FINAL
Site Inspection Report
Winder Barrow AASF
Winder, Georgia

Perfluorooctanesulfonic Acid (PFOS) and
Perfluorooctanoic Acid (PFOA) Impacted Sites
ARNG Installations, Nationwide

June 2022

Prepared for:

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
6:2 FTS	6:2 Fluorotelomer sulfonic acid
8:2 FTS	8:2 Fluorotelomer sulfonic acid
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film forming foam
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
DQI	data quality indicator
DQO	data quality objective
DUA	data usability assessment
DVR	data validation report
EIS	extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EPD	Environmental Protection Division
ERB	equipment rinsate blank
FedEx	Federal Express
FRB	field reagent blank
FTA	Fire Training Area
GAARNG	Georgia Army National Guard
HA	Health Advisory
HDPE	high-density polyethylene
IDW	investigation-derived waste
IIS	injection internal standards
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOD	limit of detection
LOQ	limit of quantitation
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate

NELAP	National Environmental Laboratory Accreditation Program
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
ng/L	nanograms per liter
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutyrate
PFBS	perfluorobutanesulfonic acid
PFCs	perfluorinated compounds
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUdA	perfluoroundecanoic acid
PID	photoionization detector
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
RPD	relative percent differences
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

Executive Summary

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at per- and polyfluoroalkyl substances (PFAS)-impacted sites at ARNG facilities nationwide. The objective of the SI at each facility is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutanesulfonic acid (PFBS) at or above screening levels (SLs). A SI was completed at Winder Barrow Army Aviation Support Facility (AASF) in Winder, Georgia. Winder Barrow AASF will also be referred to as the "facility" throughout this document.

The AASF is located in Barrow County, Winder, Georgia, at the Barrow County Airport. The AASF is north of Atlanta Highway, west of Bowman Mill Road, south of Highway 82, and east of Picklesimon Road. The communities of Bethlehem, Winder, Statham, Bogart, Auburn, and Dacula, Georgia lie within 15 miles of the AASF. The AASF is constructed on a 32.9-acre parcel of land owned by the Georgia ARNG since 1967. The AASF currently contains several buildings, two hangars, and three ramp areas. There is no fire suppression system at Winder Barrow AASF.

During the PA for PFAS, two AOIs were identified at the facility: the North Ramp Fire Training Area (FTA) and East Ramp AFFF Release Area. PFAS-containing materials were potentially released to soil and groundwater within the boundary of Winter Barrow AASF through fire training exercises. Three additional AOIs, the Tri-Max™ Storage Area, Former Storage Area, and Wash Rack, have been identified since the PA based on historic AFFF storage. The SI field activities were conducted on 16 July 2021 and from 27 to 30 September 2021, and they included the collection of soil and groundwater samples.

To fulfill the project Data Quality Objectives set forth in the approved SI Quality Assurance Project Plan Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 PFAS by liquid chromatography with tandem mass spectrometry compliant with Quality Systems Manual 5.3 Table B-15. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.9** of this Report.

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 Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). 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 and there is a release identified that is likely attributed to ARNG activities, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS.

Additionally, the USEPA issued drinking water lifetime Health Advisories (HAs) for PFOA and PFOS in May 2016 (USEPA 2016a; USEPA, 2016b). The USEPA HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. The SLs are presented on **Table ES-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain the 18 PFAS analyzed within the boundaries of the facility.

Sample chemical analytical concentrations were compared against the project SLs as described in **Table ES-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1, PFOA, PFOS, and PFBS in groundwater exceeded their respective individual SLs at temporary well locations (AOI01-01 and AOI01-02), with maximum concentrations of 1,740 nanograms per liter (ng/L) (AOI01-02), 7,350 ng/L (AOI01-

02), and 1,220 ng/L (AOI01-01), respectively. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.

- At AOI 2, PFOA and PFOS in groundwater exceeded their respective individual SLs at all temporary well locations (AOI02-01 through AOI02-03), with maximum concentrations of 181 (J+, estimated concentration biased high) ng/L (AOI02-01) and 1,210 J ng/L (AOI02-01), respectively. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.
- At AOI 3, detected concentrations of PFOA, PFOS, and PFBS in groundwater were below SLs.
- At AOI 4, PFOA and PFOS in groundwater exceeded their respective individual SLs at all l location AOI04-01 with concentrations of 622 ng/L and 62,700 ng/L, respectively. Based on the results of the SI, further evaluation of AOI 4 is warranted in the RI.
- At AOI 5, PFOA and PFOS in groundwater exceeded their respective individual SLs at both temporary well locations (AOI05-01 and AOI05-02) with maximum concentrations of 410 ng/L (AOI05-02) and 1,210 ng/L (AOI05-01), respectively. Based on the results of the SI, further evaluation of AOI 5 is warranted in the RI.
- At WB-01 and WB-02, PFOS in groundwater exceeded its SL with concentrations of 219 ng/L and 151 ng/L, respectively. Based on the results of the SI, further evaluation of the facility upgradient and downgradient areas is warranted in the RI.
- The detected concentrations of PFOS in surface soil at AOI 5 exceeded the SL at both locations (AOI05-01 and AOI05-02), with a maximum concentration of 639 µg/kg at AOI05-01.
- The detected concentrations of PFOA, PFOS, and PFBS in soil at AOI 1 through AOI 4 were below the SLs.

Table ES-2 summarizes the SI findings for soil and groundwater. Based on the conceptual site models developed and revised in light of the SI findings, there is potential for exposure to onsite workers, future construction workers, and trespassers via inhalation of dust, ingestion of surface soil, and ingestion of surface water and/or sediment; potential for exposure to future construction workers via ingestion of subsurface soil and shallow groundwater; potential for exposure to off-facility recreational users via ingestion of surface water and/or sediment; and potential for exposure to off-facility residents via ingestion of shallow groundwater caused by DoD activities at or adjacent to the facility.

Table ES-3 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOI 1: North Ramp FTA, AOI 2: East Ramp AFFF Release Area and Tri-Max™ Staging Area, AOI 4: Former Storage Area, and AOI 5: Wash Rack.

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

Analyte	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]	USEPA HA (Groundwater representative of Drinking Water) (ng/L)[b,c]
PFOA	130	1,600	40	70
PFOS	130	1,600	40	70
PFBS	1,900	25,000	600	-

Notes:

a.) Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 15 September 2021.

b.) USEPA. 2016a. Drinking Water Health Advisory (HA) for Perfluorooctanoic Acid (PFOA). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-005. May 2016. / USEPA. 2016b. Drinking Water HA for Perfluorooctane Sulfonic Acid (PFOS). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-004. May 2016.

c.) USEPA HAs apply to the PFOA and PFOS concentrations individually or combined.

Table ES-2: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	North Ramp FTA	◐	●	●
2	East Ramp AFFF Release Area	◐	●	●
	Tri-Max™ Staging Area	◐	●	●
3	Former Tri-Max™ Storage	◐	◐	●
4	Former Storage Area	◐	●	●
5	Wash Rack	●	●	●
Sitewide Location – Upgradient	Unknown	◐	N/A	●
Sitewide Location – Downgradient	Potential Facility Releases	◐	N/A	●

Legend:

N/A = not applicable

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

Table ES-3: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	North Ramp FTA	Exceedances of SLs in groundwater at source area and in the downgradient direction. No exceedances of SLs in soil.	Proceed to RI
2	East Ramp AFFF Release	Exceedances of SLs in groundwater at source area and in the downgradient direction. No exceedances of SLs in soil.	Proceed to RI
	Tri-Max™ Staging Area	Exceedances of SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI
3	Former Tri-Max™ Storage	Detections in groundwater but no exceedances of SLs. No exceedances of SLs in soil.	No further action
4	Current Tri-Max™ Storage	Exceedances of SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI
5	Wash Rack	Exceedances of SLs in groundwater at source area and in the downgradient direction. Exceedances of SLs in soil at the source area and in the downgradient direction.	Proceed to RI

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites, ARNG Installations, Nationwide. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor, AECOM Technical Services, Inc. (AECOM), under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017. The ARNG performed this SI at Winder Barrow Army Aviation Support Facility (AASF) in Winder, Georgia. Winder Barrow AASF 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; 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 including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as per- and polyfluoroalkyl substances (PFAS). The term PFAS is used throughout this report to encompass all PFAS chemicals being evaluated, including PFOA, PFOS, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the task order.

1.2 SI Purpose

A PA was performed at Winder Barrow AASF (AECOM, 2020) that identified two potential PFAS release areas at the facility, which were grouped into Areas of Interest (AOIs). Three additional AOIs have been identified since the PA based on historic aqueous film forming foam (AFFF) storage. The objective of the SI is to identify whether there has been a release to the environment from the AOIs and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

As stated in the *Federal Facilities Remedial Site Inspection Summary Guide* (USEPA, 2005), an SI has five goals:

1. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment;
2. Determine the potential need for a removal action;
3. Collect or develop data to evaluate potential release;
4. Collect data to better characterize the release for more effective and rapid initiation of a Remedial Investigation (RI), if determined necessary; and
5. Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD).

In addition to the USEPA-identified goals of an SI, the ARNG SI also identifies whether there are potential off-facility PFAS sources.

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2. Facility Background

2.1 Facility Location and Description

The Winder Barrow AASF (**Figure 2-1**) is in Barrow County near Winder, Georgia, at the Barrow County Airport. The AASF is north of Atlanta Highway, west of Bowman Mill Road, south of Highway 82, and east of Picklesimon Road. The communities of Bethlehem, Winder, Statham, Bogart, Auburn, and Dacula, Georgia lie within 15 miles of the AASF. The AASF is constructed on a 32.9-acre parcel of land owned by the Georgia ARNG (GAARNG) since 1967. The AASF includes several buildings, two hangars, and three ramp areas. There are no deluge fire suppression systems in the Winder Barrow AASF hangar spaces. The Barrow County Fire Department provides emergency response services to the facility.

2.2 Facility Environmental Setting

The City of Winder is in the Piedmont physiographic province, a region characterized by narrow valleys, occasional isolated mountains, and rolling hills with modest relief that form the foothills of the Blue Ridge Mountains. The boundary of the Piedmont on the southern margin is the fall line, which separates the Piedmont from the low-lying Coastal Plains and represents the extent of the Mesozoic Atlantic Ocean. The elevation of the facility is approximately 925 feet above mean sea level. The topography of the facility is generally level, sloping slightly to the north (**Figure 2-2**).

2.2.1 Geology

The AASF is situated on red Piedmont soils derived from the weathering of the underlying feldspar-rich igneous rocks such as granitic gneiss, and metamorphic rocks, such as biotitic gneiss, mica schist, and amphibolite rocks (**Figure 2-3**). Mineral resources of this region include hard-crushed stone, soapstone, and granite. The Piedmont is topographically composed of rolling hills, with ridges and isolated granitic plutons that rise above the landscape of the region (University of Georgia, Department of Geology, 2015).

Borings completed as a part of this SI were drilled to depths between 19 and 25 feet below ground surface (bgs). The geological data collected from the boreholes indicate that the dominant lithology of the unconsolidated material underlying the Winder Barrow AASF is comprised of fine- to medium-grained, poorly to well-graded sand. Boring logs showed varying percentages of fines (silt and clay, specifically kaolinite), gravel, and weathered rock. Fines in subsurface soil ranged from trace amounts to 45%. Trace amounts of micas, such as lepidolite, were also observed. The soils observed at the facility have a relatively high hydraulic conductivity, with well-graded sands and sand with gravel having the highest conductivity. Weathered bedrock observed at boring location AOI02-02 likely has a lower hydraulic conductivity and represents the most impermeable material.

Soil borings across the northern area of the facility showed silty sand with trace to little clay from surface to 10 feet bgs. It is possible soil in the northern portion of the facility has been re-graded for parking lot construction and leveling. It is unclear whether artificial fill is present in subsurface soil. These site observations are consistent with the expected subsurface material conditions.

2.2.2 Hydrogeology

The AASF is within the boundaries of the Piedmont and Blue Ridge aquifers, both consisting of unconsolidated material called regolith overlying the bedrock. The crystalline bedrock formed under intense heat and pressure and therefore has few primary pore spaces and very low permeability; however, large amounts of water do permeate through fractures in the bedrock and

through the regolith (University of Georgia Institute of Ecology, 2002). Wells tapping the Piedmont and Blue Ridge crystalline-rock aquifers are typically 150 to 700 feet bgs. The Piedmont and Blue Ridge aquifers are used extensively as sources for private wells and public water supply in the southeast region of the US (US Geological Survey [USGS], 2017).

No potable water wells are located within the AASF; however, an EDR Report performed as a part of the facility PA (AECOM, 2020) shows wells existing side gradient to and within 1 mile of the facility (**Figure 2-3**). Additionally, real estate listings for multiple homes in the downgradient direction describe the residential water source as “well” or “private”, and some have no water source listed. Drinking water for the AASF is supplied by the City of Winder Water Works, which sources the drinking water from the Mulberry River at the Laurel Lane reservoir and Water Plant Reservoirs (City of Winder Water Works, 2019). The Laurel Lane reservoir is approximately 4.8 miles northwest of the facility, and the Water Plant Reservoir is approximately 4.3 miles northwest of the facility. Based on the USEPA’s Unregulated Contaminant Monitoring Rule 3 data, no PFAS were detected in a public water system above the USEPA Health Advisory (HA) Level within 20 miles of the facility (USEPA, 2017a); however, data gaps exist for some of the public water systems. The HA is 70 nanograms per liter (ng/L) for PFOA and PFOS, individually or combined. PFAS analyses performed in 2016 had method detection limits (MDLs) that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

Groundwater flow within the unconsolidated surficial aquifer at the facility is influenced by surface topography. In general, surface topography slopes from the flatter, higher elevations in the southeastern portion of the facility towards the drainage canal in the northern portion of the facility. There is an approximately 15 feet drop from the northern parking areas to the base of the drainage canal ravine. It is possible that the slope was steepened by grading during construction of the northern parking lot. The drainage canal may act as a draw on groundwater flow. Depths to water measured in September 2021 during the SI ranged from 9.58 to 16.29 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate groundwater flow direction is generally to the northwest towards the drainage canal on the northern edge of the property.

2.2.3 Hydrology

The AASF is in the Upper Oconee River Basin, more specifically in the Middle Oconee River tributary region and in the Beech Creek watershed (**Figure 2-5**). Regional surface water features include Lower Twin Lake, Barber Creek, Rocky Creek, and other small unnamed lakes and tributaries. Drainage canals within the AASF boundary lead to Lower Twin Lake to the northwest. Drainage canals that are located off-facility to the northeast of the AASF drain to the Rocky Creek (Metropolitan North Georgia Water Planning District, 2016).

2.2.4 Climate

The subtropical climate at the AASF is characterized as short and mild winters, with hot and humid summers, and a long spring season. The average temperature is 59.65 degrees Fahrenheit (°F). Seasonally, temperatures vary from average highs of 71.5 °F to average lows of 47.8 °F. Average precipitation is 53.15 inches (World Climate, 2022).

2.2.5 Current and Future Land Use

The AASF is a controlled access facility and is located at the Barrow County Airport. The Winder Barrow County Airport is owned and operated by the City of Winder and provides commercial and general air service to the Winder area and northeast Georgia. Reasonably anticipated future land use is expected to remain the same.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following birds, plants, mammals, and fish are federally endangered, threatened, proposed, and/ or are listed as candidate species in Barrow County, Georgia (US Fish and Wildlife Service [USFWS], 2021).

- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Mammals**: Tricolored bat, *Perimyotis subflavus* (under review)
- **Flowering plants:** Little amphianthus, *Amphianthus pusillus* (threatened)
- **Ferns and Allies:** Black spored quillwort, *Isoetes melanospora* (endangered)
- **Fishes:** Robust redhorse, *Moxostoma robustum* (under review)

2.3 History of PFAS Use

PFAS-containing materials were potentially released to soil and groundwater within the boundary of Winder Barrow AASF through fire training exercises, AFFF handling and storage, and general maintenance activities. Descriptions of the AOIs are presented in **Section 3**.

