" = 3.50; 44.5" = 3.52; 44.75" = 3.54; 45" = 3.56; 45.25" = 3.58; 45.5" = 3.60; 45.75" = 3.62; 46" = 3.64; 46.25" = 3.66; 46.5" = 3.68; 46.75" = 3.70; 47" = 3.72; 47.25" = 3.74; 47.5" = 3.76; 47.75" = 3.78; 48" = 3.80; 48.25" = 3.82; 48.5" = 3.84; 48.75" = 3.86; 49" = 3.88; 49.25" = 3.90; 49.5" = 3.92; 49.75" = 3.94; 50" = 3.96; 50.25" = 3.98; 50.5" = 4.00; 50.75" = 4.02; 51" = 4.04; 51.25" = 4.06; 51.5" = 4.08; 51.75" = 4.10; 52" = 4.12; 52.25" = 4.14; 52.5" = 4.16; 52.75" = 4.18; 53" = 4.20; 53.25" = 4.22; 53.5" = 4.24; 53.75" = 4.26; 54" = 4.28; 54.25" = 4.30; 54.5" = 4.32; 54.75" = 4.34; 55" = 4.36; 55.25" = 4.38; 55.5" = 4.40; 55.75" = 4.42; 56" = 4.44; 56.25" = 4.46; 56.5" = 4.48; 56.75" = 4.50; 57" = 4.52; 57.25" = 4.54; 57.5" = 4.56; 57.75" = 4.58; 58" = 4.60; 58.25" = 4.62; 58.5" = 4.64; 58.75" = 4.66; 59" = 4.68; 59.25" = 4.70; 59.5" = 4.72; 59.75" = 4.74; 60" = 4.76; 60.25" = 4.78; 60.5" = 4.80; 60.75" = 4.82; 61" = 4.84; 61.25" = 4.86; 61.5" = 4.88; 61.75" = 4.90; 62" = 4.92; 62.25" = 4.94; 62.5" = 4.96; 62.75" = 4.98; 63" = 5.00; 63.25" = 5.02; 63.5" = 5.04; 63.75" = 5.06; 64" = 5.08; 64.25" = 5.10; 64.5" = 5.12; 64.75" = 5.14; 65" = 5.16; 65.25" = 5.18; 65.5" = 5.20; 65.75" = 5.22; 66" = 5.24; 66.25" = 5.26; 66.5" = 5.28; 66.75" = 5.30; 67" = 5.32; 67.25" = 5.34; 67.5" = 5.36; 67.75" = 5.38; 68" = 5.40; 68.25" = 5.42; 68.5" = 5.44; 68.75" = 5.46; 69" = 5.48; 69.25" = 5.50; 69.5" = 5.52; 69.75" = 5.54; 70" = 5.56; 70.25" = 5.58; 70.5" = 5.60; 70.75" = 5.62; 71" = 5.64; 71.25" = 5.66; 71.5" = 5.68; 71.75" = 5.70; 72" = 5.72; 72.25" = 5.74; 72.5" = 5.76; 72.75" = 5.78; 73" = 5.80; 73.25" = 5.82; 73.5" = 5.84; 73.75" = 5.86; 74" = 5.88; 74.25" = 5.90; 74.5" = 5.92; 74.75" = 5.94; 75" = 5.96; 75.25" = 5.98; 75.5" = 6.00; 75.75" = 6.02; 76" = 6.04; 76.25" = 6.06; 76.5" = 6.08; 76.75" = 6.10; 77" = 6.12; 77.25" = 6.14; 77.5" = 6.16; 77.75" = 6.18; 78" = 6.20; 78.25" = 6.22; 78.5" = 6.24; 78.75" = 6.26; 79" = 6.28; 79.25" = 6.30; 79.5" = 6.32; 79.75" = 6.34; 80" = 6.36; 80.25" = 6.38; 80.5" = 6.40; 80.75" = 6.42; 81" = 6.44; 81.25" = 6.46; 81.5" = 6.48; 81.75" = 6.50; 82" = 6.52; 82.25" = 6.54; 82.5" = 6.56; 82.75" = 6.58; 83" = 6.60; 83.25" = 6.62; 83.5" = 6.64; 83.75" = 6.66; 84" = 6.68; 84.25" = 6.70; 84.5" = 6.72; 84.75" = 6.74; 85" = 6.76; 85.25" = 6.78; 85.5" = 6.80; 85.75" = 6.82; 86" = 6.84; 86.25" = 6.86; 86.5" = 6.88; 86.75" = 6.90; 87" = 6.92; 87.25" = 6.94; 87.5" = 6.96; 87.75" = 6.98; 88" = 7.00; 88.25" = 7.02; 88.5" = 7.04; 88.75" = 7.06; 89" = 7.08; 89.25" = 7.10; 89.5" = 7.12; 89.75" = 7.14; 90" = 7.16; 90.25" = 7.18; 90.5" = 7.20; 90.75" = 7.22; 91" = 7.24; 91.25" = 7.26; 91.5" = 7.28; 91.75" = 7.30; 92" = 7.32; 92.25" = 7.34; 92.5" = 7.36; 92.75" = 7.38; 93" = 7.40; 93.25" = 7.42; 93.5" = 7.44; 93.75" = 7.46; 94" = 7.48; 94.25" = 7.50; 94.5" = 7.52; 94.75" = 7.54; 95" = 7.56; 95.25" = 7.58; 95.5" = 7.60; 95.75" = 7.62; 96" = 7.64; 96.25" = 7.66; 96.5" = 7.68; 96.75" = 7.70; 97" = 7.72; 97.25" = 7.74; 97.5" = 7.76; 97.75" = 7.78; 98" = 7.80; 98.25" = 7.82; 98.5" = 7.84; 98.75" = 7.86; 99" = 7.88; 99.25" = 7.90; 99.5" = 7.92; 99.75" = 7.94; 100" = 7.96; 100.25" = 7.98; 100.5" = 8.00; 100.75" = 8.02; 101" = 8.04; 101.25" = 8.06; 101.5" = 8.08; 101.75" = 8.10; 102" = 8.12; 102.25" = 8.14; 102.5" = 8.16; 102.75" = 8.18; 103" = 8.20; 103.25" = 8.22; 103.5" = 8.24; 103.75" = 8.26; 104" = 8.28; 104.25" = 8.30; 104.5" = 8.32; 104.75" = 8.34; 105" = 8.36; 105.25" = 8.38; 105.5" = 8.40; 105.75" = 8.42; 106" = 8.44; 106.25" = 8.46; 106.5" = 8.48; 106.75" = 8.50; 107" = 8.52; 107.25" = 8.54; 107.5" = 8.56; 107.75" = 8.58; 108" = 8.60; 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156.5" = 12.48; 156.75" = 12.50; 157" = 12.52; 157.25" = 12.54; 157.5" = 12.56; 157.75" = 12.58; 158" = 12.60; 158.25" = 12.62; 158.5" = 12.64; 158.75" = 12.66; 159" = 12.68; 159.25" = 12.70; 159.5" = 12.72; 159.75" = 12.74; 160" = 12.76; 160.25" = 12.78; 160.5" = 12.80; 160.75" = 12.82; 161" = 12.84; 161.25" = 12.86; 161.5" = 12.88; 161.75" = 12.90; 162" = 12.92; 162.25" = 12.94; 162.5" = 12.96; 162.75" = 12.98; 163" = 13.00; 163.25" = 13.02; 163.5" = 13.04; 163.75" = 13.06; 164" = 13.08; 164.25" = 13.10; 164.5" = 13.12; 164.75" = 13.14; 165" = 13.16; 165.25" = 13.18; 165.5" = 13.20; 165.75" = 13.22; 166" = 13.24; 166.25" = 13.26; 166.5" = 13.28; 166.75" = 13.30; 167" = 13.32; 167.25" = 13.34; 167.5" = 13.36; 167.75" = 13.38; 168" = 13.40; 168.25" = 13.42; 168.5" = 13.44; 168.75" = 13.46; 169" = 13.48; 169.25" = 13.50; 169.5" = 13.52; 169.75" = 13.54; 170" = 13.56; 170.25" = 13.58; 170.5" = 13.60; 170.75" = 13.62; 171" = 13.64; 171.25" = 13.66; 171.5" = 13.68; 171.75" = 13.70; 172" = 13.72; 172.25" = 13.74; 172.5" = 13.76; 172.75" = 13.78; 173" = 13.80; 173.25" = 13.82; 173.5" = 13.84; 173.75" = 13.86; 174" = 13.88; 174.25" = 13.90; 174.5" = 13.92; 174.75" = 13.94; 175" = 13.96; 175.25" = 13.98; 175.5" = 14.00; 175.75" = 14.02; 176" = 14.04; 176.25" = 14.06; 176.5" = 14.08; 176.75" = 14.10; 177" = 14.12; 177.25" = 14.14; 177.5" = 14.16; 177.75" = 14.18; 178" = 14.20; 178.25" = 14.22; 178.5" = 14.24; 178.75" = 14.26; 179" = 14.28; 179.25" = 14.30; 179.5" = 14.32; 179.75" = 14.34; 180" = 14.36; 180.25" = 14.38; 180.5" = 14.40; 180.75" = 14.42; 181" = 14.44; 181.25" = 14.46; 181.5" = 14.48; 181.75" = 14.50; 182" = 14.52; 182.25" = 14.54; 182.5" = 14.56; 182.75" = 14.58; 183" = 14.60; 183.25" = 14.62; 183.5" = 14.64; 183.75" = 14.66; 184" = 14.68; 184.25" = 14.70; 184.5" = 14.72; 184.75" = 14.74; 185" = 14.76; 185.25" = 14.78; 185.5" = 14.80; 185.75" = 14.82; 186" = 14.84; 186.25" = 14.86; 186.5" = 14.88; 186.75" = 14.90; 187" = 14.92; 187.25" = 14.94; 187.5" = 14.96; 187.75" = 14.98; 188" = 15.00; 188.25" = 15.02; 188.5" = 15.04; 188.75" = 15.06; 189" = 15.08; 189.25" = 15.10; 189.5" = 15.12; 189.75" = 15.14; 190" = 15.16; 190.25" = 15.18; 190.5" = 15.20; 190.75" = 15.22; 191" = 15.24; 191.25" = 15.26; 191.5" = 15.28; 191.75" = 15.30; 192" = 15.32; 192.25" = 15.34; 192.5" = 15.36; 192.75" = 15.38; 193" = 15.40; 193.25" = 15.42; 193.5" = 15.44; 193.75" = 15.46; 194" = 15.48; 194.25" = 15.50; 194.5" = 15.52; 194.75" = 15.54; 195" = 15.56; 195.25" = 15.58; 195.5" = 15.60; 195.75" = 15.62; 196" = 15.64; 196.25" = 15.66; 196.5" = 15.68; 196.75" = 15.70; 197" = 15.72; 197.25" = 15.74; 197.5" = 15.76; 197.75" = 15.78; 198" = 15.80; 198.25" = 15.82; 198.5" = 15.84; 198.75" = 15.86; 199" = 15.88; 199.25" = 15.90; 199.5" = 15.92; 199.75" = 15.94; 200" = 15.96; 200.25" = 15.98; 200.5" = 16.00; 200.75" = 16.02; 201" = 16.04; 201.25" = 16.06; 201.5" = 16.08; 201.75" = 16.10; 202" = 16.12; 202.25" = 16.14; 202.5" = 16.16; 202.75" = 16.18; 203" = 16.20; 203.25" = 16.22; 203.5" = 16.24; 203.75" = 16.26; 204" = 16.28; 204.25" = 16.30; 204.5" = 16.32; 204.75" = 16.34; 205" = 16.36; 205.25" = 16.38; 205.5" = 16.40; 205.75" = 16.42; 206" = 16.44; 206.25" = 16.46; 206.5" = 16.48; 206.75" = 16.50; 207" = 16.52; 207.25" = 16.54; 20					



## GROUNDWATER SAMPLING LOG

Investigator: JB CHARLESTON	Site: Site 6	
Well ID: CHRTN06-002	Sample ID: CHRTN06-002-GW-025	Date: 2-4-17

## PURGING DATA

WELL DIAMETER (inches) 0.75"	TUBING DIAMETER (inches) 1/4"	WELL SCREEN INTERVAL DEPTH 20' - 30'	STATIC DEPTH TO WATER (per S100) 25.25'	PURGE PUMP TYPE OR MANUE PD
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY (only if well applicable) = ( ) FT - ( ) FT X ( ) gal = ( ) gal				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only if well applicable) = ( ) gal + ( ) X ( ) FT + ( ) gal = ( ) gal				

WELL PUMP OR TUBING DEPTH IN WELL (ft):		25'		WELL PUMP OR TUBING DEPTH IN WELL (ft):		25'		PURGING INITIATED AT:		1205		PURGING ENDED AT:		1242		TOTAL VOLUME PURGED (gallons)		6549	
TIME	VOLUME PURGED (gallons) ML	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (per S100)	pH (Standard Units)	TEMP. (°C)	COND. (µmhos)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (per S100)							
1226	377	377	177	25.25	5.84	20.37	0.083	3.91	-179.5	60.3	Clear	None							
1234	1416	5133	177	25.25	5.24	20.21	0.079	3.42	-169	49.5	Clear								
1238	708	5841	177	25.25	5.18	20.22	0.077	3.33	-169.2	45.9									
1240	354	6195	177	25.25	5.20	20.35	0.075	3.31	-166.5	47.3									
1242	354	6549	177	25.25	5.18	20.24	0.073	3.29	-162.2	47.1									

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.10; 3" = 0.17; 4" = 0.26; 5" = 0.42; 6" = 0.79; 8" = 1.47; 12" = 3.00

TUBING INSIDE DIA. CAPACITY (Gallons): 1/4" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0023; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.030

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

## SAMPLING DATA

SAMPLED BY (PRINT) EXPLANATION: Ash Willis Franklin - Johnson	SAMPLED BY (SIGNATURE): [Signature]	SAMPLES INITIATED AT: 1242	SAMPLES ENDED AT: 1242
PUMP OR TUBING DEPTH IN WELL (ft): 25'	TUBING MATERIAL CODE: PE	FIELD FILTERED: Y <input checked="" type="checkbox"/> Filter-Element Type: <input checked="" type="checkbox"/>	Flow Size: <input checked="" type="checkbox"/>
FIELD DECONTAMINATION: PUMP Y <input checked="" type="checkbox"/> TUBING Y <input checked="" type="checkbox"/> (N/A) DUPLICATE: Y <input checked="" type="checkbox"/> (N/A)			
SAMPLE CONTAINER SPECIFICATION		SAMPLE PRESERVATION	
WELL CODE: CHRTN06-002-GW-025	# CONTAINERS: 1	MATERIAL CODE: PE	VOL (L) (mL): 250
PRESERVATIVE: NONE		TOTAL VOL. ADDED IN FLS (mL):	FINAL pH (Standard Units):
INTERMED ANALYSIS AND/OR SERTS:		SAMPLING EQUIPMENT CODE: AEP	
SAMPLING PUMP FLOW RATE (mL per minute): 177			

## REMARKS:

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

SAMPLING EQUIPMENT CODES: AEP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Show Method (Tubing Gravity Drain); O = Other (Specify)

## NOTES:

Stabilization Criteria: Increase of variation of last three consecutive readings.

