FINAL
Site Inspection Report
Army Aviation Support Facility #3
Bates Field
Mobile, Alabama

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

August 2023

Prepared for:

Army National Guard Bureau
111 S. George Mason Drive
Arlington, VA 22204

UNCLASSIFIED

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
ALARNG	Alabama Army National Guard
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
DOT	Department of Transportation
DPT	direct push technology
DQO	data quality objective
DUA	data usability assessment
EDR™	Environmental Data Resources, Inc.™
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
GPRS	Ground Penetrating Radar Systems
GSA	Geological Survey of Alabama
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MAWSS	Mobile Area Water & Sewer System
MIL-SPEC	military specification
MS/MSD	matrix spike/matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
OSD	Office of the Secretary of Defense
OWS	oil-water separator
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid

PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UCMR 3	Third Unregulated Contaminant Monitoring Rule
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

Executive Summary

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

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (**see Table ES-2 for locations**). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for relevant compounds. This SI was completed at the Army Aviation Support Facility (AASF) #3 Bates Field in Mobile, Alabama and determined further investigation is warranted for AOI 1: Flight Ramp and AOI 2: Hangar Fire Suppression System, Wash Rack, and AFFF Storage Area. AASF #3 will also be referred to as the “facility” throughout this document.

AASF #3 is located at 9055 Tanner Williams Road, approximately 12 miles west of downtown Mobile, in Mobile County, Alabama. The facility is in the northeast-most section of the Mobile Regional Airport property. AASF #3 occupies approximately 35 acres and is used for the operation, maintenance, and repair of Alabama ARNG (ALARNG) rotary-winged aircraft. The facility houses a single hangar, administrative offices, and classrooms. According to ALARNG personnel, construction of the facility began in 1996 and was completed in 1999. Water and electric utilities are provided by the City of Mobile.

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

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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

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

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

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

b.) Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Flight Ramp	◐	●	Proceed to RI
2	Hangar Fire Suppression System, Wash Rack, and AFFF Storage Area	◐	●	Proceed to RI

Legend:

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as “relevant compounds” throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at the Army Aviation Support Facility (AASF) #3 Bates Field in Mobile, Alabama. AASF #3 is also referred to as the “facility” throughout this document.

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

1.2 SI Purpose

A PA was performed at AASF #3 (AECOM Technical Services, Inc. [AECOM], 2020) that identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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2. Facility Background

2.1 Facility Location and Description

AASF #3 is located at 9055 Tanner Williams Road, approximately 12 miles west of downtown Mobile, in Mobile County, Alabama. The facility occupies a 35-acre parcel of land along the west side of Tanner Williams Road, in the northeast-most section of the Mobile Regional Airport, within the airport property boundary. The latitude and longitude for the approximate center of the AASF are 30°42'21.06" N; 88°15'10.08" W. According to Alabama ARNG (ALARNG) personnel, construction of the facility began in 1996 and was completed in 1999. The site location is depicted on **Figure 2-1**.

AASF #3 is used for the operation, maintenance, and repair of ALARNG rotary-winged aircraft. The facility includes one hangar and flight ramp and also houses administrative offices and classrooms. Roughly 50 percent (%) of AASF #3 is covered by developed or paved surfaces that are centrally located within the facility and are surrounded by maintained open fields. The AASF #3 flight ramp is connected to the Mobile Regional Airport via a taxiway located at the southwest corner of the facility.

2.2 Facility Environmental Setting

AASF #3 is located within in the Alluvial-Deltaic Plain district of the Coastal Plain physiographic province. The Alluvial-Deltaic Plain is characterized by shallow topographic relief with poorly defined drainage patterns. AASF #3 sits at an elevation of approximately 200 feet above mean sea level. The land surface is relatively flat across the facility, with some constructed berms and drainage features present throughout. The facility and surrounding topography generally slope to the northwest, with the grade steepening off-facility towards Pierce Creek (**Figure 2-2**). The facility lies within the Southern Coastal Plain ecoregion, which is characterized by low-lying plains, swampy areas, and bottomlands; it is drained by meandering, low-gradient, and sandy bottom streams (US Geological Survey [USGS], 2002).

Land use in the vicinity of AASF #3 includes residential and commercial areas to the north and east, and the Mobile Regional Airport to the south and west. The north end of the Mobile Regional Airport runway is connected to the southwest corner of AASF #3 by a taxiway. A US Coast Guard (USCG) facility, also on the Mobile Airport property, is located approximately 0.6, miles southeast of the AASF.

2.2.1 Geology

Near-surface geology in the vicinity of AASF #3 consists of undifferentiated Holocene and Pleistocene age alluvial, coastal, and low terrace deposits characterized by white, gray, orange, and red very fine- to coarse-grained sand with gravel and gray and orange sandy clay in some places (Geological Survey of Alabama [GSA], 1972). Throughout most of the area, these sands are less than 50 feet thick; however, in the Mobile River floodplain, alluvial deposits are as much as 150 feet thick (USGS, 2019).

Stratigraphically, the Pliocene age Citronelle Formation underlies the undifferentiated Holocene and Pleistocene units throughout the region; however, the Citronelle Formation is the recognized surficial unit present at AASF #3, where the alluvial deposits are absent (GSA, 1971). The Citronelle formation is characterized by moderate-reddish-brown, deeply weathered, fine to very coarse quartz sand with varicolored, typically mottled, lenticular beds of clay and clayey gravel. Limonite pebbles and lenses of limonite-cemented sand occur locally in weathered exposures. Gravel found in the Citronelle formation is composed of chert and quartz pebbles. (USGS, 2019).

The undifferentiated Miocene Series unconformably underlies the Citronelle Formation and is characterized by moderate-yellowish-orange, thinly bedded to massive, fine to coarse sand, gravelly sand, thin-bedded to massive clay, and sandy clay. Limonite pellets occur in places along clay sand contacts. Gravel in the Miocene Series is composed of quartz and chert granules and pebbles (USGS, 2019).

The Miocene age Pensacola Clay Formation conformably underlies the undifferentiated Miocene Series and is characterized by greenish-gray to light olive-gray, slightly calcareous, slightly micaceous silty to sandy clay containing beds and lenses of sand (GSA, 1985). Geologic units are depicted on **Figure 2-3**.

Direct push soil borings were completed during the SI at depths ranging between 30 to 45 feet below ground surface (bgs). The soil borings generally encountered poorly graded sand and sandy silt. Observed sands were generally fine-grained. Silty sand was encountered within the upper 10 and 20 feet of two boring locations in the northern portion of the facility. Additionally, isolated layers of lean clay were observed in borings located in the southwestern portion of the facility. Based on the depths, thicknesses, and intermittent frequency of the encountered clay layers, the clay layers appear to be lenticular. These boring observations are consistent with the Citronelle Formation; which is described as moderate-reddish-brown, deeply weathered, fine to very coarse quartz sand with varicolored, typically mottled, lenticular beds of clay, and is the recognized surficial formation present at AASF #3.

A sample for grain size analysis was collected at one location where a shift to fine grained materials was observed, AOI01-01 (28 to 30 feet bgs), and was analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil sample is comprised primarily of silt (56.35%) and clay (32.56%), with the remaining fraction comprised mostly of fine sand (10.51%). Boring logs are presented in **Appendix E**, and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

The principal groundwater-bearing units in Mobile County are the permeable sands of the Miocene Series and overlying Citronelle Formation. Hydrogeologically, these units are referred to collectively as the Miocene-Pliocene Aquifer. Individual sand beds within the aquifer may be up to 50 to 100 feet thick and are separated by clay layers that can be equal in thickness (GSA, 1972). A widespread confining unit is not recognized within the aquifer, as the sand and clay beds vary unpredictably in many areas. As a result, only locally confining clay beds are expected to be present throughout the aquifer; this is supported by observations from the SI that found clay layers were encountered infrequently and at various depths and are, therefore, considered to be lenticular and not consistent with a large-scale confining unit.

High-capacity wells tapping the aquifer in Mobile County target the prominent sands and generally range in depth from 150 to 800 feet. Wells requiring lower capacity likely do not reach these sands because of the availability of adequate supplies at shallower depths (GSA, 1972). Groundwater features surrounding the facility are shown in **Figure 2-3**.

Groundwater in the vicinity of AASF #3 was anticipated to be encountered at depths of approximately 20 to 30 feet bgs. Synoptic groundwater level measurements collected during the SI were found to range between 22.68 to 34.63 feet bgs. Groundwater elevations, calculated using depth to groundwater measurements and the surveyed ground surface elevation, were generally higher in the north-northwest investigation area and decreased towards the south-southeast, with the exception of elevated groundwater measured in the southern portion of the facility. As a result, the SI findings show an overall southeasterly groundwater flow direction over much of the facility (**Figure 2-4**). In the northern portion of the facility, a retention pond is situated in the vicinity of temporary monitoring wells AOI01-01 and MOB-01. The retention pond appears to artificially elevate the groundwater levels through groundwater mounding, potentially causing groundwater to flow radially from the pond. In the southern portion of the facility, elevated groundwater was observed at AOI01-03. The boring log from this location shows lean clay was observed from 32.5 feet bgs to at least the terminal boring depth. It is possible that this clay is the same clay layer observed at a higher elevation in adjacent boring AOI01-02, in which case the dipping clay surface may form a localized basin that is creating perched groundwater conditions in this part of the facility. As a result of these influences on the localized groundwater elevations and flow directions on-facility, the inferred regional groundwater flow direction in the surrounding vicinity of AASF #3 must still be assumed from topography and surface water drainage patterns and is considered to be to the southwest.

Drinking water at the facility and surrounding area is supplied by the Mobile Area Water & Sewer System (MAWSS), which sources all of its drinking water from Big Creek Lake (MAWSS, 2022). According to the USGS National Water Information System Mapper, the only wells identified in a 4-mile radius of the facility were 15 inactive USGS wells. A recent review of available well records on the Geological Survey of Alabama Groundwater Assessment Program's Water Well Finder indicated the presence of up to 26 wells within a 1-mile radius of the facility (GSA, 2022). The wells are located to the northeast and southeast of AASF #3 and were identified as domestic, industrial, and observation use. The nearest identified well is located approximately 1,500 feet northeast of the facility. All of the identified wells are within the MAWSS public drinking water supply area, so it is not known if any are still used as a potable source. Drinking water at AASF #3 is provided by MAWSS, which sources all drinking water from Big Creek Lake, located approximately 3 miles northwest of the facility.

2.2.3 Hydrology

AASF #3 lies within the Escatawpa River Basin, just west of the drainage divide of the Escatawpa and Mobile River Basins, and is part of the Pierce Creek-Big Creek watershed. Surface water in the vicinity of AASF #3 drains to the northwest, towards Pierce Creek, located 0.5 miles northwest of the facility. Pierce Creek flows approximately 7 miles southwest and drains into Big Creek downstream of Big Creek Lake, which is the main source of drinking water for almost 70% of Mobile County (MAWSS, 2019). Big Creek continues to flow southwest into Mississippi, where it empties into the Escatawpa River. Surface water features surrounding the facility are shown in **Figure 2-5**.

