FINAL
Site Inspection Report
Army Aviation Support Facility
Upstate
Greenville, South Carolina

Site Inspection for Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), Perfluorohexanesulfonic acid (PFHxS), Perfluorononanoic acid (PFNA), Hexafluoropropylene oxide dimer acid (HFPO-DA), and Perfluorobutanesulfonic acid (PFBS) at ARNG Installations, Nationwide

August 2023

Prepared for:

Army National Guard Bureau
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UNCLASSIFIED

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
amsl	above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	direct push technology
DQO	data quality objective
DUA	data usability assessment
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
GPRS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IBC	intermediate bulk container
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
OSD	Office of the Secretary of Defense
OWS	oil-water separator
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector

POTW	publicly owned treatment works
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
SCARNG	South Carolina Army National Guard
SCTAC	South Carolina Technology and Aviation Center
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

Executive Summary

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS). These compounds are collectively referred to as "relevant compounds" throughout the document and the applicable screening levels (SLs) are provided in **Table ES-1**.

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations.. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at the Army Aviation Support Facility (AASF) Upstate in Greenville, South Carolina and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1 and AOI 2. AASF Upstate will also be referred to as the "facility" throughout this document.

AASF Upstate, which is located approximately 6 miles south of the City of Greenville, occupies approximately 34 acres in the northern portion of South Carolina Technology and Aviation Center (formerly known as the "Donaldson Center Industrial Park"), the public airport park belonging to the County/City of Greenville, South Carolina. The facility is primarily used for aviation maintenance of rotary-wing aircraft, flight instruction, and evaluation of aviation units. The facility includes two hangars separated by an administrative building, fuel storage, oil storage, a wash rack, aircraft ramp, and a helipad.

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the two AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation (RI) for AOI 1 and AOI 2.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI, as screening values were established after SI planning and execution. However, ARNG will add HFPO-DA to the list of constituents sampled during the next phase of CERCLA if warranted.

Table ES-1: Screening Levels (Soil and Groundwater)

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) Screening values for HFPO-DA were established after SI planning and execution and thus not included as an analyte. Future CERCLA phases will include HFPO-DA if warranted.

Table ES-2: Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Hot and Cold Hangars	◐	●	N/A	Proceed to RI
2	Wash Rack	◐	●	●	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at the Army Aviation Support Facility (AASF) Upstate in Greenville, South Carolina. AASF Upstate is also referred to as the "facility" throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; United States [US] Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations.

1.2 SI Purpose

A PA was performed at AASF Upstate (AECOM Technical Services, Inc. [AECOM], 2020) that identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI, as screening values were established after SI planning and execution. However, ARNG will add HFPO-DA to the list of constituents sampled during the next phase of CERCLA if warranted.

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2. Facility Background

2.1 Facility Location and Description

AASF Upstate occupies approximately 34 acres in the northern portion of South Carolina Technology and Aviation Center (SCTAC) (formerly known as the "Donaldson Center Industrial Park"), the public airport park belonging to the County/City of Greenville, South Carolina. AASF Upstate, and the encompassing SCTAC are within a portion of land, previously occupied by the former Donaldson Air Force Base, that was acquired by the County/City of Greenville from the US Air Force in 1964 (ENSR Corporation, 2008). The facility is located approximately 6 miles south of the City of Greenville and is situated along the northern point of Donaldson Center Airport. The main gate is accessible along Connecticut Court near Perimeter Road. **Figure 2-1** illustrates the location of the AASF Upstate.

AASF Upstate is a South Carolina ARNG (SCARNG) maintenance facility for aircraft; the property has been leased from the County/City of Greenville since 3 September 2009. Construction activities for the facility began in 2011, and AASF Upstate operations officially began on 19 February 2014. The leasing agreement is set to expire on 3 September 2034 but may be extended for up to two consecutive 25-year leasing terms.

2.2 Facility Environmental Setting

AASF Upstate sits within the Piedmont Physiographic Province of South Carolina, a region characterized by rolling hills situated at the foot of the Appalachian Mountains (Cain et al., 2000). The topography slopes to the north/northeast direction, towards an unnamed pond that drains into Marrow Bone Creek (**Figure 2-2**). The aircraft ramp sits on relatively flat terrain, at an elevation of 920 feet above mean sea level (amsl), separated from the pond by an approximately 40-foot retaining wall. Overall surface elevations at the facility range from 886 to 925 feet amsl.

2.2.1 Geology

AASF Upstate is located within the Piedmont Physiographic Province, which is made up of allochthonous, extensively fractured, and deformed igneous and metamorphic crystalline rocks that are overlain by red, clayey saprolite, a product of deep in-situ chemical weathering of bedrock. Less developed saprolite can sometimes retain features of the original rock, such as foliation. The thickness of the saprolite varies across the region, generally depending on the susceptibility of the underlying bedrock to weathering (**Figure 2-3**). Rivers in this area are erosional and are confined to narrow valleys (Cain et al., 2000).

According to the US Department of Agriculture Natural Resources Conservation Service Web Soil Survey, soils within the facility boundary belong to the Cecil-Urban Land complex, an equal mixture of Cecil soils and Urban Land soils. Cecil soils are clayey residuum from weathered granite and gneiss and are characterized by well-drained sandy loams, clay, and sandy clay loams. Urban Land soils are described as human-transported soils (Web Soil Survey, 2019). According to interviews with AASF Upstate personnel, the facility was constructed on approximately 70 feet of fill. The fill was brought in for the facility construction activities, but the origins of the fill are otherwise unknown.

During the SI, varying quantities of sand were observed as the dominant lithology of the unconsolidated sediments below the AASF Upstate, with isolated layers of poorly graded sand, well-graded sand, clayey sand, and silty sand. Layer thicknesses ranged from several inches to 15 feet. Fill material primarily consisting of well graded sand increases in thickness towards the northern portion of the facility. The maximum observed thickness of fill material was 12 feet.

Clayey saprolite was observed below the fill, on top of the bedrock where refusal was encountered in several borings. The borings were completed at depths between 11 and 40 feet below ground surface (bgs). Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

Groundwater at AASF Upstate occurs in the saprolite and fractured bedrock, which are hydraulically connected. Only one aquifer exists at the facility, the shallow surficial aquifer. Though the saprolite is clayey, groundwater still moves through it. Groundwater movement is dictated by primary porosity features as well as secondary features, including fracturing, faulting, and degree of weathering. The groundwater flow direction follows the topographic gradient (trending north to northeast). Groundwater features are presented on **Figure 2-3**.

An Environmental Data Resources, Inc.™ report provided a well search for a 1-mile radius surrounding the facility. Using additional online resources, such as state and local Geographic Information System databases, wells were researched to a 4-mile radius of the facility. Multiple monitoring wells are located in the surrounding area. Groundwater level measurements for the monitoring wells screened in the bedrock of the Piedmont and Blue Ridge crystalline-rock aquifer are between 20 to 22 feet bgs (US Geological Survey [USGS], 2019). There are no water supply wells within the facility, and potable water is supplied by Greenville Water (ENSR Corporation, 2008). Greenville Water has surface water intakes at Table Rock Reservoir, North Saluda Reservoir, and Lake Keowee (Greenville Water, 2020). All three drinking water intakes are located between 25 and 30 miles from the facility. One public water supply well is located cross-gradient of the facility, approximately 3.5 miles to the south.

Depths to water measured in February 2022 during the SI ranged from 4.87 to 26.37 feet bgs. Variation in depth to groundwater appears to reflect historic site topography, pre-development of the AASF. Groundwater appears to primarily exist in the saprolitic zones above the weathered bedrock and below the contact with the fill above. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate the groundwater flow direction at the AASF is primarily to the north.

2.2.3 Hydrology

AASF Upstate is located in the Brushy Creek-Reedy River Watershed. A stormwater drainage system carries stormwater from the parking lot, aircraft ramp, and nearby grassy areas and discharges below a retaining wall into an unnamed pond, located north of the aircraft ramp. The pond is connected to an unnamed tributary of Marrow Bone Creek. A drainage ditch also bounds the southern and eastern end of the aircraft ramp and carries stormwater into an on-facility retention basin located directly northeast of the helipad. The retention basin is not expected to discharge into the adjacent pond, except during major storm events (SynTerra, 2016). Surface water that is not captured by the stormwater drainage system follows the topographic gradient and flows north/northeast towards either the pond or retention basin. Marrow Bone Creek is located approximately 800 feet north of the pond and flows northeast before connecting to the Reedy River, approximately 1.2 miles east of the facility. Surface water features are presented on **Figure 2-5**.

2.2.4 Climate

AASF Upstate is in a humid, subtropical climate zone characterized by long and warm summers and short and mild winters. Rainfall is generally greater during the summer months but otherwise well-distributed year-round, with a normal annual precipitation of 47.2 inches. Summer temperatures peak in July, with an average temperature of 80 degrees Fahrenheit (°F). Winter

temperatures are lowest in January, with an average temperature of 42 °F. The region typically receives about 4.7 inches of snowfall annually (National Weather Service Forecast Office, 2020).

2.2.5 Current and Future Land Use

The facility is used by SCARNG for aviation maintenance of rotary-wing aircraft, flight instruction, and evaluation of aviation units (SynTerra, 2016). Related infrastructure includes two hangars separated by an administrative building, fuel storage, oil storage, a wash rack, aircraft ramp, and a helipad. Reasonably anticipated future land use is not expected to change from the current land use.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

A wildlife survey has not occurred at the facility, and the facility does not have any significant areas of habitat. The following species have not been identified at the facility but may be present in the surrounding area.

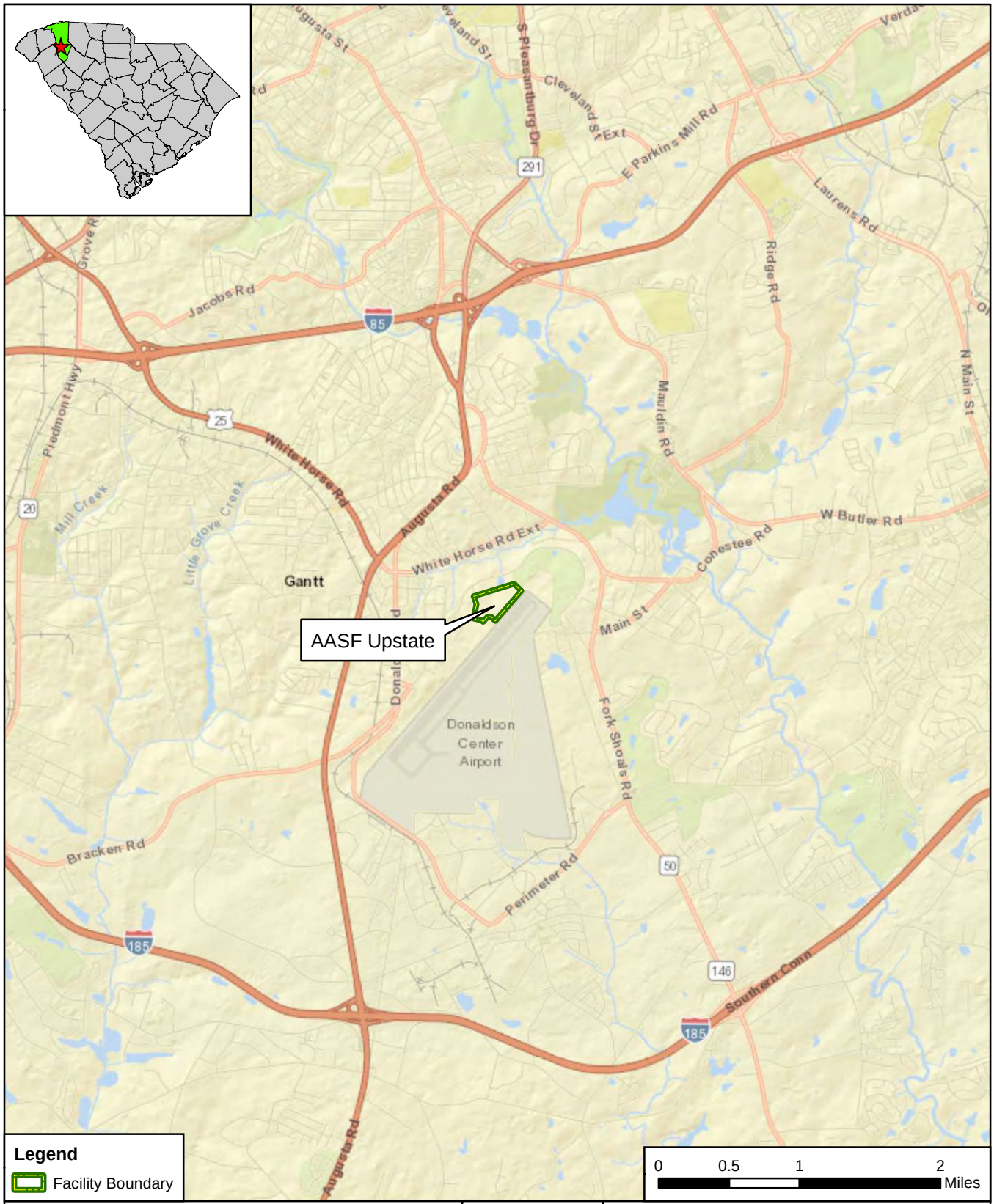
The following amphibians, birds, clams, conifers, cycads, crustaceans, plants, insects, lichens, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Greenville County, South Carolina (US Fish and Wildlife Service [USFWS], 2022).

