FINAL
Site Inspection Report
Chesterfield Limited Army Aviation Support Facility
Chesterfield, Virginia

Site Inspections for Perfluorooctanoic Acid (PFOA), Perfluorooctanesulfonic Acid (PFOS), Perfluorohexanesulfonic Acid (PFHxS), Perfluorononanoic acid (PFNA), Hexafluoropropylene oxide dimer Acid (HFPO-DA) and Perfluorobutanesulfonic Acid (PFBS)

April 2023

Prepared for:

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

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

LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
%	Percent
µg/kg	Microgram(s) per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film forming foam
Amsl	Above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual site model
DoD	Department of Defense
DPT	Direct-push technology
DQO	Data Quality Objectives
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EB	Equipment blank
EDR™	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FB	Field blank
FD	Field duplicate
FedEx	Federal Express
ft	Foot (feet)
ft^2	Square foot (feet)
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide-dimer acid
IDW	Investigation-derived waste
in.	Inch(es)
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	Liquid Chromatography Tandem Mass Spectrometry
MS	Matrix spike
MSD	Matrix spike duplicate

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

ng/L	Nanogram(s) per liter
No.	Number
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RI	Remedial investigation
SI	Site Inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VAARNG	Virginia Army National Guard

EXECUTIVE SUMMARY

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based 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) (Assistant Secretary of Defense) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA)[1]. These compounds are collectively referred to as "relevant compounds" throughout the document and the applicable Screening Levels (SLs) are provided below in **Table ES-1**.

The PA identified Areas of Interest (AOIs) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. 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 a comparison of SI results to SLs for the relevant compounds. This SI was completed at the Chesterfield Limited Army Aviation Support Facility (AASF) in Chesterfield, Virginia, and determined further investigation is warranted for AOI 1 – Building 7431. The AASF will be referred to as the "Site or Facility" throughout this document.

The Facility, operated by the Virginia ARNG (VAARNG), consists of approximately 2.7 acres within the Chesterfield County Airport in Chesterfield, Virginia, approximately 16 miles southwest of Richmond. The facility consists of 19,500 square feet (ft^2) of hangar space, 2,218 ft^2 of office space, and associated aircraft parking areas. The Facility's current lease began in 2013. Chesterfield Limited AASF is located within the eastern Piedmont Physiographic Province of Virginia near the fall line, which separates the Piedmont and the Coastal Plain physiographic provinces.

The PA identified one AOI for investigation during the SI phase. SI sampling results from the AOI were compared to OSD SLs. **Table ES-2** summarizes the SI results for the AOI.
Based on the results of this SI, and following the CERCLA process, a remedial investigation (RI) is warranted for AOI 1: Building 7431.

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

Notes:
1. OSD. 2022. Risk Based Screening Levels Calculated for Groundwater and Soil using U.S. Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient=0.1. 6 July 2022
2. 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.

µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

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

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area	Groundwater Facility Boundary	Future Action
1	Building 7431	◐	●	●	Proceed to RI

Legend:
● = Detected; exceedance of screening levels
◐ = Detected; no exceedance of screening levels
○ = Not detected

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on 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 components listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide-dimer acid (HFPO-DA) [2] at ARNG facilities nationwide. The ARNG performed this SI at the Chesterfield Limited Army Aviation Support Facility (AASF) in Chesterfield, Virginia . The Chesterfield Limited AAFS will be referred to as the "Site" or "Facility" throughout this report.

The SI project elements were performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. 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 Army requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Chesterfield Limited AAFS (AECOM Technical Services, Inc. [AECOM] 2020) that identified one Area of Interest (AOI) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. The objective of the SI is to identify whether there has been a release to the environment from the AOI 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.

[2] 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. SITE BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The Chesterfield Limited AASF is located within the Chesterfield County Airport in Chesterfield, Virginia, near the interchange of Route 10 and Route 288 (**Figure 2-1**). The facility consists of 19,500 square feet (ft^2) of hangar space (Buildings 7431 and 7417), 2,218 ft^2 of second floor office space (Building 7501), and associated aircraft parking areas. Building 7431 is approximately 9,500 ft^2 with approximately 1,000 ft^2 used for office space. The remaining portion is used as a hangar. Building 7431 was constructed in 1979, and office space renovations were completed in 2010. The previous tenant was A.T. Massey Corporation. Virginia Army National Guard (VAARNG) acquired the property from the Chesterfield County Airport, via lease in May 2013 (AECOM 2020). A second building, Building 7417, was built in 2005 and acquired by VAARNG via lease from the Chesterfield County Airport in May 2013. The building footprint is approximately 10,000 ft^2. The interior is used as a large hangar space that has a clear-span frame and a concrete slab floor. The hangar houses several aircraft and stores maintenance chemicals and materials. A third building, Building 7501 to the north of Building 7431, is used by VAARNG for additional office space. The remainder of this building is used as a hangar by other entities. No information on the specific use or contents of Building 7501 was identified in the PA. As noted, the property is leased by the VAARNG from the Chesterfield County Airport, which is owned and operated by Chesterfield County, Virginia. Access to the Site is provided through Airfield Drive.

2.2 FACILITY ENVIRONMENTAL SETTING

The topography of the site generally resides at a surface elevation of approximately 205 feet (ft) above mean sea level (amsl) and slopes slightly to the southeast, according to maps derived from a U.S. Geological Survey 7.5′ Digital Elevation Model and confirmed during surveying conducted as part of the SI. Adjacent properties to the airport include an industrial park to the west, Virginia Route 10 to the south, undeveloped woodland to the east, and a residential area to the north. Chesterfield Limited AASF is located within the eastern Piedmont Physiographic Province of Virginia (AECOM 2020).

2.2.1 Geology

The Chesterfield Limited AASF is located in the eastern Piedmont Physiographic Province of Virginia. The Site is located near the fall line, which separates the Piedmont and the Coastal Plain physiographic provinces. The Facility is located in the approximate boundary between highlands erosion to the west, and deposition in the lowlands to the east. The uppermost geologic unit at Chesterfield Limited AASF is the Tertiary-age unconsolidated sand and gravel. These deposits are thin outliers from the Coastal Plain and they directly overlie the weathered Mississippian-age granite bedrock. These commonly oxidized yellow-orange to yellow-brown deposits represent a fluvial to marginal-marine depositional environment and may be genetically related to the facies of the Choptank Formation (AECOM 2020).

As indicated in the 2019 Environmental Data Resources, Inc. (EDR™) report, there are three major soil components found at the Chesterfield Limited AASF property: Coalfax Variant,

Bourne, and Aquults. These fine sandy loams are moderately to poorly drained and possess a high corrosion potential (AECOM 2020). Soils encountered during the SI activities were predominantly clays.

During the SI, the soil underlying Chesterfield Limited AASF was found to be generally composed of light brown to dark brown silty clay, which transitions to yellowish brown clay. Layers of silty sand and clayey sand were encountered just above highly weathered bedrock. The borings were completed at depths between 17.5 to 20 ft below ground surface (bgs). Samples for grain size analyses were collected at two locations, AOI01-SB-4 and AOI01-SB-5 and analyzed via ASTM International (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of silt (20 to 60 percent [%]), clay (16 to 34%), and sand (6 to 22%). Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

The shallow water-table aquifer (Yorktown aquifer) comprises fine-grained quartz sand interbedded with silt and clay laminae. The Yorktown aquifer is underlain by three confined artesian aquifers. The 2019 EDR™ report indicated that no drinking water supply wells are present within a 1-mile radius of the Facility. At the time of the PA, depth to groundwater was inferred to occur between 1 and 15 ft bgs. The shallow water-table aquifer is unconfined; therefore, groundwater flows under the influence of gravity, with flow patterns resembling a subdued reflection of local topography. As such, shallow groundwater flow across the entire installation was assumed to flow to the east/southeast towards Reedy Creek or southerly towards Swift Creek and that groundwater discharges to local streams in the area within the James River Basin (**Figure 2-3**) (AECOM 2020). During the SI, depth to water ranged from 3.6 to 9.5 ft bgs. Groundwater elevations calculated using depth to groundwater measurements and survey data collected during the SI indicate groundwater within the shallow underlying aquifer flows primarily to the northwest.

An EDR™ report conducted a well search for a 1-mile radius surrounding the facility. Using additional online resources, such as state and local geographic information system databases, wells were researched to a 4-mile radius of the Facility. Groundwater is not used for drinking water at the Chesterfield County Airport. Public water services are provided to airport facilities by Chesterfield County, which sources its water from Lake Chesdin, located approximately 12 miles south of the Facility. Multiple groundwater wells are located within a 4-mile radius of the Facility and are classified as domestic, public/municipal/government, and unknown. According to available data, there are three domestic and one public/municipal/government wells located south/southeast and downgradient of the facility.

2.2.3 Hydrology

There are no wetlands adjacent to the Chesterfield Limited AASF, although the surrounding airport property includes approximately 65 acres of wetlands. According to the Chesterfield County Airport Stormwater Pollution Prevention Plan, revised on 12 January 2015, stormwater runoff from the airport generally flows southeast towards Reedy Creek, although surface water in the northern property may also discharge to Licking Creek or through wetlands into Cosby Lake. Overland sheet flow is conveyed to one of seven outfall areas. Chesterfield Limited AASF is

located within the Outfall #2 drainage area, which consists of a 48-inch (in.) reinforced concrete pipe located at the southeastern end of the runway. Outfall #2 receives runoff from the runway, parking lots, apron, and hangar buildings, and directly discharges into Reedy Creek. All surface water from the property eventually discharges into the James River approximately 7 miles east of the airport boundary (AECOM 2020). Surface water flow patterns are presented in **Figure 2-4**.

2.2.4 Climate

The climate of Chesterfield, Virginia, is characterized as humid sub-tropical. The hot season lasts approximately 3.6 months between May and September and experiences normal maximum and minimum temperatures of 88 degrees Fahrenheit (°F) and 67°F, respectively. The cold season lasts approximately 3 months between December and March and experiences normal maximum and minimum temperatures of 50°F and 30°F, respectively (AECOM 2020).

Although precipitation is fairly well distributed throughout the year, Chesterfield experiences some seasonal variation in monthly rainfall. On average, the most precipitation occurs in the month of August, with an average total accumulation of 4.7 in., and the least precipitation occurs in the month of February, with an average total accumulation of 2.8 in. (AECOM 2020).

2.2.5 Current and Future Land Use

Prior to the 1970s, the current location of the Chesterfield County Airport was largely undeveloped. Construction of the airport began in 1972 and included the acquisition of 556 acres of land for runways, hangar facilities, terminal buildings, and parking areas. The current lease of the Chesterfield Limited AASF property began in 2013. Future land use is not expected to change (AECOM 2020).

2.2.6 Sensitive Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the Facility, and the Facility does not have any significant areas of habitat. The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Chesterfield County, Virginia (U.S. Fish and Wildlife Service 2021):

- Flowering Plants: Sensitive Joint-vetch, *Aeschynomene virginica,* Threatened; Swamp Pink, *Helonias bullata,* Threatened
- Mollusks: Atlantic Pigtoe, *Fusconaia masoni,* Proposed Threatened
- Mammal: Northern Long-eared Bat, *Myotis septentrionalis,* Threatened.

2.3 HISTORY OF PFAS USE

Aqueous film forming foam (AFFF), a firefighting agent, was commonly used by the United States military to extinguish petroleum fires, for firefighting training, and for the suppression of fires in uncontained areas. Military use of AFFF began in the 1970s and was most widely used at DoD installations with airfields.

One potential PFAS release area was identified at the facility during the PA (AECOM 2020). A mobile Tri-Max™ fire extinguisher was observed to be staged outside the southern corner of the hangar during the visual site inspection. The storage or use of AFFF at the facility by ARNG could not be confirmed by interviews and records obtained during the PA. A description of the AOI is presented in **Section 3**.

2.4 HISTORICAL PFAS INVESTIGATIONS

No previous PFAS investigations have been conducted at or within the vicinity of Chesterfield Limited AASF.

