FINAL
Site Inspection Report
Blair Hangar Army Aviation Operations Facility
St. Croix, United States Virgin Islands

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)
ARNG Installations, Nationwide

December 2023

Prepared for:

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

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	Degrees Fahrenheit
%	Percent
µg/kg	Microgram(s) per kilogram
AAOF	Army Aviation Operations Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film-forming foam
amsl	Above mean sea level
AOI	Area of interest
ARFF	Airport Rescue Fire Fighter
ARNG	Army National Guard
bgs	Below ground surface
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
DoD	Department of Defense
DPT	Direct-push technology
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
ID	Identification
IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	Liquid chromatography tandem mass spectrometry
MIL-SPEC	Military Specification
MS	Matrix spike
MSD	Matrix spike duplicate

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

ND	Non-detect
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	Per- and polyfluoroalkyl substances
PFBA	Perfluorobutanoic acid
PFBS	Perfluorobutanesulfonic acid
PFHxA	Perfluorohexanoic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PFPeA	Perfluoropentanoic acid
PFTeDA	Perfluorotetradecanoic acid
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
U.S.	United States
USEPA	U.S. Environmental Protection Agency
VIARNG	Virgin Islands Army National Guard

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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 one Area of Interest (AOI), where PFAS-containing materials may have been stored, disposed, or released historically (see **Table ES-2** for AOI location). 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 SLs for the relevant compounds. This SI was completed at the Blair Hangar Army Aviation Operations Facility (AAOF) in St. Croix, United States (U.S.) Virgin Islands and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1. Blair Hangar AAOF will be referred to as the "Facility" throughout this document.

The Facility, operated by the Virgin Islands ARNG encompasses approximately 1.25 acres on the south coast of the island of St. Croix, U.S. Virgin Islands. The Facility is located within the Henry E. Rohlson International Airport, approximately 45 miles south of Charlotte Amalie, the capital of the island of St. Thomas. Occupancy of the ARNG facility began in 1977; however, the Blair Hangar wasn't constructed until 1991. Blair Hangar AAOF is located within the rolling plains characteristic of the south-central portion of the island, which is comprised of alluvial deposits consisting of gravel, silt and clays. The Facility is currently inactive and has not been continuously occupied or used since 2017 due to hurricane damage. Blair Hangar AAOF is undergoing construction and is expected to be occupied sometime in the future (AECOM Technical Services, Inc. 2020).

The PA identified one AOI, composed of two potential PFAS release areas, for investigation during the SI phase. SI sampling results from the AOI were compared to OSD SLs. **Table ES-2**

1

[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.

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.

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

Analyte	Residential (Soil) (µg/kg)[1] 0-2 ft bgs	Industrial/Commercial Composite Worker (Soil) (µg/kg)[1] 2-15 ft bgs	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. July 2022. Risk Based Screening Levels Calculated for Groundwater and Soil using U.S. Environmental Protection Agency's Regional Screening Level Calculator. Hazard Quotient = 0.1. May 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.

bgs = Below ground surface
µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

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

AOI	Potential PFAS Release Area	Soil Source Area	Groundwater Source Area	Future Action
1	Tri-Max™ Training Area and AFFF Storage Area	◐	●	Proceed to RI

Legend:

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

Note:
AFFF = Aqueous film-forming foam

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 compounds 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 Blair Hangar Army Aviation Operations Facility (AAOF) in St. Croix, United States (U.S.) Virgin Islands. The Blair Hangar AAOF is also referred to as the "Facility" throughout this document.

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 U.S. Department of the Army (DA) requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Blair Hangar AAOF (AECOM Technical Services, Inc. [AECOM] 2020) that identified one Area of Interest (AOI), composed of two potential PFAS release areas, 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. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

Blair Hangar AAOF is located on the south coast of the island of St. Croix, located approximately 45 miles south of Charlotte Amalie, St. Thomas (capital of the U.S. Virgin Islands). The island of St. Croix is the largest of the three islands included in the U.S. Virgin Islands group and is approximately 21 miles long and 6 miles at its widest. The Facility is an inactive support installation situated on approximately 1.25 acres (**Figure 2-1**) located adjacent to the Henry E. Rohlsen International Airport. The Facility is surrounded by commercial facilities supporting operation of the airport and air services (AECOM 2020).

Limited information regarding the historical use of Blair Hangar AAOF by the Virgin Islands ARNG (VIARNG) was found during the PA. The earliest known VIARNG occupancy at the Facility goes back to 1977. According to VIARNG personnel, Blair Hangar was built in 1991. The Facility maintained both fixed-wing and rotary-wing aircraft; however, more exact details were not provided. Maintenance activities at the Facility continued until December 2017, when Hurricane Maria struck St. Croix and left Blair Hangar in disrepair. Since that time, Blair Hangar has not been continuously occupied or used by the VIARNG, however the AAOF is currently undergoing construction and is expected to be occupied in the future. Real estate documentation and leasing agreements were not available at the time of the PA (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

The island of St. Croix is generally characterized by mountainous areas in the north and east that are flanked by rolling plains to the south. The northern mountainous range dips steeply to the sea and forms the northern spine of the island. The eastern range mountains are less rugged and are separated by broad low-lying areas. A nearly flat to gently rolling land surface characterizes the plains to south and southwest of the Facility (AECOM 2020).

As seen on **Figure 2-1**, the Facility is located within the plain in the south-central portion of the island immediately adjacent to the Caribbean Sea. The topography across the Facility is generally flat and is at approximately 75 feet (ft) above mean sea level (amsl). Much of the Facility is paved with either asphalt or concrete. Unpaved grassy areas are present along the sides of the hangar, apron, and parking area (AECOM 2020).

The following sections include information on geology, hydrogeology, hydrology, climate, and current and future land use. The topography at the Facility is shown on **Figure 2-2**. The regional geology and groundwater features are shown on **Figure 2-3**. The regional surface water features and drainage basins are shown on **Figure 2-4**. Groundwater elevations and contours are presented on **Figure 2-5**.

2.2.1 Geology

The geology of St. Croix includes surficial alluvial deposits with deeper carbonate and volcanic parent rock. The north and east mountainous areas are underlain by consolidated volcanic rock and sedimentary strata that include volcanic flows and breccia. These formations more specifically consist of fine- to coarse-grained tuffaceous sandstone, lapilli tuff, and mudstone. The observed volcanic rock is blue to olive gray in color, dense, and is folded and faulted due to the island-arc accretion that formed the island (AECOM 2020).

Closer to the Facility, within the central plain, the subsurface geology is comprised of a thin layer of alluvial deposits underlain by the Kingshill Limestone and Jealousy Formation. The surficial alluvial deposits are composed of gravel, sand, silt, and clay ranging in thickness from 8 to 76 ft across the plain. Generally, the thickness of the alluvial deposits increases with distance from the northern mountainous area. Underlying the alluvial deposits is the Kingshill Limestone, which consists of calcareous sediments of limestone and minor dolomite of Pliocene age with some silt, sand, and gravel. The formation dips to the southeast and is approximately 50 to 217 ft thick across the plain depending on location. The formation is dominated by planktonic foraminifera rich carbonate muds, giving it a white to buff appearance. Underlying the Kingshill Limestone is the Jealousy Formation. The Jealousy Formation consists of a deep-water limestone marl, calcareous clay, and some conglomerate (several thin layers). There is no significant difference between the Jealousy Formation and the Kingshill Limestone aside from color, as the Jealousy Formation is blue-gray (AECOM 2020).

During the SI, loose, tan and gray, fine-medium sands were observed as the dominant lithology. In many of the boreholes interbedded clays of various thickness were observed within the fine-medium sands. The borings were completed at depths between 21 and 45 ft below ground surface (bgs). Varying quantities of sand were noted, specifically isolated layers of silty sand, clayey sand, and sand with gravel were also observed in the borings with thicknesses ranging from a few inches to 2 ft. Samples for grain size analyses were collected at one location, AOI01-01, and analyzed via American Society for Testing and Materials Method D-422. The results indicate that the soil samples are comprised primarily of sand (56.6 percent [%]) and silt (27.2%). These results and Facility observations are consistent with the reported depositional environment of the region. Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

Groundwater underlying the Facility is found in the alluvial deposits and Kingshill Limestone. The alluvial deposits are moderately permeable and act as temporary storage for rainfall, which is the primary source of recharge for the shallow aquifer. Information obtained from several reports that gauged existing public drinking water wells and private wells in the southern plain was assessed to determine depth to groundwater. Depths to water within the alluvial deposits across the plain ranged from 5 to 68 ft bgs. The well field in closest proximity to the Facility (Golden Grove Well Field) ranges from 13 to 43 ft bgs. In areas where the alluvial deposits are saturated, the surficial alluvial aquifer is hydraulically connected to groundwater in the Kingshill Limestone beneath. For this reason, the top of the Jealousy Formation is considered to be a confining layer and the bottom of the hydrologic unit. The general direction of regional groundwater flow across the plain is south-southeast toward the coast (**Figure 2-2**). Depths to water measured in April 2023 during the SI ranged from 12.87 to 14.96 ft bgs. Groundwater elevation contours from the SI are presented on **Figure 2-5** and indicate the groundwater flow direction at the Facility is primarily to the south. No significant pumping wells were identified within 0.5 miles. Several well fields exist within 1 mile of the Facility to the north and east (upand cross-gradient). The nearest of these well fields (Golden Grove Well Field) is located approximately 0.75 miles upgradient of the Facility to the northeast, and Fairplains is located approximately 1 mile upgradient/cross-gradient to the east (AECOM 2020).

2.2.3 Hydrology

Limited surface water features exist on St. Croix. Most streams on the island originate in the northern mountainous range and flow intermittently. Stream flow rarely reaches the sea before infiltrating into the alluvial deposits. The closest stream feature to the Facility is the River Gut system, which is approximately 0.75 miles to the north. Storm runoff is usually a significant part of stream flow on the island. Runoff peaks in the hours after the start of a storm and recede rapidly. There are no surface water features within the Facility boundary (**Figure 2-4**) (AECOM 2020).

Within the boundaries of the Facility are a network of exterior stormwater drains. The drain system is used to collect stormwater and convey it from the apron to the grassy area surrounding the hangar. According to VIARNG personnel, the system is similar to a French drain and contains a gravel bottom to facilitate infiltration. Between 2013-2015, a catch basin was added to the drainage system to facilitate infiltration and evaporation after storm events (AECOM 2020). The floor drains found inside Blair Hangar AAOF are believed to drain to the oil/water separator on the south side of the site and out to the municipal sewer system. No evidence of a treatment system was found on-site; therefore, it is assumed that domestic wastewater system is tied to the local sewer system (EA Engineering, Science, and Technology, Inc., PBC [EA] 2021a).

Precipitation captured from the roof of the hangar is stored in two concrete underground cisterns (**Figure 2-3**). During the PA research, as-built drawings were not provided for the cisterns; it is unknown how deep the cisterns are set. It is unclear whether the water in the cisterns have any communication with groundwater, however based on relevant compound concentrations in groundwater samples and from the cistern water samples it is clear that groundwater infiltration into the cisterns is at most de minimis. At the time of the site visit, the Facility was not occupied, and no personnel were using the water. During the scoping teleconference with Facility personnel conducted on 12 April 2021, it was determined that the water in the cisterns is used primarily for washing aircrafts; however, VIARNG personnel indicated that if the Facility becomes occupied by more than 25 people, the cisterns will be considered a public drinking water source. Based on a review of the USEPA Unregulated Contaminant Monitoring Rule 3 data, no public water supply has been sampled on the island (AECOM 2020).

2.2.4 Climate

The climate of St. Croix is tropical, with clearly defined wet and dry seasons. Hot and humid weather is common between May and November, with high temperatures between 88 and 90 degrees Fahrenheit (°F) and low temperatures between 77 and 79°F. During the cooler months (December–April), high temperatures reach 82 to 84°F, with low temperatures reaching 72 to 73°F. Most rainfall occurs during the rainy season, between May and November, and averages approximately 40 to 47 inches annually. The rainy season coincides with the Atlantic Ocean hurricane season, which lasts from June to November. Tropical storms and hurricanes have the highest probability of forming in the months of August, September, and October. These storms have the potential to bring strong winds and torrential rain (AECOM 2020).

2.2.5 Current and Future Land Use

Blair Hangar AAOF is currently unused by the VIARNG and has not been an occupied since Hurricane Maria struck St. Croix in September 2017. The Facility is currently under construction and is expected to be occupied again in the near future (AECOM 2020). A perimeter fence surrounds the Facility but has been found to have holes that may allow trespassers to enter (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 on St. Croix Island, U.S. Virgin Islands (U.S. Fish and Wildlife Services 2022):

- Mammal: West Indian Manatee *(Trichechus manatus)* – Threatened
- Reptiles: Hawksbill Sea Turtle (*Eretmochelys imbricata)* – Federally Endangered; Leatherback Sea Turtle (*Dermochelys coriacea)* – Federally Endangered; St. Croix Ground Lizard (*Ameiva polops)* – Federally Endangered

2.3 HISTORY OF PFAS USE

One AOI, including two potential release areas, were identified in the PA where aqueous film-forming foam (AFFF) may have been used, stored, disposed, or released historically at Blair Hangar AAOF (AECOM 2020). Interviews and records obtained during the PA indicate that regular fire training exercises were performed with AFFF on-site using two Tri-Max™ 30 portable fire extinguishing units. Training occurred on an annual basis from approximately 2000 to 2016. Additionally, AFFF was stored on-site in chemical storage sheds located in the northwestern portion of the Facility (AECOM 2020). AFFF may have historically been released at the Facility during familiarization training and fire training activities. Additional AFFF releases may have occurred from incidental spills in the Tri-Max™ Training Area and the AFFF Storage Area. The potential PFAS release areas were grouped into one AOI based on preliminary data and presumed groundwater flow directions. A description of the AOI is presented in Section 3.

Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

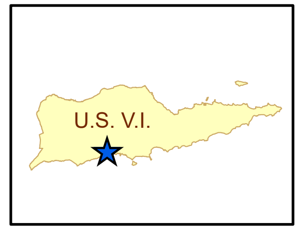

Figure 2-1
Facility Location

Facility Data

Facility Boundary

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

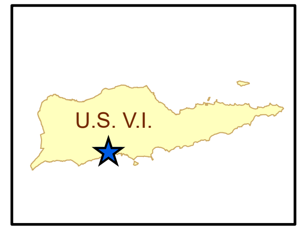

Figure 2-2
Facility Topography

Facility Data

Facility Boundary

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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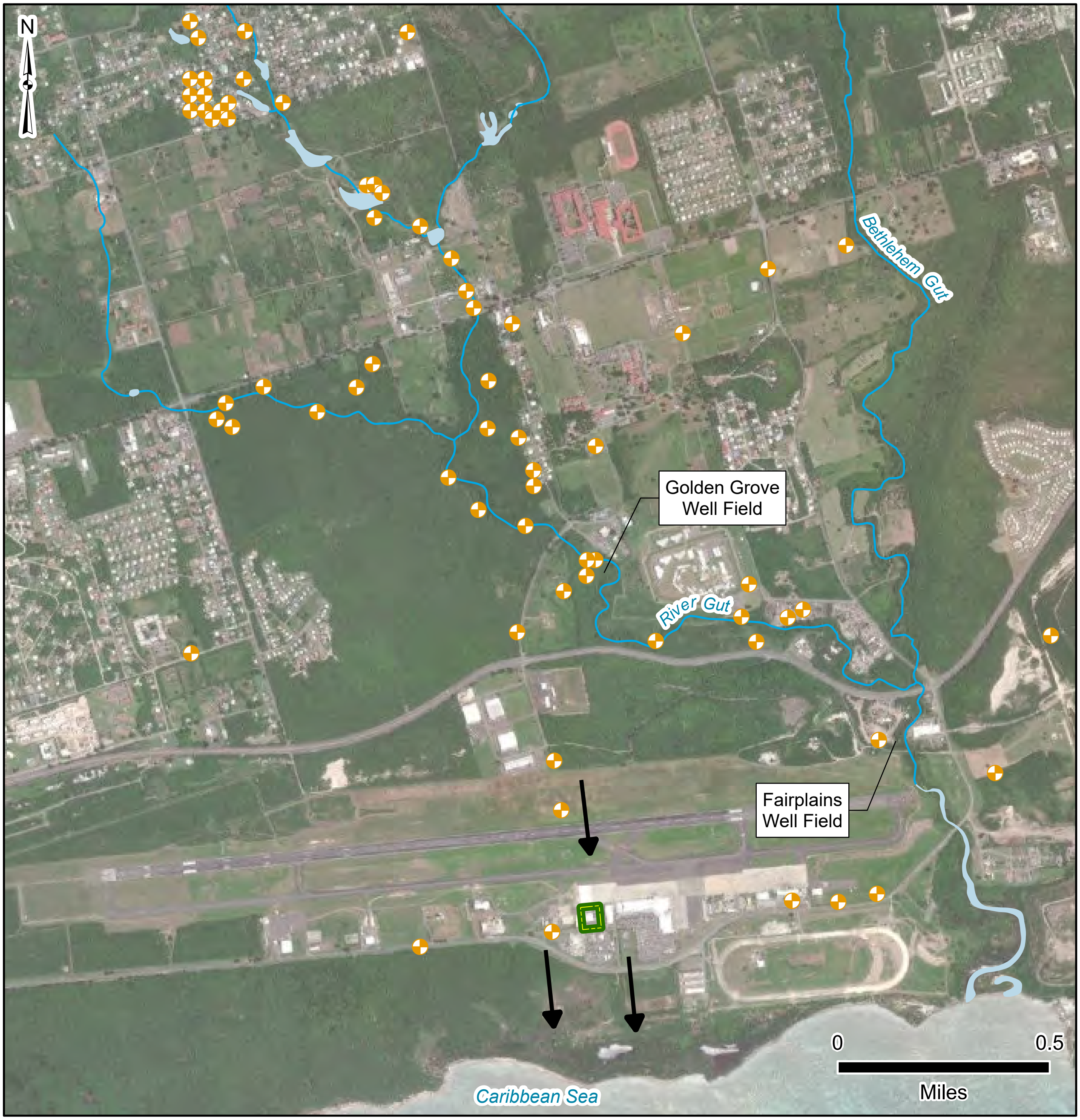
Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

Figure 2-3
Groundwater Features



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Facility Data

Facility Boundary

Well Type

Unknown/Other Well

Hydrology/Hydrogeology

Groundwater Flow Direction

River/Stream

Waterbody

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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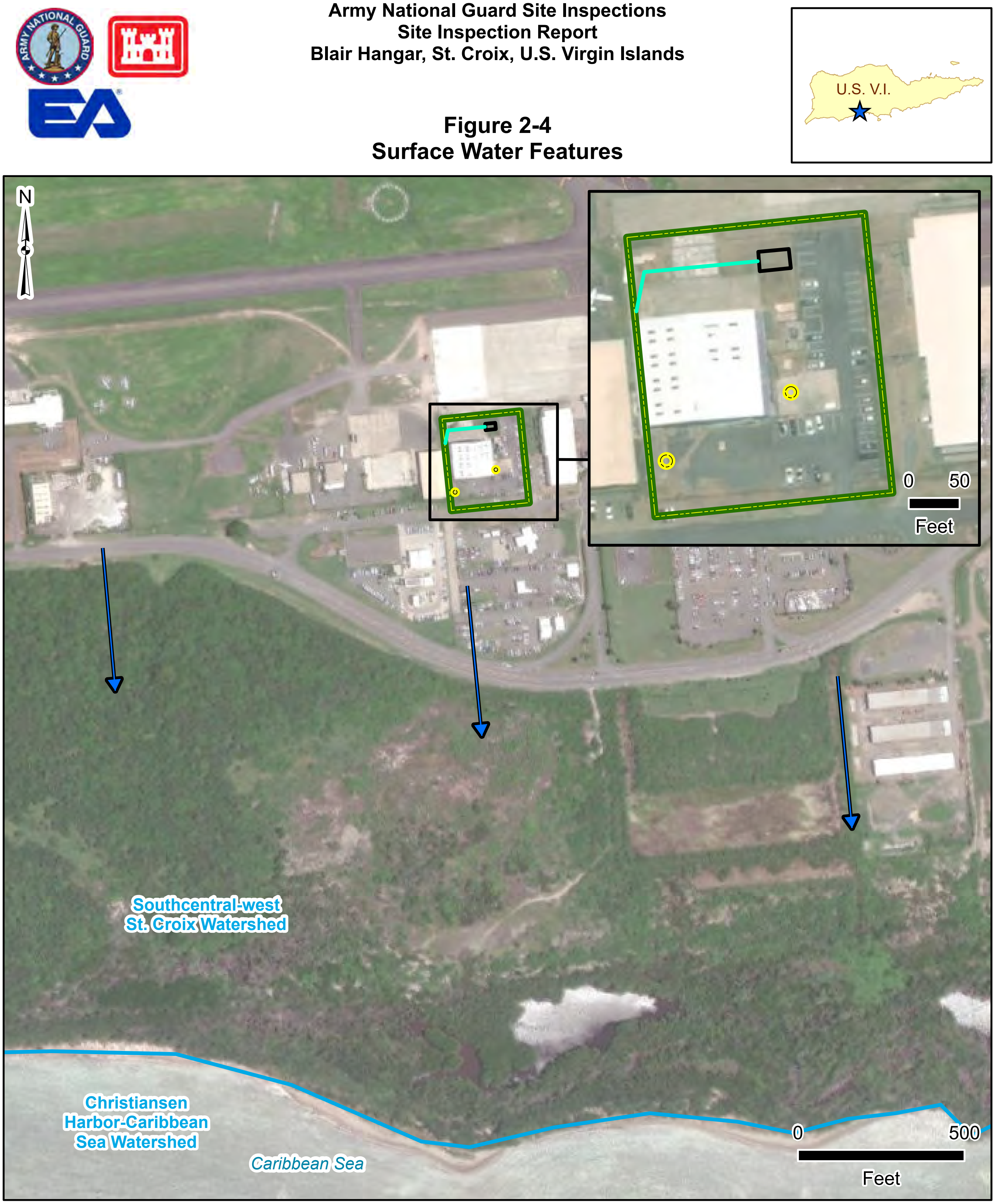
Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

Figure 2-4
Surface Water Features



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Facility Data
Facility Boundary

Hydrology
Surface Water Flow Direction
Drain
Catch Basin
Cistern

Watershed Boundary

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
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Prepared For:....................USACE
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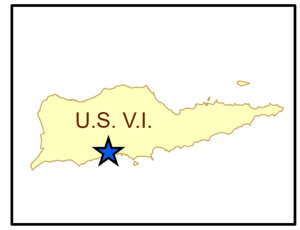
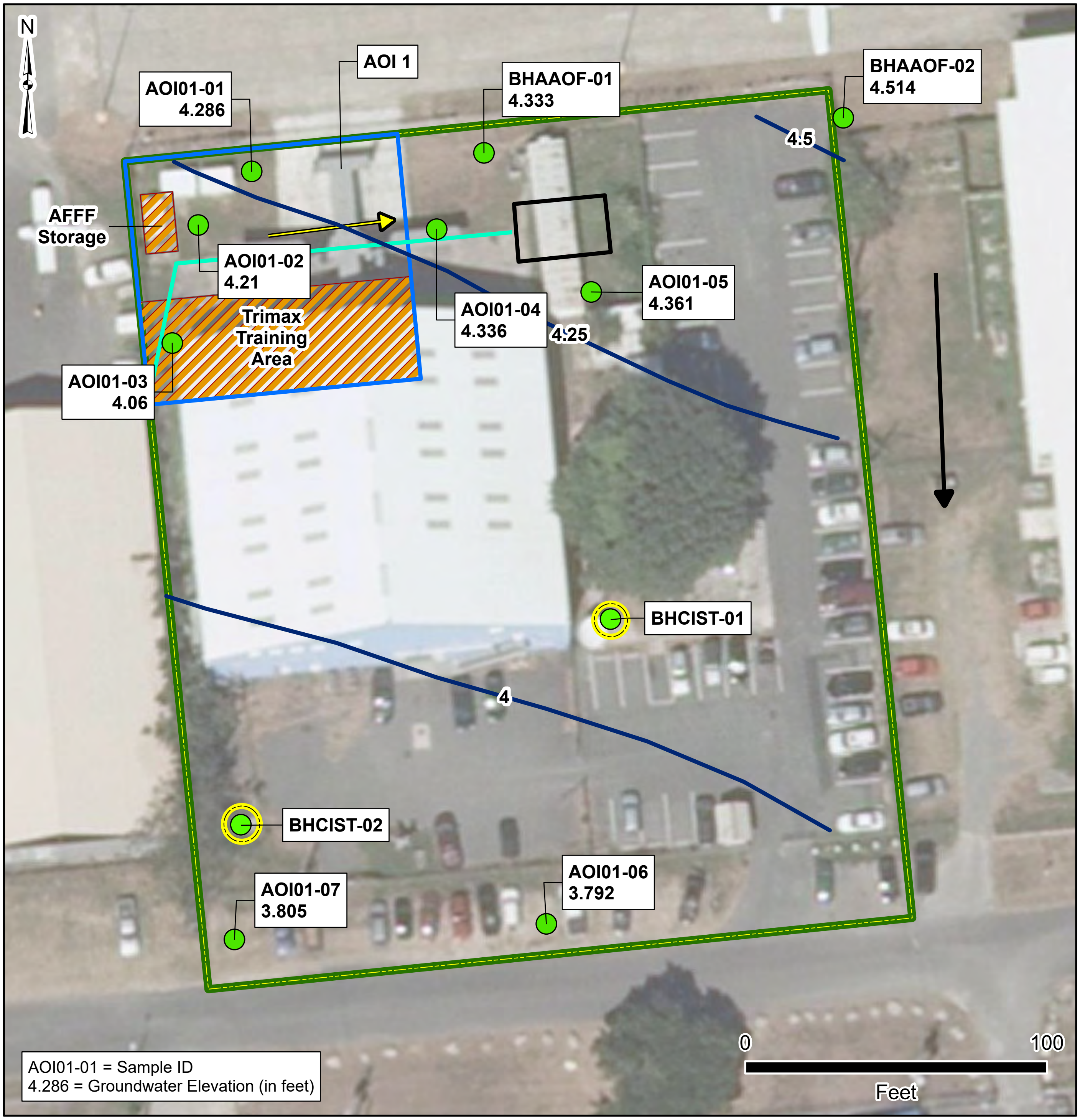


Figure 2-5
Groundwater Elevations



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Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- Sample Location

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Groundwater Elevation Contour Interval 0.25 feet

- Catch Basin
- Cistern

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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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, two potential release areas were identified at Blair Hangar AAOF and grouped into one AOI identified as: AOI 1. The AOI is shown on **Figure 3-1**.