- **Amphibians:** Green salamander, *Aneides aeneus* (status undefined)
- **Birds:** Golden-winged warbler, *Vermivora chrysoptera* (under review)
- **Clams:** Appalachian elktoe, *Alasmidonta raveneliana* (endangered); Longsolid, *Fusconaia subrotunda* (proposed threatened)
- **Conifers and Cycads:** Carolina hemlock, *Tsuga caroliniana* (under review)
- **Crustaceans:** Little River crayfish, *Cambarus spicatus* (under review); Mimic crayfish, *Distocambarus carlsoni* (under review)
- **Flowering Plants:** Small whorled pogonia, *Isotria medeoloides* (threatened); Bunched arrowhead, *Sagittaria fasciculata* (endangered); White fringeless orchid, *Platanthera integrilabia* (threatened); Dwarf-flowered heartleaf, *Hexastylis naniflora* (threatened); White irisette, *Sisyrinchium dichotomum* (endangered); Mountain sweet pitcher-plant, *Sarracenia rubra ssp. jonesii* (endangered); Sunfacing coneflower, *Rudbeckia heliopsidis* (under review); Mountain Purple pitcherplant, *Sarracenia purpurea var. montana* (under review); Swamp pink, *Helonias bullata* (threatened)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Lichens:** Rock gnome lichen, *Gymnoderma lineare* (endangered)
- **Mammals**: Tricolored bat, *Perimyotis subflavus* (under review); Little brown bat, *Myotis lucifugus* (under review); Rafinesque's big-eared bat, *Plecotus rafinesquii* (species of concern); Northern long-eared bat, *Myotis septentrionalis* (threatened)
- **Reptiles**: Bog turtle, *Glyptemys muhlenbergii* (threatened)

2.3 History of PFAS Use

Three potential release areas were identified at AASF Upstate during the PA where aqueous film-forming foam (AFFF) may have been used or released historically (AECOM, 2020). AASF Upstate includes two maintenance hangars: the Cold Hangar and the Hot Hangar. Both hangars are

equipped with fire suppression systems that utilize AFFF. In April 2014, a test of both fire suppression systems was performed during which both hangers were filled with foam. In July 2019, a tripped valve caused an accidental release from one overhead foam generator. Rinse water from this accidental release was directed to the Wash Rack. The potential release areas were grouped into two AOIs based on proximity to one another and presumed groundwater flow. A description of each AOI is presented in **Section 3**.



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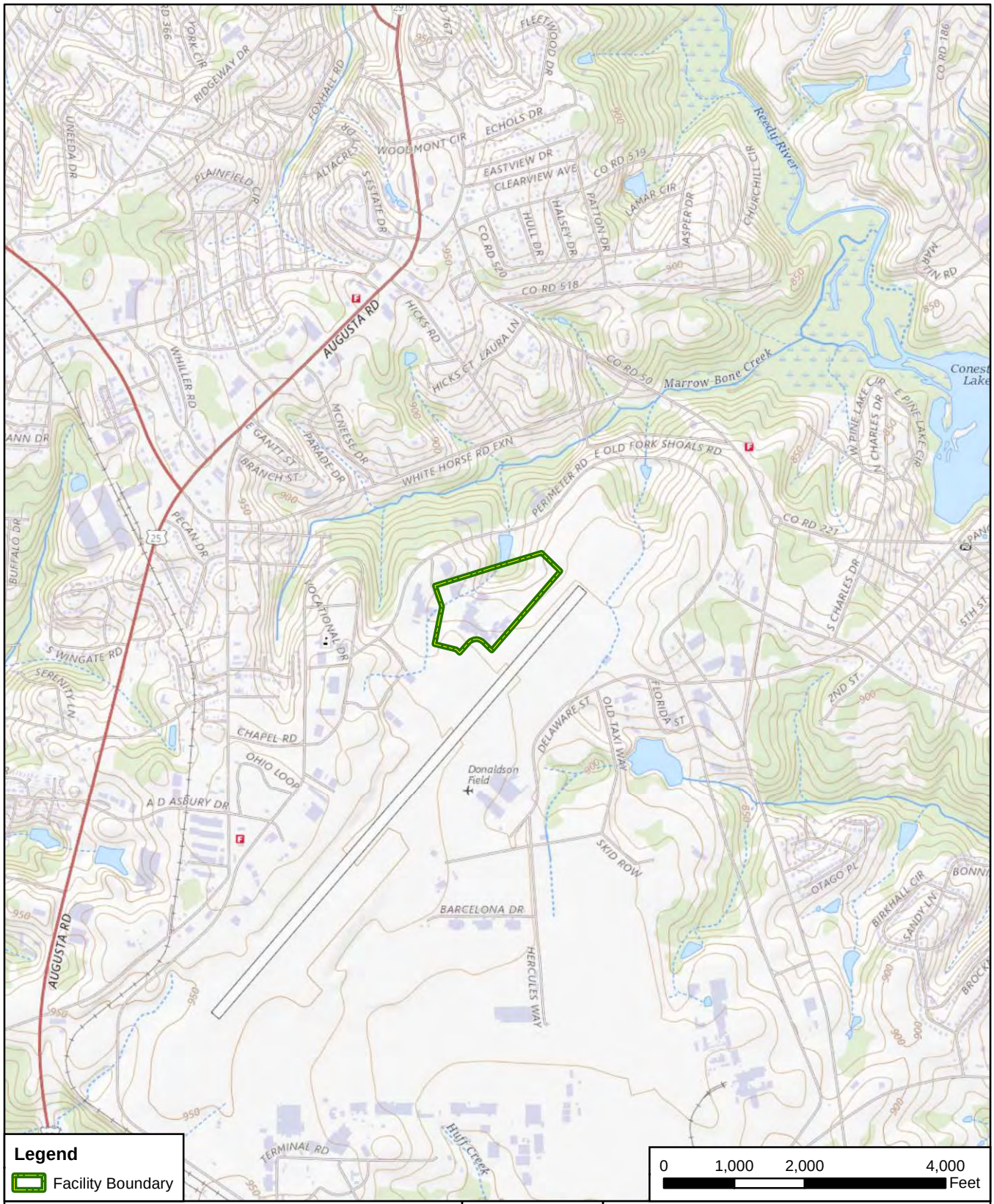
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	8/24/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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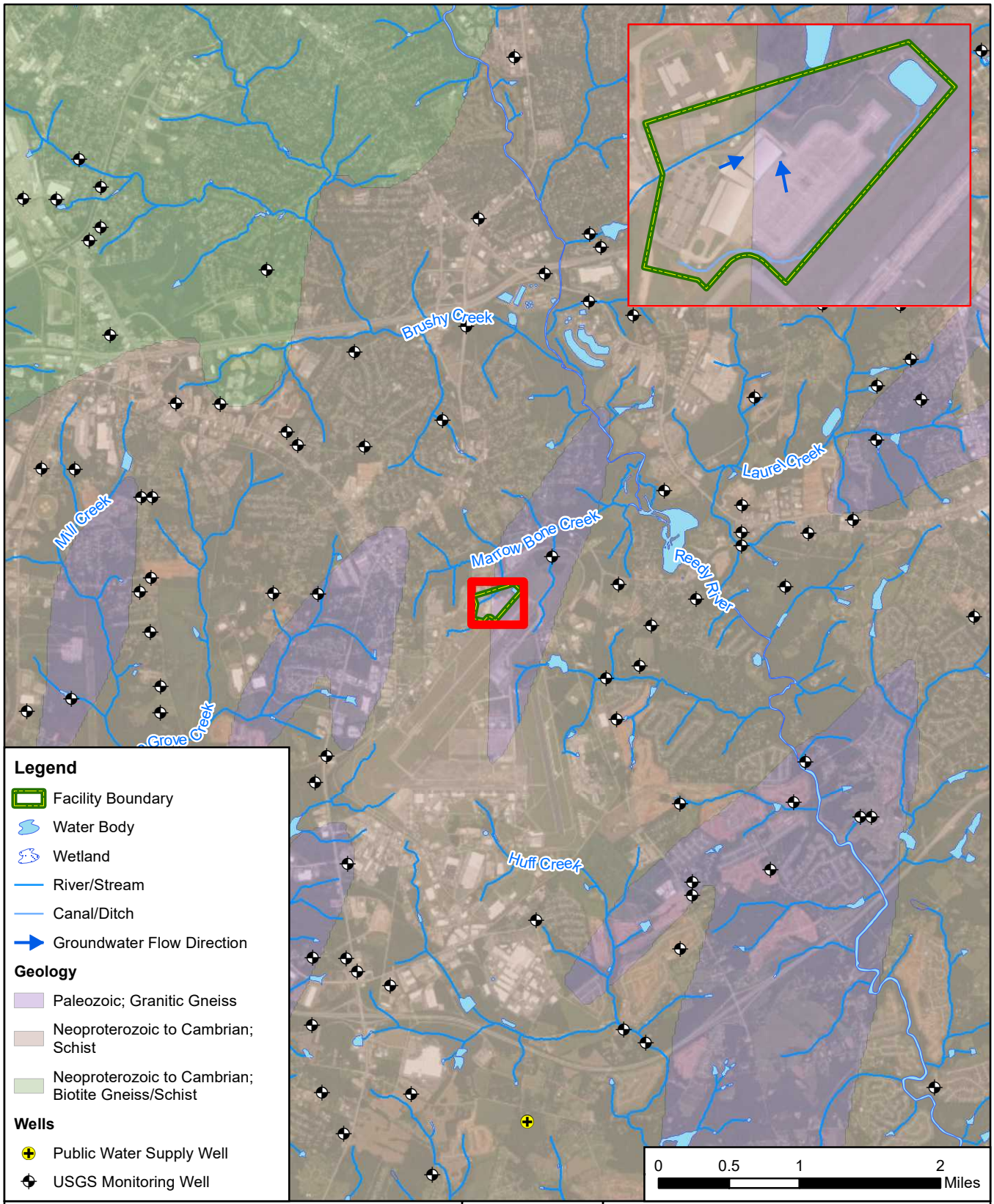
Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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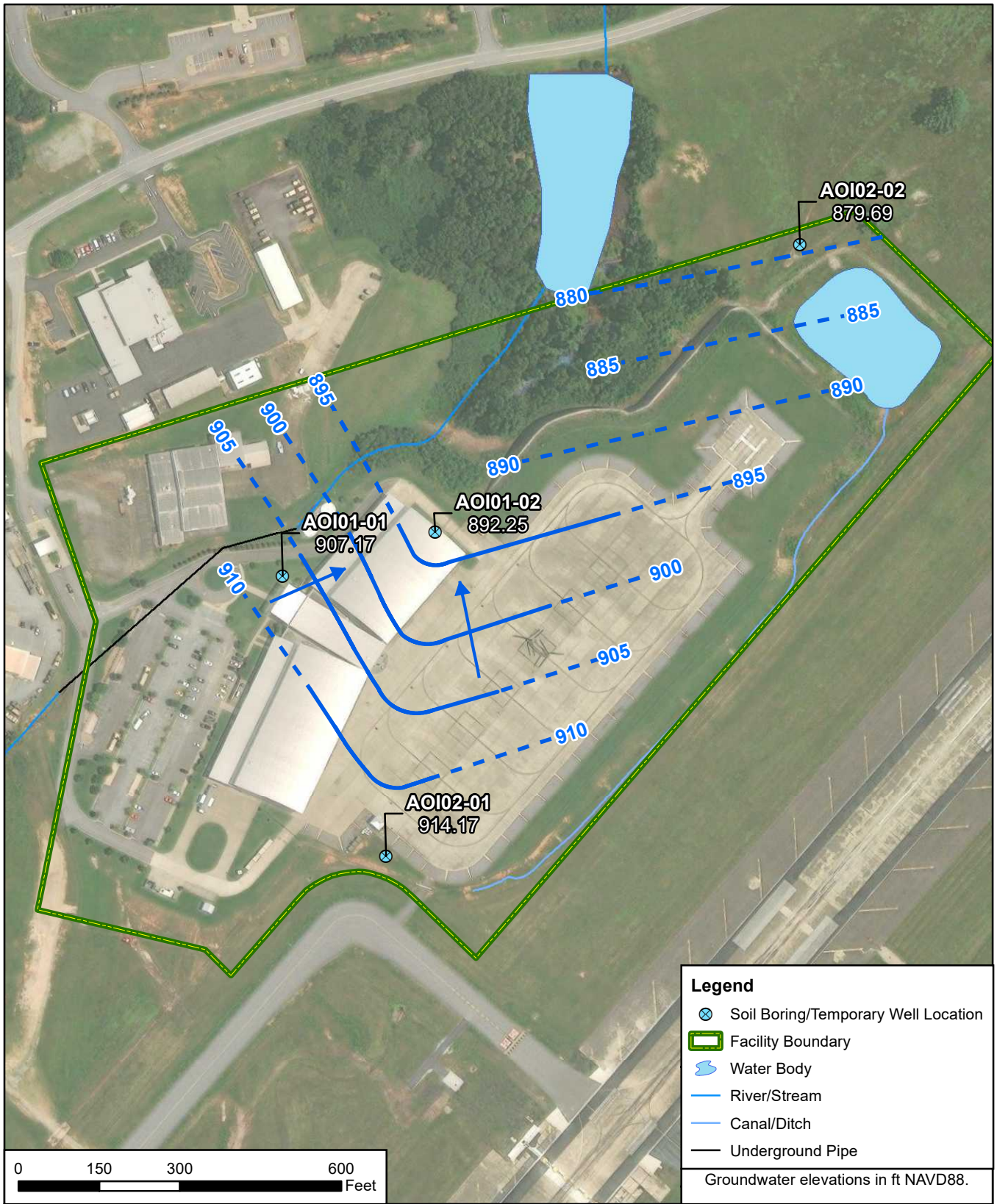
Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3



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Groundwater Elevations, February 2022