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

Revision Date: March 14, 2016





# GROUNDWATER SAMPLING LOG

Investigator: <b>JD CHARLESTON</b>	Site: <b>SITE 60 NAAF</b>
Well No: <b>CHRTN06-003</b>	Sample: <b>CHRTN06-003- GW-030</b> DATE: <b>2-4-17</b>

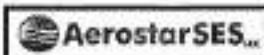
## PURGING DATA

WELL DIAMETER (inches): <b>0.75"</b>	TUBING DIAMETER (inches): <b>1/4"</b>	WELL SCREEN INTERNAL DEPTH TO WATER (feet): <b>25.35'</b>	STATIC DEPTH TO WATER (feet): <b>25.2'</b>	PURGE PUMP TYPE: <b>PP</b>
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH (ft) - STATIC DEPTH TO WATER) X WELL CAPACITY				
(only if not applicable) = 1 11 12 13 14 15 16 17 18 19 20				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME				
(only if not applicable) = 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40				

INITIAL PUMP OR TUBING DEPTH IN WELL (ft)		FINAL PUMP OR TUBING DEPTH IN WELL (ft)		PURGING INTERVAL AT		PURGING INTERVAL AT		TOTAL VOLUME PURGED (gallons)		L	
TIME	WELL DEPTH (ft)	WELL VOLUME PURGED (gallons)	PURGE RATE (gallons/min)	WATER TO WATER (ft)	PH (Standard)	TEMP (°C)	COND (µS/cm)	COND (µS/cm)	COND (µS/cm)	TURBIDITY (NTU)	COLOR (Pt-Co)
0845	0	0	175	—	—	—	—	—	—	—	—
0855	1.75	1.75	175	n/a	5.79	17.76	0.099	4.00	-265.0	0.1	cloudy
0905	1.75	3.50	175	n/a	5.86	17.00	0.112	3.28	-305.0	0.1	cloudy
0910	0.8	4.30	175	n/a	5.43	17.99	0.076	3.55	-220.0	3.5	cloudy
0920	1.15	6.05	175	n/a	5.37	18.03	0.072	3.48	-248.9	2.12	cloudy
0930	1.75	7.80	175	n/a	5.32	18.23	0.069	3.35	-197.2	1.52	cloudy
0940	1.15	9.55	175	n/a	5.24	18.54	0.069	3.24	-189.8	1.25	cloudy
0950	1.75	11.3	175	n/a	5.22	18.52	0.067	3.26	-183.6	1.17	cloudy
FE 02/04/2017											

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.03; 1" = 0.04; 1.25" = 0.05; 1.5" = 0.06; 1.75" = 0.07; 2" = 0.08; 2.25" = 0.09; 2.5" = 0.10; 2.75" = 0.11; 3" = 0.12; 3.25" = 0.13; 3.5" = 0.14; 3.75" = 0.15; 4" = 0.16; 4.25" = 0.17; 4.5" = 0.18; 4.75" = 0.19; 5" = 0.20; 5.25" = 0.21; 5.5" = 0.22; 5.75" = 0.23; 6" = 0.24; 6.25" = 0.25; 6.5" = 0.26; 6.75" = 0.27; 7" = 0.28; 7.25" = 0.29; 7.5" = 0.30; 7.75" = 0.31; 8" = 0.32; 8.25" = 0.33; 8.5" = 0.34; 8.75" = 0.35; 9" = 0.36; 9.25" = 0.37; 9.5" = 0.38; 9.75" = 0.39; 10" = 0.40; 10.25" = 0.41; 10.5" = 0.42; 10.75" = 0.43; 11" = 0.44; 11.25" = 0.45; 11.5" = 0.46; 11.75" = 0.47; 12" = 0.48; 12.25" = 0.49; 12.5" = 0.50; 12.75" = 0.51; 13" = 0.52; 13.25" = 0.53; 13.5" = 0.54; 13.75" = 0.55; 14" = 0.56; 14.25" = 0.57; 14.5" = 0.58; 14.75" = 0.59; 15" = 0.60; 15.25" = 0.61; 15.5" = 0.62; 15.75" = 0.63; 16" = 0.64; 16.25" = 0.65; 16.5" = 0.66; 16.75" = 0.67; 17" = 0.68; 17.25" = 0.69; 17.5" = 0.70; 17.75" = 0.71; 18" = 0.72; 18.25" = 0.73; 18.5" = 0.74; 18.75" = 0.75; 19" = 0.76; 19.25" = 0.77; 19.5" = 0.78; 19.75" = 0.79; 20" = 0.80; 20.25" = 0.81; 20.5" = 0.82; 20.75" = 0.83; 21" = 0.84; 21.25" = 0.85; 21.5" = 0.86; 21.75" = 0.87; 22" = 0.88; 22.25" = 0.89; 22.5" = 0.90; 22.75" = 0.91; 23" = 0.92; 23.25" = 0.93; 23.5" = 0.94; 23.75" = 0.95; 24" = 0.96; 24.25" = 0.97; 24.5" = 0.98; 24.75" = 0.99; 25" = 1.00; 25.25" = 1.01; 25.5" = 1.02; 25.75" = 1.03; 26" = 1.04; 26.25" = 1.05; 26.5" = 1.06; 26.75" = 1.07; 27" = 1.08; 27.25" = 1.09; 27.5" = 1.10; 27.75" = 1.11; 28" = 1.12; 28.25" = 1.13; 28.5" = 1.14; 28.75" = 1.15; 29" = 1.16; 29.25" = 1.17; 29.5" = 1.18; 29.75" = 1.19; 30" = 1.20; 30.25" = 1.21; 30.5" = 1.22; 30.75" = 1.23; 31" = 1.24; 31.25" = 1.25; 31.5" = 1.26; 31.75" = 1.27; 32" = 1.28; 32.25" = 1.29; 32.5" = 1.30; 32.75" = 1.31; 33" = 1.32; 33.25" = 1.33; 33.5" = 1.34; 33.75" = 1.35; 34" = 1.36; 34.25" = 1.37; 34.5" = 1.38; 34.75" = 1.39; 35" = 1.40; 35.25" = 1.41; 35.5" = 1.42; 35.75" = 1.43; 36" = 1.44; 36.25" = 1.45; 36.5" = 1.46; 36.75" = 1.47; 37" = 1.48; 37.25" = 1.49; 37.5" = 1.50; 37.75" = 1.51; 38" = 1.52; 38.25" = 1.53; 38.5" = 1.54; 38.75" = 1.55; 39" = 1.56; 39.25" = 1.57; 39.5" = 1.58; 39.75" = 1.59; 40" = 1.60; 40.25" = 1.61; 40.5" = 1.62; 40.75" = 1.63; 41" = 1.64; 41.25" = 1.65; 41.5" = 1.66; 41.75" = 1.67; 42" = 1.68; 42.25" = 1.69; 42.5" = 1.70; 42.75" = 1.71; 43" = 1.72; 43.25" = 1.73; 43.5" = 1.74; 43.75" = 1.75; 44" = 1.76; 44.25" = 1.77; 44.5" = 1.78; 44.75" = 1.79; 45" = 1.80; 45.25" = 1.81; 45.5" = 1.82; 45.75" = 1.83; 46" = 1.84; 46.25" = 1.85; 46.5" = 1.86; 46.75" = 1.87; 47" = 1.88; 47.25" = 1.89; 47.5" = 1.90; 47.75" = 1.91; 48" = 1.92; 48.25" = 1.93; 48.5" = 1.94; 48.75" = 1.95; 49" = 1.96; 49.25" = 1.97; 49.5" = 1.98; 49.75" = 1.99; 50" = 2.00; 50.25" = 2.01; 50.5" = 2.02; 50.75" = 2.03; 51" = 2.04; 51.25" = 2.05; 51.5" = 2.06; 51.75" = 2.07; 52" = 2.08; 52.25" = 2.09; 52.5" = 2.10; 52.75" = 2.11; 53" = 2.12; 53.25" = 2.13; 53.5" = 2.14; 53.75" = 2.15; 54" = 2.16; 54.25" = 2.17; 54.5" = 2.18; 54.75" = 2.19; 55" = 2.20; 55.25" = 2.21; 55.5" = 2.22; 55.75" = 2.23; 56" = 2.24; 56.25" = 2.25; 56.5" = 2.26; 56.75" = 2.27; 57" = 2.28; 57.25" = 2.29; 57.5" = 2.30; 57.75" = 2.31; 58" = 2.32; 58.25" = 2.33; 58.5" = 2.34; 58.75" = 2.35; 59" = 2.36; 59.25" = 2.37; 59.5" = 2.38; 59.75" = 2.39; 60" = 2.40; 60.25" = 2.41; 60.5" = 2.42; 60.75" = 2.43; 61" = 2.44; 61.25" = 2.45; 61.5" = 2.46; 61.75" = 2.47; 62" = 2.48; 62.25" = 2.49; 62.5" = 2.50; 62.75" = 2.51; 63" = 2.52; 63.25" = 2.53; 63.5" = 2.54; 63.75" = 2.55; 64" = 2.56; 64.25" = 2.57; 64.5" = 2.58; 64.75" = 2.59; 65" = 2.60; 65.25" = 2.61; 65.5" = 2.62; 65.75" = 2.63; 66" = 2.64; 66.25" = 2.65; 66.5" = 2.66; 66.75" = 2.67; 67" = 2.68; 67.25" = 2.69; 67.5" = 2.70; 67.75" = 2.71; 68" = 2.72; 68.25" = 2.73; 68.5" = 2.74; 68.75" = 2.75; 69" = 2.76; 69.25" = 2.77; 69.5" = 2.78; 69.75" = 2.79; 70" = 2.80; 70.25" = 2.81; 70.5" = 2.82; 70.75" = 2.83; 71" = 2.84; 71.25" = 2.85; 71.5" = 2.86; 71.75" = 2.87; 72" = 2.88; 72.25" = 2.89; 72.5" = 2.90; 72.75" = 2.91; 73" = 2.92; 73.25" = 2.93; 73.5" = 2.94; 73.75" = 2.95; 74" = 2.96; 74.25" = 2.97; 74.5" = 2.98; 74.75" = 2.99; 75" = 3.00; 75.25" = 3.01; 75.5" = 3.02; 75.75" = 3.03; 76" = 3.04; 76.25" = 3.05; 76.5" = 3.06; 76.75" = 3.07; 77" = 3.08; 77.25" = 3.09; 77.5" = 3.10; 77.75" = 3.11; 78" = 3.12; 78.25" = 3.13; 78.5" = 3.14; 78.75" = 3.15; 79" = 3.16; 79.25" = 3.17; 79.5" = 3.18; 79.75" = 3.19; 80" = 3.20; 80.25" = 3.21; 80.5" = 3.22; 80.75" = 3.23; 81" = 3.24; 81.25" = 3.25; 81.5" = 3.26; 81.75" = 3.27; 82" = 3.28; 82.25" = 3.29; 82.5" = 3.30; 82.75" = 3.31; 83" = 3.32; 83.25" = 3.33; 83.5" = 3.34; 83.75" = 3.35; 84" = 3.36; 84.25" = 3.37; 84.5" = 3.38; 84.75" = 3.39; 85" = 3.40; 85.25" = 3.41; 85.5" = 3.42; 85.75" = 3.43; 86" = 3.44; 86.25" = 3.45; 86.5" = 3.46; 86.75" = 3.47; 87" = 3.48; 87.25" = 3.49; 87.5" = 3.50; 87.75" = 3.51; 88" = 3.52; 88.25" = 3.53; 88.5" = 3.54; 88.75" = 3.55; 89" = 3.56; 89.25" = 3.57; 89.5" = 3.58; 89.75" = 3.59; 90" = 3.60; 90.25" = 3.61; 90.5" = 3.62; 90.75" = 3.63; 91" = 3.64; 91.25" = 3.65; 91.5" = 3.66; 91.75" = 3.67; 92" = 3.68; 92.25" = 3.69; 92.5" = 3.70; 92.75" = 3.71; 93" = 3.72; 93.25" = 3.73; 93.5" = 3.74; 93.75" = 3.75; 94" = 3.76; 94.25" = 3.77; 94.5" = 3.78; 94.75" = 3.79; 95" = 3.80; 95.25" = 3.81; 95.5" = 3.82; 95.75" = 3.83; 96" = 3.84; 96.25" = 3.85; 96.5" = 3.86; 96.75" = 3.87; 97" = 3.88; 97.25" = 3.89; 97.5" = 3.90; 97.75" = 3.91; 98" = 3.92; 98.25" = 3.93; 98.5" = 3.94; 98.75" = 3.95; 99" = 3.96; 99.25" = 3.97; 99.5" = 3.98; 99.75" = 3.99; 100" = 4.00; 100.25" = 4.01; 100.5" = 4.02; 100.75" = 4.03; 101" = 4.04; 101.25" = 4.05; 101.5" = 4.06; 101.75" = 4.07; 102" = 4.08; 102.25" = 4.09; 102.5" = 4.10; 102.75" = 4.11; 103" = 4.12; 103.25" = 4.13; 103.5" = 4.14; 103.75" = 4.15; 104" = 4.16; 104.25" = 4.17; 104.5" = 4.18; 104.75" = 4.19; 105" = 4.20; 105.25" = 4.21; 105.5" = 4.22; 105.75" = 4.23; 106" = 4.24; 106.25" = 4.25; 106.5" = 4.26; 106.75" = 4.27; 107" = 4.28; 107.25" = 4.29; 107.5" = 4.30; 107.75" = 4.31; 108" = 4.32; 108.25" = 4.33; 108.5" = 4.34; 108.75" = 4.35; 109" = 4.36; 109.25" = 4.37; 109.5" = 4.38; 109.75" = 4.39; 110" = 4.40; 110.25" = 4.41; 110.5" = 4.42; 110.75" = 4.43; 111" = 4.44; 111.25" = 4.45; 111.5" = 4.46; 111.75" = 4.47; 112" = 4.48; 112.25" = 4.49; 112.5" = 4.50; 112.75" = 4.51; 113" = 4.52; 113.25" = 4.53; 113.5" = 4.54; 113.75" = 4.55; 114" = 4.56; 114.25" = 4.57; 114.5" = 4.58; 114.75" = 4.59; 115" = 4.60; 115.25" = 4.61; 115.5" = 4.62; 115.75" = 4.63; 116" = 4.64; 116.25" = 4.65; 116.5" = 4.66; 116.75" = 4.67; 117" = 4.68; 117.25" = 4.69; 117.5" = 4.70; 117.75" = 4.71; 118" = 4.72; 118.25" = 4.73; 118.5" = 4.74; 118.75" = 4.75; 119" = 4.76; 119.25" = 4.77; 119.5" = 4.78; 119.75" = 4.79; 120" = 4.80; 120.25" = 4.81; 120.5" = 4.82; 120.75" = 4.83; 121" = 4.84; 121.25" = 4.85; 121.5" = 4.86; 121.75" = 4.87; 122" = 4.88; 122.25" = 4.89; 122.5" = 4.90; 122.75" = 4.91; 123" = 4.92; 123.25" = 4.93; 123.5" = 4.94; 123.75" = 4.95; 124" = 4.96; 124.25" = 4.97; 124.5" = 4.98; 124.75" = 4.99; 125" = 5.00; 125.25" = 5.01; 125.5" = 5.02; 125.75" = 5.03; 126" = 5.04; 126.25" = 5.05; 126.5" = 5.06; 126.75" = 5.07; 127" = 5.08; 127.25" = 5.09; 127.5" = 5.10; 127.75" = 5.11; 128" = 5.12; 128.25" = 5.13; 128.5" = 5.14; 128.75" = 5.15; 129" = 5.16; 129.25" = 5.17; 129.5" = 5.18; 129.75" = 5.19; 130" = 5.20; 130.25" = 5.21; 130.5" = 5.22; 130.75" = 5.23; 131" = 5.24; 131.25" = 5.25; 131.5" = 5.26; 131.75" = 5.27; 132" = 5.28; 132.25" = 5.29; 132.5" = 5.30; 132.75" = 5.31; 133" = 5.32; 133.25" = 5.33; 133.5" = 5.34; 133.75" = 5.35; 134" = 5.36; 134.25" = 5.37; 134.5" = 5.38; 134.75" = 5.39; 135" = 5.40; 135.25" = 5.41; 135.5" = 5.42; 135.75" = 5.43; 136" = 5.44; 136.25" = 5.45; 136.5" = 5.46; 136.75" = 5.47; 137" = 5.48; 137.25" = 5.49; 137.5" = 5.50; 137.75" = 5.51; 138" = 5.52; 138.25" = 5.53; 138.5" = 5.54; 138.75" = 5.55; 139" = 5.56; 139.25" = 5.57; 139.5" = 5.58; 139.75" = 5.59; 140" = 5.60; 140.25" = 5.61; 140.5" = 5.62; 140.75" = 5.63; 141" = 5.64; 141.25" = 5.65; 141.5" = 5.66; 141.75" = 5.67; 142" = 5.68; 142.25" = 5.69; 142.5" = 5.70; 142.75" = 5.71; 143" = 5.72; 143.25" = 5.73; 143.5" = 5.74; 143.75" = 5.75; 144" = 5.76; 144.25" = 5.77; 144.5" = 5.78; 144.75" = 5.79; 145" = 5.80; 145.25" = 5.81; 145.5" = 5.82; 145.75" = 5.83; 146" = 5.84; 146.25" = 5.85; 146.5" = 5.86; 146.75" = 5.87; 147" = 5.88; 147.25" = 5.89; 147.5" = 5.90; 147.75" = 5.91; 148" = 5.92; 148.25" = 5.93; 148.5" = 5.94; 148.75" = 5.95; 149" = 5.96; 149.25" = 5.97; 149.5" = 5.98; 149.75" = 5.99; 150" = 6.00; 150.25" = 6.01; 150.5" = 6.02; 150.75" = 6.03; 151" = 6.04; 151.25" = 6.05; 151.5" = 6.06; 151.75" = 6.07; 152" = 6.08; 152.25" = 6.09; 152.5" = 6.10; 152.75" = 6.11; 153" = 6.12; 153.25" = 6.13; 153.5" = 6.14; 153.75" = 6.15; 154" = 6.16; 154.25" = 6.17; 154.5" = 6.18; 154.75" = 6.19; 155" = 6.20; 155.25" = 6.21; 155.5" = 6.22; 155.75" = 6.23; 156" = 6.24; 156.25" = 6.25; 156.5" = 6.26; 156.75" = 6.27; 157" = 6.28; 157.25" = 6.29; 157.5" = 6.30; 157.75" = 6.31; 158" = 6.32; 158.25" = 6.33; 158.5" = 6.34; 158.75" = 6.35; 159" = 6.36; 159.25" = 6.37; 159.5" = 6.38; 159.75" = 6.39; 160" = 6.40; 160.25" = 6.41; 160.5" = 6.42; 160.75" = 6.43; 161" = 6.44; 161.25" = 6.45; 161.5" = 6.46; 161.75" = 6.47; 162" = 6.48; 162.25" = 6.49; 162.5" = 6.50; 162.75" = 6.51; 163" = 6.52; 163.25" = 6.53; 163.5" = 6.54; 163.75" = 6.55; 164" = 6.56; 164.25" = 6.57; 164.5" = 6.58; 164.75" = 6.59; 165" = 6.60; 165.25" = 6.61; 165.5" = 6.62; 165.75" = 6.63; 166" = 6.64; 166.25" = 6.65; 166.5" = 6.66; 166.75" = 6.67; 167" = 6.68; 167.25" = 6.69; 167.5" = 6.70; 167.75" = 6.71; 168" = 6.72; 168.25" = 6.73; 168.5" = 6.74; 168.75" = 6.75; 169" = 6.76; 169.25" = 6.77; 169.5" = 6.78; 169.75" = 6.79; 170" = 6.80; 170.25" = 6.81; 170.5" = 6.82; 170.75" = 6.83; 171" = 6.84; 171.25" = 6.85; 171.5" = 6.86; 171.75" = 6.87; 172" = 6.88; 172.25" = 6.89; 172.5" = 6.90; 172.75" = 6.91; 173" = 6.92; 173.25" = 6.93; 173.5" = 6.94; 173.75" = 6.95; 174" = 6.96; 174.25" = 6.97; 174.5" = 6.98; 174.75" = 6.99; 175" = 7.00; 175.25" = 7.01; 175.5" = 7.02; 175.75" = 7.03; 176" = 7.04; 176.25" = 7.05; 176.5" = 7.06; 176.75" = 7.07; 177" = 7.08; 177.25" = 7.09; 177.5" = 7.10; 177.75" = 7.11; 178" = 7.12; 178.25" = 7.13; 178.5" = 7.14; 178.75" = 7.15; 179" = 7.16; 179.25" = 7.17; 179.5" = 7.18; 179.75" = 7.19; 180" = 7.20; 180.25" = 7.21; 180.5" = 7.22; 180.75" = 7.23; 181" = 7.24; 181.25" = 7.25; 181.5" = 7.26; 181.75" = 7.27; 182" = 7.28; 182.25" = 7.29; 182.5" = 7.30; 182.75" = 7.31; 183" = 7.32; 183.25" = 7.33; 183.5" = 7.34; 183.75" = 7.35; 184" = 7.36; 184.25" = 7.37; 184.5" = 7.38; 184.75" = 7.39; 185" = 7.40; 185.25" = 7.41; 185.5" = 7.42; 185.75" = 7.43; 186" = 7.44; 186.25" = 7.45; 186.5" = 7.46; 186.75" = 7.47; 187" = 7.48; 187.25" = 7.49; 187.5" = 7.50; 187.75" = 7.51; 188" = 7.52; 188.25" = 7.53; 188.5" = 7.54; 188.75" = 7.55; 189" = 7.56; 189.25" = 7.57; 189.5" = 7.58; 189.75" = 7.59; 190" = 7.60; 190.25" = 7.61; 190.5" = 7.62; 190.75" = 7.63; 191" = 7.64; 191.25" = 7.65; 191.5" = 7.66; 191.75" = 7.67; 192" = 7.68; 192.25" = 7.69; 192.5" = 7.70; 192.75" = 7