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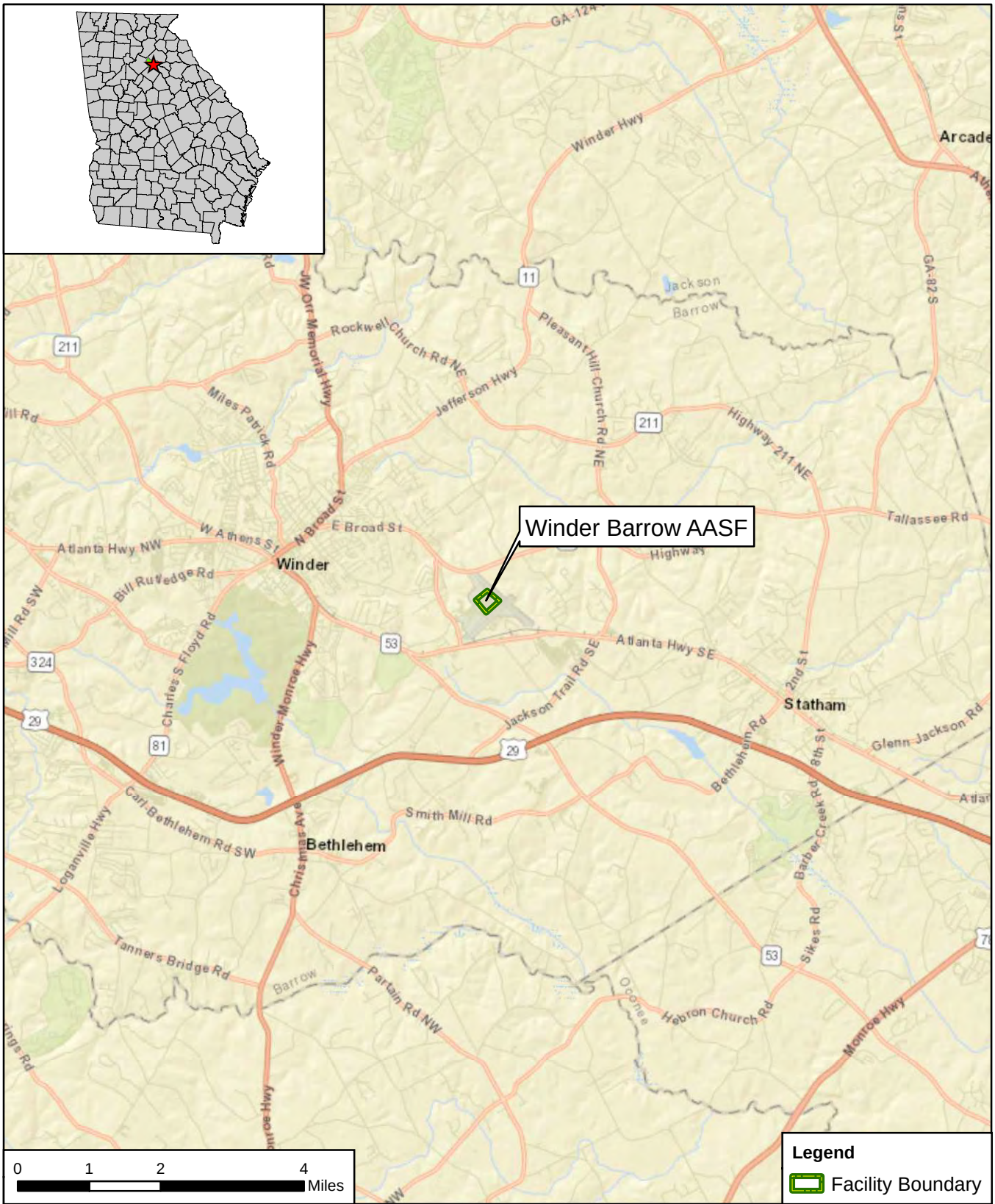

CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/2/2022	GIS BY	MS	2/2/2022
SCALE	1:125,000	CHK BY	JW	2/2/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	2/2/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1

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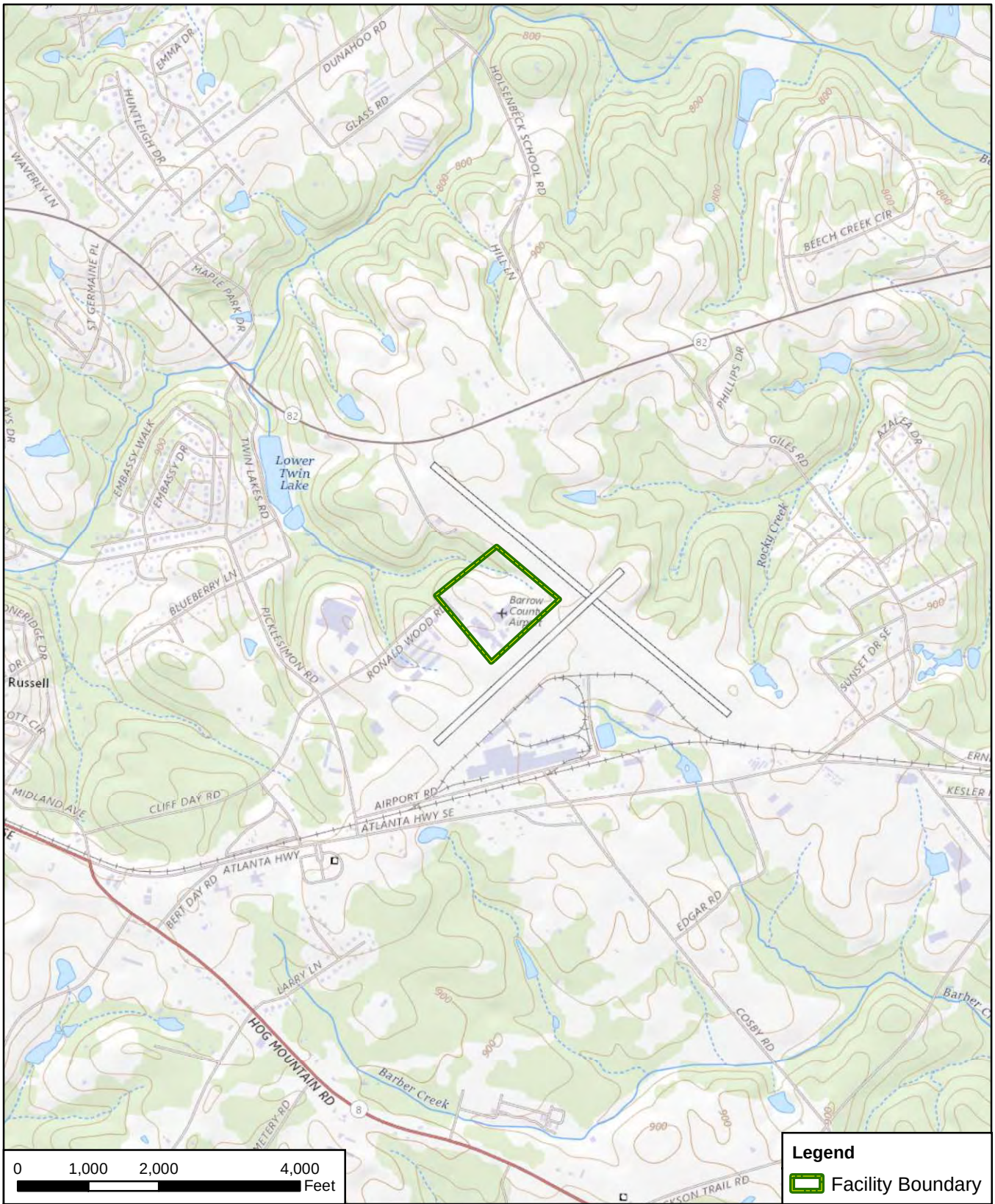

CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/2/2022	GIS BY	MS	2/2/2022
SCALE	1:24,000	CHK BY	JW	2/2/2022
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	2/2/2022

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Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2

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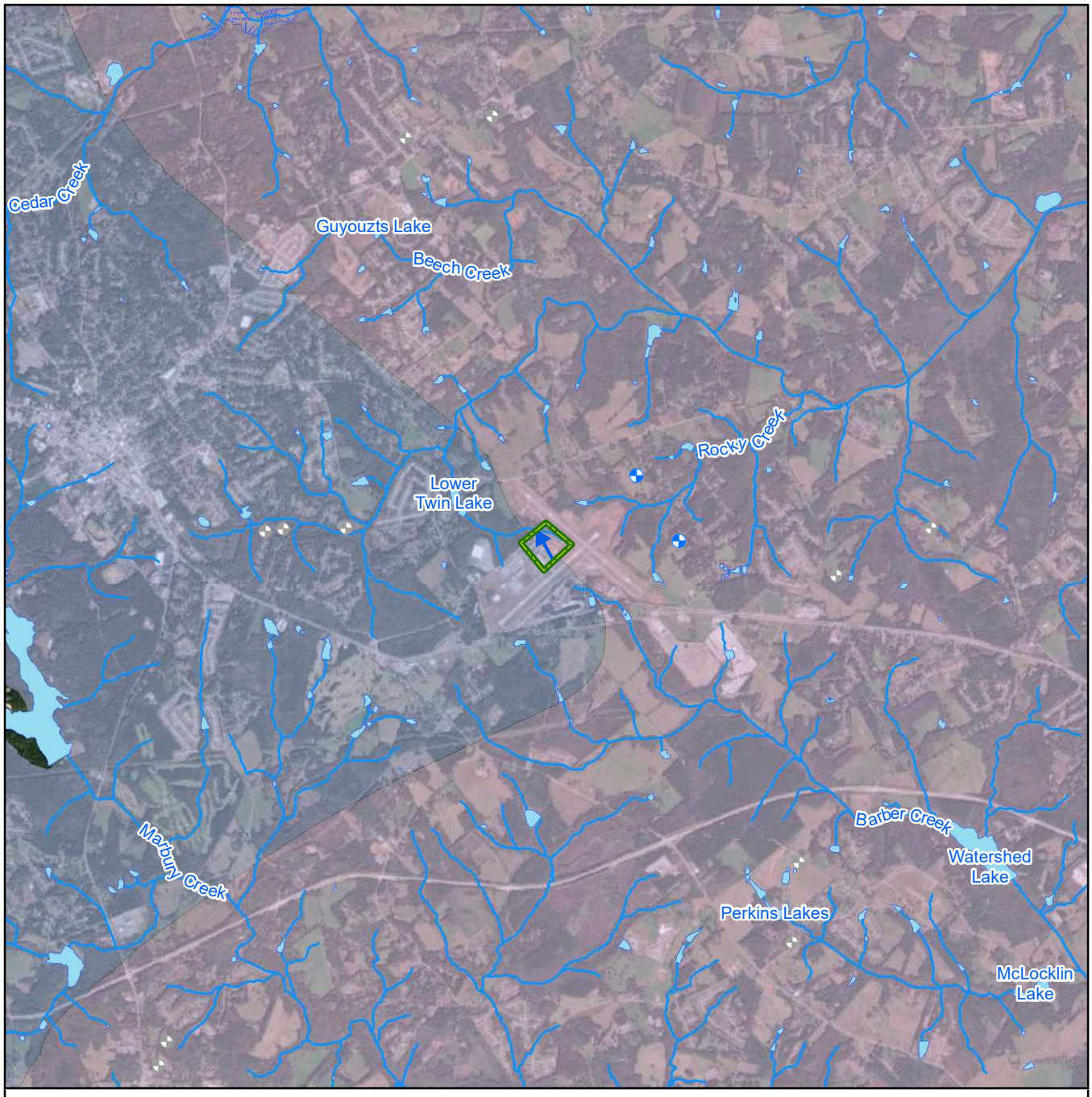

Legend

- Facility Boundary
- Water Body
- Wetlands
- River/Stream
- Groundwater Flow Direction

Geology

- Granitic Gneiss Undifferentiated
- Biotitic Gneiss/Mica Schist/Amphibolite

Wells

- Water Well
- USGS NWIS Inactive Well

0 0.5 1 2 Miles

CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/3/2022	GIS BY	MS	2/3/2022
SCALE	1:63,360	CHK BY	JW	2/3/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	2/3/2022

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Groundwater Features

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Figure 2-3

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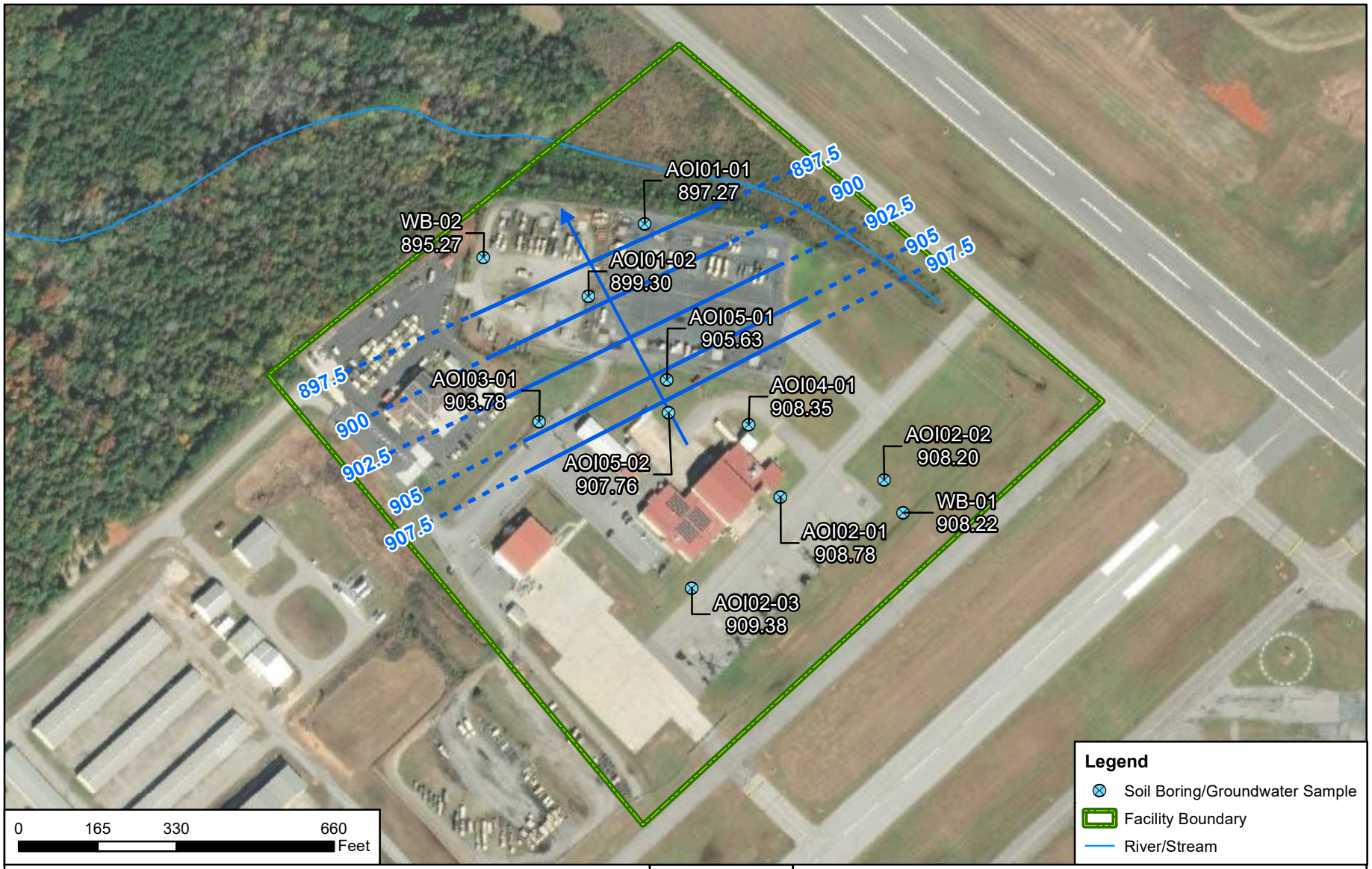

CLIENT	ARNG			
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Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/3/2022