Drainage at AASF #3 is controlled by sheet flow and several shallow drainages that direct surface runoff to the northwest. A retention pond is located at the northwest corner of the facility that, per ALARNG personnel, collects all on-facility runoff as well as some runoff from parts of the nearby airport property to the west. The retention pond also receives overflow from the facility's oil-water separator (OWS) during upset conditions. Runoff captured by the retention pond either evaporates or infiltrates to groundwater, as there is no outflow from the pond.

2.2.4 Climate

Alabama's climate is humid and subtropical. The average temperature in Mobile is 67.25 degrees Fahrenheit (°F), with an average high of 77.5 °F and an average low of 57 °F. Rainfall in Alabama usually is abundant and distributed throughout the year. Mobile receives an average of 66.22 inches of rain per year (World Climate, 2022).

2.2.5 Current and Future Land Use

The ALARNG AASF #3 facility is within the Mobile Regional Airport property and is used for the operation, maintenance, and repair of ALARNG rotary-winged aircraft. Properties surrounding AASF #3 primarily consist of the Mobile Regional Airport to the west and south, including a USCG facility located on the airport property southeast of the AASF. Residential areas are located immediately north and east of AASF #4, across Tanner Williams Road, and a recreational park is immediately east of the facility. Commercial properties exist southeast of the facility and undeveloped land is located to the west and southwest, beyond the airport. Reasonably anticipated future land use is not expected to change from the current land use.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following amphibians, birds, clams, insects, fish, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Mobile County, Alabama (US Fish and Wildlife Service [USFWS], 2022).

- **Amphibians:** Dusky gopher frog, *Rana sevosa* (endangered)
- **Birds:** Red knot, Piping Plover, Calidris canutus rufa (threatened), *Charadrius melodus* (threatened), Wood stork, *Mycteria americana* (threatened), Eastern Black rail, *Laterallus jamaicensis ssp. jamaicensis* (threatened)
- **Clams:** Southern clubshell, *Pleurobema decisum* (endangered), Inflated heelsplitter, *Potamilus inflatus* (threatened)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Fish:** Gulf sturgeon, *Acipenser oxyrinchus (=oxyrhynchus) desotoi* (threatened), Alabama sturgeon, *Scaphirhynchus suttkusi* (endangered)
- **Mammals:** West Indian Manatee, *Trichechus manatus* (threatened)
- **Reptiles:** Alligator snapping turtle, *Macrochelys temminckii* (proposed), Loggerhead sea turtle, *Caretta caretta* (threatened), Gopher tortoise, *Gopherus polyphemus* (candidate), Eastern indigo snake, *Drymarchon corais couper* (threatened), Kemp's ridley sea turtle, *Lepidochelys kempii* (endangered), Hawksbill sea turtle, E*retmochelys imbricat*a (endangered), Black pinesnake, *Pituophis melanoleucus lodingi* (threatened), Alabama red-bellied turtle, *Pseudemys alabamensis* (endangered), Leatherback sea turtle, *Dermochelys coriacea* (endangered)

2.3 History of PFAS Use

Four potential release areas (grouped into two AOIs) where AFFF may have been used or released historically were identified at AASF #3 (AECOM, 2020). PFAS-containing materials were potentially released to surface soil within the boundary of AASF #3 through equipment discharge, accidental leaks and spills, and any potential undocumented fire suppression system testing. The potential release areas were grouped into two AOIs based on proximity to one another and presumed groundwater flow. These areas include:

- AOI 1: Flight Ramp
- AOI 2: Hangar Fire Suppression System, Wash Rack, and the AFFF Storage Area located east of the Flight Ramp

Foam-containing firefighting equipment was known to have been present at the facility as early as 1999 until present. AFFF Tri-Max™ 30 mobile extinguisher units were staged along the Flight Ramp southwest of the hangar building. The Tri-Max™ 30 units were maintained by a contractor. Prior to removal of the Tri-Max™ 30 units around 2008, some of the units were discharged on the southeast portion of the Flight Ramp.

The AASF #3 hangar overhead fire suppression system is equipped with an 800-gallon AFFF tank filled with Chemguard 3% AFFF. The current system was installed from 2016 to 2018 and replaced the AFFF system that was part of the original hangar construction in 1999. Prior to replacement, ALARNG noted that the original overhead dispensing nozzles were rusted, the bladder system within the AFFF concentrate tank was found to be ruptured, and the shutoff valve/backflow preventer had been installed backward. Information regarding a full-scale test of the original suppression system is not available. Two poly 55-gallon drums containing Chemguard 3% left over from the system hangar fire suppression system upgrade are stored on secondary containment in the chemical storage building. Descriptions of AOI 1 and AOI 2 are further presented in **Section 3**.

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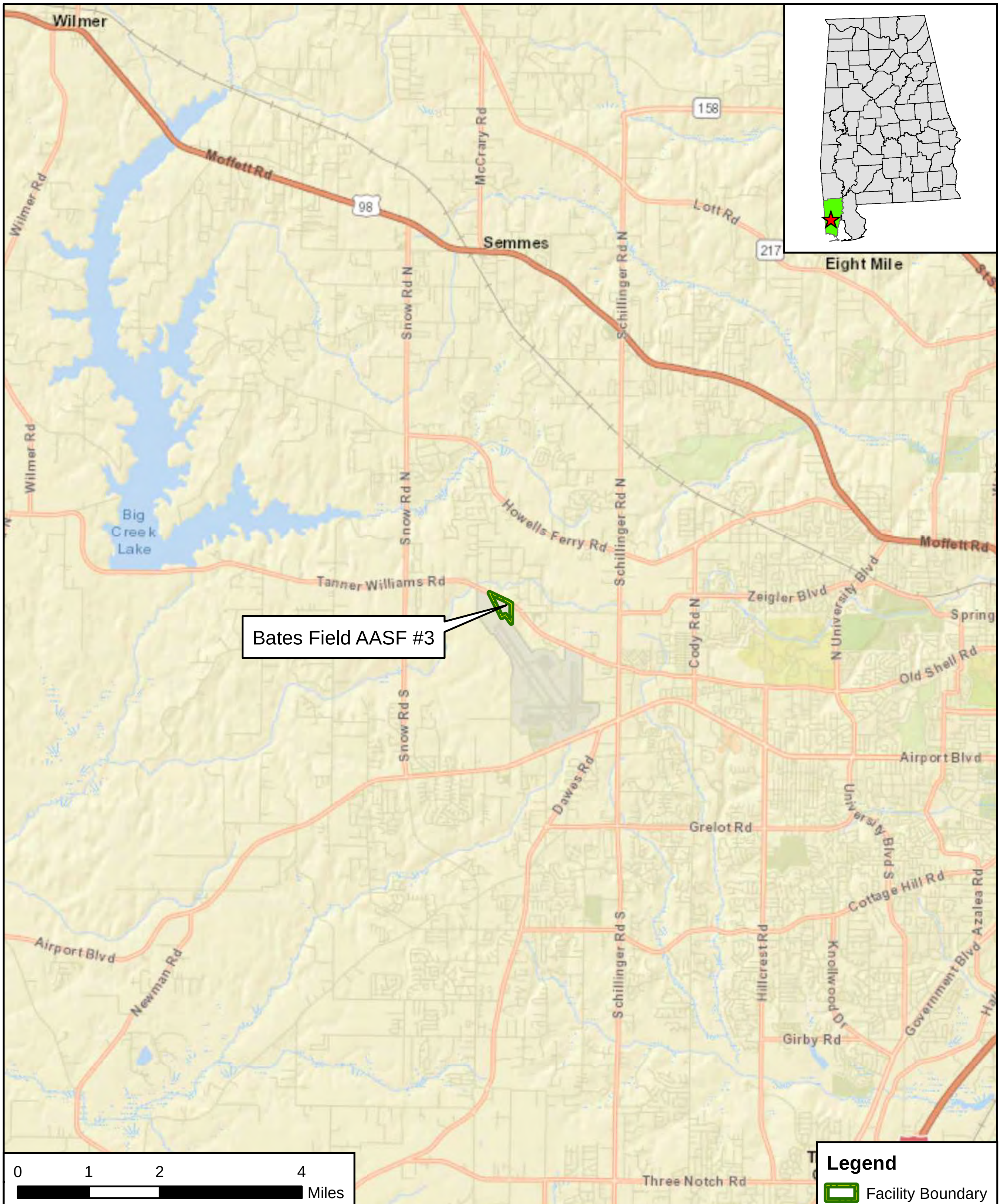