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Site Inspection Report
Chesterfield Limited AASF, Virginia

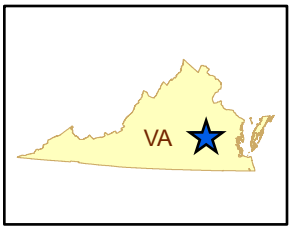

Figure 2-1
Facility Location

Facility Data

- Facility Boundary
- Chesterfield County Airport

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Site Inspection Report
Chesterfield Limited AASF, Virginia

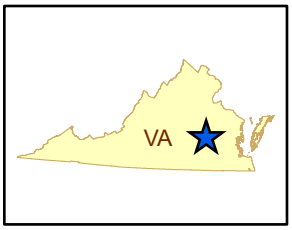
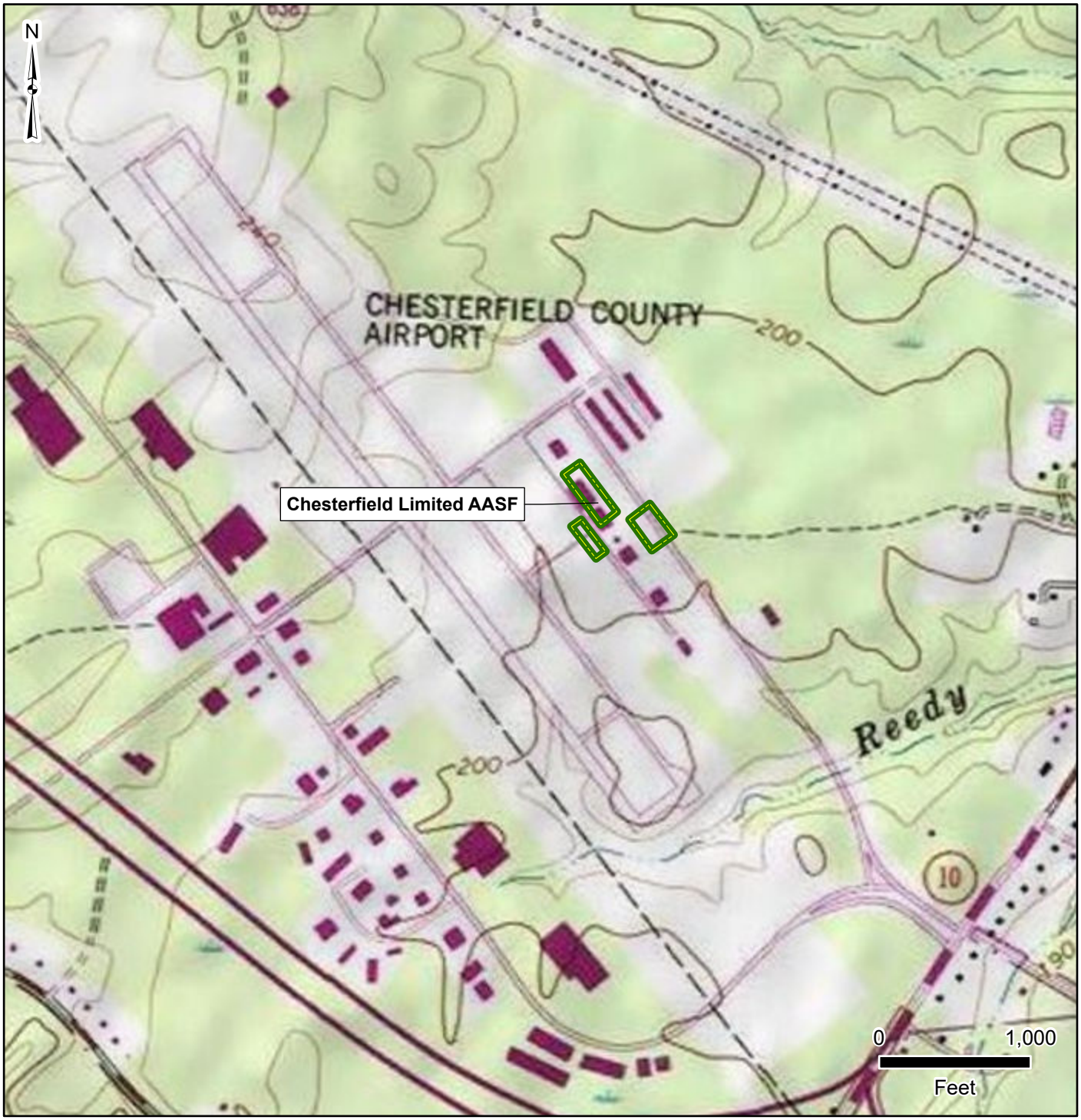


Figure 2-2
Topography



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Site Inspection Report
Chesterfield Limited AASF, Virginia

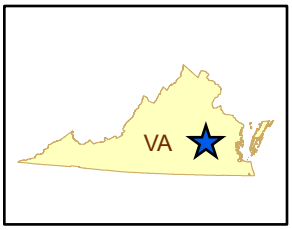
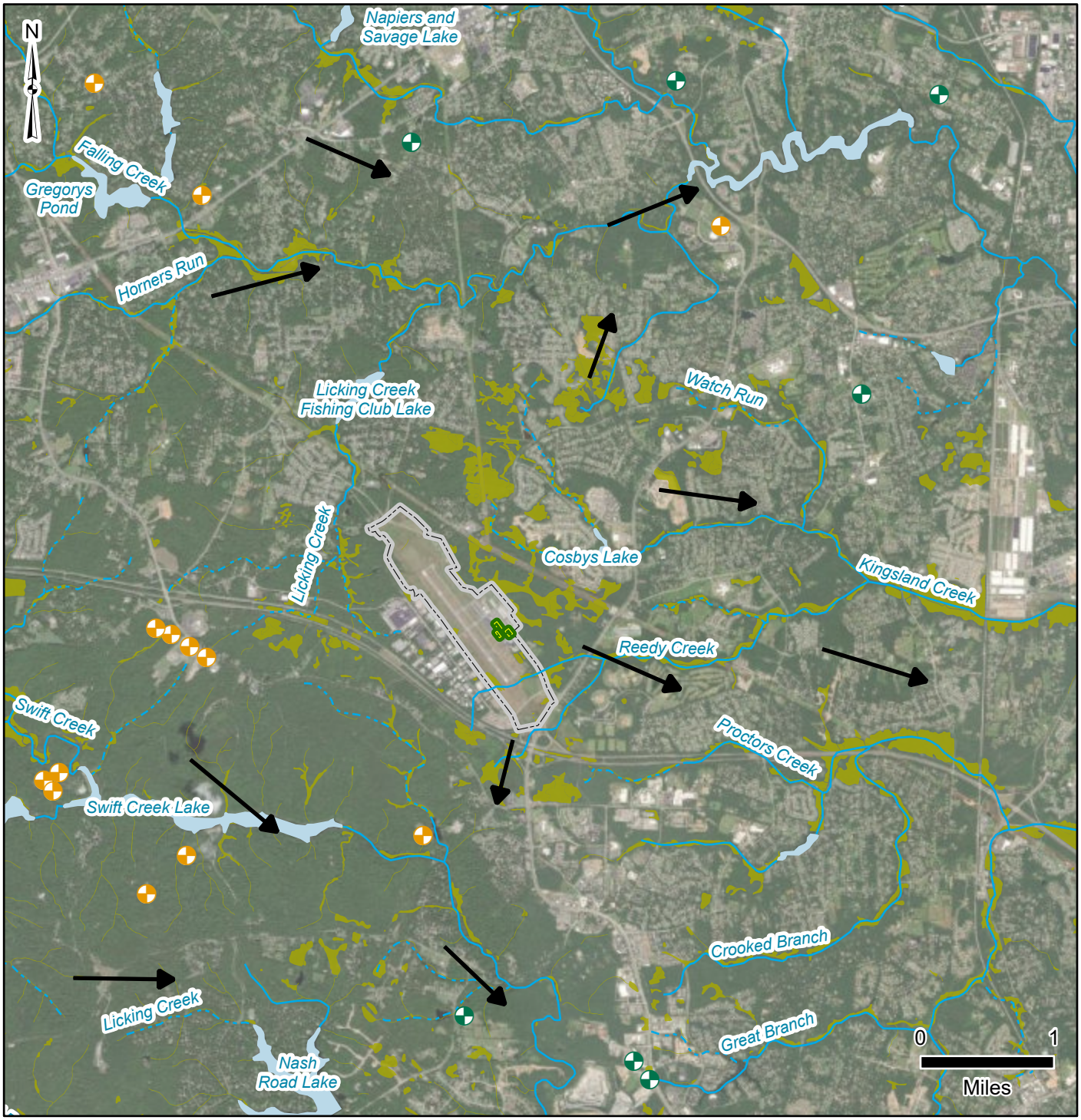


Figure 2-3
Groundwater Features



Facility Data
- Facility Boundary
- Chesterfield County Airport

Well Type
- Domestic
- Public/Municipal/ Government

Hydrology/Hydrogeology
- Inferred Regional Groundwater Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Waterbody
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

*Inferred regional groundwater flow direction is based on regional flow, as presented in the PA.

Date:..... April 2023
Prepared By:.....EA
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Site Inspection Report
Chesterfield Limited AASF, Virginia

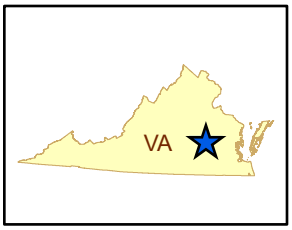
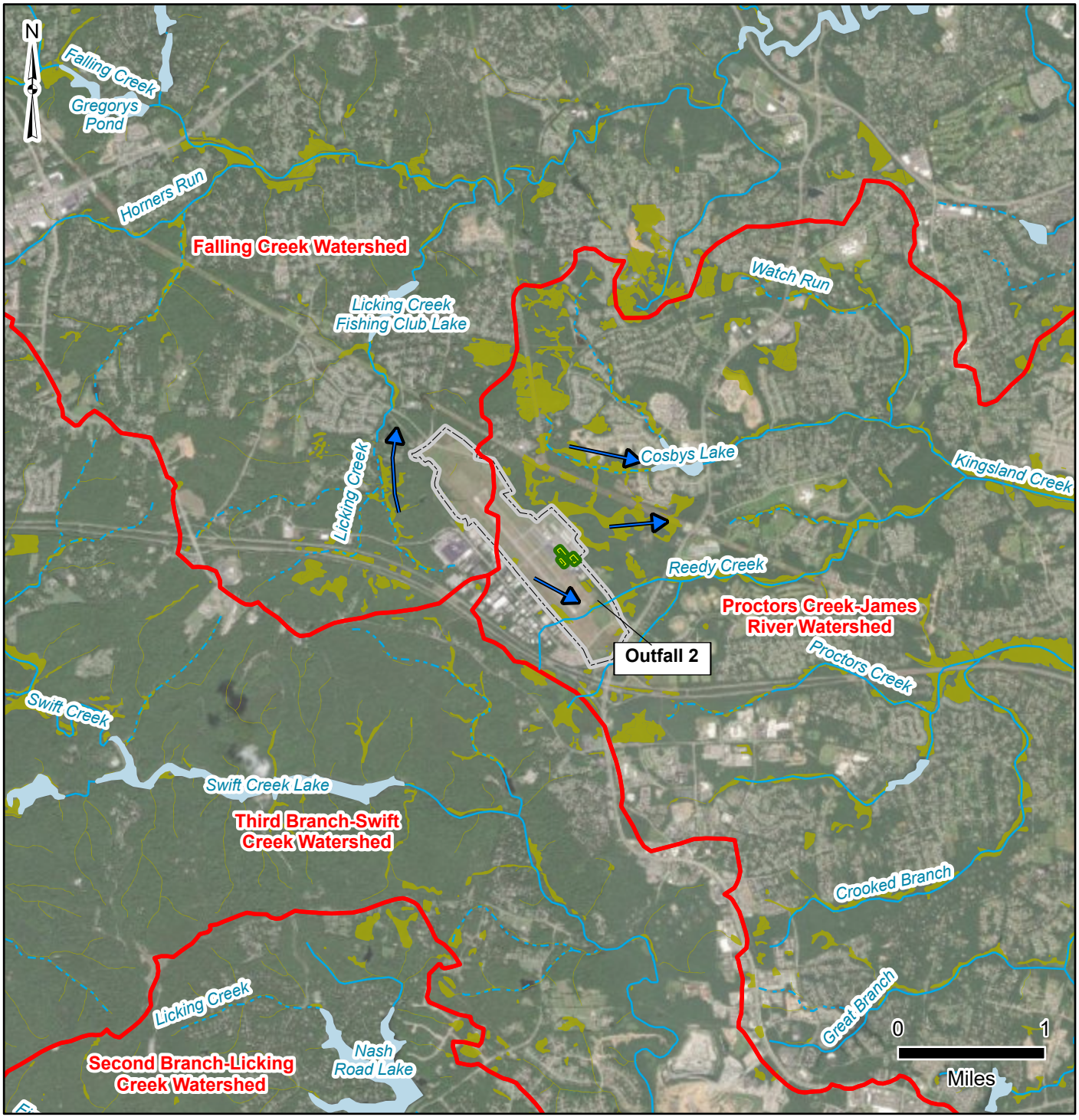


