FINAL
Site Inspection Report
Fargo Army Aviation Support Facility #2
Fargo, North Dakota

Site Inspection for Perfluorooctanoic Acid (PFOA), Perfluorooctanesulfonic Acid (PFOS), Perfluorohexanesulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Hexafluoropropylene Oxide Dimer Acid (HFPO-DA), and Perfluorobutanesulfonic Acid (PFBS)
ARNG Installations, Nationwide

October 2023

Prepared for:

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

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
%	Percent
µg/kg	Microgram(s) per kilogram
µg/L	Microgram(s) per liter
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous Film Forming Foam
amsl	Above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
bgs	Below ground surface
bmsl	Below mean sea level
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	Direct-push technology
DQI	Data quality indicator
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EIS	Extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
FTA	Fire Training Area
GPR	Ground-penetrating radar
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
HQ	Hazard Quotient

IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	Liquid chromatography tandem mass spectrometry
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LLC	Limited Liability Company
LOQ	Limit of quantification
MS	Matrix spike
MSD	Matrix spike duplicate
NDANG	North Dakota Air National Guard
NDARNG	North Dakota Army National Guard
NDDEQ	North Dakota Department of Environmental Quality
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
No.	Number
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PVC	polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RI	Remedial investigation
RPD	Relative percent difference
SI	Site Inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning

UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment & Infrastructure, Inc.

EXECUTIVE SUMMARY

The Army National Guard (ARNG) G-9 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 regarding Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (Assistant Secretary of Defense, 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), 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 used, 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 a comparison of SI results to screening levels (SLs) for the relevant compounds. This SI was completed at the Fargo Army Aviation Support Facility (AASF) #2 in Fargo, North Dakota and determined that no further investigation by DoD (ARNG G-9) is warranted for AOI 1: Hangar. The Fargo AASF #2 will be referred to as the "Facility" throughout this document.

The Facility, operated by North Dakota ARNG (NDARNG), encompasses approximately 0.40 acres in Fargo, North Dakota. The Facility is in Cass County, approximately one mile northwest of Fargo, North Dakota. The Facility is surrounded on all sides by the Hector International Airport. Fargo AASF #2 is constructed on a parcel of land that is owned by the Hector International Airport, under an operational lease by Fargo Jet Center Limited Liability Company (LLC), and has been operated by the NDARNG from 2012 to present (AECOM Technical Services, Inc. [AECOM], 2020).

The PA identified one AOI for investigation during the SI phase. SI sampling results from the AOI were compared to OSD SLs. **Table ES-2** summarizes the SI results for the AOI. Based on the results of this SI, and following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, further evaluation of the contamination of groundwater confirmed at the Facility is warranted. However, surface soil data suggests the source(s) of contamination is not the result of NDARNG activities at the Facility. Therefore, no further investigation by DoD (ARNG G-9) is warranted at this time.

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

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

Analyte[1,2]	Residential (Soil) (µg/kg)[1] (0-2 feet bgs)	Industrial / Commercial Composite Worker (Soil) (µg/kg)[1] (2-15 feet 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 in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ)=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.

Abbreviations:
µg/kg = microgram(s) per kilogram
bgs = below ground surface
ng/L = nanogram(s) per liter

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

AOI	Potential Release Area	Soil – Adjacent to Potential Source Area[1]	Groundwater – Adjacent to Potential Source Area[1,2]	Future Action
1	Hangar	◐	●	No Further Action

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

1 All samples collected to assess AOI were collected adjacent to the potential source area and were located off-Facility.
2 Groundwater exceedance not associated with DoD release; no further action by ARNG G-9.

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) 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 regarding Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (Assistant Secretary of Defense, 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum are 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)[1]. The ARNG performed this SI at the Fargo Army Aviation Support Facility (AASF) #2 in Fargo, North Dakota. The Fargo AASF #2 is also referred to as the "Facility" throughout this report.

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

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Fargo AASF #2 (AECOM Technical Services, Inc. [AECOM], 2020) that identified one Area of Interest (AOI) where PFAS-containing materials may have been used, stored, disposed, or historically released. 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.

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

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The Facility is in Cass County, approximately one mile northwest of Fargo, North Dakota and is surrounded on all sides by the Hector International Airport (**Figure 2-1**). The Facility is accessible from North University Drive from the east and 19th Avenue North from the south. The Facility is constructed on a parcel of land that has been leased from the Fargo Jet Center LLC since 2012 on two separate leases, one from 2012 to 2015, and the current one from 2016 to present. The current lease ends on 30 September 2023 with the option of two more one-year lease extensions. Before 2012, the Fargo Jet Center LLC leased the site to other operators who used the hangar facility for aircraft and other equipment storage. Fargo AASF #2 consists of one hangar and one administrative building, which is a portion of a larger building complex with other users or operators not associated with NDARNG.

2.2 FACILITY ENVIRONMENTAL SETTING

The Facility is surrounded on all sides by the Hector International Airport, with the airfield located just northwest of the Facility. The 119th Wing of the North Dakota Air National Guard (ANG), Hector Field ANG Base, is located approximately 1000 feet northeast of the Facility. The land just north of the Hector ANG Base consists of several cemeteries. The areas beyond the airport property are residential and commercial to the east and south and agricultural to the north and west. The Facility lies within the Red River Valley of North Dakota, which is characterized by glacial lake sediments. The Facility is approximately 2 miles west of the Red River and approximately 5 miles southwest of the Sheyenne River. The elevation of the Facility is approximately 904 feet above mean sea level (amsl) (AECOM, 2020).

The following sections include information on geology, hydrogeology, hydrology, climate, current and future land use, sensitive habitat, and threatened/endangered species. The topography and the Facility are 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 Facility lies within the southeastern side of the state of North Dakota, in Cass County, within the Drift Prairie area and the Red River Valley. Fargo is a part of the Central Lowland, which is covered with glacial deposits. In the glacial deposits in Cass County, there are four major surface units; they are defined as ground moraine, lake plain, shore, and deltaic deposits. Ground moraine can be found within the first 20 feet below the surface and is composed of till, silt, gravel, sand, heterogeneous mixture of clay, and boulders with clay and silt predominating. The lake plain deposits consist of silt and clay that can be found as two separate layers in the lake plain deposit. The silt unit comprises the surface deposits with a lower-level clay unit. The two layers are marked by desiccation and vegetal remnant. The deposits known as “shore” border the lake plain on the west side and consist of silt, clay, sand, and gravel. They are typically the smallest layer and only range to 15 feet maximum depth. Deltaic deposits consist of fine to medium sand and silt and can range to 120 feet deep. These four layers overlie sedimentary

rocks from the Cretaceous age, except in places where the Cretaceous shale eroded, in which case, the layers sit on Precambrian crystalline rocks (AECOM, 2020).

The underlying rock from the glacial deposits consist of three Cretaceous bedrock units that can be defined as the Greenhorn Formation, Graneros Shale, and Dakota Sandstone, altogether lying 200-650 feet below the surface. In a few areas, Precambrian crystalline rocks can be found, consisting of red and green clay derived from granite, but these rocks are only found at depths over 900 feet below ground surface (North Dakota Geological Survey, 1949; AECOM, 2020). During the SI, five borings were advanced between 6 to 15 feet (ft) below ground surface (bgs). The soil was classified as clay containing some fine materials at all boring locations with the exception being a sand layer encountered from 4.5 to 5 ft bgs at AOI01-02. The grain size analysis conducted on the soil samples collected from the AOI confirms the field observation of fine-grained soils consisting of clay and silt.

2.2.2 Hydrogeology

The Facility is just east of the Red River of the North Drainage Basin, located to the west and northwest of several surficial aquifers (West Fargo North, West Fargo South, Nodak, and Fargo Aquifers). North Dakota's surficial aquifers consist of sand and gravel. The surficial aquifers range from tens to hundreds of feet thick and are quite discontinuous (North Dakota Environmental Quality, 2021). The recharge to the aquifers can happen in two possible ways: through precipitation from upland areas and water that comes from the sandstone layers, as it moves laterally into the recharge areas, and from percolation in gravel aquifers, which extends into lake deposits resting on underlying till (North Dakota Geological Survey, 1968; AECOM, 2020).

The groundwater within the Nodak aquifer flows into the Fargo, West Fargo North and the West Fargo South Aquifers (Ripley, 2000; AECOM, 2020). No potable water wells are located within the boundary of the Facility; however, monitoring/observation, domestic, and commercial wells exist within 2 miles of the Facility. The closest commercial well is approximately 0.8 miles north of the Facility.