Groundwater Elevations, September 2021

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 2-4

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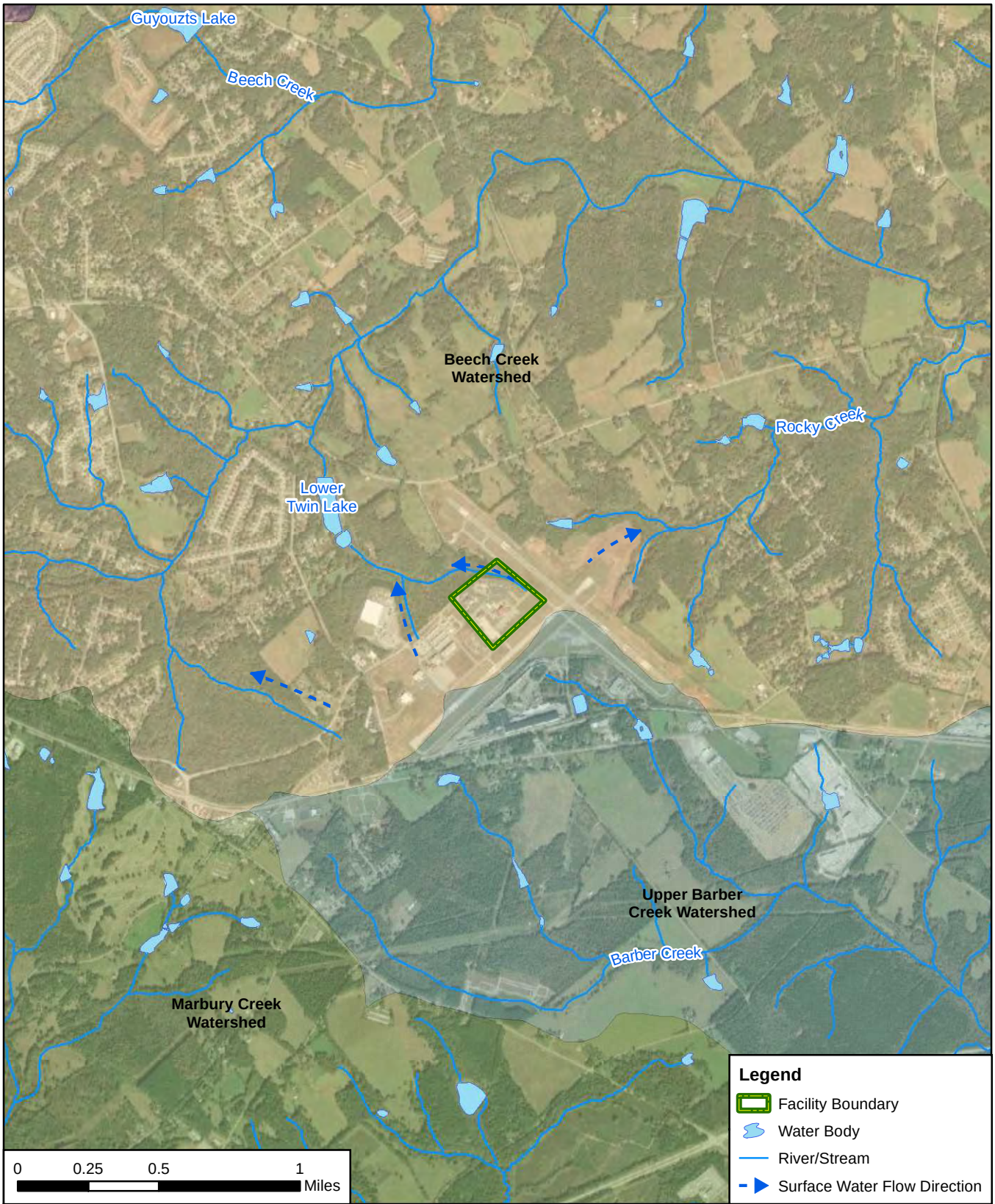

CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/2/2022	GIS BY	MS	2/2/2022
SCALE	1:31,680	CHK BY	JW	2/2/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	2/2/2022

Surface Water Features

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Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

This section presents a summary of each potential PFAS release area by AOI. Based on the PA findings, two potential PFAS release areas, the North Ramp Fire Training Area (FTA) and East Ramp AFFF Release Area, were identified at Winder Barrow AASF (AECOM, 2020). Three additional AOIs have been identified since the PA based on historic AFFF storage (AECOM, 2021a). The potential PFAS release areas are shown on **Figure 3-1**.

3.1 AOI 1

AOI 1 consists of one potential PFAS release area. The release area is described below.

3.1.1 North Ramp FTA

AOI 1 is the FTA located on the north ramp where the City of Atlanta Fire Department visited the facility for a fire training course. During the training event, a 55-gallon drum was ignited, and AFFF may have been dispensed from a firetruck to douse the fire. No information was available regarding concentration or volume of AFFF potentially released. This potential release occurred during one event prior to 2004; however, the exact date is unknown.

Historically, the north ramp was completely paved; however, sometime between 1999 and 2005, the western third of the pavement was removed and left bare ground or gravel cover. The north ramp has no storm drains, and surface water flows north, toward a low-lying area in the northern corner of the AASF and then to the drainage canal on the northwest border of the AASF, potentially releasing PFAS to surface water, sediment, and surface soil.

3.2 AOI 2

AOI 2 consists of two potential PFAS release areas. The release areas are described below.

3.2.1 East Ramp AFFF Release Area

AOI 2 is located southeast of Hangar 2. During an elementary school field trip demonstration, there was an unintentional release of AFFF from the facility crash rescue firetruck. It is unknown if GAARNG fire response assets were used during the fire training demonstration. The AFFF release occurred on the ramp directly southeast of Hangar 2. No information is available regarding concentration or volume of AFFF potentially released.

3.2.2 Tri-Max™ Staging Area

In addition, facility staff stated that, at various times, Tri-Max™ fire extinguishers have been staged on the flight ramp; however, the exact timeframe and locations of Tri-Max™ fire extinguishers on the flight ramp are uncertain. It is presumed that the units were stationed on the east side of the main ramp, between aircraft parking positions.

3.3 AOI 3

AOI 3 consists of one potential PFAS release area. The release area is described below.

3.3.1 Former Tri-Max™ Storage

AOI 3 is a storage cage located in the center of the facility that was used to house twelve 30-gallon Tri-Max™ fire extinguishers; however, since the PA, the units were moved and are currently staged at AOI 4, pending transport to an off-site repair facility. There are no Tri-Max™ units present at AOI 3. The Tri-Max™ fire extinguishers were stationed on the main ramp since approximately 2003, but it is unknown when they were moved to AOI 3. The units are routinely removed from the facility to be serviced by a contractor and are not known to have been dispensed at the facility. No information is available regarding the concentration of AFFF used in the fire extinguishers.

3.4 AOI 4

AOI 4 consists of one potential PFAS release area. The release area is described below

3.4.1 Former Storage Area

AOI 4 is a small garage located on the northeast side of Hangar 2. The garage formerly stored the AASF crash rescue firetruck until approximately 2004. The crash rescue firetruck is not known to have been used to extinguish fires but may have been used to store AFFF in 5-gallon buckets. Bulk AFFF was also stored in the same garage but was removed when the crash rescue firetruck was removed in 2004. Additionally, twelve 30-gallon Tri-Max™ fire extinguishers awaiting offsite transport and disposal are currently staged on the southeast side of the garage. The Tri-Max™ units are currently full. The small garage has no floor drains, but a bay door opens on the west end of the garage to a gravel driveway.

3.5 AOI 5

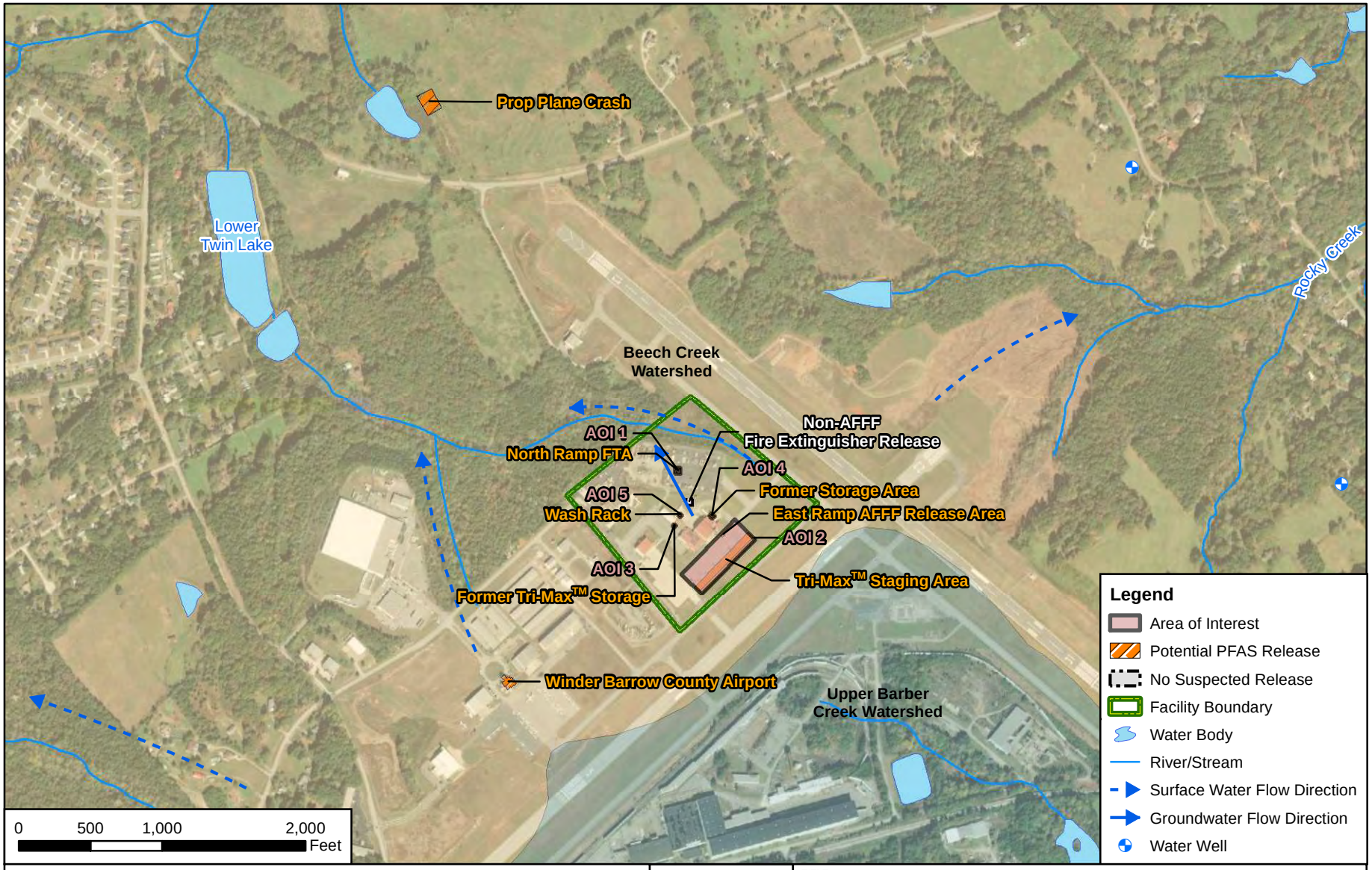
AOI 5 consists of one potential PFAS release area. The release area is described below

3.5.1 Wash Rack

AOI 5 is the Wash Rack located northwest of Hangar 2. Following the known AFFF release during the elementary school field trip demonstration, the former crash rescue firetruck was washed at the Wash Rack. It is unclear whether AFFF hose lines were drained or rinsed during that time. Additionally, 5-gallon buckets have been temporarily stored in a flammable container adjacent to the Wash Rack. No known AFFF releases have been confirmed at AOI 5. The Wash Rack is plumbed to a recirculatory system that cycles through to a settling tank. Sediments from the settling tank have not been removed since 2005. The settling tank, which was installed in 1997, is concrete-lined with a 6-inch concrete bottom.

3.6 Adjacent Sources

In addition to the AOIs identified, two potential off-facility sources of PFAS adjacent to the AASF, not under the control of the GAARNG, were identified during the PA. On 26 September 2017 a small single prop plane crashed in the wood line of a pasture across from Winder Barrow County Airport on Highway 82. AFFF was released by Barrow County Emergency Services in response, but no information was available regarding concentration or volume of AFFF potentially released. The crash site is downgradient from the AASF. Additionally, the Barrow Airport County Emergency Service Department conducts fire training exercises at the Barrow County Airport but does not use AFFF for their exercises. There is a fire suppression system present on Barrow County Airport property; however, there is no information available regarding the type of suppression system or extinguishant used.



CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Winder Barrow AASF, GA			
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SCALE	1:12,000	CHK BY	JW	2/3/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/3/2022

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TITLE

Areas of Interest

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

Project Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support the project decision-making process. The specific DQOs established for this facility are described below. These DQOs were developed in accordance with the USEPA's seven-step iterative process (USEPA, 2006).

4.1 Problem Statement

The following problem statement was developed during project planning:

The presence of PFAS, which may pose a risk to human health or the environment, in environmental media at the facility is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve.

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 Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). 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 three compounds: PFOS, PFOA, and PFBS.

Additionally, the USEPA issued drinking water lifetime Health Advisories (HAs) for PFOA and PFOS in May 2016 (USEPA 2016a; USEPA, 2016b). The USEPA HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. The SLs are presented in Section 6.1 of this Report.

The following quotes from the DA policy documents form the basis for this project (DA, 2016; DA, 2018):

- "The Army will research and identify locations where PFOS- and/or PFOA-containing products, such as AFFF, are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider FTAs, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas.".
- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination.".
- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA HA levels." (USEPA, 2016a; USEPA, 2016b).

4.2 Goals of the Study

The following goals were established for this SI:

1. Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.
2. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
3. Determine the potential need for a Time Critical Removal Action (TCRA) (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.
4. Collect data to better characterize the release areas for more effective and rapid initiation of a RI (if determined necessary).
5. If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).
6. Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.

4.3 Information Inputs

Primary information inputs included:

- The PA for Winder Barrow AASF (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)-Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.4 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).

4.5 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs and decision rules as defined in the SI QAPP Addendum (AECOM, 2021a). These rules governed response actions based on the results of the SI sampling effort.

The decision rules described in the **Worksheet #11** of the SI QAPP Addendum identify actions based on the following:

Groundwater:

- Is there a human receptor within 4 miles of the facility?
- What is the concentration of PFOA, PFOS, and PFBS at the potential release areas?

- What is the concentration of PFOA, PFOS, and PFBS at the facility boundary upgradient and downgradient of the potential release areas?
- What does the conceptual site model (CSM) suggest in terms of source, pathway and receptor?

Soil:

- What is the concentration of PFOA, PFOS, and PFBS in shallow surface soil (0 to 2 feet bgs)?
- What is the concentration of PFOA, PFOS, and PFBS in deep soil (i.e., capillary fringe)?
- What does the CSM suggest in terms of source, pathway, and receptor?

Soil and groundwater samples were collected from each of the potential release areas. Groundwater was encountered at approximately 9.56 to 22.5 feet bgs.

4.6 Data Usability Assessment

The Data Usability Assessment (DUA) 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.

Data Quality Indicators (DQIs) (Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity) are important components in assessing data usability. These DQIs were evaluated in the subsequent sections and demonstrate that the data presented in this SI report are of high quality. Although the SI data are considered reliable, some degree of uncertainty can be associated with the data collected. Specific factors that may contribute to the uncertainty of the data evaluation are described below. The Data Validation Report (DVR) (**Appendix A**) presents explanations for all qualified data in greater detail.

4.6.1 Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate relative percent differences (RPD); laboratory precision is measured with calibration verification, internal standard recoveries, laboratory control spike (LCS) and matrix spike (MS) duplicate RPD.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. No associated calibration verifications displayed results outside the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

LCS/laboratory control spike duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

MS/matrix spike duplicate (MSD) samples were prepared, analyzed, and reported for all preparation batches. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. MS/MSD samples were submitted to the laboratory for analysis at a rate of 5 percent (%). The MS/MSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for PFAS and general chemistry parameters. The field duplicate samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a) with several exceptions. Several field duplicate pairs displayed one non-detect result for a compound while the associated field duplicate sample displayed a positive result. The non-detect parent sample result was qualified UJ,fd while the positive duplicate sample result was qualified J,fd. The qualified field duplicate pair results should be considered usable as estimated values.

4.6.2 Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in the LCS/LCSD, MS/MSD, and surrogates.

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis. The LCS/LCSD samples were within the project established accuracy limits presented in the QAPP Addendum (AECOM, 2021a).

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. The MS/MSD samples were within the project established control limits presented in the QAPP Addendum (AECOM, 2021a) with limited exceptions. Parent samples AOI02-01-GW and AOI01-02-SB-16-18 displayed MS/MSD percent recoveries outside the project established control limits for multiple target analytes. In field sample AOI02-01-GW, the native sample results for multiple analytes displayed concentrations greater than four times the spike values; these recoveries were not applicable for qualification and the field sample results should be considered usable as reported. The positive field sample result associated with low MS/MSD recoveries was qualified as estimate with a positive bias. The positive field sample result with associated high MD/MSD recoveries was qualified as estimate with a negative bias. The positive field sample result associated with the indeterminate bias was qualified as estimate. These field sample results should be considered usable as qualified as estimated values.

Extraction internal standards (EIS) were added by the laboratory during sample extraction to measure relative responses of target analytes and used to correct for bias associated with matrix interferences and sample preparation efficiencies, injection volume variances, mass spectrometry ionization efficiencies, and other associated preparation and analytical anomalies. The EIS samples were within the project established accuracy limits presented in the QAPP Addendum (AECOM, 2021a).

Injection internal standards (IIS) were added by the laboratory after sample extraction and prior to analysis as a legacy requirement of DoD QSM 5.1 to measure relative responses of target analytes. Even though not required under the current DoD QSM 5.3 analysis, the IIS are still added to the sample after extraction as an additional QC measure. The IIS percent recoveries were outside the established precision limits presented in the QAPP Addendum (AECOM, 2021a)

for several analytes. The impact on data usability was not assessed and the field samples were re-analyzed by the laboratory to confirm the initial results. Data quality was not impacted by IIS percent recoveries outside the established precision limits because PFAS analytes are not quantitated based on IIS recoveries.

4.6.3 Representativeness

Representativeness qualitatively expresses the degree to which data accurately reflect site conditions. Factors that affect the representativeness of analytical data include appropriate sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences.