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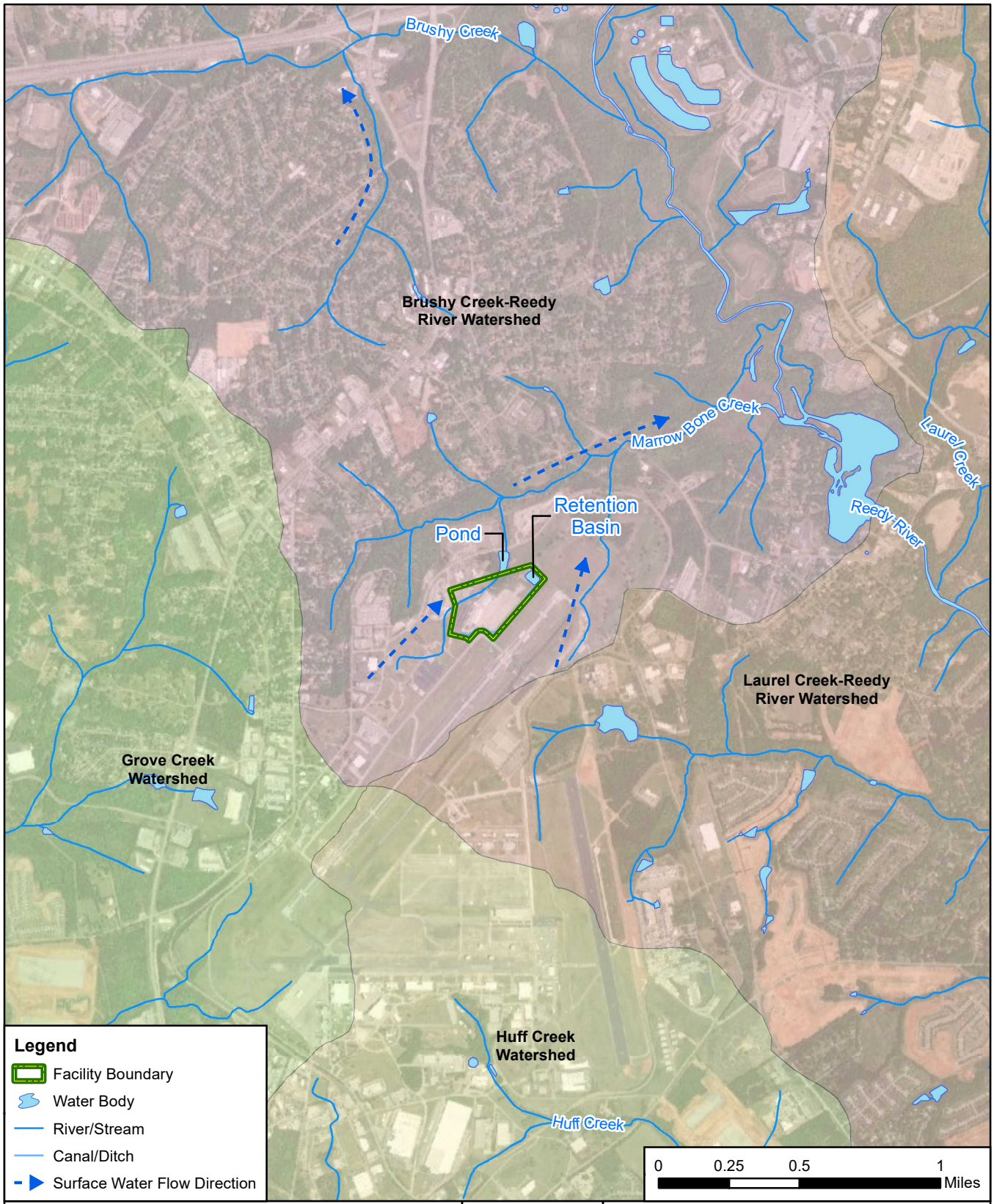
Figure 2-4



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Suface Water Features

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Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, three potential release areas were identified at AASF Upstate and grouped into two AOIs (AECOM, 2020). The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 Hot and Cold Hangars

AOI 1 consists of the Hot and Cold Hangars, where system testing resulted in a release of foam from the fire suppression systems in both hangars in 2014. In addition, a second smaller release occurred in 2019 in the Cold Hangar during quarterly inspection activities.

The Cold Hangar (also known as the "North Hangar") is an unheated aircraft hangar located north of the Hot Hangar. The Hot Hangar (also known as the "South Hangar") is a heated aircraft hangar located immediately south of the Cold Hangar. The hangars were built in 2014, and both hangars contain fire suppression systems connected to both a 100-gallon tank of Ansulite 3 percent (%) AFFF and a 400-gallon tank of JET-X 2% high expansion foam. The AFFF and JET-X tanks are both housed in a tank room within the Cold Hangar, and both tanks supply the fire suppression systems of the Cold Hangar and Hot Hangar. The AFFF tank is connected to the fire hoses mounted on the wall of the hangars, and the JET-X tank is connected to the overhead foam generators. In September 2020, the bladder was replaced on the 400-gallon tank of 2% JET-X high expansion foam. In October 2021, the 100-gallon tank of Ansulite 3% AFFF was replaced following a bladder issue; the concentrate from the old tank was placed in 55-gallon drums and stored in the tank room pending disposal.

A contractor conducted a test of both the Cold and Hot Hangar's overhead fire suppression systems in April 2014, and it is unknown if the AFFF handlines were also tested during this event. According to interviews with AASF Upstate personnel, the Cold Hangar and the Hot Hangar were filled with foam up to approximately one-third of each hangar's capacity. The foam was then hosed down the trench drains located on the perimeter of the hangar floor. A plastic sheet was used to contain the foam from escaping the hangars. Following the fire suppression system testing, the foam tanks were topped off. The amount of JET-X product dispensed is unknown.

During quarterly inspection of system valves and pumps in July 2019, a contractor accidentally tripped a valve and triggered a release of an unknown amount of foam from one overhead foam generator. The foam, presumably JET-X, puddled on top of an aircraft, and the aircraft was taken to the wash rack for washing. The remaining release on the hangar floor was mopped up, and the rinse water was placed into the wash rack's waste intermediate bulk container (IBC) totes. AASF Upstate personnel speculated that the release originated from leftover foam in the fire suppression system piping after the April 2014 testing.

A visual inspection of the tank room during the PA observed corrosion and staining on the top of the AFFF tank. AASF Upstate personnel stated that this condition has been observed on the tank since 2014 and is likely attributed to the contractor spilling AFFF while refilling the tank. It is unknown if the tank room inside the Cold Hangar is heated.

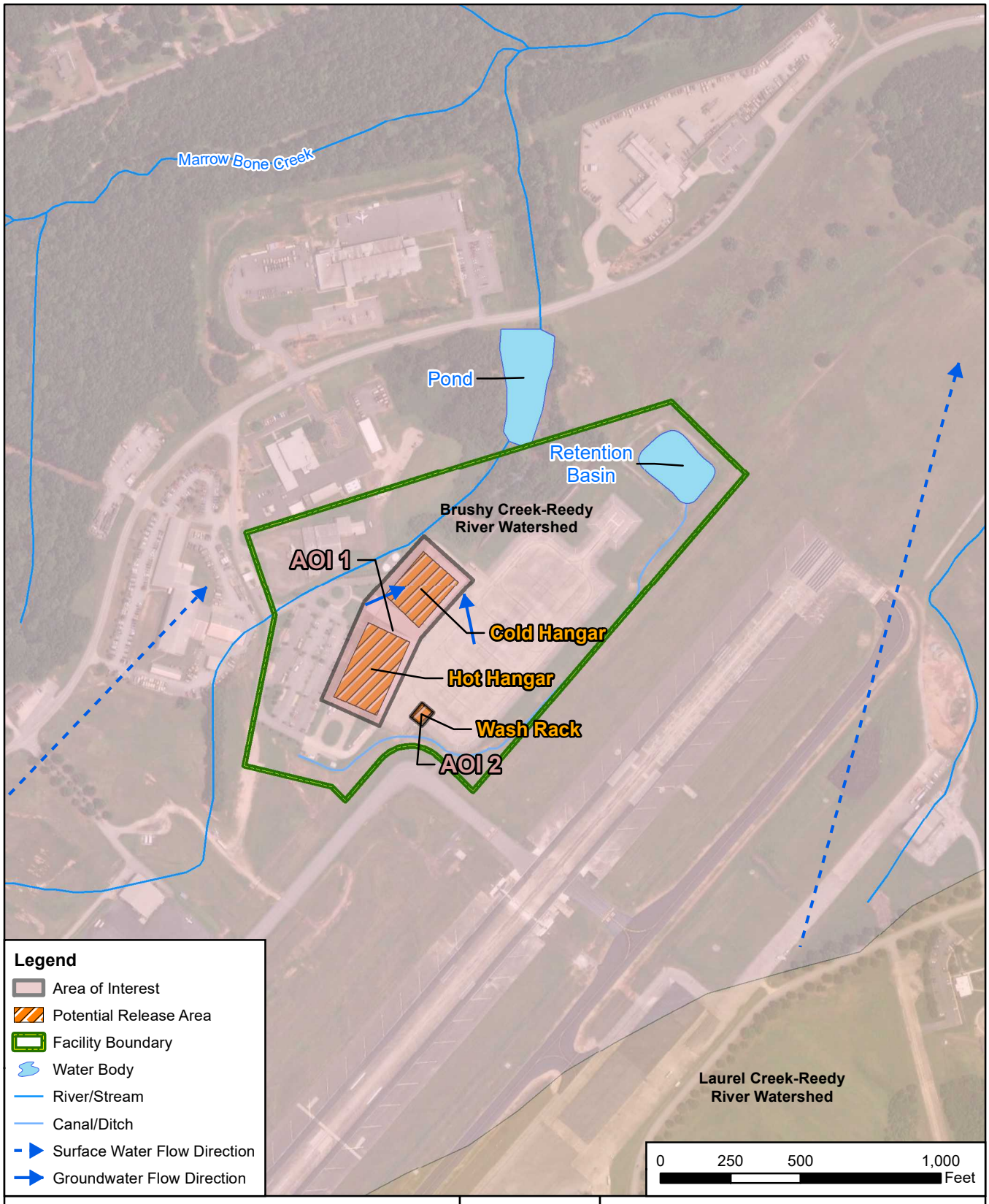
The Hot and Cold Hangars have trench drains located along the perimeter of the hangar floor, where released foam from the fire suppression systems was primarily directed. The trench drains are connected to two oil/water separators (OWSs) located in front of the hangars. The OWSs have 2,000- and 3,000-gallon capacities and discharge to a concrete reservoir, located east of the hangars, which then discharges to a publicly owned treatment works (POTW) (SynTerra, 2016). The exact location of the concrete reservoir is unknown.

3.2 AOI 2 Wash Rack

AOI 2 is the wash rack, where rinse water from the 2019 accidental release of JET-X foam in the Cold Hangar was directed. The wash rack is located within the southern portion of the aircraft ramp, in front of the Hot Hangar, and is used as a wash down area for aircraft. The drains of the wash rack lead to an OWS. Although the wash rack was designed to be closed system, the local water authority has not allowed for discharges from the OWS into a POTW; therefore, the water from the OWS is pumped out and stored in IBC totes for disposal by an approved disposal contractor (SynTerra, 2016). Additional details regarding the disposal destination of the IBC totes were not available. The IBC totes are stored adjacent to the wash rack.

In July 2019, foam was accidentally released from overhead generators onto an aircraft following the quarterly system inspection at the Cold Hangar (AOI 1). The foam released is presumed to be JET-X high expansion foam. The affected aircraft was brought to the wash rack and washed thoroughly to remove the foam. The remaining release on the hangar floor was mopped up, and the rinse water was placed into the wash rack's waste IBC totes. It is assumed that wash water from the wash rack was also transferred to the IBC totes as standard procedure. It is unknown if wash water containing residual foam were discharged to adjacent unpaved areas during washing or if any spills occurred during transfer to or from IBC totes.

It is possible that residual foam in wash water were accidentally discharged to adjacent unpaved areas during washing activities as well as during transfer to or from IBC totes. Releases may have migrated into surrounding soil and subsurface soil, and releases in run-off from the wash rack may have also migrated into the drainage ditch leading into the retention basin. The retention basin discharges to the unnamed pond during major storm events; however, runoff typically evaporates or infiltrates into the ground (SynTerra, 2016).



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	2/2/2023

Areas of Interest

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

As identified during the Data Quality Objective (DQO) process and outlined in the SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 Problem Statement

ARNG will recommend an AOI for Remedial Investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based SLs. The SLs are presented in **Section 6.1** of this report.

4.2 Information Inputs

Primary information inputs included:

- The PA for AASF Upstate (AECOM, 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s).

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 2021).

4.5 Data Usability Assessment

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017).

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the SI QAPP Addendum (AECOM, 2021).

5. Site Inspection Activities

This section describes the environmental investigation and sampling activities that occurred as part of the SI. The SI sampling approach was based on the findings of the PA and implemented in accordance with the following approved documents:

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Army Aviation Support Facility, Greenville, South Carolina* dated October 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Army Aviation Support Facility Upstate, Greenville, South Carolina* dated November 2021 (AECOM, 2021); and
- *Final Site Safety and Health Plan, AASF Upstate, Greenville, South Carolina* dated January 2022 (AECOM, 2022).

The SI field activities were conducted from 28 January 2022 to 10 February 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 18 compounds by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.3 Table B-15 to fulfill the project DQOs:

- Sixteen (16) soil samples from four boring locations and four hand auger locations;
- Four grab groundwater samples from four temporary wells;
- Eleven (11) quality assurance (QA)/quality control (QC) samples.