Figure 2-4
Surface Water Features



Facility Data
- Facility Boundary
- Chesterfield County Airport

Hydrology
- Surface Water Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Waterbody
- Wetlands
- Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020
NWI 2021

Date:..... April 2023
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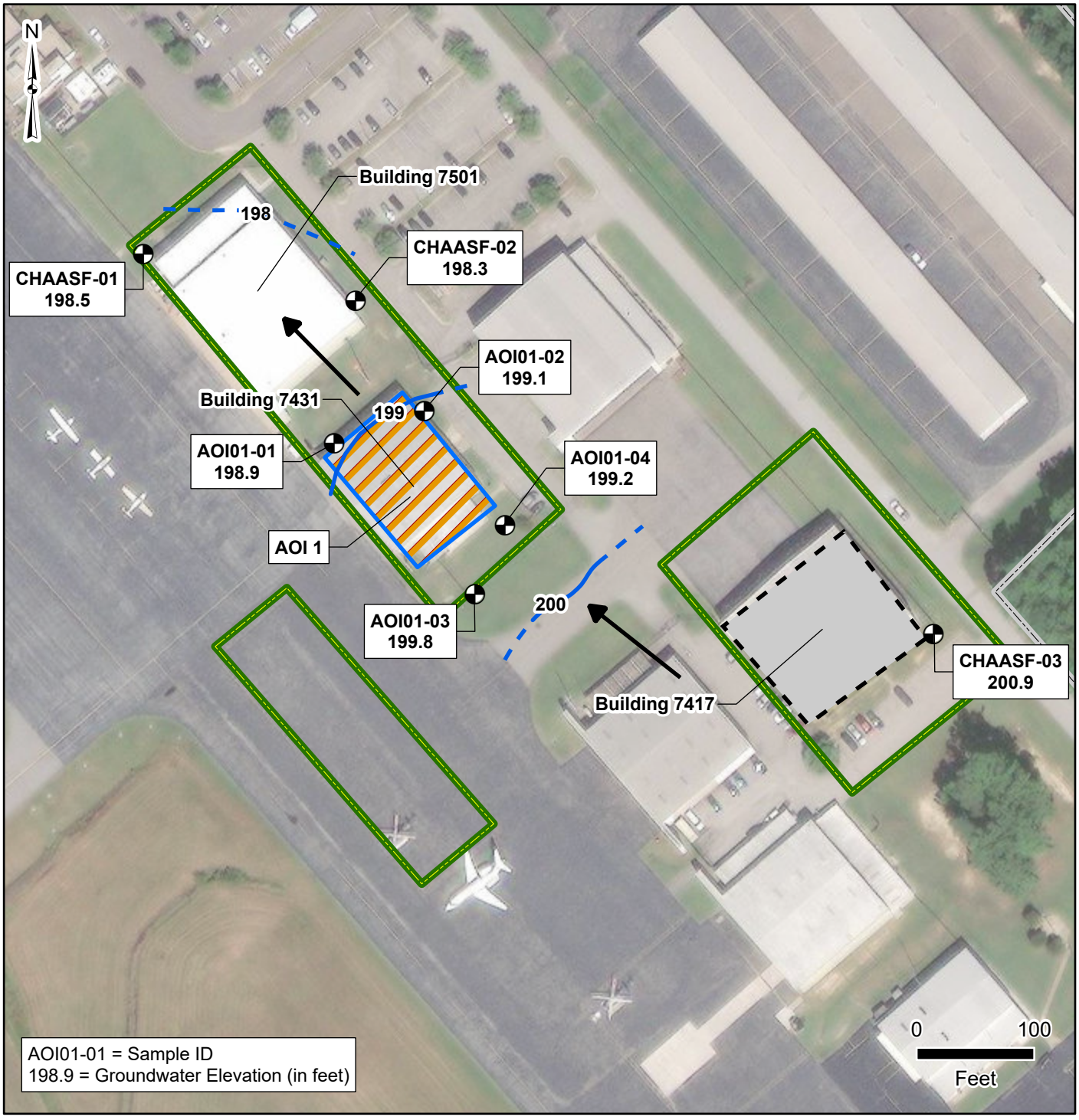
Chesterfield Limited AASF, Virginia

Figure 2-5
Groundwater Elevations, July 2021



Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrogeology

- Well Location
- Groundwater Flow Direction
- Groundwater Elevation Contour Interval (1 Foot)
- Dashed where Inferred

*Local groundwater flow direction was refined based on groundwater elevations identified during the SI.

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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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, one potential release area was identified at the Facility: AOI 1 - Building 7431. The potential AOI is shown on **Figure 3-1**.

3.1 AOI 1 – BUILDING 7431

AOI 1 consists of a one-story building located at 7431 Airfield Drive, North Chesterfield, Virginia 23237. The building is approximately 9,500 ft^2 with approximately 1,000 ft^2 used for office space. The remaining portion is used as a hangar. Building 7431 was constructed in 1979, and office space renovations were completed in 2010. The previous tenant was A.T. Massey Corporation. VAARNG acquired the property from the County of Chesterfield, Virginia, via lease in May 2013 (AECOM 2020).

During the PA visual SI, no evidence was found of an AFFF system or fire extinguishers containing AFFF having been stored in the hanger. According to an interview with the Chesterfield County Airport Operations Manager, AFFF has not been stored historically or currently at Building 7431. A mobile Tri-Max™ fire extinguisher was observed staged outside the southern corner of the hangar. At the time of the SI field event, the extinguisher was observed staged between Buildings 4731 and 7501. The contents of the Tri-Max™ fire extinguisher are unknown; however, the Operations Manager stated that the Tri-Max™ had never been used or tested to his knowledge, which spans back to 2001 and covers the entire period of interest (2013–present) (AECOM 2020). During the interview process, no VAARNG personnel were available to be interviewed to clarify the findings or provide additional insight as to why the Tri-Max™ fire extinguisher was present.

3.2 ADJACENT SOURCES

Two potential off-facility sources of PFAS are adjacent to the Facility and are not under the control of the VAARNG. A description of each off-facility source is presented below and shown on **Figure 3-1**.

3.2.1 Chesterfield County Fire Station #15

Chesterfield County Fire Station #15 is located at 7300 Airfield Drive, North Chesterfield, Virginia 23237, in the adjoining property southeast of Chesterfield Limited AASF. The fire station resides on approximately 0.75 acre and also includes a helipad and backyard field. The fire station provides emergency services to the Chesterfield Limited AASF (AECOM 2020).

An interview with the Battalion Chief for Chesterfield Fire & EMS revealed that minor amounts of AFFF were released through weekly spray pattern testing of equipment in the field adjacent to and behind the fire station from 1989 until 2017, when there were some equipment issues. While weekly spray pattern testing currently occurs in the same location with water, residual PFAS may have been released from the previous testing of equipment with AFFF. It is unknown what may have occurred before the Battalion Chief's tenure starting in 2002 (AECOM 2020).

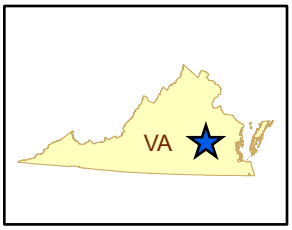
The AFFF products used by the station are National Foam Universal Plus 3x6 AR-AFFF, National Foam Universal Goal 1x3 AR-AFFF, and Ansul AFFF, varying in concentration from 1 to 6 % and stored in 5-gallon buckets and two totes of 275- and 330-gallon capacity. A foam response trainer is currently stationed at Fire Station #15. Two P-19 Aircraft Rescue Firefighting vehicles are also associated with the fire station. An old fire engine is reported to have leaked product at the Chesterfield Fire & EMS on AASF property (AECOM 2020). The Chesterfield County Fire Station #15 is considered a cross-gradient/upgradient off-facility source area based on the SI findings.

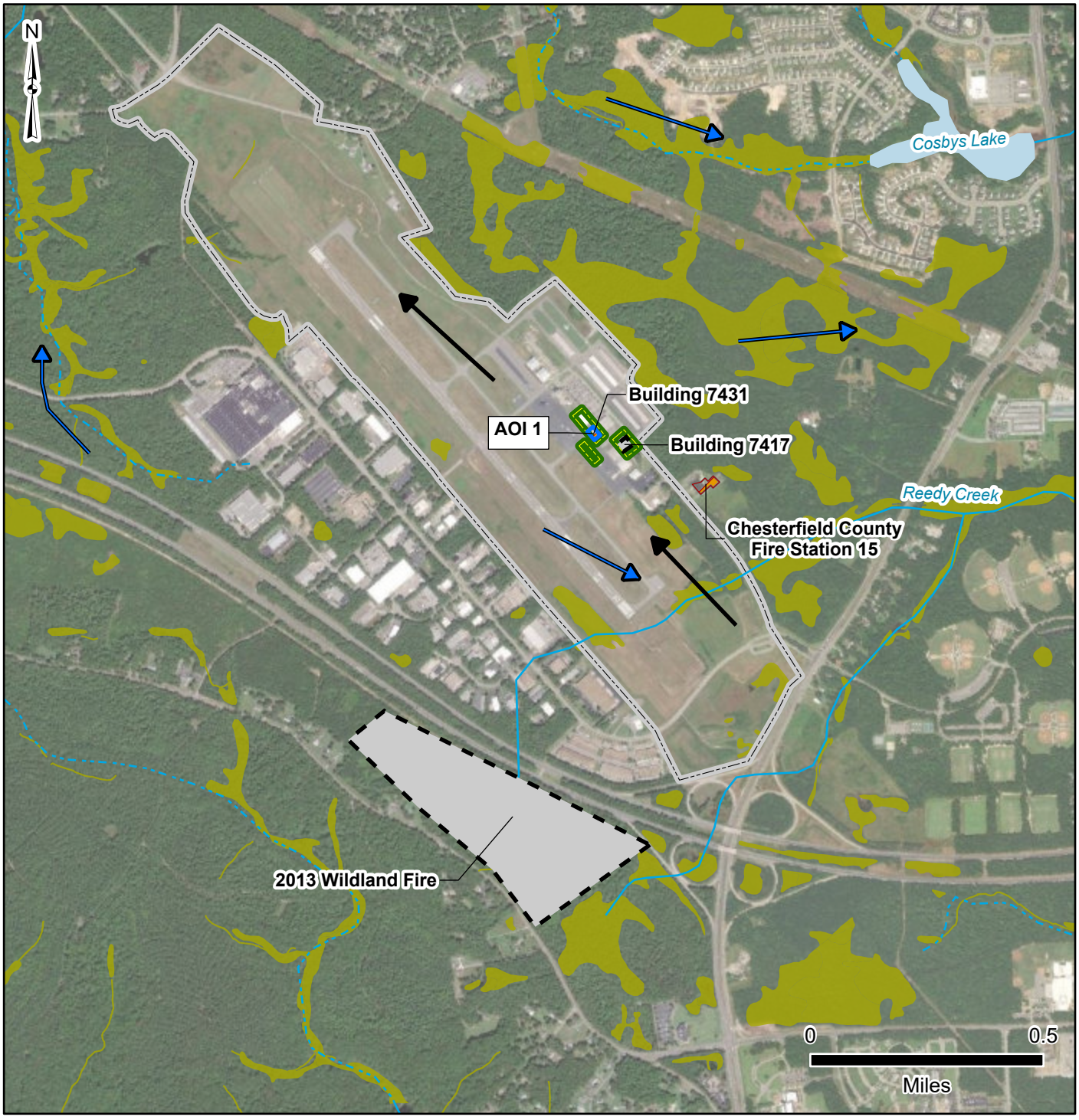
3.2.2 Wildland Fire

In 2013, a large brush fire occurred between Route 288 and Courthouse Road, adjacent to the southern boundary of the Chesterfield County Airport. The brush fire impacted approximately 75 acres. First responders reportedly used only water to extinguish the fire, and Chesterfield Fire & EMS staff confirmed that no AFFF was used in the emergency response (AECOM 2020).

Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

Figure 3-1
Areas of Interest





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Local Inferred Groundwater Flow Direction
- Perennial Creek/Stream Intermittent Creek/
- Stream Waterbody
- Wetlands

*Local groundwater flow direction was refined based on groundwater elevations identified during the SI.

Data Sources:
ESRI 2020
AECOM 2020
NWI 2021

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the data quality objective (DQO) process and outlined in the SI Uniform Federal Policy- (UFP) Quality Assurance Project Plan (QAPP) Addendum (EA Engineering, Science, and Technology, Inc., PBC [EA] 2021a), 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 relative compounds at each of the sampled AOIs.

4.1 PROBLEM STATEMENT

ARNG will recommend AOIs for remedial investigation (RI) if site-related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based screening levels. The SLs are presented in Section 6.1 of this report.

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for the Chesterfield Limited AASF
- Analytical data collected during other environmental sampling efforts at the Chesterfield Limited AASF
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the UFP-QAPP Addendum (EA 2021a)
- Field data collected including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figure 2-2**). Off-site sampling was not included in the scope of this SI. If future off-site sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins Lancaster Laboratories Env, LLC, accredited under the DoD Environmental Laboratory Accreditation Program (ELAP); (DoD ELAP; Accreditation No. 1.01) and the National Environmental Laboratory Accreditation Program; Certificate No.1.01). PFAS data underwent 100 % Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019 and DoD Data Validation Guidelines Module 3: Data

Validation Procedure of Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual (QSM) Table B-15 (2020). PFAS data were compared to applicable SLs and decision rules as defined in the UFP-QAPP Addendum (EA 2021a).

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 2019; USEPA 2017b).

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 UFP-QAPP (EA 2021a).

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 was implemented in accordance with the following approved documents:

- *Final Preliminary Assessment Report, Chesterfield Limited Army Aviation Support Facility (AASF), Virginia, Virginia Army National Guard dated July 2020* (AECOM 2020)

- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide*. dated December 2020 (EA 2020a)

- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Chesterfield Limited Army Aviation Support Facility, Chesterfield, Virginia, dated June 2021* (EA 2021a)

- *Final Programmatic Accident Prevention Plan, Revision 1 dated November 2020* (EA 2020b)

- *Final Accident Prevention Plan/Site Safety and Health Plan Addendum, Chesterfield Limited Army Aviation Support Facility, Virginia, dated February 2021* (EA 2021b).

The SI field activities were conducted from 6 to 8 July 2021 and consisted of direct-push technology (DPT) boring and soil sample collection, temporary monitoring well installation, and grab groundwater sample collection. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 24 PFAS via liquid chromatography tandem mass spectrometry (LC/MS/MS) compliant with QSM Version 5.3 Table B-15 to fulfill the project DQOs:

- Twenty one (21) soil samples from seven locations (soil borings locations)
- Seven (7) grab groundwater samples from seven temporary well locations.
- Three (3) field blanks (FBs)
- Five (5) equipment rinsate samples
- Four (4) field duplicate 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 medium. 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**. 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 of these activities are presented below.

5.1.1 Technical Project Planning

The U.S. Army Corps of Engineers (USACE) Technical Project Planning (TPP) Process, Engineer Manual (EM) 200-1-2 (Department of Army 2016a) 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. There was no Virginia Department of Environmental Quality regulatory involvement in the planning process; therefore, the initial meetings included ARNG, VAARNG, USACE, and representatives familiar with the facility.

A TPP Meeting (no. 3) was held on 11 April 2023 to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. The stakeholders for this TPP included VAARNG, USACE, and the Virginia Department of Environmental Quality representatives familiar with the Facility, the regulations, and the community.

5.1.2 Utility Clearance

EA's drilling subcontractor, GSI Mid-Atlantic, contacted Miss Utility of Virginia to notify them of intrusive work at the facility. Utility clearance was performed at each of the proposed boring locations on 2 July 2021 with input from the EA field team. General locating services were used to complete the clearance. Additionally, the first 5 ft of each boring were pre-cleared by GSI Mid-Atlantic using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

A sample from a deionized water source at the EA Ecotoxicological Laboratory was collected on 31 March 2021, prior to mobilization. Results of the sample confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. Specifically, the samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the wash rack spigot source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures (Appendix A) to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA 2021a*).* A Geoprobe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top 5 ft of the boring in compliance with utility clearance procedures.

Three discrete soil samples were collected for PFAS analysis from each soil boring: one sample at the surface (collected from 0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was collected approximately 1 ft above the groundwater table[3], and one was collected at the mid-point between the surface and the groundwater table (not to exceed 15 ft bgs). Groundwater was encountered at depths ranging from 13 to 15 ft bgs during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 17.5 to 20 ft bgs.

Soil sample locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. The soil boring locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during review of the UFP-QAPP Addendum (EA 2021a).

During the drilling, the soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System. A photoionization detector (PID) was used to screen the breathing zone during boring activities as a part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook. Depth interval, recovery thickness, PID concentrations, moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix E**.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard chain-of-custody procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic compound (TOC) (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the UFP-QAPP Addendum (EA 2021a).

Field duplicate (FD) samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, one equipment blank (EB) was collected per day 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°C during shipment.

[3] Location of groundwater interface was determined based on the depth of observed saturation in the core sample.

DPT borings were converted to temporary wells, which were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA 2021a). After removal of the casings, boreholes were abandoned using soil cuttings and bentonite chips. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces and no additional restoration services were required.

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 10-ft section of 1-in. Schedule 40 polyvinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe and screen were used at each location to avoid cross-contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. Samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well intervals. Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. The temporary wells were purged using low flow techniques 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 in a separate container. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain-of-custody procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA 2021a). 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.

Field Duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/matrix spike duplicates (MSDs) were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. Two field blanks (FBs) were collected in accordance with the UFP-QAPP Addendum (EA 2021a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor site-wide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements were collected from the newly installed temporary monitoring wells, taken from the survey mark on the northern side of the well casing. Groundwater elevation data are provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a Trimble R10 real-time kinematic differential global positioning system. All vertical elevations were found with a Leica DNA03 Level. Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected on 8 July 2021 and are provided in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the Chesterfield UFP-QAPP Addendum (EA 2021a).

As agreed upon with USACE, VAARNG, and ARNG during the 12 February 2021 teleconference, soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities were discharged back to the ground surface at the completion of sampling activities[4].

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 off-site at a licensed solid waste landfill.

5.7 LABORATORY ANALYTICAL METHODS

Samples were analyzed for a subset of 24 PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Env, LLC, a DoD ELAP-certified laboratory.

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

5.8 DEVIATIONS FROM UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on observed field conditions. These deviations were discussed between EA, ARNG, and USACE. Two deviations from the UFP-QAPP Addendum are noted below:

- Groundwater was encountered deeper than expected (14-16 ft bgs) and all borings were advanced to 20 ft bgs.

[4] As it is considered non-hazardous waste, Liquid IDW was not tested prior to discharge.

- Soil samples were collected from four intervals (1–2 ft, 7–8 ft, 12–13 ft, and 15–16 ft) at boring location AOI01-03 and only two intervals (1–2 ft and 8–9 ft) at upgradient boundary boring location CHAASF-03 due to a field error[5].

- Deep subsurface soil samples collected at depths ranging from 12 to 16 ft bgs were compared to the industrial/commercial worker scenario SLs to provide a conservative assessment of that potential exposure route, as described in **Section 6.1**.

[5] An extra sample was erroneously collected at location AOI01-03 and a third sample was not collected from CHAASF-03.

Table 5-1. Samples by Medium
Chesterfield Limited AASF, Chesterfield, Virginia
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI01-01-SB-01	7/7/21	1	X			
AOI01-01-SB-6	7/7/21	6	X	X	X	
AOI01-01-SB-12	7/7/21	12	X			
AOI01-02-SB-1	7/7/21	1	X			
AOI01-02-SB-8	7/7/21	8	X			
AOI01-02-SB-16	7/7/21	16	X			
AOI01-03-SB-1	7/7/21	1	X			
AOI01-03-SB-7	7/7/21	7	X			
AOI01-03-SB-12	7/7/21	12	X			
AOI01-03-SB-15	7/7/21	15	X			
AOI01-04-SB-1	7/7/21	1	X			
AOI01-04-SB-7	7/7/21	7	X			
AOI01-04-SB-14	7/7/21	14	X			
CHAASF-01-SB-1	7/7/21	1	X			
CHAASF-01-SB-6	7/7/21	6	X			
CHAASF-01-SB-12	7/7/21	12	X			
CHAASF-02-SB-1	7/7/21	1	X			
CHAASF-02-SB-6	7/7/21	6	X			
CHAASF-02-SB-12	7/7/21	12	X			
CHAASF-03-SB-1	7/7/21	1	X			
CHAASF-03-SB-9	7/7/21	9	X			
CHAASF-FD1-Soil	7/7/21	14	X			FD
CHAASF-FD2-Soil	7/7/21	16	X			FD
CHAASF-FD3-Soil	7/7/21	12	X			FD
Groundwater Samples						
AOI01-01-GW	7/7/21	-	X			
AOI01-02-GW	7/8/21	-	X			
AOI01-03-GW	7/8/21	-	X			
AOI01-04-GW	7/7/21	-	X			
CHAASF-FD1-GW	7/7/21	-	X			FD
CHAASF-01-GW	7/8/21	-	X			
CHAASF-02-GW	7/8/21	-	X			
CHAASF-03-GW	7/7/21	-	X			
Blank Samples						
CHAASF-EB-01	7/7/21	-	X			EB
CHAASF-FB-01	7/7/21	-	X			FB
CHAASF-FB-02	7/8/21	-	X			FB

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Chesterfield Limited AASF, Chesterfield, Virginia
Site Inspection Report