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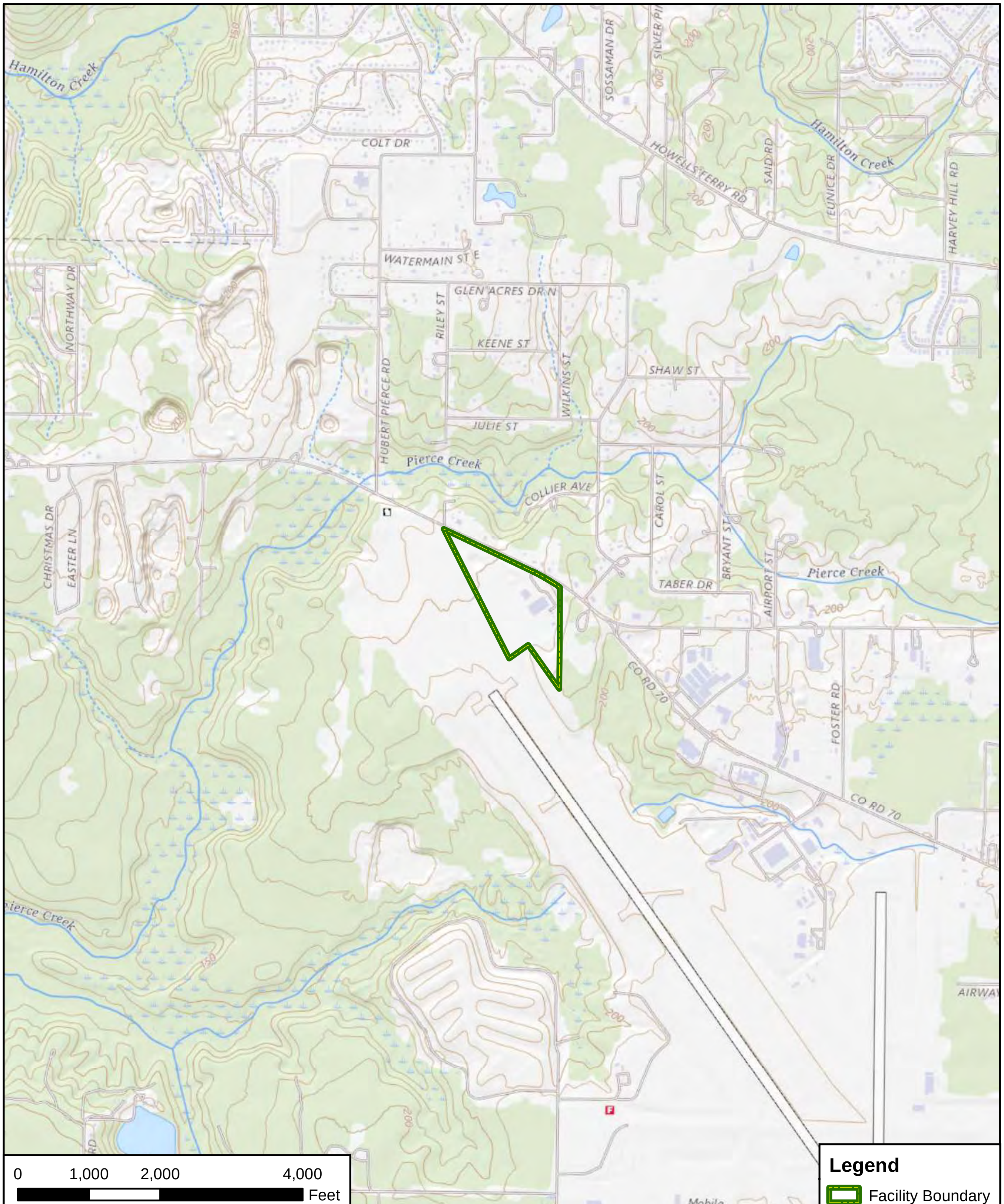
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	8/12/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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PROJECT	Site Inspection at Bates Field AASF #3, AL			
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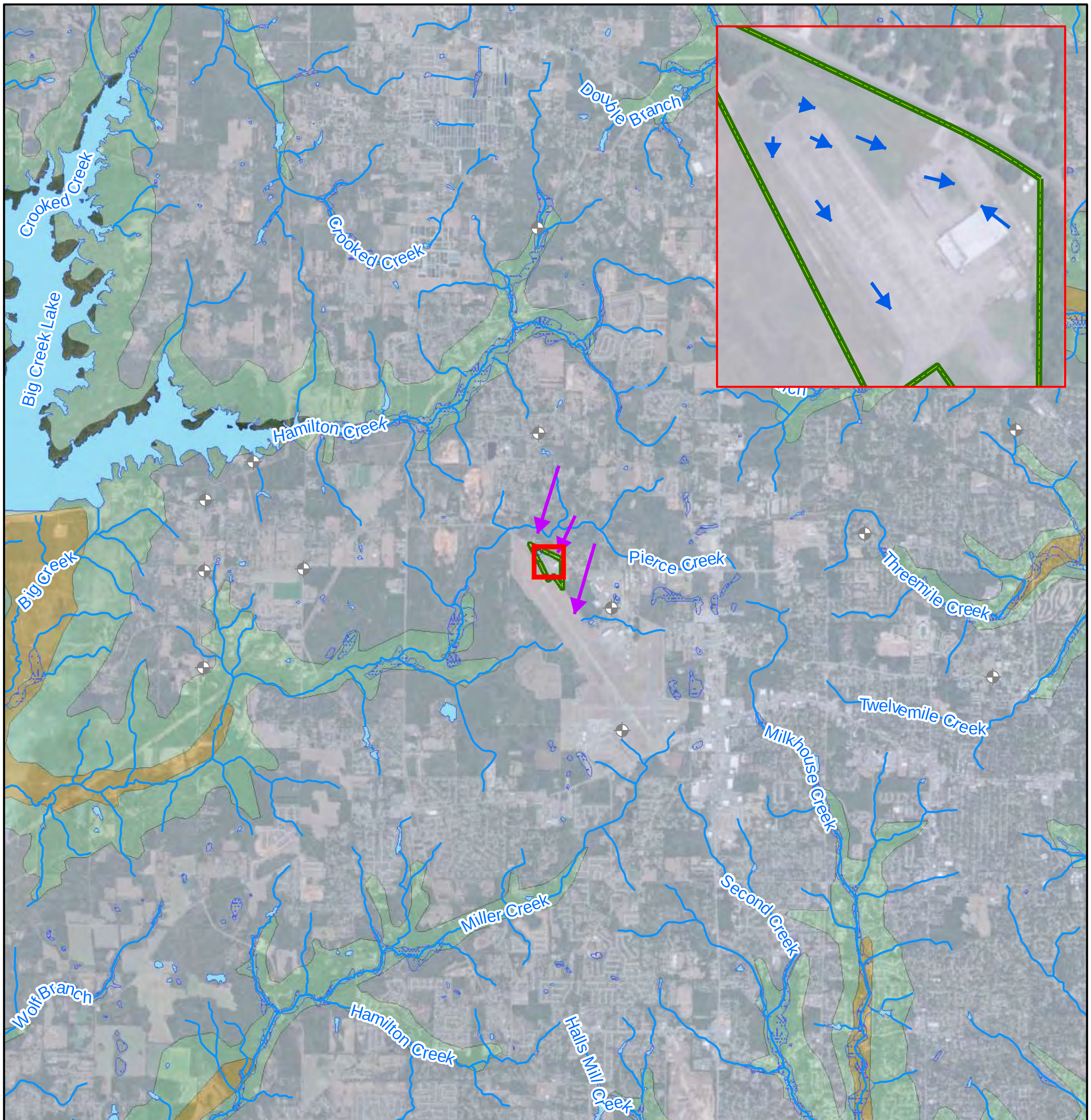
SCALE	1:24,000	CHK BY	VG	8/12/2022
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	8/12/2022

N

Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



Facility Boundary
Water Body
Wetland
Stream/River
Inferred Groundwater Flow Direction
Groundwater Flow Direction

Geology
Alluvial, coastal, and low terrace deposits
Citronelle Formation
Miocene Series undifferentiated

Wells
USGS Inactive Monitoring Well

0 0.75 1.5 3 Miles

CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	9/1/2022	GIS BY	MS	9/1/2022
SCALE	1:95,040	CHK BY	MC	9/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/1/2022

N

Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3

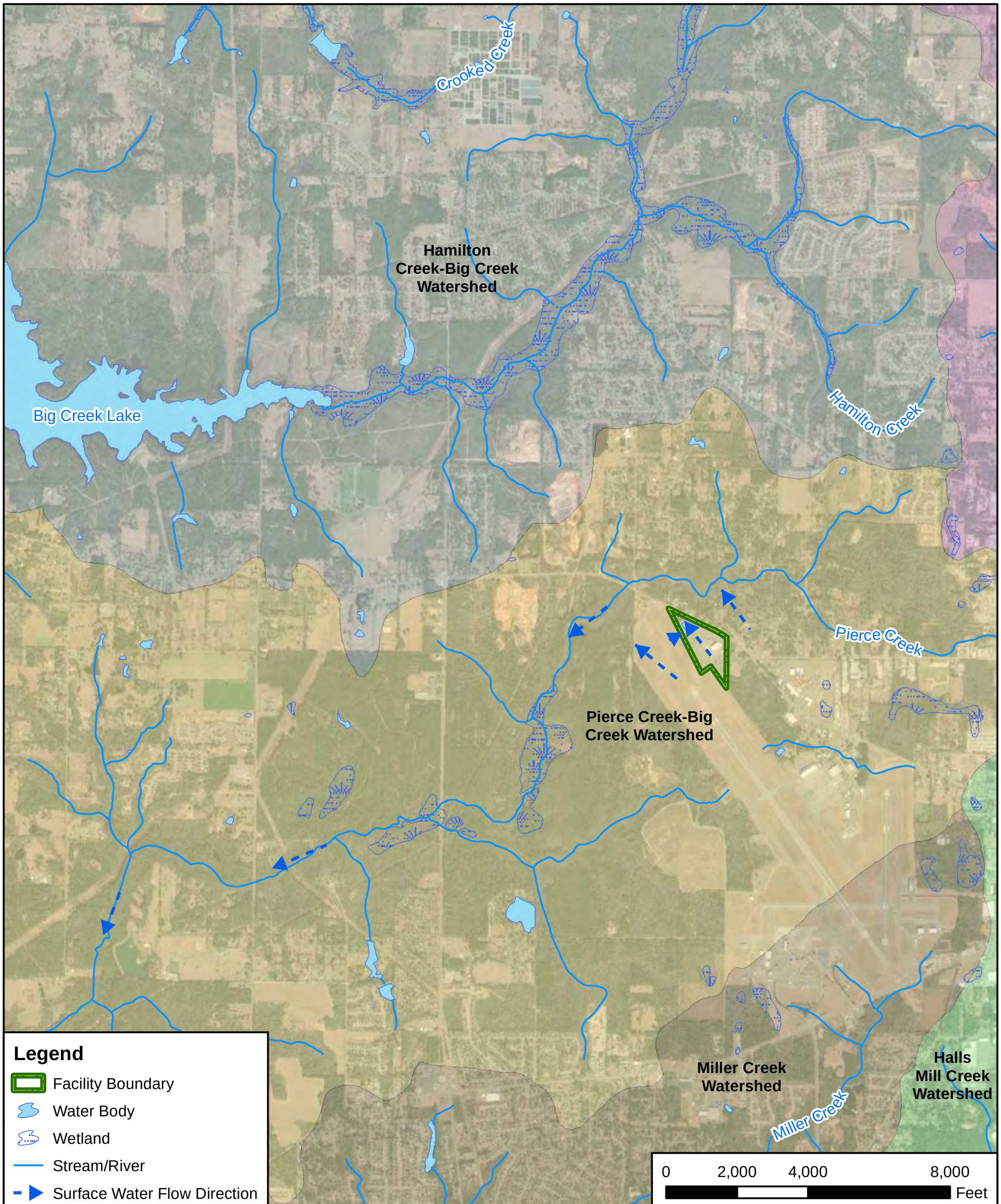
CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	10/20/2022	GIS BY	MS	10/20/2022
SCALE	1:3,600	CHK BY	VG	10/20/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/20/2022

N

Groundwater Elevations, January 2022

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/16/2022

Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, three potential release areas were identified at AASF #3 and grouped into two AOIs (AECOM, 2020). A fourth potential release area, AFFF Storage Area, was added after the PA was finalized and grouped into AOI 2. The potential release areas are shown on **Figure 3-1**.

Two potential off-facility sources of PFAS adjacent to AASF #3, not under the control of the ALARNG, were identified during the PA (AECOM, 2020). These potential off-facility sources include the USCG facility (adjacent to the southeast and also within the Mobile Regional Airport) and all other hangars, ramps, taxiways, runways, and facilities located on the Mobile Regional Airport property not associated with ALARNG activity. According to interviewed ALARNG personnel, the hangar at the USCG facility may be equipped with an AFFF dispensing system, and an AFFF release may have occurred between 2014 and 2015. Additionally, the ALARNG personnel stated some hangars at the Mobile Regional Airport are suspected to be equipped with AFFF suppression systems; however, the use and storage of AFFF at the Mobile Regional Airport are unknown. The USCG facility and Mobile Airport are also shown on Figure 3-1 as a potential adjacent sources; however, it must be noted that this SI did not evaluate off-facility sources, and these locations are shown for informational purposes only.

3.1 AOI 1

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

3.1.1 Flight Ramp

AOI 1 is the Flight Ramp located along the western portion of the facility. According to ALARNG personnel with knowledge of the facility dating back to 2002, approximately 10 AFFF Tri-Max™ 30 mobile extinguisher units were historically (until about 2008) staged along the Flight Ramp southwest of the hangar building. The Tri-Max™ 30 units were maintained by a contractor, and ALARNG did not have copies of the disposal documents or knowledge of the type and where the Tri-Max™ 30 units were transported and disposed. However, ALARNG personnel did indicate that prior to removal of the Tri-Max™ 30 units around 2008, at least some of these units were discharged on the southeast portion of the Flight Ramp. Currently, dry chemical Purple K units are used on the ramp. It was noted during the PA that the ramp is not constructed with storm drains. Surface water drainage from the Flight Ramp appears to flow northwest via sheet flow or via shallow drainage on the west side of the ramp to the retention pond located at the northwest corner of the facility property.