## GROUNDWATER SAMPLING LOG

LOCATION: JB CHARLESTON	SITE: CH SITE 7
WELL ID: CHRTN07-001	SAMPLE ID: CHRTN07-001-GW-040 DATE: 2-4-17

## PURGING DATA

WELL DIAMETER (inches): 0.75	TUBING DIAMETER (inches): 3/8	WELL SCREEN/SCREEN DEPTH (ft): 35 ft - 45 ft	STATIC DEPTH TO WATER (see BTG): 40.23	PUMP TYPE (see BTG): 0.75"
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTG - STATIC DEPTH TO WATER) X WELL CAPACITY				
(only if not applicable) = 44.83' x 0.04 = 1.79 gal				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME				
(only if not applicable) = 1.79 gal + (0.04 x 40') + 0.01 gal = 2.57 gal				

TIME	VOLUME PUMPED (gallons)	CUMULATIVE VOLUME PUMPED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet BTG)	pH (standard units)	TEMP. (°C)	COND. (µmhos)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (describe)
1530	3gal	3gal	N/A	40	5.48	17.7	20.2	6.67	3.9	Out of Range	Brown	None

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.315" = 0.05; 2" = 0.16; 2.315" = 0.27; 4" = 0.65; 6" = 1.02; 8" = 1.47; 12" = 3.04  
TUBING INSIDE DIA. CAPACITY (Gallons): 1/8" = 0.0005; 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 = Baler; BP = Booster Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

## SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Ash Willis Franklin	SAMPLING EQUIPMENT: Baler	SAMPLED AT: 1530	SAMPLED DEPTH AT: 1530
PUMP OR TUBING DEPTH (ft): 40'	TUBING: 3/8"	FIELD PLUMBER: Y	FIELD SUPERVISOR: H
FIELD OCCUPATION: PUMP		TUBING: H (Hydraulic)	
SAMPLE CONTAINER SPECIFICATION		SAMPLE PRESERVATION	
SAMPLE CODE: CHRTN07-001-GW-040	VOLUME (GAL): 2.50	ANALYST: J. A. 578	EQUIPMENT CODE: B
ANALYST: J. A. 578		EQUIPMENT CODE: B	

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 = Booster Pump; ESP = Electric Submersible Pump; HPPP = Reverse Flow Peristaltic Pump; SM = Shovel Method (Tubing Gravity Drain); O = Other (Specify)

## NOTES:

Submersible Cables: for record of condition of test lines, condition: medium

pH:  $\pm 0.2$  units; Temperature:  $\pm 0.2^\circ\text{C}$ ; Specific Conductance:  $\pm 6\%$ ; Dissolved Oxygen: all readings  $\leq 20\%$  saturation; optionally,  $\pm 0.2$  mg/L or  $\pm 10\%$  (whichever is greater); Turbidity: all readings  $\leq$

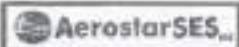
Revision Date: March 14, 2016

\* Check valve w/ 3/8" tubing using gravity to grab sample









## GROUNDWATER SAMPLING LOG

Location: JR CHARLESTON Site: 08  
Well ID: CHRTN08-001 Sample ID: CHRTN08-001-GW-055 Date: 12/02/2017

PURGING DATA  
WELL: 0.75 TUBING: 3/8" WELL SCREEN DIRECTION: 50° - 60° STATIC WATER DEPTH: 53.35  
PUMP TYPE: 5000 see remarks

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY  
(only if well capacity) 62.49

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

WELL PUMP ON TUBING: 55 FINAL PUMP ON TUBING: 55 PURGING STARTED AT: 0455 PURGING STOPPED AT: 1055 TUBING VOLUME PURGED (gallons): 272.7

TIME	US/2000 PUMPED (gallons)	CORAL WANE TUBING (gallons)	PERCENT BATH (gallons)	DEPTH TO WATER (feet)	WELL SCREEN DEPTH (feet)	TIME (hr)	DEPTH (feet)	DEPTH (feet)	DEPTH (feet)	DEPTH (feet)	DEPTH (feet)	DEPTH (feet)	DEPTH (feet)
1055	2 1/2	2 1/2	1/4	53	11.00	15.6	22.1	6.30	-95.4	out of range	0.00	1.00	1.00
F.V. 12/02/2017													