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by liquid chromatography tandem mass spectrometry (LC/MS/MS) Compliant with Quality Systems Manual (QSM) 5.3 Table B-15, including the specific preparation requirements (i.e. ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in Table B-15 were monitored, standards that contained both branched and linear isomers when available were used, and isotopically labeled standards were used for quantitation.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. The laboratory used approved standard methods in accordance with the QAPP Addendum (AECOM, 2021a) for all analyses. All technical and analytical holding times were met by the laboratory for the initial results with limited exceptions. The holding time for pH analysis is considered ‘immediate’ so all pH sample results have been qualified as estimate.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. One instrument and one method blank displayed target analyte concentrations greater than the detection limit (DL). Two decontamination samples were qualified “U” during data validation due to associated detection in the method blank. The reported decon sample result values were adjusted to be equal to the limit of detection (LOD); the LOD was elevated to the concentration of the blank detection in instances where the blank concentration was greater than the LOD. The results are usable as qualified but should be considered false positives and treated as non-detect. The remaining field sample results associated with the blank detection were non-detect or displayed concentrations greater than five times the blank concentrations.

Field blanks and equipment blanks were also collected for groundwater and soil samples. The field blank WB-ERB-01 displayed a concentration for PFOS greater than the DL. The associated field sample results that displayed positive results less than five times the blank detection were qualified “U” during data validation. The results are usable as qualified but should be considered false positives and treated as non-detect. The reported field sample result values were adjusted to be equal to the limit of detection (LOD); the LOD was elevated to the concentration of the blank detection in instances where the blank concentration was greater than the LOD.

A sample of the water used for decontamination of the drill rig was collected in advance of the field effort. The blank samples WB-DECON-01, WB-DECON-02, and DRUM-DECON-01 displayed concentrations greater than the DL for multiple target analytes. The associated field sample results were non-detect or displayed positive results greater than five times the blank detections.

Overall, the data are usable for evaluating the presence or absence of PFAS at the facility. Sufficient usable data were obtained to meet the objectives of the SI.

4.6.4 Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures help ensure comparability. Standard field sampling and typical laboratory protocols were used during the SI and are considered comparable to ongoing investigations.

4.6.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per parameter is as follows and reflects the exclusion of “X/UX” flagged data, if applicable:

- PFAS in aqueous media by LC/MS/MS compliant with DoD QSM 5.3 Table B-15 at 100%
- PFAS in solid media by LC/MS/MS compliant with DoD QSM 5.3 Table B-15 at 100%
- pH in soil by USEPA Method 9045D at 100%
- Total organic carbon (TOC) by USEPA Method 9060 at 100%

4.6.6 Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, an MDL study, and calibration standards at the limit of quantitation (LOQ). In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the QAPP Addendum (AECOM, 2021a). The laboratory provided the requested MDL studies and provided applicable calibration standards at the LOQ. In order to achieve the DQOs for sensitivity outlined in the QAPP Addendum (AECOM, 2021a), the laboratory reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the DL were reported and qualified “J” as estimated values by the laboratory.

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* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Winder Barrow AASF* dated February 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Winder Barrow AASF* dated September 2021 (AECOM, 2021a); and
- *Final Site Safety and Health Plan, Winder Barrow AASF* dated September 2021 (AECOM, 2021b).

The SI field activities were conducted on 16 July 2021, and from 27 to 30 September 2021 and consisted of decontamination water source sampling, 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, 2021a), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 18 PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 to fulfill the project DQOs:

- 38 soil samples from 11 boring locations;
- 11 grab groundwater samples from 11 temporary well locations; and
- 17 quality assurance (QA) 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**, land survey data are provided in **Appendix B3**, and investigation-derived waste (IDW) polygons 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 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 quantitative and qualitative DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 30 August 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, GAARNG, and USACE. The Georgia Department of Environmental Protection was invited but did not attend the meeting. 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, 2021a).

A TPP Meeting 3 was held on 9 May 2022 to discuss the results of the SI. Meeting minutes for the 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 the Georgia 811 “Call Before You Dig” utility clearance provider to notify them of intrusive work on 14 September 2021. By 24 September 2021, Georgia 811 coordinated the utility clearance of all proposed boring locations for electric, telecommunication, gas, and water lines. Additionally, AECOM contracted Ground Penetrating Radar Systems, LLC. (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 27 September 2021 with input from the AECOM field team. 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 PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be acceptable for use in a PFAS investigation prior to the start of field activities. A sample from a potable water source at Winder Barrow AASF was collected on 16 July 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample are provided in **Appendix F**. A discussion of the results is presented in **Section 4.6.3**.

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021a). Prior to the start of field work each day, a PFAS 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 direct push technology (DPT) and hand auger, in accordance with the SI QAPP Addendum (AECOM, 2021a). 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 in **Table 5-1**. Photographs of the soil cores are included in **Appendix C**.

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. Five additional locations were identified for only surface soil samples; at each location samples were collected from 0 to 2 feet bgs.

The soil cores were continuously logged for lithological descriptions by a 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 sampling forms (**Appendix B2**) 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**.

Soil borings completed during the SI found fine to fine- to medium-grained, poorly to well-graded sand as the dominant lithology of the unconsolidated material below the Winder Barrow AASF. Boring logs showed varying percentages of fines (silt and clay, specifically kaolinite), gravel, and weathered rock. Fines in subsurface soil ranged from trace amounts to 45%. Trace amounts of micas, such as lepidolite, were also observed. The soils observed at the facility have a relatively high hydraulic conductivity, with well-graded sands and sand with gravel having the highest conductivity. The borings were completed at depths between 19 and 25 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 for PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15), TOC (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2021a).

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. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, ERBs 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.

All DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) using bentonite chips at completion of sampling activities. In general, most borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces. One boring was advanced in a paved parking area. The locations where only surface soil samples were collected were not converted to temporary wells for groundwater sampling.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Eleven temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth, 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. 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**.

The temporary wells were allowed to recharge after installation before collection of groundwater samples. After the recharge period, groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. 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 [DO], and oxidation-reduction potential [ORP]) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) after 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 for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021a).

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 FRB was collected in accordance with the Programmatic UFP-QAPP (PQAPP) (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Temporary wells were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) by removing the PVC and backfilling the hole with bentonite chips. Most temporary wells were installed in grass areas to avoid disturbing concrete or asphalt; one temporary well was installed in paved parking lot.

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 30 September 2021. Groundwater elevation measurements were collected from the 11 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 2-5**. Groundwater elevation data is provided in **Table 5-2**.

5.5 Surveying

The northern side of each well casing was surveyed by GeoSurvey, Ltd., a Georgia-licensed land surveyor, following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed temporary monitoring wells on the facility were collected on 30 September 2021 in the applicable Universal Transverse Mercator zone projection with World Geodetic System 84 datum (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B3**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of PFAS IDW is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021a) 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 left in place at the point of the source. The soil cuttings were distributed on the ground surface on the downgradient side of the boring. The soil IDW was not sampled and assumes the PFAS 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 discharged directly to the ground surface slightly downgradient of the source. The liquid IDW was not sampled and assumes the PFAS characteristics of the associated groundwater samples collected from that source location.

The locations where IDW was placed (i.e., an IDW polygon) are displayed on the figure in **Appendix B4**.

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, and unused monitoring well construction materials generated during the field activities were disposed of as non-hazardous solid waste to be transported to a licensed solid waste landfill.

5.7 Laboratory Analytical Methods

Samples were analyzed for a subset of 18 PFAS 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. The 18 PFAS analyzed as part of the ARNG SI program include the following:

- 6:2 fluorotelomer sulfonic acid (6:2 FTS)
- 8:2 fluorotelomer sulfonic acid (8:2 FTS)
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- Perfluorobutyrate (PFBA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanoic acid (PFHxA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluoropentanoic acid (PFPeA)
- Perfluorotetradecanoic acid (PFTeDA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluoroundecanoic acid (PFUdA)

Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.8 Deviations from SI QAPP Addendum

No deviations from the SI QAPP Addendum were necessary to complete SI field work.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Winder Barrow AASF, Georgia

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	PFAS by 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	9/28/2021 9:30	0 - 2	x			
AOI01-01-SB-0-2-A	9/28/2021 9:30	0 - 2	x			FD
AOI01-01-SB-9-11	9/28/2021 9:45	9 - 11	x			
AOI01-01-SB-18-20	9/28/2021 9:55	18 - 20	x			
AOI01-02-SB-0-2	9/28/2021 10:30	0 - 2	x	x	x	
AOI01-02-SB-0-2-A	9/28/2021 10:30	0 - 2		x	x	FD
AOI01-02-SB-02-MS	9/28/2021 10:30	0 - 2		x		MS
AOI01-02-SB-0-2-MSD	9/28/2021 10:30	0 - 2		x		MSD
AOI01-02-SB-8-10	9/28/2021 10:55	8 - 10	x			
AOI01-02-SB-16-18	9/28/2021 11:05	16 - 18	x			
AOI01-02-SB-16-18-MS	9/28/2021 11:05	16 - 18	x			MS
AOI01-02-SB-16-18-MSD	9/28/2021 11:05	16 - 18	x			MSD
AOI02-01-SB-0-2	9/27/2021 14:35	0 - 2	x			
AOI02-01-SB-9-11	9/27/2021 14:55	9 - 11	x			
AOI02-01-SB-9-11-A	9/27/2021 14:55	9 - 11	x			FD
AOI02-01-SB-18-20	9/27/2021 15:05	18 - 20	x	x	x	
AOI02-02-SB-0-2	9/27/2021 12:35	0 - 2	x			
AOI02-02-SB-7-9	9/27/2021 12:45	7 - 9	x			
AOI02-02-SB-16-18	9/27/2021 12:55	16 - 18	x			
AOI02-03-SB-0-2	9/27/2021 15:30	0 - 2	x			
AOI02-03-SB-10-12	9/27/2021 15:40	10 - 12	x			
AOI02-03-SB-19-21	9/27/2021 15:50	19 - 21	x			
AOI02-04-SB-0-2	9/30/2021 8:05	0 - 2	x			
AOI02-05-SB-0-2	9/30/2021 8:15	0 - 2	x			
AOI02-06-SB-0-2	9/30/2021 8:25	0 - 2	x			
AOI02-07-SB-0-2	9/30/2021 8:35	0 - 2	x			
AOI02-08-SB-0-2	9/30/2021 8:45	0 - 2	x			
AOI03-01-SB-0-2	9/28/2021 13:10	0 - 2	x	x		
AOI03-01-SB-10-12	9/28/2021 13:35	10 - 12	x			
AOI03-01-SB-20-22	9/28/2021 13:45	20 - 22	x			
AOI03-01-SB-20-22-A	9/28/2021 13:45	20 - 22	x			FD
AOI04-01-SB-0-2	9/29/2021 8:20	0 - 2	x	x		
AOI04-01-SB-8-10	9/29/2021 8:45	8 - 10	x			
AOI04-01-SB-18-20	9/29/2021 8:55	18 - 20	x			
AOI05-01-SB-0-2	9/28/2021 14:30	0 - 2	x			
AOI05-01-SB-7-9	9/28/2021 14:45	7 - 9	x			
AOI05-01-SB-14-16	9/28/2021 14:55	14 - 16	x	x		
AOI05-02-SB-0-2	9/28/2021 16:00	0 - 2	x			
AOI05-02-SB-0-2-A	9/28/2021 16:00	0 - 2	x			FD
AOI05-02-SB-7-9	9/28/2021 16:10	7 - 9	x			
AOI05-02-SB-13-15	9/28/2021 16:20	13 - 15	x			
WB-01-SB-0-2	9/27/2021 13:35	0 - 2	x	x	x	
WB-01-SB-0-2-MS	9/27/2021 13:35	0 - 2	x			MS
WB-01-SB-0-2-MSD	9/27/2021 13:35	0 - 2	x			MSD
WB-01-SB-10-12	9/27/2021 13:55	10 - 12	x			
WB-01-SB-20-22	9/27/2021 14:05	20 - 22	x			
WB-02-SB-0-2	9/28/2021 12:05	0 - 2	x			
WB-02-SB-9-11	9/28/2021 12:15	9 - 11	x			
WB-02-SB-18-20	9/28/2021 12:25	18 - 20	x			

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Winder Barrow AASF, Georgia

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Groundwater Samples						
AOI01-01-GW	9/29/2021 8:30	NA	x			
AOI01-02-GW	9/28/2021 16:30	NA	x			
AOI01-02-GW-A	9/28/2021 16:30	NA	x			FD
AOI02-01-GW	9/28/2021 11:15	NA	x			
AOI02-01-GW-MS	9/28/2021 11:15	NA	x			MS
AOI02-01-GW-MSD	9/28/2021 11:15	NA	x			MSD
AOI02-02-GW	9/28/2021 12:50	NA	x			
AOI02-03-GW	9/28/2021 10:00	NA	x			
AOI03-01-GW	9/29/2021 12:15	NA	x			
AOI03-01-GW-A	9/29/2021 12:15	NA	x			FD
AOI04-01-GW	9/29/2021 14:00	NA	x			
AOI05-01-GW	9/29/2021 16:45	NA	x			
AOI05-02-GW	9/29/2021 15:30	NA	x			
WB-01-GW	9/28/2021 14:00	NA	x			
WB-02-GW	9/29/2021 10:30	NA	x			
Quality Control Samples						
WB-ERB-01	9/28/2021 12:35	NA	x			from hand auger
WB-ERB-02	9/28/2021 15:00	NA	x			from hand auger
WB-FRB-01	9/29/2021 14:10	NA	x			
WB-DECON-01	7/16/2021 11:30	NA	x			from hose connecting to decon water source spigot
WB-DECON-02	7/16/2021 11:40	NA	x			from decon water source spigot
Drum-DECON-01	9/28/2021 8:20	NA	x			from drill rig decon water container

Notes:
AOI = area of interest
ASTM = American Society for Testing and Materials
bgs = below ground surface
DECON = decontamination
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
LC/MS/MS = Liquid Chromatography Mass Spectrometry
NA = not applicable
MS/MSD = matrix spike/ matrix spike duplicate
PFAS = per- and polyfluoroalkyl substances
pH = potential of hydrogen; quantitative measure of the acidity or basicity of aqueous or other liquid solutions
QSM = Quality Systems Manual
SB = soil boring
TOC = total organic carbon
USEPA = United States Environmental Protection Agency
WB = Winder Barrow

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Winder Barrow AASF, Georgia

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	25	19.8 - 24.8	911.71	911.39	14.44	14.12	897.27
	AOI01-02	25	14.88 - 19.88	913.37	913.31	14.07	14.00	899.30
2	AOI02-01	25	15.2 - 20.2	921.80	921.28	13.02	12.49	908.78
	AOI02-02	20	15 - 20	919.30	918.66	11.1	10.46	908.20
	AOI02-03	25	20 - 25	921.60	920.67	12.22	11.29	909.38
	AOI02-04	2	NA	NA	919.70	NA	NA	NA
	AOI02-05	2	NA	NA	919.05	NA	NA	NA
	AOI02-06	2	NA	NA	918.83	NA	NA	NA
	AOI02-07	2	NA	NA	918.90	NA	NA	NA
	AOI02-08	2	NA	NA	918.35	NA	NA	NA
3	AOI03-01	25	19.83 - 24.83	919.43	918.75	15.65	14.97	903.78
4	AOI04-01	25	16 - 21	924.46	920.66	16.11	12.31	908.35
5	AOI05-01	20	15 - 20	919.35	917.75	13.72	12.13	905.63
	AOI05-02	20	14.79 - 19.79	921.90	919.49	14.14	11.73	907.76
Sitewide	WB-01	25	20 - 25	918.71	917.79	10.49	9.58	908.22
	WB-02	24	19 - 24	912.39	911.56	17.12	16.29	895.27

Notes:
AOI = area of interest
bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988
WB = Winder Barrow