3.2 AOI 2

AOI 2 consists of three potential release areas, as described below. Any releases at AOI 2 could have occurred on the hangar floor or on the pavement of the Wash Rack and AFFF storage area. It is possible AFFF may have infiltrated into the subsurface soil via joints or cracks in the floor slab and pavement or run off to the surrounding grassy areas.

3.2.1 Hangar Fire Suppression System

The AASF #3 hangar building contains an overhead fire suppression system equipped with an 800-gallon AFFF tank filled with Chemguard 3% AFFF. Two 60,000-gallon water tanks located approximately 300 feet northeast of the hangar are used as the water supply for the AFFF system.

The current system was installed as part of a state-wide effort to upgrade fire suppression systems and was constructed from 2016 to 2018, replacing the AFFF system that was part of the original hangar construction in 1999. During the PA interviews, ALARNG personnel indicated that an unknown type of AFFF was used in the original suppression system. It is unknown where the components and concentrate from the original system were taken. Information regarding a full-scale test of the original suppression system could not be ascertained. According to the ALARNG personnel interviewed, a full-scale test of the new system was not conducted, and the system has not been triggered. During the visual inspection, some corrosion and rust staining were observed at the floor drain beneath the current AFFF concentrate tank.

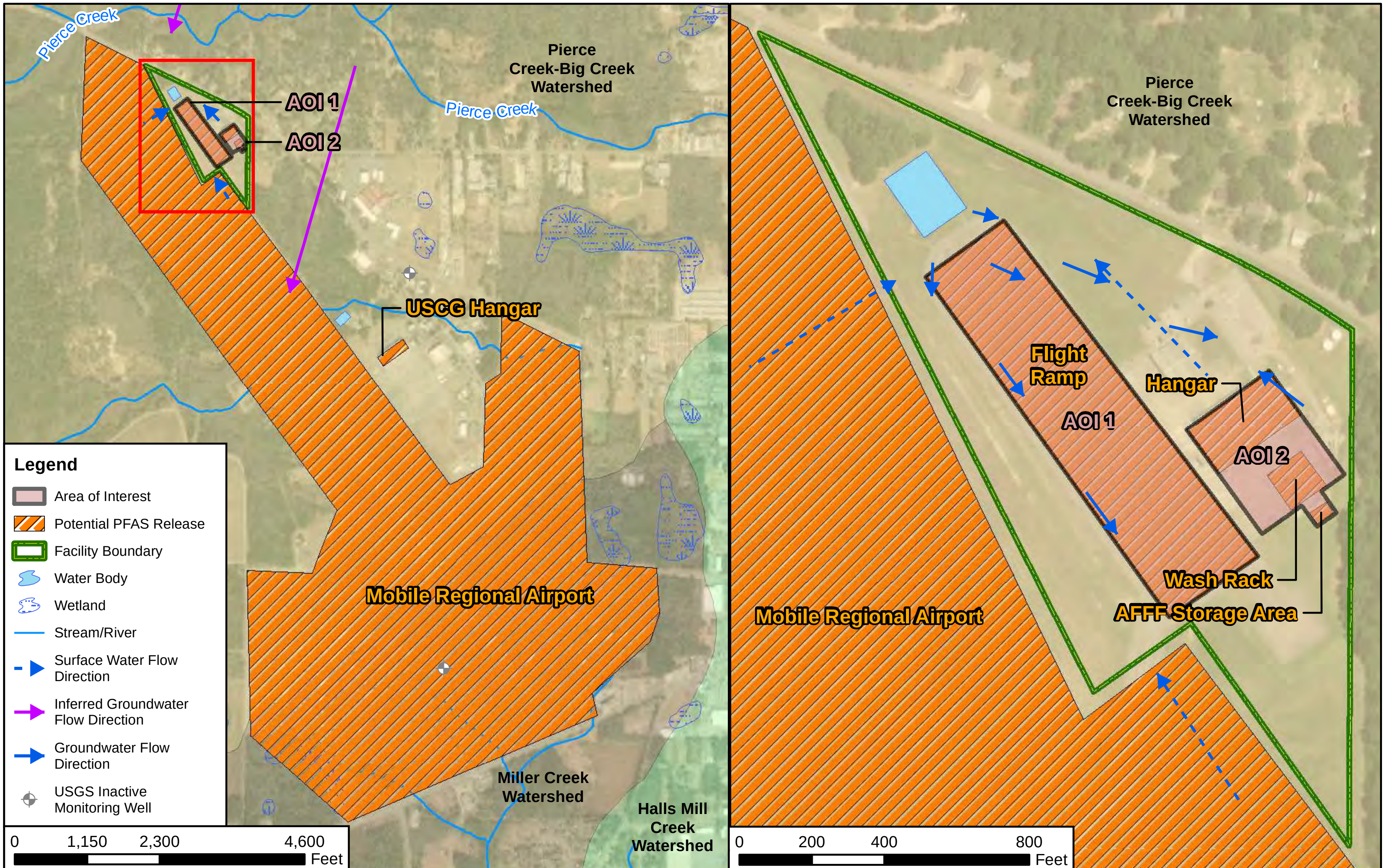
Floor and trench drains in the hangar building drain to the above-ground OWS, which discharges to the MAWSS municipal sanitary sewer system. An overflow basin located beside the OWS receives flow during upset conditions when the OWS is not functioning properly or is overwhelmed during significant rainfall events. According to ALARNG personnel, recent dye testing indicated that the overflow basin drains to the retention pond.

3.2.2 Wash Rack

The Wash Rack is located southeast of the hangar building and is used to wash aircraft. According to ALARNG personnel with knowledge of the property dating back to 2002, annual fire training using a burn barrel and Purple K units was conducted at the Wash Rack. ALARNG personnel stated that AFFF was not used as part of these fire training exercises. As identified earlier, approximately 10 AFFF Tri-Max™ 30 units were historically staged along the Flight Ramp located southwest of the hangar building. Although ALARNG personnel stated that only Purple K units were used in fire training, there is the possibility that the AFFF Tri-Max™ 30 units may have been used for fire training, or that some of the AFFF known to have been discharged on the Flight Ramp drained to the Wash Rack. The Wash Rack is sloped on all sides towards one drain in the center of the Wash Rack. The Wash Rack drains to the OWS and combines with drainage from the hangar, then drains to the sanitary sewer system, or to the overflow basin and retention pond in upset conditions.

3.2.3 AFFF Storage Area

During the PA site visit, ALARNG personnel noted two poly 55-gallon drums containing Chemguard 3% AFFF that are currently staged on secondary containment, within a chemical storage building southeast of the hangar and Wash Rack. These drums contain AFFF concentrate left over by a contractor after the 800-gallon tank for the overhead suppression system had been filled to capacity. At the time of the visual inspection, no evidence of drum leaks or spills were apparent. No floor drains were evident in the storage building.



CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	9/1/2022	GIS BY	MS	9/1/2022
SCALE	1:27,600	CHK BY	MC	9/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/1/2022

N

Areas of Interest

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

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

4.1 Problem Statement

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

4.2 Information Inputs

Primary information inputs included:

- The PA for AASF #3 (AECOM, 2020);
- Analytical data collected as part of ALARNG drinking water at the facility (ALARNG, 2017);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). The SI scope was bounded vertically by the observed depths of the surficial groundwater table. Temporal boundaries of the study were limited by seasonal conditions present during the Winter 2022 field work.

4.4 Analytical Approach

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

4.5 Data Usability Assessment

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

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

5. Site Inspection Activities

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

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, AASF #3 Bates Field, Mobile, Alabama* dated September 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, AASF #3 Bates Field, Mobile, Alabama* dated November 2021 (AECOM, 2021); and
- *Final Site Safety and Health Plan, AASF #3 Bates Field, Mobile, Alabama* dated January 2022 (AECOM, 2022).

The SI field activities were conducted from 18 to 25 January 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021).

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

- Twenty-four (24) soil samples from ten (10) locations;
- Seven (7) grab groundwater samples from seven (7) temporary wells; and
- Sixteen (16) quality assurance (QA)/quality control (QC) samples.

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

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 22 September 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG G-9, ALARNG, and USACE. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021).

A TPP Meeting 3 was held on 26 July 2023 to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

Both AECOM and their drilling contractor, Walker-Hill Environmental, contacted Alabama 811 one-call utility clearance contractor prior to mobilization to notify them of intrusive work. Because Alabama 811 locators do not locate private utilities, such as those belonging to AASF #3, AECOM contracted Ground Penetrating Radar Systems, LLC (GPRS) to perform utility clearance for private utilities at all boring locations. GPRS performed the utility clearance under the oversight of the AECOM field team on 19 January 2022 using industry standard methods in addition to ground-penetrating radar. Additionally, the first 5 feet of the direct-push borings were advanced using hand augering methods to visually verify utility clearance in the shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be acceptable for use prior to the start of field activities. Potable water samples from two sources at AASF #3 were collected on 17 November 2021, prior to mobilization, and analyzed 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 the DUA **(Appendix A)**.

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

5.2 Soil Borings and Soil Sampling

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

In general, 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 observed groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table. If groundwater was not encountered above 30 feet bgs, the intermediate sample was collected from the 13- to 15-foot bgs interval.

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

Direct push soil borings were completed during the SI at depths ranging between 30 to 45 feet bgs. The soil borings generally encountered poorly graded sand and sandy silt. Observed sands were generally fine-grained. Silty sand was encountered within the upper 10 and 20 feet of two boring locations in the northern portion of the facility, AOI01-01 and MOB-01, respectively. Additionally, isolated layers of lean clay were observed below 25 feet bgs in several borings located in the southwestern portion of the facility. Based on the depths, thicknesses, and intermittent frequency of the encountered clay layers in the soil borings, the clay layers appear to be lenticular. Red and brown colored soils were generally encountered in the upper portion of the soil borings, suggesting a higher degree of weathering, while white, pink, and yellow soils were generally encountered in the lower portions of the soil borings. These results and facility observations are consistent with the Citronelle Formation, which is the recognized surficial unit present at the facility, and is described as moderate-reddish-brown, deeply weathered, fine to very coarse quartz sand with varicolored, typically mottled, lenticular beds of clay.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the SI QAPP Addendum (AECOM, 2021).

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

The boreholes were converted to temporary wells, as described in **Section 5.3**, and then subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021) at the completion of sampling activities. The ground surface at each boring location was restored to match surrounding cover.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed in seven boring locations 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**.

Sufficient time was allowed for groundwater accumulation in the temporary wells before proceeding with collection of groundwater samples. Wells were purged using a peristaltic pump or bladder pump with PFAS-free HDPE tubing to remove sediment to the extent reasonable in an effort to minimize the turbidity of the samples. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected. Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. 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. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSD samples were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. Because non-dedicated sampling equipment was required due to the use of a bladder pump at several locations, equipment rinsate blanks were collected at a rate of 5% and analyzed for the same parameters as the groundwater samples. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 °C during shipment.