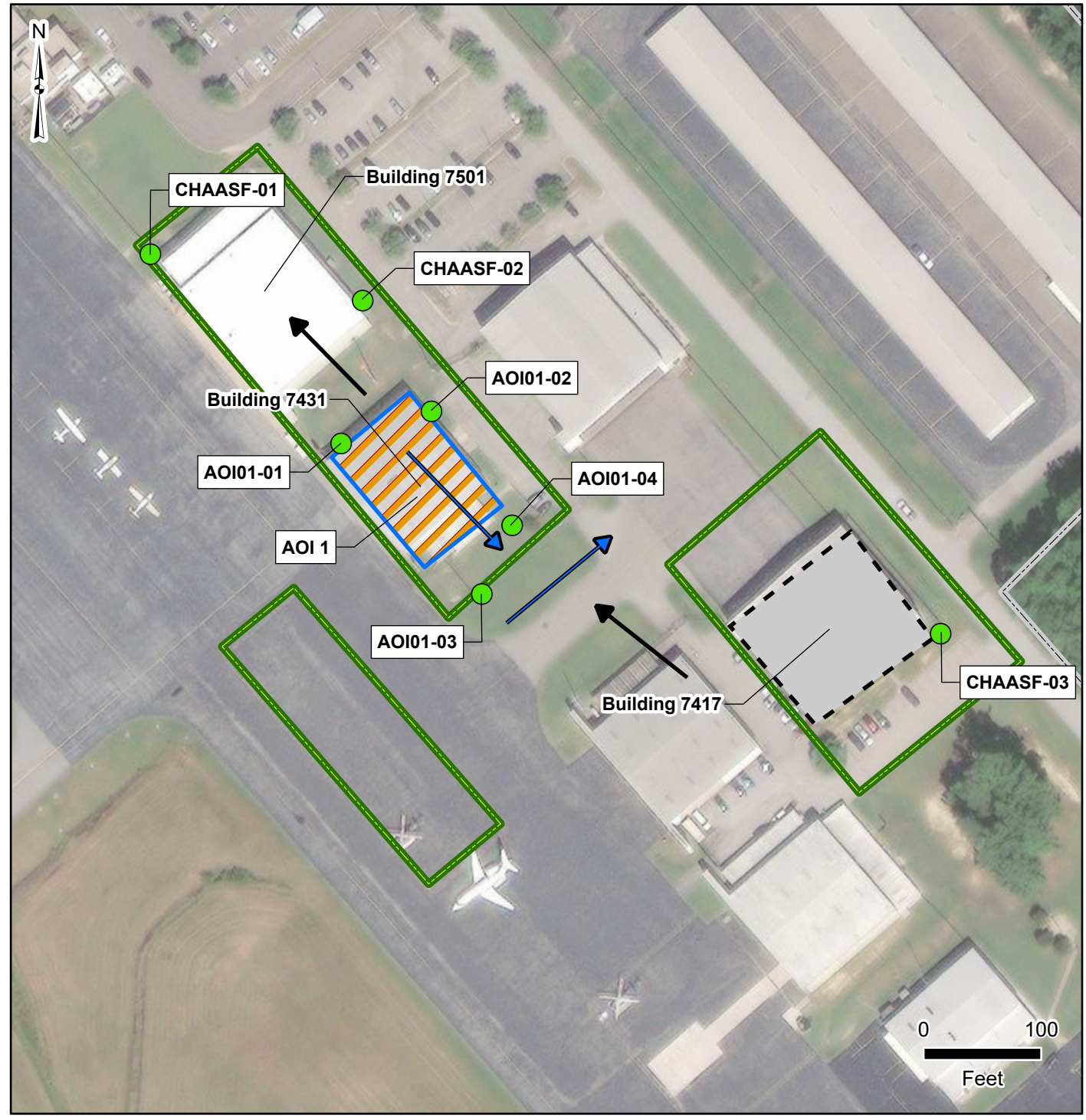
Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AOI01-01	18	13-18
	AOI01-02	19	14-19
	AOI01-03	19	14-19
	AOI01-04	20	15-20
Chesterfield Limited AASF Boundary	CHAASF-01	17.5	12.5-17.5
	CHAASF-02	18	13-18
	CHAASF-03	20	15-20

Table 5-3. Groundwater Elevation
Chesterfield Limited AASF, Chesterfield, Virginia
Site Inspection Report

Monitoring Well Identification	Top of Casing Elevation (ft amsl)	Depth to Water (ft below top of casing)	Groundwater Elevation (ft amsl)
AOI01-01	206.35	7.5	198.9
AOI01-02	205.15	6.1	199.1
AOI01-03	203.44	3.6	199.8
AOI01-04	204.71	5.5	199.2
CHAASF-01	207.98	9.5	198.5
CHAASF-02	207.55	9.2	198.3
CHAASF-03	205.62	4.7	200.9

Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

Figure 5-1
Site Inspection Sample Locations



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Sample Locations
- DPT

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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6. SITE INSPECTION RESULTS

This section presents the analytical results of the SI for the AOI. The analytical results are reported and evaluated in the subsequent sections. The SLs used in this evaluation are presented in **Section 6.1 and Table 6-1**. A discussion of the results for the AOI is provided in **Section 6.3**. **Tables 6-2 through 6-5** present PFAS results for samples with detections in soil and groundwater; only constituents detected in one or more samples are included. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 SCREENING LEVELS

The 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	Residential (Soil) (µg/kg)[1]	Industrial / Commercial Composite Worker (Soil) (µg/kg)[1]	Tap Water (Groundwater) (ng/L)[1]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based SLs in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient=0.1. 6 July 2022.
2. 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.

µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the facility: the residential scenario is applied to surface soil results (0 to 2 ft bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 ft bgs). However, as discussed in the SI QAPP Addendum deviation in **Section 5.8**, the industrial/commercial worker scenario was also applied to deep subsurface soil samples collected from the soil borings (12 to 16 ft bgs) in AOI 1, providing a conservative assessment of that potential exposure route for the industrial/commercial workers.

6.2 SOIL PHYSIOCHEMICAL ANALYSES

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

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

Soil pH was measured as 4.9 in a sample collected from AOI 1. TOC was 200 milligrams per kilograms in the sample collected from AOI 1.

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1 - Building 7431. The detected compounds are summarized in **Tables 6-2 through 6-5**. Soil and groundwater results are presented on **Figures 6-1 through 6-7**

6.3.1 AOI 1 – Soil Analytical Results

Tables 6-2 through 6-4 summarize the detected compounds in soil. **Figures 6-1 through 6-5** present the ranges of detections in soil.

Soil was sampled in 4 boring locations associated with one potential release area at AOI 1. Soil was sampled from three intervals at all locations.

PFOA was detected in the surface interval (1–2 ft bgs) of boring location AOI01-01 at a concentration of 0.39 J+ µg/kg, which is below the associated SL of 130.0 µg/kg. PFOS, PFHxS, PFNA, and PFBS were not detected in the surface interval at any boring locations associated with AOI 1. Additionally, there were no detections of PFOA, PFOS, PFHxS, PFNA, and PFBS in any of the subsurface soil intervals associated with AOI 1.

6.3.2 AOI 1 – Groundwater Analytical Results

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

Groundwater samples were collected from four temporary wells surrounding AOI 1 during the SI. PFOS, PFOA, PFHxS, and PFBS were detected in groundwater samples collected from AOI 1. PFOA was detected in all four temporary wells with values ranging from 1.8 J ng/L (AOI01-04) to 7 J ng/L (AOI01-02). One detection of PFOA (7 ng/L) in a sample collected from AOI01-02 exceeded the associated SL of 6 ng/L. Detections of PFOS in all four wells exceeded the associated SL of 4 ng/L. PFOS was detected with values ranging from 4.7 J ng/L (AOI01-04) to 35 J ng/L (AOI01-02). PFBS was detected in all four temporary wells below the SL with values ranging from 2.5 J ng/L (AOI01-01 and AOI01-02) to 7.0 J ng/L (AOI01-03). PFHxS was detected in all four temporary wells below the SL with values ranging from 16 J ng/L (AOI01-04) to 30.0 J ng/L (AOI01-03). PFNA was not detected in samples collected from any of the wells.

6.3.3 AOI 1 – Conclusions

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

6.4 FACILITY BOUNDARY LOCATIONS

This section presents the analytical results for soil and groundwater in comparison to SLs for samples collected at the upgradient and downgradient facility boundary. The detected compounds are summarized in **Tables 6-2 through 6-5**. Soil and groundwater results are presented in **Figures 6-1 through 6-7.**

6.4.1 Facility Boundary Locations – Soil Analytical Results

Tables 6-2 through **6-4** summarize the detected compounds in soil. **Figures 6-1** through **6-5** present the ranges of detections in soil.

Soil was sampled in three boring locations associated with the facility boundary during the SI. Soil was sampled from three intervals at all locations, with the exception of CHAASF-03, where only two samples were collected as noted in **Section 5.8**.

PFOA was detected in the surface interval (1–2 ft bgs) of boring locations CHAASF-01 and CHAASF-03 with a maximum concentration of 0.64 J µg/kg at boring location CHAASF-01. PFOS was detected in the surface interval of boring locations CHAASF-01, CHAASF-02, and CHAASF-03 with a maximum concentration of 1.6 J µg/kg at boring location CHAASF-03. PFOA and PFOS detections were well below associated SLs of 19 µg/kg and 13 µg/kg, respectively. PFBS and PFHxS were detected in the surface interval of boring location CHAASF-01 at concentrations of 2.8 µg/kg and 0.94 µg/kg, which are well below associated SLs

of 1900 µg/kg and 130 µg/kg, respectively. There were no detections of PFOS, PFOS, PFHxS, PFNA, or PFBS in any of the subsurface soil intervals associated with the boring locations along the facility boundary.

6.4.2 Facility Boundary Locations – Groundwater Analytical Results

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

Groundwater samples were collected from three temporary wells associated with the facility boundary during the SI. PFOA was detected in groundwater at temporary well location CHAASF-01 at a concentration of 58. J ng/L, which exceeds the SL of 6 ng/L. PFOA was also detected in CHAASF-02 (5.3 J ng/L) and CHAASF-03 (2.6 J ng/L) at values below the OSD SL of 6 ng/L. PFOS was detected in all three temporary well locations. Two of the detections, 4.6 J ng/L (CHAASF-03) and 18 J ng/L (CHAASF-02), exceeded the associated SL of 4 ng/L. PFHxS was detected in all three temporary boundary wells. One of the detections, 71 J ng/L (CHAASF-01), exceeded the associated SL of 39 ng/L. PFBS was detected in all three locations with values ranging from 0.69 J ng/L (CHAASF-03) to 290.0 J ng/L (CHAASF-01). PFBS detections were below the associated OSD SL of 601 ng/L. PFNA was not detected in any groundwater samples.

6.4.3 Facility Boundary Locations – Conclusions

PFOA, PFOS, and PFHxS were detected in groundwater at concentrations above their respective SLs. Based on the exceedances of the SLs in groundwater, further evaluation of the facility boundary is warranted.

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

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		CHAASF-01		CHAASF-02		CHAASF-03	
	Sample Name	AOI01-01-SB-01		AOI01-02-SB-1		AOI01-03-SB-1		AOI01-04-SB-1		CHAASF-01-SB-1		CHAASF-02-SB-1		CHAASF-03-SB-1	
	Parent Sample ID														
	Depth (ft bgs)	0-1		0-1		0-1		0-1		0-1		0-1		0-1	
	Sample Date	7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS(E537M) (µg/kg)															
Perfluorobutanesulfonic acid (PFBS)	1,900	ND	UJ	ND	UJ	ND	UJ	ND	UJ	2.8	J	ND	UJ	ND	UJ
Perfluorohexanesulfonic acid	130	ND	UJ	ND	UJ	ND	UJ	ND	UJ	0.94	J	ND	UJ	ND	UJ
Perfluorononanoic acid	19	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorooctanesulfonic acid (PFOS)	13	ND	UJ	ND	UJ	ND	UJ	ND	UJ	0.41	J	0.25	J	1.6	J
Perfluorooctanoic acid (PFOA)	19	0.39	J+	ND	UJ	ND	UJ	ND	UJ	0.64	J	ND	UJ	0.48	J+

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.

UJ = Analyte was not detected and was reported less than LOD. Associated numerical value is approximate.

µg/kg = Microgram(s) per kilogram
1. The Screening Levels for soil are based on incidental ingestion of soil in a residential scenario.
2. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.
Screening values for HFPO-DA were established after SI planning and execution and thus not included as an analyte. Future CERCLA phases will include HFPO-DA if warranted
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD.

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

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-03		AOI01-04		CHAASF-01		CHAASF-02		CHAASF-03	
	Sample Name	AOI01-01-SB-06		AOI01-02-SB-8		AOI01-03-SB-12		AOI01-03-SB-7		AOI01-04-SB-7		CHAASF-01-SB-6		CHAASF-02-SB-6		CHAASF-03-SB-8	
	Parent Sample ID																
	Depth (ft bgs)	5-6		7-8		11-12		6-7		7-8		5-6		5-6		7-8	
	Sample Date	7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS (E537M) (µg/kg)																	
Perfluorobutanesulfonic acid (PFBS)	25000	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorohexanesulfonic acid	1600	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorononanoic acid	250	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorooctanesulfonic acid (PFOS)	160	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorooctanoic acid (PFOA)	250	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ

Notes:
UJ = Analyte was not detected and was reported less than LOD. Associated numerical value is approximate.
µg/kg = Microgram(s) per kilogram.
1. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
2. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.
Screening values for HFPO-DA were established after SI planning and execution and thus not included as an analyte. Future CERCLA phases will include HFPO-DA if warranted
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD.