3.1 AOI 1 – TRI-MAX^{TM} TRAINING AREA AND AFFF STORAGE AREA

3.1.1 Tri-Max^{TM} Training Area

According to VIARNG personnel, regular training exercises were performed using Tri-Max^{TM} 30 portable fire extinguishers. Multiple VIARNG personnel confirmed the Facility had two Tri-Max^{TM} 30 units that were used for training on an annual basis from the early-2000s until 2016. Training records and personnel accounts of training that took place since 2016 were incomplete and unavailable at the time of the PA. Training consisted of spraying AFFF against the outside (and occasionally inside) of the northwest hangar bay door in a sweeping motion. The reported volume of AFFF released during the training exercises ranged from 1-2 gallons to the entire 30-gallon tank. After completion of the training, the expended AFFF was sprayed with water into the drain system surrounding the apron on the north side of the hangar. The drain was described as a French drain that would allow runoff to easily evaporate or infiltrate into the subsurface. Between 2013-2016, a catch basin was added to the drain system to facilitate infiltration and evaporation after storm events. Floor drains were observed inside the hangar and would have likely captured any AFFF or any other liquids released inside the hangar. No as-builts or construction drawings were available during the PA, so it is unclear whether the floor drains inside the hangar are connected to the municipal storm drain system located under the main road south of the hangar (AECOM 2020).

3.1.2 AFFF Storage Area

AFFF used in the Tri-Max^{TM} 30 units was stored in the chemical storage sheds in the northwest corner of the Facility. According to VIARNG personnel, two 5-gallon buckets of AFFF were typically stored in the chemical storage sheds. The timeframe of use and storage of AFFF at the Facility were unknown at the time of the PA. Additionally, the manufacturer and type of AFFF were not known, and previous safety data sheets were lost during Hurricane Maria. Information regarding refilling or servicing of the Tri-Max^{TM} units was unknown at the time of the PA interviews. Because AFFF was present within the storage sheds, and little institutional knowledge regarding the handling and transfer of AFFF was available at the time of the PA, it is possible that AFFF may have incidentally been released in this area (AECOM 2020).

3.2 ADJACENT SOURCES

Several potential off-facility sources of PFAS are adjacent to the Facility and are not under the control of the VIARNG. The potential adjacent sources are shown on **Figure 3-1** and described in the following sections for information purposes only.

3.2.1 Former Airport Rescue Fire Fighter Fire Training Area

Fire training activities were conducted by the Airport Rescue Fire Fighter (ARFF) team at several locations surrounding the Henry E. Rohlsen International Airport runway. Two fire training areas were identified by the ARFF Chief and were located on undeveloped land on the eastern side of the airport. One was located on the northeast side of the runway and another on the southeast of the runway. The exact years of operation and use were not known; however, the ARFF Chief recalled that both locations were used from the late-1990s through the early-2000s. During this period, training occurred multiple times a year. Typical fire training activities consisted of igniting a petroleum-based fuel (avgas, diesel, or gel) and extinguishing it using AFFF. It is assumed these training activities occurred using firetrucks and not portable units; however, no specific details regarding the source of AFFF were found during the PA. According to the ARFF Chief, secondary containment was used during these fire training exercises. It is not known if the secondary containment fully captured all AFFF sprayed during training. Additionally, it is unknown what happened to the propellent and remaining AFFF in the secondary containment after the training exercises (AECOM 2020). These areas are located hydraulically cross-gradient of the AOI (EA 2021a).

3.2.2 ARFF Stations

The current ARFF station opened in 2018 and is located approximately 1,100 ft west of Blair Hangar AAOF. The station houses two firetrucks that each store approximately 200 gallons of AFFF. According to the ARFF Chief, twice that amount of AFFF is also stored at the station per Federal Aviation Administration regulations. The AFFF is stored within a closet in the ARFF station (AECOM 2020).

Prior to 2018, the ARFF station was located approximately 2,100 ft east of Blair Hangar AAOF and was in operation from 1967-2018. Little information was obtained during the PA regarding the former ARFF station; however, the ARFF Chief did confirm that the former station stored AFFF within the building and in firetrucks that were housed in the building. The former ARFF station is currently occupied by a moving company and other airport support facilities (AECOM 2020).

The ARFF stations are considered hydraulically cross-gradient of the AOI (EA 2021a).

3.2.3 Historic Emergency Responses

Numerous incidents and plane crashes within the airport property have been historically documented by the Federal Aviation Administration and ARFF team. The ARFF Chief was able to provide additional information on several crashes that occurred over the last 28 years during his time working for the ARFF team. At the time of the PA site visit, the ARFF team was using 6% AFFF from Chemguard. Specifics regarding the brand, concentration, and volume of AFFF used during each incident were not recalled by the ARFF Chief. Details regarding these crashes are listed below (AECOM 2020):

- 1991 Eastern Air Line Tire Fire: after landing and taxiing to the terminal, a tire on an Eastern Air Line flight caught fire and was extinguished by the ARFF team using AFFF.

This emergency response was approximately 500 ft northeast of Blair Hangar AAOF. This release area is cross-gradient of the AAOF.

- 1994 Queen Air Crash: AFFF was used to extinguish a fire on the runway after a Queen Air crash. This emergency response was approximately 2,000 ft northeast of Blair Hangar AAOF. This release area is cross-gradient of the AAOF.

- 1995 Civil Air Patrol Crash: shortly after take-off a Civil Air Patrol flight crashed approximately 1,200 ft northeast of the airport runway, outside the property boundary of the airport (approximately 5,000 ft northeast of Blair Hangar AAOF). The ARFF team responded to the incident and used AFFF to suppress the fire. This release area is cross gradient of the AAOF.

- 2016 Private Plane Crash: AFFF was used to extinguish a fire from a private plane crash located approximately 300 ft north of the western end of the airport runway. This emergency response was approximately 1,800 ft northwest of Blair Hangar AAOF. This release area is cross-gradient of the AAOF.

- 2017 Private Plane Crash: AFFF was used to extinguish a fire from a private plane crash located approximately 500 ft south of the western end of the airport runway. This particular emergency response was 6,000 ft west of Blair Hangar AAOF. This release area is cross-gradient of the AAOF (AECOM 2020).

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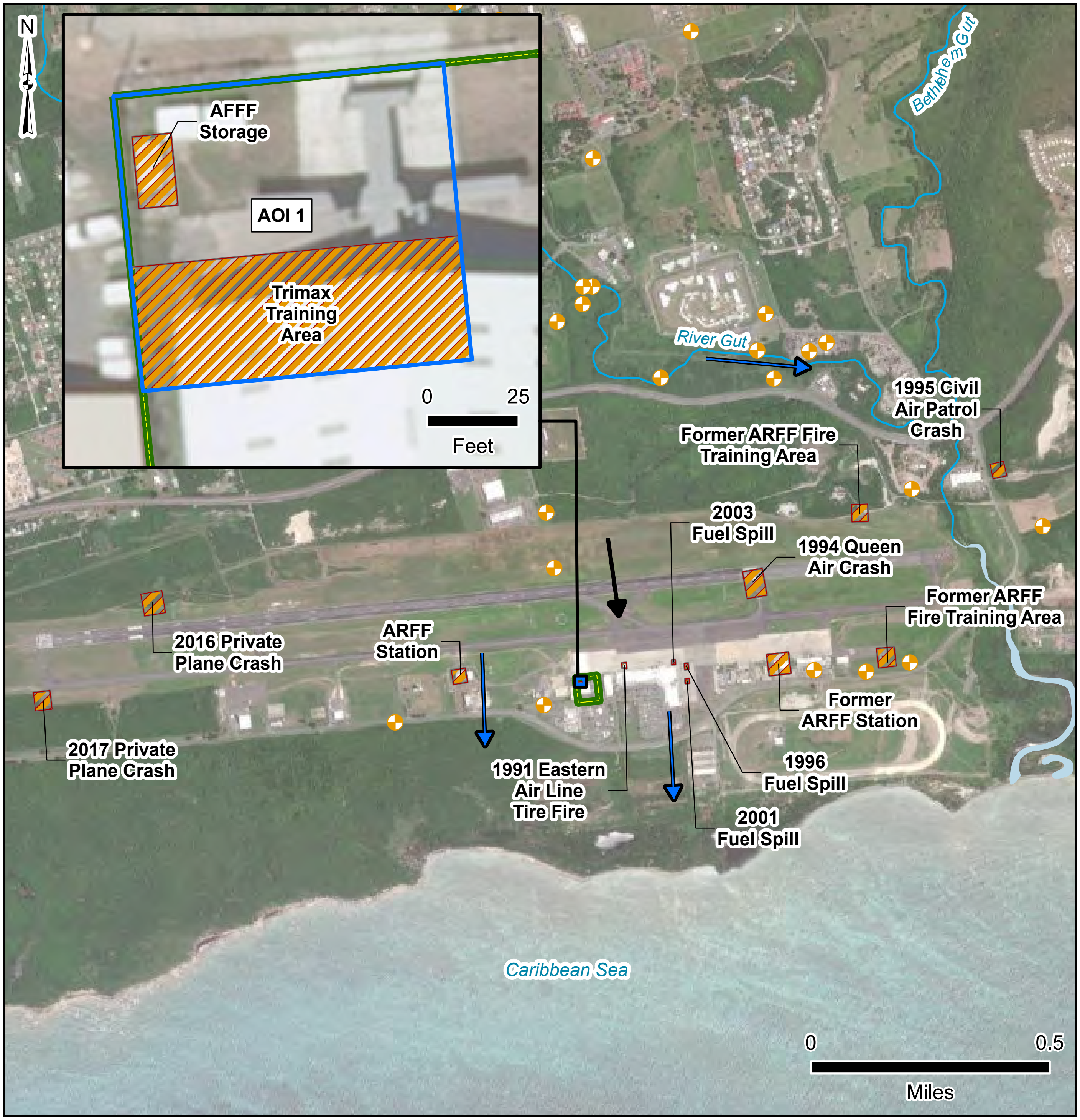
Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

Figure 3-1
Areas of Interest



Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\BlairHangar\BlairHangar.aprx

Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Well Type
- Unknown/Other Well

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction
- River/Stream
- Waterbody

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:...........................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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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 2021a), the objective of the SI is to identify whether there has been a release to the environment at the AOI 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 in the sampled AOI.

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 Blair Hangar AAOF (AECOM 2020)
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP-QAPP Addendum (EA 2021a)
- 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 horizontally 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). 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 Environmental, LLC, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP); Accreditation Number 101 and the National Environmental Laboratory Accreditation Program (NELAP); Certificate Number 6408. PFAS data underwent 100% Stage 2B validation in accordance with the DoD General Data Validation Guidelines (DA 2019a) and DoD Data Validation Guidelines Module 3: Data Validation Procedure of Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual (QSM) Table B-15 (DA 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 (DA 2019a, 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 UFP-QAPP Addendum (EA 2022a).

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, Blair Hangar AAOF, U.S. Virgin Islands,* dated August 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, Blair Hangar AAOF, U.S. Virgin Islands* dated January 2022 (EA 2022)

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

- *Final Site Safety and Health Plan, Blair Hangar AAOF, U.S. Virgin Islands,* dated August 2021 (EA 2021b).

The SI field activities were conducted from 10 to 17 April 2023 and consisted of direct-push technology (DPT) borings 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 5.9.

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-seven (27) soil samples from 9 soil boring locations
- Eleven (11) grab groundwater samples from 9 temporary well locations and 2 cisterns
- Twenty-two (22) quality assurance/quality control 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 TPP Process, Engineer Manual 200-1-2 (DA 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.

A combined TPP Meeting 1 and 2 was held on 6 December 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with Engineer Manual 200-1-2. The stakeholders for this SI include ARNG G-9, USACE, VIARNG, and the U.S. Army Corps of Engineers. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The combined TPP Meeting 1 and 2 minutes were memorialized in the UFP-QAPP Addendum (EA 2021a).

A TPP Meeting 3 was held on 29 November to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of the final report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

EA contacted the Utility Notification Center to notify them of intrusive work at the Facility. EA contracted Jaca & Sierra, a private utility location service, to perform utility clearance at the Facility. Utility clearance was performed at each of the proposed boring locations on 10 April 2023 with input from the EA field team. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 ft of each boring were pre-cleared by EA's drilling subcontractor, Jaca & Sierra, using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source on-site which is sourced by the cisterns was chosen for decontamination of drilling equipment (identified as BHCIST-02). A sample from this water source was taken on 13 April 2023 and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. This water had been previously sampled and low levels of PFAS (below SLs) were report. As an extra precaution, a 5-gallon carbon unit was used to filter the water prior to its use.