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

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 25 January 2022. Groundwater level measurements were collected from the temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. Groundwater was measured between 22.68 to 34.63 feet bgs. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-2**.

5.5 Surveying

The northern side of each well casing was surveyed by Alabama-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021). Survey data from the newly installed wells on the facility were collected on 25 January 2022 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 investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) were generated during the SI activities from the ten soil boring locations. No soil IDW was generated at the surface soil sample locations. Due to the minimal amount of soil IDW generated, all soil IDW were containerized in one labeled, 55-gallon Department of Transportation (DOT)-approved steel drums and stored on the east-central portion of the facility (near AOI02-03). Based on laboratory results, containerized soil cuttings will be managed and disposed of off-facility by ARNG, under a separate contract held by EA Engineering, Science, and Technology, Inc. (EA). Specifics on the disposal of solid IDW will be addressed in an IDW Treatment Memorandum submitted by EA.

Liquid IDW generated during SI activities (i.e., purge water and decontamination fluids) were containerized in two labeled, 55-gallon DOT-approved steel drums and stored next to the soil IDW drums. Based on laboratory results, ARNG will manage and dispose of the liquid IDW off-facility under a separate contract held by EA. Specifics on the disposal of liquid IDW will be addressed in an IDW Treatment Memorandum submitted by EA.

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

5.7 Laboratory Analytical Methods

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

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, AASF #3 Bates Field, Mobile, Alabama

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-00-02	1/22/2022 13:40	00-02	x	x	x		
AOI01-01-SB-00-02-D	1/22/2022 13:40	00-02	x	x	x		Duplicate
AOI01-01-SB-00-02-MS	1/22/2022 13:40	00-02	x	x	x		MS/MSD
AOI01-01-SB-00-02-MSD	1/22/2022 13:40	00-02	x	x	x		MS/MSD
AOI01-01-SB-10-12	1/23/2022 9:12	10-12	x				
AOI01-01-SB-10-12-MS	1/23/2022 9:12	10-12	x				MS/MSD
AOI01-01-SB-10-12-MSD	1/23/2022 9:12	10-12	x				MS/MSD
AOI01-01-SB-22-24	1/23/2022 9:15	22-24	x				
AOI01-01-SB-28-30	1/23/2022 9:20	28-30				x	
AOI01-02-SB-00-02	1/23/2022 10:30	00-02	x				
AOI01-02-SB-13-15	1/23/2022 10:40	13-15	x				
AOI01-02-SB-30-32	1/24/2022 16:30	30-32	x				
AOI01-03-SB-00-02	1/23/2022 11:24	00-02	x				
AOI01-03-SB-13-15	1/23/2022 13:30	13-15	x				
AOI01-03-SB-30-32	1/23/2022 14:00	30-32	x				
AOI02-01-SB-00-02	1/24/2022 9:00	00-02	x				
AOI02-01-SB-13-15	1/24/2022 9:25	13-15	x				
AOI02-01-SB-33-35	1/24/2022 9:38	33-35	x				
AOI02-02-SB-00-02	1/24/2022 9:55	00-02	x	x	x		
AOI02-02-SB-00-02-D	1/24/2022 9:55	00-02	x				Duplicate
AOI02-02-SB-13-15	1/24/2022 12:00	13-15	x				
AOI02-02-SB-33-35	1/24/2022 12:35	33-35	x				
AOI02-03-SB-00-02	1/23/2022 12:30	00-02	x				
AOI02-03-SB-13-15	1/23/2022 14:55	13-15	x				
AOI02-03-SB-33-35	1/24/2022 15:30	33-35	x				
AOI02-04-SB-00-02	1/23/2022 14:20	00-02	x				
MOB-01-SB-00-02	1/22/2022 10:50	00-02	x				
MOB-01-SB-13-15	1/22/2022 11:40	13-15	x				
MOB-01-SB-28-30	1/22/2022 12:30	28-30	x				
MOB-02-SB-00-02	1/22/2022 14:05	00-02	x				
MOB-03-SB-00-02	1/23/2022 11:00	00-02	x				
MOB-03-SB-00-02-D	1/23/2022 11:00	00-02	x				Duplicate

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, AASF #3 Bates Field, Mobile, Alabama

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Groundwater Samples							
AOI01-01-GW	1/23/2022 16:17	NA	x				
AOI01-01-GW-D	1/23/2022 16:17	NA	x				Duplicate
AOI01-02-GW	1/25/2022 10:51	NA	x				
AOI01-03-GW	1/24/2022 12:27	NA	x				
AOI02-01-GW	1/25/2022 9:23	NA	x				
AOI02-02-GW	1/24/2022 16:02	NA	x				
AOI02-02-GW-MS	1/24/2022 16:02	NA	x				MS/MSD
AOI02-02-GW-MSD	1/24/2022 16:02	NA	x				MS/MSD
AOI02-03-GW	1/25/2022 12:24	NA	x				
MOB-01	1/23/2022 9:42	NA	x				
Quality Control Samples							
MOB-DECON-01	11/17/2021 11:05	NA	x				DECON
MOB-DECON-02	11/17/2021 10:30	NA	x				DECON
MOB-FRB-01	1/25/2022 13:15	NA	x				FRB
MOB-ERB-01	1/22/2022 14:44	NA	x				ERB
MOB-ERB-02	1/25/2022 13:30	NA	x				ERB
MOB-ERB-03	1/25/2022 9:40	NA	x				ERB

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
ERB = equipment rinsate blank
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
QSM = Quality Systems Manual
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, AASF #3 Bates Field, Mobile, Alabama

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	30	21-26	206.04	204.88	23.84	22.68	182.20
	AOI01-02	43	38-43	209.19	208.29	34.13	33.23	175.06
	AOI01-03	33	28-33	210.82	210.43	30.05	29.66	180.77
	MOB-1	35	30-35	207.52	207.00	30.35	29.83	177.17
2	AOI02-01	40	35-40	209.90	209.37	34.65	34.12	175.25
	AOI02-02	40	35-40	211.25	209.85	35.28	33.88	175.97
	AOI02-03	45	40-45	211.21	210.64	35.20	34.63	176.01

Notes:
bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988

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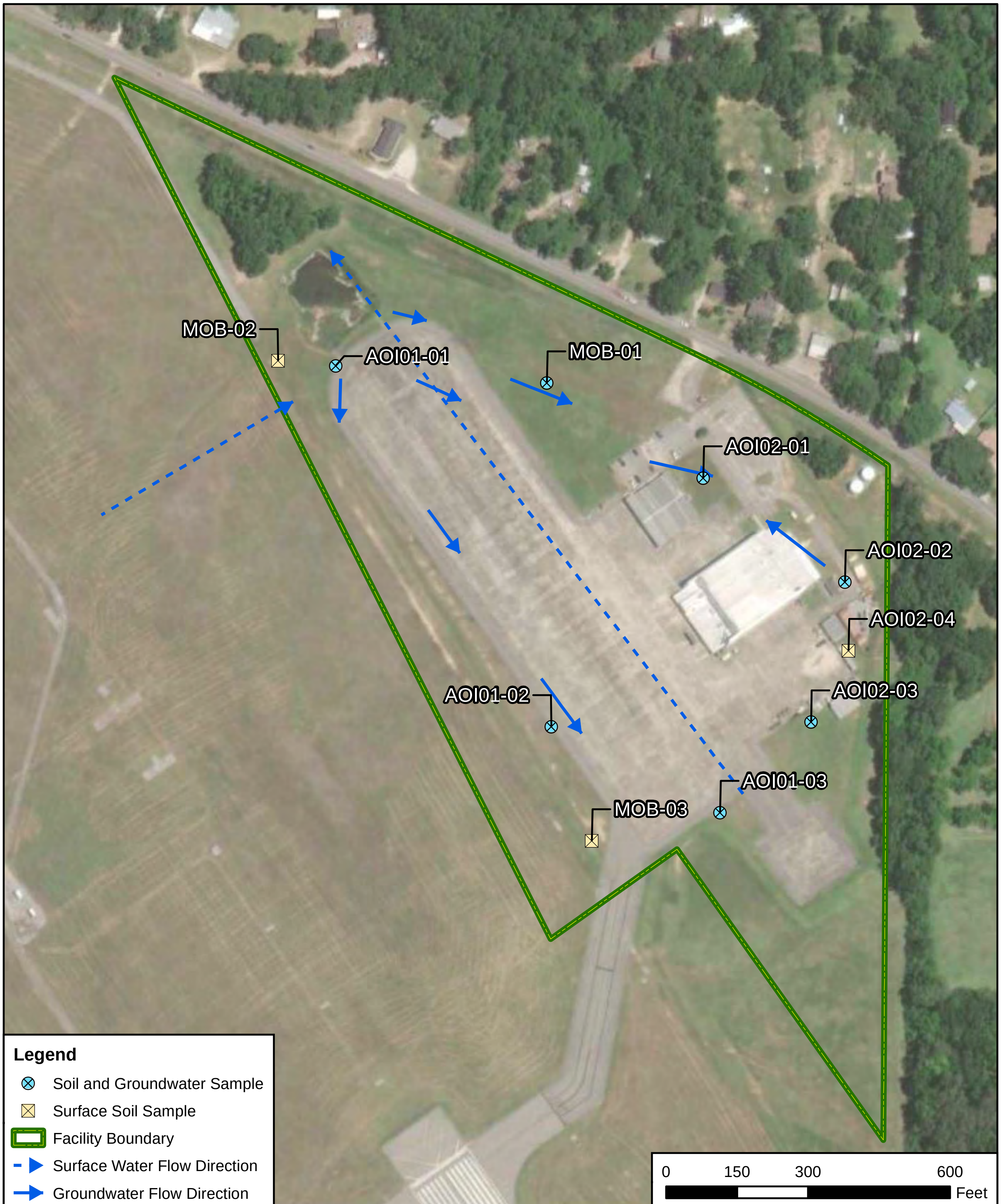

CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	9/1/2022	GIS BY	MS	9/1/2022
SCALE	1:3,600	CHK BY	VG	9/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/1/2022

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 6.4**. **Table 6-2** through **Table 6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

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

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

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

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter
a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.
b.) Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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

6.2 Soil Physicochemical Analyses

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

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

6.3 AOI 1

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

6.3.1 AOI 1 Soil Analytical Results

Surface soil was sampled from 0 to 2 feet bgs at boring locations AOI01-01 through AOI01-03 and MOB-01 through MOB-03. Soil was also sampled from shallow subsurface soil (10 to 15 feet bgs) and deep subsurface soil (22 to 32 feet bgs) at boring locations AOI01-01 through AOI01-03 and MOB-01. AOI01-01 and MOB-02 were located to the north-northwest of the Flight Ramp; MOB-01 was located to the east-northeast of the Flight Ramp; AOI01-02 and MOB-03 were located to the west-southwest of the Flight Ramp; and AOI01-03 was located to the south of the Flight Ramp. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFOS, PFHxS, and PFNA were detected in surface soil at concentrations below their SLs. PFOS and PFHxS were also detected in deep subsurface soil. There were no detections of PFOA, PFOS, PFHxS, or PFNA in shallow subsurface soil. PFBS was not detected in soil at any interval.