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, a Field Change Request Form is provided in **Appendix B3**, land survey data are provided in **Appendix B4**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

In preparation for the SI field activities, project team members participated in Technical Project Planning (TPP) meetings, performed utility clearance, and sampled decontamination source water. Details for each of these activities are presented below.

5.1.1 Technical Project Planning

The US Army Corps of Engineers (USACE) TPP Process, Engineer Manual (EM) 200-1-2 (USACE, 2016) defines four phases to project planning: 1.) defining the project phase; 2.) determining data needs; 3.) developing data collection strategies; and 4.) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with

defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 13 September 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, SCARNG, USACE, and South Carolina Department of Health and Environmental Control. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021).

A TPP Meeting 3 was held after the field event to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM placed a ticket with South Carolina 811, the local utility clearance provider, to notify them of intrusive work on 28 January 2022. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 28 January 2022 with input from the AECOM field team and AASF Upstate facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

A potable water source at AASF Upstate was sampled on 23 December 2021 to assess usability for decontamination of drilling equipment. Results of the sample collected (AU-PW-01) confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. Specifically, the sample was analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021). Prior to the start of field work each day, a Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Soil samples were collected via hand auger and direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2021). A GeoProbe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top five feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1** and depths are provided **Table 5-1**.

At temporary well locations, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample

at the mid-point between the surface and the groundwater table. At hand auger locations, one surface soil sample (0 to 2 feet bgs) was collected.

The soil cores were continuously logged for lithological descriptions by an AECOM field geologist using the Unified Soil Classification System (USCS). A photoionization detector (PID) was used to screen the breathing zone during boring activities as part of personal safety requirements. Observations and measurements were recorded on boring logs (**Appendix E**) and in a non-treated field logbook (i.e., composition notebook). Depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) were recorded. The boring logs are provided in **Appendix E**.

During the SI, varying quantities of sand were observed as the dominant lithology of the unconsolidated sediments below the AASF Upstate with isolated layers of poorly graded sand, well-graded sand, clayey sand, and silty sand. Layer thicknesses ranged from several inches to 15 feet. The borings were completed at depths between 11 and 40 feet bgs. Total depth was achieved at locations AOI01-01 and AOI01-02. Refusal due to bedrock was encountered at locations AOI01-03 (<5 feet bgs), AOI02-01 (11 feet bgs), and AOI02-02 (14.5 feet bgs).

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A), and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2021). Grain size samples were not collected because extensive horizontal and vertical clay units were not identified by the field geologist.

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/MS duplicates (MSDs) were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, equipment rinsate blanks were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021) using grout at completion of sampling activities. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth, wherever conditions allowed, a temporary well was constructed of a 5-foot section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. At AOI01-02 only, a 10-foot section of well screen was installed to reduce the possibility of a submerged well screen as water was not readily apparent in the saprolitic clay lithology. New PVC pipe and screen were used to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. After the recharge period, groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing at all wells except AOI01-02. A bladder pump was used to collect a groundwater sample from temporary well AOI01-02, as the depth of the well screen was too deep for the use of a peristaltic pump. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance,

pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021) by removing the PVC and backfilling the hole with neat cement grout. Upon completion of well abandonment, the ground surface at each location was patched to match existing surrounding conditions.

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 10 February 2022. Groundwater elevation measurements were collected from the four new temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-2**.

5.5 Surveying

The northern side of each well casing was surveyed by South Carolina-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021). Survey data from the newly installed wells on the facility were collected on 10 February 2022 in the applicable Universal Transverse Mercator zone projection with North American Datum 83 2011 (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B4**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were containerized in properly labeled 55-gallon drums. The IDW was stored at a location designated by the AASF Upstate Environmental Manager and SCARNG. ARNG will coordinate waste profiling, transportation, and disposal of the solid IDW. The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location.

Liquid IDW generated during SI activities (i.e. purge water, development water, and decontamination fluids) were containerized in properly labeled 55-gallon drums. The IDW was stored at a location designated by the AASF Upstate Environmental Manager and SCARNG.

ARNG will coordinate waste profiling, transportation, and disposal of the liquid IDW. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples collected from that source location.

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other environmental media generated during the field activities were disposed of at a licensed solid waste landfill.

5.7 Laboratory Analytical Methods

Samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.8 Deviations from SI QAPP Addendum

One deviation from the SI QAPP Addendum was identified during review of the field documentation. This deviation is noted below and is documented in a Field Change Request Form (**Appendix B3**):

- During the installation of temporary monitoring wells, shallow bedrock (<5 feet bgs) was encountered in the southern portion of the facility. A temporary well was unable to be installed, and no groundwater sample was collected from proposed sample location AOI01-03. Several alternate locations were attempted but were unsuccessful in achieving depth or encountering groundwater. Depth to bedrock is homogenous across the southern portion of the facility. The original location of AOI01-03 was proposed to provide an upgradient location between the facility and the former Donaldson Air Force Base/Donaldson Airport and existing industries. No alternative location was available within the facility boundary, and no alternative drilling method was available. Locations AOI01-01 and AOI02-01 are the upgradient most locations that were able to be installed due to the facility geology and will serve dual purpose as upgradient wells. This action was documented in a Field Change Request Form provided in **Appendix B3**.
- During the installation of temporary monitoring well AOI01-02, the onsite field geologist had difficulty determining the depth to groundwater due to the predominant saprolitic clay lithology. A clear visual distinction between moist and wet soil was not readily apparent so a 10-foot section well screen was installed at AOI01-02 to provide a larger screen interval and reduce the possibility of a submerged well screen.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, AASF Upstate, South Carolina

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI01-01-SB-0-2	2/8/2022 15:30	0 - 2	x			
AOI01-01-SB-0-2-D	2/8/2022 15:30	0 - 2	x			FD
AOI01-01-SB-6-8	2/8/2022 16:00	6 - 8	x			
AOI01-01-SB-14-16	2/8/2022 16:30	14 - 16	x			
AOI01-02-SB-0-2	2/9/2022 9:40	0 - 2	x	x	x	
AOI01-02-SB-0-2-D	2/9/2022 9:40	0 - 2		x		FD
AOI01-02-SB-0-2-MS	2/9/2022 9:40	0 - 2		x		MS
AOI01-02-SB-0-2-MSD	2/9/2022 9:40	0 - 2		x		MSD
AOI01-02-SB-13-15	2/9/2022 10:30	13 - 15	x			
AOI01-02-SB-33-35	2/9/2022 10:45	33 - 35	x			
AOI01-03-SB-0-2	2/8/2022 10:00	0 - 2	x			
AOI01-04-SB-0-2	2/10/2022 11:15	0 - 2	x			
AOI02-01-SB-0-2	2/8/2022 11:25	0 - 2	x			
AOI02-01-SB-4-6	2/8/2022 12:00	4 - 6	x	x	x	
AOI02-01-SB-6-8	2/8/2022 12:15	6 - 8	x			
AOI02-02-SB-0-2	2/9/2022 14:45	0 - 2	x			
AOI02-02-SB-5-7	2/9/2022 15:10	5 - 7	x			
AOI02-02-SB-5-7-D	2/9/2022 15:10	5 - 7	x			FD
AOI02-02-SB-10-12	2/9/2022 15:20	10 - 12	x			
AOI02-03-SB-0-2	2/10/2022 11:25	0 - 2	x			
AOI02-04-SB-0-2	2/10/2022 11:50	0 - 2	x			
Groundwater Samples						
AOI01-01-GW	2/9/2022 11:20	NA	x			
AOI01-01-GW-D	2/9/2022 11:20	NA	x			FD
AOI01-02-GW	2/10/2022 14:20	NA	x			
AOI02-01-GW	2/9/2022 14:45	NA	x			
AOI02-02-GW	2/10/2022 11:45	NA	x			
AOI02-02-GW-MS	2/10/2022 11:45	NA	x			MS
AOI02-02-GW-MSD	2/10/2022 11:45	NA	x			MSD

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, AASF Upstate, South Carolina

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Quality Control Samples						
AU-PW-01	12/23/2021 10:20	NA	x			Decon Source Water
AU-FRB-01	2/10/2022 13:40	NA	x			
AU-ERB-01	2/9/2022 14:00	NA	x			DPT Rod
AU-ERB-02	2/8/2022 10:45	NA	x			Hand Auger
AU-ERB-03	2/10/2022 14:35	NA	x			Bladder Pump
AU-ERB-04	2/10/2022 13:30	NA	x			Decon Station (Tote/Pressure Washer)

Notes:
AASF = Army Aviation Support Facility
AOI = area of interest
AU = AASF Upstate
bgs = below ground surface
Decon = decontamination
DPT = direct push technology
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
NA = not applicable
QSM = Quality Systems Manual
SB = soil boring
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, AASF Upstate, South Carolina

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-01	20	15 - 20	921.63	919.09	14.46	11.92	907.17
	AOI01-02	40	30 - 40	918.87	918.62	26.62	26.37	892.25
2	AOI02-01	11	6 - 11	920.46	919.04	6.29	4.87	914.17
	AOI02-02	14.5	9.5 - 14.5	887.68	886.62	7.99	6.93	879.69

Notes:
AASF = Army Aviation Support Facility
bgs = below ground surface
btoc = below top of casing
NAVD88 = North American Vertical Datum 1988

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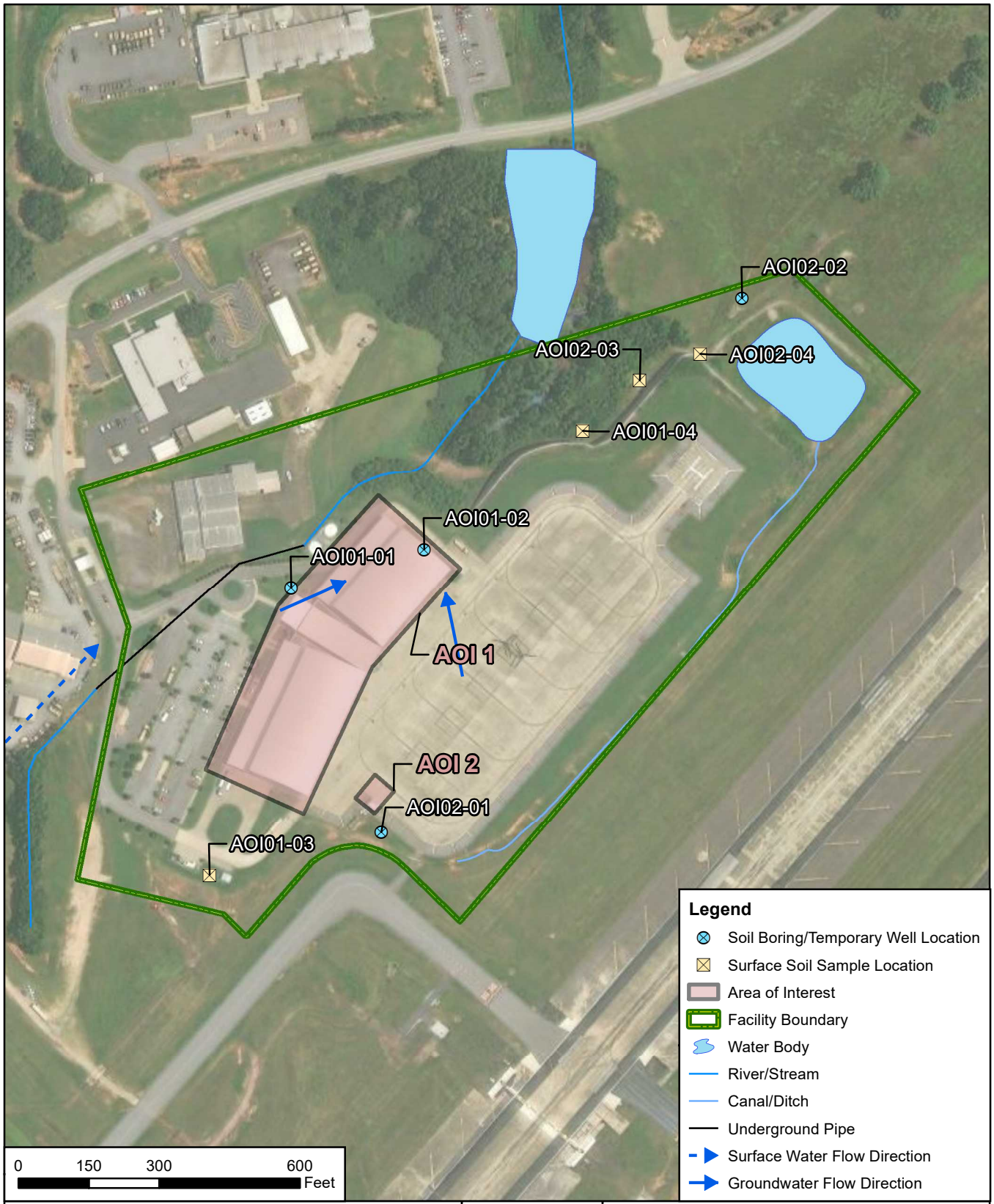

CLIENT	ARNG			
PROJECT	Site Inspection at AASF Upstate, SC			
REVISED	2/2/2023	GIS BY	MS	2/2/2023
SCALE	1:3,600	CHK BY	BW	2/2/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	2/2/2023

N

Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** and **Section 6.4**. **Table 6-2** through **Table 6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD dated 6 July 2022 (Assistant Secretary of Defense, 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1** below.

Table 6-1: Screening Levels (Soil and Groundwater)

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) Screening values for HFPO-DA were established after SI planning and execution and thus not included as an analyte. Future CERCLA phases will include HFPO-DA if warranted.

The data in the subsequent sections are compared to the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the facility: the residential scenario is applied to surface soil results (0 to 2 feet bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 feet bgs). The SLs are not applied to deep subsurface soil results (>15 feet bgs) because 15 feet is the anticipated limit of construction activities.