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

Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-03		AOI01-04		AOI01-04		CHAASF-01		CHAASF-01		CHAASF-02	
Sample Name	AOI01-01-SB-12		AOI01-02-SB-16		CHAASF-FD2-Soil		AOI01-03-SB-15		AOI01-04-SB-14		CHAASF-FD1-Soil		CHAASF-01-SB-12		CHAASF-FD3-Soil		CHAASF-02-SB-12	
Parent Sample ID					AOI01-02-SB-16						AOI01-04-SB-14				CHAASF-01-SB-12			
Depth (ft bgs)	11-12		15-16		15-16		14-15		13-14		13-14		11-12		11-12		11-12	
Sample Date	7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021		7/7/2021	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	Qual	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS(E537M) (µg/kg)																		
Perfluorobutanesulfonic acid (PFBS)	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorohexanesulfonic acid	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorononanoic acid	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorooctanesulfonic acid (PFOS)	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorooctanoic acid (PFOA)	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ

Notes:
UJ = Analyte was not detected and was reported less than LOD. Associated numerical value is approximate.
Screening values for HFPO-DA were established after SI planning and execution and thus not included as an analyte. Future CERCLA phases will include HFPO-DA if warranted
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD.

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

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-04		CHAASF-01		CHAASF-02		CHAASF-03	
	Sample Name	AOI01-01-GW		AOI01-02-GW		AOI01-03-GW		AOI01-04-GW		CHAASF-FD1-GW		CHAASF-01-GW		CHAASF-02-GW		CHAASF-03-GW	
	Parent Sample ID									AOI01-04-GW							
	Sample Date	7/7/2021		7/8/2021		7/8/2021		7/7/2021		7/7/2021		7/8/2021		7/8/2021		7/7/2021	
Analyte	**Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS(E537M) (ng/L)																	
Perfluorobutanesulfonic acid (PFBS)	601	2.5	J	2.5	J	7	J	4.9	J	5.6	J	290	J	3	J	0.69	J
Perfluorohexanesulfonic acid	39	16	J	16	J	30	J	16	J	20	J	71	J	16	J	1.7	J
Perfluorononanoic acid	6	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluorooctanesulfonic acid (PFOS)	4	8.2	J	35	J	5.4	J	4.7	J	5.6	J	0.96	J	18	J	4.6	J
Perfluorooctanoic acid (PFOA)	6	3.7	J	7	J	2.2	J	1.8	J	2.2	J	58	J	5.3	J	2.6	J

Notes:

J = Estimated concentration.

UJ = Analyte was not detected and was reported less than LOD. Associated numerical value is approximate.

ng/L = Nanogram(s) per liter.

1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

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

Values exceeding the Screening Level are shaded gray.

ND = Analyte not detected above the LOD.

Qual = Qualifier.

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

Figure 6-1
PFOS Detections in Soil (AOI 1)

Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

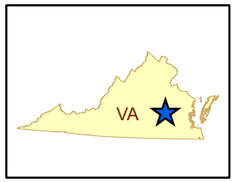
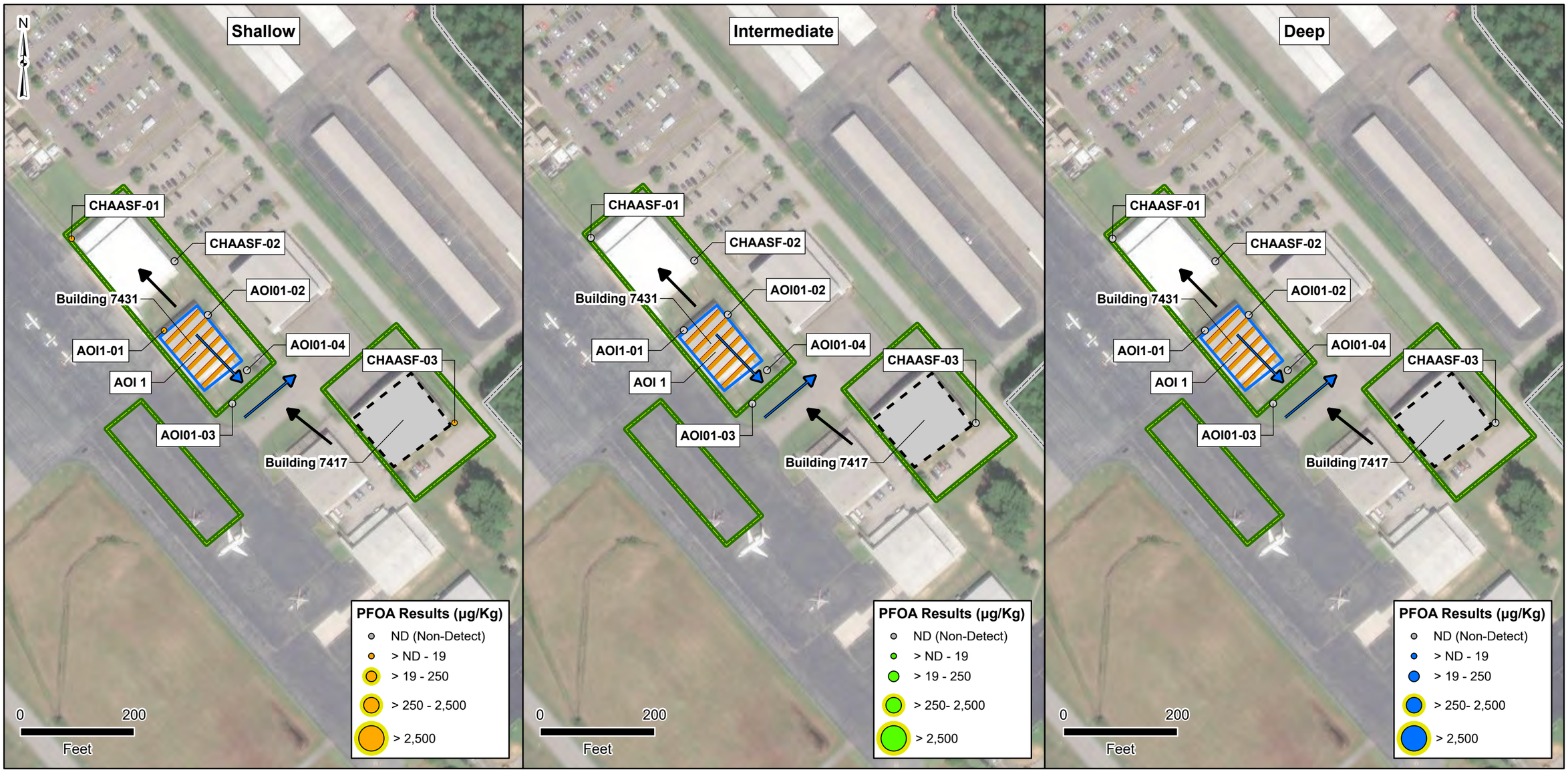


Figure 6-2
PFOA Detections in Soil (AOI 1)



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

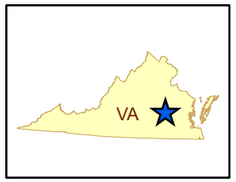
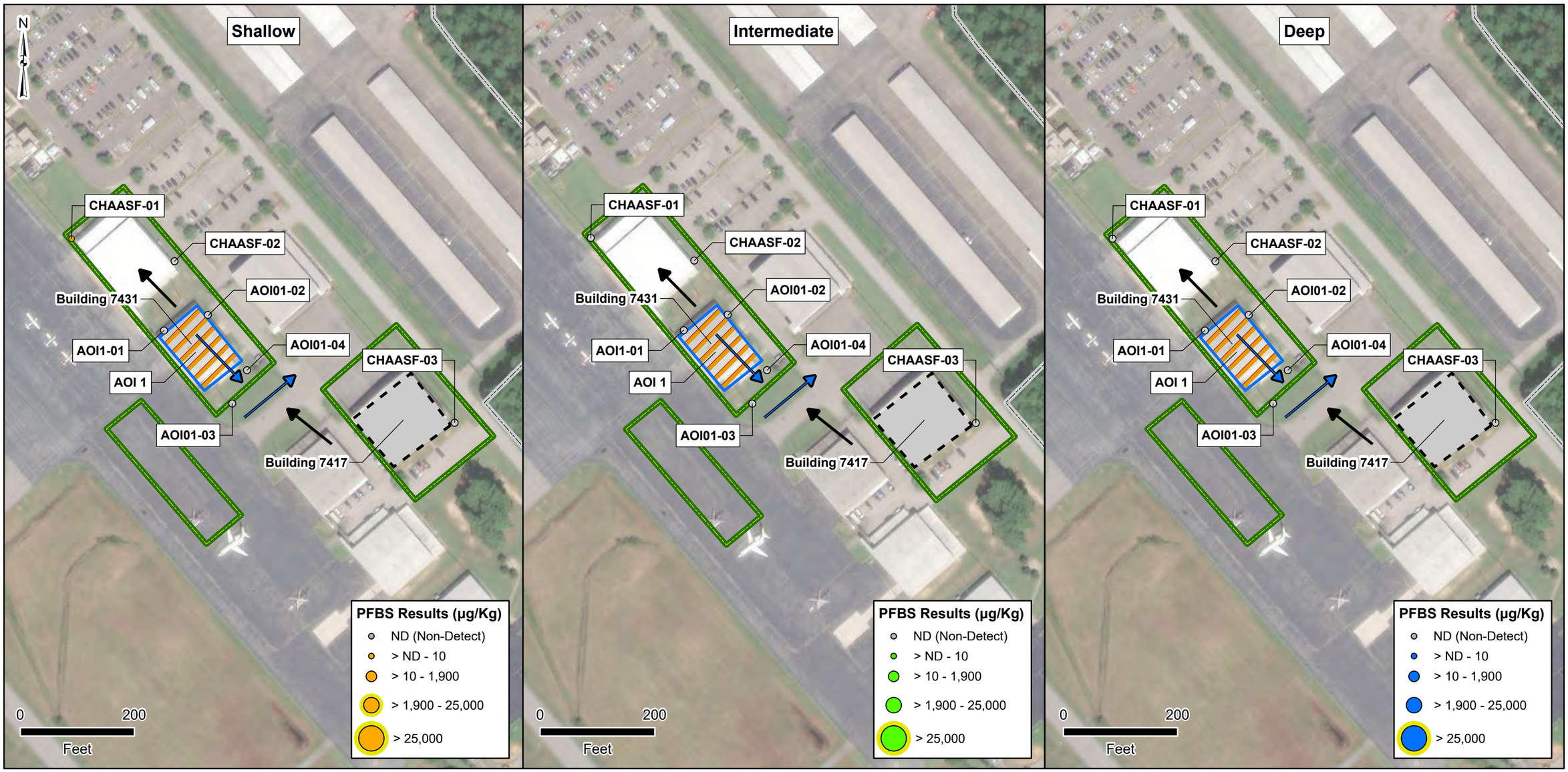


Figure 6-3
PFBS Detections in Soil (AOI 1)