In surface soil, PFOA, PFOS, PFHxS, and PFNA were detected at least two orders of magnitude below their SLs. The maximum detected concentration among all four compounds was PFOA, which was detected at 0.547 J micrograms per kilogram (µg/kg) at MOB-02. PFBS was not detected.

In the shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were not detected. In the deep subsurface soil, PFOA, PFBS, and PFNA were not detected. PFOS and PFHxS were detected in deep subsurface soil at MOB-01, at concentrations below 1 µg/kg.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater was sampled from temporary monitoring wells AOI01-01 through AOI01-03 and MOB-01. **Figure 6-6** and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

PFOS was detected in groundwater at concentrations above the SL. PFOA, PFBS, and PFHxS were detected in groundwater, at concentrations below their SLs. PFNA was not detected in groundwater.

PFOS exceeded the 4 nanograms per liter (ng/L) groundwater SL at all AOI 1 temporary wells, except AOI01-02, and was detected at a maximum concentration of 12.6 ng/L in MOB-01. The maximum observed concentrations of PFOA, PFBS, and PFHxS were also detected at MOB-01, but were below their SLs, at concentrations of 2.09 J ng/L, 1.08 J ng/L, and 4.32 J ng/L, respectively.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, and PFNA were detected in soil, at concentrations below their SLs. PFOS was detected in groundwater at several locations, at concentrations above the SL. PFOA, PFBS, and PFHxS were detected in groundwater, at concentrations below their SLs. Based on the exceedances of the PFOS SL 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: Hangar Fire Suppression System, Wash Rack, and AFFF Storage Area. The results in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.4.1 AOI 2 Soil Analytical Results

Surface soil was sampled from 0 to 2 feet bgs at boring locations AOI02-01 through AOI02-04. Soil was also sampled from shallow subsurface soil (13 to 15 feet bgs) and deep subsurface soil (33 to 35 feet bgs) at boring locations AOI02-01 through AOI02-03. AOI02-01 was located to the north of the Hangar; AOI02-02 was located to the east of the Hangar and north of the Wash Rack; AOI02-03 was located to the west of the AFFF Storage Area; and AOI02-04 was located to the east of the Wash Rack. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in surface soil, at concentrations below their SLs. PFOS was also detected in deep subsurface soil. There were no detections of PFOA, PFOS, PFBS, PFHxS, or PFNA in shallow subsurface soil.

In surface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were detected at least one order of magnitude below their SLs. The maximum detected concentration among all five compounds was PFOS, which was detected at 1.74 µg/kg at A0I02-04.

In the shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were not detected. In the deep subsurface soil, PFOA, PFBS, PFHxS, and PFNA were not detected. PFOS was detected in deep subsurface soil only at AOI02-03, at a concentration of 0.068 J µg/kg.

6.4.2 AOI 2 Groundwater Analytical Results

Groundwater was sampled from temporary monitoring wells AOI02-01 through AOI02-03. **Figure 6-6** and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

PFOA was detected in groundwater, at a concentration above the SL. PFOS, PFBS, and PFHxS were detected in groundwater, at concentrations below their SLs. PFNA was not detected in groundwater.

PFOA exceeded the 6 ng/L groundwater SL at one location, AOI02-02, at a concentration of 6.96 ng/L. The maximum observed concentrations of PFOS, PFBS, and PFHxS were also detected at AOI02-02, but below their SLs, at concentrations of 2.20 J ng/L, 3.50 J ng/L, and 16.0 ng/L, respectively.

6.4.3 AOI 2 Conclusions

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

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, AASF #3 Bates Field

	Area of Interest	AOI01																AOI02			
	Sample ID	AOI01-01-SB-00-02		AOI01-01-SB-00-02-D		AOI01-02-SB-00-02		AOI01-03-SB-00-02		MOB-01-SB-00-02		MOB-02-SB-00-02		MOB-03-SB-00-02		MOB-03-SB-00-02-D		AOI02-01-SB-00-02		AOI02-02-SB-00-02	
	Sample Date	01/22/2022		01/22/2022		01/23/2022		01/23/2022		01/22/2022		01/22/2022		01/23/2022		01/23/2022		01/24/2022		01/24/2022	
	Depth	0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		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, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U	ND	U	ND	U	0.057	J	ND	U	ND	U	ND	U	ND	U
PFNA	19	0.075	J	0.075	J	0.021	J	0.035	J	0.039	J	0.239	J	0.033	J	ND	UJ	0.027	J	0.026	J
PFOA	19	0.171	J	0.153	J	ND	U	0.143	J	ND	U	0.547	J	ND	U	ND	U	0.083	J	ND	U
PFOS	13	0.184	J	0.189	J	ND	U	0.076	J	0.169	J	0.221	J	0.123	J	0.062	J	0.106	J	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

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

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL
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.

Notes
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, AASF #3 Bates Field

	Area of Interest	AOI02					
	Sample ID	AOI02-02-SB-00-02-D		AOI02-03-SB-00-02		AOI02-04-SB-00-02	
	Sample Date	01/24/2022		01/23/2022		01/23/2022	
	Depth	0-2 ft		0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	1900	ND	U	0.039	J	ND	U
PFHxS	130	ND	U	0.157	J	0.045	J
PFNA	19	0.027	J	0.039	J	0.031	J
PFOA	19	ND	U	ND	U	ND	U
PFOS	13	ND	U	0.725	J	1.74	

Grey Fill — Detected concentration exceeded OSD Screening Levels

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

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL
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.

Notes
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

	Area of Interest	AOI01								AOI02					
	Sample ID	AOI01-01-SB-10-12		AOI01-02-SB-13-15		AOI01-03-SB-13-15		MOB-01-SB-13-15		AOI02-01-SB-13-15		AOI02-02-SB-13-15		AOI02-03-SB-13-15	
	Sample Date	01/23/2022		01/23/2022		01/23/2022		01/22/2022		01/24/2022		01/24/2022		01/23/2022	
	Depth	10-12 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)															
PFBS	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

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

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, AASF #3 Bates Field

Area of Interest	AOI01								AOI02					
Sample ID	AOI01-01-SB-22-24		AOI01-02-SB-30-32		AOI01-03-SB-30-32		MOB-01-SB-28-30		AOI02-01-SB-33-35		AOI02-02-SB-33-35		AOI02-03-SB-33-35	
Sample Date	01/23/2022		01/24/2022		01/23/2022		01/22/2022		01/24/2022		01/24/2022		01/24/2022	
Depth	22-24 ft		30-32 ft		30-32 ft		28-30 ft		33-35 ft		33-35 ft		33-35 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)														
PFBS	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	ND	U	ND	U	ND	U	0.138	J	ND	U	ND	U	ND	U
PFNA	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	ND	U	ND	U	ND	U	0.951	J	ND	U	ND	U	0.068	J

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, AASF #3 Bates Field

	Area of Interest	AOI01										AOI02					
	Sample ID	AOI01-01-GW		AOI01-01-GW-D		AOI01-02-GW		AOI01-03-GW		MOB-01-GW		AOI02-01-GW		AOI02-02-GW		AOI02-03-GW	
	Sample Date	01/23/2022		01/23/2022		01/25/2022		01/24/2022		01/23/2022		01/25/2022		01/24/2022		01/25/2022	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																	
PFBS	601	ND	U	ND	U	ND	U	ND	U	1.08	J	ND	U	3.50	J	ND	U
PFHxS	39	ND	UJ	1.34	J	ND	U	ND	U	4.32	J	ND	U	16.0		ND	U
PFNA	6	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	6	ND	U	ND	U	ND	U	0.969	J	2.09	J	ND	U	6.96		ND	U
PFOS	4	6.71		7.66		2.08	J	5.31		12.6		1.97	J	2.20	J	1.11	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

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

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL
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.

Notes
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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CLIENT	ARNG
PROJECT	Site Inspection at Bates Field AASF #3, AL

REVISED 9/1/2022	GIS BY	MS	9/1/2022
SCALE 1:4,208	CHK BY	VG	9/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community	PM	CM	9/1/2022

Legend

Facility Boundary

0 175 350 700 Feet

N

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

PFOA Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-1

CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	8/12/2022	GIS BY	MS	8/12/2022
SCALE	1:4,208	CHK BY	VG	8/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/12/2022

Legend

Facility Boundary

0 175 350 700 Feet

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

N

PFOS Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-2

CLIENT	ARNG				
PROJECT	Site Inspection at Bates Field AASF #3, AL				
REVISED	8/12/2022	GIS BY	MS	8/12/2022	
SCALE	1:4,208	CHK BY	VG	8/12/2022	
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/12/2022	

Legend

Facility Boundary

0 175 350 700 Feet

N

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

PFBS Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-3

CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	8/12/2022	GIS BY	MS	8/12/2022
SCALE	1:4,208	CHK BY	VG	8/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/12/2022

Legend

Facility Boundary

0 175 350 700 Feet

N

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

PFHxS Detections in Soil

AECOM 12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-4

CLIENT	ARNG				
PROJECT	Site Inspection at Bates Field AASF #3, AL				
REVISED	8/12/2022	GIS BY	MS	8/12/2022	
SCALE	1:4,208	CHK BY	VG	8/12/2022	
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/12/2022	