WELL CAPACITY (Gallons Per Foot): 0.75' = 0.02, 1' = 0.04, 1.25' = 0.05, 1.5' = 0.06, 1.75' = 0.07, 2' = 0.08, 2.25' = 0.09, 2.5' = 0.10, 2.75' = 0.11, 3' = 0.12, 3.25' = 0.13, 3.5' = 0.14, 3.75' = 0.15, 4' = 0.16, 4.25' = 0.17, 4.5' = 0.18, 4.75' = 0.19, 5' = 0.20, 5.25' = 0.21, 5.5' = 0.22, 5.75' = 0.23, 6' = 0.24, 6.25' = 0.25, 6.5' = 0.26, 6.75' = 0.27, 7' = 0.28, 7.25' = 0.29, 7.5' = 0.30, 7.75' = 0.31, 8' = 0.32, 8.25' = 0.33, 8.5' = 0.34, 8.75' = 0.35, 9' = 0.36, 9.25' = 0.37, 9.5' = 0.38, 9.75' = 0.39, 10' = 0.40, 10.25' = 0.41, 10.5' = 0.42, 10.75' = 0.43, 11' = 0.44, 11.25' = 0.45, 11.5' = 0.46, 11.75' = 0.47, 12' = 0.48, 12.25' = 0.49, 12.5' = 0.50, 12.75' = 0.51, 13' = 0.52, 13.25' = 0.53, 13.5' = 0.54, 13.75' = 0.55, 14' = 0.56, 14.25' = 0.57, 14.5' = 0.58, 14.75' = 0.59, 15' = 0.60, 15.25' = 0.61, 15.5' = 0.62, 15.75' = 0.63, 16' = 0.64, 16.25' = 0.65, 16.5' = 0.66, 16.75' = 0.67, 17' = 0.68, 17.25' = 0.69, 17.5' = 0.70, 17.75' = 0.71, 18' = 0.72, 18.25' = 0.73, 18.5' = 0.74, 18.75' = 0.75, 19' = 0.76, 19.25' = 0.77, 19.5' = 0.78, 19.75' = 0.79, 20' = 0.80, 20.25' = 0.81, 20.5' = 0.82, 20.75' = 0.83, 21' = 0.84, 21.25' = 0.85, 21.5' = 0.86, 21.75' = 0.87, 22' = 0.88, 22.25' = 0.89, 22.5' = 0.90, 22.75' = 0.91, 23' = 0.92, 23.25' = 0.93, 23.5' = 0.94, 23.75' = 0.95, 24' = 0.96, 24.25' = 0.97, 24.5' = 0.98, 24.75' = 0.99, 25' = 1.00, 25.25' = 1.01, 25.5' = 1.02, 25.75' = 1.03, 26' = 1.04, 26.25' = 1.05, 26.5' = 1.06, 26.75' = 1.07, 27' = 1.08, 27.25' = 1.09, 27.5' = 1.10, 27.75' = 1.11, 28' = 1.12, 28.25' = 1.13, 28.5' = 1.14, 28.75' = 1.15, 29' = 1.16, 29.25' = 1.17, 29.5' = 1.18, 29.75' = 1.19, 30' = 1.20, 30.25' = 1.21, 30.5' = 1.22, 30.75' = 1.23, 31' = 1.24, 31.25' = 1.25, 31.5' = 1.26, 31.75' = 1.27, 32' = 1.28, 32.25' = 1.29, 32.5' = 1.30, 32.75' = 1.31, 33' = 1.32, 33.25' = 1.33, 33.5' = 1.34, 33.75' = 1.35, 34' = 1.36, 34.25' = 1.37, 34.5' = 1.38, 34.75' = 1.39, 35' = 1.40, 35.25' = 1.41, 35.5' = 1.42, 35.75' = 1.43, 36' = 1.44, 36.25' = 1.45, 36.5' = 1.46, 36.75' = 1.47, 37' = 1.48, 37.25' = 1.49, 37.5' = 1.50, 37.75' = 1.51, 38' = 1.52, 38.25' = 1.53, 38.5' = 1.54, 38.75' = 1.55, 39' = 1.56, 39.25' = 1.57, 39.5' = 1.58, 39.75' = 1.59, 40' = 1.60, 40.25' = 1.61, 40.5' = 1.62, 40.75' = 1.63, 41' = 1.64, 41.25' = 1.65, 41.5' = 1.66, 41.75' = 1.67, 42' = 1.68, 42.25' = 1.69, 42.5' = 1.70, 42.75' = 1.71, 43' = 1.72, 43.25' = 1.73, 43.5' = 1.74, 43.75' = 1.75, 44' = 1.76, 44.25' = 1.77, 44.5' = 1.78, 44.75' = 1.79, 45' = 1.80, 45.25' = 1.81, 45.5' = 1.82, 45.75' = 1.83, 46' = 1.84, 46.25' = 1.85, 46.5' = 1.86, 46.75' = 1.87, 47' = 1.88, 47.25' = 1.89, 47.5' = 1.90, 47.75' = 1.91, 48' = 1.92, 48.25' = 1.93, 48.5' = 1.94, 48.75' = 1.95, 49' = 1.96, 49.25' = 1.97, 49.5' = 1.98, 49.75' = 1.99, 50' = 2.00, 50.25' = 2.01, 50.5' = 2.02, 50.75' = 2.03, 51' = 2.04, 51.25' = 2.05, 51.5' = 2.06, 51.75' = 2.07, 52' = 2.08, 52.25' = 2.09, 52.5' = 2.10, 52.75' = 2.11, 53' = 2.12, 53.25' = 2.13, 53.5' = 2.14, 53.75' = 2.15, 54' = 2.16, 54.25' = 2.17, 54.5' = 2.18, 54.75' = 2.19, 55' = 2.20, 55.25' = 2.21, 55.5' = 2.22, 55.75' = 2.23, 56' = 2.24, 56.25' = 2.25, 56.5' = 2.26, 56.75' = 2.27, 57' = 2.28, 57.25' = 2.29, 57.5' = 2.30, 57.75' = 2.31, 58' = 2.32, 58.25' = 2.33, 58.5' = 2.34, 58.75' = 2.35, 59' = 2.36, 59.25' = 2.37, 59.5' = 2.38, 59.75' = 2.39, 60' = 2.40, 60.25' = 2.41, 60.5' = 2.42, 60.75' = 2.43, 61' = 2.44, 61.25' = 2.45, 61.5' = 2.46, 61.75' = 2.47, 62' = 2.48, 62.25' = 2.49, 62.5' = 2.50, 62.75' = 2.51, 63' = 2.52, 63.25' = 2.53, 63.5' = 2.54, 63.75' = 2.55, 64' = 2.56, 64.25' = 2.57, 64.5' = 2.58, 64.75' = 2.59, 65' = 2.60, 65.25' = 2.61, 65.5' = 2.62, 65.75' = 2.63, 66' = 2.64, 66.25' = 2.65, 66.5' = 2.66, 66.75' = 2.67, 67' = 2.68, 67.25' = 2.69, 67.5' = 2.70, 67.75' = 2.71, 68' = 2.72, 68.25' = 2.73, 68.5' = 2.74, 68.75' = 2.75, 69' = 2.76, 69.25' = 2.77, 69.5' = 2.78, 69.75' = 2.79, 70' = 2.80, 70.25' = 2.81, 70.5' = 2.82, 70.75' = 2.83, 71' = 2.84, 71.25' = 2.85, 71.5' = 2.86, 71.75' = 2.87, 72' = 2.88, 72.25' = 2.89, 72.5' = 2.90, 72.75' = 2.91, 73' = 2.92, 73.25' = 2.93, 73.5' = 2.94, 73.75' = 2.95, 74' = 2.96, 74.25' = 2.97, 74.5' = 2.98, 74.75' = 2.99, 75' = 3.00, 75.25' = 3.01, 75.5' = 3.02, 75.75' = 3.03, 76' = 3.04, 76.25' = 3.05, 76.5' = 3.06, 76.75' = 3.07, 77' = 3.08, 77.25' = 3.09, 77.5' = 3.10, 77.75' = 3.11, 78' = 3.12, 78.25' = 3.13, 78.5' = 3.14, 78.75' = 3.15, 79' = 3.16, 79.25' = 3.17, 79.5' = 3.18, 79.75' = 3.19, 80' = 3.20, 80.25' = 3.21, 80.5' = 3.22, 80.75' = 3.23, 81' = 3.24, 81.25' = 3.25, 81.5' = 3.26, 81.75' = 3.27, 82' = 3.28, 82.25' = 3.29, 82.5' = 3.30, 82.75' = 3.31, 83' = 3.32, 83.25' = 3.33, 83.5' = 3.34, 83.75' = 3.35, 84' = 3.36, 84.25' = 3.37, 84.5' = 3.38, 84.75' = 3.39, 85' = 3.40, 85.25' = 3.41, 85.5' = 3.42, 85.75' = 3.43, 86' = 3.44, 86.25' = 3.45, 86.5' = 3.46, 86.75' = 3.47, 87' = 3.48, 87.25' = 3.49, 87.5' = 3.50, 87.75' = 3.51, 88' = 3.52, 88.25' = 3.53, 88.5' = 3.54, 88.75' = 3.55, 89' = 3.56, 89.25' = 3.57, 89.5' = 3.58, 89.75' = 3.59, 90' = 3.60, 90.25' = 3.61, 90.5' = 3.62, 90.75' = 3.63, 91' = 3.64, 91.25' = 3.65, 91.5' = 3.66, 91.75' = 3.67, 92' = 3.68, 92.25' = 3.69, 92.5' = 3.70, 92.75' = 3.71, 93' = 3.72, 93.25' = 3.73, 93.5' = 3.74, 93.75' = 3.75, 94' = 3.76, 94.25' = 3.77, 94.5' = 3.78, 94.75' = 3.79, 95' = 3.80, 95.25' = 3.81, 95.5' = 3.82, 95.75' = 3.83, 96' = 3.84, 96.25' = 3.85, 96.5' = 3.86, 96.75' = 3.87, 97' = 3.88, 97.25' = 3.89, 97.5' = 3.90, 97.75' = 3.91, 98' = 3.92, 98.25' = 3.93, 98.5' = 3.94, 98.75' = 3.95, 99' = 3.96, 99.25' = 3.97, 99.5' = 3.98, 99.75' = 3.99, 100' = 4.00, 100.25' = 4.01, 100.5' = 4.02, 100.75' = 4.03, 101' = 4.04, 101.25' = 4.05, 101.5' = 4.06, 101.75' = 4.07, 102' = 4.08, 102.25' = 4.09, 102.5' = 4.10, 102.75' = 4.11, 103' = 4.12, 103.25' = 4.13, 103.5' = 4.14, 103.75' = 4.15, 104' = 4.16, 104.25' = 4.17, 104.5' = 4.18, 104.75' = 4.19, 105' = 4.20, 105.25' = 4.21, 105.5' = 4.22, 105.75' = 4.23, 106' = 4.24, 106.25' = 4.25, 106.5' = 4.26, 106.75' = 4.27, 107' = 4.28, 107.25' = 4.29, 107.5' = 4.30, 107.75' = 4.31, 108' = 4.32, 108.25' = 4.33, 108.5' = 4.34, 108.75' = 4.35, 109' = 4.36, 109.25' = 4.37, 109.5' = 4.38, 109.75' = 4.39, 110' = 4.40, 110.25' = 4.41, 110.5' = 4.42, 110.75' = 4.43, 111' = 4.44, 111.25' = 4.45, 111.5' = 4.46, 111.75' = 4.47, 112' = 4.48, 112.25' = 4.49, 112.5' = 4.50, 112.75' = 4.51, 113' = 4.52, 113.25' = 4.53, 113.5' = 4.54, 113.75' = 4.55, 114' = 4.56, 114.25' = 4.57, 114.5' = 4.58, 114.75' = 4.59, 115' = 4.60, 115.25' = 4.61, 115.5' = 4.62, 115.75' = 4.63, 116' = 4.64, 116.25' = 4.65, 116.5' = 4.66, 116.75' = 4.67, 117' = 4.68, 117.25' = 4.69, 117.5' = 4.70, 117.75' = 4.71, 118' = 4.72, 118.25' = 4.73, 118.5' = 4.74, 118.75' = 4.75, 119' = 4.76, 119.25' = 4.77, 119.5' = 4.78, 119.75' = 4.79, 120' = 4.80, 120.25' = 4.81, 120.5' = 4.82, 120.75' = 4.83, 121' = 4.84, 121.25' = 4.85, 121.5' = 4.86, 121.75' = 4.87, 122' = 4.88, 122.25' = 4.89, 122.5' = 4.90, 122.75' = 4.91, 123' = 4.92, 123.25' = 4.93, 123.5' = 4.94, 123.75' = 4.95, 124' = 4.96, 124.25' = 4.97, 124.5' = 4.98, 124.75' = 4.99, 125' = 5.00, 125.25' = 5.01, 125.5' = 5.02, 125.75' = 5.03, 126' = 5.04, 126.25' = 5.05, 126.5' = 5.06, 126.75' = 5.07, 127' = 5.08, 127.25' = 5.09, 127.5' = 5.10, 127.75' = 5.11, 128' = 5.12, 128.25' = 5.13, 128.5' = 5.14, 128.75' = 5.15, 129' = 5.16, 129.25' = 5.17, 129.5' = 5.18, 129.75' = 5.19, 130' = 5.20, 130.25' = 5.21, 130.5' = 5.22, 130.75' = 5.23, 131' = 5.24, 131.25' = 5.25, 131.5' = 5.26, 131.75' = 5.27, 132' = 5.28, 132.25' = 5.29, 132.5' = 5.30, 132.75' = 5.31, 133' = 5.32, 133.25' = 5.33, 133.5' = 5.34, 133.75' = 5.35, 134' = 5.36, 134.25' = 5.37, 134.5' = 5.38, 134.75' = 5.39, 135' = 5.40, 135.25' = 5.41, 135.5' = 5.42, 135.75' = 5.43, 136' = 5.44, 136.25' = 5.45, 136.5' = 5.46, 136.75' = 5.47, 137' = 5.48, 137.25' = 5.49, 137.5' = 5.50, 137.75' = 5.51, 138' = 5.52, 138.25' = 5.53, 138.5' = 5.54, 138.75' = 5.55, 139' = 5.56, 139.25' = 5.57, 139.5' = 5.58, 139.75' = 5.59, 140' = 5.60, 140.25' = 5.61, 140.5' = 5.62, 140.75' = 5.63, 141' = 5.64, 141.25' = 5.65, 141.5' = 5.66, 141.75' = 5.67, 142' = 5.68, 142.25' = 5.69, 142.5' = 5.70, 142.75' = 5.71, 143' = 5.72, 143.25' = 5.73, 143.5' = 5.74, 143.75' = 5.75, 144' = 5.76, 144.25' = 5.77, 144.5' = 5.78, 144.75' = 5.79, 145' = 5.80, 145.25' = 5.81, 145.5' = 5.82, 145.75' = 5.83, 146' = 5.84, 146.25' = 5.85, 146.5' = 5.86, 146.75' = 5.87, 147' = 5.88, 147.25' = 5.89, 147.5' = 5.90, 147.75' = 5.91, 148' = 5.92, 148.25' = 5.93, 148.5' = 5.94, 148.75' = 5.95, 149' = 5.96, 149.25' = 5.97, 149.5' = 5.98, 149.75' = 5.99, 150' = 6.00, 150.25' = 6.01, 150.5' = 6.02, 150.75' = 6.03, 151' = 6.04, 151.25' = 6.05, 151.5' = 6.06, 151.75' = 6.07, 152' = 6.08, 152.25' = 6.09, 152.5' = 6.10, 152.75' = 6.11, 153' = 6.12, 153.25' = 6.13, 153.5' = 6.14, 153.75' = 6.15, 154' = 6.16, 154.25' = 6.17, 154.5' = 6.18, 154.75' = 6.19, 155' = 6.20, 155.25' = 6.21, 155.5' = 6.22, 155.75' = 6.23, 156' = 6.24, 156.25' = 6.25, 156.5' = 6.26, 156.75' = 6.27, 157' = 6.28, 157.25' = 6.29, 157.5' = 6.30, 157.75' = 6.31, 158' = 6.32, 158.25' = 6.33, 158.5' = 6.34, 158.75' = 6.35, 159' = 6.36, 159.25' = 6.37, 159.5' = 6.38, 159.75' = 6.39, 160' = 6.40, 160.25' = 6.41, 160.5' = 6.42, 160.75' = 6.43, 161' = 6.44, 161.25' = 6.45, 161.5' = 6.46, 161.75' = 6.47, 162' = 6.48, 162.25' = 6.49, 162.5' = 6.50, 162.75' = 6.51, 163' = 6.52, 163.25' = 6.53, 163.5' = 6.54, 163.75' = 6.55, 164' = 6.56, 164.25' = 6.57, 164.5' = 6.58, 164.75' = 6.59, 165' = 6.60, 165.25' = 6.61, 165.5' = 6.62, 165.75' = 6.63, 166' = 6.64, 166.25' = 6.65, 166.5' = 6.66, 166.75' = 6.67, 167' = 6.68, 167.25' = 6.69, 167.5' = 6.70, 167.75' = 6.71, 168' = 6.72, 168.25' = 6.73, 168.5' = 6.74, 168.75' = 6.75, 169' = 6.76, 169.25' = 6.77, 169.5' = 6.78, 169.75' = 6.79, 170' = 6.80, 170.25' = 6.81, 170.5' = 6.82, 170.75' = 6.83, 171' = 6.84, 171.25' = 6.85, 171.5' = 6.86, 171.75' = 6.87, 172' = 6.88, 172.25' = 6.89, 172.5' = 6.90, 172.75' = 6.91, 173' = 6.92, 173.25' = 6.93, 173.5' = 6.94, 173.75' = 6.95, 174' = 6.96, 174.25' = 6.97, 174.5' = 6.98, 174.75' = 6.99, 175' = 7.00, 175.25' = 7.01, 175.5' = 7.02, 175.75' = 7.03, 176' = 7.04, 176.25' = 7.05, 176.5' = 7.06, 176.75' = 7.07, 177' = 7.08, 177.25' = 7.09, 177.5' = 7.10, 177.75' = 7.11, 178' = 7.12, 178.25' = 7.13, 178.5' = 7.14, 178.75' = 7.15, 179' = 7.16, 179.25' = 7.17, 179.5' = 7.18, 179.75' = 7.19, 180' = 7.20, 180.25' = 7.21, 180.5' = 7.22, 180.75' = 7.23, 181' = 7.24, 181.25' = 7.25, 181.5' = 7.26, 181.75' = 7.27, 182' = 7.28, 182.25' = 7.29, 182.5' = 7.30, 182.75' = 7.31, 183' = 7.32, 183.25' = 7.33, 183.5' = 7.34, 183.75' = 7.35, 184' = 7.36, 184.25' = 7.37, 184.5' = 7.38, 184.75' = 7.39, 185' = 7.40, 185.25' = 7.41, 185.5' = 7.42, 185.75' = 7.43, 186' = 7.44, 186.25' = 7.45, 186.5' = 7.46, 186.75' = 7.47, 187' = 7.48, 187.25' = 7.49, 187.5' = 7.50, 187.75' = 7.51, 188' = 7.52, 188.25' = 7.53, 188.5' = 7.54, 188.75' = 7.55, 189' = 7.56, 189.25' = 7.57, 189.5' = 7.58, 189.75' = 7.59, 190' = 7.60, 190.25' = 7.61, 190.5' = 7.62, 190.75' = 7.63, 191' = 7.64, 191.25' = 7.65, 191.5' = 7.66, 191.75' = 7.67, 192' = 7.68, 192.25' = 7.69, 192.5' = 7.70, 192.75' = 7.71, 193' = 7.72, 193.25' = 7.73, 193.5' = 7.74, 193.75' = 7.75, 194' = 7.76, 194.25' = 7.77, 194.5' = 7.78, 194.75' = 7.79, 195' = 7.80, 195.25' = 7.81, 195.5' = 7.82, 195.75' = 7.83, 196' = 7.84, 196.25' = 7.85, 196.5' = 7.86, 196.75' = 7.87, 197' = 7.88, 197.25' = 7.89, 197.5' = 7.90, 197.75' = 7.91, 198' = 7.92, 198.25' = 7.93, 198.5' = 7.94, 198.75' = 7.95, 199' = 7.96, 199.25' = 7.97, 199.5' = 7.98, 199.75' = 7.99, 200' = 8.00, 200.25' = 8.01, 200.5' = 8.02, 200.75' = 8.03, 201' = 8.04, 201.25' = 8.05, 201.5' = 8.06, 201.75' = 8.07, 202' = 8.08, 202.25' = 8.09, 202.5' = 8.10, 202.75' = 8.11, 203' = 8.12, 203.25' = 8.13, 203.5' = 8.14, 203.75' = 8.15, 204' = 8.16, 204.25' = 8.17, 204.5' = 8.18, 204.75' = 8.19, 205' = 8.20, 205.25' = 8.21, 205.5' = 8.22, 205.75' = 8.23, 206' = 8.24, 206.25' = 8.25, 206.5' = 8.26, 206.75' = 8.27, 207' = 8.28, 207.25' = 8.29, 207.5' = 8.30, 207.75' = 8.31, 208' = 8.32, 208.25' = 8.33, 208.5' = 8.34, 208.75' = 8.35, 209' = 8.36, 209.25' = 8.37, 209.5' = 8.38, 209.75' = 8.39, 210' = 8.40, 210.25' = 8.41, 210.5' = 8.42, 210.75' = 8.43, 211'



## GROUNDWATER SAMPLING LOG

Lab: JH CHARLSTON	Site: 5128
Well: CHRN08-002	DATE: CHRN08-002-6W-050 2-5-17

PURCHASING DATA	
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90
91	92
93	94
95	96
97	98
99	100

WELL Diameter (inches) 0.75"	THROW Diameter (inches) 3/8"	WELL ACCESS (INTERNAL DEPTH) 45 ft. 55 ft.	WATER DEPTH 50.24	WELL FLAT TYPE 3a Remots
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WELL VOLUME PLUMB: 1 WELL VOLUME = (TOTAL WELL DEPTH - BTOD = STATIC DEPTH TO WATER) X WELL CAPACITY					
1 well ft well capacity	= 1	ft	=	ft	=
				gal	=
					gal

$$\text{FOURMINT VOLUME (GAL)} = \frac{1}{4} \left( \text{EQUIPMENT VOL.} + \text{PUMP VOLUME} + \frac{\text{TURNING CAPACITY}}{2} \right) \times \frac{\text{TURNING LENGTH}}{100} + \text{ROOM OR L. VOLUME}$$

WELL NAME OR NUMBER DEPT #1 (HILL) (PUB)	TOTAL PLANT OR TUBING DEPTH IN FEET (HILL)	PRESSURE IN PSI (HILL)	FLUIDS MISC AT	DATE 10-16-80	TIME 1640	YR
	50'	1640				Yr

[illegible][illegible]

#### SAMPLING DATA

NAME: Ash Willis FRANKLIN J. JOHNSON	SIGNATURE: 	DATES: 1/6/40 1/6/40
---	--	-------------------------

PLP 24 58102	1.382	PLP-PL 38102	1	1	File No	no
DIFFERENTIAL: 56'	WATER COR PL	Measurment type				

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2. Literature Review	3	3. Results	3
3. Discussion	4	4. Conclusion	4
4. References	5		

[illegible]

500-GU-65t	/	DE	JSC					Hrd. Gnd Crst S37	Gmrgd	N/A
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$P/A$

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Check valve on #8 tubing by hand

**SAMPLING EQUIPMENT CODES:** AP = After-Peristaltic Pump; B = Bore; BP = Backer Pump; ESP = Electric Submersible Pump;  
RFP = Reverse Flow Peristaltic Pump; AM = Steel Mashed (Using Gravel) Cans; O = Other (Specify)

FOOTNOTES

2007/10/10

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pH:  $\pm 0.1$  units; Temperature:  $\pm 0.1^\circ\text{C}$ ; Specific Conductance:  $\pm 1\%$  Dissolved Oxygen: all readings  $< 10\%$  saturation; sulfide:  $\pm 0.2\text{ mg/L}$  or  $\pm 10\%$  (whichever is greater); Turbidity: all readings  $< 10\text{ NTU}$ .