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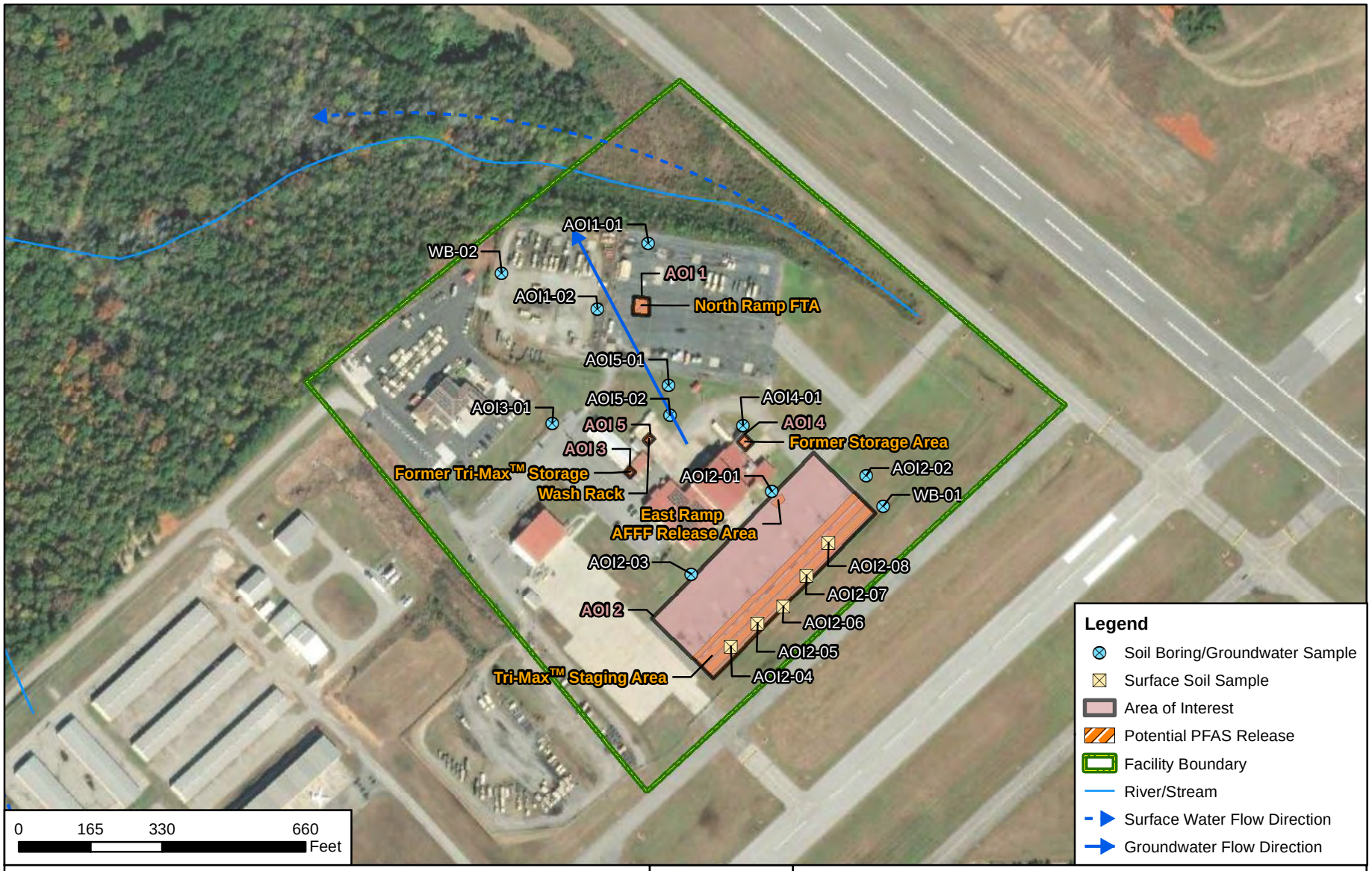

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/3/2022	GIS BY	MS	2/3/2022
SCALE	1:3,960	CHK BY	JW	2/3/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/3/2022

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** through **Section 6.8**. **Table 6-2** through **Table 6-5** present PFAS results for samples with detections in soil and groundwater; only constituents detected in one or more samples are included. 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 15 September 2021 (Assistant Secretary of Defense, 2021). 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 three compounds: PFOS, PFOA, and PFBS.

Additionally, the USEPA issued drinking water lifetime Health Advisories (HAs) for PFOA and PFOS in May 2016 (USEPA 2016a; USEPA, 2016b). The USEPA HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. The SLs are presented on **Table 6-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain PFAS within the boundaries of the facility.

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

Analyte	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]	USEPA HA (Groundwater representative of Drinking Water) (ng/L)[b,c]
PFOA	130	1,600	40	70
PFOS	130	1,600	40	70
PFBS	1,900	25,000	600	-

Notes:

a.) Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 15 September 2021.

b.) USEPA. 2016a. Drinking Water HA for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-005. May 2016. / USEPA. 2016b. Drinking Water HA for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-004. May 2016.

c.) USEPA HAs apply to the PFOA and PFOS concentrations individually or combined.

The data in the subsequent sections are compared against 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 of PFAS contaminants. According to the Interstate Technology Regulatory Council (ITRC), several important PFAS 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, which includes one potential PFAS release area: the North Ramp FTA. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.3.1 AOI 1 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the AOI 1. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from three intervals at boring locations AOI01-01 and AOI01-02. Samples were collected from surface soil (0 to 2 feet bgs), shallow subsurface soil (8 to 11 feet bgs), and deep subsurface soil (16 to 20 feet bgs). PFOA, PFOS, and PFBS were detected in soil at concentrations below the respective SLs. PFOA was not detected in surface or shallow subsurface soil at location AOI01-01. PFOA was detected in surface soil at location AOI01-02, with a concentration of 0.239 (J, estimated concentration) micrograms per kilogram (µg/kg). PFOA was not detected in shallow subsurface soil at location AOI01-02. PFOS was detected in surface soil at locations AOI01-01 and AOI01-02, with concentrations ranging from 0.337 J µg/kg to 2.71 µg/kg. PFOS was not detected in shallow subsurface soil at these locations. PFBS was not detected in surface soil at location AOI01-01. PFBS was detected in surface soil at location AOI01-02, with a concentration of 0.034 J µg/kg. PFBS was not detected in shallow subsurface soil at locations AOI01-01 or AOI01-02.

PFOA was not detected in deep subsurface soil at location AOI01-01. PFOA was detected at location AOI01-02, with a concentration of 0.512 J- µg/kg in the deep subsurface soil. PFOS was detected in deep subsurface soil at locations AOI01-01 and AOI01-02, with concentrations of 4.15 µg/kg and 2.46 J µg/kg, respectively. PFBS was detected in deep subsurface soil at locations AOI01-01 and AOI01-02, with of 0.110 J µg/kg and 0.134 J µg/kg, respectively.

6.3.2 AOI 1 Groundwater Analytical Results

PFOA, PFOS and PFBS in groundwater exceeded the SLs at AOI 1. **Figure 6-4** presents the ranges of detections of PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from temporary monitoring well locations AOI01-01 and AOI01-02 at the North Ramp FTA. The SL of 40 ng/L for PFOA was exceeded at AOI01-01 and AOI01-02, with concentrations of 506 ng/L and 1,740 ng/L (Duplicate), respectively. The SL of 40 ng/L for PFOS was exceeded at AOI01-01 and AOI01-02, with concentrations of 7,180 ng/L and 7,350 ng/L (Duplicate), respectively. Both maximum concentrations occurred at location AOI01-02, which is adjacent to the ramp. PFBS was detected above the SL of 600 ng/L at location AOI01-01, with a concentrations of 1,220 ng/L. PFBS was detected at location AOI01-02 below its respective SL, with a maximum concentration of 464 ng/L (Duplicate).

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 1. The detected concentrations of PFOA, PFOS, and PFBS in soil were several orders of magnitude lower than the soil SLs. PFOA, PFOS, and PFBS were detected in groundwater at concentrations exceeding their respective individual SLs of 40 ng/L (PFOA and PFOS) and 600 ng/L (PFBS). Based on the exceedances of the SLs for PFOA, PFOS, and PFBS 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, which includes two potential PFAS release areas: the East Ramp AFFF Release Area and Tri-Max™ Staging Area. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.4.1 AOI 2 Soil Analytical Results

PFOA and PFOS did not exceed the SLs in soil at AOI 2. PFBS was not detected in soil at AOI 2. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from three intervals at boring locations AOI02-01, AOI02-02, and AOI02-03. The samples were collected from surface soil (0 to 2 feet bgs), shallow subsurface soil (7 to 12 feet bgs), and deep subsurface soil (16 to 21 feet bgs). Surface soil was also sampled from one interval at boring locations AOI02-04 through AOI02-08. PFOA and PFOS were detected in soil with concentrations below the SLs, and PFBS was not detected in soil. PFOA was detected in surface soil at five locations, with concentrations ranging from 0.102 J µg/kg (AOI02-06) to 0.440 J µg/kg (AOI02-02). PFOA was not detected at in shallow subsurface soil. PFOS was detected in surface soil at seven locations with concentrations ranging from 0.182 J µg/kg (AOI02-06) to 7.91 µg/kg (AOI02-02). PFOS was detected in shallow subsurface soil at three locations with concentrations ranging from 0.163 J µg/kg (AOI02-03) to 0.810 J µg/kg (AOI02-01). PFBS was not detected at any locations in surface and shallow subsurface soil.

PFOA was detected in the deep subsurface soil at location AOI102-02, with a concentration of 0.586 J µg/kg. PFOA was not detected in deep subsurface soil at any other locations. PFOS was detected in deep subsurface soil at locations AOI02-01 and AOI02-02, with concentrations ranging from of 0.748 J µg/kg to 0.900 J µg/kg. PFBS was not detected in deep subsurface soil.

6.4.2 AOI 2 Groundwater Analytical Results

PFOA and PFOS in groundwater exceeded the SLs at AOI 2. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from temporary monitoring well locations AOI02-01 through AOI02-03 at the East Ramp AFFF Release Area. The SL of 40 ng/L for PFOA was exceeded at AOI02-01, AOI01-02, and AOI02-03, with concentrations of 181 J+ ng/L, 42 ng/L, and 104 ng/L, respectively. The SL of 40 ng/L for PFOS was exceeded at AOI02-01, AOI01-02, and AOI02-03, with concentrations of 1,210 J ng/L, 1,060 ng/L, and 42.3 ng/L, respectively. PFBS was detected below the SL of 600 ng/L at all locations, with concentrations ranging from 3.95 J ng/L to 42.5 ng/L. The maximum concentrations occurred at AOI02-01, which is adjacent to the East Ramp AFFF Release Area.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 2. The detected concentrations of PFOA, PFOS, and PFBS in soil were below their respective soil SLs. PFOA and PFOS were detected in groundwater at concentrations exceeding their respective individual SLs of 40 ng/L. PFBS was detected in groundwater at concentrations below the SL. Based on the exceedances of the SLs for PFOA and PFOS in groundwater, further evaluation at AOI 2 is warranted.

6.5 AOI 3

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 3, which includes one potential PFAS release area: the Former Tri-Max™ Storage Area. The detected compounds in soil and groundwater are presented in **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.5.1 AOI 3 Soil Analytical Results

PFOA, PFOS, and PFBS in soil did not exceed the SLs in soil at AOI 3. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from three intervals at boring location AOI03-01. The samples were collected from surface soil (0 to 2 feet bgs), shallow subsurface soil (10 to 12 feet bgs), and deep subsurface soil (20 to 22 feet bgs). PFOA, PFOS, and PFBS were detected at concentrations below the SLs. PFOA and PFOS were detected in surface soil, with concentrations of 0.587 J µg/kg and 5.09 µg/kg, respectively. PFBS was detected in shallow subsurface soil, with a concentration of 0.026 J µg/kg. PFOA, PFOS, and PFBS were not detected in deep subsurface soil.

6.5.2 AOI 3 Groundwater Analytical Results

PFOA, PFOS, and PFBS in groundwater from temporary monitoring well location AOI03-01 did not exceed the SLs at AOI 3. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from temporary monitoring well location AOI03-01, which is downgradient from the Former Tri-Max™ Storage Area. PFOA and PFBS were detected at

concentrations below the SLs, and PFOS was not detected. The maximum concentrations of PFOA and PFBS were 36.9 ng/L and 21.0 ng/L, respectively.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 3. The detected concentrations of PFOA, PFOS, and PFBS in soil were several orders of magnitude lower than the soil SLs. PFOA and PFBS was detected in groundwater at concentrations below their respective SLs of 40 ng/L and 600 ng/L. PFOS was not detected in groundwater at AOI 3. Because PFOA, PFOS, and PFBS did not exceed SLs in soil or groundwater, further evaluation at AOI 3 is not warranted.

6.6 AOI 4

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 4, which includes one potential PFAS release area: the Former Storage Area. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.6.1 AOI 4 Soil Analytical Results

PFOA, PFOS, and PFBS in soil did not exceed the SLs in soil at AOI 4. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from three intervals at boring location AOI04-01. The samples were collected from surface soil (0 to 2 feet bgs), shallow subsurface soil (8 to 10 feet bgs), and deep subsurface soil (18 to 20 feet bgs). PFOA, PFOS, and PFBS were detected at concentrations below the SLs. PFOA was detected in surface soil and shallow subsurface soil with concentrations of 0.54 J µg/kg and 0.179 J µg/kg, respectively. PFOA was not detected in the deeper subsurface soil. PFOS was detected in surface soil and shallow subsurface soil, with concentrations of 64.2 µg/kg and 16.3 µg/kg, respectively. PFOS was detected in deep subsurface soil, with a concentration of 16.1 µg/kg. PFBS was detected in surface soil and shallow subsurface soil, with concentrations of 0.207J µg/kg and 0.468 J µg/kg, respectively. PFBS was detected in deep subsurface soil, with a concentration of 0.043 J µg/kg.

6.6.2 AOI 4 Groundwater Analytical Results

PFOA and PFOS in groundwater from temporary monitoring well location AOI04-01 exceeded SLs at AOI 4. **Figure 6-4** presents the detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from temporary monitoring well location AOI04-01 at the Former Storage Area. The SLs of 40 ng/L for PFOA and PFOS were exceeded at AOI04-01, with concentrations of 622 ng/L and 62,700 ng/L, respectively. PFBS was detected at a concentration of 436 ng/L.

6.6.3 AOI 4 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 4. The detected concentrations of PFOA, PFOS, and PFBS in soil were below their respective soil SLs. PFOA and PFOS detections in groundwater exceeded their respective individual SLs of 40 ng/L. PFBS was detected in groundwater at concentrations below the SL.

Based on the exceedances of the SLs for PFOA and PFOS in groundwater, further evaluation of AOI 4 is warranted.

6.7 AOI 5

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 5, which includes one potential PFAS release area: the Wash Rack. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.7.1 AOI 5 Soil Analytical Results

PFOS in soil exceeded its SL in soil at AOI 5. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from three intervals at boring locations AOI05-01 and AOI05-02. The samples were collected from surface soil (0 to 2 feet bgs), shallow subsurface soil (7 to 15 feet bgs), and deep subsurface soil (14 to 16 feet bgs). PFOA was detected in surface soil at both locations below the SL, with concentrations ranging from 6.24 µg/kg (AOI05-02 Duplicate) to 29.8 µg/kg (AOI05-01). PFOS exceeded the SL of 130 µg/kg in surface soil, with concentrations ranging from 137 µg/kg (AOI05-02 Duplicate) to 639 µg/kg (AOI05-01). PFBS was detected in surface soil below the SL, with concentrations ranging from non-detect to 0.045 J µg/kg. PFOA, PFOS, and PFBS did not exceed the SLs in shallow subsurface soil, and were detected at maximum concentrations of 17.4 µg/kg, 84.4 µg/kg, and 4.08 µg/kg, respectively, at location AOI05-01. PFOA, PFOS, and PFBS were detected in the deep subsurface, with concentrations of 0.278 J µg/kg, 0.570 J µg/kg, and 0.096 J µg/kg at location AOI05-01, respectively.

6.7.2 AOI 5 Groundwater Analytical Results

PFOA and PFOS in groundwater exceeded the SLs at AOI 5. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from temporary monitoring well locations AOI05-01 and AOI05-02 at the Wash Rack. The SL of 40 ng/L for PFOA was exceeded at AOI05-01 and AOI05-02, with concentrations of 386 ng/L and 410 ng/L, respectively. The SL of 40 ng/L for PFOS was exceeded at AOI05-01 and AOI05-02, with concentrations of 1,210 ng/L and 329 ng/L, respectively. PFBS was detected below the SL of 600 ng/L at AOI05-01 and AOI05-02, with concentrations of 373 ng/L and 46.6 J ng/L, respectively. The maximum PFOA and PFBS concentrations occurred at AOI05-01, which is adjacent to the Wash Rack.

6.7.3 AOI 5 Conclusions

Based on the results of the SI, PFOS was detected in soil at concentrations exceeding the SL. PFOA and PFOS were detected in groundwater at concentrations exceeding their respective individual SLs of 40 ng/L. PFBS was detected in groundwater and soil at concentrations below the SL. Based on the exceedances of the SLs for PFOS in soil and PFOA and PFOS in groundwater, further evaluation of AOI 5 is warranted.

6.8 Sitewide

This section presents the analytical results for soil and groundwater in comparison to SLs for temporary monitoring wells installed sitewide across the Winder Barrow AASF to determine the

presence or absence of PFAS in environmental media upgradient (WB-01) and downgradient (WB-02) from potential PFAS release areas. Location WB-01 serves to assess potential PFAS migration onto the facility from an off-facility source, but may be influenced by its proximity to the facility septic field and an open stormwater drainage line. Location WB-02 serves to assess potential PFAS migration off-facility from onsite potential release areas. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.8.1 Sitewide Soil Analytical Results

PFOS, PFOA, and PFBS did not exceed the SLs in soil. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from three intervals at boring locations, WB-01 and WB-02. The samples were collected from surface soil (0 to 2 feet bgs), shallow subsurface soil (9 to 12 feet bgs), and deep subsurface soil (18 to 22 feet bgs). PFOA, PFOS, and PFBS were detected in soil, at concentrations below the respective SLs. PFOA was detected in surface soil, with concentrations ranging from 0.102 J µg/kg to 0.189 J µg/kg. PFOA was detected in shallow subsurface soil, with concentrations ranging from non-detect to 0.208 J µg/kg. PFOA was not detected in deep subsurface soil. PFOS was detected in surface soil, with concentrations ranging from 0.745 J µg/kg to 1.16 J µg/kg. PFOS was detected in shallow subsurface soil, with concentrations ranging from 0.338 J µg/kg to 0.806 J µg/kg. PFOS was detected in deep subsurface soil, with concentrations ranging from 0.092 J µg/kg to 0.830 J µg/kg. PFBS was not detected in soil at either location.