Depth to groundwater at the Facility as measured in May 2022 during the SI ranged from 2.1 to 3.7 ft bgs. Synoptic water level measurements taken from temporary monitoring wells during the SI fieldwork (see **Section 5.4**) did not indicate a clear localized groundwater flow direction. The area received approximately 1 inch of rain on 9 May 2022 (National Centers for Environmental Information [NCEI 2022]), 2022), and the groundwater elevations measured at the temporary wells during the SI were likely still showing the effects of the precipitation. The depth to the water table fluctuates seasonally (with a depth to the high-water table of approximately 1 ft bgs following the spring thaw in April through June), the typical depth to groundwater ranges from approximately 4 to 10 ft bgs (SAIC, 2013; ANG, 2019). Given the shallow depth to groundwater, it is possible that local groundwater may flow preferentially with stormwater runoff that is managed with storm sewers, culverts, and ditches. It is also likely that shallow groundwater intersects the Facility's stormwater drainage structures and interacts with stormwater runoff. The regional groundwater flow direction is generally from west to east (HMTC, 1987; ANG, 2019). Groundwater elevations from the SI are presented in **Figure 2-5**.

Drinking water for the Facility is supplied by the City of Fargo, which sources water from the Red River, Sheyenne River and Lake Ashtabula (City of Fargo, 2019; AECOM, 2020).

2.2.3 Hydrology

No naturally occurring drainage systems, streams, or bodies of water are located at the Facility. Natural drainage at the Facility and surrounding airport are not well defined due to the flat topography. Stormwater runoff is managed via the Hector International Airport's stormwater system using a series of storm sewers, culverts, and ditches that flow to several open man-made ditches; these in turn flow north and east to the Red River, which lies about 2 miles east of the Facility (ANG, 2019; AECOM, 2020). Due to the man-made features, the surface water flow at the Facility flows primarily to the northeast and partially to the southwest (**Figure 2-4**). The general regional surface water flow is east toward the Red River.

2.2.4 Climate

The climate at the Facility consists of four clearly separated seasons, with shorter, warm summers and freezing, snowy, cloudy, windy winters. Temperatures vary from average highs of 70.2 degrees Fahrenheit (°F) to average lows of 6.3 °F. The average annual temperature is 40.5 °F. Average precipitation is 20.8 inches of rain (World Climate, 2019; AECOM, 2020).

2.2.5 Current and Future Land Use

The Facility is a controlled access facility with publicly accessible roads and is surrounded on all sides by the Hector International Airport. The Facility consists of one hangar and one administrative building. The anticipated future land use is not expected to change from the current land use.

Future improvements, land acquisitions, and land use controls at the Hector International Airport are unknown. In 2016, the Hector International Airport proposed an $81 million dollar expansion and improvement project. Some improvements include runway expansion, additional hangars/buildings, main terminal expansion, and additional public parking additions (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 have not been identified at the Facility but may be present in the surrounding area.

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Cass County, North Dakota (U.S. Fish and Wildlife Services, 2021):

Insects: Monarch Butterfly *Danaus plexippus* (Endangered)

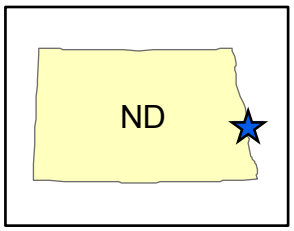
Mammals: Northern Long-eared Bat, *Myotis septentrionalis* (Endangered)

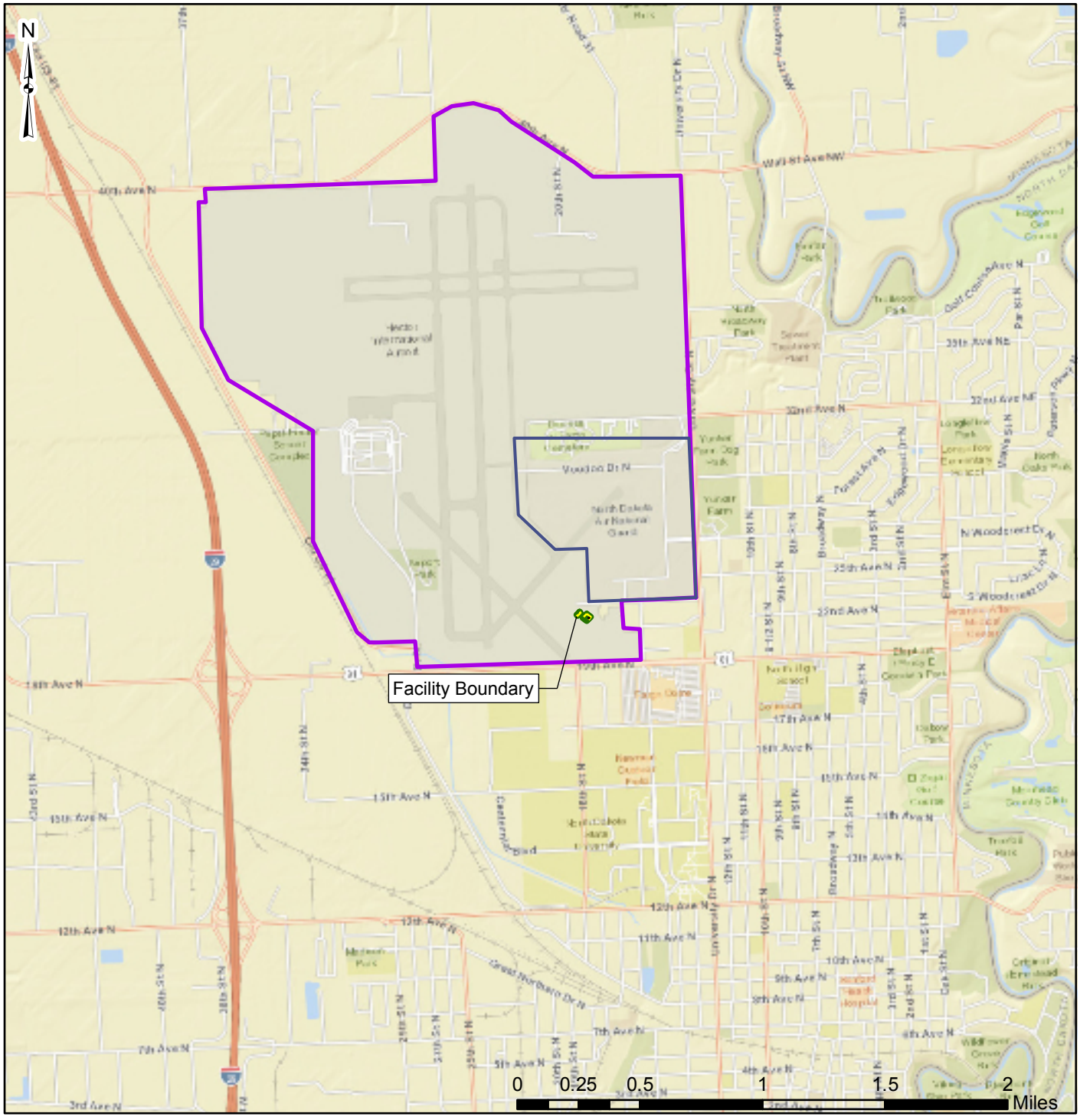
2.3 HISTORY OF PFAS USE

Aqueous film forming foam (AFFF), a firefighting agent, was commonly used by the U.S. military to extinguish petroleum fires, for firefighting training, and for the suppression of fires in uncontained areas. Military use of AFFF began in the 1970s and was most widely used at Department of Defense (DoD) installations with airfields. The Hangar was identified as a potential PFAS release area at the Facility during the PA (AECOM, 2020). One Tri-Max™ 30 fire extinguisher was found in the building under tarps and other supplies. Personnel were not aware that the Tri-Max™ 30 was at the Facility, where the fire extinguisher originated from, or how long it was at the Facility. One interviewee indicated that the Tri-Max™ 30 has not been used since NDARNG arrived at the Facility in 2012. A description of the AOI is presented in **Section 3**.

Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 2-1
Facility Location





Facility Data

- Facility Boundary
- Potential PFAS Release
- North Dakota Air National Guard Base Investigation Boundaries
- Approximate Hector International Airport Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

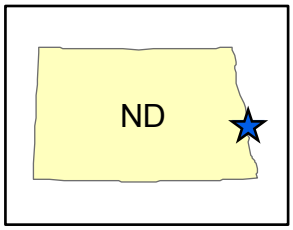
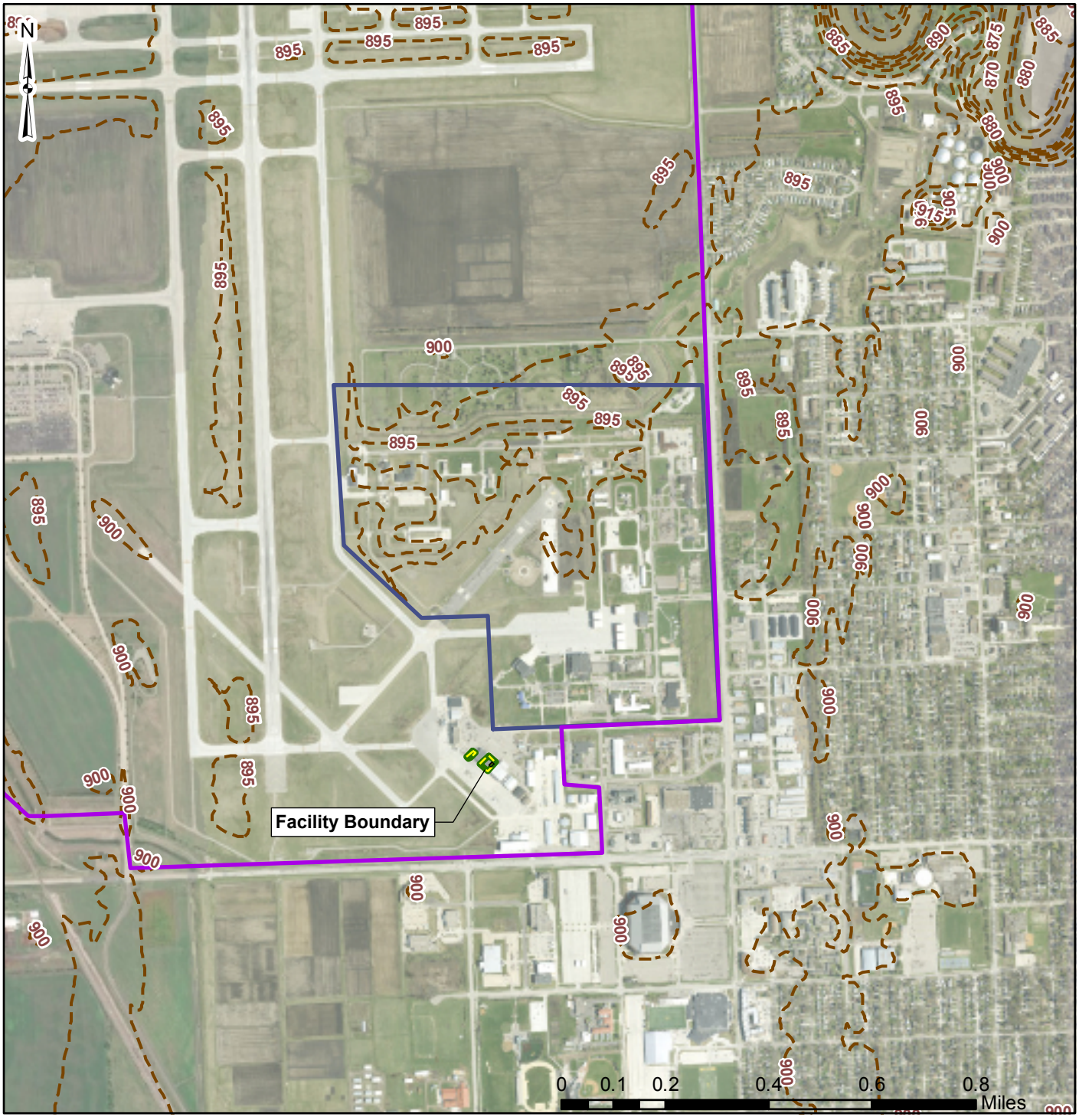


Figure 2-2
Facility Topography



Facility Data

- Facility Boundary
- Potential PFAS Release
- Approximate Hector International Airport Boundary
- North Dakota Air National Guard Base Investigation Boundaries (NDANGB)

Topography

- Elevation Contour (10 ft. interval)

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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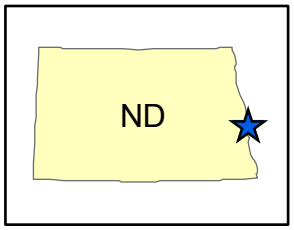
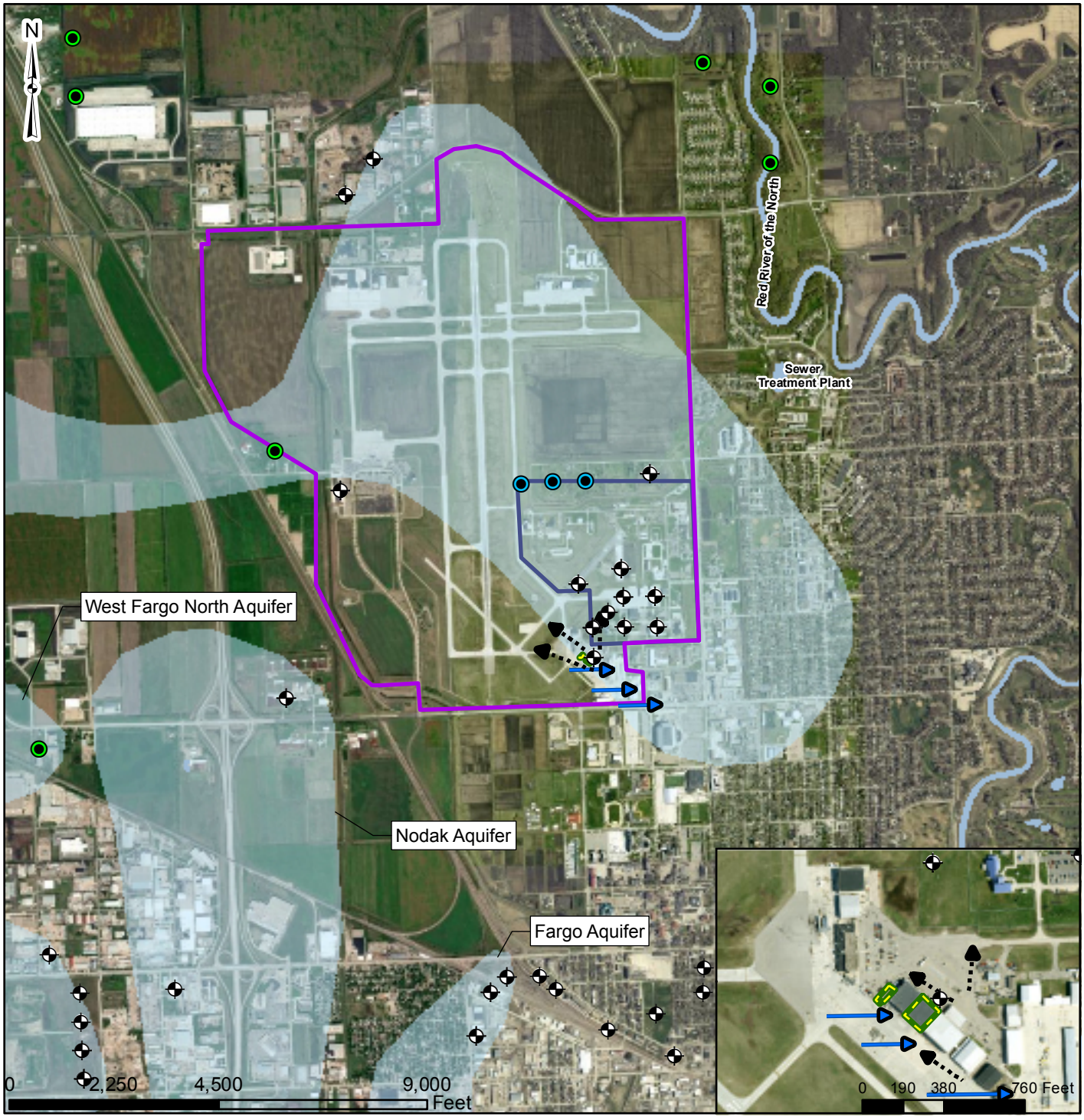
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 2-3
Groundwater Features