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

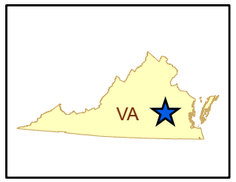
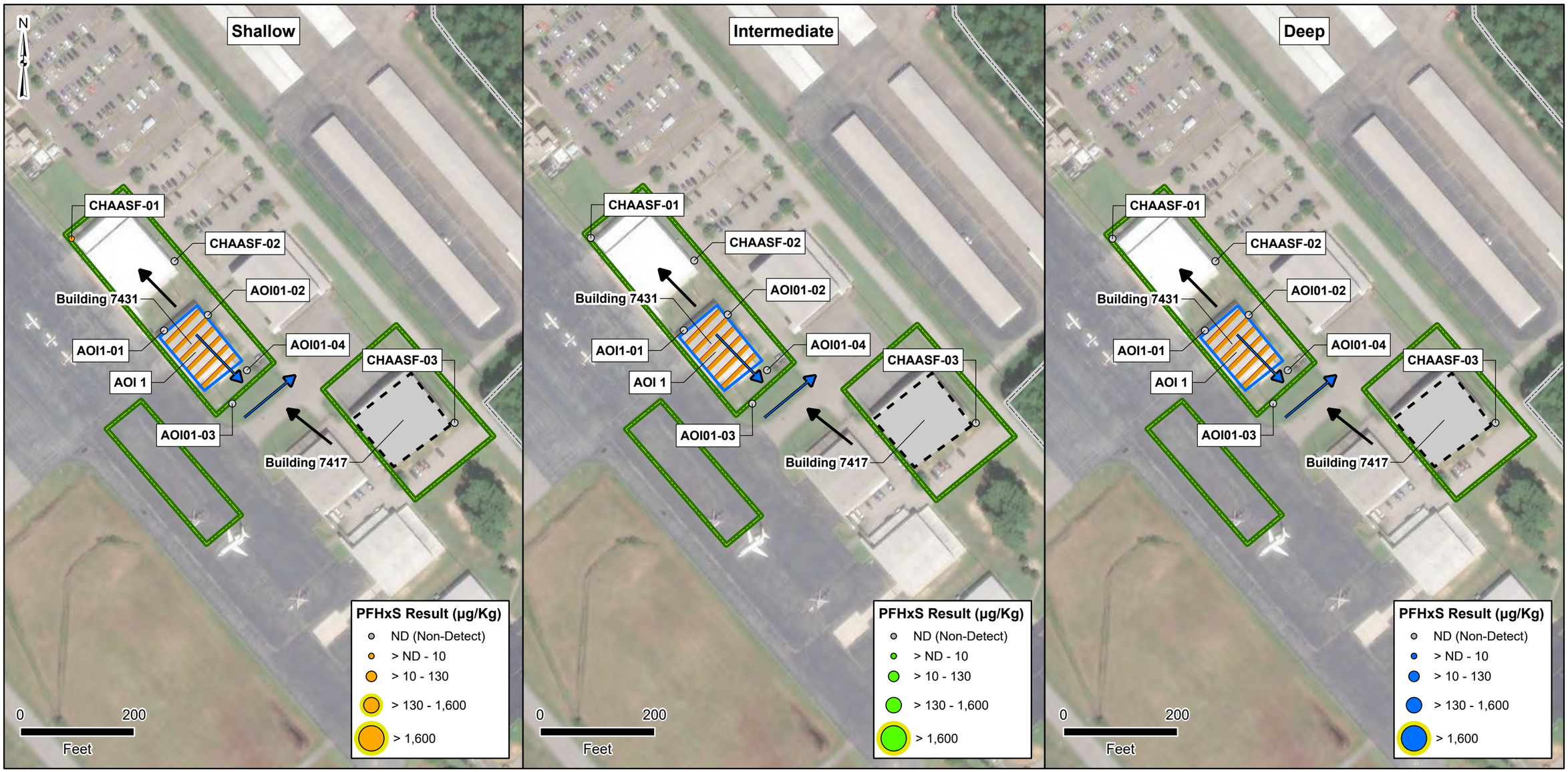


Figure 6-4
PFHxS Detections in Soil (AOI 1)



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

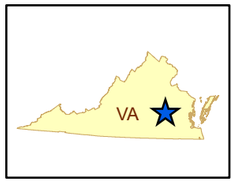
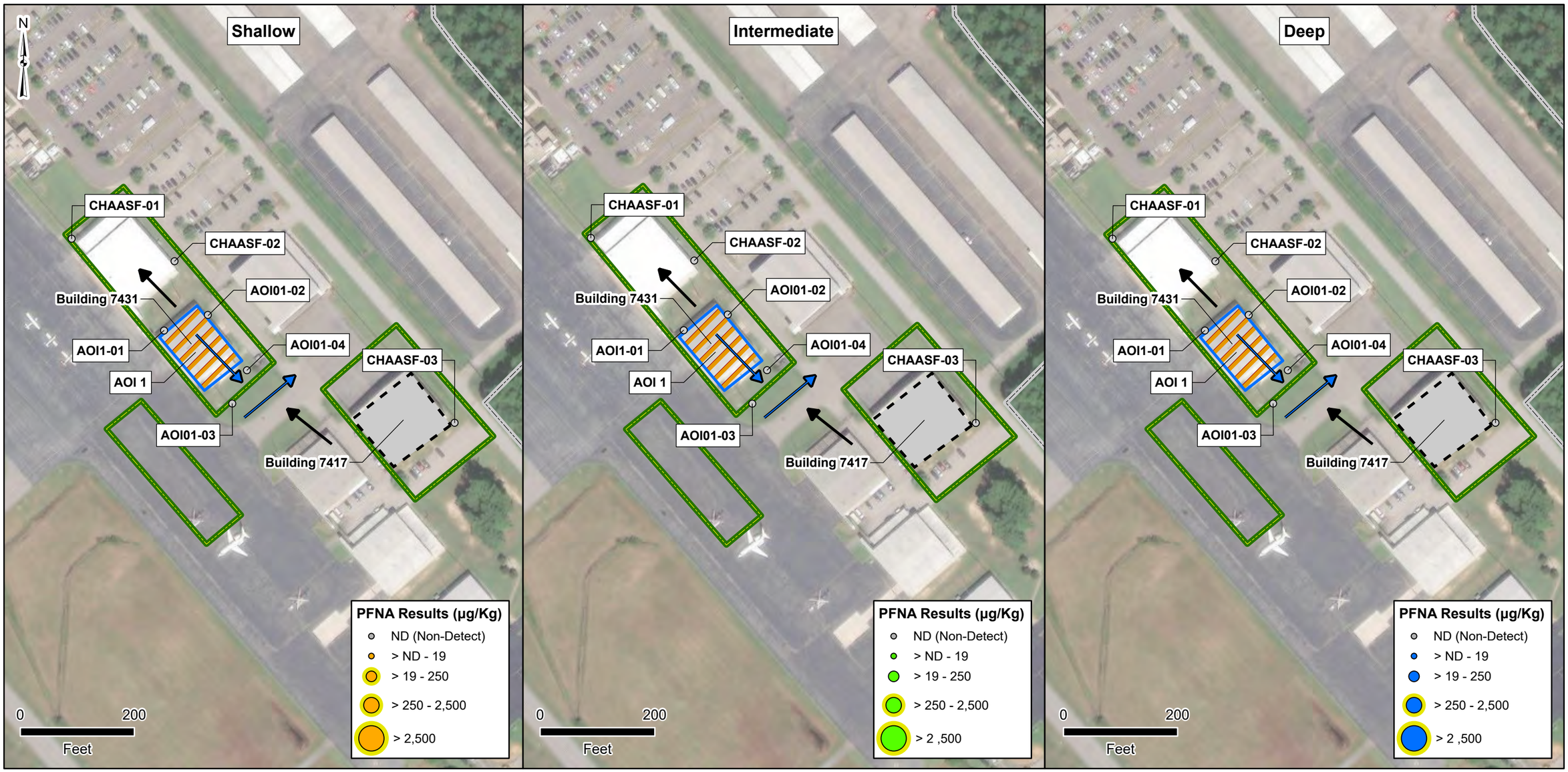


Figure 6-5
PFNA Detections in Soil (AOI 1)



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

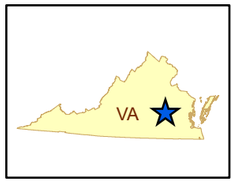
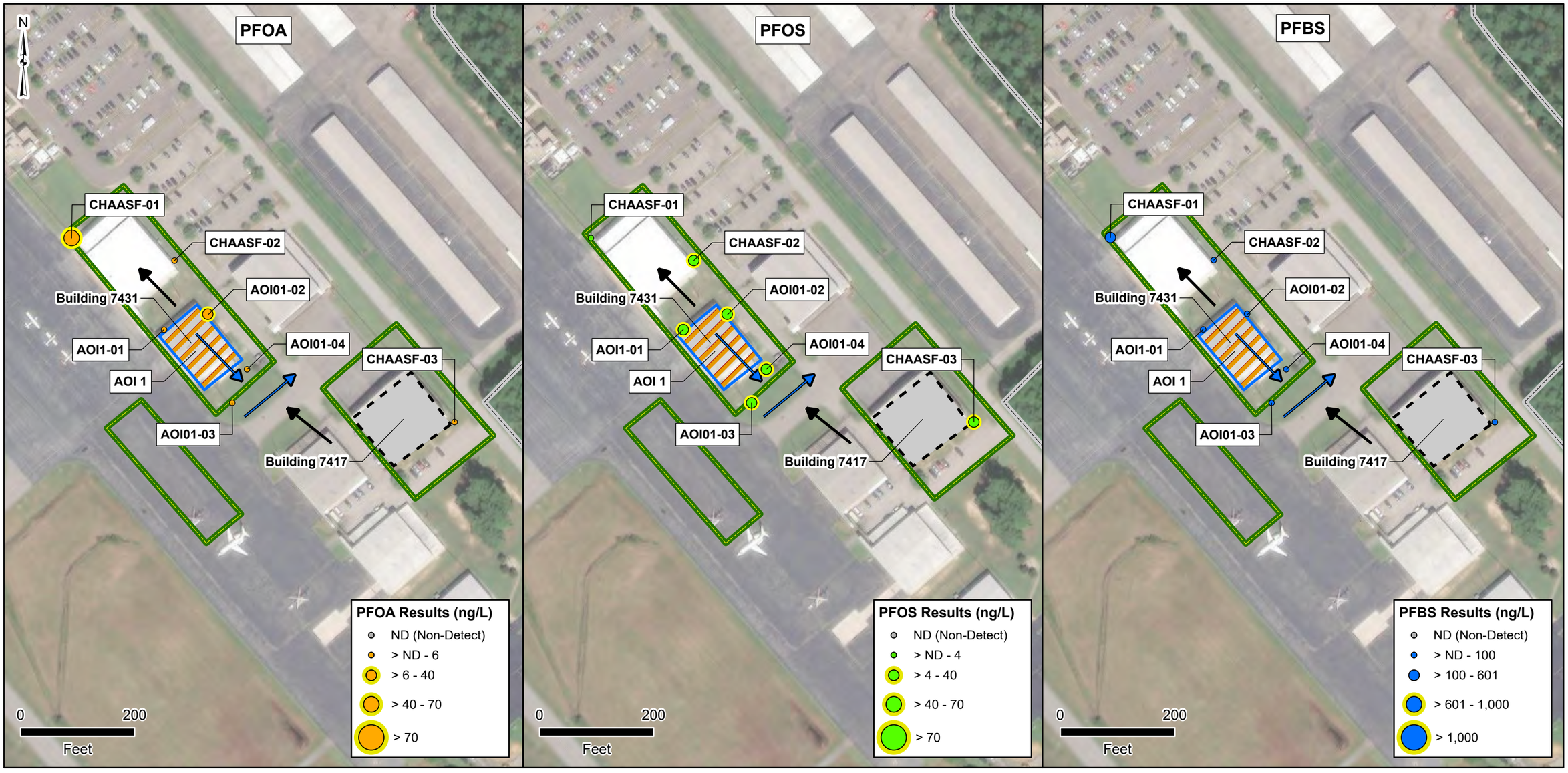


Figure 6-6
PFOS, PFOA and PFBS Detections in Groundwater (AOI 1)



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

Notes:
PFOA = Perfluorooctanesulfonic acid
PFOS = Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Chesterfield Limited AASF, Virginia