6.8.2 Sitewide Groundwater Analytical Results

PFOS in groundwater exceeded the SLs at both sitewide locations. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from temporary monitoring well locations WB-01 and WB-02 to determine the presence or absence of PFAS at locations upgradient and downgradient of potential PFAS release areas. PFOA was detected below the SL of 40 ng/L at WB-01 and WB-02, with concentrations of 16.3 ng/L and 22.9 ng/L, respectively. The SL of 40 ng/L for PFOS was exceeded at WB-01 and WB-02, with concentrations of 219 ng/L and 151 ng/L, respectively. PFBS was detected below the SL of 600 ng/L at WB-01 and WB-02, with concentrations of 3.10 J ng/L and 8.53 ng/L, respectively. The presence of PFOA, PFOS, and PFBS in groundwater at WB-01 indicates the potential for PFAS to migrate onsite from an offsite source; however, groundwater at location WB-01 may be influenced by PFAS migration from the flight ramp via the open stormwater drainage line and the nearby septic field. The presence of PFOA, PFOS, and PFAS at WB-02 indicates that PFAS may potentially migrate offsite from the potential PFAS areas associated with AOI 1 through AOI 5.

6.8.3 Sitewide Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater. The detected concentrations of PFOA, PFOS, and PFBS in soil were several orders of magnitude lower than the soil SLs. PFOA, PFOS, and PFBS were detected in groundwater. PFOS was detected in groundwater at concentrations exceeding the SL of 40 ng/L, upgradient and downgradient of potential PFAS release areas. Although temporary well WB-01 is located at the upgradient facility boundary, it is in the downgradient direction of surface water flow from the flight ramp via an open stormwater drainage line that flows northeast along the facility boundary and is

adjacent to the facility septic field. It is possible that historical releases of PFAS to the flight ramp area or septic field may contribute to PFAS in soil and groundwater at location WB-01. Based on the exceedances of the SL for PFOS in groundwater, further evaluation at the facility is warranted.

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Winder Barrow AASF, Georgia

Area of Interest		AOI01						AOI02													
Sample ID		AOI01-01-SB-0-2		AOI01-01-SB-0-2-A		AOI01-02-SB-0-2		AOI02-01-SB-0-2		AOI02-02-SB-0-2		AOI02-03-SB-0-2		AOI02-04-SB-0-2		AOI02-05-SB-0-2		AOI02-06-SB-0-2		AOI02-07-SB-0-2	
Sample Date		09/28/2021		09/28/2021		09/28/2021		09/27/2021		09/27/2021		09/27/2021		09/30/2021		09/30/2021		09/30/2021		09/30/2021	
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		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	Result	Qual
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
8:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
NEtFOSAA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
NMeFOSAA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFBA	-	ND		ND		0.055	J	ND		0.188	J	0.088	J	0.080	J	0.215	J	ND		ND	
PFBS	1900	ND		ND		0.034	J	ND		ND		ND		ND		ND		ND		ND	
PFDA	-	ND		ND		ND		ND		0.120	J	ND		ND		ND		ND		ND	
PFDoA	-	ND		ND		ND		ND		0.029	J	ND		ND		ND		ND		ND	
PFHpA	-	ND		ND		0.086	J	ND		0.154	J	0.056	J	0.092	J	0.124	J	ND		ND	
PFHxA	-	ND		ND		0.156	J	0.029	J	0.206	J	0.097	J	0.203	J	0.255	J	0.031	J	0.026	J
PFHxS	-	ND		ND		1.32		0.079	J	0.520	J	0.139	J	0.270	J	ND		0.038	J	ND	
PFNA	-	ND		ND		0.023	J	0.240	J	0.622	J	0.104	J	0.056	J	ND		0.026	J	0.049	J
PFOA	130	ND		ND		0.239	J	ND		0.440	J	0.265	J	0.177	J	ND		0.102	J	ND	
PFOS	130	1.72		2.71		0.337	J	6.23		7.91		2.38		0.905	J	ND		0.182	J	2.72	
PFPeA	-	ND		ND		0.118	J	0.038	J	0.263	J	0.143	J	0.154	J	0.319	J	0.060	J	0.031	J
PFTeDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFTrDA	-	ND		ND		ND		ND		0.081	J	ND		ND		ND		ND		ND	
PFUnDA	-	ND		ND		ND		0.055	J	0.377	J	ND		ND		ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

A	duplicate
AASF	Army Aviation Support Facility
AOI	Area of Interest
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
-	not applicable

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Winder Barrow AASF, Georgia

Area of Interest		AOI02		AOI03		AOI04		AOI05						Sitewide			
Sample ID		AOI02-08-SB-0-2		AOI03-01-SB-0-2		AOI04-01-SB-0-2		AOI05-01-SB-0-2		AOI05-02-SB-0-2		AOI05-02-SB-0-2-A		WB-01-SB-0-2		WB-02-SB-0-2	
Sample Date		09/30/2021		09/28/2021		09/29/2021		09/28/2021		09/28/2021		09/28/2021		09/27/2021		09/28/2021	
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	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																	
8:2 FTS	-	0.237	J	ND		ND		ND		0.073	J	0.050	J	ND		ND	
NEtFOSAA	-	ND		ND		ND		1.75	J	2.92		1.46		ND		ND	
NMeFOSAA	-	ND		ND		ND		1.59	J	ND		ND		ND		ND	
PFBA	-	0.059	J	0.107	J	0.124	J	ND		0.326	J	0.309	J	0.065	J	ND	
PFBS	1900	ND		ND		0.207	J	ND		0.045	J	0.042	J	ND		ND	
PFDA	-	ND		ND		ND		ND		0.259	J	0.209	J	ND		ND	
PFDoA	-	0.335	J	ND		ND		ND		0.050	J	0.041	J	ND		ND	
PFHpA	-	0.065	J	0.156	J	0.047	J	1.29	J	0.240	J	0.229	J	0.032	J	0.039	J
PFHxA	-	0.114	J	0.239	J	0.352	J	1.82	J	0.705	J	0.674	J	0.037	J	0.109	J
PFHxS	-	0.096	J	0.669	J	8.30		17.7		8.99		7.76		0.041	J	0.334	J
PFNA	-	0.040	J	0.329	J	0.630	J	0.901	J	6.68		6.23		0.042	J	0.031	J
PFOA	130	0.186	J	0.587	J	0.540	J	29.8		7.27		6.24		0.102	J	0.189	J
PFOS	130	0.773	J	5.09		64.2		639		162		137		0.745	J	1.16	J
PFPeA	-	0.058	J	0.160	J	0.183	J	0.454	J	0.528	J	0.500	J	0.053	J	0.080	J
PFTeDA	-	0.152	J	ND		ND		ND		ND		ND		ND		ND	
PFTrDA	-	1.50		ND		ND		ND		0.971	J	0.768	J	ND		ND	
PFUnDA	-	0.153	J	0.036	J	ND		ND		2.85		2.18		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
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
WB	Winder Barrow
µg/kg	micrograms per kilogram
-	not applicable

Table 6-3
PFAS Detections in Shallow Subsurface Soil
Site Inspection Report, Winder Barrow AASF, Georgia

Area of Interest		AOI01				AOI02								AOI03		AOI04		AOI05			
Sample ID		AOI01-01-SB-9-11		AOI01-02-SB-8-10		AOI02-01-SB-9-11		AOI02-01-SB-9-11-A		AOI02-02-SB-7-9		AOI02-03-SB-10-12		AOI03-01-SB-10-12		AOI04-01-SB-8-10		AOI05-01-SB-7-9		AOI05-02-SB-7-9	
Sample Date		09/28/2021		09/28/2021		09/27/2021		09/27/2021		09/27/2021		09/27/2021		09/28/2021		09/29/2021		09/28/2021		09/28/2021	
Depth		9 - 11 ft		8 - 10 ft		9 - 11 ft		9 - 11 ft		7 - 9 ft		10 - 12 ft		10 - 12 ft		8 - 10 ft		7 - 9 ft		7 - 9 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
6:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		0.101	J	ND		ND	
PFBA	-	ND		ND		ND		ND		ND		ND		ND		0.134	J	0.822	J	ND	
PFBS	25000	ND		ND		ND		ND		ND		ND		0.026	J	0.468	J	4.08		ND	
PFHpA	-	ND		ND		ND		ND		ND		ND		0.036	J	0.148	J	1.98		ND	
PFHxA	-	0.059	J	0.064	J	ND	UJ	0.047	J	0.047	J	ND		0.107	J	0.559	J	19.3		0.041	J
PFHxS	-	ND		0.084	J	0.051	J	0.068	J	0.053	J	ND		ND		5.39		97.6		0.394	J
PFNA	-	ND		ND		ND	UJ	0.028	J	0.032	J	ND		ND		ND		ND		0.808	J
PFOA	1600	ND		ND		ND		ND		ND		ND		ND		0.179	J	17.4		0.126	J
PFOS	1600	ND		ND		0.671	J	0.810	J	0.737	J	0.163	J	ND		16.3		84.4		2.64	
PFPeA	-	0.027	J	0.039	J	ND	UJ	0.032	J	0.029	J	ND		0.089	J	0.226	J	2.57		0.029	J
PFUnDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		0.043	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

A	duplicate
AASF	Army Aviation Support Facility
AOI	Area of Interest
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
-	not applicable

Table 6-3
PFAS Detections in Shallow Subsurface Soil
Site Inspection Report, Winder Barrow AASF, Georgia

Area of Interest		AOI05		Sitewide			
Sample ID		AOI05-02-SB-13-15		WB-01-SB-10-12		WB-02-SB-9-11	
Sample Date		09/28/2021		09/27/2021		09/28/2021	
Depth		13 - 15 ft		10 - 12 ft		9 - 11 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
6:2 FTS	-	ND		ND		ND	
PFBA	-	ND		ND		ND	
PFBS	25000	ND		ND		ND	
PFHpA	-	0.036	J	ND		0.045	J
PFHxA	-	0.090	J	0.044	J	0.083	J
PFHxS	-	0.271	J	ND		0.715	J
PFNA	-	ND		ND		0.050	J
PFOA	1600	0.130	J	ND		0.208	J
PFOS	1600	ND		0.338	J	0.806	J
PFPeA	-	0.039	J	ND		0.027	J
PFUnDA	-	ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

A	duplicate
AASF	Army Aviation Support Facility
AOI	Area of Interest
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
WB	Winder Barrow
µg/kg	micrograms per kilogram
-	not applicable

Table 6-4
PFAS Detections in Deep Subsurface Soil
Site Inspection Report, Winder Barrow AASF, Georgia

Area of Interest	AOI01				AOI02						AOI03				AOI04		AOI05		Sitewide			
Sample ID	AOI01-01-SB-18-20		AOI01-02-SB-16-18		AOI02-01-SB-18-20		AOI02-02-SB-16-18		AOI02-03-SB-19-21		AOI03-01-SB-20-22		AOI03-01-SB-20-22-A		AOI04-01-SB-18-20		AOI05-01-SB-14-16		WB-01-SB-20-22		WB-02-SB-18-20	
Sample Date	09/28/2021		09/28/2021		09/27/2021		09/27/2021		09/27/2021		09/28/2021		09/28/2021		09/29/2021		09/28/2021		09/27/2021		09/28/2021	
Depth	18 - 20 ft		16 - 18 ft		18 - 20 ft		16 - 18 ft		19 - 21 ft		20 - 22 ft		20 - 22 ft		18 - 20 ft		14 - 16 ft		20 - 22 ft		18 - 20 ft	
Analyte	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual			Result	Qual	Result	Qual
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																						
6:2 FTS	ND		0.924	J	0.354	J	ND		ND		ND		ND		ND		0.421	J	ND		ND	
PFBA	ND		0.123	J	ND		0.087	J	ND		ND		ND		ND		ND		ND		ND	
PFBS	0.110	J	0.134	J	ND		ND		ND		ND		ND		0.043	J	0.096	J	ND		ND	
PFHpA	ND		0.230	J	ND		0.232	J	0.064	J	ND		ND		ND		0.081	J	ND		ND	
PFHxA	0.119	J	0.607	J	0.113	J	0.600	J	0.125	J	0.029	J	ND	UJ	0.183	J	0.253	J	ND		ND	
PFHxS	0.566	J	1.61		0.519	J	0.100	J	0.112	J	0.077	J	0.087	J	0.877	J	1.48		ND		ND	
PFNA	0.087	J	0.281	J	ND		0.379	J	ND		ND		ND		ND		0.040	J	ND		0.025	J
PFOA	ND		0.512	J-	ND		0.586	J	ND		ND		ND		ND		0.278	J	ND		ND	
PFOS	4.15		2.46	J	0.748	J	0.900	J	ND		ND		ND		16.1		0.570	J	0.092	J	0.830	J
PFPeA	0.042	J	0.384	J	0.053	J	0.303	J	0.116	J	ND		ND		0.058	J	0.100	J	ND		ND	

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

A	duplicate
AASF	Army Aviation Support Facility
AOI	Area of Interest
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
WB	Winder Barrow
µg/kg	micrograms per Kilogram

Table 6-5
PFAS Detections in Groundwater
Site Inspection Report, Winder Barrow AASF, Georgia

Area of Interest			AOI01						AOI02						AOI03				AOI04	
Sample ID			AOI01-01-GW		AOI01-02-GW		AOI01-02-GW-A		AOI02-01-GW		AOI02-02-GW		AOI02-03-GW		AOI03-01-GW		AOI03-01-GW-A		AOI04-01-GW	
Sample Date			09/29/2021		09/28/2021		09/28/2021		09/28/2021		09/28/2021		09/28/2021		09/29/2021		09/29/2021		09/29/2021	
Analyte	OSD Screening Level [a]	USEPA HA [b]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																				
6:2 FTS	-	-	300		2040		2030		717	J	2.72	J	85.4		3.80	J	4.44		ND	
8:2 FTS	-	-	34.3		3.78	J	4.19		9.45		ND		31.5		ND		ND		ND	
PFBA	-	-	253		330		382		50.0		13.9		80.2		8.40		7.81		254	
PFBS	600	-	1220		417		464		42.5		3.95	J	35.7		21.0		20.1		436	
PFDA	-	-	3.13	J	ND	UJ	1.46	J	ND		ND		ND		ND		ND		ND	
PFHpA	-	-	238		667		787		50.5		10.9		154		15.5		14.3		199	
PFHxA	-	-	1620		2060		2250		247	J	26.5		291		70.8		66.5		1400	
PFHxS	-	-	6500		4740		5150		1020	J	113		405		310		291		10900	
PFNA	-	-	102		846		1020		32.4		55.9		54.0		ND		ND		72.1	
PFOA	40	70	**506**		**1540**		**1740**		**181**	J+	42.0		**104**		36.9		35.0		**622**	
PFOS	40	70	**7180**		**6580**		**7350**		**1210**	J	**1060**		42.3		ND		ND		**62700**	
PFPeA	-	-	607		1100		1310		111		22.8		249		23.3		21.7		418	
PFUnDA	-	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total PFOA+PFOS	-	70	**7690**		**8120**		**9090**		**1390**		**1100**		**146**		36.9		35.0		**63300**	

Grey Fill	Detected concentration exceeded OSD Screening Levels
Bold Font	Detected concentration exceeded USEPA HA Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

b. USEPA, 2016. Drinking Water Health Advisory for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

A	duplicate
AASF	Army Aviation Support Facility
AOI	Area of Interest
DC	District of Columbia
DL	detection limit
EPA	Environmental Protection Agency
GW	groundwater
HA	Health Advisory
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
WB	Winder Barrow
ng/l	nanogram per liter

Table 6-5
PFAS Detections in Groundwater
Site Inspection Report, Winder Barrow AASF

		Area of Interest	AOI05				Sitewide			
		Sample ID	AOI05-01-GW		AOI05-02-GW		WB-01-GW		WB-02-GW	
		Sample Date	09/29/2021		09/29/2021		09/28/2021		09/29/2021	
Analyte	OSD Screening Level [a]	USEPA HA [b]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)										
6:2 FTS	-	-	1860		42.2		ND		11.4	
8:2 FTS	-	-	40.5		ND		ND		2.79	J
PFBA	-	-	158		43.7		5.30		10.1	
PFBS	600	-	373		46.6		3.10	J	8.53	
PFDA	-	-	ND		ND		ND		ND	
PFHpA	-	-	389		107		3.91		11.1	
PFHxA	-	-	1070		253		17.6		36.0	
PFHxS	-	-	3040		824		46.5		94.7	
PFNA	-	-	175		93.5		3.61	J	4.07	
PFOA	40	70	**386**		**410**		16.3		22.9	
PFOS	40	70	**1210**		**329**		**219**		**151**	
PFPeA	-	-	569		110		6.53		21.1	
PFUnDA	-	-	ND		2.20	J	ND		3.45	J
Total PFOA+PFOS	-	70	**1600**		**739**		**235**		**174**	