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 to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

A total of nine borings were completed during the SI. Soil boring locations are shown on **Figure 5-1**. The initial boring locations were selected based on the AOI information provided in the PA

(AECOM 2020) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA 2022). Several boring locations were adjusted within a 50-ft offset to accommodate drill rig access, and adjustments were documented in a field change request that was approved by ARNG and USACE prior to the start of intrusive activities. This field change request is documented in **Appendix B4**. Samples were generally collected in grass covered areas where applicable, to avoid disturbing concrete or asphalt surfaces. Non-dedicated sampling equipment (i.e., hand auger) was decontaminated between sampling locations.

Surface soil samples from 0 to 2 ft bgs were collected from all nine boring locations using a hand auger. Subsurface 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. Three discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was collected approximately 1 ft above the groundwater table, and one 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 12.87 to 14.96 ft bgs during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 20 to 25 ft bgs and boring sample depths are provided in **Table 5-1**.

During the mobilization, the soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System. A photoionization detector 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, photoionization detector 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 HDPE bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic carbon (TOC) (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the UFP-QAPP Addendum (EA 2021a).

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. 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 degrees Celsius during shipment.

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 bentonite chips. Borings were installed in unpaved areas to avoid disturbing concrete or asphalt surfaces.

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using a GeoProbe® DT325 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-inch Schedule 40 polyvinyl chloride screen with sufficient casing to reach the ground surface. New polyvinyl chloride 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 after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well intervals using a peristaltic pump with PFAS-free HDPE tubing. 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 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 FedEx under standard COC 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).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. Three field blanks (FBs) were collected in accordance with the UFP-QAPP Addendum (EA 2021a). One EB was collected per day (a total of eight) and analyzed for the same parameters as the groundwater samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius during shipment.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor Facility-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 is provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed by Antillean Engineers Incorporated, a licensed surveying firm in the Virgin Islands, using a Trimble R10 real-time kinematic differential global positioning system. 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 10 April 2023 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. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the UFP-QAPP Addendum (EA 2021a).

Soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities were drummed on-site due to suspected petroleum contamination.

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 for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Environmental, LLC, in Lancaster, Pennsylvania, a DoD ELAP- and NELAP-certified laboratory.

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

5.8 DEVIATIONS FROM SITE INVESTIGATION UFP-QAPP ADDENDUM

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

- Several sampling locations had to be adjusted in the field due to utilities. These changes are noted in the Field Change Request Form provided in **Appendix B4**.

Table 5-1. Site Inspection Samples by Medium
Blair Hangar AAOF, St. Croix, U.S. Virgin Islands
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM Version 5.3)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI01-01-SB-0-2	4/11/2023	0-2	X	X	X	
AOI01-02-SB-0-2	4/11/2023	0-2	X			
AOI01-03-SB-0-2	4/11/2023	0-2	X			
AOI01-04-SB-0-2	4/11/2023	0-2	X			
AOI01-05-SB-0-2	4/11/2023	0-2	X			
AOI01-06-SB-0-2	4/11/2023	0-2	X			MS/MSD
AOI01-07-SB-0-2	4/11/2023	0-2	X			MS/MSD
BHAAOF-01-SB-0-2	4/11/2023	0-2	X			
BHAAOF-02-SB-0-2	4/11/2023	0-2	X			
AOI01-01-SB-7-8	4/12/2023	7-8	X			
AOI01-02-SB-7-9	4/12/2023	7-9	X			
AOI01-03-SB-7-9	4/12/2023	7-9	X			
AOI01-04-SB-7-9	4/13/2023	7-9	X			
AOI01-05-SB-7-9	4/14/2023	7-9	X			
AOI01-06-SB-7-9	4/15/2023	7-9	X			
AOI01-07-SB-7-9	4/15/2023	7-9	X			
BHAAOF-01-SB-7-9	4/13/2023	7-9	X			
BHAAOF-02-SB-9-11	4/14/2023	9-11	X			
AOI01-01-SB-13-15	4/12/2023	13-15	X			
AOI01-02-SB-11-13	4/12/2023	11-13	X			
AOI01-03-SB-13-15	4/12/2023	13-15	X			
AOI01-04-SB-13-15	4/13/2023	13-15	X			
AOI01-05-SB-13-15	4/14/2023	13-15	X			
AOI01-06-SB-11-13	4/14/2023	11-13	X			
AOI01-07-SB-12-14	4/15/2023	12-14	X			
BHAAOF-01-SB-13-15	4/13/2023	13-15	X			
BHAAOF-02-SB-21-23	4/14/2023	21-23	X			
BHAAOF-DUP-SB-01	4/11/2023	0-2	X	X	X	DUP for AOI01-01-SB-0-2
BHAAOF-DUP-SB-02	4/11/2023	0-2	X			DUP for AOI01-05-SB-0-2
BHAAOF-DUP-SB-03	4/11/2023	0-2	X			DUP for BHAAOF-02-SB-0-2
Groundwater Samples						
AOI01-01-GW	4/13/2023	-	X			MS/MSD
AOI01-02-GW	4/13/2023	-	X			
AOI01-03-GW	4/13/2023	-	X			
AOI01-04-GW	4/13/2023	-	X			
AOI01-05-GW	4/14/2023	-	X			
AOI01-06-GW	4/15/2023	-	X			
AOI01-07-GW	4/15/2023	-	X			
BHAAOF-01-GW	4/14/2023	-	X			

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM Version 5.3)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
BHAAOF-02-GW	4/15/2023	-	X			
BHCIST-01-GW	4/13/2023	-	X			Cistern #1
BHCIST-02-GW	4/13/2023	-	X			Cistern #2
BHAAOF-DUP-GW-01	4/13/2023	-	X			DUP for BHCIST-02-GW
BHAAOF-DUP-GW-02	4/13/2023	-	X			DUP for AOI01-02-GW
Blank Samples						
BHAAOF-FB-01	4/13/2023	-				
BHAAOF-FB-02	4/14/2023	-				
BHAAOF-FB-03	4/15/2023	-				
BHAAOF-EB-01	4/11/2023	-				
BHAAOF-EB-02	4/12/2023	-				
BHAAOF-EB-03	4/13/2023	-				
BHAAOF-EB-04	4/13/2023	-				
BHAAOF-EB-05	4/14/2023	-				
BHAAOF-EB-06	4/14/2023	-				
BHAAOF-EB-07	4/15/2023	-				
BHAAOF-EB-08	4/15/2023	-				

Notes:
DUP = Field duplicate

**Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Blair Hangar AAOF, St. Croix, U.S. Virgin Islands
Site Inspection Report**

Area of Interest	Boring ID	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AOI01-01	20	15-20
	AOI01-02	20	15-20
	AOI01-03	20	15-20
	AOI01-04	20	15-20
	AOI01-05	20	15-20
	AOI01-06	20	15-20
	AOI01-07	20	15-20
Facility boundary	BHAAOF-01	20	15-20
	BHAAOF-02	25	15-20

**Table 5-3. Groundwater Elevation
Blair Hangar AAOF, St. Croix, U.S. Virgin Islands
Site Inspection Report**

Temporary Monitoring Well ID	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Ground Surface Elevation (ft amsl)	Groundwater Elevation (ft amsl)
AOI01-01-GW	19.246	14.96	19.093	4.133
AOI01-02-GW	18.440	14.23	18.526	4.296
AOI01-03-GW	18.030	13.97	17.944	3.974
AOI01-04-GW	18.256	13.92	18.166	4.246
AOI01-05-GW	17.791	13.43	18.020	4.59
AOI01-06-GW	16.112	12.32	16.077	3.757
AOI01-07-GW	16.675	12.87	16.723	3.853
BHAAOF-01-GW	18.313	13.98	18.519	4.539
BHAAOF-02-GW	17.944	13.43	18.027	4.597

Notes:
[1] Temporary well screen set above total depth to capture groundwater interface
btoc = Below top of casing
ID = Identification

Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

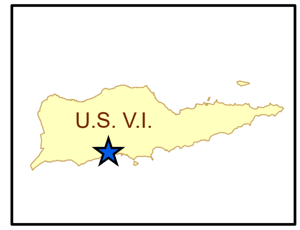

Figure 5-1
Site Inspection Sample Locations

Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Sample Locations
- Sample Location

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

- Cistern

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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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 the AOI and boundary areas is provided in Sections 6.3 and 6.4. **Tables 6-2 through 6-5** present results for 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 in **Table 6-1** below.

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

Analyte	Residential 0 to 2 ft bgs (Soil) (µg/kg)[1]	Industrial/Commercial Composite Worker 2 to 15 ft bgs (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. July 2022. Risk-Based Screening Levels in Groundwater and Soil using USEPA's Regional Screening Level Calculator. Hazard Quotient=0.1. May 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). The SLs are not applied to deep subsurface soil results (greater than 15 ft bgs) because 15 ft is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important 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 grain size, pH, and TOC were analyzed in soil sample AOI01-01-SB- [0-2]. Results showed a pH value of 7.6, and a TOC result of 56,000 milligrams per kilogram. The grain size analysis indicated 56.6% sand, 27.2% silt, 16.2% gravel, and 0% clay.

6.3 AOI 1 – TRI-MAX™ TRAINING AREA AND AFFF STORAGE AREA

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes the Tri-Max™ Training Area and AFFF Storage Area. The detected compounds are summarized in **Tables 6-2 through 6-5**. **Figures 6-1 through 6-7** present detections for relevant compounds in soil and groundwater.

6.3.1 AOI 1 – Soil Analytical Results

Tables 6-2 through 6-4 summarize the soil results. **Figures 6-1 through 6-7** present the ranges of detections in soil.

Soil was sampled at nine boring locations associated with the two potential release areas at AOI 1. Soil was sampled from three intervals at locations AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, and AOI01-07, BHAAOF-01, and BHAAOF-02. Samples were generally collected from: surface (0-2 ft bgs), shallow subsurface soil (7 to 9 ft bgs), and deep subsurface soil (11 to 15 ft bgs).

Surface soil (0-2 ft bgs) was collected from each soil boring (AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, AOI01-07, BHAAOF-01, and BHAAOF-02). Three of the five relevant PFAS compounds were detected below their SLs in the surface soil samples. PFBS and PFHxS were not detected in any of the surface soil samples. PFOA was detected below the SL of 19 μg/kg at AOI01-01, AOI01-03, AOI01-04, and AOI01-07 with the maximum concentration of 5.5 μg/kg at AOI01-04. PFNA was detected below the SL of 19 μg/kg in surface soil at all soil borings, with the maximum concentration being 10.0 μg/kg at AOI01-04.

PFOS was detected below the SL of 13 μg/kg at all soil borings, with the maximum concentration being 8.1 μg/kg at AOI01-07. Four of the five relevant PFAS compounds were detected below their SLs in the surface soil samples from BHAAOF-01 and BHAAOF-02. PFBS was not detected in any of the surface soil samples. PFHxS was detected below the screening level (SL) of 130 μg/kg at BHAAOF-02 (0.97 μg/kg). PFNA was detected below the SL of 19 μg/kg at BHAAOF-01 (0.25 μg/kg) and BHAAOF-02 (0.29 μg/kg). PFOS was detected below the SL of 13 μg/kg at BHAAOF-01 (8.3 μg/kg) and BHAAOF-02 (9.4 μg/kg) PFOA was detected below the SL of 19 μg/kg at AOI01-07 (0.84 μg/kg) and BHAAOF-01 (1 μg/kg).

Shallow subsurface soil (7-11 ft. bgs) was collected from each soil boring (AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, AOI01-07, BHAAOF-01, and BHAAOF-02). Four of the five relevant PFAS compounds were detected in shallow subsurface soil. PFBS was not detected in any of the shallow subsurface soil samples. PFHxS was detected below the SL of 1,600 μg/kg at AOI01-01 and AOI01-06 with the maximum concentration being 0.7 μg/kg at AOI01-06. PFNA was detected below the SL of 250 μg/kg at AOI01-02 and AOI01-04 with the maximum concentration of 0.75 μg/kg at AOI01-02. PFOS was detected below the SL of 160 μg/kg at AOI01-02, AOI01-04, AOI01-06, and AOI01-07 with the maximum concentration being 1.9 μg/kg at AOI01-02. PFOA was detected below the SL of 250 μg/kg at AOI01-02 and AOI01-04 with maximum concentration of 0.68 μg/kg at AOI01-04. At BHAAOF-01 and BHAAOF-02, two of the five relevant PFAS compounds were detected below the SLs in shallow subsurface soil. PFBS was not detected in any of the shallow subsurface soil samples. PFHxS was detected below the SL of 1,600 μg/kg at BHAAOF-02 with a concentration of 0.54 μg/kg. PFOS was detected below the SL of 160 μg/kg at BHAAOF-02 with a concentration of 0.34 μg/kg.

Deep subsurface soil (11-23 ft bgs) was collected from each soil boring (AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, and AOI01-07). Two of the five relevant PFAS compounds were detected in deep subsurface soil. PFBS, PFHxS, and PFNA were not detected in any of the deep subsurface soil samples. At AOI01-02, PFOA was detected with a value of 0.31 μg/kg, and PFOS was detected with a value of 0.4 μg/kg. At BHAAOF-01 and BHAAOF-02, none of the relevant PFAS compounds were detected.