Facility Data

- Facility Boundary
- Approximate Hector International Airport Boundary
- North Dakota Air National Gaurd Base Investigation Boundaries (NDANGB)

Hydrology Features

- Commercial Well
- Domestic Well
- Monitoring Well
- Shallow Local Groundwater Flow Direction from SI
- General Regional Groundwater Flow Direction
- Surficial Aquifers

Data Sources:
ESRI 2020
AECOM 2020
North Dakota state agencies and the ND GIS Hub

Date:.....January 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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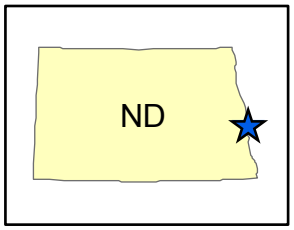
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 2-4
Surface Water Features



Facility Data

- Facility Boundary
- Onsite Potential PFAS Release
- Approximate Hector International Airport Boundary
- North Dakota Air National Gaurd Base Investigation Boundaries (NDANGB)

Hydrology Features

- Shallow Local Groundwater Flow Direction from SI
- General Regional Groundwater Flow Direction
- Unnamed Tributaries
- Surface Runoff Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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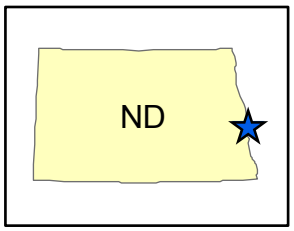
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 2-5
Groundwater Elevation, May 2022



Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology Features

- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI
- Groundwater Contours
- Inferred Groundwater Contours

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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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. One potential release area was identified at the Facility and identified as: AOI 1 Hangar. The AOI is shown on **Figure 3-1**.

3.1 AOI 1 – HANGAR

AOI 1 is comprised of the hangar portion of the building, which is a portion of a larger complex not operated by NDARNG. One Tri-Max™ 30 fire extinguisher was identified at the Facility inside the Hangar. The Facility's current personnel and interviewees were not aware that the Tri-Max™ 30 extinguisher was in the Hangar and did not know when it arrived at the Facility. No visible leaking or corrosion were noted on the fire extinguisher. According to NDARNG personnel, the Tri-Max™ 30 fire extinguisher was removed from the Facility and transported to Bismarck AASF #1 the week of 7 February 2020. Subsequently, the Tri-Max™ 30 extinguisher was emptied of its contents and the AFFF liquid was shipped offsite for disposal in November 2020. None of the NDARNG personnel had ever worked or trained with the Tri-Max™ 30 extinguisher. Due to the lack of information regarding the Tri-Max™ 30 fire extinguisher, the Hangar was identified as an AOI. There are trench drains in the Hangar that lead to an oil/water separator and then to the Fargo Sanitary Wastewater Treatment Plant (AECOM, 2020). Potential exposure from this AOI could occur as a result of an undocumented use or release of AFFF from the Tri-Max™ 30 fire extinguisher in the Hangar location. A release of AFFF could potentially flow through the doors located on either side of the Hangar and impact the soil and/or groundwater.

3.2 ADJACENT SOURCES

An SI was completed at Hector Field Air National Guard Base. Hector Field is the home of the 119th Fighter Wing. North Dakota Air National Guard (NDANG) was formed in 1947 and occupies approximately 209 acres of the Hector International Airport, northeast of the Fargo AASF #2. A description of each off-facility source associated with Hector Field is presented below and shown on **Figure 3-2.**

3.2.1 Building 215 – Former Fire Station

Building 215, the Main Base Former Fire Station, was used from the 1950s to 2011 and is located northeast and cross-gradient of the Fargo AASF#2. AFFF was stored in fire rescue vehicles, and a known discharge of 180 gallons of AFFF into the building's floor drains occurred in 2001. Although the soil samples did not exceed the NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions (AECOM, 2020).

3.2.2 Building 217 – Main Hangar

Building 217, the Main Base Hangar, was equipped with AFFF fire suppression systems since 1992. Building 217 is located northeast and cross-gradient of the Fargo AASF#2. Regular AFFF fire suppression system testing was conducted from 1992 to 2014. Although the soil samples did

not exceed the NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions. PFAS contamination levels in groundwater did exceed the NDANG SI screening levels (AECOM, 2020).

3.2.3 Aircraft Parking Apron

An aircraft parking apron, where potential AFFF releases may have occurred, is located northeast and cross-gradient of the Fargo AASF#2. Although soil samples did not exceed the NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions. PFAS contamination in groundwater exceeded the NDANG SI screening levels (AECOM, 2020).

3.2.4 Nozzle Testing Area - North of Apron

Documented nozzle testing using AFFF occurred in this area, located northeast and cross-gradient of the Fargo AASF #2. Although the soil samples did not exceed the NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions. PFAS contamination levels in groundwater exceeded the NDANG SI screening levels (AECOM, 2020).

3.2.5 Former Fire Training Area – ERP Site 10

Former on-Base Fire Training Area (FTA), used from the 1950s through mid-1989, is located northeast and cross-gradient of the Fargo AASF#2. AFFF was likely utilized during this time. PFOS concentrations in soil exceeded the NDANG SI screening levels and additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions (AECOM, 2020).

3.2.6 Nozzle Testing Area - South of Building 340

Documented nozzle testing using AFFF occurred in this area, located northeast and cross-gradient of the Fargo AASF #2. Although the soil and groundwater samples did not exceed the NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/ horizontal directions (AECOM, 2020).

3.2.7 Nozzle Testing Area – East of Building 340

Documented nozzle testing using AFFF occurred in this area, located northwest and cross-gradient of the Fargo AASF#2. Although the soil and groundwater samples did not NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions (AECOM, 2020).

3.2.8 Stormwater Outfalls #2 and #3

Stormwater Outfalls #2 and #3, which receive stormwater from several potential release locations potentially impacted by AFFF use, are located north/northeast and cross-gradient of the Fargo AASF#2. Although the sediment samples did not exceed the NDANG SI screening levels,

additional sampling was proposed upstream of the outfall and downstream outside the NDANG Base boundary to determine the nature and extent in the vertical/horizontal directions. PFAS contamination levels in surface water exceeded the NDANG SI screening levels (AECOM, 2020).

3.2.9 Soil Stockpile Area

The soil stockpile area received post land-farmed soils from the Former FTA-ERP Site 10, located northeast and cross-gradient of the Fargo AASF#2. Although the soil samples did not exceed the NDANG SI screening levels, additional sampling was proposed to determine the nature and extent in the vertical/horizontal directions. PFAS contamination levels in groundwater exceeded the NDANG SI screening levels (AECOM, 2020).

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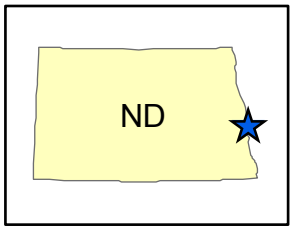
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 3-1
Areas of Interest



Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release

Shallow Local Groundwater Flow Direction from SI

Data Sources:
ESRI 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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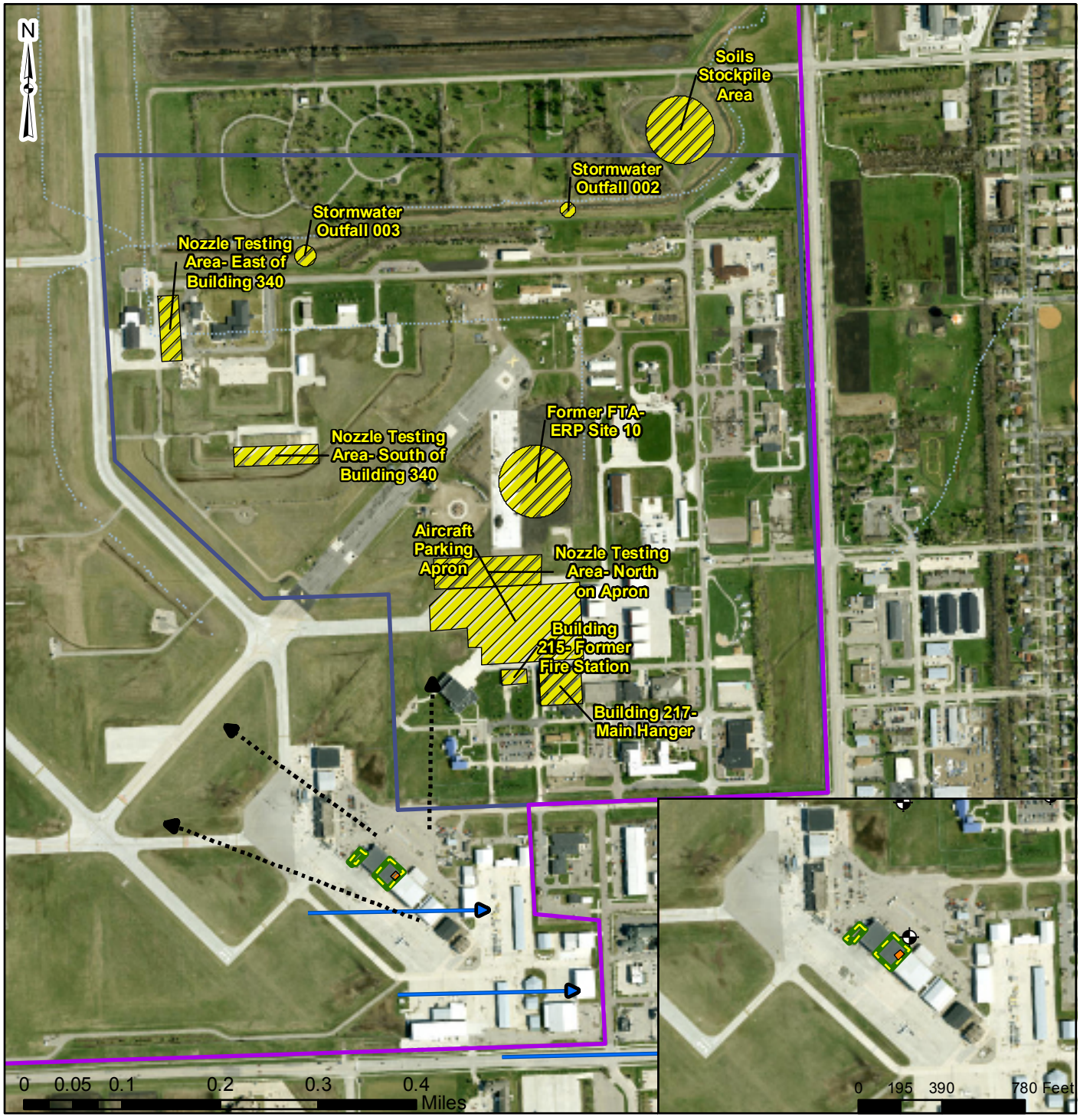
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 3-2
Adjacent Sources



Facility Data

- Facility Boundary
- Onsite Potential PFAS Release
- Offsite Potential PFAS Release
- Approximate Hector International Airport Boundary
- North Dakota Air National Gaurd Base Investigation Boundaries (NDANGB)

Hydrology Features

- Shallow Local Groundwater Flow Direction from SI
- General Regional Groundwater Flow Direction
- Unnamed Tributaries

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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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/Wood, 2022), 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 the 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 the presence or absence of relevant compounds at the sampled AOI.

4.1 PROBLEM STATEMENT

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

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for Fargo Army Aviation Support Facility #2 (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/Wood, 2022)
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.
- Site Inspection Report for Perfluorooctane Sulfonate and Perfluoroocatanoic Acid at Hector Field Air National Guard Base Fargo, North Dakota (March 2019)

4.3 STUDY BOUNDARIES

The scope of the SI was horizontally bounded by the property limits of Fargo AASF #2. Due to the limited areas leased by NDARNG at the Fargo AASF #2, all sample locations were on airfield property (**Figures 2-1** and **2-2**). ARNG, through U.S. Army Corps of Engineers (USACE) (ARNG's agent), procured a fully executed right-of-entry to conduct the proposed off-facility sampling. The scope of the SI was bounded vertically by the depth of temporary monitoring wells installed within groundwater, where encountered (maximum depth of 15 feet bgs). 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, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 1.01) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 021). Data were compared to applicable SLs within this document and decision rules as defined in the UFP-QAPP Addendum (EA/Wood, 2022).

4.5 DATA USABILITY ASSESSMENT

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

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the UFP-QAPP (EA, 2020).

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, Fargo Army Aviation Support Facility #2, North Dakota,* 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, 2020)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Fargo Army Aviation Support Facility #2, North Dakota* dated February 2022 (EA/Wood, 2022)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2020 (EA, 2020)
- *Final Site Safety and Health Plan, Fargo Army Aviation Support Facility #2, North Dakota,* dated November 2021 (EA/Wood, 2021).

The SI field activities were conducted from 09 to 11 May 2022 and consisted of utility clearance, DPT boring and 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/Wood, 2022), except as noted in **Section 5.8**.

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

- Nine (9) soil samples from three locations (soil borings locations)
- Five (5) grab groundwater samples from five temporary well locations
- Eight (8) quality assurance (QA)/quality control (QC) samples.

Figure 5-1 provides the sample locations for all media across the Facility. **Table 5-1** presents the list of samples collected for each 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**. Sampling forms are provided in **Appendix B2**, and land survey data are provided in **Appendix B3.** Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 18 January 2022, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI included ARNG, NDARNG, USACE, North Dakota Department of Environmental Quality (NDDEQ), and representatives familiar with the Facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the UFP-QAPP Addendum (EA/Wood, 2022).

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

5.1.2 Utility Clearance

WSP USA Environment & Infrastructure, Inc. (WSP), previously doing business as Wood Environment & Infrastructure Solutions, Inc., contacted the North Dakota One Call to notify them of intrusive work at the Facility. WSP contracted GPRS, Inc. a private utility location service, to perform utility clearance at the Facility. Utility clearance was performed at each of the proposed boring locations on 09 May 2022 with input from the WSP field team. General locating services and ground-penetrating radar (GPR) were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared by WSP's drilling subcontractor, Dakota Technologies, Inc., using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to meet acceptability criteria, as defined in the UFP-QAPP Addendum, prior to the start of field activities. A sample from a potable water source at Fargo AASF #2, was collected on 07 February 2022, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 (DoD, 2020). The results of the sample of the potable water source used for

decontamination of drilling equipment during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

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

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA, 2020). A Geoprobe® 66DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top 5 ft of the boring in compliance with utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. One boring location was adjusted within a 5-feet offset for reasons including drill rig access, utility avoidance and bias toward sampling within observed drainage features.

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. Total boring completion depths, to accommodate temporary well installation, ranged from 6 to 15 ft bgs.

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

Soil borings completed during the SI found low to high plasticity fines with varying levels of sand and gravel as the dominant lithology of the unconsolidated sediments below the Fargo AASF #2. The borings were completed at depths between 6 and 15 feet bgs. Isolated layers of well graded gravelly sand were also described in the boring logs at thicknesses ranging from 0.5 to 1.0 feet. These observations are consistent with the understood depositional environment of the region.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain-of-custody (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) (EPA Method 9060A), pH (EPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

Field duplicate samples were collected at a rate of 10 percent (%) and analyzed for the same parameters as the accompanying samples. Matrix spike/matrix spike duplicate (MS/MSD) pairs 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 for use in confirming that samples were preserved at or below 6 degrees Celsius (°C) 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/Wood, 2022). After removal of the casings, boreholes were abandoned using bentonite chips. Borings installed in asphalt surfaces were restored in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using a GeoProbe® 66DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 5-ft section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. Samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well intervals. 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. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field blank (FB) was collected in accordance with the UFP-QAPP Addendum (EA/Wood, 2022). A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI UFP-QAPP Addendum (EA/Wood, 2022) by removing the PVC and backfilling the hole with bentonite chips.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

A synoptic groundwater gauging event was performed on 11 May 2022. Groundwater elevation measurements were collected from the five new temporary monitoring wells. Water level measurements were taken from the survey mark on the northern side of the well casing. The synoptic water level measurements from the gauging event indicated a localized groundwater flow direction that was generally towards the north. This groundwater flow direction is not consistent with the regional groundwater flow direction to the east and is believed to have been influenced by heavy precipitation. The regional groundwater flow direction is generally from west to east (HMTC 1987; ANG, 2019). The groundwater elevations that were measured during the SI are included on the groundwater contour map, **Figure 2-5**, and groundwater elevation data are provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a Trimble R10 real-time kinematic differential global positioning system. 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 11 May 2022 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/Wood, 2022).

Soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities were contained in labeled, 55-gallon DOT-approved steel drums, and left onsite in a designated waste storage area. The IDW was not sampled and assumes the characteristics of the associated samples collected from that source location. The solid and liquid IDW will be disposed of via a Resource Conservation and Recovery Act Subtitle C landfill. The disposal is being managed under a separate contract task (EA Engineering, Science, and Technology, Inc., 2021). Specifics on the disposal of solid and liquid IDW will be addressed in an IDW Technical Memorandum.

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

5.7 LABORATORY ANALYTICAL METHODS

Samples were analyzed by LC/MS/MS, compliant with QSM Version 5.3 Table B-15, at Eurofins in Lancaster, Pennsylvania, a DoD ELAP and NELAP-certified laboratory.

One soil sample was also analyzed for TOC using EPA Method 9060A, pH by EPA Method 9045D, and grain size using ASTM Method D422.

5.8 DEVIATIONS FROM SI UFP-QAPP ADDENDUM

No deviations from the UFP-QAPP Addendum were identified.

Table 5-1. Site Inspection Samples by Medium
Fargo AASF #2, Fargo, North Dakota
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (EPA Method 9060A)	pH (EPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
AOI01-01-SB-0-2	5/10/2022	0-2	X	X	X	X	MS/MSD Collected
AOI01-01-SB-4-5	5/10/2022	4-5	X				
AOI01-01-SB-9-10	5/10/2022	9-10	X				
AOI01-02-SB-0-2	5/10/2022	0-2	X				Parent Sample of DUP-01-Soil
AOI01-02-SB-2-3	5/10/2022	2-3	X				
AOI01-02-SB-3.5-4.5	5/10/2022	3.5-4.5	X				
AOI01-03-SB-0-2	5/10/2022	0-2	X				
AOI01-03-SB-3-4	5/10/2022	3-4	X				
AOI01-03-SB-7-8	5/10/2022	7-8	X				
DUP-01-Soil	5/10/2022		X				
Groundwater Samples							
AASF2-01-GW	5/10/2022		X				
AOI01-01-GW	5/10/2022		X				
AOI01-02-GW	5/10/2022		X				Parent Sample of DUP-01-GW
AOI01-03-GW	5/10/2022		X				MS/MSD Collected
AOI01-04-GW	5/10/2022		X				
DUP-01-GW	5/10/2022		X				
Blank Samples							
AASF2-EB-HA	5/10/2022		X				Equipment Blank collected From Hand Auger
AASF2-FB-01	5/10/2022		X				Field Blank

Notes:
AASF = Army Aviation Support Facility
ASTM = American Society for Testing and Materials
bgs = below ground surface
EB = equipment blank
FD = field duplicate
FB = field blank
MS/MSD = matrix spike/ matrix spike duplicate
TOC = total organic carbon
EPA = Environmental Protection Agency

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Fargo AASF #2, Fargo, North Dakota
Site Inspection Report

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AASF2-01	6	1-6
	AOI01-01	15	10-15
	AOI01-02	10	5-10
	AOI01-03	14	9-14
	AOI01-04	12	7-12

Notes:
AASF = Army Aviation Support Facility
bgs = below ground surface
ft = feet

Table 5-3. Groundwater Elevation
Fargo AASF #2, Fargo, North Dakota
Site Inspection Report

Monitoring Well ID	Top of Casing Elevation (ft NAVD88)	Depth to Water (ft btoc)	Depth to Water (ft bgs)	Groundwater Elevation (ft NAVD 88)
AASF2-01	898.461	4.13	2.11	894.331
AOI01-01	896.41	3.74	3.71	892.67
AOI01-02	896.773	2.38	2.33	894.393
AOI01-03	897.789	3.26	2.50	894.529
AOI01-04	899.771	6.18	3.46	893.591

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

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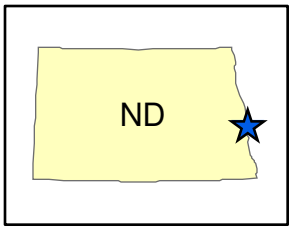
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 5-1
Site Inspection Sample Locations



Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release
- Temporary Groundwater Well Location
- Soil Boring and Temporary Groundwater Well Location
- Shallow Local Groundwater Flow Direction from SI
- General Regional Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 1983 StatePlane

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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 is provided in **Sections 6.3**. SLs for relevant compounds, for both soil and groundwater, are presented in **Table 6-1**. **Tables 6-2** through **6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 SCREENING LEVELS

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in an OSD memorandum (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 may proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1**.

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

Analyte[1,2]	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 in Groundwater and Soil using U.S. Environmental Protection Agency's (EPA's) Regional Screening Level Calculator. Hazard Quotient (HQ)=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.

Abbreviations:
µg/kg = microgram(s) per kilogram
bgs = below ground surface
ft = feet
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 feet bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 feet bgs). The SLs are not applied to deep subsurface soil results (>15 feet bgs) because 15 feet is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

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

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

6.3 AOI 1

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

6.3.1 AOI 1 Soil Analytical Results

Soil samples were collected from three boring locations associated with AOI 1 during the SI; AOI01-01, AOI01-02, and AOI01-03. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Tables 6-2** and **Table 6-4** summarize the soil results.

Surface soil (0 to 2 ft bgs) was sampled from boring locations AOI01-01 through AOI01-03, with a duplicate surface soil sample collected at AOI01-02. Soil was also sampled from shallow subsurface soil (2 to 5 ft bgs) and deep subsurface soil intervals (3.5 to 10 ft bgs) from boring locations AOI01-01 through AOI01-03.

PFHxS and PFOA were detected in surface soil at concentrations below their respective SLs. PFHxS was detected in two of the three surface soil samples (AOI01-01 and AOI01-03) with a maximum concentration of 0.56 J µg/kg. PFOA was detected in one of three surface soil

locations (AOI01-03) at 0.33 J µg/kg. PFBS and PFNA were not detected in surface soil samples.

PFBS, PFHxS, PFNA, PFOA and PFOS were not detected in shallow or deep subsurface soils.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater samples were collected from five temporary wells associated with AOI 1 during the SI (AOI01-01 through AOI01-04 and AASF2-01). Temporary well AASF-02 was installed to the west of AOI 1, which was assumed to be upgradient based on the inferred west to east regional groundwater flow direction. Synoptic water level measurements taken during the SI indicated that the local groundwater flow direction at the Facility appeared to be toward the north. This groundwater flow direction is not consistent with the inferred regional groundwater flow direction to the east and is believed to have been influenced by heavy precipitation. Based on a local groundwater flow direction to the north, all sample locations are cross gradient of AOI 1. **Figures 6-6 and 6-7** presents the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring well locations AOI01-01 through AOI01-04 and AASF2-01, with a duplicate groundwater sample collected at AOI01-02. PFHxS, PFOA and PFOS were detected at concentrations exceeding their respective SLs. PFHxS was detected in groundwater at all sample locations at concentrations that ranged from 0.99 J ng/L to 55 ng/L and exceeded the SL at AOI01-04. PFOA was detected in groundwater at four of the five sample locations at concentrations that ranged from 1.5 J ng/L to 11 ng/L and exceeded the SL at AOI01-01 and AOI01-02. PFOS was detected in groundwater AOI01-01 at 7.7 ng/L, which exceeded the SL. PFBS was detected in groundwater at all five sample locations at concentrations below the SL that ranged from 1.5 J ng/L to 4.2 ng/L. PFNA was not detected in groundwater samples collected from temporary monitoring well locations.

6.3.3 Conclusions

PFHxS, PFOS and PFOA were detected in groundwater at concentrations above their respective SL at sample locations that were used to assess AOI 1. Relevant compounds were also detected in the groundwater sample from temporary well AASF2-01, located west of AOI 1, but at concentrations below SLs. The synoptic water level measurements from the SI gauging event indicated that localized groundwater flow was generally towards the north. Information provided in the ANG 2019 SI Report states that the inferred regional groundwater flow direction is generally from west to east (HMTC 1987; ANG, 2019). PFHxS and PFOA were detected in surface soil at estimated concentrations well below their respective SLs. The maximum concentration detected in surface soil was 0.56 J µg/kg (PFHxS) at AOI01-03. Based on the regional groundwater flow and the calculated local groundwater flow direction, detections of relevant compounds in AASF2-01, AOI01-02 and AOI01-04 may indicate the presence of off-Facility sources.