Grey Fill	Detected concentration exceeded OSD Screening Levels
Bold Font	Detected concentration exceeded USEPA HA Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

b. USEPA, 2016. Drinking Water Health Advisory for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
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PFDA	perfluorodecanoic acid
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PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

A	duplicate
AASF	Army Aviation Support Facility
AOI	Area of Interest
DC	District of Columbia
DL	detection limit
EPA	Environmental Protection Agency
GW	groundwater
HA	Health Advisory
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
-	not applicable

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CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/2/2022	GIS BY	MS	2/2/2022
SCALE	1:3,960	CHK BY	JW	2/2/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/2/2022

Legend

Facility Boundary

River/Stream

0 165 330 660 Feet

N

PFOA Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-1

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CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/2/2022	GIS BY	MS	2/2/2022
SCALE	1:3,960	CHK BY	JW	2/2/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/2/2022

Legend

Facility Boundary

River/Stream

0 165 330 660 Feet

N

PFOS Detections in Soil

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-2

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CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/2/2022	GIS BY	MS	2/2/2022
SCALE	1:3,960	CHK BY	JW	2/2/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/2/2022

Legend

Facility Boundary

River/Stream

0 165 330 660 Feet

N

PFBS Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-3

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PFOA

PFOS

PFBS

AOI01-01
WB-02
AOI01-02
AOI05-01
AOI03-01
AOI04-01
AOI05-02
AOI02-02
AOI02-01
WB-01
AOI02-03

PFOA Results (ng/L)
- ND
- >ND - 10
- >10 - 40
- >40 - 70
- >70 - 400
- >400

PFOS Results (ng/L)
- ND
- >ND - 10
- >10 - 40
- >40 - 70
- >70 - 400
- >400

PFBS Results (ng/L)
- ND
- >ND - 100
- >100 - 600
- >600 - 1,000
- >1,000 - 6,000
- >6,000

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Winder Barrow AASF, GA			
REVISED	2/3/2022	GIS BY	MS	2/3/2022
SCALE	1:4,200	CHK BY	JW	2/3/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	2/3/2022

Legend
- Facility Boundary
- Groundwater Flow Direction

0 175 350 700 Feet

N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-4

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7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **Figure 7-3**. 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 figures use 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 PFOA, PFOS, or PFBS 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 PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway may warrant further investigation.

In general, the potential routes of exposure to PFAS 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 PFAS 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 (though unlikely due to restricted access), residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at the AOIs based on the aforementioned criteria.

7.1.1 AOI 1

During a one-time training event performed by the City of Atlanta Fire Department, AFFF may have been released to paved and/or bare surfaces depending on the time of the event at AOI 1. PFOA, PFOS, and PFBS were detected in soil at AOI 1 and confirm the release of PFAS to soil.

Based on the results of the SI at AOI 1, ground-disturbing activities could potentially result in site worker, future construction worker, or trespasser exposure to PFOA, PFOS, and PFBS via inhalation of dust or ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFOA, PFOS, and PFBS via ingestion of subsurface soil. No current construction activities are occurring at AOI 1. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

During an elementary school field trip demonstration, AFFF was unintentionally released from a facility crash rescue firetruck to the ramp directly southeast of Hangar 2. The AFFF may have been released to paved and unpaved surfaces. In addition, Tri-Max™ fire extinguishers have been staged on the flight ramp historically; however, the exact timeframe and locations of the Tri-Max™ fire extinguishers on the flight ramp are uncertain. It is presumed that the units were stationed on the east side of the main ramp, between aircraft parking positions. PFOA and PFOS were detected in soil at AOI 2 at the East Ramp AFFF Release Area and the potential historical Tri-Max™ fire extinguisher staging areas and confirm the release of PFAS to soil at AOI 2.

Based on the results of the SI at AOI 2, ground-disturbing activities could potentially result in site worker, future construction worker, or trespasser exposure to PFOA and PFOS via inhalation of dust or ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFOS via ingestion of subsurface soil. No current construction activities are occurring at AOI 2. The CSM for AOI 2 is presented on **Figure 7-1**.

7.1.3 AOI 3

Potential releases of AFFF may have occurred at AOI 3 as a result of the storage of twelve 30-gallon Tri-Max™ fire extinguishers in a storage cage. The fire extinguishers are currently staged at AOI 4 pending transport to an off-site repair facility. If AFFF were released in the AOI 3 storage cage area, releases would have occurred to paved surfaces. PFOA, PFOS, and PFBS were detected in soil at the nearest downgradient unpaved area from the Tri-Max™ fire extinguisher storage cage, indicating that a release of PFAS to soil at AOI 3 occurred.

Based on the results of the SI at AOI 3, ground-disturbing activities could potentially result in site worker, future construction worker, or trespasser exposure to PFOA and PFOS via inhalation of dust or ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFBS via ingestion of subsurface soil. No current construction is occurring at AOI 3. The CSM for AOI 3 is presented on **Figure 7-2**.

7.1.4 AOI 4

Potential releases of AFFF may have occurred at AOI 4 as a result of storing the former facility crash rescue firetruck in a garage until approximately 2004. The crash rescue firetruck may have been used to store AFFF in 5-gallon buckets. Bulk AFFF was also stored in the garage prior to 2004. Additionally, Tri-Max™ fire extinguishers awaiting offsite transport and disposal are currently staged on the southeast side of the garage. The garage has no floor drains, but a bay door opens on the west end of the garage to a gravel driveway. PFOA, PFOS, and PFBS were detected in soil at AOI 4, with the PFOS concentrations detected orders of magnitude higher than PFOA or PFBS, and confirm the release of PFAS to soil.

Based on the results of the SI at AOI 4, ground-disturbing activities could potentially result in site worker, future construction worker, or trespasser exposure to PFOA, PFOS, and PFBS via inhalation of dust or ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFOA, PFOS, and PFBS via ingestion of subsurface soil. No current construction is occurring at AOI 4. The CSM for AOI 4 is presented on **Figure 7-1**.

7.1.5 AOI 5

AFFF may have been released to the Wash Rack at AOI 5 as a result of washing the former crash rescue firetruck. Additionally, 5-gallon buckets have been stored in a flammable container

adjacent to the Wash Rack and could have caused accidental releases of AFFF to paved surfaces, soil and the Wash Rack recirculatory system. PFOA, PFOS, and PFBS were detected in soil, and PFOS was detected above its SL, and confirm the release of PFAS to soil at AOI 5.

Based on the results of the SI at AOI 5, ground-disturbing activities could potentially result in site worker, future construction worker, or trespasser exposure to PFOA, PFOS, and PFBS via inhalation of dust or ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFOA, PFOS, and PFBS via ingestion of subsurface soil. No current construction is occurring at AOI 5. The CSM for AOI 5 is presented on **Figure 7-3**.

7.2 Groundwater Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at the AOIs based on the aforementioned criteria. Winder Barrow AASF receives its potable water from the City of Winder Water Works; therefore, the ingestion exposure pathway for site workers and trespassers is considered incomplete. According to online resources, there are multiple residences downgradient from the AASF that use private well water. Therefore, the ingestion exposure pathway for off-facility residents is considered potentially complete.

7.2.1 AOI 1

PFOA and PFOS in groundwater exceeded the SLs at both temporary monitoring well locations (AOI01-01and AOI01-02), and PFBS exceeded the SL at one temporary monitoring well location (AOI01-01) at AOI 1. Depths to water at AOI 1 measured in September 2021 during the SI ranged from 13.96 to 22.5 feet bgs. Therefore, groundwater may be encountered during construction activities, and the ingestion exposure pathway for future construction workers is considered potentially complete. Because well water is listed as the water source for multiple downgradient residences, the exposure pathway for off-facility resident is also potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA and PFOS in groundwater exceeded the SLs at all three temporary monitoring well locations (AOI02-01, AOI02-02, and AOI02-03) at AOI 2. PFBS was detected in groundwater at all three temporary monitoring wells at concentrations below the SL. Depths to water at AOI 2 measured in September 2021 during the SI ranged from 10.48 to 12.53 feet bgs. Therefore, groundwater may be encountered during construction activities, and the ingestion exposure pathway for future construction workers is considered potentially complete. Because well water is listed as the water source for multiple downgradient residences, the exposure pathway for off-facility resident is also potentially complete. The CSM for AOI 2 is presented on **Figure 7-1**.

7.2.3 AOI 3

PFOA and PFBS in groundwater were detected below SLs at the one temporary monitoring well location (AOI03-01) at AOI 3. PFOS was not detected in groundwater at AOI 3. Depth to water in AOI 3 measured in September 2021 during the SI was 14.79 feet bgs. Therefore, groundwater may be encountered during construction activities, and the ingestion exposure pathway for future construction workers is considered potentially complete. The CSM for AOI 3 is presented on **Figure 7-2**.

7.2.4 AOI 4

PFOA and PFOS in groundwater were detected above SLs at the one temporary monitoring well location (AOI04-01) at AOI 4. PFBS was detected in groundwater below the SL. Depth to water at AOI 4 measured in September 2021 during the SI was 12.33 feet bgs. Therefore, groundwater may be encountered during construction activities, and the ingestion exposure pathway for future construction workers is considered potentially complete. The exposure pathway for off-facility resident is also potentially complete based on the presence of private wells in the downgradient direction. The CSM for AOI 4 is presented on **Figure 7-1**.

7.2.5 AOI 5

PFOA and PFOS in groundwater were detected above SLs at both temporary monitoring well locations (AOI05-01 and AOI05-02) at AOI 5. PFBS was detected in groundwater below the SL. Depths to water at AOI 5 measured in September 2021 during the SI ranged from 12.07 to 12.15 feet bgs. Therefore, groundwater may be encountered during construction activities, and the ingestion exposure pathway for future construction workers is considered potentially complete. The exposure pathway for off-facility resident is also potentially complete based on the presence of private wells in the downgradient direction. The CSM for AOI 5 is presented on **Figure 7-3**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results for PFOA, PFOS, and PFBS 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.

7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to groundwater and surface water via leaching and run-off. Surface water runoff at AOI 1 flows to the north towards the drainage canal. Because PFOA, PFOS, and PFBS were detected in soil and were detected above SLs in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the north, towards the drainage canal on the northern edge of the property via groundwater discharge or surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete.

The drainage canal on the northern edge of the property flows off facility to Lower Twin Lake to the northwest, which is used for recreational activities. Due to potential recreational use of Lower Twin Lake, the surface water and sediment ingestion exposure pathway for off-facility recreational users is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

Surface water runoff at AOI 2 flows east across the facility septic field and is conveyed around the septic field via a stormwater drainage ditch that connects to the drainage canal along the northeast boundary of the facility. Additionally, groundwater flows northwest towards the drainage canal on the northern edge of the property. Because PFOA and PFOS were detected in soil and PFOA and PFOS were detected above SLs in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the septic field stormwater drainage ditch and the drainage canal on the northern edge of the property via groundwater discharge or stormwater runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete.

Because the drainage canal on the northern edge of the property flows to Lower Twin Lake, which is used for recreational activities, the surface water and sediment ingestion exposure pathway for off-facility recreational users is also considered potentially complete. The CSM for AOI 2 is presented on **Figure 7-1**.

7.3.3 AOI 3

Surface water runoff at AOI 3 flows to the drainage canal on the northwest border of the AASF. Additionally, groundwater flows northwest towards the drainage canal on the northern edge of the property. Because PFOA, PFOS, and PFBS were detected in soil and PFOA and PFBS were detected in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the drainage canal on the northern edge of the property via groundwater discharge or stormwater runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete.

Because the drainage canal on the northern edge of the property flows to Lower Twin Lake, which is used for recreational activities, the surface water and sediment ingestion exposure pathway for off-facility recreational users is also considered potentially complete. The CSM for AOI 3 is presented on **Figure 7-2**.

7.3.4 AOI 4

Surface water runoff at AOI 4 flows to the drainage canal on the northwest border of the AASF and groundwater at the AOI flows northwest towards the drainage canal on the northern edge of the property. Because PFOA, PFOS, and PFBS were detected in soil and PFOA and PFOS were detected above SLs in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the north towards the drainage canal on the northern edge of the property via groundwater discharge and surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete

Because the drainage canal on the northern edge of the property flows to Lower Twin Lake, which is used for recreational activities, the surface water and sediment ingestion exposure pathway for off-facility recreational users is also considered potentially complete. The CSM for AOI 4 is presented on **Figure 7-1**.

7.3.5 AOI 5

No wastewater from the Wash Rack is discharged to the environment; however, when the Wash Rack is not in use, stormwater runoff is conveyed to a drainage ditch north of the Wash Rack via an underground pipe. The ditch connects to the drainage canal on the northwest border of the AASF and flows off-facility. In addition, groundwater at the AOI flows northwest towards the drainage canal on the northern edge of the property. Because PFOA, PFOS, and PFBS were detected in soil and groundwater, with PFOS concentrations exceeding the SL in soil and PFOA and PFOS concentrations exceeding the SLs in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the north towards the drainage canal on the northern edge of the property via groundwater discharge and surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete

Because the drainage canal on the northern edge of the property flows to Lower Twin Lake, which is used for recreational activities, the surface water and sediment ingestion exposure pathway for off-facility recreational users is also considered potentially complete. The CSM for AOI 5 is presented on **Figure 7-3**.

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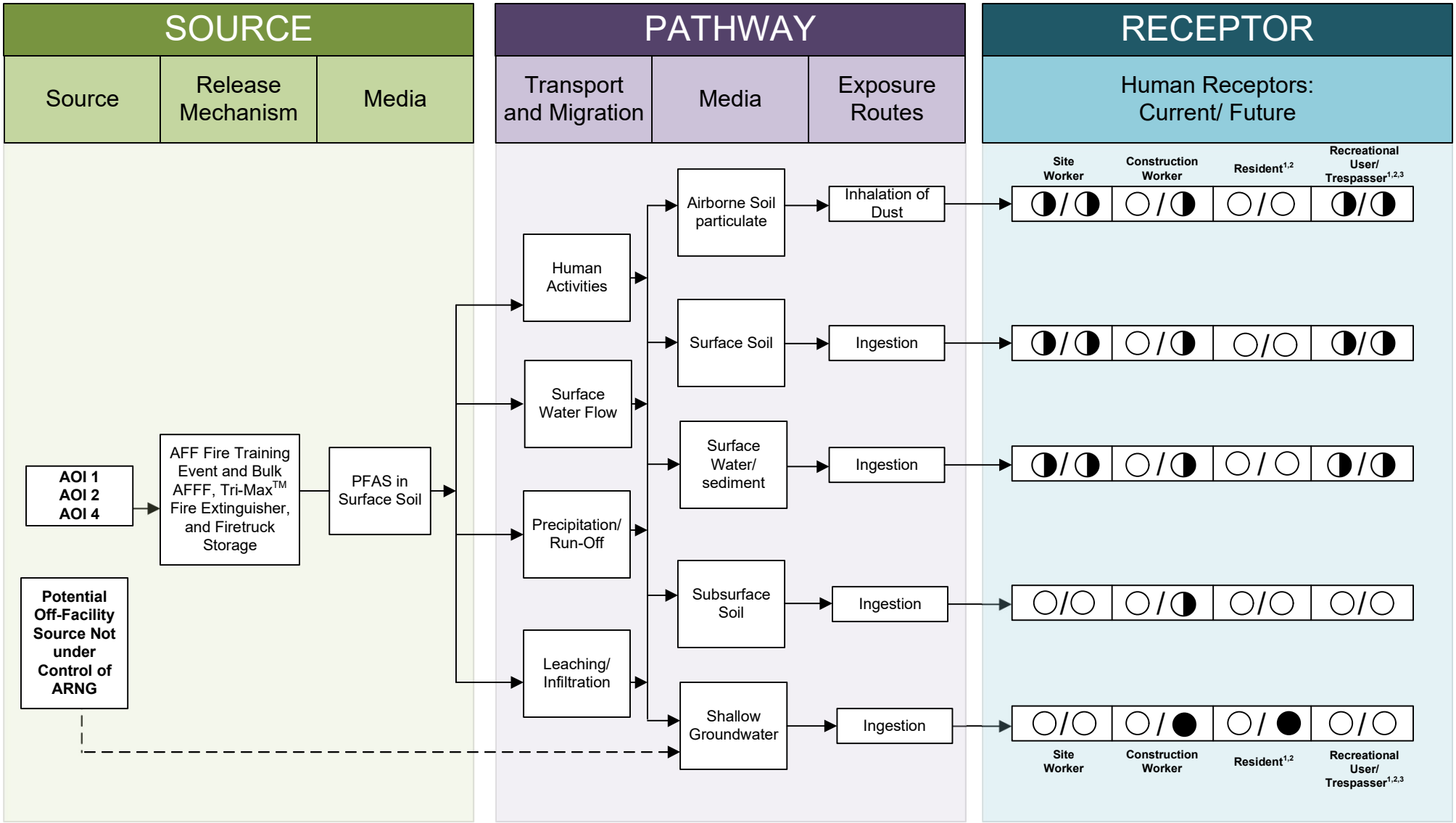