6.3.2 AOI 1 – Groundwater Analytical Results

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

Groundwater was sampled from seven temporary monitoring wells and two cisterns associated with the two potential release areas at AOI 1 (the cisterns are not known to be in communication with groundwater, but rather fill with rainwater captured by the roof of the hangar). These temporary well locations consist of AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, and AOI01-07, and the two cistern locations consist of BHCIST-01 and BHCIST-02. Each of the five relevant PFAS compounds were detected at AOI 1, four of these compounds being detected above their respective SLs (PFHxS, PFNA, PFOS, and PFOA).

PFHxS was detected above the SL of 39 ng/L at all temporary wells except for AOI01-05 where it was detected below the SL. PFHxS was not detected in samples from either cistern. The maximum exceedance concentration detected was 140 ng/L at AOI01-04.

PFNA was detected above the SL of 6 ng/L at AOI01-04 (7.4 ng/L) and AOI01-07 (10 ng/L), and was detected below the SL at all other temporary well locations. PFNA was not detected in samples from either cistern.

PFOS was detected above the SL of 4 ng/L at all monitoring wells, the maximum exceedance concentration being 280 ng/L at AOI01-04. PFOS was not detected in samples from either cistern.

PFOA was detected above the SL of 6 ng/L at all temporary wells except for AOI01-02 and AOI01-03, where it was detected below the SL. The maximum exceedance concentration was found to be 31 ng/L at AOI01-07. PFOA was detected below the SL in both cisterns, at 0.76 ng/L at BHCIST-02 and 0.59 ng/L at BHCIST-01. PFOA is the only relevant compound that was detected in the two cisterns.

PFBS was detected below the SL of 601 ng/L in samples from each of the seven monitoring wells and was not detected in samples from either of the two cisterns. The maximum concentration detected was 20 ng/L from AOI01-04.

Each of the five relevant PFAS compounds were detected at locations BHAAOF-01 and BHAAOF-02, three of these compounds being detected above their respective SLs.

PFBS was detected below the SL of 601 ng/L in samples from both of the temporary monitoring wells, with concentrations of 25 ng/L at BHAAOF-01 and 78 ng/L at BHAAOF-02.

PFHxS was detected above the SL of 39 ng/L at both temporary monitoring wells, with concentrations of 190 ng/L at BHAAOF-01 and 570 ng/L at BHAAOF-02.

PFNA was detected below the SL of 6 ng/L at both wells, with concentrations of 1.9 ng/L at BHAAOF-01 and 1.3 ng/L at BHAAOF-02.

PFOS was detected above the SL of 4 ng/L at both wells, with concentrations of 320 ng/L at BHAAOF-01 and 300 ng/L at BHAAOF-02.

PFOA was detected above the SL of 6 ng/L at both wells, with concentrations of 16 ng/L at BHAAOF-01 and 38 ng/L at BHAAOF-02.

6.3.3 AOI 1 – Conclusions

Based on the results of the SI, four of the five relevant compounds, PFOA, PFOS, PFHxS, and PFNA, were detected in soil below their respective SLs. The surface soil samples had the most detections, while the deep subsurface soil samples had the fewest. PFOA, PFOS, and PFNA were detected below their SLs in surface soil. PFOA, PFOS, PFHxS, and PFNA were detected below their SLs in shallow subsurface soil. PFOA and PFOS were detected below their SLs in deep subsurface soil. Since no SL exceedances occurred throughout the sampled soil profile, no further evaluation of soil at AOI 1 is necessary.

Four of the five relevant compounds, PFHxS, PFNA, PFOS, and PFOA, were detected above their respective SLs in groundwater samples from AOI 1. PFBS was detected below the SL. In both cistern samples, PFOA was detected below the SL, and none of the other relevant compounds were detected. Since SL exceedances occurred in samples from several of the temporary monitoring wells, further evaluation of the groundwater at AOI 1 is warranted. Since no SL exceedances occurred within the cistern samples, no further evaluation of the water within the cisterns is necessary.

As for the samples collected from BHAAOF-01 and BHAAOF-02, three of the five relevant compounds, PFOS, PFHxS, and PFNA, were detected in soil below their respective SLs. The surface soil samples had the most detections, while the deep subsurface soil samples had the fewest. PFHxS, PFOS, and PFNA were detected below their SLs in surface soil. PFHxS and PFOS were detected below their SLs in shallow subsurface soil. None of the relevant compounds were detected in deep subsurface soil. Since no SL exceedances occurred throughout the sampled soil profile, no further evaluation of soil at the Facility is necessary.

PFHxS, PFOS, and PFOA were detected in groundwater above their respective SLs between BHAAOF-01 and BHAAOF-02, and PFBS and PFNA below their SLs. Since SL exceedances occurred in the groundwater of both temporary monitoring wells, further evaluation of groundwater and the Facility boundary is warranted.

6.4 CISTERN SAMPLING RESULTS

Sampling of water from both cisterns onsite was performed under the direction of the ARNG in June 2017 to assess the potential presence of PFAS in the drinking water source. One sample was collected from each cistern and analyzed using USEPA Modified Method 537. A total of 18 PFAS compounds were analyzed for, and only six PFAS analytes were detected; all other analytes were non-detect. Samples were collected from these two cisterns again on 13 April 2023 to continue to assess presence of PFAS in the cisterns. PFAS concentrations below SLs were reported in samples. The cisterns are not currently being used as a drinking water source.

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

	Location ID	AOI01-01		AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05	
	Sample Name	AOI01-01-SB-0-2		BHAAOF-DUP-SB-01		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI01-05-SB-0-2	
	Parent Sample ID			AOI01-01-SB-0-2									
	Sample Date	4/11/2023		4/11/2023		4/11/2023		4/11/2023		4/11/2023		4/11/2023	
	Sample Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	3.4		3.2		0.93		3.9		10		0.51	J
Perfluorooctanesulfonic acid (PFOS)	13	4	J+	4.4	J+	3.4	J+	3.1	J+	1.7	J+	2.4	J+
Perfluorooctanoic acid (PFOA)	19	2	J+	1.9	J+	ND	U	2.5	J+	5.5		ND	U

Notes:

1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
J = Estimated concentration.
J+ = Estimated concentration, biased high.
LC/MS/MS = Liquid chromatography tandem mass spectrometry
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
PFAS = Per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
Qual = Qualifier.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit
Values exceeding the Screening Level are shaded gray.

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

	Location ID	AOI01-05		AOI01-06		AOI01-07		BHAAOF-01		BHAAOF-02		BHAAOF-02	
	Sample Name	BHAAOF-DUP-SB-02		AOI01-06-SB-0-2		AOI01-07-SB-0-2		BHAAOF-01-SB-0-2		BHAAOF-02-SB-0-2		BHAAOF-DUP-SB-03	
	Parent Sample ID	AOI01-05-SB-0-2										BHAAOF-02-SB-0-2	
	Sample Date	4/11/2023		4/11/2023		4/11/2023		4/11/2023		4/11/2023		4/11/2023	
	Sample Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	ND	U	ND	U	ND	U	ND	U	0.97	J+	1.2	J+
Perfluorononanoic acid (PFNA)	19	0.34	J	0.41	J	1.1		2.7		0.25	J	0.29	J
Perfluorooctanesulfonic acid (PFOS)	13	1.9	J+	4.7	J+	8.1	J+	2.9	J+	8.3	J+	9.4	J+
Perfluorooctanoic acid (PFOA)	19	ND	U	ND	U	0.84	J+	1	J+	ND	U	ND	U

Notes:

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

2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

µg/kg = Microgram(s) per kilogram.

ft bgs = Feet below ground surface.

J = Estimated concentration.

J+ = Estimated concentration, biased high.

LC/MS/MS = Liquid chromatography tandem mass spectrometry

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

PFAS = Per- and polyfluoroalkyl substances

QSM = Quality Systems Manual

Qual = Qualifier.

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

Values exceeding the Screening Level are shaded gray.

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

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06		AOI01-07		BHAAOF-01		BHAAOF-02	
	Sample Name	AOI01-01-SB-7-8		AOI01-02-SB-7-9		AOI01-03-SB-7-9		AOI01-04-SB-7-9		AOI01-05-SB-7-9		AOI01-06-SB-7-9		AOI01-07-SB-7-9		BHAAOF-01-SB-7-9		BHAAOF-02-SB-9-11	
	Parent Sample ID																		
	Sample Date	4/12/2023		4/12/2023		4/12/2023		4/13/2023		4/14/2023		4/15/2023		4/15/2023		4/13/2023		4/14/2023	
	Sample Depth (ft bgs)	7-8		7-9		7-9		7-9		7-9		7-9		7-9		7-9		9-11	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																			
Perfluorobutanesulfonic acid (PFBS)	25000	ND	UJ	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	0.45	J	ND	U	ND	U	ND	U	ND	U	0.7	J-	ND	U	ND	U	0.54	J-
Perfluorononanoic acid (PFNA)	250	ND	UJ	0.75		ND	U	0.23	J	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	ND	UJ	1.9		ND	U	0.26	J	ND	U	1.4		0.25	J	ND	U	0.34	J
Perfluorooctanoic acid (PFOA)	250	ND	UJ	0.31	J	ND	U	0.68		ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
J = Estimated concentration.
J- = Estimated concentration, biased low.
LC/MS/MS = Liquid chromatography tandem mass spectrometry
ND = Analyte not detected above the LOD (LOD values are presented in
PFAS = Per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
Qual = Qualifier.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted LOD. However, the reported adjusted detection limit is approximate and may be inaccurate or imprecise.
Values exceeding the Screening Level are shaded gray.

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

Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06		AOI01-07		BHAAOF-01		BHAAOF-02	
Sample Name	AOI01-01-SB-13-15		AOI01-02-SB-11-13		AOI01-03-SB-13-15		AOI01-04-SB-13-15		AOI01-05-SB-13-15		AOI01-06-SB-11-13		AOI01-07-SB-12-14		BHAAOF-01-SB-13-15		BHAAOF-02-SB-21-23	
Parent Sample ID																		
Sample Date	4/12/2023		4/12/2023		4/12/2023		4/13/2023		4/14/2023		4/15/2023		4/15/2023		4/13/2023		4/14/2023	
Sample Depth (ft bgs)	13-15		11-13		13-15		13-15		13-15		11-13		12-14		13-15		21-23	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																		
Perfluorobutanesulfonic acid (PFBS)	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	ND	U	0.4	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	ND	U	0.31	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
J = Estimated concentration.
LC/MS/MS = Liquid chromatography tandem mass spectrometry
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
PFAS = Per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
Qual = Qualifier.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).

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

	Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06	
	Sample Name	AOI01-01-GW		AOI01-02-GW		BHAAOF-DUP-GW-02		AOI01-03-GW		AOI01-04-GW		AOI01-05-GW		AOI01-06-GW	
	Parent Sample ID					AOI01-02-GW									
	Sample Date	4/13/2023		4/13/2023		4/13/2023		4/13/2023		4/13/2023		4/14/2023		4/15/2023	
Analyte	**Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)															
Perfluorobutanesulfonic acid (PFBS)	601	17		11		11		10		20		6.1		17	
Perfluorohexanesulfonic acid (PFHxS)	39	130		58		58		53		140		33	J-	130	
Perfluorononanoic acid (PFNA)	6	2.7		0.63	J	0.71	J	ND	UJ	7.4		5.6		1.3	J
Perfluorooctanesulfonic acid (PFOS)	4	130		62		60		69	J+	280		110		130	
Perfluorooctanoic acid (PFOA)	6	13		2.2		2.3		2.1	J+	20		9.9	J-	7.9	

Notes:

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

J = Estimated concentration.
J- = Estimated concentration, biased low.
J+ = Estimated concentration, biased high.
LC/MS/MS = Liquid chromatography tandem mass spectrometry
ng/L = Nanogram(s) per liter.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
PFAS = Per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
Qual = Qualifier.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted LOD. However, the reported adjusted detection limit is approximate and may be inaccurate or imprecise.
Values exceeding the Screening Level are shaded gray.