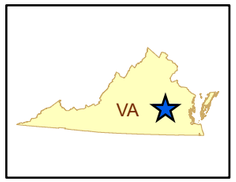
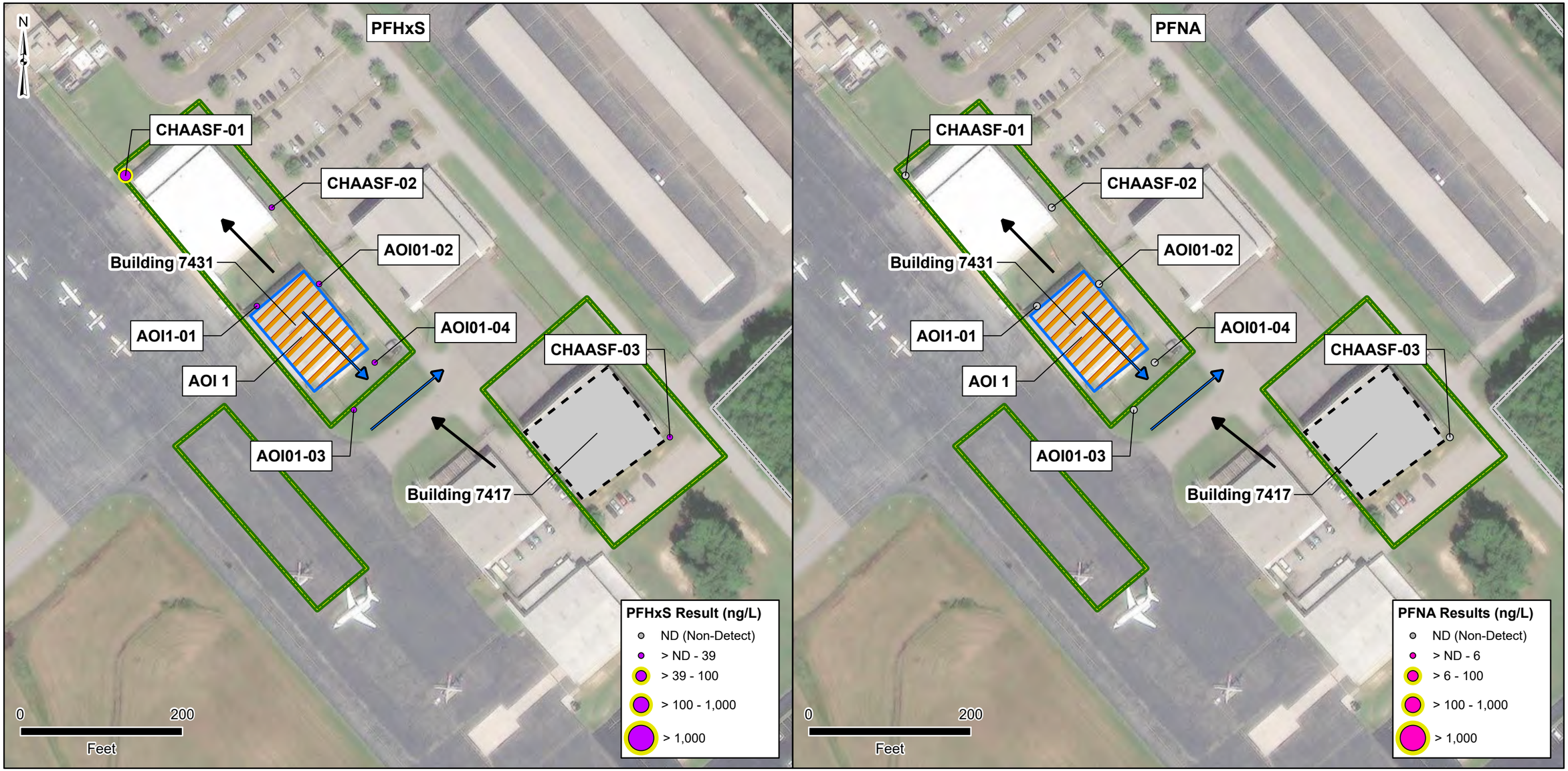


Figure 6-7
PFHxS and PFNA Detections in Groundwater (AOI 1)



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Chesterfield County Airport

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

Notes:
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:..... April 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 18N

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7. EXPOSURE PATHWAYS

The conceptual site model (CSM) for the AOI, based on the SI findings, is presented on **Figure 7-1.** Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined solely 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. SLs are presented in **Section 6.1** of this report.

1. Contaminant source
2. Environmental fate and transport
3. Exposure point
4. Exposure route
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 no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if PFOA, PFOS, or PFBS are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway and a complete pathway may warrant further investigation.

In general, the potential relevant compounds exposure pathways are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of PFAS toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA 2001). Receptors at the facility include facility workers (e.g., facility staff and visiting soldiers), construction workers, trespassers, residents outside the facility boundary, and recreational users outside of the facility boundary. The CSM for AOI 1, revised based on the SI findings, is presented on **Figure 7-1**.

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1 – Building 7431

AOI 1 includes Building 7431 where a Tri-Max™ fire extinguisher filled with unknown contents was observed outside of the southern corner of the building during the PA site visit. No soil borings near the Tri-Max™ fire extinguisher location had detections of relevant compounds.

PFOA was detected in surface soil at location AOI01-01 at a concentration below the associated screening level. Based on the results of the SI at AOI 1, ground-disturbing activities to surface soil may result in site worker and construction worker exposure to PFOA via inhalation of dust or incidental ingestion of surface soil. The facility is within a 1-mile radius of residential areas, so nearby off-facility residents and trespassers may also be exposed to airborne soil particles resulting from ground- disturbing activities. None of the relevant compounds were detected in subsurface soils. As such, ground-disturbing activities to subsurface soil would not result in construction worker exposure to relevant compounds via ingestion. The exposure pathways for inhalation are potentially complete for site and construction workers, residents and trespassers/recreational users. The CSM is presented in **Figure 7-1**.

7.2 GROUNDWATER EXPOSURE PATHWAY

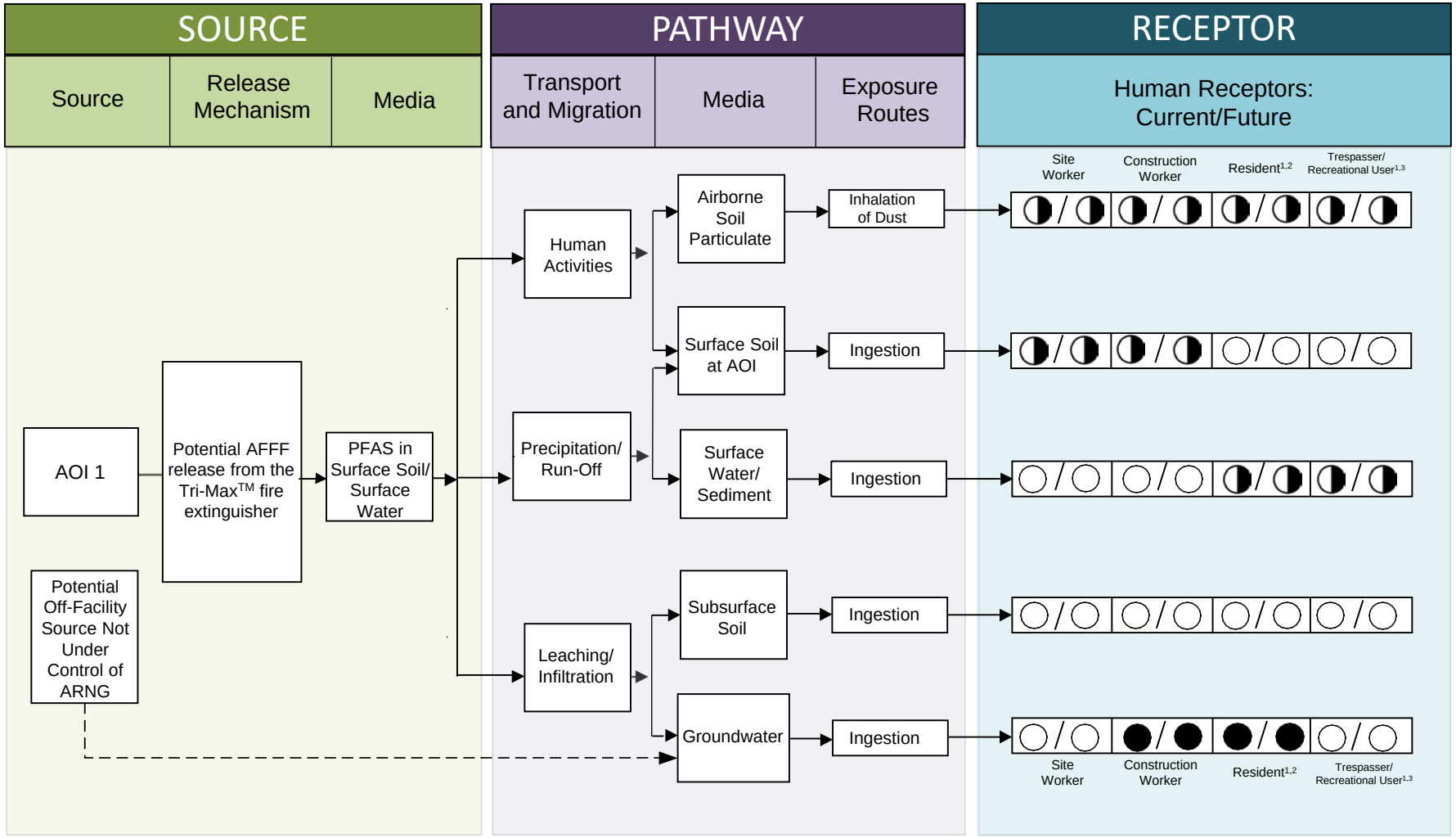
The SI results for groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 based on the aforementioned criteria.

7.2.1 AOI 1 – Building 7431

PFOA, PFOS, PFHxS, and PFBS were detected in groundwater from the temporary wells associated with AOI 1. PFOS and PFOA were detected at concentrations that exceeded associated SLs. PFHxS was also detected in groundwater above the SL in a facility boundary location. Due to the existence of multiple domestic and public groundwater wells in the surrounding area of the facility, off-facility residents may be potentially exposed to groundwater via ingestion. Based on this information, the ingestion exposure pathway is potentially complete for construction workers (via incidental ingestion) during subsurface work activities. The ingestion exposure pathway for site workers is incomplete, as drinking water for the Facility is provided by an upgradient surface water source (not provided by downgradient groundwater). The CSM is presented in **Figure 7-1**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAYS

Based on available information, potential AFFF releases may be drained to Outfall #2, which receives runoff from the runway, parking lots, apron, and hangar buildings, and directly discharges into Reedy Creek, a tributary of the James River. Off-facility receptors such as residents and recreational users may be exposed to relevant compounds via ingestion of surface water and sediment in the James River and its tributaries, or via the ingestion of fish contaminated with relevant compounds (AECOM 2020). Surface water and sediment were not included in the scope for this SI; therefore, sampling of these media was not conducted. As such, the exposure pathways via the ingestion of surface water and sediment are considered potentially complete.



LEGEND

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

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-1
Conceptual Site Model, AOI 1
Chesterfield Limited AASF, VA

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8. SUMMARY AND OUTCOME

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

8.1 SITE INSPECTION ACTIVITIES SUMMARY

The SI field activities at the facility were conducted from 6 to 8 July 2021. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI UFP-QAPP Addendum (EA 2021a), samples were collected and analyzed for a subset of 24 compounds by LC/MS/MS compliant with QSM Version 5.3 Table B-15 as follows:

- Twenty-one soil (21) samples from seven locations (soil borings locations)
- Seven (7) grab groundwater samples from seven temporary well locations
- Nine (9) quality assurance/quality control 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 the AOI 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 CSM was refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOI, described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, further evaluation in the form of a RI is warranted for AOI 1. Based on the CSM developed and revised based on the SI findings, there is potential for exposure to drinking water receptors from releases during historical DoD activities at the Site, and potentially from off-facility sources. Sample chemical analytical concentrations collected during this SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to SLs is as follows:

- AOI 1:
    - PFBS and PFHxS were not detected in groundwater at concentrations exceeding associated SLs and PFNA was not detected. Detections of PFOS from all wells, ranging from 4.7 J ng/L to 35 J ng/L, exceeded the associated SL (4.0 ng/L). PFOA was detected in well AOI01-02 at a concentration (7.0 J ng/L) that exceeded the associated SL (6.0 ng/L). Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.

— PFOA was detected in soil in one out of four borings associated with AOI 1 at a low concentration, several orders of magnitude below the SL. PFOS, PFHxS, PFNA, and PFBS were not detected in soil at AOI 1.

- At the boundary:

— The groundwater sample taken from CHAASF-01, located at the northwestern facility boundary and downgradient of AOI 1, exceeded SLs for PFOA and PFHxS. Additionally, two detections of PFOS, 4.6 J ng/L (CHAASF-03) and 18 J ng/L (CHAASF-02), exceeded the associated SL of 4 ng/L. CHAASF-02 is downgradient of AOI-01 and CHAASF-03 is upgradient of AOI-01. PFBS was detected in all three boundary locations with values ranging from 0.69 J ng/L (CHAASF-03) to 290.0 J ng/L (CHAASF-01). PFBS detections were below the associated OSD SL of 601 ng/L. PFNA was not detected in any boundary samples. Based on the results of the SI further evaluation of the boundary is warranted.

— All detections of PFOA, PFOS, PFHxS, PFNA, and PFBS in soil at the facility boundary locations were below associated SLs.

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 PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Building 7431	◐	●	●	Proceed to RI

Legend:
● = Detected; exceedance of SLs
◐ = Detected; no exceedance of SLs
○ = Not detected

9. REFERENCES

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