Revision Date: March 04, 2003



## GROUNDWATER SAMPLING LOG

Location: JIB CHARLESTON	Site: SITE 8	
Well ID: CHKTN08-003	Sample ID: CHKTN08-003-6W-055	Date: 2-5-17

## PURGING DATA

Well Diameter (inches): 0.75"	Drill Bit (inches): 3/8"	Well Screen Interval (feet): 50 ft - 60 ft	Static Depth to Water (feet): 55.52	Purge Pump Type: check valve see Remarks
Well Volume Purge: 1 Well Volume = (TOTAL WELL DEPTH BTDC - STATIC DEPTH TO WATER) X WELL CAPACITY				
Well Capacity: 55.22				

Equipment Volume Purge: 1 Equipment Vol. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
---

Initial Pump On Tubing Depth (ft): 55'	Final Pump On Tubing Depth (ft): 55'	Purging Interval (ft): 1215	Purging Interval (ft): 1421	Total Volume Purged (gallons): 10 gal
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Time	Volume Pumped (gallons)	Original Volume Purged (gallons)	Pumps Made (gallons)	Water To Meter (ft BTDC)	pH (standard unit)	Temp (°C)	Cond (µS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Color (PCU)	Odor (describe)
1420	10	10	n/a	n/a	5.54	18.2	47.8	5.60	-14.8	0.2	100	—
<div>4</div>												

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.63; 6" = 1.02; 8" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gallons): 1/8" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

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

## SAMPLING DATA

Sampled By (Print/Signature): Ash with Franklin Johnson	Sampler ID: CHKTN08-003	Sampled At: 1420	Sampled At: 1421
Pump or Tubing: 55'	Tubing: PE	Flow Filtered: Y	Flow Filter: n/a
Depth in Well (ft):	Field Description: HSP	Tubing: H (Hand)	Duplicate: Y

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION				STEP-BY-STEP ANALYSIS METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (gallons per minute)
SAMPLE CODE	#COLLIMERS	SAMPLE CODE	VOLUME (mL)	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (mL)	PHEN (µS (standard unit))	PHEN (µS (standard unit))			
CHKTN08-003-6W-055	1	PE	250					Method 8210	Remarks	N/A
<div>4</div>										

Remarks: Used check valve w/ 3/8" tubing by hand

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

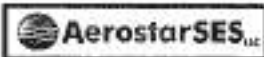
SAMPLING EQUIPMENT CODES: RPP = Reverse Flow Peristaltic Pump; B = Bailor; BP = Bailor Pump; ESP = Electric Submersible Pump; RPP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Gently Squeezed); O = Other (Specify)

## NOTES:

Instructions: Circle the name of method of test for comparison 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 ± 10% (whichever is greater)

Revision Date: March 14, 2015



## GROUNDWATER SAMPLING LOG

Investigator: J.B. CHARLESTON	Site: Site 9	
Well No: CRTN09-001	Sample ID: CRTN09-001-6W-025	Date: 2-6-17

## PURGING DATA

WELL SCREEN DIA (inches): 0.75"	TUBING CAPACITY (gals/ft): 1/4"	WELL SCREEN INTERNAL DEPTH (TO WATER) (ft): 20 to 30 ft	STATIC DEPTH (TO WATER) (ft): 23.91	PURGE PUMP TYPE (SEE LIST): PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTWC - STATIC DEPTH TO WATER) X WELL CAPACITY (only for well applications) = 1 ft x 1/4" = 0.25 gal				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only for well applications) = 0.25 gal + (1/4" x 100 ft) + 0.25 gal = 25.25 gal				

TIME	VOLUME PURGED (gallons)	WELL VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (ft) (BTWC)	pH (Standard Add)	TEMP. (°C)	COND. µmhos	DISSOLVED OXYGEN mg/L	ORP (mV)	TURBIDITY (NTU)	COLOR (PCU/PCU)	ODOR (Description)
1212	3gal	3gal	177	23.5	6.28	21.0	24.6	6.39	-19.3	out of Range	Brown	None
1222	1,776mL	13,126mL	1	23.5	5.63	21.3	15.8	6.27	-21.1	out of Range	1	1
1300	6726	19,752mL	1	23.5	5.69	21.6	14.3	6.35	-2.0	1	1	1
1302	354	20,206	1	25.8	5.59	21.4	14.3	5.83	-3.8	1	1	1
1304	354	20,560	1	25.8	5.59	21.3	14.3	5.31	-6.8	1	1	1
		~ 5.48gal										

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.29; 4" = 0.66; 6" = 1.02; 8" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (GAL/FT): 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" = 0.018

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

## SAMPLING DATA

SAMPLED BY (PRINT) (INITIALS): Ash Willis	SAMPLED BY (SIGNATURE): [Signature]	SAMPLED INITIAL AT: 1304	SAMPLED DATED AT: 1304
PUMP OR TUBING DEPTH IN WELL (ft): 25'	TUBING SAMPLING CODES: PE	FIELD USE ONLY Field Equipment Type: [Blank]	Field Use Only Field Equipment Type: [Blank]
PUMP DECONTAMINATION: PUMP Y <input checked="" type="checkbox"/> TUBING Y <input checked="" type="checkbox"/>		DUPLICATE: Y <input checked="" type="checkbox"/>	
SAMPLE CONTAINER SPECIFICATION		SAMPLE PRESERVATION	
SAMPLE ID: CRTN09-001-6W-025	CONTAINER: 1 PE 250	PRESERVATIVE: NONE	TOTAL VOL. ADDED IN FIELD (mL): [Blank]
ANALYSIS METHOD: [Blank]		ANALYSIS METHOD: [Blank]	
SAMPLING EQUIPMENT CODE: APP		SAMPLING EQUIPMENT CODE: APP	
SAMPLING RATE (mL/min): 177		SAMPLING RATE (mL/min): 177	

## REMARKS:

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

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

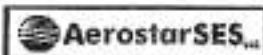
## NOTES:

(Standard Criteria for range of values of test items consecutive readings)

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

Revision Date: March 14, 2016





## GROUNDWATER SAMPLING LOG

002

Investigator: JB CHARLESTON	Well ID: CHRTW09-002	Sample ID: CHRTW09-002-GW-023	DATE: 02/06/2017
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## PURGING DATA

WELL DIAMETER (inches): 0.75	TUBING DIAMETER (inches): 1/4	WELL SCREEN INTERVAL (feet): 20 ft - 30 ft BGS	STATIC DEPTH TO WATER (feet): 20.77	PURGE PUMP TYPE (or label): PP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTDC - STATIC DEPTH TO WATER) X WELL CAPACITY				
(only if used if applicable) $\pi \times C \times PI \times PD \times (LWC + CG)$				
32.30				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME X (TUBING CAPACITY X TUBING LENGTH + FLOW CELL VOLUME)				
(only if used if applicable) $\pi \times (ID + C) \times L \times PI \times (LWC + CG)$				

INITIAL PUMP OR TUBING DEPTH IN WELL (feet)		FINAL PUMP OR TUBING DEPTH IN WELL (feet)		PURGE VOLUME (gallons)		PURGE RATE (gpm)		TOTAL VOLUME PURGED (gallons)		TOTAL VOLUME PURGED (gallons)		TOTAL VOLUME PURGED (gallons)	
25.0		25.0		1300		4423		L2					
TIME	VOLUME PURGED (gallons)	TIME	VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet BTDC)	PI (standard units)	PUMP (%)	COND. (µmhos)	DISCHARGE (mg/L)	ORP (mV)	TEMPERATURE (°F)	COLOR (Pt-Co)	ODOR (perceived)
1300					20.77								
1310	2.4	2.4	240	4	4	7.20	20.0	0.197	4.73	55.4	02	brown	
1320	1.25	3.65	125	11	11	5.13	21.0	0.046	4.96	56.8	98.5	brown	
1330	1.25	4.90	125	11	11	5.24	21.0	0.042	5.19	24.9	704	brown	
1340	1.25	6.15	125	11	11	5.16	20.8	0.038	4.90	29.5	515	brown	
1350	1.25	7.40	125	11	11	5.15	20.8	0.035	5.06	28.8	451	brown	
1400	1.25	8.65	125	11	11	5.12	20.6	0.034	5.14	30.4	393	brown	
1410	1.25	9.90	125	11	11	5.32	20.5	0.032	5.29	28.2	361	brown	
1420	1.25	11.15	125	11	11	5.20	20.6	0.031	5.22	31.7	340	brown	
1423	0.25	11.40	125	11	11	5.20	20.6	0.031	5.37	32.2	323	brown	
FJ, 02/06/2017													

WELL CAPACITY (Gallons Per Foot): 0.75' = 0.02; 1' = 0.04; 1.25' = 0.05; 2' = 0.10; 3' = 0.15; 4' = 0.20; 5' = 0.25; 6' = 0.30; 7' = 0.35; 8' = 0.40; 9' = 0.45; 10' = 0.50
TUBING INSIDE DIA. CAPACITY (Gallons Per Foot): 1/8" = 0.0005; 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 = Baller Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

## SAMPLING DATA

SAMPLED BY (PRINT) / APPLICATION: Franklin Johnson / ASI	SAMPLED (SIGNATURE): Franklin Johnson	SAMPLED (DATE): 1/25	SAMPLED (TIME): 1426
PUMP OR TUBING DEPTH IN WELL (feet): 25.0	TUBING DEPTH IN WELL (feet): 25.0	FIELD FILTERED: (X)	FIELD FILTERED (Filter No.): 1/1
FIELD CONTAMINATION: PUMP Y (X) TUBING Y (X)		DUPLICATE: Y (X)	
SAMPLE CONTAINER SPECIFICATION: BRAND CODE: I PE VOLUME (mL): 250		SAMPLE PRESERVATION: METHOD: 537M	
CHRTW09-002-GW-023		APP	
FJ, 02/06/2017			

DTW BGS = 18.59	TD BGS = 30.04
MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; Y = Teflon; O = Other (Specify)	
SAMPLING EQUIPMENT CODES: APP = Alter Peristaltic Pump; B = Baller; BP = Baller Pump; ESP = Electric Submersible Pump; RPP = Reverse Flow Peristaltic Pump; SM = Squeeze Method (Tubing Gravity Drain); O = Other (Specify)	

NOTES: (Redaction criteria: removal of sensitive information)

pH:  $\pm 0.2$  units; Temperature:  $\pm 0.2^\circ\text{C}$ ; Specific Conductance:  $\pm 5\%$ ; Dissolved Oxygen: all readings  $\leq 20\%$  saturation; optionally,  $\pm 0.2$  mg/L or  $\pm 10\%$  (whichever is greater); Turbidity: all readings  $\leq$

Revision Date: March 14, 2019





## GROUNDWATER SAMPLING LOG

Location: JB CHARLESTON	Site: 09	
Well ID: CHRTN09-003	Sample ID: CHRTN09-003-GW-025	Date: 02/06/2017

## PURGING DATA

Well Diameter (inches): 0.75	Tubing Diameter (inches): 1/4	Well Screen Interval Depth: P1 - P2	Static Depth (to water) (ft): 22.09	Purge Pump Type or Size: PP
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WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH BTDC - STATIC DEPTH TO WATER) X WELL CAPACITY

(only if not applicable)

32.40

ft

gal

gal

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

(only if not applicable)

gal

ft

gal

gal

Initial Pump On Time (min): 25.0	Final Pump On Time (min): 25.0	Purge Volume (gallons): 1520	Purging Method: 1615	Total Volume Purged (gallons): 1615
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TIME	VOLUME FLOWED (gallons)	CUMULATIVE VOLUME FLOWED (gallons)	PURGE RATE (gpm)	DEPTH TO (ft BTDC)	pH (standard method)	TEMP. (°C)	COND. (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	COLOR (Pt-Co)	ODOR (description)
1520				22.09								
1530	1.0	1.0	100	11	5.44	20.7	0.047	4.06	69.3	0.0	brown	
1540	1.0	2.0	100	11	4.90	20.7	0.044	4.37	85.1	0.0	brown	
1550	1.0	3.0	100	11	4.92	20.7	0.040	4.92	82.9	0.0	brown	
1600	1.0	4.0	100	11	4.90	20.4	0.036	5.16	93.7	0.0	brown	
1605	0.5	4.5	100	11	4.78	20.4	0.030	6.07	103.4	0.0	brown	
1618	0.3	4.8	100	11	4.72	20.3	0.029	6.04	115.0	0.0	brown	
1613	0.5	5.3	100	11	4.73	20.3	0.029	6.08	120.8	0.0	brown	
1615	0.2	5.5	100	11	4.74	20.3	0.030	5.93	120.7	0.0	brown	
F.T. 02/06/2017												

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.10; 3" = 0.22; 4" = 0.45; 5" = 1.02; 6" = 1.47; 8" = 3.08

TUBING INSIDE DIA. CAPACITY (GALLONS): 1/8" = 0.0005; 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 = Balloon; BP = Booster Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

## SAMPLING DATA

SAMPLED BY (PRINT NAME): Franklin Johnson / ASL	SAMPLED (SIGNATURE): Franklin Johnson	SAMPLED DATE: 1615	SAMPLED TIME: 1616
PUMP OR TUBING: 25.0	TUBING: 25.0	FIELD # (TUBING): 1615	FIELD # (PUMP): 1616
DEPTH (ft) (Well): 25.0	ANTENNA CODE (ft): 25.0	Filter Equipment Type: 1615	Filter Size: n/a

FIELD COORDINATION				SAMPLE INFORMATION				ANALYSIS INFORMATION			
FIELD #	PUMP	TUBING	DUPLICATE	SAMPLE CODE	MODAL CODE	VOLUME (mL)	MODAL CODE	ANALYSIS CODE	ANALYSIS CODE	ANALYSIS CODE	ANALYSIS CODE
3	Y	Y	Y	CHRTN09-003-GW-025	PE	250	PE	337M	APP	100	
F.T. 02/06/2017											

PTW = 19.48 BGS  
TO = 29.69 BGS  
High turbidity due to clay in portions of the screen interval

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 = Balloon; BP = Booster Pump; ESP = Electric Submersible Pump; RPP = Reverse Flow Peristaltic Pump; SM = Screen Method (Tubing Screen Only); O = Other (Specify)

## NOTES:

Standardize Orders for sample collection and analysis.

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 ±

Revision Date: March 14, 2016



## SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)

Project Name: Silo Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 2-3-17

Sample Technician(s): Ash Willis / Frankie Johnson

Station ID: CHRTND2-004

Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

## SEDIMENT SAMPLE

Sample ID: CHRTND2-004 - SD-01 Sample Collection Time: 1625

Sample Depth: ~0.5' Sediment Description: Grey silty sand

Collection Method: SS Spoon Analysis/Method: modified EPA 537

Sample Container: PE 250 mL Preservative: N/A

## SURFACE WATER SAMPLE

Sample ID: CHRTND2-004 - SW-001 Sample Collection Time: 1625

Sample Depth: ~0.5' Collection Method: Surface Collection

Analysis/Method: modified EPA 537 Sample Container: PE 250 mL

Preservative: N/A Water Quality (circle one): Clear Cloudy Turbid Other

## GROUNDWATER SAMPLE (GRAB)

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_ Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_ Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_ Water Quality (circle one): Clear Cloudy Turbid Other

COMMENTS: MS/MSD and Duplicate for both.

**AerostarSE5<sub>LLC</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 2-07-17

Sample Technician(s): Ash Willis / Franklin Johnson

Station ID: CHRTN03-004

Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

**SEDIMENT SAMPLE**

Sample ID: CHRTN03-004-SD-001 Sample Collection Time: 1435

Sample Depth: 10.5' Sediment Description: Silty fine sand

Collection Method: Spoon Analysis/Method: Modified EPA 537

Sample Container: PE 250 mL Preservative: N/A

**SURFACE WATER SAMPLE**

Sample ID: CHRTN03-004-SW-001 Sample Collection Time: 1435

Sample Depth: 10.5' Collection Method: Sample collector

Analysis/Method: Modified EPA 537 Sample Container: PE 250 mL

Preservative: N/A Water Quality (circle one): Clear Cloudy Turbid Other

**GROUNDWATER SAMPLE (GRAB)**

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_ Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_ Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_ Water Quality (circle one): Clear Cloudy Turbid Other

**COMMENTS:**



## SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 02/09/2017

Sample Technician(s): Franklin Johnson

Station ID: CHRTN04-004

Type(s) of Sample (circle all that apply): ☒ Sediment ☐ Surface Water ☒ Groundwater

## SEDIMENT SAMPLE

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_ Sediment Description: \_\_\_\_\_

Collection Method: \_\_\_\_\_ Analysis/Method: \_\_\_\_\_

Sample Container: \_\_\_\_\_ Preservative: \_\_\_\_\_

## SURFACE WATER SAMPLE

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_ Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_ Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_ Water Quality (circle one): Clear Cloudy Turbid Other

## GROUNDWATER SAMPLE (GRAB)

Sample ID: CHRTN04-001-GW-013 Sample Collection Time: 1000

Sample Depth: 13 ft RGS Collection Method: GRAB

Analysis/Method: 537 M Sample Container: 250 mL PE

Preservative: N/A Water Quality (circle one): Clear ☒ Cloudy Turbid Other

## COMMENTS:

pH = 6.24 Turbidity = 0.8

Cond = 0.251 mS/cm

D.O = 0.18 mg/L

Temp = 16.7 °C

ORP = -19.7 mV



**AerostarSES<sub>inc</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**Project Name: Site Inspections of AFFF Areas (USACE Savannah District)ASL Project No: M2032.0001Installation: Joint Base CharlestonDate: 02/09/2017Sample Technician(s): Frank A. JohnsonStation ID: CHRTM04-002

Type(s) of Sample (circle all that apply):

Sediment

Surface Water

Groundwater**SEDIMENT SAMPLE**

Sample ID: \_\_\_\_\_

Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_

Sediment Description: \_\_\_\_\_

Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_

Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_

**SURFACE WATER SAMPLE**

Sample ID: \_\_\_\_\_

Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_

Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_

Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_

Water Quality (circle one): Clear Cloudy Turbid Other**CHRTM04-002-CW GROUNDWATER SAMPLE (GRAB)**Sample ID: CHRTM04-002-CW-013Sample Collection Time: 1130Sample Depth: 13 ft BGSCollection Method: GRABAnalysis/Method: 537MSample Container: 250 mL PEPreservative: n/aWater Quality (circle one): Clear Cloudy Turbid Other**COMMENTS:**

pH: 6.07

turbidity = O.R.

Temp = 17.5°C

Normal Sample and a duplicate collected.