6.2 Soil Physicochemical Analyses

To provide basic soil parameter information, soil samples were analyzed for TOC, and pH which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC and pH sampling.

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions and are therefore relatively mobile in groundwater (Xiao et al., 2015), but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy, 2006; Guelfo and Higgins, 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients (K_{oc} values) can help in evaluating transport potential, though other geochemical factors (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC, 2018).

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Hot and Cold Hangars. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI01-01 through AOI01-04. Soil was also sampled from shallow subsurface soil (between 6 and 16 feet bgs) from boring locations AOI01-01 and AOI01-02 and deep subsurface soil (33 to 35 feet bgs) from boring location AOI01-02. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFOS, PFHxS, PFNA, and PFBS were each detected in at least one surface soil location at concentrations below their SLs, with the following maximum concentrations: PFOA at 5.56 micrograms per kilogram (µg/kg); PFOS at 9.48 µg/kg; PFHxS at 3.24 µg/kg; PFNA at 3.10 µg/kg; and PFBS at 0.063 J µg/kg. PFOS, PFHxS, and PFBS were detected below their SLs in shallow subsurface soil at location AOI01-01, with concentrations of 0.372 J µg/kg, 1.21 µg/kg, and 0.037 J µg/kg, respectively. PFOA and PFNA were not detected in shallow subsurface soil.

PFOA, PFHxS, and PFBS were detected in deep subsurface soil at AOI01-02, at concentrations of 0.145 J µg/kg, 0.931 J µg/kg, and 0.050 J µg/kg, respectively. PFOS and PFNA were not detected in deep subsurface soil.

6.3.2 AOI 1 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring wells AOI01-01 and AOI01-02. The following maximum concentrations were measured:

- PFOA was detected above the SL of 6 nanograms per liter (ng/L) at AOI01-02, with a concentration of 174 ng/L.
- PFOS was detected above the SL of 4 ng/L at AOI01-02, with a concentration of 7.07 ng/L.
- PFHxS was detected above the SL of 39 ng/L at AOI01-02, with a concentration of 972 ng/L.
- PFNA was detected below the SL of 6 ng/L at AOI01-01, with a maximum concentration of 1.68 J ng/L in the field duplicate sample (AOI01-01-GW-D).

- PFBS was detected below the SL of 601 ng/L at both locations, with a maximum concentration of 56.5 ng/L in the field duplicate sample (AOI01-01-GW-D).

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil below their SLs. PFOA, PFOS, and PFHxS were detected in groundwater at concentrations above their SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2: Wash Rack. The results in soil and groundwater are summarized on **Table 6-2**, **Table 6-3**, and **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.4.1 AOI 2 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI02-01 through AOI02-04. Soil was also sampled from various shallow subsurface soil intervals from boring locations AOI02-01 (4 to 6 feet bgs; 6 to 8 feet bgs) and AOI02-02 (5 to 7 feet bgs; 10 to 12 feet bgs). **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** and **Table 6-3** summarize the soil results.

PFOS, PFHxS, PFNA, and PFBS were each detected in at least one surface soil location at concentrations below their SLs, with the following maximum concentrations: PFOS at 2.53 µg/kg; PFHxS at 2.38 µg/kg; PFNA at 0.054 J µg/kg; and PFBS at 0.060 J µg/kg. PFOA was not detected in surface soil. PFOA and PFOS were detected below their SLs in shallow subsurface soil at AOI02-02 (10 to 12 feet bgs), with concentrations of 0.114 J µg/kg and 0.081 J µg/kg, respectively. PFHxS and PFBS were detected below their SLs in shallow subsurface soil at AOI02-01, with maximum concentrations of 0.715 J µg/kg and 0.081 J µg/kg, respectively, in the 4 to 6 feet bgs interval. PFNA was not detected in shallow subsurface soil.

6.4.2 AOI 2 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring wells AOI02-01 and AOI02-02. The following maximum concentrations were measured:

- PFOA was detected above the SL of 6 ng/L at AOI02-02, with a concentration of 17.6 ng/L.
- PFOS was detected above the SL of 4 ng/L at both locations, with a maximum concentration of 17.8 ng/L.
- PFHxS and PFBS were detected below their SLs at both locations, with maximum concentrations of 32.9 ng/L and 6.85 ng/L, respectively.
- PFNA was detected below the SL at AOI02-02, with a concentration of 3.30 J ng/L.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil at concentrations below their SLs. PFOA and PFOS were detected in groundwater at concentrations above their SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 2 is warranted.

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, AASF Upstate

Area of Interest		AOI01										AOI02							
Sample ID		AOI01-01-SB-0-2		AOI01-01-SB-0-2-D		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI02-01-SB-0-2		AOI02-02-SB-0-2		AOI02-03-SB-0-2		AOI02-04-SB-0-2	
Sample Date		02/08/2022		02/08/2022		02/09/2022		02/08/2022		02/10/2022		02/08/2022		02/09/2022		02/10/2022		02/10/2022	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																			
PFBS	1900	ND	U	ND	U	ND	U	ND	U	0.063	J	0.060	J	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U	3.24		0.256	J	2.38		ND	U	0.131	J	ND	U
PFNA	19	2.62		3.10		ND	U	0.104	J	0.191	J	ND	U	ND	U	0.036	J	0.054	J
PFOA	19	5.19		5.56		ND	U	1.12	J	0.248	J	ND	U	ND	U	ND	U	ND	U
PFOS	13	0.152	J	0.173	J	0.360	J	9.48		1.67		0.104	J	ND	U	2.53		0.525	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on residential scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, AASF Upstate

Area of Interest		AOI01						AOI02									
Sample ID		AOI01-01-SB-6-8		AOI01-01-SB-14-16		AOI01-02-SB-13-15		AOI02-01-SB-4-6		AOI02-01-SB-6-8		AOI02-02-SB-5-7		AOI02-02-SB-5-7-D		AOI02-02-SB-10-12	
Sample Date		02/08/2022		02/08/2022		02/09/2022		02/08/2022		02/08/2022		02/09/2022		02/09/2022		02/09/2022	
Depth		6-8 ft		14-16 ft		13-15 ft		4-6 ft		6-8 ft		5-7 ft		5-7 ft		10-12 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																	
PFBS	25000	ND	U	0.037	J	ND	U	0.081	J	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	1.21		ND	U	ND	U	0.715	J	0.043	J	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.114	J
PFOS	160	0.372	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.081	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, AASF Upstate

Area of Interest	AOI01	
Sample ID	AOI01-02-SB-33-35	
Sample Date	02/09/2022	
Depth	33-35 ft	
Analyte	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)		
PFBS	0.050	J
PFHxS	0.931	J
PFNA	ND	U
PFOA	0.145	J
PFOS	ND	U

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
µg/kg	micrograms per kilogram

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, AASF Upstate

	Area of Interest	AOI01						AOI02			
	Sample ID	AOI01-01-GW		AOI01-01-GW-D		AOI01-02-GW		AOI02-01-GW		AOI02-02-GW	
	Sample Date	02/09/2022		02/09/2022		02/10/2022		02/09/2022		02/10/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)											
PFBS	601	48.5		56.5		55.6		6.85		1.93	J
PFHxS	39	10.4		9.12		972		32.9		24.4	
PFNA	6	1.39	J	1.68	J	ND	U	ND	U	3.30	J
PFOA	6	3.18	J	4.64		174		2.17	J	17.6	
PFOS	4	1.40	J	2.30	J	7.07		6.16		17.8	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022 Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

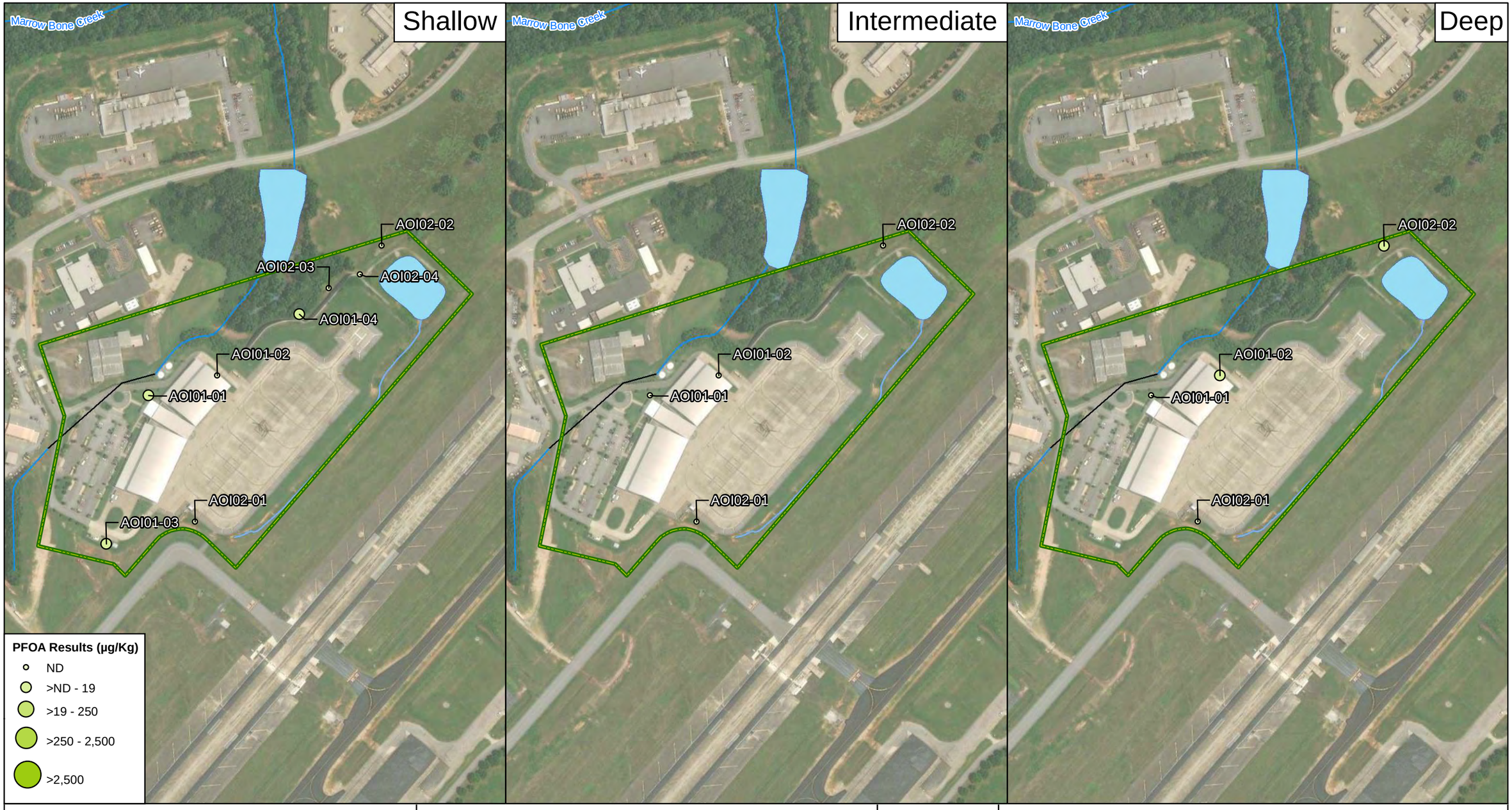
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
GW	groundwater
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter



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SCALE	1:4,800	CHK BY	BW	8/24/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/24/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe

0 200 400 800 Feet

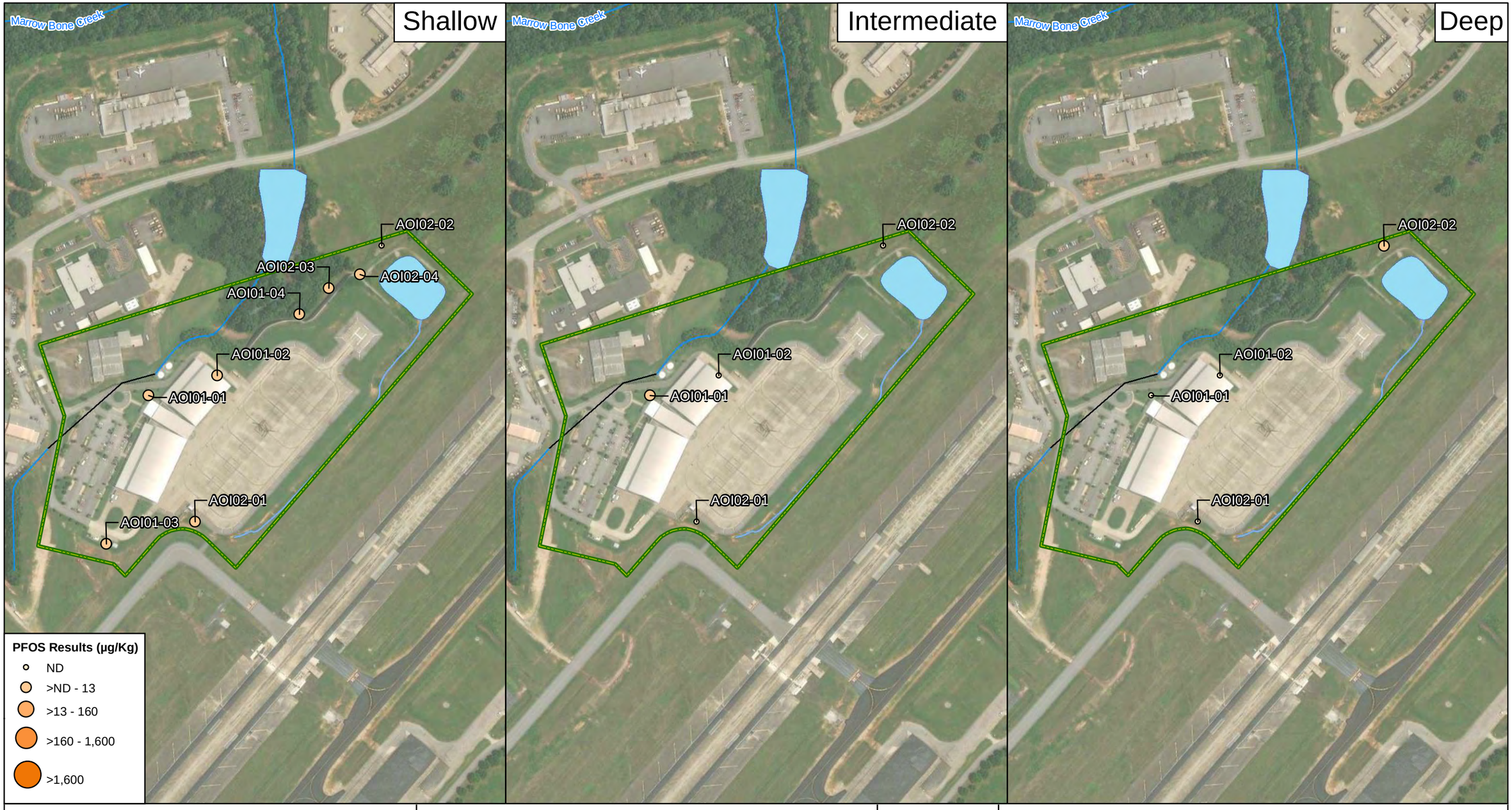
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFOA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-1