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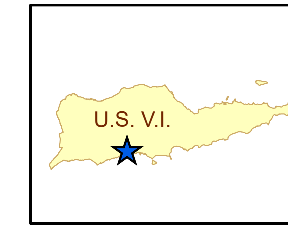
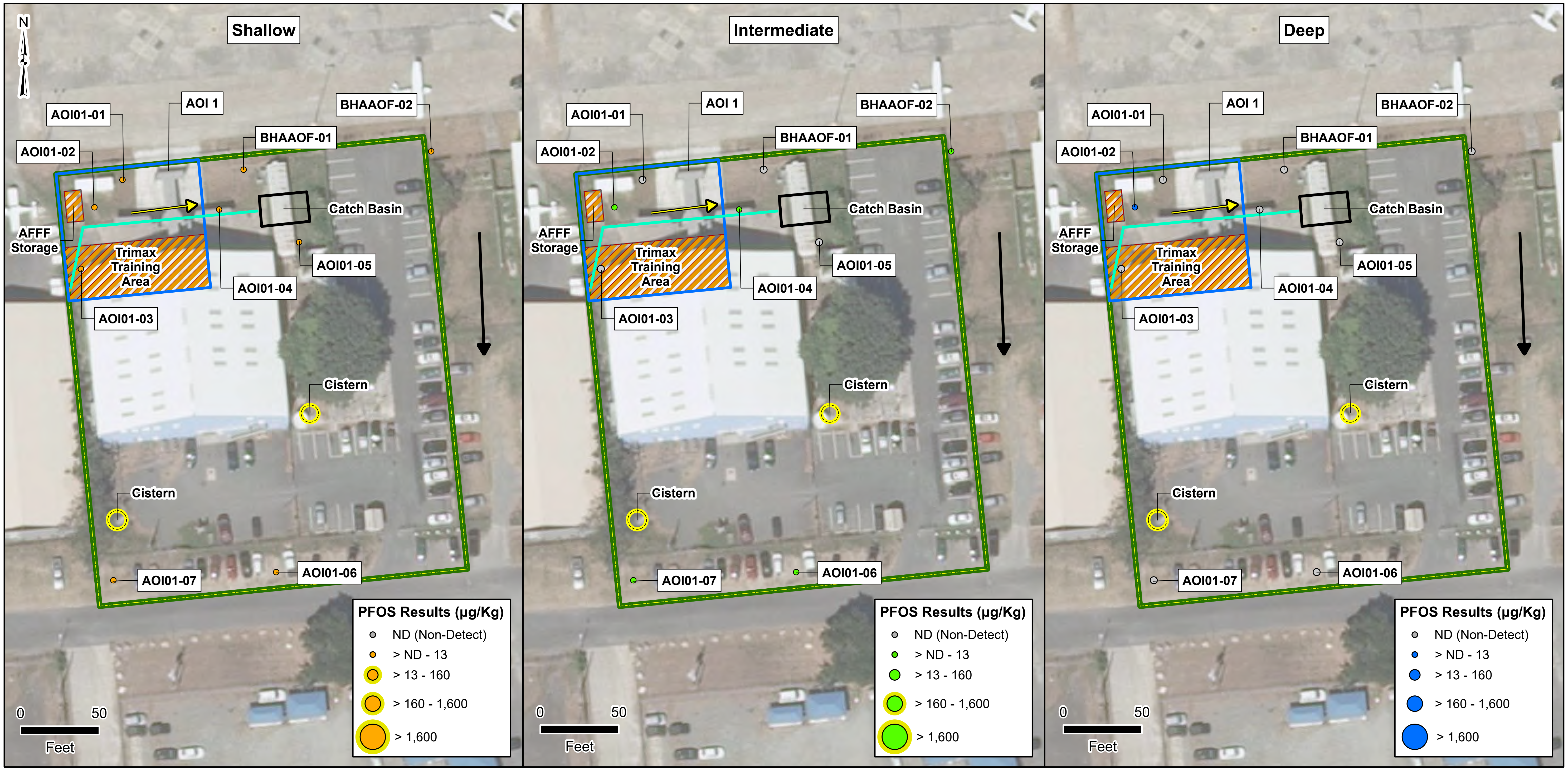
Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

Figure 6-1
AOI 1
PFOS Detections in Soil





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

Cistern

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 2021
AECOM 2020

Date:..........................August 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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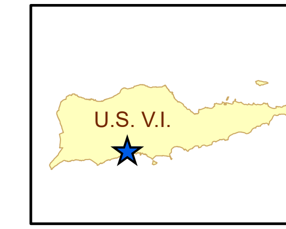
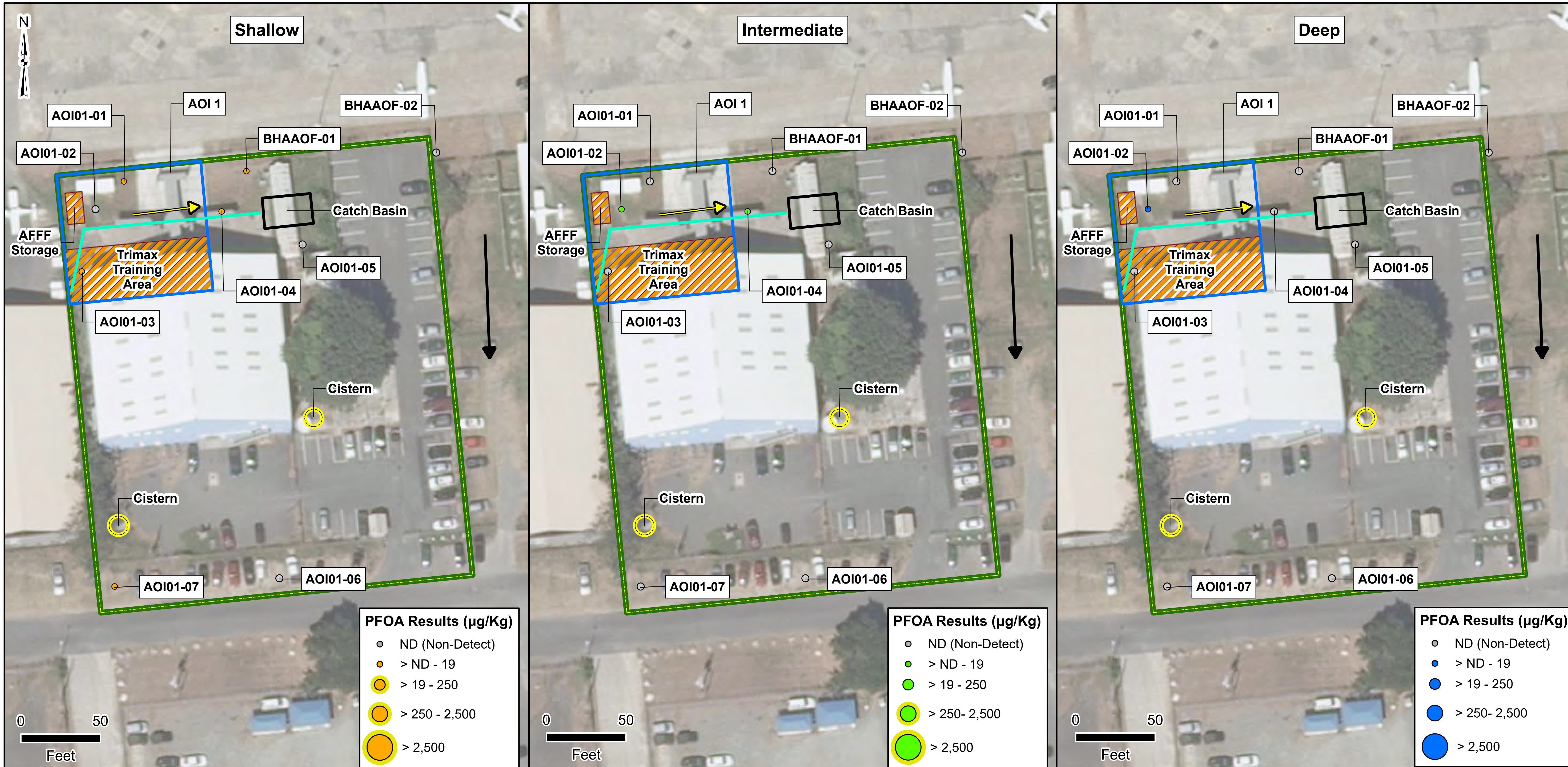
Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

Figure 6-2
AOI 1
PFOA Detections in Soil





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

- Cistern

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 2021
AECOM 2020

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Prepared For:...................USACE
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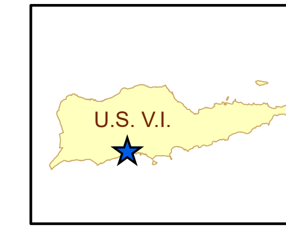
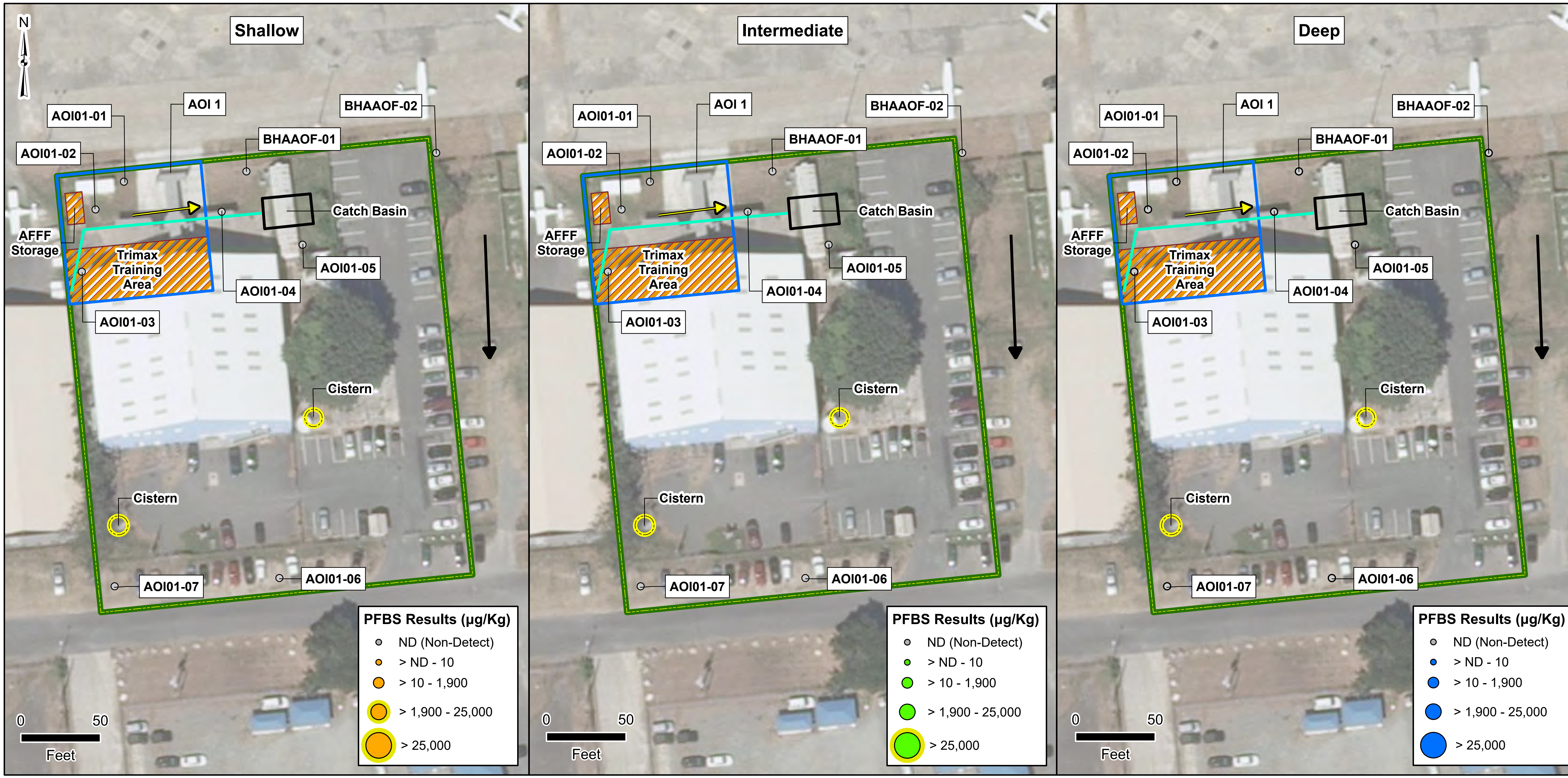
Figure 6-3
AOI 1
PFBS Detections in Soil





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

- Cistern

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 2021
AECOM 2020

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Prepared For:....................USACE
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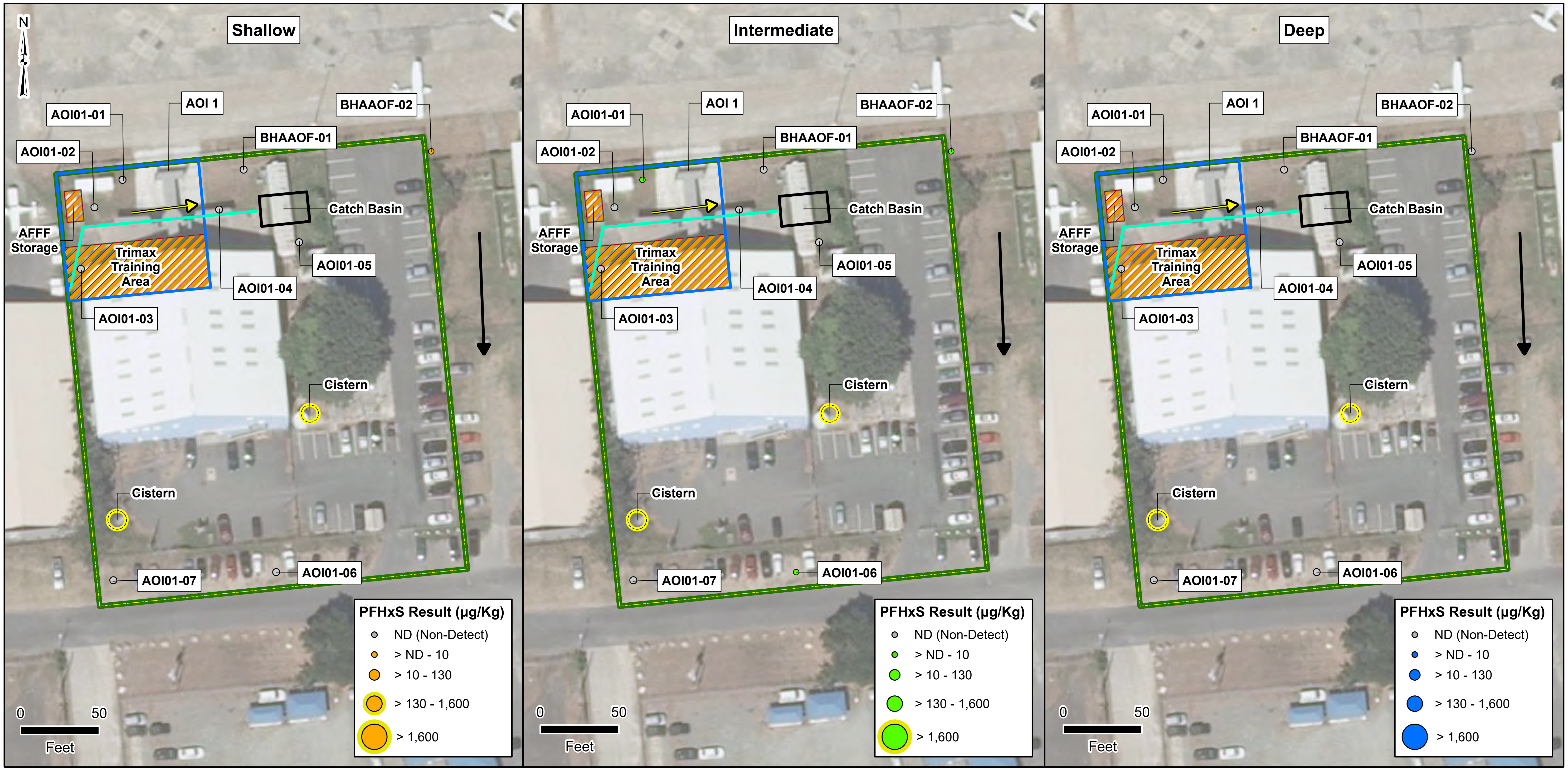
Figure 6-4
AOI 1
PFHxS Detections in Soil



Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology

- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

- Cistern

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 2021
AECOM 2020

Date:..........................August 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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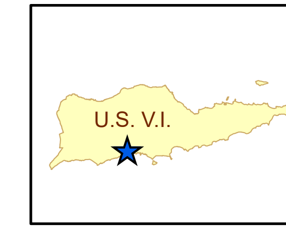
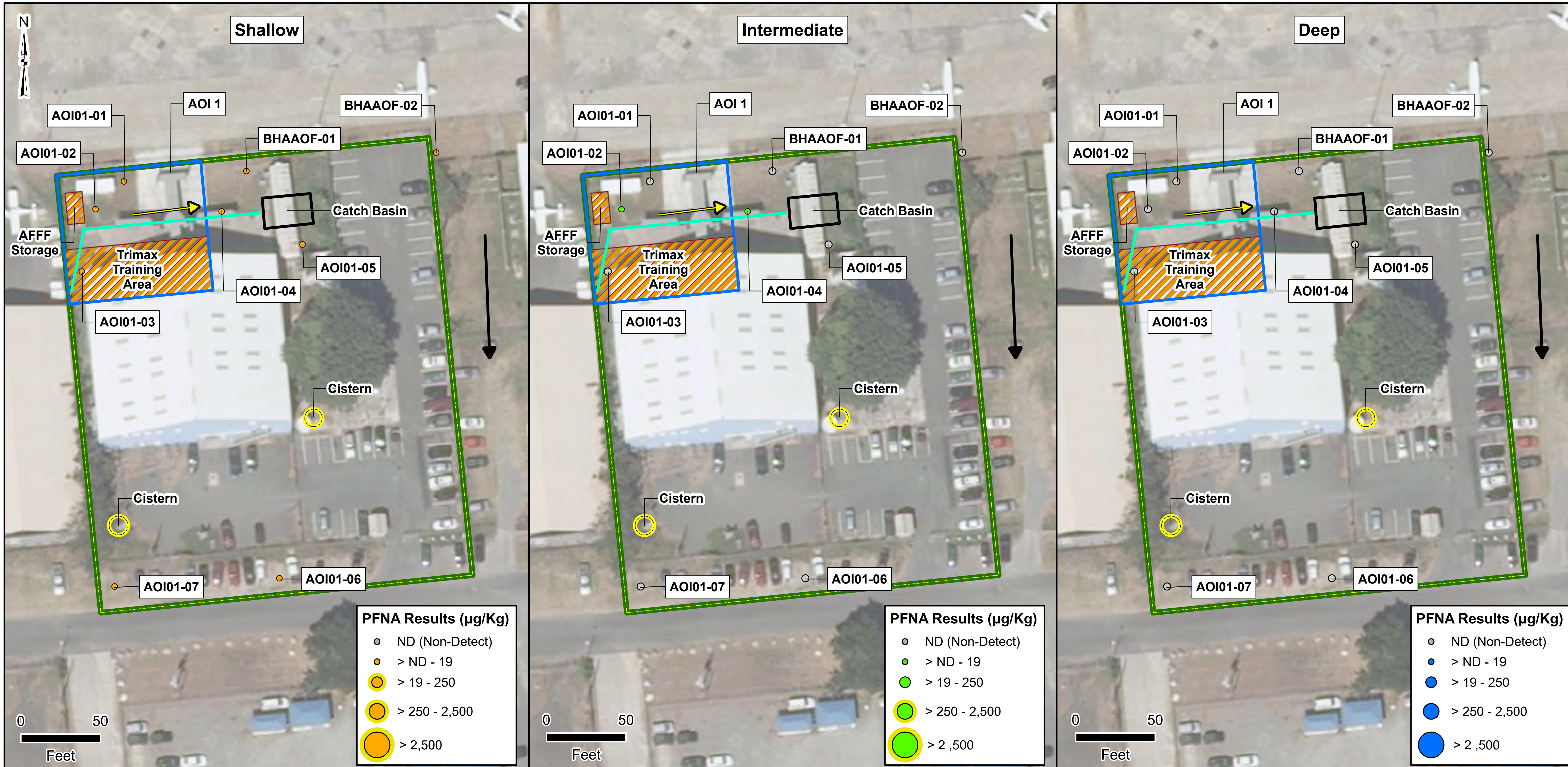
Figure 6-5
AOI 1
PFNA Detections in Soil





Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology

- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

- Cistern

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 2021
AECOM 2020

Date:..........................August 2023
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Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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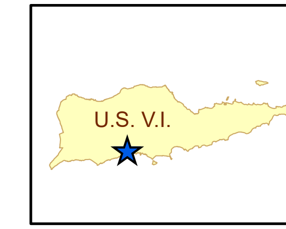
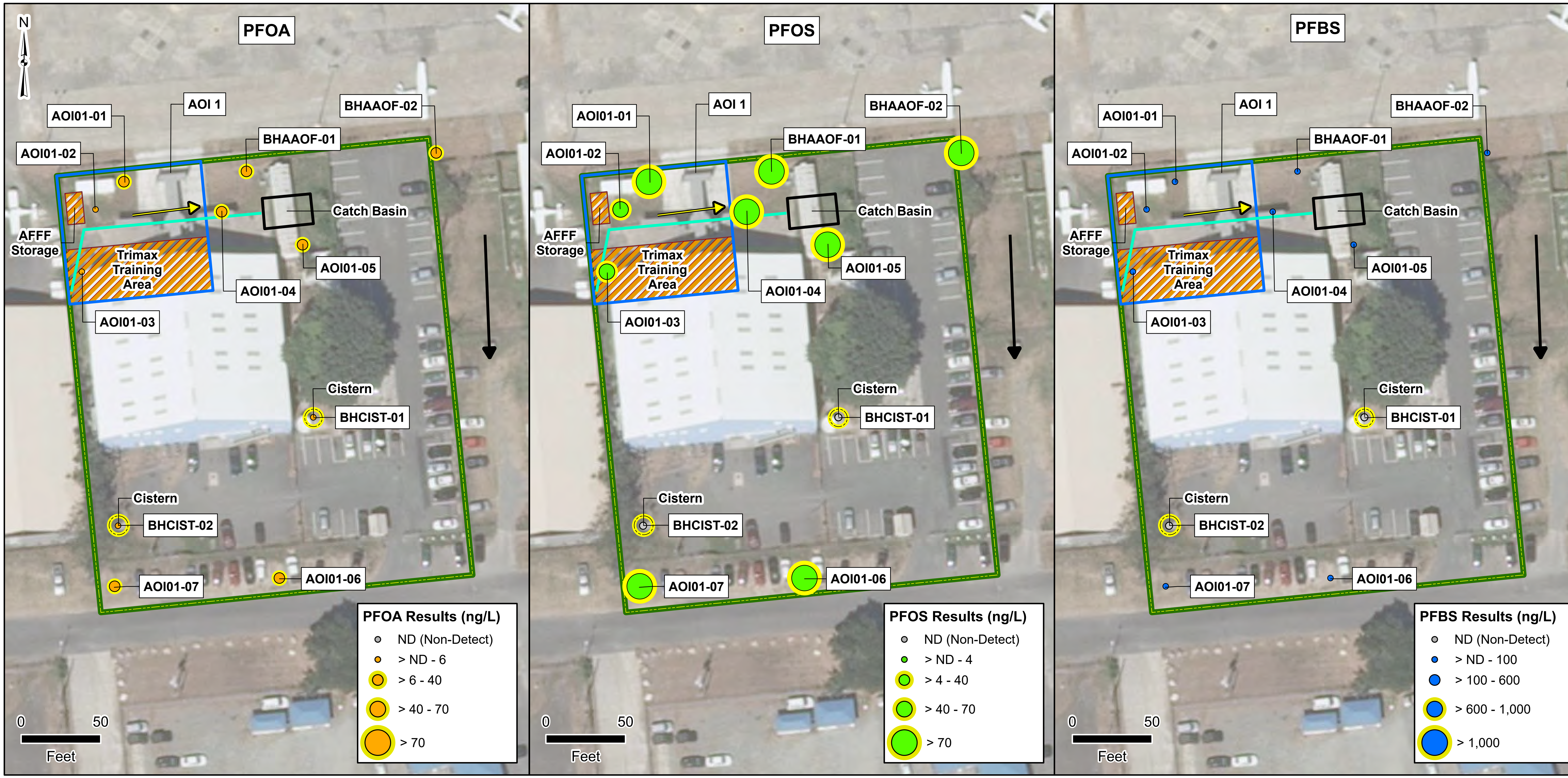
Figure 6-6
AOI 1
PFOA, PFOS and PFBS Detections in Groundwater





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Stormwater Drainage Flow Direction
- Drain
- Catch Basin