There was no evidence of a release within the NDARNG Facility.

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

Area of Interest		AOI01							
Location ID		AOI01-01		AOI01-02		AOI01-02		AOI01-03	
Sample ID		AOI01-01-SB-0-2		AOI01-02-SB-0-2		DUP-01-Soil		AOI01-03-SB-0-2	
Sample Date		5/10/2022		5/10/2022		5/10/2022		5/10/2022	
Depth		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)									
PFBS	1900	ND	U	ND	U	ND	U	ND	U
PFHxS	130	0.27	J	ND	U	ND	U	0.56	J
PFNA	19	ND	U	ND	U	ND	U	ND	U
PFOA	19	ND	U	ND	U	ND	U	0.33	J
PFOS	13	ND	U	ND	U	ND	U	ND	U

Notes

Gray Fill — Detected concentrations exceeded OSD Screening Levels

References

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

Chemical Abbreviations

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

Interpreted Qualifiers

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

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AASF	Army Aviation Support Facility
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

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Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report
Fargo AASF #2

	Area of Interest	AOI01					
	Location ID	AOI01-01		AOI01-02		AOI01-03	
	Sample ID	AOI01-01-SB-4-5		AOI01-02-SB-2-3		AOI01-03-SB-3-4	
	Sample Date	5/10/2022		5/10/2022		5/10/2022	
	Depth	4 - 5 ft		2 - 3 ft		3 - 4 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	25000	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense, July 2022. *Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022.* The screening levels for soil are based on Industrial/Commercial Composite Worker scenario for direct ingestion of contaminated soil.

Chemical Abbreviations

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

Interpreted Qualifiers

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

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AASF	Army Aviation Support Facility
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

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Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report
Fargo AASF #2

Area of Interest		AOI01					
Location ID		AOI01-01		AOI01-02		AOI01-03	
Sample ID		AOI01-01-SB-9-10		AOI01-02-SB-3.5-4.5		AOI01-03-SB-7-8	
Sample Date		5/10/2022		5/10/2022		5/10/2022	
Depth		9 - 10 ft		3.5 - 4.5 ft		7 - 8 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	25000	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense, July 2022. *Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022.* The screening levels for soil are based on Industrial/Commercial Composite Worker scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

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

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AASF	Army Aviation Support Facility
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Chemical Abbreviations

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

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Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report
Fargo AASF #2

Area of Interest		AOI01											
Location ID		AOI01-01		AOI01-02		AOI01-02, Duplicate		AOI01-03		AOI01-04		AASF2-01	
Sample Name		AOI01-01-GW		AOI01-02-GW		DUP-01-GW		AOI01-03-GW		AOI01-04-GW		AASF2-01-GW	
Sample Date		5/10/2022		5/10/2022		5/10/2022		5/10/2022		5/10/2022		5/10/2022	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFBS	601	4.2		2.2		2.0		1.5	J	4.7		1.7	J
PFHxS	39	15		11	J+	9.0		0.99	J	55		5.5	J+
PFNA	6	ND	U	ND	UJ	ND	UJ	ND	U	ND	UJ	ND	UJ
PFOA	6	11		6.9	J	4.6	J+	ND	U	1.5	J	5.9	J
PFOS	4	7.7		ND	UJ	ND	UJ	ND	U	ND	UJ	ND	UJ

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

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

Chemical Abbreviations

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

Interpreted Qualifiers

J = Estimated concentration.
J+ = The result is an estimated quantity, but the result may be biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted DL.
UJ = The analyte was not detected at a level greater than or equal to the adjusted DL.
However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
ng/L	nanogram(s) per liter
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