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SCALE	1:4,800	CHK BY	BW	8/24/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/24/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe

0 200 400 800 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFOS Detections in Soil

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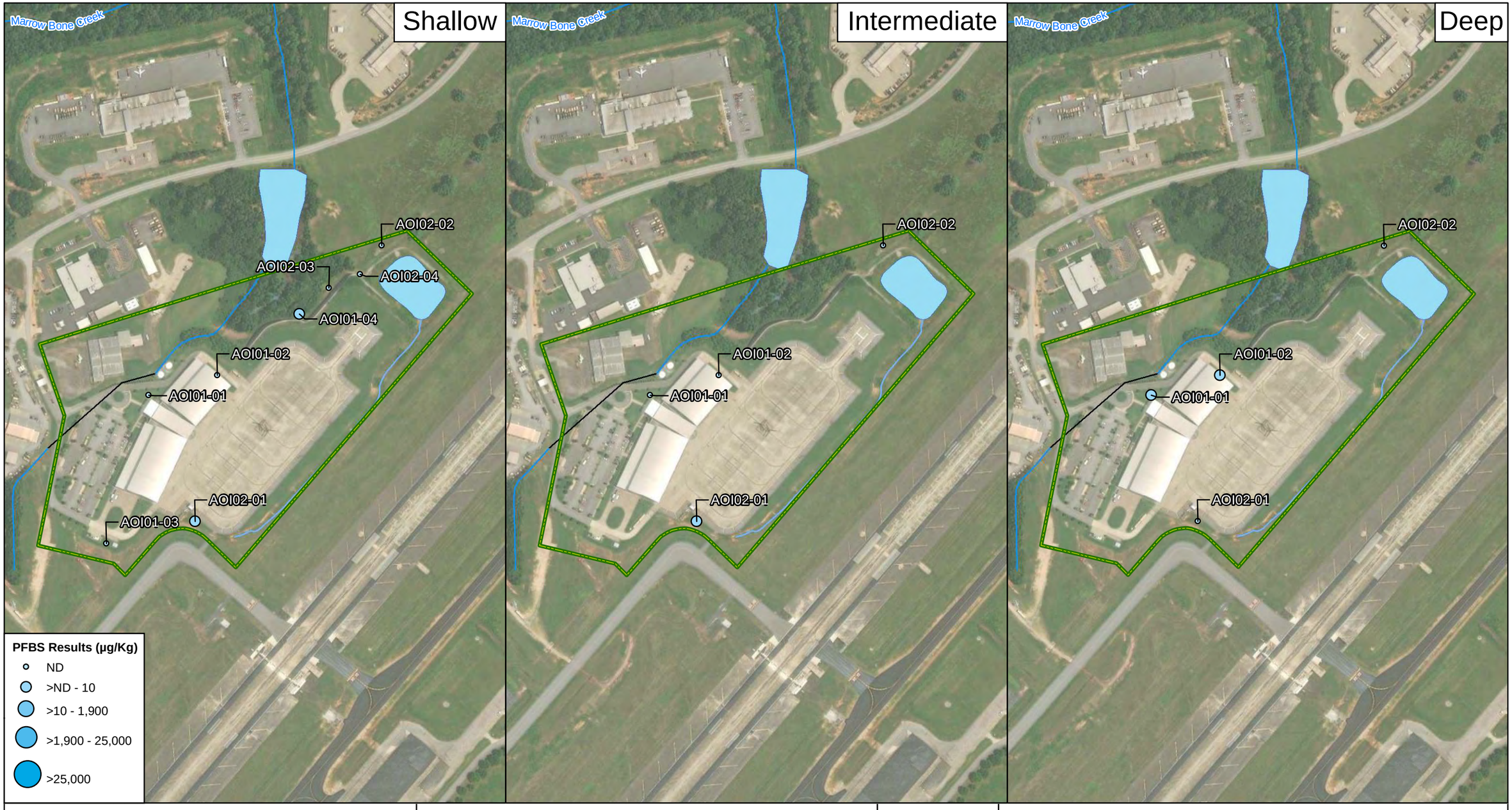
Germantown, MD 20876

Figure 6-2



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SCALE	1:4,800	CHK BY	BW	10/4/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/4/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe

0 200 400 800 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFBS Detections in Soil

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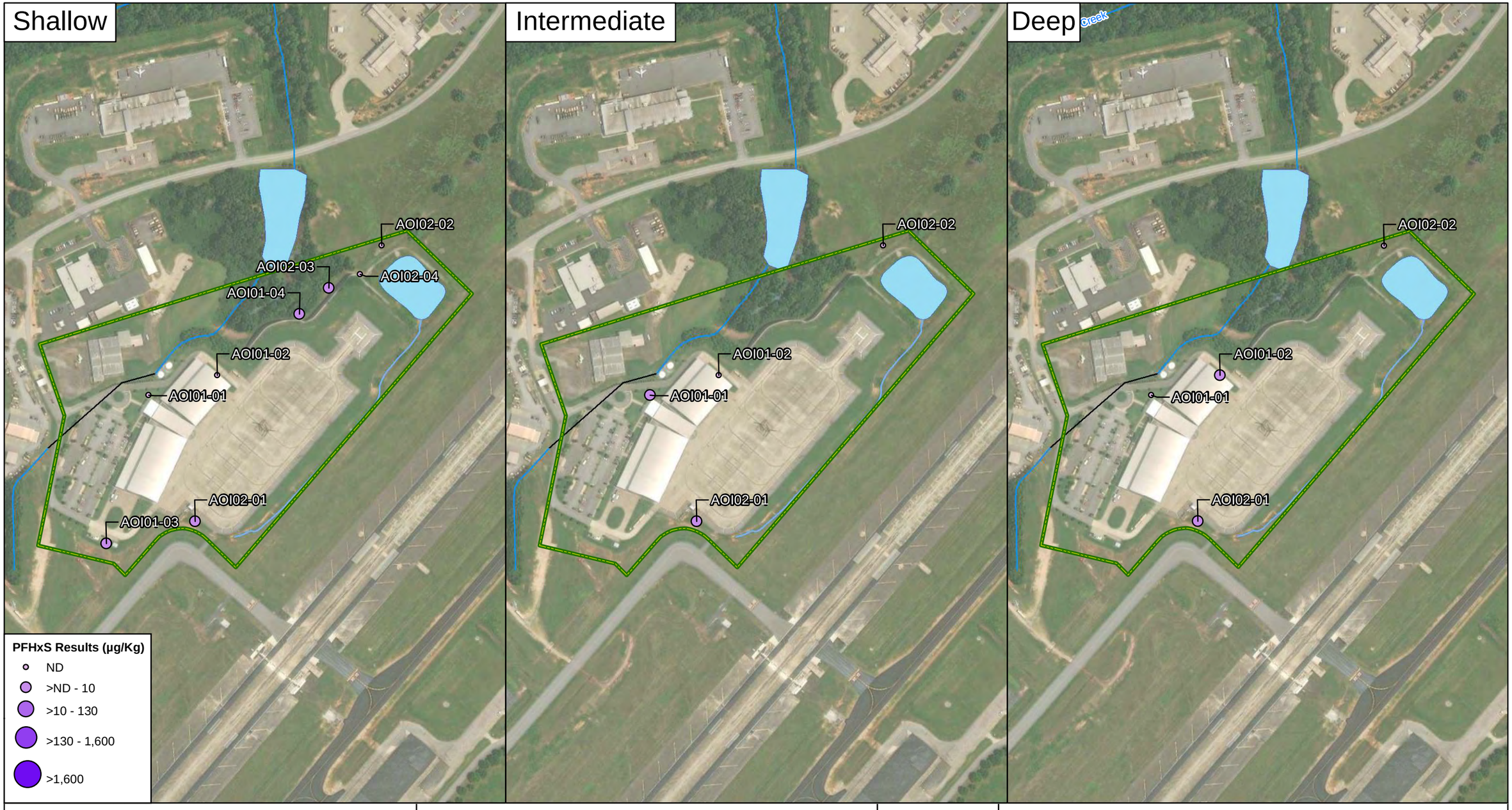
Figure 6-3



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SCALE	1:4,800	CHK BY	BW	10/4/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/4/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe

0 200 400 800 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFHxS Detections in Soil

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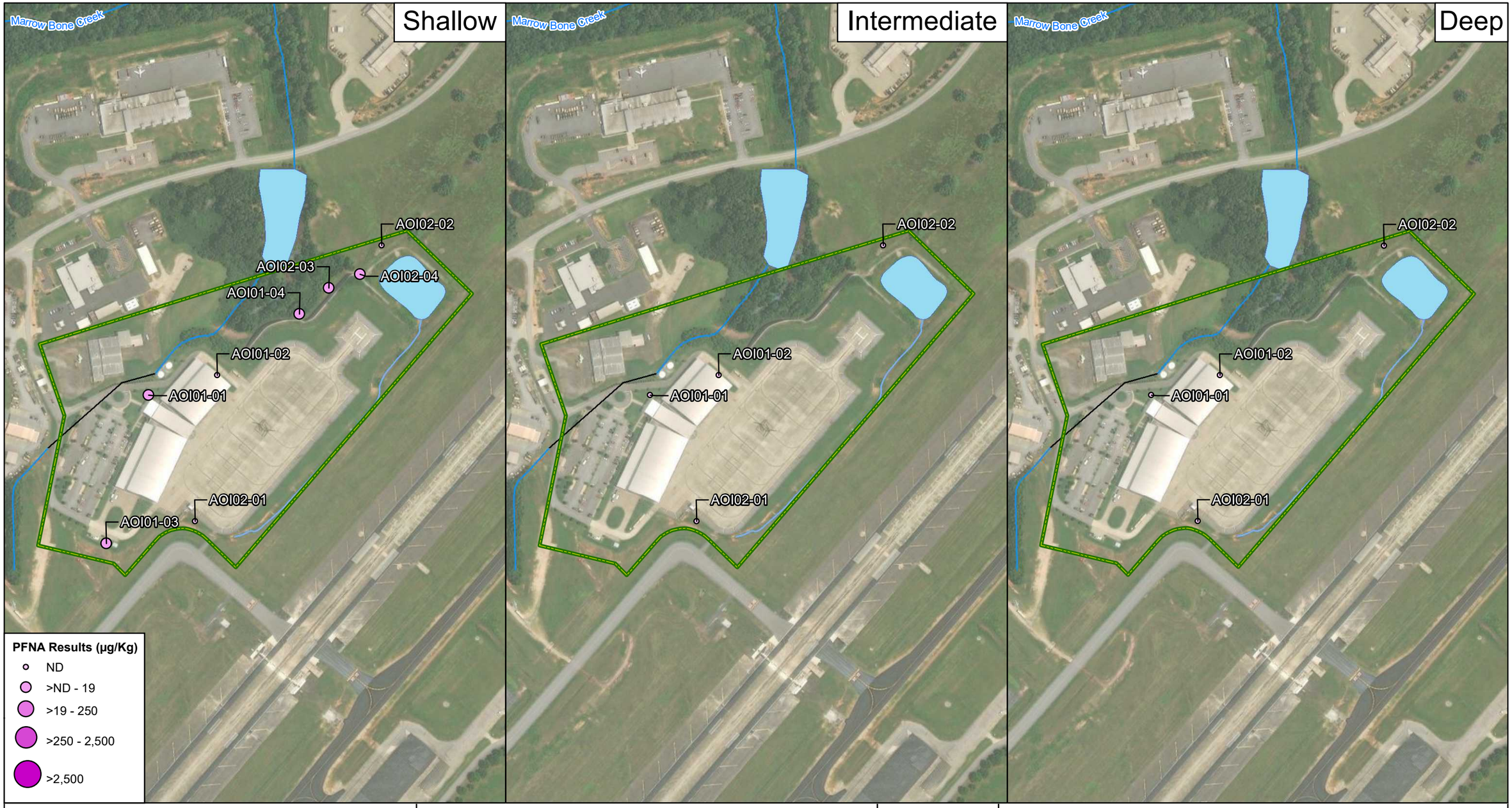
Germantown, MD 20876