Cistern

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

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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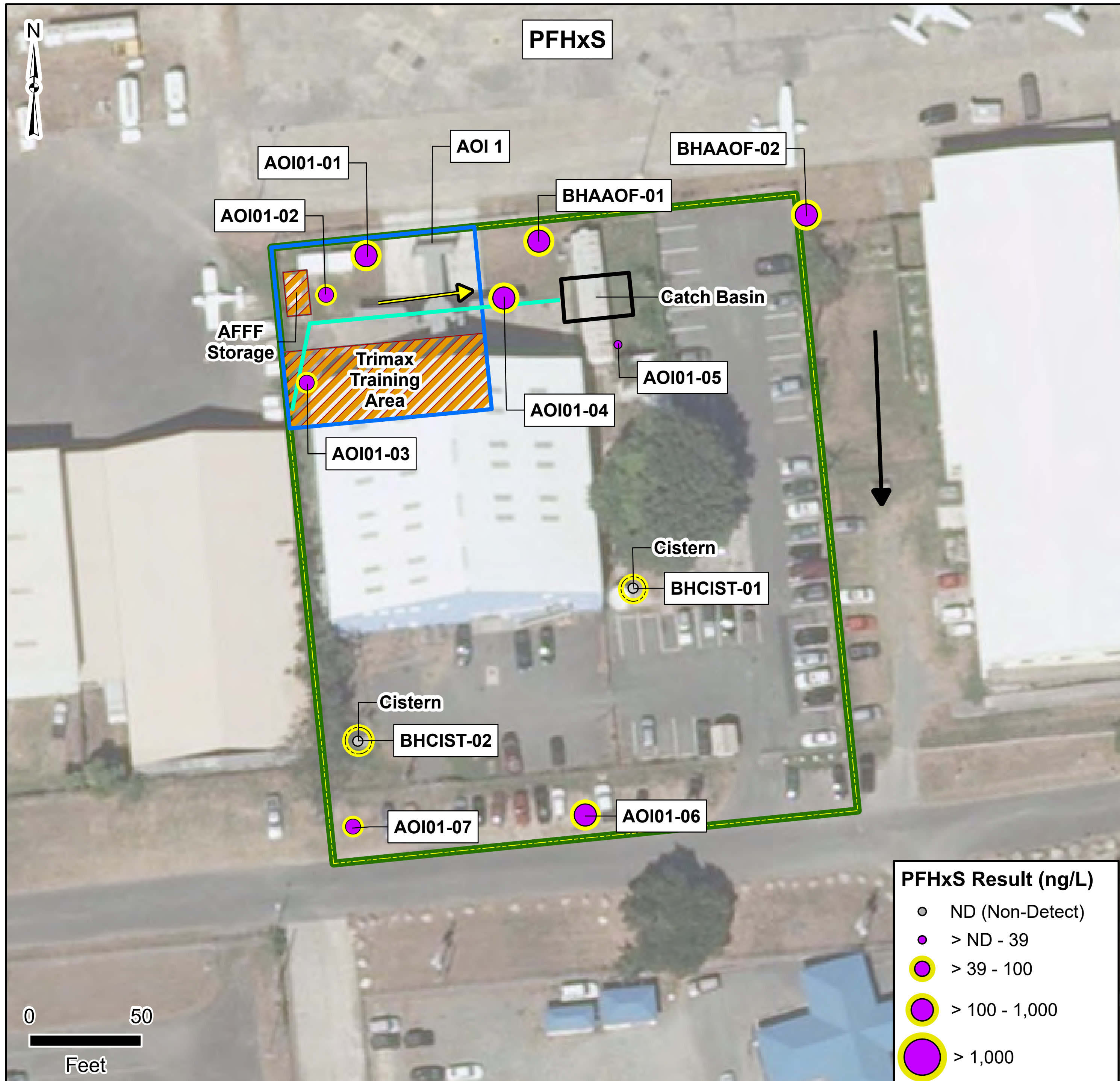
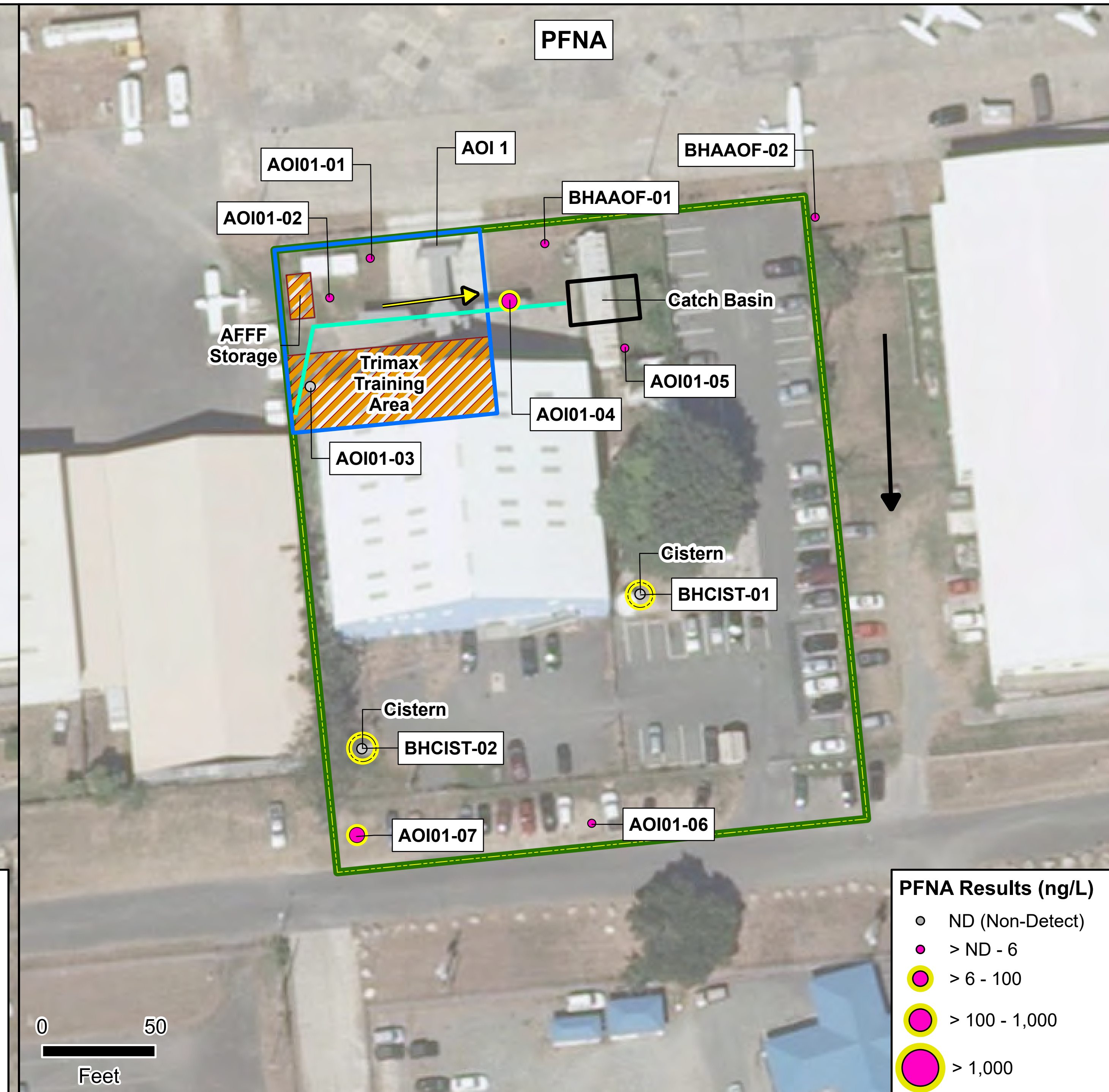
Army National Guard Site Inspections
Site Inspection Report
Blair Hangar, St. Croix, U.S. Virgin Islands

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





Facility Data
Facility Boundary
Area of Interest
Potential PFAS Release

Hydrology/Hydrogeology
Groundwater Flow Direction
Stormwater Drainage Flow Direction
Drain
Catch Basin

Cistern

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

Data Sources:
ESRI 2021
AECOM 2020

Date:..........................August 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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7. EXPOSURE PATHWAYS

The conceptual site model (CSM) for the AOI, revised 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 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
5. Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figure uses an empty circle symbol to represent an incomplete exposure pathway. Areas with no identified complete 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 CSM indicates 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 Facility workers, construction workers, and trespassers at the Facility.

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 – Tri-Max™ Training Area and AFFF Storage Area

From approximately 2000 to 2016, fire training exercises that may have included the release of AFFF occurred at the potential release areas associated with AOI 1, the Tri-Max™ Training Area and the AFFF Storage Area. AFFF was also stored in chemical storage sheds located in the northwestern portion of the Facility, and potential incidental spills may have occurred at AOI 1. PFOS, PFOA, PFNA, and PFHxS were detected below their respective SLs in soil at AOI 1. Based on the results of the SI in AOI 1, ground-disturbing activities to surface soil could result in Facility worker and construction worker exposure to the present relevant compounds via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for Facility workers and construction workers are considered partially complete. The CSM is presented on **Figure 7-1**.

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1 – Tri-Max™ Training Area and AFFF Storage Area

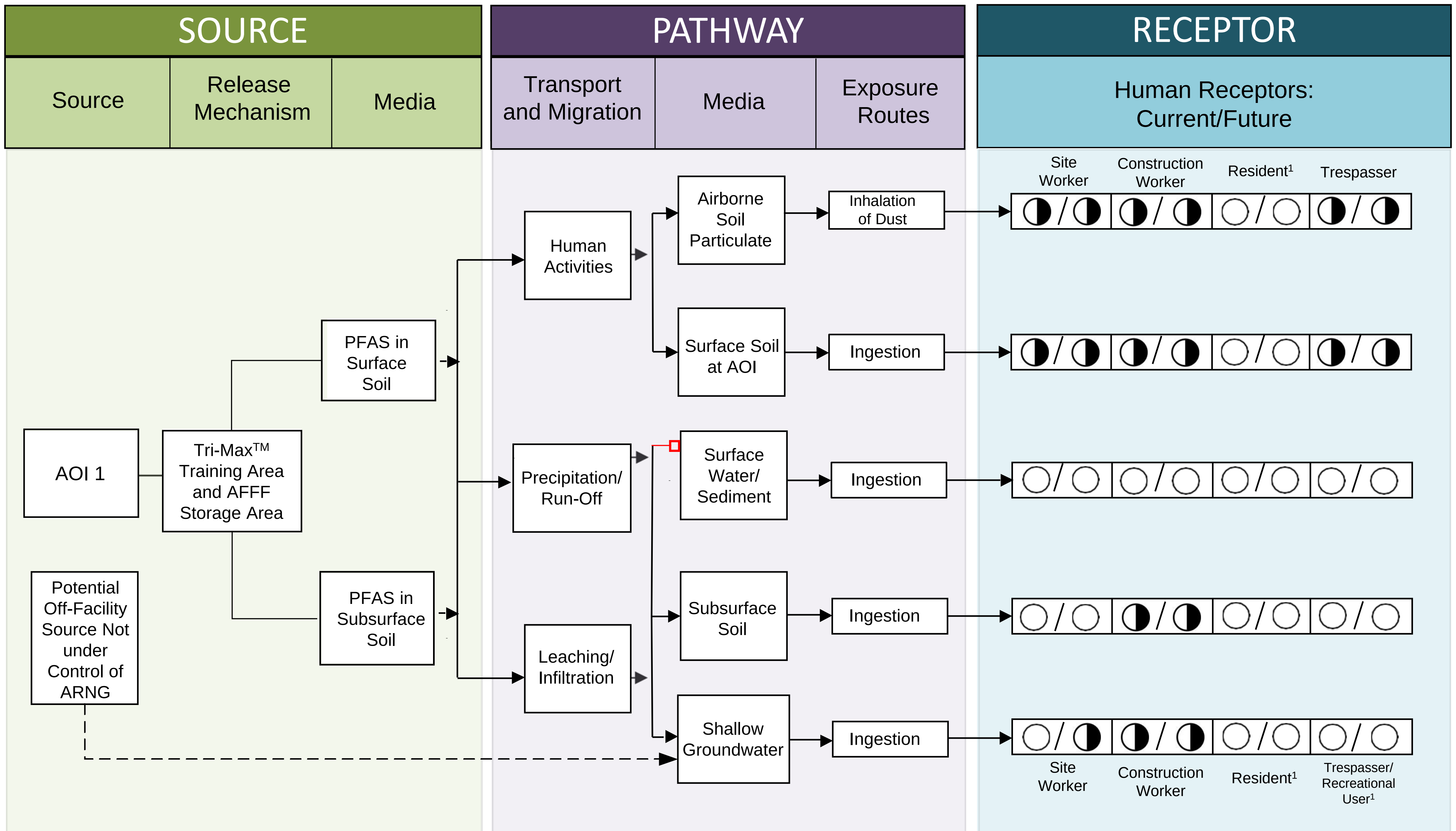
During the time of potential PFAS release associated with AOI 1, expended AFFF was rinsed into the drain system surrounding the northern end of the apron, and it was noted on a site visit that the French drains extended into the grassy area surrounding the hangar apron. PFAS may have been washed into the grassy areas surrounding the apron where it could eventually infiltrate shallow groundwater. Since groundwater was found to be at depths less than 15 ft bgs, the groundwater ingestion exposure pathway for Facility workers and construction workers is considered partially complete. It is also notable that drinking water consumption from the on-site cisterns is not actively occurring at this time, but results of the SI did determine that PFOA was present in both cisterns at concentrations below the SL. Since groundwater wells located nearby the Facility are located either upgradient or side-gradient of the Facility, the pathway for PFAS exposure to off-facility residents via ingestion of groundwater is considered incomplete. The CSM is presented on **Figure 7-1**.

7.3 SURFACE WATER/SEDIMENT EXPOSURE PATHWAY

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

7.3.1 AOI 1 – Tri-Max™ Training Area and AFFF Storage Area

Limited surface water features exist on St. Croix, and the closest stream feature to the Facility is the River Gut system, which is approximately 0.75 miles to the north. Storm runoff is usually a significant part of stream flow on the island and runoff peaks in the hours after the start of a storm and recede rapidly. There are no surface water features within the Facility boundary (AECOM 2020) and drainage connects to the sewer system. Due to the limited surface water movement within the Facility boundary and near the Facility, the pathway for PFAS exposure to receptors via ingestion of surface water or sediment is considered incomplete. The CSM is presented on **Figure 7-1**.



LEGEND

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

Notes:

1. The resident receptor refer to off-site resident.

Figure 7-1
Conceptual Site Model
AOI 1 Blair Hangar AAOF

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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

The SI field activities at the Facility were conducted from 10 to 17 April 2023. The SI field activities included soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a).

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 PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 as follows:

- Twenty-seven (27) soil samples from 9 soil boring locations
- Eleven (11) grab groundwater samples from 9 temporary well locations and 2 cisterns
- Twenty-two (22) 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 AOIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOIs, which are described in Section 7.

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA in the form of an RI is warranted for AOI 1. Based on the CSMs developed and revised based on the SI findings, there is potential for exposure to soil and groundwater from releases during historical DoD activities at the Facility, and potentially from off-facility sources. Sample 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:
  - Four of the five relevant compounds (PFOS, PFOA, PFNA, and PFHxS) were detected in groundwater above their respective SLs in the source areas and near the Facility boundary at AOI 1. PFBS was detected at concentrations below the SL.

— Four of the five relevant compounds (PFOS, PFOA, PFNA, and PFHxS) were detected below their respective SLs in the soil profile.

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	Future Action
1	Tri-Max™ Training Area and AFFF Storage Area	◑	●	Proceed to RI

Legend:

● = Detected; exceedance of screening levels

◑ = Detected; no exceedance of screening levels

○ = Not detected

Note:

AFFF = Aqueous film-forming foam

9. REFERENCES

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