D.O. = 3.51 mg/L

Cond = 0.108 mS/cm

ORP = 0.4 mV

**Aerostar SES<sub>INC</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 02/09/2017

Sample Technician(s): Franklin Johnson

Station ID: CHRTM04-003

Type(s) of Sample (circle all that apply):      Sediment      Surface Water      Groundwater

SEDIMENT SAMPLE	
Sample ID: _____	Sample Collection Time: _____
Sample Depth: _____	Sediment Description: _____
Collection Method: _____	Analysis/Method: _____
Sample Container: _____	Preservative: _____

SURFACE WATER SAMPLE	
Sample ID: _____	Sample Collection Time: _____
Sample Depth: _____	Collection Method: _____
Analysis/Method: _____	Sample Container: _____
Preservative: _____	Water Quality (circle one): Clear    Cloudy    Turbid    Other

GROUNDWATER SAMPLE (GRAB)	
Sample ID: <u>CHRTM04-003-GW-013</u>	Sample Collection Time: <u>1225</u>
Sample Depth: <u>13 ft BGS</u>	Collection Method: <u>GRAB</u>
Analysis/Method: <u>SS 7M</u>	Sample Container: <u>250 mL PE</u>
Preservative: <u>n/a</u>	Water Quality (circle one): Clear <u>Cloudy</u> Turbid    Other

**COMMENTS:** Temp 18.3°C      turbidity = 0. R<sub>1</sub>  
 P.O. = 0.12 mg/L  
 Cond = 0.344 mS/cm  
5.48 pH  
ORP = -137.4 mV

**AerostarSES<sub>LLC</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)  
ASL Project No: M2032.0001  
Installation: Joint Base Charleston  
Date: 2-9-17  
Sample Technician(s): Ash Willis Franklin Johnson  
Station ID: CHRTN04-004  
Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

**SEDIMENT SAMPLE**

Sample ID: CHRTN04-004-SO-001 Sample Collection Time: 0915  
Sample Depth: 0-6" Sediment Description: Silt with Organics  
Collection Method: SS Spoon Analysis/Method: 537M  
Sample Container: 250mL PE Preservative: n/a

**SURFACE WATER SAMPLE**

Sample ID: CHRTN04-004-SW-001 Sample Collection Time: 0945  
Sample Depth: 0-6" Collection Method: Dip Bottle  
Analysis/Method: 537M Sample Container: 250mL PE  
Preservative: n/a Water Quality (circle one): Clear Cloudy Turbid Other

**GROUNDWATER SAMPLE (GRAB)**

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_  
Sample Depth: \_\_\_\_\_ Collection Method: \_\_\_\_\_  
Analysis/Method: \_\_\_\_\_ Sample Container: \_\_\_\_\_  
Preservative: \_\_\_\_\_ Water Quality (circle one): Clear Cloudy Turbid Other

**COMMENTS:**

**AerostarSES<sub>LLC</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 2-7-16

Sample Technician(s): Ash Willis / Franklin Johnson

Station ID: CHRTN05-001

Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

**SEDIMENT SAMPLE**

Sample ID: CHRTN05-001 - SD#001 Sample Collection Time: 1410

Sample Depth: ~0.5' Sediment Description: Silty fine sand-sand

Collection Method: spoon Analysis/Method: Mod. Fed EPA 537

Sample Container: PE 250 Preservative: N/A

**SURFACE WATER SAMPLE**

Sample ID: CHRTN05-001 - SW#001 Sample Collection Time: 1410

Sample Depth: ~0.5' Collection Method: Sample Collector

Analysis/Method: Mod. Fed EPA 537 Sample Container: PE 250mL

Preservative: N/A Water Quality (circle one): Clear Cloudy Turbid Other

**GROUNDWATER SAMPLE (GRAB)**

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_ Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_ Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_ Water Quality (circle one): Clear Cloudy Turbid Other

**COMMENTS:**



**AerostarSES<sub>INC</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 2-7-17

Sample Technician(s): Ash Willis / Franklin Johnson

Station ID: CHETNOS - 002 - ~~GAWA~~

Type(s) of Sample (circle all that apply):      Sediment      Surface Water      Groundwater

SEDIMENT SAMPLE	
Sample ID: _____	Sample Collection Time: _____
Sample Depth: _____	Sample Description: _____
Collection Method: _____	Analysis/Method: _____
Sample Container: _____	Preservative: _____

SURFACE WATER SAMPLE	
Sample ID: _____	Sample Collection Time: _____
Sample Depth: _____	Collection Method: _____
Analysis/Method: _____	Sample Container: _____
Preservative: _____	Water Quality (circle one): Clear    Cloudy    Turbid    Other

GROUNDWATER SAMPLE (GRAB)	
Sample ID: <u>CHETNOS - 002 - GIN - 000</u>	Sample Collection Time: <u>1500</u>
Sample Depth: <u>8'</u>	Collection Method: <u>Hydro punch</u>
Analysis/Method: <u>MODIFIED EPA 537</u>	Sample Container: <u>PE 250ml</u>
Preservative: <u>N/A</u>	Water Quality (circle one): Clear    Cloudy <u>Turbid</u> Other

COMMENTS:	
<u>Temp</u>	<u>21.8</u>
<u>pH</u>	<u>6.63</u>
<u>DO</u>	<u>1.74</u>
<u>Cond</u>	<u>25.1</u>
<u>ORP</u>	<u>32.0</u>

**AerostarSES<sub>LLC</sub>****SAMPLE COLLECTION LOG****SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)**

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 2-3-16

Sample Technician(s): Ash Willis / Franklin Johnson

Station ID: CHRTN06-004

Type(s) of Sample (circle all that apply):

☒ Sediment☐ Surface Water☐ Groundwater**SEDIMENT SAMPLE**

Sample ID: CHRTN06-004-SB-001 Sample Collection Time: 0910

Sample Depth: ~0.5' Sediment Description: Poorly sorted, black, silty sand

Collection Method: SS Spoon Analysis/Method: Modified EPA 837

Sample Container: PE 250 mL Preservative: N/A

**SURFACE WATER SAMPLE**

Sample ID: CHRTN06-004-SW-001 Sample Collection Time: 0910

Sample Depth: ~0.5' Collection Method: SAMPLE COLLECTOR

Analysis/Method: MODIFIED EPA 837 Sample Container: PE 250 mL

Preservative: N/A Water Quality (circle one): ☒ Clear ☐ Cloudy ☐ Turbid ☐ Other

**GROUNDWATER SAMPLE (GRAB)**

Sample ID: \_\_\_\_\_ Sample Collection Time: \_\_\_\_\_

Sample Depth: \_\_\_\_\_ Collection Method: \_\_\_\_\_

Analysis/Method: \_\_\_\_\_ Sample Container: \_\_\_\_\_

Preservative: \_\_\_\_\_ Water Quality (circle one): ☐ Clear ☐ Cloudy ☐ Turbid ☐ Other

**COMMENTS:**



## SEDIMENT / SURFACE WATER / GROUNDWATER (GRAB)

Project Name: Site Inspections of AFFF Areas (USACE Savannah District)

ASL Project No: M2032.0001

Installation: Joint Base Charleston

Date: 2-3-17

Sample Technician(s): Ash Willis / Franklin Johnson

Station ID: CHRTN08-004

Type(s) of Sample (circle all that apply): Sediment Surface Water Groundwater

## SEDIMENT SAMPLE

Sample ID: CHRTN08-004-S0-001 Sample Collection Time: 0930

Sample Depth: ~0.5' Sediment Description: Finely sorted, red-brown silty sand

Collection Method: SS Spoon Analysis/Method: MODIFIED EPA 537

Sample Container: PE 250mL Preservative: N/A

## SURFACE WATER SAMPLE

Sample ID: CHRTN08-004-SW-001 Sample Collection Time: 0930

Sample Depth: ~0.5' Collection Method: SAMPLE COLLECTION

Analysis/Method: MODIFIED EPA 537 Sample Container: PE 250mL

Preservative: N/A Water Quality (circle one): Clear Cloudy Turbid Other

## GROUNDWATER SAMPLE (GRAB)

Sample ID: CHRTN08-004-GW-001 Sample Collection Time: 0930

Sample Depth: ~0.5' Collection Method: GRAB

Analysis/Method: MODIFIED EPA 537 Sample Container: PE 250mL

Preservative: N/A Water Quality (circle one): Clear Cloudy Turbid Other

## COMMENTS:



## Gas Meter Calibration Sheet

Location: <u>Joint Base Charleston</u>	Project #: <u>M2032.0001</u>	Date: <u>02/02/2017</u>
<b>Instrument Information</b>		
Manufacturer: <u>RAE Systems</u>	Model: <u>MultirAE Lite</u>	Serial #: <u>M01CA02812</u>
Calibrated By: <u>F. Johnson</u>	Company Association: <u>Geologist</u>	

### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Actual meter reading				Pass/Fail
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO	
<del>1131</del>	<del>Y</del>	<del>Y</del>	<del>Y</del>	<del>Y</del>	<del>Y</del>			<del>17.5</del>	<del>PASS</del>	<del>PASS</del>					
1131	Y	Y	Y	Y	Y		50	18.0	10	50	22	17.5	PASS	PASS	✓

### Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
1131	Y	<u>Isobutylene</u>	<u>100.00</u>	<u>100 ppm</u>	<u>85 ppm</u>	<u>✓</u>





## Gas Meter Calibration Sheet

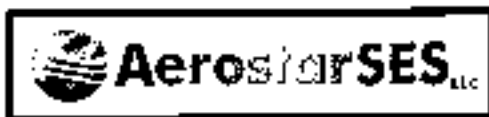
Location: <u>Joint Base Charleston</u>	Project #: <u>M2032.0001</u>	Date: <u>02/02/2017</u>
<b>Instrument Information</b>		
Manufacturer: <u>RAE Systems</u>	Model: <u>Multi RAE Lite</u>	Serial #: <u>MO1CA06551</u>
Calibrated By: <u>A. Willis</u>	Company Association: <u>Geoscient</u>	

### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Actual meter reading				Pass/Fail
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO	
1420	Y	Y	Y	Y	Y		50	18.0	10	50	PASS	PASS	PASS	PASS	✓

### Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
1420	Y	Isobutylene	100.00	100.00	PASS	



## MultiRAE Calibration Sheet

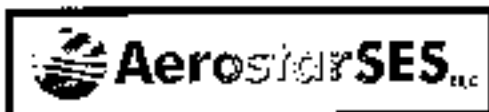
Location: Joint Base Charleston	Project #: M2032.0001	Date: 2/3/17
<b>Instrument Information</b>		
Manufacturer: Honeywell Res Systems	Model: PGM-6288 Multi Gas Lite	Serial #: M01CA02812
Calibrated By: William Kira	Company Association: Field Scientist	

### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (10%)	Oxygen (20.9%)	H2S (10 ppm)	CO (10 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
08:15	Y	Y	Y	Y	Y	Multi gas	50	18	10	50	P	P	P	✓

### Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
08:15	Y	Isobutylene	100	100	Pass	✓



## MultiRAE Calibration Sheet

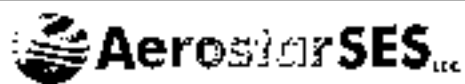
Location: Joint Base Charleston	Project #: M2032.0001	Date: 2/4/17
<b>Instrument Information</b>		
Manufacturer: Honeywell RAE Systems	Model: PGM-6300 Multi Gas C.O.C	Serial #: M01CA02812
Calibrated By: Jeremy Klein	Company Association: Field Scientist	

### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
0750	Y	Y	Y	Y	Y	Multigas	50	18	10	50	P	P	P	P

### Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
0750	Y	Isobutylene	100	100	Pass	✓



## MultiRAE Calibration Sheet

Location: Joint Base Charleston Project #: M2032.0001 Date: 2/5/17

### Instrument Information

Manufacturer: Honeywell Res Systems Model: PGM-8208 Multi Rae Lite Serial #: M01CA02812  
 Calibrated By: Jeremy Klein Company Association: Field Scientist

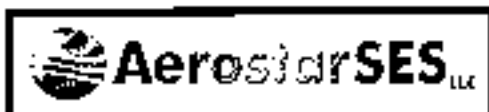
### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (10%)	Oxygen (20.9%)	H2S (10 ppm)	CO (10 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
0745	Y	Y	Y	Y	Y	Multigas	50	18	10	50	P	P	P	P

### Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
0745	Y	Isobutylene	100	100	100.15	





# MultiRAE Calibration Sheet

Location: Joint Base Charleston Project #: M2032.0001 Date: 2/6/17

## Instrument Information

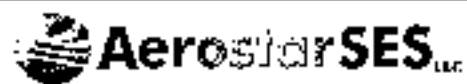
Manufacturer: Honeywell Rae Systems Model: PGM-6286 Multi Gas Lite Serial #: M01CA02812  
Calibrated By: Company Association: Field Scientist

## Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
0740	Y	Y	Y	Y	Y	Multigas	50	18	10	50	P	P	P	P

## Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
0740	Y	Isobutylene	100	100	100	



# MultiRAE Calibration Sheet

Location: Joint Base Charleston Project #: M2032.0001 Date: 2/7/17

## Instrument Information

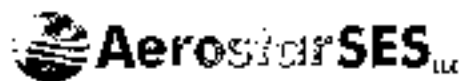
Manufacturer: Honeywell Gas Systems Model: RGM-5208 Multi Gas Lite Serial #: MD1CA02B12  
 Calibrated By: Jeremy Kline Company Association: Field Scientist

## Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
0740	Y	Y	Y	Y	Y	Multigas	50	18	10	50	P	P	P	P

## Photoionization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
0740	Y	isobutylene	100	100	Pass	✓



## MultiRAE Calibration Sheet

Location: Joint Base Charleston Project #: M2032.0001 Date: 2/8/17

### Instrument Information

Manufacturer: Honeywell RAE System Model: PGM-6208 Multi Gas Line Serial #: M01CA02812

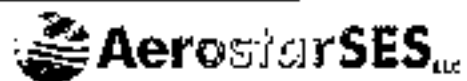
Calibrated By: Jeremy Allen Company Association: Field Scientist

### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
0930	Y	Y	Y	Y	Y	Multigas	50	18	10	50	P	P	P	P

### Photolization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
0930	Y	Isobutylene	100	100	Pass	



## MultiRAE Calibration Sheet

Location: Joint Base Charleston	Project #: M2032.0001	Date: 2/9/17
<b>Instrument Information</b>		
Manufacturer: Honeywell RAE Systems	Model: PGM-6208 Multi Gas Lite	Serial #: M01CA02812
Calibrated By: Jermi Klein	Company Association: Field Scientist	

### Combustible Gas/Oxygen/Carbon Monoxide/Hydrogen Sulfide Calibration

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Pass/Fail (P/F)			
		LEL (0%)	Oxygen (20.9%)	H2S (0 ppm)	CO (0 ppm)		% LEL	% Oxygen	ppm H2S	ppm CO	% LEL	% Oxygen	ppm H2S	ppm CO
0730	/	Y	Y	Y	Y	Multigas	50	18	10	50	P	P	P	P

### Photolization Detector Calibration

Time	Battery Charged (Y/N)	Calibration Standard	Calibration standard concentration (ppm)	Expected meter reading	Actual meter reading	Comments
0730	Y	Isobutylene	100	100	Pass	✓





## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	M2032.0001		Date:	02/02/2017	
<b>Instrument Information</b>								
Manufacturer:	YSI		Model:	556		Serial #:	07E201623	
Calibrated By:	F. Johnson			Company Association:	Geologist			

Time		Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
1440	pH	4	3.74	3.97		
		7	6.91	7.00		
		10	10.16	10.00		

Time	Conductivity	Standard	Reading Before Calibration <sup>mS/cm</sup> (µS/cm)	Reading After Calibration <sup>mS/cm</sup> (µS/cm)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1440		1.413	0.764	1.413		

Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1440		340				

Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1440		100%	294.5	101.3		



## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	M2032.0001		Date:	02/02/2017	
<b>Instrument Information</b>								
Manufacturer:	YSI		Model:	Pro		Serial #:	16M103095	
Calibrated By:	A. Willis			Company Association: Geologist				
Time	pH	Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date		
1420		4	3.97	4.00				
		7	6.96	6.99				
		10	10.45	10.01				
Time	Conductivity	Standard	Reading Before Calibration <sup>mS/cm</sup> <del>µS/cm</del>	Reading After Calibration <sup>mS/cm</sup> <del>µS/cm</del>	Buffer Solution Lot Number	Buffer Solution Expiration Date		
1420		1413	1403	1413				
Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date		
Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date		



## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	M2032.0001		Date:	02/03/2017	
<b>Instrument Information</b>								
Manufacturer:	YSI		Model:	Pro		Serial #:	16M103095	
Calibrated By:	A. Willis			Company Association: Geolcast				

Time	pH	Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
1300		4	3.94	4.00	/	/
		7	6.98	6.99		
		10	10.09	10.02		

Time	Conductivity	Standard	Reading Before Calibration <small>mS/cm</small>	Reading After Calibration <small>mS/cm</small>	Buffer Solution Lot Number	Buffer Solution Expiration Date
1300		1413	1.410	1.413		

Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date

Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date



## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	M2032.0001		Date:	02/03/2017	
<b>Instrument Information</b>								
Manufacturer:	YSI		Model:	556		Serial #:	07E101623	
Calibrated By:	F. Johnson			Company Association: Geologist				

Time		Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
1315	pH	4	4.04	4.00	/	/
		7	7.06	7.00		
		10	10.02	10.01		

Time	Conductivity	Standard	Reading Before Calibration <small>(<math>\mu S/cm</math>)</small>	Reading After Calibration <small>(<math>\mu S/cm</math>)</small>	Buffer Solution Lot Number	Buffer Solution Expiration Date
1315		1413	1.306	1415		

Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date

Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1315		100%	76.3	100.6	n/a	n/a





## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	M2032.0001		Date:	02/04/2017	
<b>Instrument Information</b>								
Manufacturer:	YSI		Model:	556		Serial #:	07E101623	
Calibrated By:	F. Johnson			Company Association: Geologist				

Time	pH	Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
0800		4	4.30	4.06	/	/
		7	6.72	7.02		
		10	10.14	10.00		

Time	Conductivity	Standard	Reading Before Calibration <small>(<math>\mu S/cm</math>)</small>	Reading After Calibration <small>(<math>\mu S/cm</math>)</small>	Buffer Solution Lot Number	Buffer Solution Expiration Date
0800		1.143	1.091	1.413		

Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date
0800		240.0	257.2	240.0		

Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date
0800		100%	132.1	100.1	N/A	N/A



## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #: M2032.0001	Date: 02/06/2017
<b>Instrument Information</b>				
Manufacturer:	YSI		Model: FRO	Serial #: 16M103095
Calibrated By:	A. Willis		Company Association: Geologist	

Time	pH	Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
1040		4	3.97	4.00	/	/
		7	6.98	7.01		
		10	9.39	10.00		

Time	Conductivity	Standard	Reading Before Calibration <small>mS/cm</small>	Reading After Calibration <small>mS/cm</small>	Buffer Solution Lot Number	Buffer Solution Expiration Date
1040		1.413	1.401	1.413		

Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1040		240.0	237.0	240.1		

Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date



## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	M2032,0001		Date:	02/06/2017	
<b>Instrument Information</b>								
Manufacturer:	YSI		Model:	SS6 Pro		Serial #:	160104257	
Calibrated By:	F. Johnson			Company Association: Geologist				

Time	pH	Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
12:14		4	3.92	4.00		
		7	7.11	7.00		
		10	9.90	10.00		

Time	Conductivity	Standard	Reading Before Calibration <small>ms/cm</small>	Reading After Calibration <small>ms/cm</small>	Buffer Solution Lot Number	Buffer Solution Expiration Date
12:14		1.413	127.5	141		

Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date
12:14		240.0	240.4	240.2		

Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date
12:14		100%	107.2	97.2	N/A	N/A



## Daily Calibration Sheet

Location:	Joint Base Charleston		Project #:	Date: 02/08/2017		
<b>Instrument Information</b>						
Manufacturer:	YSI		Model:	Pro		Serial #: 36M103095
Calibrated By:	F. Johnson			Company Association: Geologist		
Time	pH	Standard	Reading Before Calibration	Reading After Calibration	Buffer Solution Lot Number	Buffer Solution Expiration Date
1015		4	3.95	4.00	/	/
		7	7.17	7.03		
		10	10.13	10.00		
Time	Conductivity	Standard	Reading Before Calibration <small>ms/cm</small>	Reading After Calibration <small>ms/cm</small>	Buffer Solution Lot Number	Buffer Solution Expiration Date
1015		1413	0.80	1.41		
Time	ORP	Standard	Reading Before Calibration (mV)	Reading After Calibration (mV)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1015		240.0	234.5	240.0		
Time	DO	Standard	Reading Before Calibration (%)	Reading After Calibration (%)	Buffer Solution Lot Number	Buffer Solution Expiration Date
1015		100%	93.9	99.5	N/A	N/A






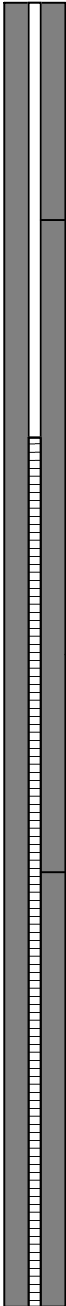
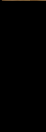


# BORING LOG - CHRTN01-001 (Page 1 of 1)

Site Name : AFFF Area 1  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Bill Hart  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 5.0  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/2/17  
 End Date : 2/2/17  
 Northing : 386675.14  
 Easting : 2299504.28  
 Surface Elev. (ft)\* : 33.09  
 Total Depth (ft)\*\* : 15.0

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: CHRTN01-001 Elev (TOC): 33.52	
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)								DESCRIPTION
0	1	100	(0.0 - 3.5) CLAYEY SAND, 10YR 4/4, dark yellowish brown, low plasticity, medium soft, no odor, damp	0	SC				SS	CHRTN01-001-SS-001 CHRTN01-001-SS-901 Note: Interval 0.0 - 0.5 ft	 <div>Riser 0.75 in. Sch 40 PVC</div> <div>Open 2.25 in. diameter borehole</div> <div>Screen 5.0 - 15.0 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC</div> <div>End Cap</div>	
1	2											
2	3											
3	4											
4	5		(3.5 - 5.0) CLAYEY SAND, 5Y 2.5/1, black, medium plasticity, soft, no odor, moist		SC				SO	CHRTN01-001-SO-004 CHRTN01-001-SO-904 Note: Interval 3.0 - 4.0 ft		
5		66	(5.0 - 8.3) SILTY CLAY, 5Y 5/1, gray, high plasticity, medium stiff, no odor, damp	0	CL							
6												
7												
8												
9		100	(8.3 - 15.0) SILTY SAND, 5Y 6/1, gray, non-plastic, soft, no odor, saturated	0	SM							
10												
11												
12												
13	7											
14												
15			End of Borehole 15.0 ft BGS									

Riser  
0.75 in.  
Sch 40 PVC

Open 2.25 in.  
diameter  
borehole

Screen  
5.0 - 15.0  
ft bgs  
0.010 in.  
Prepack  
machine slot  
Sch 40 PVC

End Cap




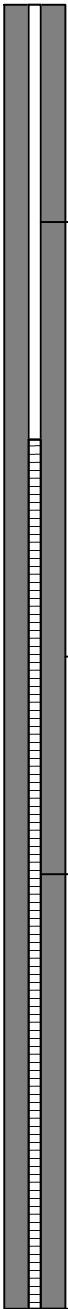

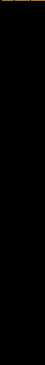

# BORING LOG - CHRTN01-002 (Page 1 of 1)

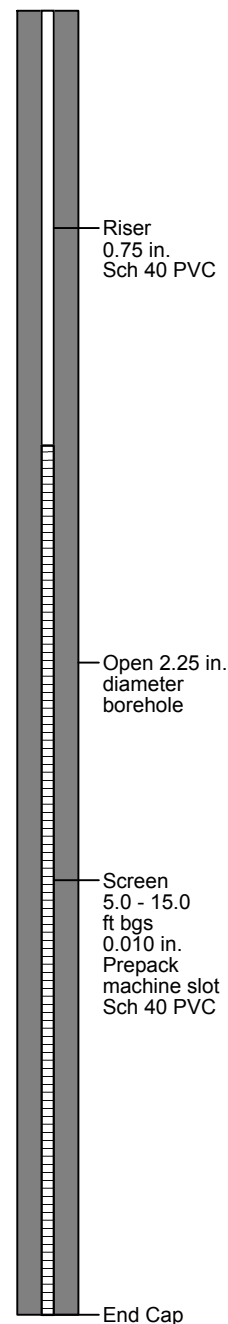
Site Name : AFFF Area 1  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Bill Hart  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 6.0  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/2/17  
 End Date : 2/2/17  
 Northing : 386786.12  
 Easting : 2299537.79  
 Surface Elev. (ft)\* : 34.46  
 Total Depth (ft)\*\* : 15.0

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: CHRTN01-002 Elev. (TOC): 34.80
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)							
0	1	100	(0.0 - 3.5) CLAYEY SAND with organics, 7.5YR 4/1, dark gray, non-plastic, soft, no odor, slightly damp	0	SC				SS	CHRTN01-002-SS-001 Note: Interval 0.0 - 0.5 ft	 <div>Riser 0.75 in. Sch 40 PVC</div> <div>Open 2.25 in. diameter borehole</div> <div>Screen 5.0 - 15.0 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC</div> <div>End Cap</div>
1	2										
2	3										
3	4										
4	5	60	(3.5 - 5.0) SILTY SAND, 10YR 6/6, brownish yellow, low plasticity, very soft, no odor, damp	0	SM				SO	CHRTN01-002-SO-005 Note: Interval 4.0 - 5.0 ft	
5	6										
6	7										
7	8										
8	9	76	(6.5 - 10.7) SILTY CLAY, 5Y 2.5/1, black, high plasticity, soft, no odor, wet		CL						
9	10										
10	11										
11	12										
12	13	76	(10.7 - 15.0) SILTY SAND, 5Y 6/2, light olive gray, very soft, no odor, medium plasticity, saturated		SM						
13	14										
14	15										
15											
End of Borehole 15.0 ft BGS											






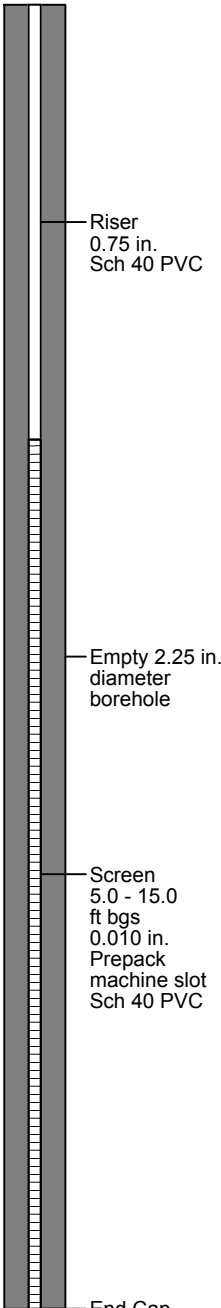



# BORING LOG - CHRTN01-003 (Page 1 of 1)

Site Name : AFFF Area 1  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Bill Hart  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 6.3  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/2/17  
 End Date : 2/2/17  
 Northing : 386698.61  
 Easting : 2299562.98  
 Surface Elev. (ft)\* : 34.19  
 Total Depth (ft)\*\* : 15.0

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: CHRTN01-003 Elev. (TOC): 34.57
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)							
0	1	100	(0.0 - 3.5) CLAYEY SAND with organics, 10YR 4/4, dark yellowish brown, low plasticity, soft, no odor, damp			0					 <div>Riser 0.75 in. Sch 40 PVC</div> <div>Empty 2.25 in. diameter borehole</div> <div>Screen 5.0 - 15.0 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC</div> <div>End Cap</div>
1	2										
2	3										
3	4										
4	5	70	(3.5 - 8.3) CLAYEY SAND, 5Y 2.5/1, black, soft, medium plasticity, no odor, moist			0					
5	6										
6	7										
7	8										
8	9	60	(8.3 - 10.3) SILTY CLAY, 5Y 5/1, gray, high plasticity, medium stiff, no odor			0					
9	10										
10	11										
11	12										
12	13	60	(10.3 - 15.0) SILTY SAND, 5Y 6/1, gray, soft, non plastic, saturated, sulfur smell			0					
13	14										
14	15										
15											
End of Borehole 15.0 ft BGS											



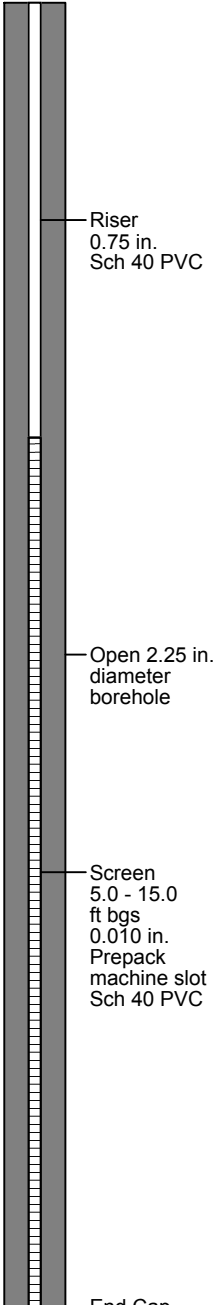
# BORING LOG - CHRTN02-001 (Page 1 of 1)

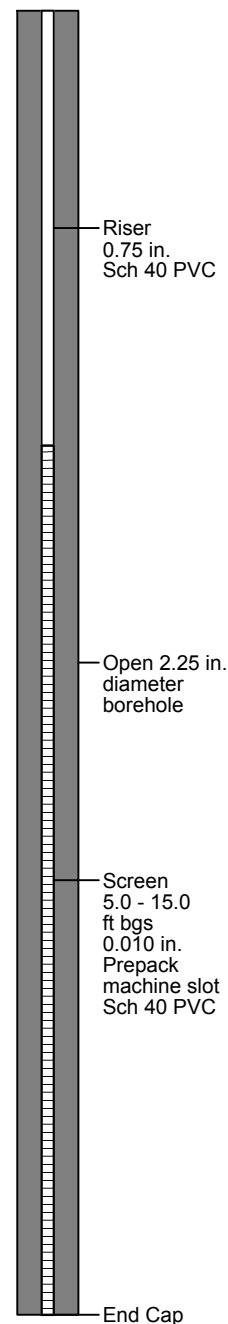
Site Name : AFFF Area 2  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 6.0  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/8/17  
 End Date : 2/8/17  
 Northing : 386173.12  
 Easting : 2290620.77  
 Surface Elev. (ft)\* : 30.35  
 Total Depth (ft)\*\* : 15.0

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: CHRTN02-001 Elev. (TOC): 30.31				
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)								DESCRIPTION			
0	1	100	(0.0 - 3.5) SILT (Organic), medium plasticity, 2.5Y 3/1, dark gray, very soft, no odor, damp			0	OL		SS	CHRTN02-001-SS-001 Note: Interval 0.0 - 0.5 ft					
1	2														
2	3														
3	4														
4	5		(3.5 - 4.8) SILTY SAND, 2.5Y 4/2, dark grayish brown, soft, low plasticity, no odor, damp				SM	SO	CHRTN02-001-SO-005 Note: Interval 4.0 - 5.0 ft	Riser 0.75 in. Sch 40 PVC					
5	6	(4.8 - 5.9) SILTY CLAY, 5Y 5/1, gray, high plasticity, medium stiff, no odor, damp			0	SC									
6	7	(5.9 - 11.2) SILTY SAND, 2.5Y 6/1, gray, non-plastic, very soft, no odor, saturated				SM						Open 2.25 in. diameter borehole			
7	8														
8	9														
9	10														
10	11	88				0	SM							Screen 5.0 - 15.0 ft bgs 0.010 in. Prepack machine slot Sch 40 PVC	
11	12		(11.2 - 15.0) SILTY SAND, 2.5Y 7/8 to 7/3, yellow to pale brown, low plasticity, soft, no odor, saturated												
12	13														
13	14														
14	15	88					SM								
			End of Borehole 15.0 ft BGS			0									







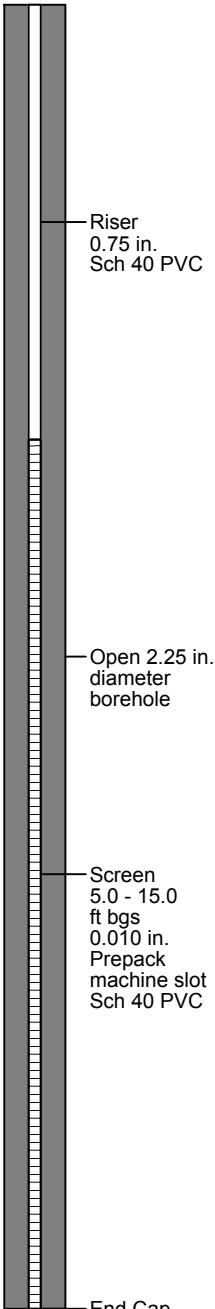
# BORING LOG - CHRTN02-002 (Page 1 of 1)