Figure 6-4



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PROJECT	Site Inspection at AASF Upstate, SC			
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SCALE	1:4,800	CHK BY	BW	10/4/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/4/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe

0 200 400 800 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFNA Detections in Soil

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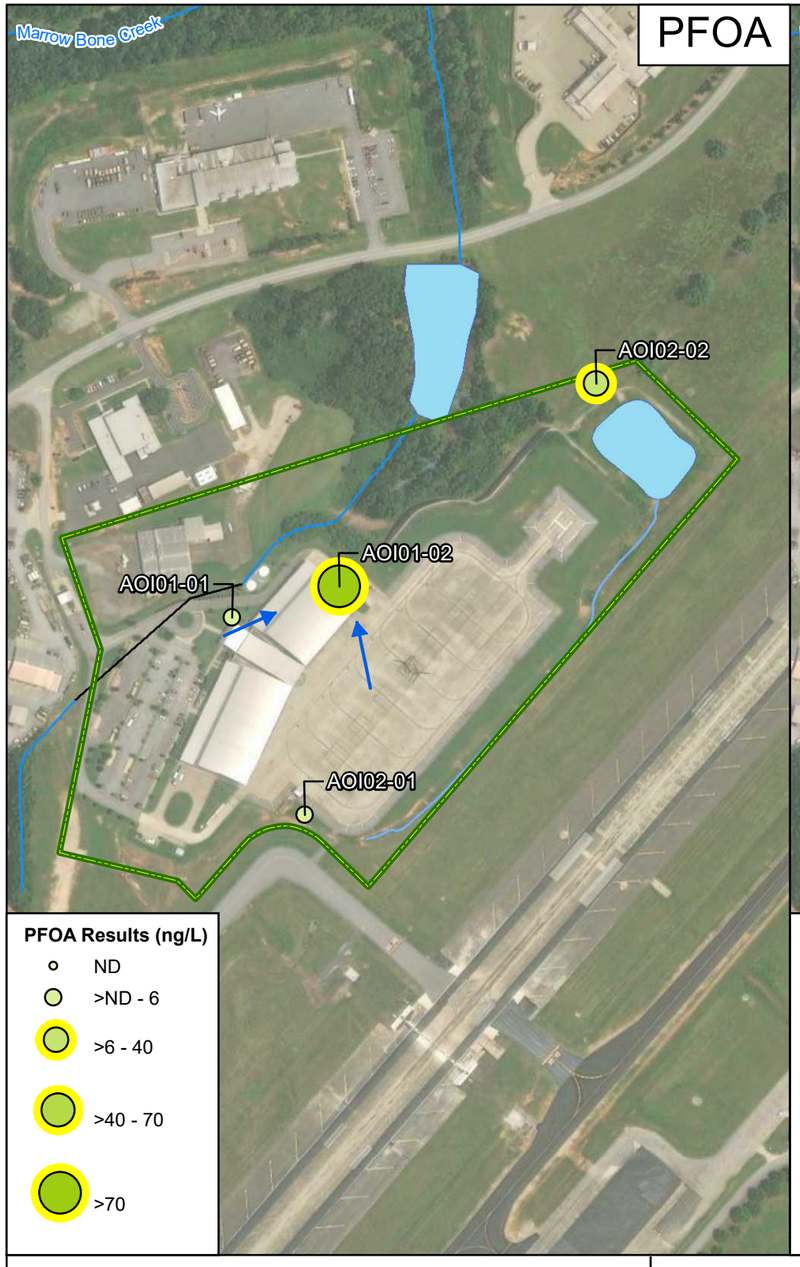
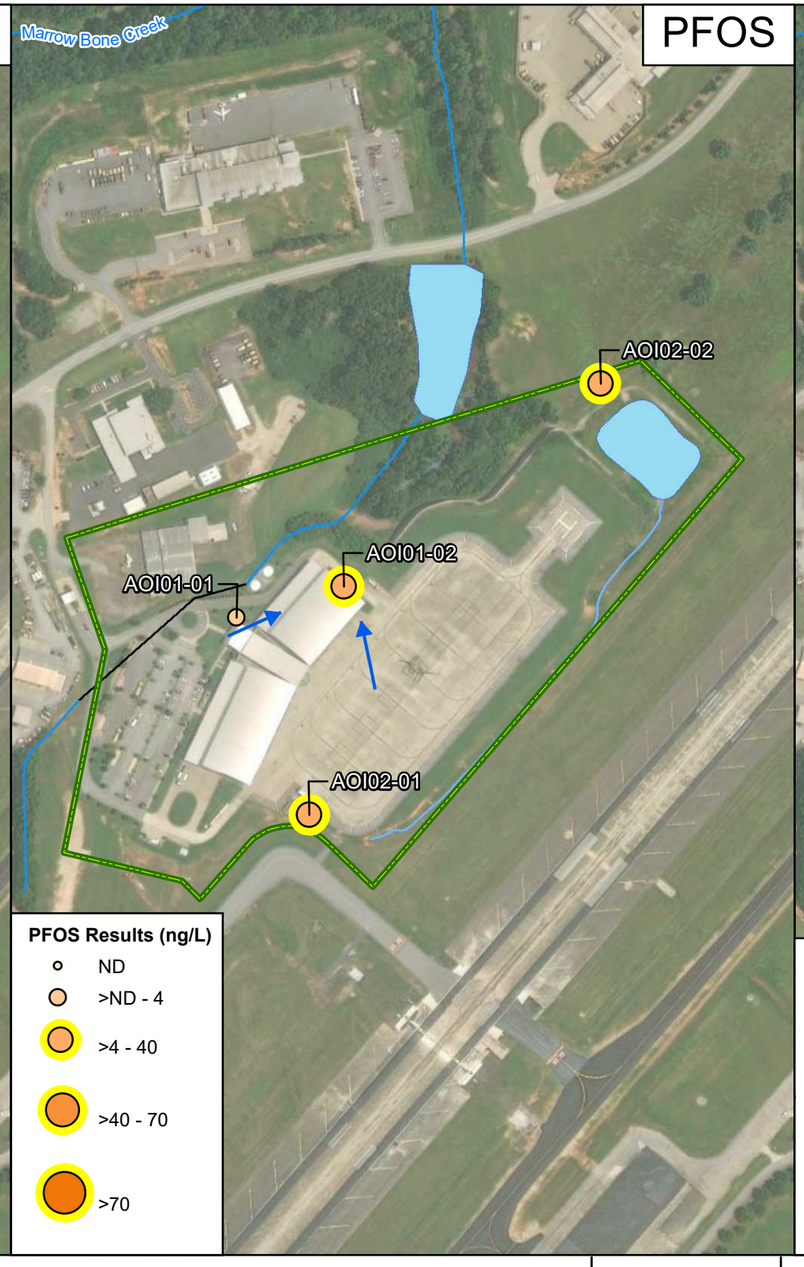
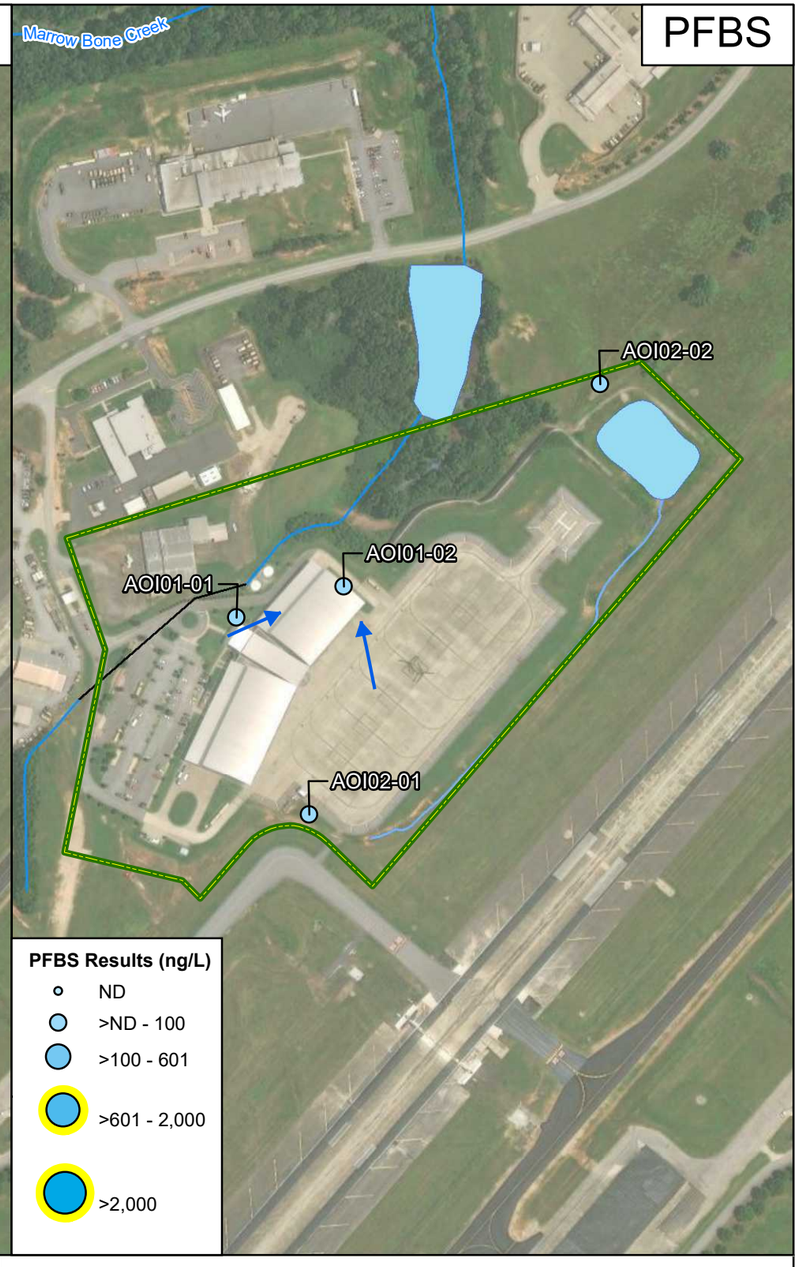
Germantown, MD 20876

Figure 6-5







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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe
Groundwater Flow Direction

0 200 400 800 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

N

PFOA, PFOS, and PFBS Detections in Groundwater

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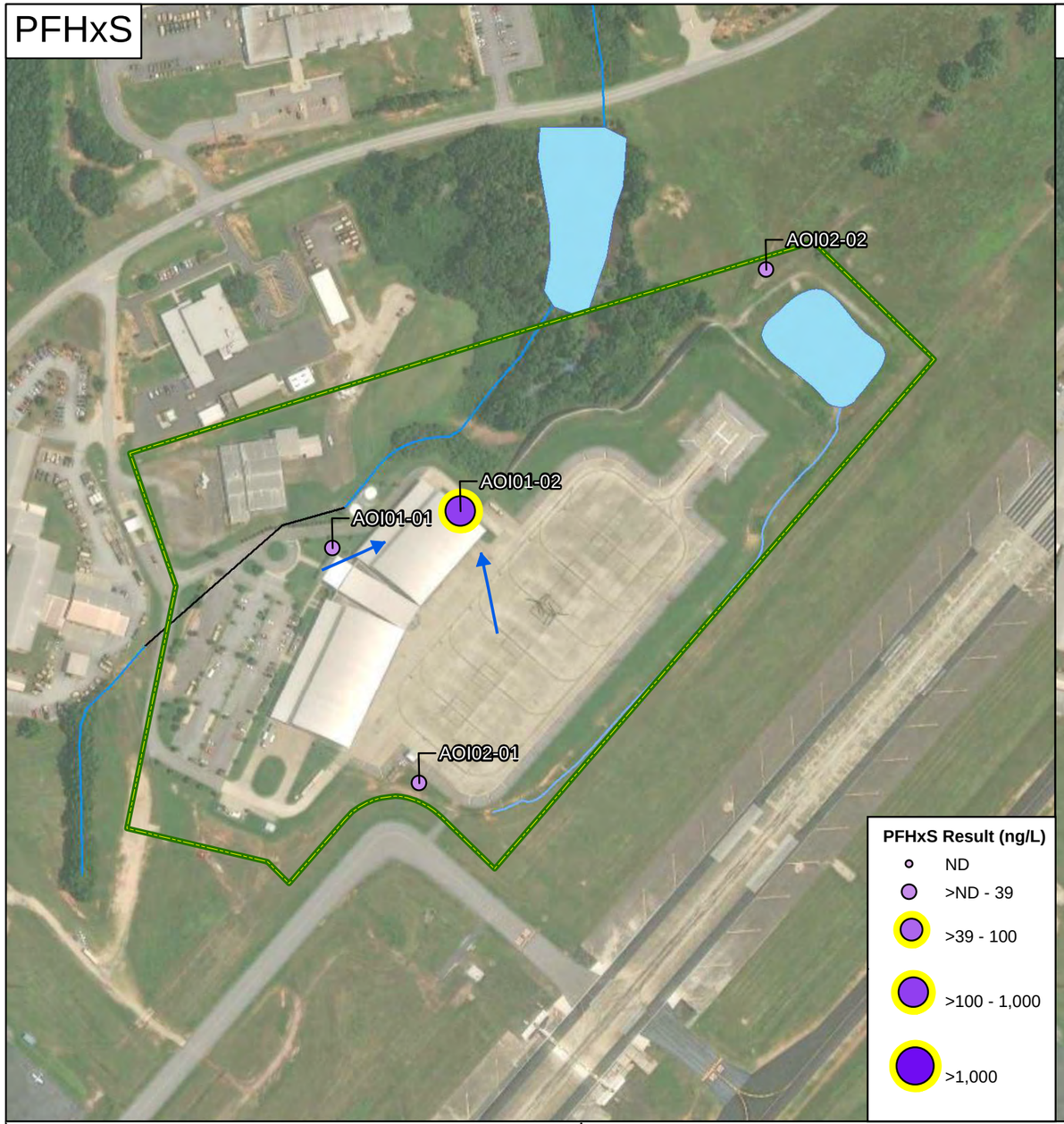
Germantown, MD 20876