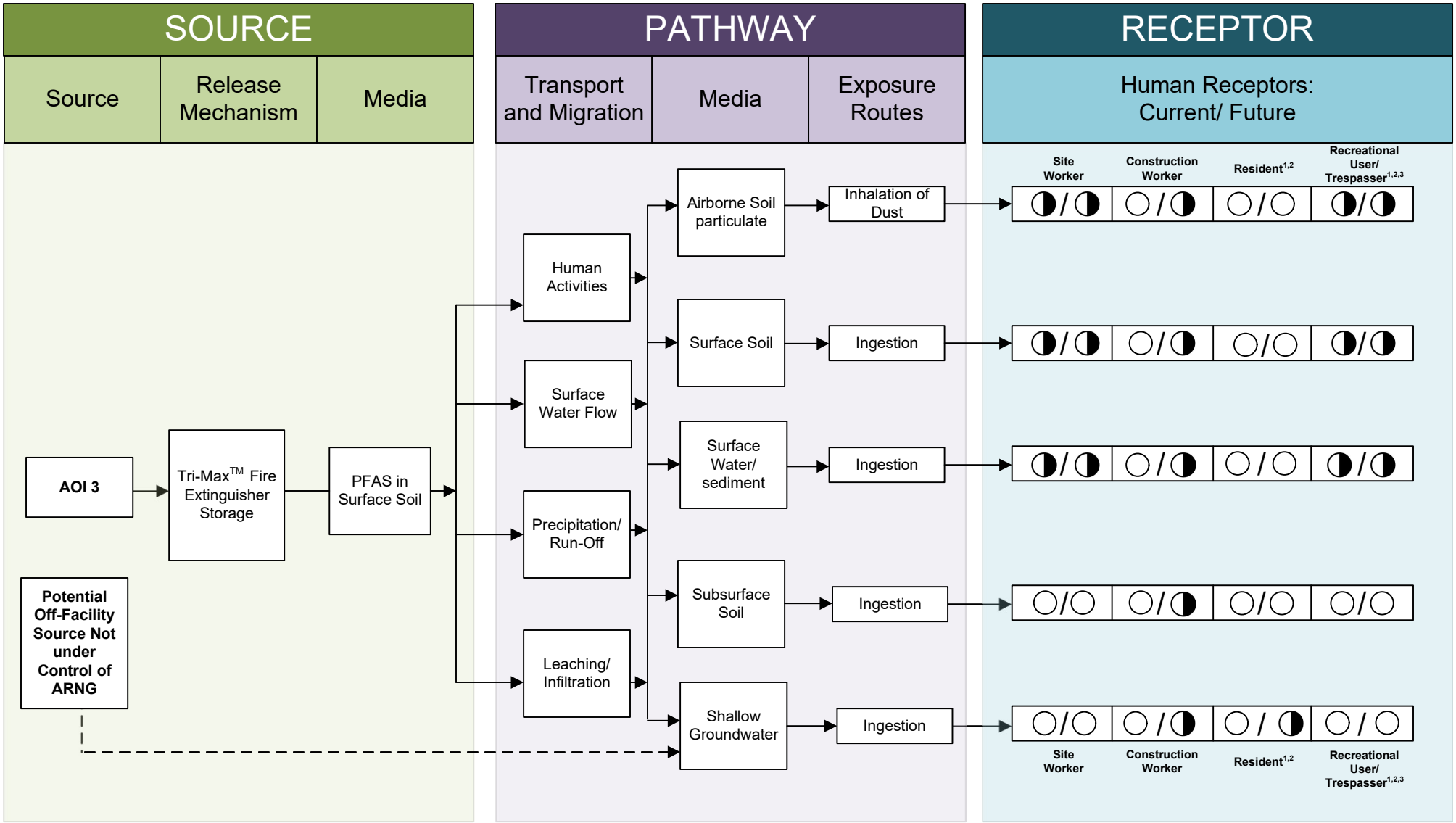
LEGEND

- 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. Dermal contact exposure pathway is incomplete for PFAS.
3. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-1
Conceptual Site Model, AOI 1, AOI 2, and AOI 4
Winder Barrow AASF



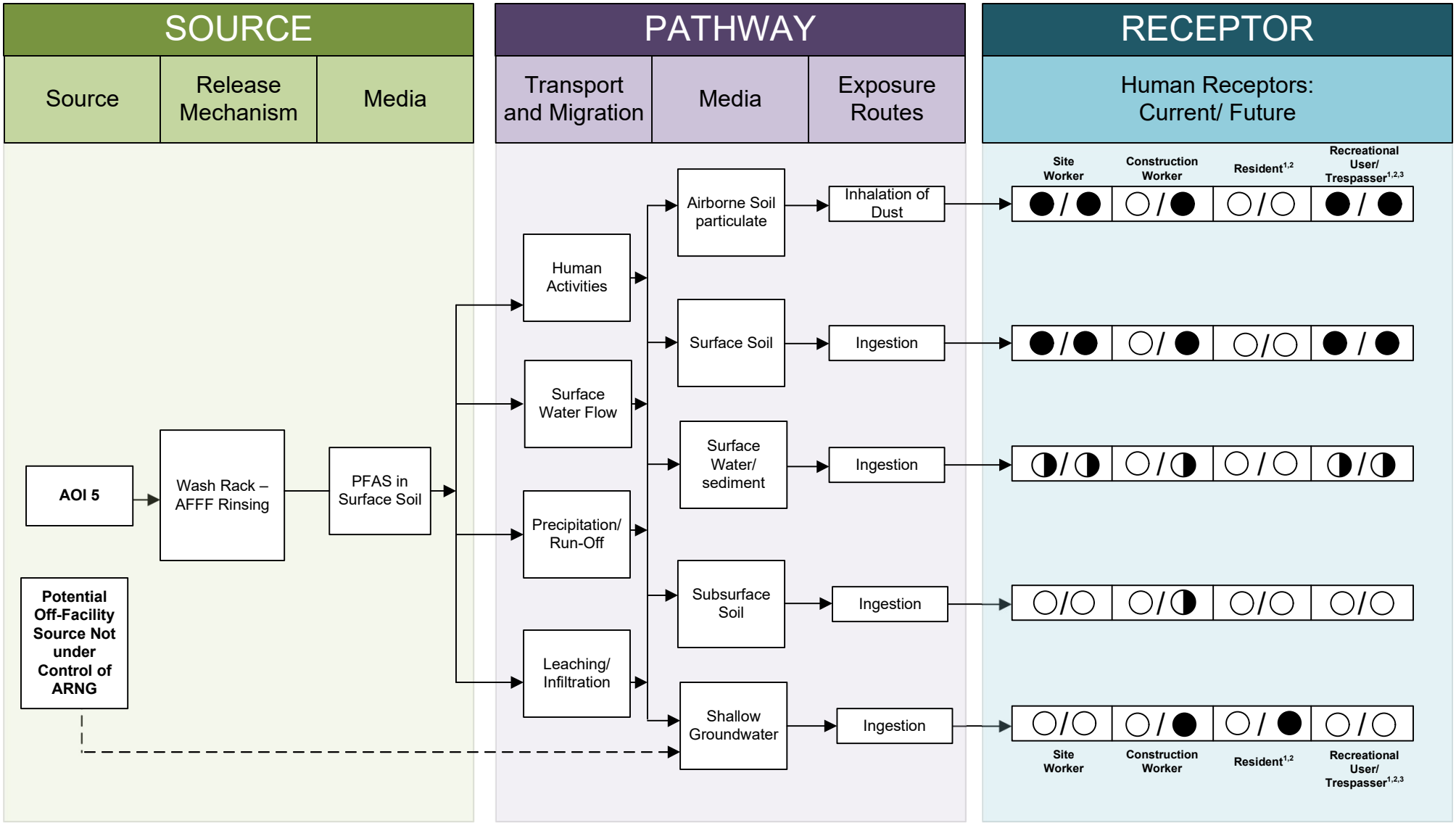
LEGEND

- 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. Dermal contact exposure is incomplete for PFAS.
3. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-2
Conceptual Site Model, AOI 3
Winder Barrow AASF



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. Dermal contact exposure pathway is incomplete for PFAS.
3. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-3
Conceptual Site Model, AOI 5
Winder Barrow AASF

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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 16 July 2021, and from 27 to 30 September 2021 and consisted of decontamination water source sampling, 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, 2021a).

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.7** of this Report.

- 38 soil samples from 11 boring locations;
- 11 grab groundwater samples from 11 temporary well locations; and
- 17 QA samples.

The information gathered during this investigation was used to determine if PFOA, PFOS, and/or PFBS were present at or above SLs. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure to PFOA, PFOS, and PFBS at the AOIs, which are described in **Section 7**.

8.2 SI Goals Evaluation

As described in **Section 4.2**, the SI activities were designed to achieve six main goals or DQOs. This section describes the SI goals and the conclusions that can be made for each based on the data collected during this investigation.

1. *Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.*

   PFOA, PFOS, and PFBS were detected at the facility in soil and groundwater. PFOA, PFOS, and PFBS were detected both at the source areas, as well as at the upgradient and downgradient facility boundary areas. PFOA and PFOS in groundwater at AOI 1: North Ramp FTA, AOI 2: East Ramp AFFF Release Area and Tri-Max™ Staging Area, AOI 4: Former Storage Area, AOI 5: Wash Rack exceeded the SL of 40 ng/L (individually). PFOS in groundwater at the upgradient and downgradient facility boundary areas (WB-01 amd WB-02) also exceeded the SL of 40 ng/L. PFBS in groundwater at AOI 1: North Ramp FTA exceeded the SL of 600 ng/L. The detected concentrations of PFOA and PFBS in soil samples from all AOIs were below the SLs. PFOS in soil at AOI 5: Wash Rack exceeded the SL of 130 µg/kg.

2. *Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.*

   One potential PFAS release area was removed from further consideration based on the groundwater and soil data collected during this SI: Former Tri-Max™ Storage Area at AOI

3. PFOA, PFOS, and PFBS were not detected in groundwater and/ or soil above the SLs in this area.

3. *Determine the potential need for a TCRA (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.*

   Based on the data collected during this SI, there is a potentially complete pathway between the potential PFAS release areas and downgradient drinking water receptors due to the presence of private wells in the downgradient direction.

4. *Collect data to better characterize the release areas for more effective and rapid initiation of a RI (if determined necessary).*

   All of the borings completed as a part of this SI were drilled to depths between 19 and 25 feet bgs. The geological data collected from the boreholes indicate that the dominant lithology of the unconsolidated material underlying the Winder Barrow AASF is comprised of fine- to medium-grained, poorly to well-graded sand. Boring logs showed varying percentages of fines (silt and clay, specifically kaolinite), gravel, and weathered rock. The soils observed at the facility have a relatively high hydraulic conductivity, with well-graded sands and sand with gravel having the highest conductivity. Weathered bedrock observed at boring location AOI02-02 likely has a lower hydraulic conductivity and represents the most impermeable material. These site observations are consistent with the expected subsurface material conditions.

   Depth to water at the facility ranges from approximately 9.58 to 16.29 feet bgs. Groundwater flow direction is to the northwest towards the drainage canal on the northern edge of the property, which drains to Lower Twin Lake. These geologic and hydrogeologic observations inform development of technical approach for the RI.

5. *If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities)*

   Based upon the evaluation of groundwater and soil results in comparison to SLs, in combination with the groundwater flow direction analysis, the results of the SI indicate that the source of detected concentrations of PFOA, PFOS, and PFBS at the facility is likely attributable to ARNG activities. Although the evaluation of groundwater and soil results at the upgradient facility boundary area (WB-01) indicate that an off-facility source is contributing to PFOA, PFOS, and PFBS detections onsite, the groundwater and soil results at WB-01 may be influenced by PFAS migration via the adjacent open stormwater drainage line and septic field. The pathway for PFAS migration onsite from off-facility sources in the upgradient direction requires further evaluation.

6. *Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.*

   Detections of PFOA, PFOS, and PFBS in soil and groundwater at source areas and the upgradient and downgradient facility boundary areas indicate there is a potentially complete pathway between source and receptor.

8.3 Outcome

Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to off-facility drinking water receptors from sources on facility resulting from historical

DoD activities based on the presence of private wells in the downgradient direction. The exposure pathway for on-facility drinking water receptors is considered incomplete because there are no potable wells at the facility and drinking water is supplied by the City of Winder Water Works. There is potential for exposure to onsite workers, future construction workers and trespassers via inhalation of dust, ingestion of surface soil, and ingestion of surface water and/or sediment. There is potential for exposure to future construction workers via ingestion of subsurface soil and shallow groundwater. Additionally, there is potential for exposure to off-facility recreational users via ingestion of surface water and/ or sediment. Sample analytical concentrations collected during the SI were compared against the project SLs for PFOA, PFOS, and PFBS 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 PFBS in groundwater exceeded their respective individual SLs at temporary well locations (AOI01-01 and AOI01-02), with maximum with concentrations of 1,740 ng/L (AOI01-02), 7,350 ng/L (AOI01-02) and 1,220 ng/L (AOI01-01), respectively. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.
- At AOI 2, PFOA and PFOS in groundwater exceeded their respective individual SLs at all temporary well locations (AOI02-01 through AOI02-03), with maximum concentrations of 181 J+ ng/L (AOI02-01) and 1,210 J ng/L (AOI02-01), respectively. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.
- At AOI 3, detected concentrations of PFOA, PFOS, and PFBS in groundwater were below SLs.
- At AOI 4, PFOA and PFOS in groundwater exceeded their respective individual SLs at location AOI04-01, with concentrations of 622 ng/L and 62,700 ng/L, respectively. Based on the results of the SI, further evaluation of AOI 4 is warranted in the RI.
- At AOI 5, PFOA and PFOS in groundwater exceeded their respective individual SLs at both temporary well locations (AOI05-01 and AOI05-02), with maximum concentrations of 410 ng/L (AOI05-02) and 1,210 ng/L (AOI05-02), respectively. Based on the results of the SI, further evaluation of AOI 5 is warranted in the RI.
- At WB-01 and WB-02, PFOS in groundwater exceeded its SL with concentrations of 219 ng/L and 151 ng/L, respectively. Based on the results of the SI, further evaluation of the facility upgradient and downgradient areas is warranted in the RI.
- The detected concentrations of PFOS in surface soil at AOI 5 exceeded the SL at both locations (AOI05-01 and AOI05-02), with a maximum concentration of 639 µg/kg at AOI05-01.
- The detected concentrations of PFOA, PFOS, and PFBS in soil at AOI 1 through AOI 4 were below the SLs.

Table 8-1 summarizes the SI results for soil and groundwater. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to onsite workers, future construction workers, and trespassers via inhalation of dust, ingestion of surface soil, and ingestion of surface water and/or sediment; potential for exposure to future construction workers via ingestion of subsurface soil and shallow groundwater; potential for exposure to off-facility recreational users via ingestion of surface water and/or sediment; and potential for exposure to off-facility residents via ingestion of shallow groundwater caused by DoD activities at or adjacent to the facility.

Table 8-2 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation

is warranted in the RI for AOI 1: North Ramp FTA, AOI 2: East Ramp AFFF Release Area and Tri-Max™ Staging Area, AOI 4: Former Storage Area, and AOI 5: Wash Rack.

Table 8-1: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	North Ramp FTA	◐	●	●
2	East Ramp AFFF Release Area	◐	●	●
	Tri-Max™ Staging Area	◐	●	●
3	Former Tri-Max™ Storage	◐	◐	●
4	Former Storage Area	◐	●	●
5	Wash Rack	●	●	●
Sitewide Location – Upgradient	Unknown	◐	N/A	●
Sitewide Location – Downgradient	Potential Facility Releases	◐	N/A	●

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

Table 8-2: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	North Ramp FTA	Exceedances of SLs in groundwater at source area and in the downgradient direction. No exceedances of SLs in soil.	Proceed to RI
2	East Ramp AFFF Release	Exceedances of SLs in groundwater at source area and in the downgradient direction. No exceedances of SLs in soil.	Proceed to RI
	Tri-Max™ Staging Area	Exceedances of SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI
3	Former Tri-Max™ Storage	Detections in groundwater but no exceedances of SLs. No exceedances of SLs in soil.	No further action
4	Current Tri-Max™ Storage	Exceedances of SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI
5	Wash Rack	Exceedances of SLs in groundwater at source area and in the downgradient direction. Exceedances of SLs in soil at the source area and in the downgradient direction.	Proceed to RI

9. References

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