Legend

Facility Boundary

0 175 350 700 Feet

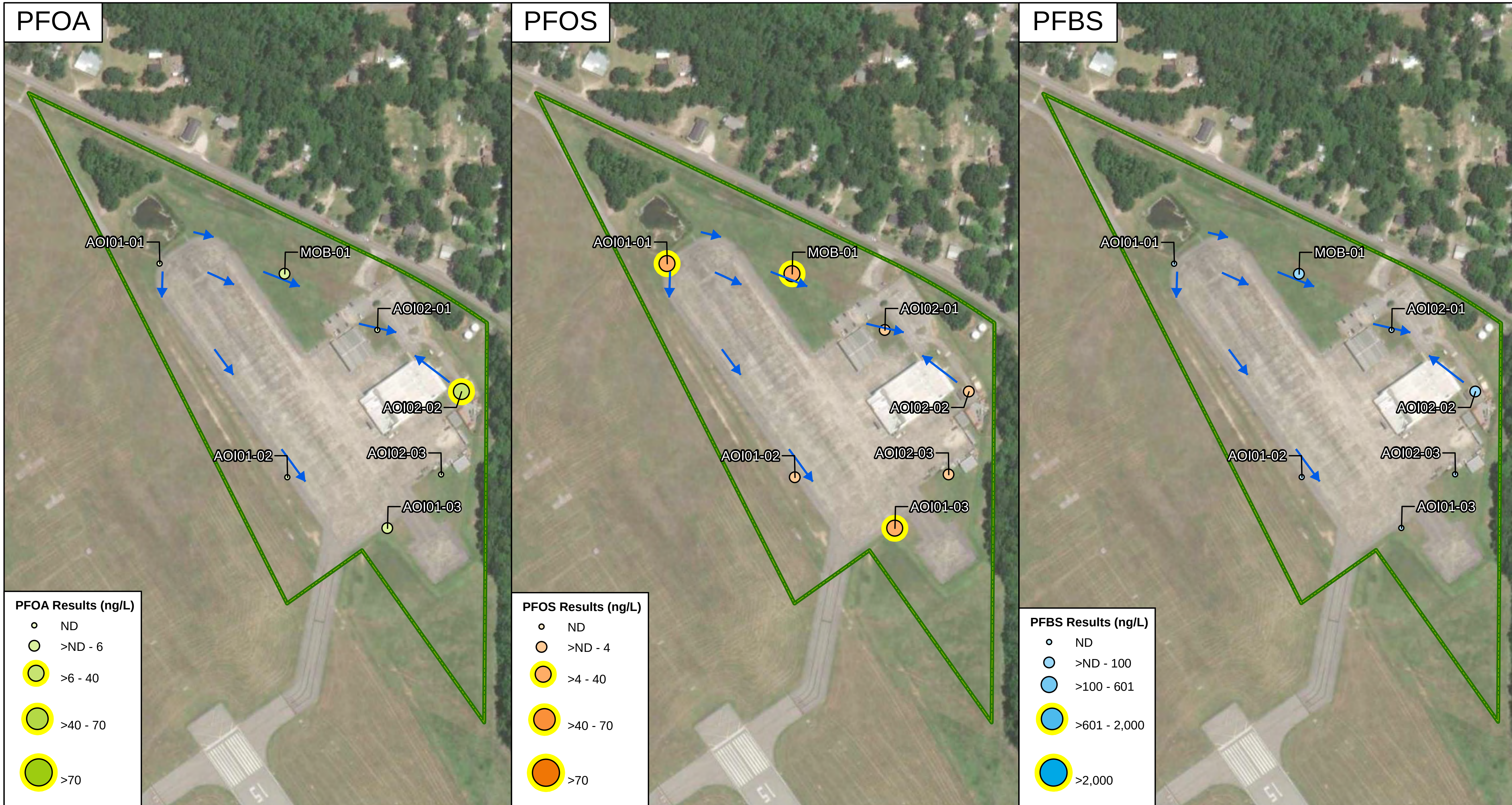
N

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

PFNA Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-5



CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:4,208	CHK BY	VG	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

Legend

Facility Boundary

Groundwater Flow Direction

0 175 350 700 Feet

N

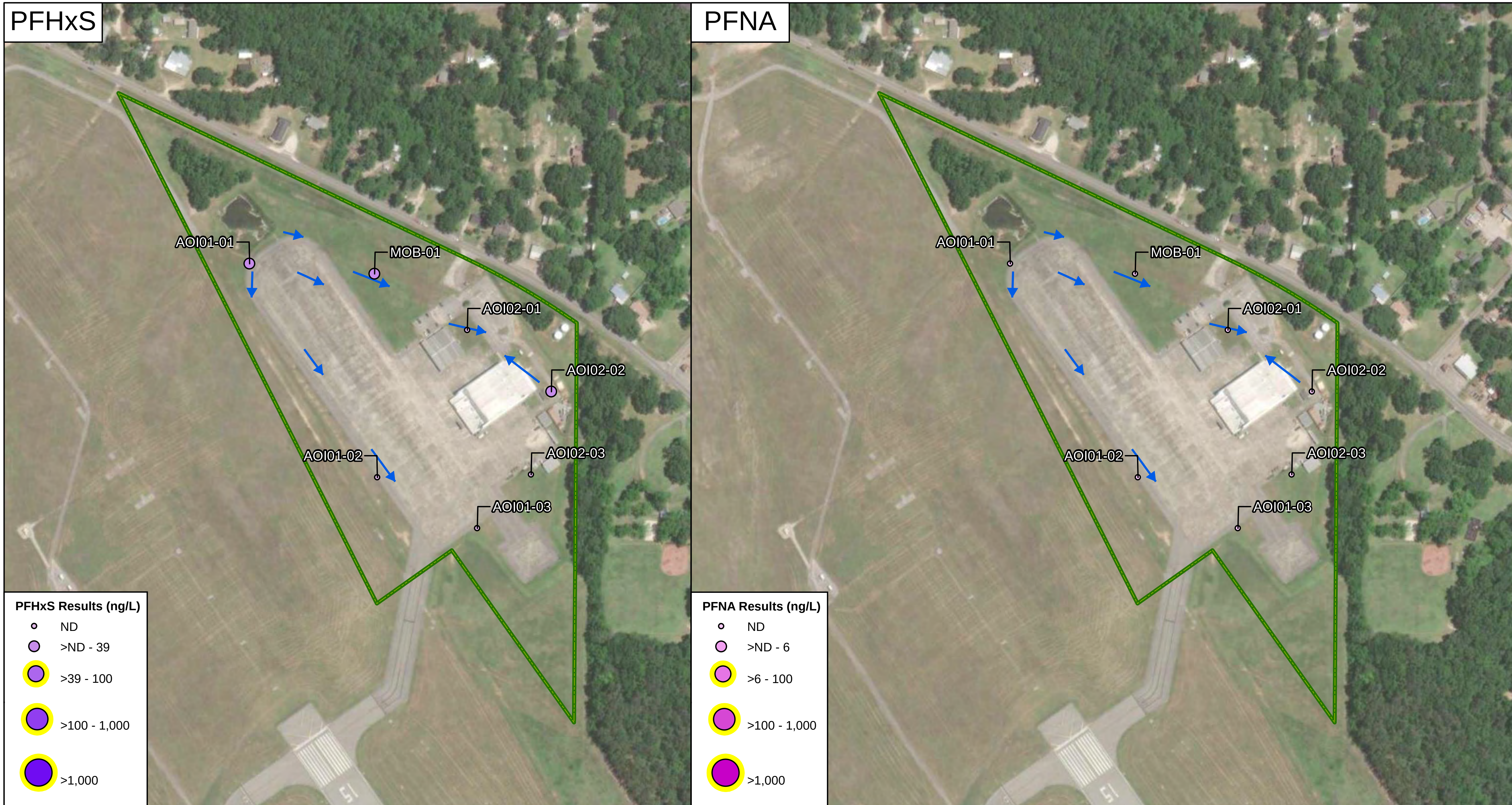
Exceedances of the OSD SL are depicted with a yellow halo.

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-6



CLIENT	ARNG			
PROJECT	Site Inspection at Bates Field AASF #3, AL			
REVISED	9/1/2022	GIS BY	MS	9/1/2022
SCALE	1:4,196	CHK BY	VG	9/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/1/2022

Legend

Facility Boundary

Groundwater Flow Direction

0 175 350 700 Feet

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

N

PFHxS and PFNA Detections in Groundwater

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-7

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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 7-2**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to Remedial Investigation (RI) or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

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

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers (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 in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 and AOI 2 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 contains one potential release area. According to ALARNG personnel with knowledge of the facility dating back to 2002, approximately 10 AFFF Tri-Max™ 30 mobile extinguisher units were staged along the Flight Ramp southwest of the hangar building. The Tri-Max™ 30 units were maintained by a contractor. Prior to removal of the Tri-Max™ 30 units around 2008, some of the units were discharged on the southeast portion of the Flight Ramp. Grassy areas are adjacent to the Flight Ramp.

PFOA, PFOS, PFHxS, and PFNA were detected in surface soil, at concentrations below their SLs. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the soil exposure pathways for those receptors are considered potentially complete. Additionally, off-facility residential and recreational users across Tanner Williams Road to the northeast may be potentially exposed to constituents in surface soil via inhalation of dust. The surface soil exposure pathway for trespassers is incomplete because the facility has secure access. In the shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were not detected. PFOS and PFHxS were detected at trace concentrations in the deep subsurface soil; however, the construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Therefore, the soil exposure pathway for incidental ingestion of subsurface soil by construction workers is considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 contains three potential release areas. Since 1999, the AASF #3 hangar has used an overhead fire suppression system. The current overhead fire suppression system is equipped with an 800-gallon AFFF tank filled with Chemguard 3% AFFF. Two poly 55-gallon drums containing Chemguard 3% are stored in the chemical storage building. Annual fire training using Purple K units was reportedly conducted at the Wash Rack. The Wash Rack and all hangar drains convey to the OWS, which then drains to the sanitary sewer, or to the overflow basin in upset conditions and on to the retention pond. Grassy areas are adjacent to AOI 2.

PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in surface soil, at concentrations below their SLs. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the soil exposure pathways for those receptors are considered potentially complete. Additionally, off-facility residential and recreational users across Tanner Williams Road to the northeast may be potentially exposed to constituents in surface soil via inhalation of dust. The surface soil exposure pathway for trespassers is incomplete because the facility has secure access. In the shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were not detected. PFOS was detected at trace concentrations in the deep subsurface soil; however, the construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Therefore, the soil exposure pathway for incidental ingestion of subsurface soil by construction workers is considered incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.2 Groundwater Exposure Pathway

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

7.2.1 AOI 1

PFOS was detected in groundwater, at concentrations above the SL. Drinking water at AASF #3 is provided by MAWSS, which sources all drinking water from Big Creek Lake, located approximately 3 miles northwest of the facility. Therefore, the ingestion exposure pathway for site workers and the groundwater exposure pathway for trespassers are incomplete due to secure facility access. Multiple domestic wells that could potentially be in use were identified within 1 mile of the facility. These wells are in the up- and side-gradient directions relative to inferred regional groundwater flow; however, the variability in groundwater flow observed at the facility may place some of these wells downgradient. Therefore, the ingestion pathway for off-facility residents is conservatively considered potentially complete. At AOI 1, groundwater was observed at depths ranging between 22.68 to 33.23 feet bgs. The construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Therefore, the incidental ingestion exposure pathway is considered incomplete for future construction workers. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA was detected in groundwater, at concentrations above the SL. Drinking water at AASF #3 is provided by MAWSS, which sources all drinking water from Big Creek Lake, located approximately 3 miles northwest of the facility. Therefore, the ingestion exposure pathway to site workers is considered incomplete. Multiple domestic wells that could potentially still be in use were identified within 1 mile of the facility. These wells are in the up- and side-gradient directions relative to inferred regional groundwater flow; however, the variability in groundwater flow observed at the facility may place some of these wells downgradient. Therefore, the ingestion pathway for off-facility residents is considered potentially complete. At AOI 2, groundwater was observed at depths ranging between 33.88 to 34.63 feet bgs. Therefore, the incidental groundwater exposure pathway is considered incomplete for future construction workers. The CSM for AOI 2 is presented on **Figure 7-2**.