Figure 6-6

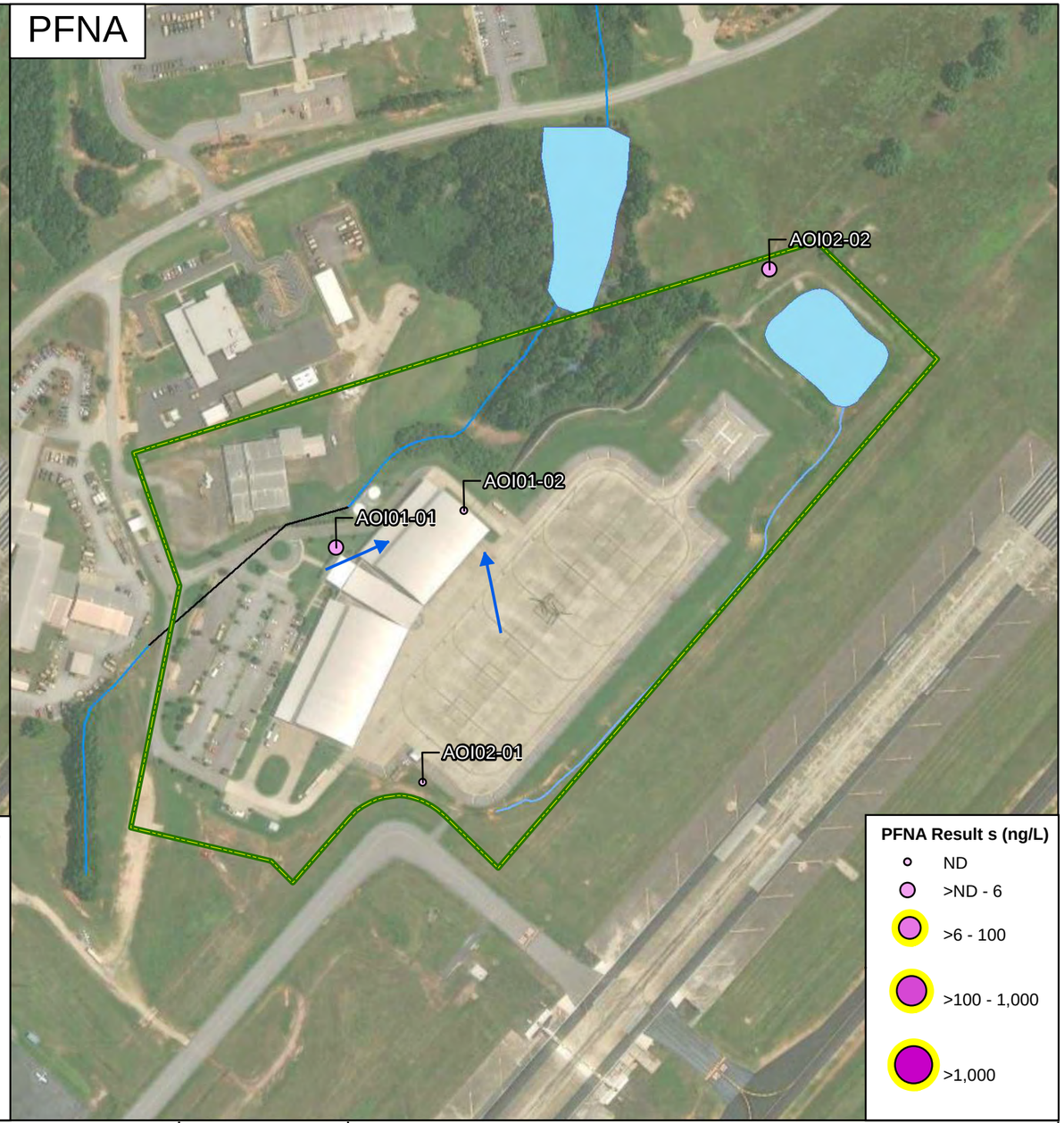
PFHxS



PFHxS Result (ng/L)

- ND
- >ND - 39
- >39 - 100
- >100 - 1,000
- >1,000

PFNA



PFNA Result s (ng/L)

- ND
- >ND - 6
- >6 - 100
- >100 - 1,000
- >1,000

CLIENT	ARNG			
PROJECT	Site Inspection at AASF Upstate, SC			
REVISED	10/4/2022	GIS BY	MS	10/4/2022
SCALE	1:3,600	CHK BY	BW	10/4/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/4/2022

Facility Boundary
Water Body
River/Stream
Canal/Ditch
Underground Pipe
Groundwater Flow Direction

0 150 300 600 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

N

PFHxS and PFNA Detections in Groundwater

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Germantown, MD 20876

Figure 6-7

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7. Exposure Pathways

The conceptual site models (CSMs) for each AOI, revised based on the SI findings, are presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

1. Contaminant source;
2. Environmental fate and transport;
3. Exposure point;
4. Exposure route; and
5. Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figure uses an empty circle symbol to represent an incomplete exposure pathway. Areas with an incomplete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of relevant compounds above the SLs. Areas with an identified potentially complete pathway that have detections of the relevant compounds above the SLs may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in an RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers, residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 and AOI 2 based on the aforementioned criteria.

7.1.1 AOI 1 and AOI 2

AOI 1 consists of the Hot and Cold Hangars, where AFFF has been released from the fire suppression systems. Rinse water following cleanup of a release at AOI 1 was diverted to the wash rack at AOI 2.

The relevant compounds were detected in surface soil at both AOIs. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and future construction workers are potentially complete. The relevant compounds were detected in shallow subsurface soil at both AOIs. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. The CSM for AOI 1 and AOI 2 is presented on **Figure 7-1**.

7.2 Groundwater Exposure Pathway

The SI results in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors based on the aforementioned criteria.

7.2.1 AOI 1 and AOI 2

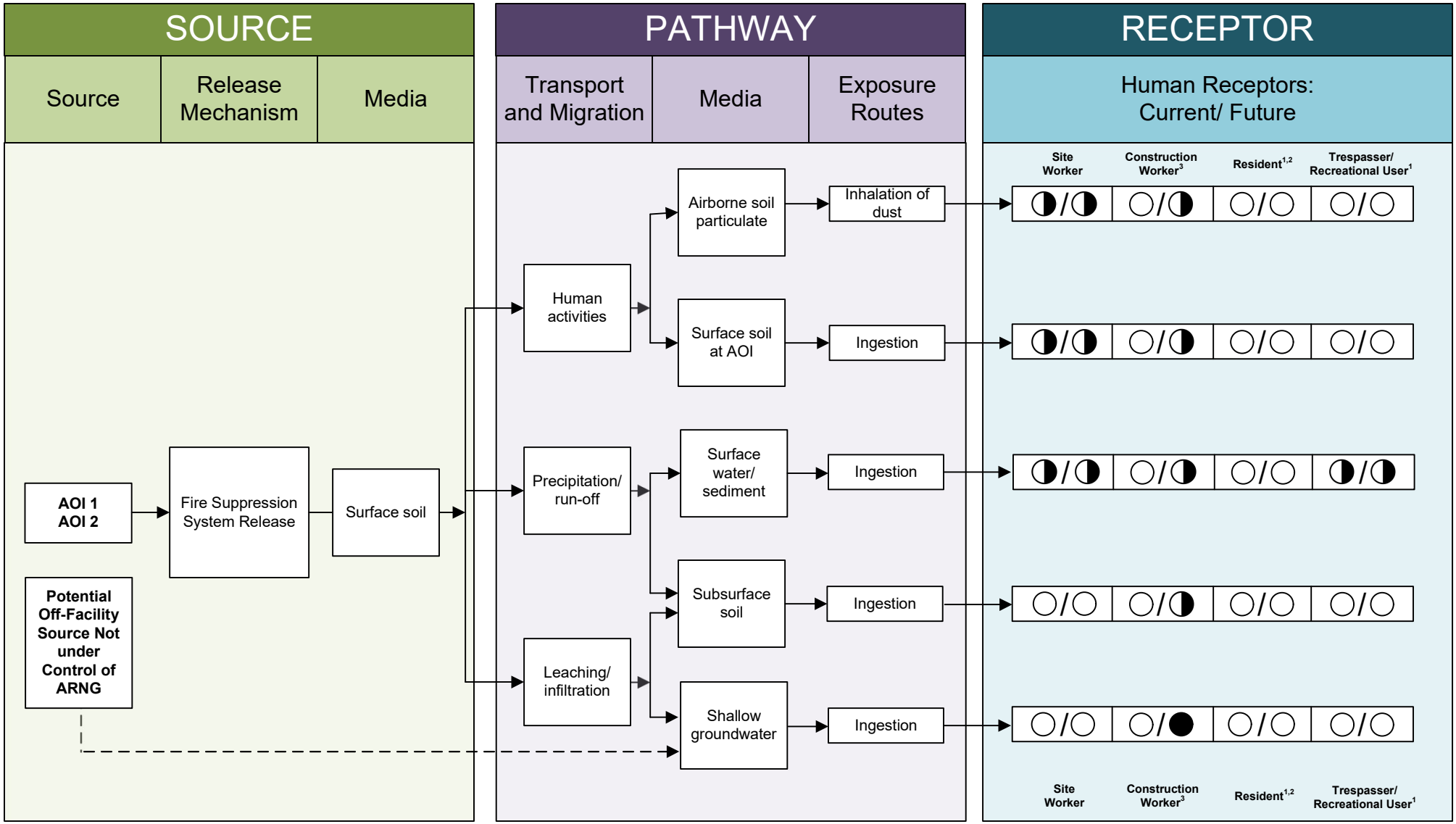
PFOA, PFOS, and PFHxS were detected above their SLs in groundwater samples collected at AOI 1. PFOA and PFOS were detected above their SLs in groundwater samples collected at AOI 2. Depths to water measured at the AOIs in February 2022 during the SI ranged from 4.87 to 26.37 feet bgs. Therefore, construction workers could reasonably encounter groundwater (<15 feet bgs) and the ingestion exposure pathway for future construction workers is considered potentially complete. Potable water at the facility is supplied by Greenville Water, which sources from surface water intakes located between 25 and 30 miles from the facility. Additionally, a well search conducted within a 4-mile radius of the facility found one public supply well located cross-gradient of the facility, approximately 3.5 miles south. Therefore, the ingestion exposure pathway for site workers and off-facility residents is considered incomplete. The CSM for AOI 1 and AOI 2 is presented on **Figure 7-1**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors. Surface water and sediment samples were not collected and analyzed during this SI.

7.3.1 AOI 1 and AOI 2

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because the relevant compounds were detected in soil and groundwater at the AOIs, it is possible that those compounds may have migrated from soil and groundwater to the unnamed pond located north of the aircraft ramp or the on-facility retention basin located northeast of the helipad. Therefore, the surface water and sediment ingestion exposure pathway for site workers and future construction workers is considered potentially complete. Additionally, the pond is connected to an unnamed tributary of Marrow Bone Creek, which subsequently discharges to Reedy River. Due to the potential recreational use of Reedy River, the surface water and sediment ingestion exposure pathway for recreational users is also considered potentially complete. The CSM for AOI 1 and AOI 2 is presented on **Figure 7-1**.



LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.

Figure 7-1
Conceptual Site Model, AOI 1 and AOI 2
AASF Upstate

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8. Summary and Outcome

This section summarizes SI activities and findings. The most significant findings are summarized in this section and are reproduced directly or abstracted from information contained in this report. The outcome provides general and comparative interpretations of the findings relative to the SLs.

8.1 SI Activities

The SI field activities were conducted from 28 January 2022 to 10 February 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021), samples were collected and analyzed for a subset of 18 compounds by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

- Sixteen (16) soil samples from four boring locations and four hand auger locations;
- Four grab groundwater samples from four temporary wells;
- Eleven (11) QA/QC samples.

An SI is conducted when the PA determines an AOI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOIs, which are described in **Section 7**.

8.2 Outcome

Based on the results of this SI, further evaluation under CERCLA is warranted in an RI for AOI 1 and AOI 2 (see **Table 8-1**). Based on the CSMs developed and revised in light of the SI findings, there is no potential for exposure to drinking water receptors from sources on the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - PFOA, PFOS, and PFHxS in groundwater exceeded their SLs at monitoring well AOI01-02. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 174 ng/L. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 7.07 ng/L. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 972 ng/L. Detected concentrations of PFNA and PFBS in groundwater were below their SLs.
    - The detected concentrations of the relevant compounds in soil at AOI 1 were below their SLs.
    - Based on the exceedances of the SLs in groundwater, further evaluation of AOI 1 is warranted in an RI.

- At AOI 2:
    - PFOA and PFOS in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 17.6 ng/L at location AOI02-02. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 17.8 ng/L at AOI02-02. Detected concentrations of PFHxS, PFNA, and PFBS in groundwater were below their SLs.
    - The detected concentrations of the relevant compounds in soil at AOI 2 were below their SLs.
    - Based on the exceedances of the SLs in groundwater, further evaluation of AOI 2 is warranted in an RI.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI, as screening values were established after SI planning and execution. However, ARNG will add HFPO-DA to the list of constituents sampled during the next phase of CERCLA if warranted.

Table 8-1 summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

Table 8-1: Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Hot and Cold Hangars	◐	●	N/A	Proceed to RI
2	Wash Rack	◐	●	●	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

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