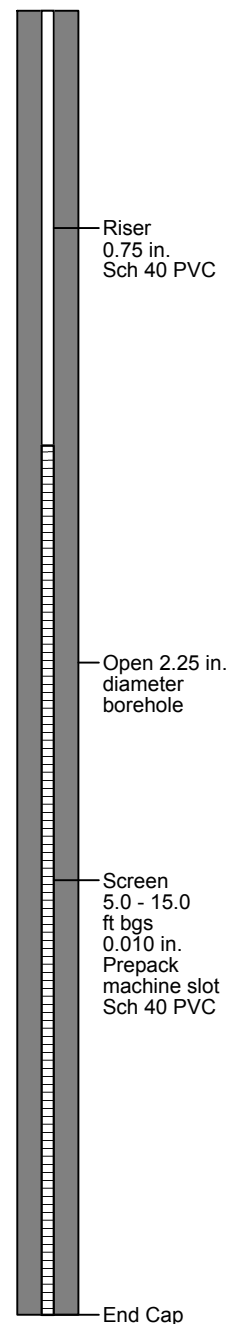
Site Name : AFFF Area 2  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 7.9  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/8/17  
 End Date : 2/8/17  
 Northing : 386072.04  
 Easting : 2290644.90  
 Surface Elev. (ft)\* : 29.94  
 Total Depth (ft)\*\* : 15.0

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: CHRTN02-002 Elev. (TOC): 29.98		
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)								DESCRIPTION	
0	1		(0.0 - 2.0) SILT with gravel, 2.5Y 3/2, dark gray, low plasticity, soft, no odor, damp		0				SS	CHRTN02-002-SS-001 Note: Interval 0.0 - 0.5 ft			
1	2				OL								
2	3	100			(2.0 - 7.8) SANDY CLAY, 10YR 5/8, strong brown, some molting with gray, stiff, highly plasticity, no odor, slightly damp								
3	4												
4	5												
5	6		wet		0	CL			SO	CHRTN02-002-SO-006 Note: Interval 5.0 - 6.0 ft			
6	7	88											
7	8				(7.8 - 8.6) SILTY SAND, 7.5YR 7/8, reddish yellow, soft, no odor, low plasticity, saturated			SM					
8	9				(8.6 - 9.3) SANDY CLAY, 2.5Y 6/1, gray, highly plasticity, stiff, no odor, wet			CL					
9	10		(9.3 - 10.6) SILTY SAND, 2.5Y 6/1, gray, low plasticity, soft, no odor, saturated		0	SM							
10	11		(10.6 - 15.0) SILTY SAND, 2.5Y 5/4, light olive brown, low plasticity, soft, no odor, saturated										
11	12												
12	13	100						SM					
13	14												
14	15				0								
End of Borehole 15.0 ft BGS													





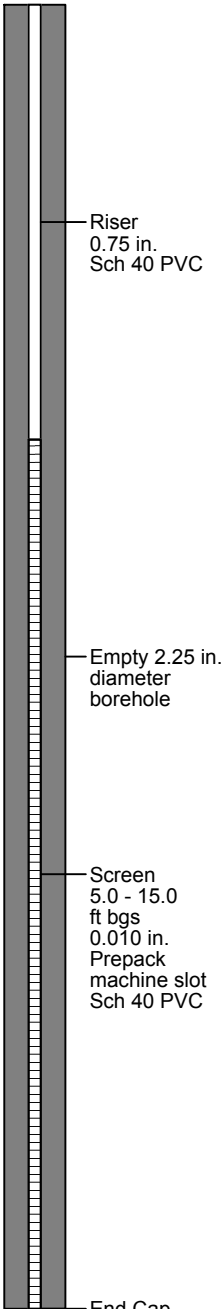
# BORING LOG - CHRTN02-003 (Page 1 of 1)

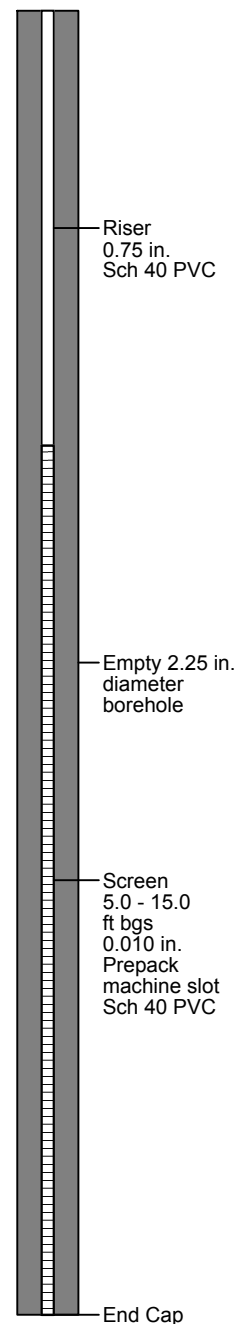
Site Name : AFFF Area 2  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 7.2  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/8/17  
 End Date : 2/8/17  
 Northing : 386153.33  
 Easting : 2290675.81  
 Surface Elev. (ft)\* : 30.53  
 Total Depth (ft)\*\* : 15.0

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: CHRTN02-002 Elev. (TOC): N/A
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)							
0	1	100	(0.0 - 1.5) SILT (Organic), 2.5Y 3/2, dark grayish brown, low plasticity, soft, no odor, damp	0	OL			SS	CHRTN02-003-SS-001 Note: Interval 0.0 - 0.5 ft		
1	2		(1.5 - 4.0) CLAYEY SAND, 2.5Y 5/6, light olive brown, medium stiff, medium plasticity, no odor, moist		SC						
2	3										
3	4										
4	5	90	(4.0 - 7.2) SANDY CLAY, 2.5Y 6/1, gray grading to yellowish brown, medium stiff, highly plasticity, wet to depth	0	CL			SO	CHRTN02-003-SO-006 Note: Interval 5.0 - 6.0 ft		
5	6										
6	7										
7	8		(7.2 - 15.0) SILTY SAND, 2.5Y 6/1, gray grading to light olive brown, non-plastic, no odor, saturated								
8	9	100									
9	10										
10	11										
11	12										
12	13										
13	14										
14	15										
15	End of Borehole 15.0 ft BGS										





# BORING LOG - CHRTN03-001 (Page 1 of 1)

Site Name : AFFF Area 3  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 7.7  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/7/17  
 End Date : 2/7/17  
 Northing : 391222.61  
 Easting : 2291254.59  
 Surface Elev. (ft)\* : 38.77  
 Total Depth (ft)\*\* : 15.0

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: CHRTN03-001 Elev. (TOC): 38.76
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)							
0	1	100	(0.0 - 2.5) SILT (Organic), 2.5Y 5/1/N, black, medium plasticity, medium stiff, no odor, slightly damp		0				SS	CHRTN03-001-SS-001 Note: Interval 0.0 - 0.5 ft	
1	2										
2	3										
3	4										
4	5	98	(2.5 - 5.0) SILTY SAND, 2.5Y 5/6, light olive brown, soft, medium plasticity, no odor, damp							CHRTN03-001-SO-006 Note: Interval 5.0 - 6.0 ft	
5	6										
6	7										
7	8										
8	9	100	(5.0 - 7.6) CLAYEY SAND, 2.5Y 7/2, light gray with strong brown mottling, high plasticity, no odor, damp		0				SO		
9	10										
10	11										
11	12										
12	13	100	(7.6 - 15.0) SILTY SAND, 5Y 7/1, light gray, low plasticity, no odor, wet to saturated								
13	14										
14	15										
15											
End of Borehole 15.0 ft BGS											

Riser  
0.75 in.  
Sch 40 PVC

Open 2.25 in.  
diameter  
borehole

Screen  
5.0 - 15.0  
ft bgs  
0.010 in.  
Prepack  
machine slot  
Sch 40 PVC

End Cap



# BORING LOG - CHRTN03-002 (Page 1 of 1)

Site Name : AFFF Area 3  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 6.6  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/7/17  
 End Date : 2/7/17  
 Northing : 391243.22  
 Easting : 2291225.48  
 Surface Elev. (ft)\* : 39.97  
 Total Depth (ft)\*\* : 15.0

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: CHRTN03-002 Elev. (TOC): 40.21		
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)								DESCRIPTION	
0	1	100	(0.0 - 2.5) SILT (Organic), 2.5Y 5/1/N, black, medium plasticity, medium stiff, no odor, slightly damp		0				SS	CHRTN03-002-SS-001 Note: Interval 0.0 - 0.5 ft			
1	2												
2	3				(2.5 - 5.0) SILTY SAND, 2.5Y 5/6, light olive brown, soft, medium plasticity, no odor, damp								
3	4												
4	5												
5	6	88	(5.0 - 7.6) CLAYEY SAND, 2.5Y 7/2, light gray with strong brown mottling, high plasticity, no odor, damp,		0				SO	CHRTN03-002-SO-005 Note: Interval 5.0 - 6.0 ft			
6	7												
7	8				(7.6 - 15.0) SILTY SAND, 5Y 7/1, light gray, low plasticity, no odor, wet to saturated								
8	9												
9	10	100			0								
10	11												
11	12												
12	13												
13	14												
14	15												
End of Borehole 15.0 ft BGS													

Riser  
0.75 in.  
Sch 40 PVC

Open 2.25 in.  
diameter  
borehole

Screen  
5.0 - 15.0  
ft bgs  
0.010 in.  
Prepack  
machine slot  
Sch 40 PVC

End Cap





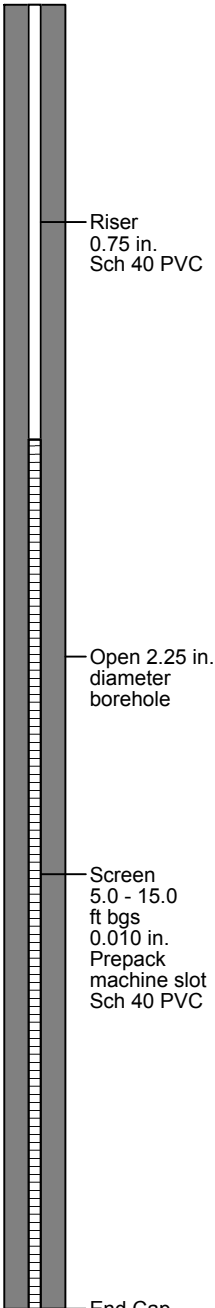
# BORING LOG - CHRTN03-003 (Page 1 of 1)

Site Name : AFFF Area 3  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe 7822 DT  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 7.7  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/7/17  
 End Date : 2/7/17  
 Northing : 391218.45  
 Easting : 2291061.06  
 Surface Elev. (ft)\* : 40.13  
 Total Depth (ft)\*\* : 15.0

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: CHRTN03-003 Elev. (TOC): 40.22	
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)								DESCRIPTION
0	1	100	(0.0 - 3.5) SILT (Organic), 2.5Y 5/1/N, black, non-plastic, no odor, slightly damp		0				SS	CHRTN03-003-SS-001 Note: Interval 0.0 - 0.5 ft		
1	2					OL						
2	3											
3	4											
4	5	86	(3.5 - 4.5) SILTY SAND, 10YR 4/4, dark yellowish brown, soft, low plasticity, no odor, slightly damp			SM						
5	6		(4.5 - 7.5) CLAYEY SAND, 7.5YR 5/8, strong brown, medium plasticity, no odor, damp,		0				SO	CHRTN03-003-SO-006 Note: Interval 5.0 - 6.0 ft		
6	7					SC						
7	8		(7.5 - 8.7) SILTY SAND, 10YR 5/4, yellowish brown, medium stiff, medium plasticity, no odor, wet			SM						
8	9	100	(8.7 - 9.5) SILTY SAND, 10YR 6/2, light brownish gray with reddish yellow mottling, some light brownish gray, low plasticity, soft, no odor, saturated									
9	10				0	SM						
10	11											
11	12		(11.5 - 15.0) SILTY SAND, 10YR 6/2, light brownish gray, low plasticity, soft, no odor, saturated									
12	13	7				SM						
13	14											
14	15				0							
			End of Borehole 15.0 ft BGS									

Riser  
0.75 in.  
Sch 40 PVC

Open 2.25 in.  
diameter  
borehole

Screen  
5.0 - 15.0  
ft bgs  
0.010 in.  
Prepack  
machine slot  
Sch 40 PVC

End Cap








# BORING LOG - CHRTN04-001 (Page 1 of 1)

Site Name : AFFF Area 4  
 Drilling Company : CASCADE  
 Drilling Method : Geoprobe SP-16  
 Driller : Dan Ferrel  
 Borehole Diameter : 2.25 in.  
 Boring Completion : Abandoned with Bentonite Chips  
 Abandonment Date : 2/09/17  
 DTW During Drilling (ft) : 7.0  
 Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/9/17  
 End Date : 2/9/17  
 Northing : 386344.07  
 Easting : 2294507.75  
 Surface Elev. (ft)\* : 30.1  
 Total Depth (ft)\*\* : 15.0

DEPTH IN FEET (BGS)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Hydropunch Screen (11.0 - 15.0 ft):
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)							
0	1	100	(0.0 - 3.0) SILT (Organic), 2.5Y 5/1/N, black, non-plastic, no odor, slightly damp	0	OL			SS	CHRTN04-001-SS-001 Note: Interval 0.0 - 0.5 ft		
1	2										
2	3										
3	4	90	(3.0 - 5.5) SILTY SAND, 2.5Y 5/1, gray, soft, low plasticity, moist, no odor	0	SM			SO	CHRTN04-001-SO-006 Note: Interval 5.0 - 6.0 ft		
4	5										
5	6										
6	7	84	(5.5 - 7.9) SILTY SAND, 2.5Y 3/2, very dark grayish brown, soft, moist no odor saturated	0	SM		▼				
7	8										
8	9										
9	10		(7.9 - 13.1) SANDY CLAY, high plasticity, 2.5Y 5/1, gray, stiff, no odor, damp	0	CL						
10	11										
11	12										
12	13		(13.1 - 15.0) SILTY SAND, 2.5Y 7/1, light gray, low plasticity, soft, no odor, saturated	0	SM			WG	CHRTN04-001-GW-013 Note: Interval 11.0 - 15.0 ft		
13	14										
14	15										
End of Borehole 15.0 ft BGS											



# BORING LOG - CHRTN04-002 (Page 1 of 1)

Site Name : AFFF Area 4  
Drilling Company : CASCADE  
Drilling Method : Geoprobe SP-16  
Driller : Dan Ferrel  
Borehole Diameter : 2.25 in.  
Boring Completion : Abandoned with Bentonite Chips  
Abandonment Date : 2/09/17  
DTW During Drilling (ft) : 7.5  
Logged By : Jeremy Klein

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

Joint Base Charleston-Air

Start Date : 2/9/17  
End Date : 2/9/17  
Northing : 386512.29  
Easting : 2294639.64  
Surface Elev. (ft)\* : 31.55  
Total Depth (ft)\*\* : 15.0

DEPTH IN FEET (BGS)	INTERVAL	% RECOVERY	Water Levels	Measurements	PID (ppm)	USCS	Munsell Soil Color	Depth to Water (DTW)	SAMPLE TYPE	SAMPLE ID	Hydropunch Screen (11.0 - 15.0 ft)
			▼ During Drilling	*Above Mean Sea Level (AMSL) feet (ft)  **Below Ground Surface (BGS) feet (ft)							
0	1	100	(0.0 - 1.0) SILT (Organic), 2.5Y 3/3, dark olive brown, low plasticity, no odor, damp	0	OL			SS	CHRTN04-002-SS-001 CHRTN04-002-SS-901 Note: Interval 0.0 - 0.5 ft		
1	2		(1.0 - 2.0) SILTY SAND, 2.5Y 5/6, light olive brown, low plasticity, soft, no odor, damp	0	SM						
2	3		(2.0 - 3.5) SILTY SAND, 2.5Y 3/2, very dark grayish brown, low plasticity, soft, moist no odor		SM						
3	4		(3.5 - 4.5) SILTY SAND, 2.5Y 5/1, black, soft, medium plasticity, no odor, moist		SM						
4	5		90	(4.5 - 6.5) SILTY SAND, 10YR 3/3, dark brown, soft, medium plasticity, no odor, moist	0	SM			SO	CHRTN04-002-SO-006 CHRTN04-002-SO-906 Note: Interval 5.0 - 6.0 ft	
5	6	(6.5 - 7.5) SILTY SAND, 2.5 4/4, olive brown, soft, no odor, low plasticity, wet			SM						
6	7	(7.5 - 8.3) SILTY SAND, 2.5Y 5/3, light olive brown, non-plastic, soft, no odor, saturated			SM						
7	8	(8.3 - 8.9) CLAYEY SAND, 2.5Y 4/3, olive brown, stiff, high plasticity, no odor, damp			SC						
8	9	84		(8.3 - 14.3) SANDY CLAY, 2.5Y 5/1, gray, stiff to medium stiff, high plasticity, no odor, damp						CHRTN04-002-GW-013 CHRTN04-002-GW-913 Note: Interval 11.0 - 15.0 ft	
9	10		Grading to olive yellow, 2.5Y 6/6		CL						
10	11										
11	12										
12	13							WG			
13	14		(14.3 - 15.0) SILTY SAND, 10YR 6/8, brownish yellow, medium stiff, medium plasticity grading to low plasticity, no odor, wet to saturated	0	SM						
14	15										
15	16	End of Borehole 15.0 ft BGS									