7.3 Surface Water and Sediment Exposure Pathway

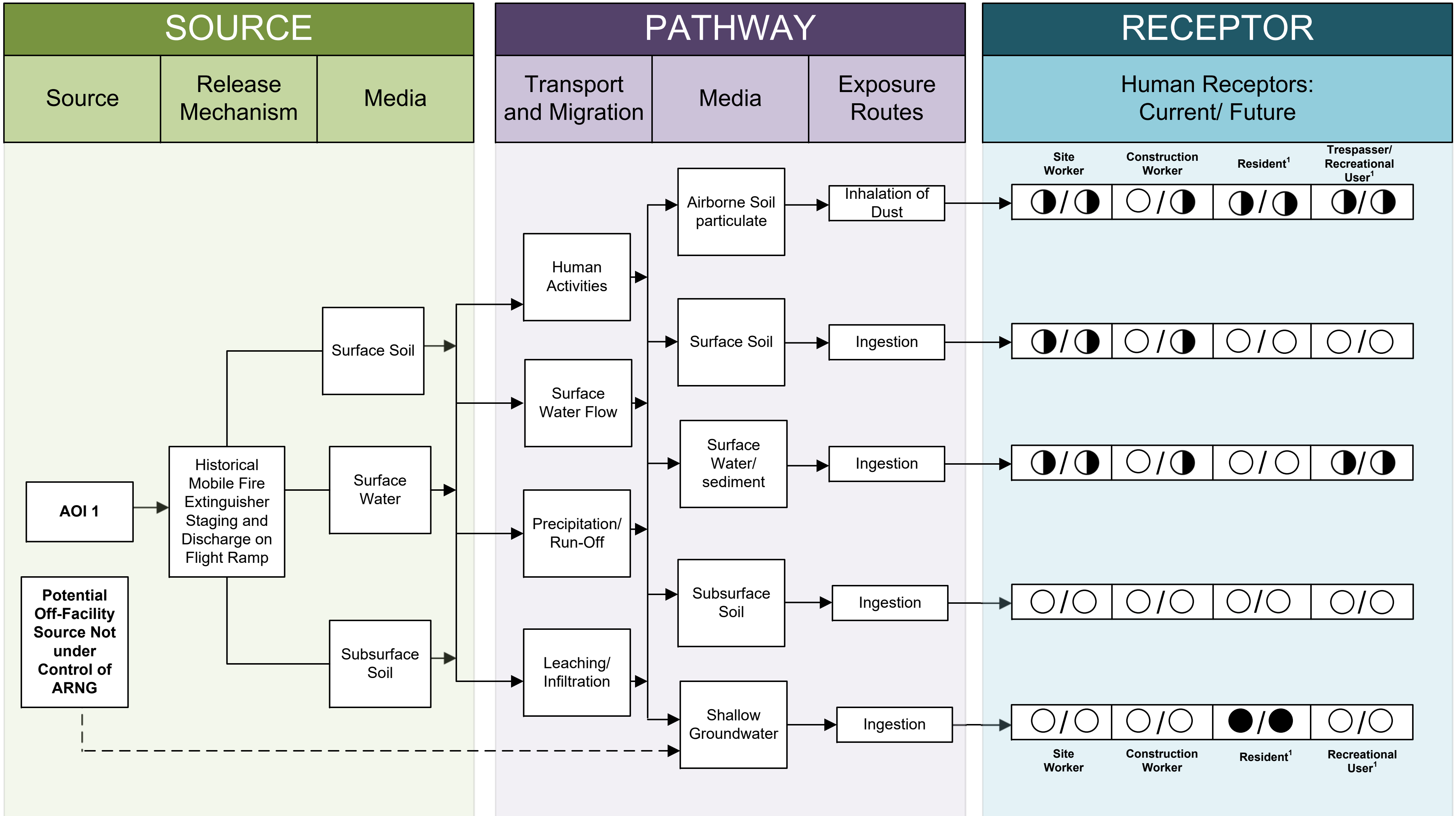
The SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors. PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Surface water drainage from the Flight Ramp appears to flow northwest via sheet flow or via shallow drainage on the west side of the ramp to the retention pond located at the northwest corner of the facility property. The retention pond has no outflow and empties through infiltration or evaporation. Surface water in the vicinity of AASF #3 that is not captured by the retention pond drains to the northwest, towards Pierce Creek, located 0.5 miles northwest of the facility. Pierce Creek flows southwest and drains into Big Creek downstream of Big Creek Lake, which is the main source of drinking water for almost 70% of Mobile County (MAWSS, 2019). Big Creek continues to flow southwest into Mississippi, where it empties into the Escatawpa River.

7.3.1 AOI 1

At AOI 1, PFOA, PFOS, PFHxS, and PFNA were detected in soil. Runoff from the Flight Ramp drains primarily to the on-facility retention pond. It is also possible that constituents released to the ground surface and not captured by the pond may have migrated off-facility to Pierce Creek. Therefore, site workers, future construction workers, and off-facility recreational users may be exposed to these constituents in surface water and sediment via the incidental ingestion exposure pathway. The surface water and sediment exposure pathway is incomplete for trespassers due to the secure facility access. PFOA, PFOS, PFBS, and PFHxS were detected in groundwater; however, groundwater to surface water discharge is not anticipated based on site conditions. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

At AOI 2, PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in soil. Drainage from the Hangar and Wash Rack during upset conditions flows to the retention pond. It is also possible that those constituents released to the ground surface and not captured by the pond may have migrated from off-facility to Pierce Creek. Therefore, site workers, future construction workers, and off-facility recreational users may be exposed to these constituents in surface water and sediment via the incidental ingestion exposure pathway. PFOA, PFOS, PFBS, and PFHxS were detected in groundwater; however, groundwater to surface water discharge is not anticipated based on facility conditions. The CSM for AOI 2 is presented on **Figure 7-2**.



LEGEND

Flow-Chart Stops

Flow-Chart Continues

Partial / Possible Flow

Incomplete Pathway

Potentially Complete Pathway

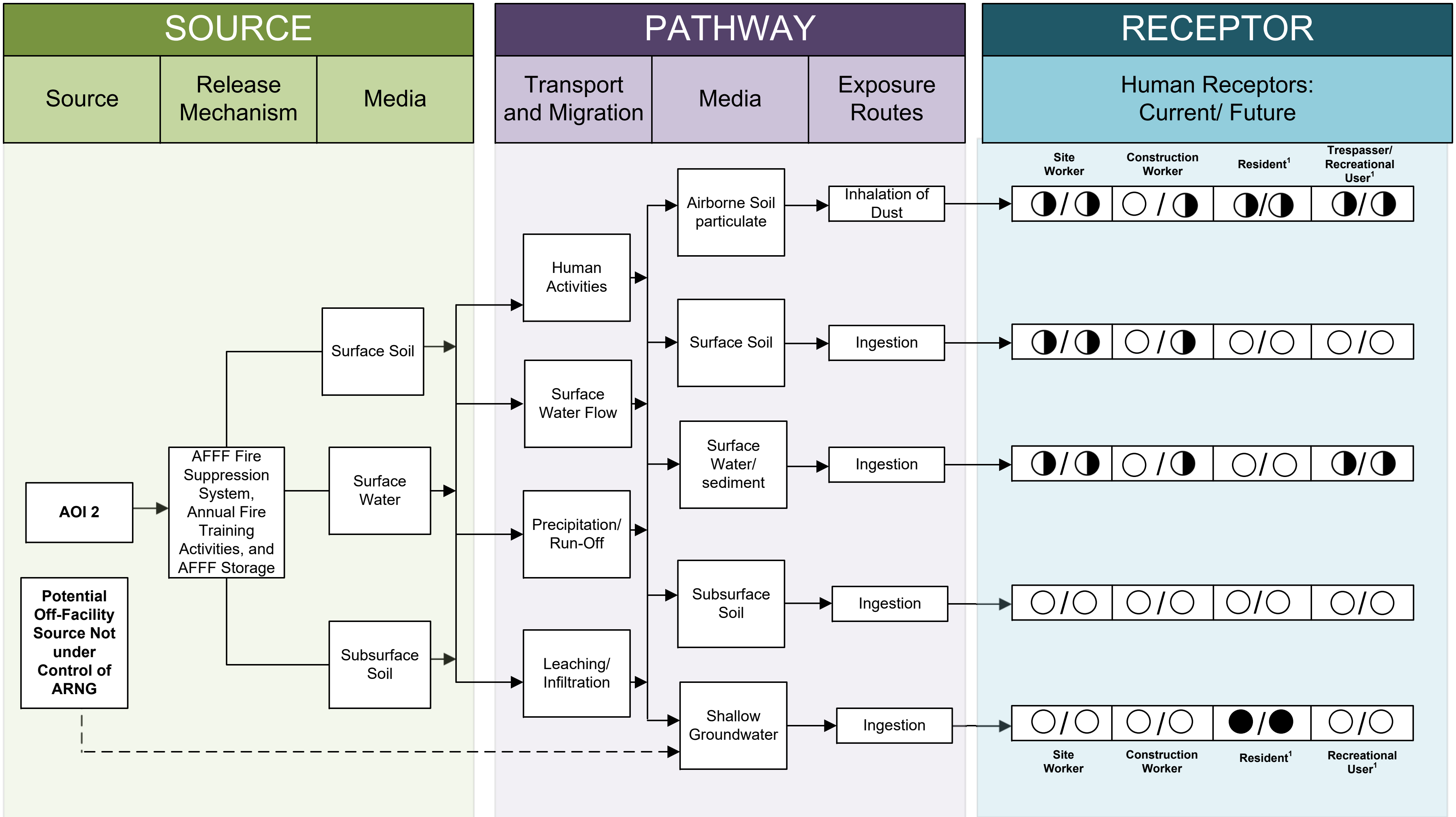
Potentially Complete Pathway with Exceedance of SL

NOTES

1. The resident and recreational users refer to off-site receptors.

2. No active construction was observed at the AOI during the SI field event.

Figure 7-1
Conceptual Site Model, AOI 1
AASF #3, Mobile, Alabama



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. No active construction was observed at the AOI during the SI field event.

Figure 7-2
Conceptual Site Model, AOI 2
AASF #3, Mobile, Alabama

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 18 to 25 January 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021).

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

- Twenty-four (24) soil samples from ten (10) locations;
- Seven (7) grab groundwater samples from seven (7) temporary wells; and
- Sixteen (16) QA/QC samples.

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

8.2 Outcome

Based on the results of this SI, further evaluation is warranted in an RI for AOI 1: Flight Ramp and AOI 2: Hangar Fire Suppression System, Wash Rack, and AFFF Storage Area. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to drinking water receptors from AOI 1 and AOI 2 from sources on the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
  - The detected concentrations of PFOA, PFOS, PFHxS, and PFNA in soil at AOI 1 were below their SLs. PFBS was not detected in soil at AOI 1.
  - PFOS in groundwater exceeded the SL of 4 ng/L at wells AOI01-01, AOI01-03, and MOB-01, at concentrations of 7.66 ng/L, 5.31 ng/L, and 12.6 ng/L, respectively. Based on the results of the SI, further evaluation of AOI 1 is warranted in an RI.
- At AOI 2:
  - The detected concentrations of PFOA, PFOS, PFBS, PFHxS, and PFNA in soil at AOI 1 were below their SLs.

- PFOA in groundwater exceeded the SL of 6 ng/L at AOI02-02, at a concentration of 6.96 ng/L. Based on the results of the SI, further evaluation of AOI 2 is warranted in an RI.

Groundwater elevations, calculated using depth to groundwater measurements and the surveyed ground surface elevation, were generally higher in the north-northwest investigation area and decreased towards the south-southeast, with the exception of elevated groundwater measured in the southern portion of the facility. As a result, the SI findings show an overall southeasterly groundwater flow direction on the facility. In the northern portion of the facility, groundwater may be artificially elevated by the retention pond, and in the southern portion of the facility, groundwater may be perched atop a clay layer. The natural groundwater flow direction in the vicinity of AASF #3 is not known, but it is inferred to be to the southwest.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Flight Ramp	◐	●	Proceed to RI
2	Hangar Fire Suppression System, Wash Rack, and AFFF Storage Area	◐	●	Proceed to RI

Legend:

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

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