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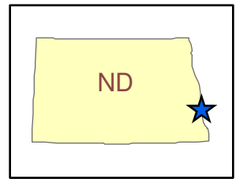
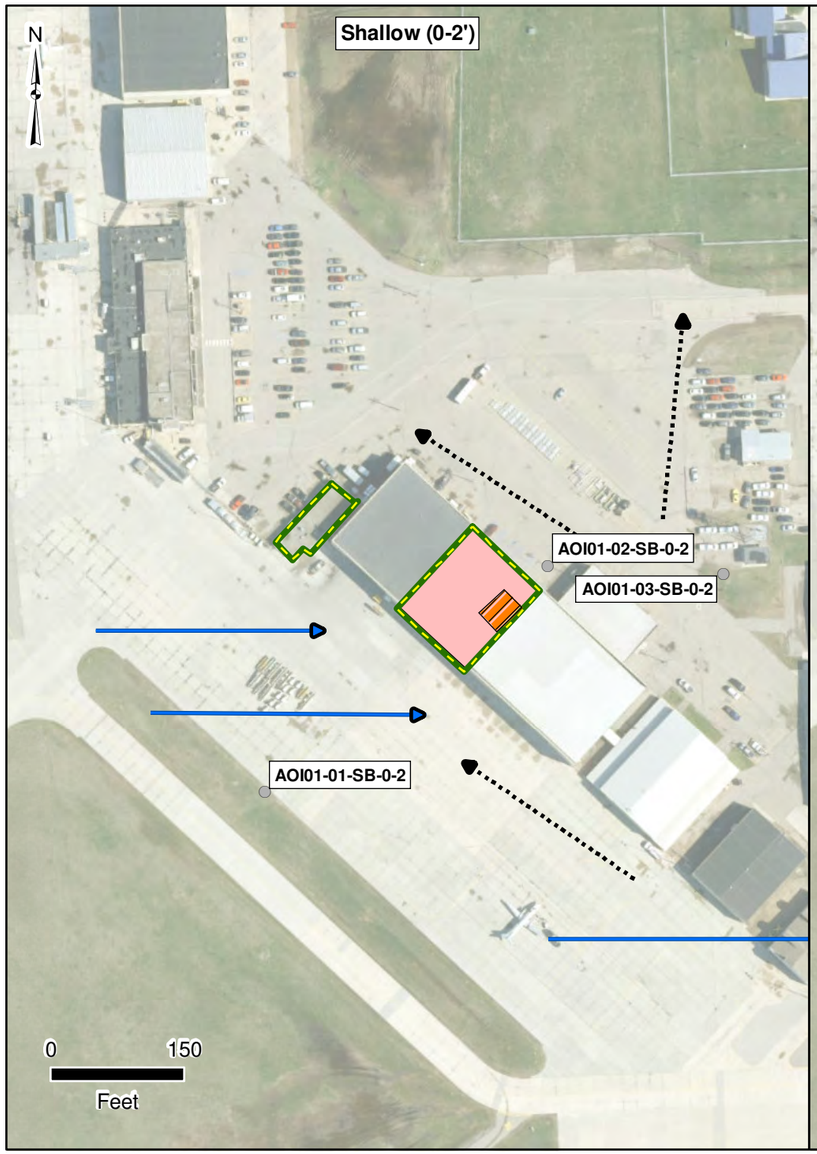
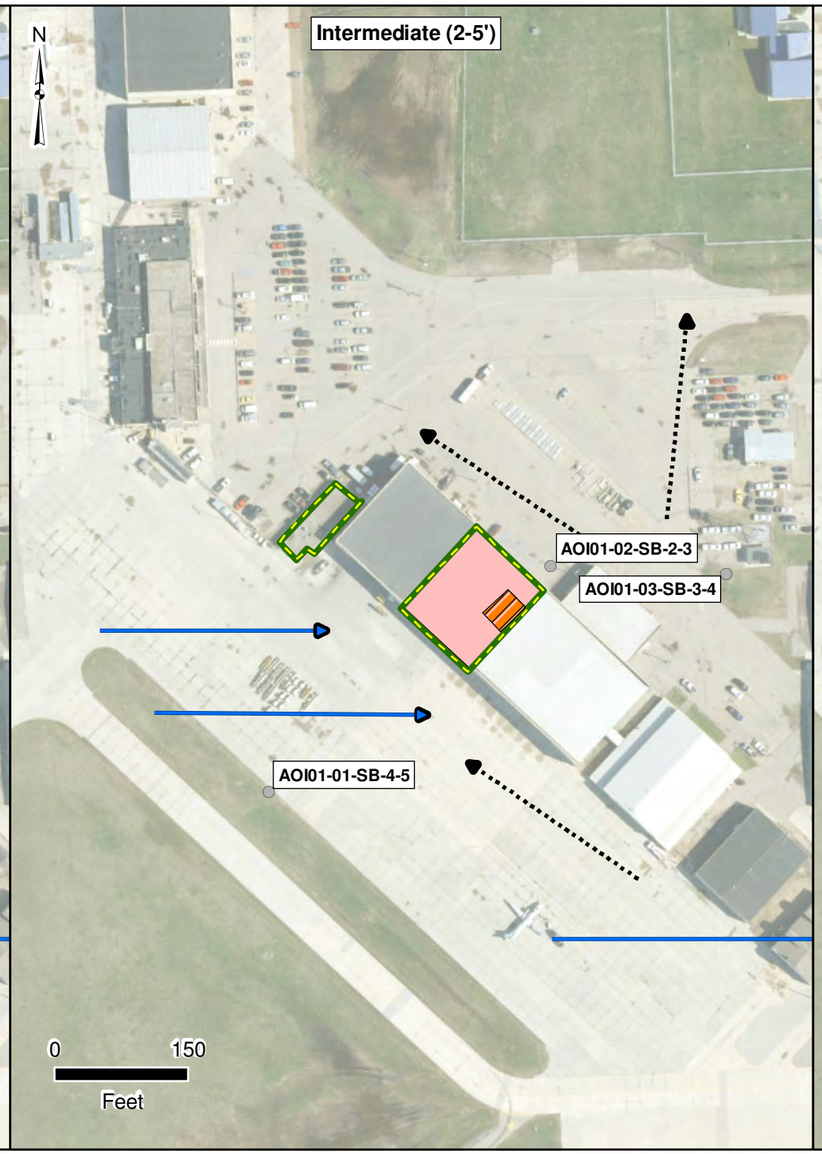
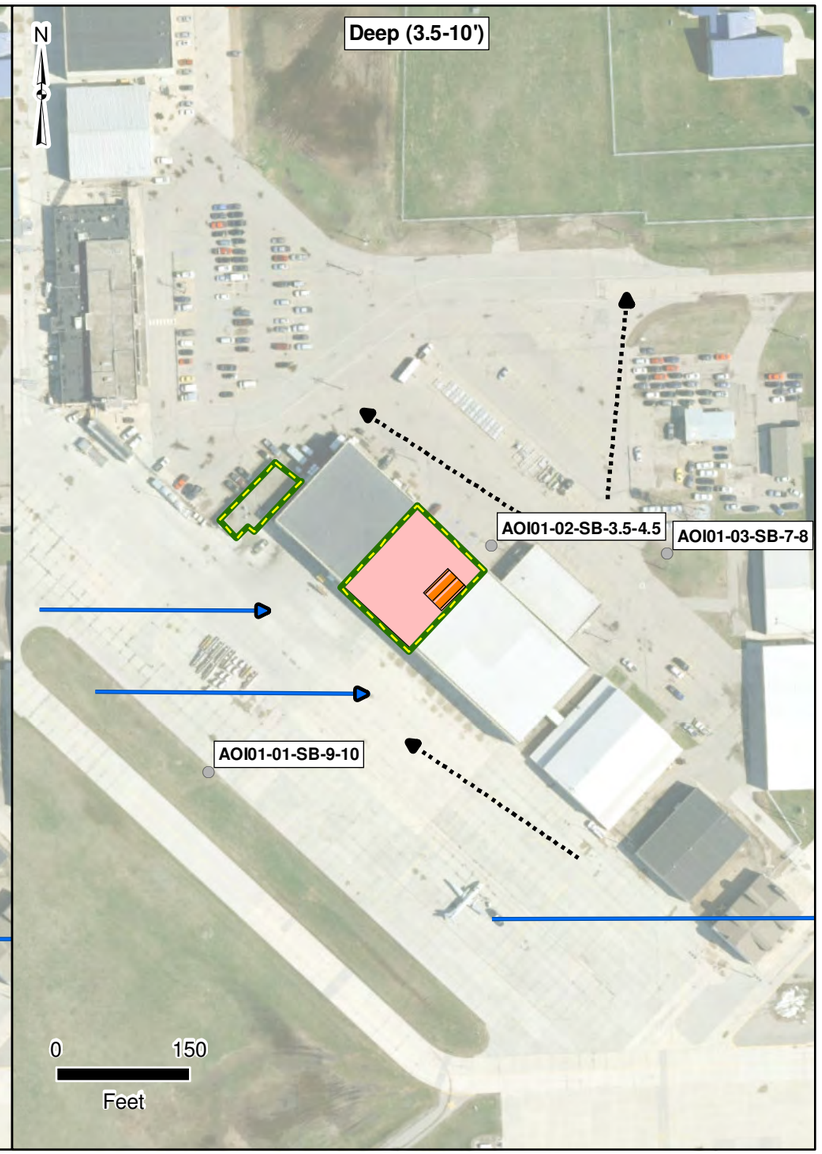
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 6-1
PFOS Detections in Soil









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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

PFOS Results (µg/Kg)
- ND
- >ND - 13
- >13 - 160
- >160 - 1,600
- >1,600

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFOS = perfluorooctanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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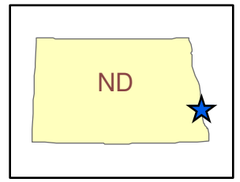
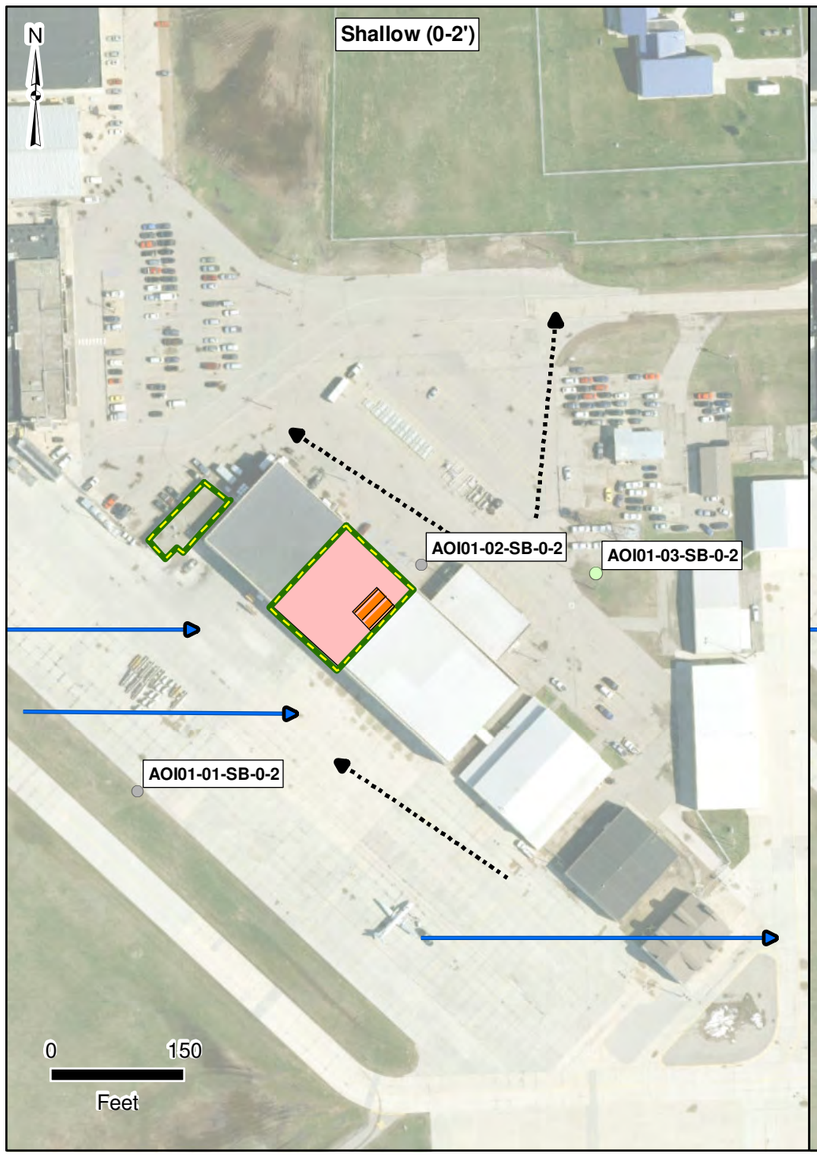
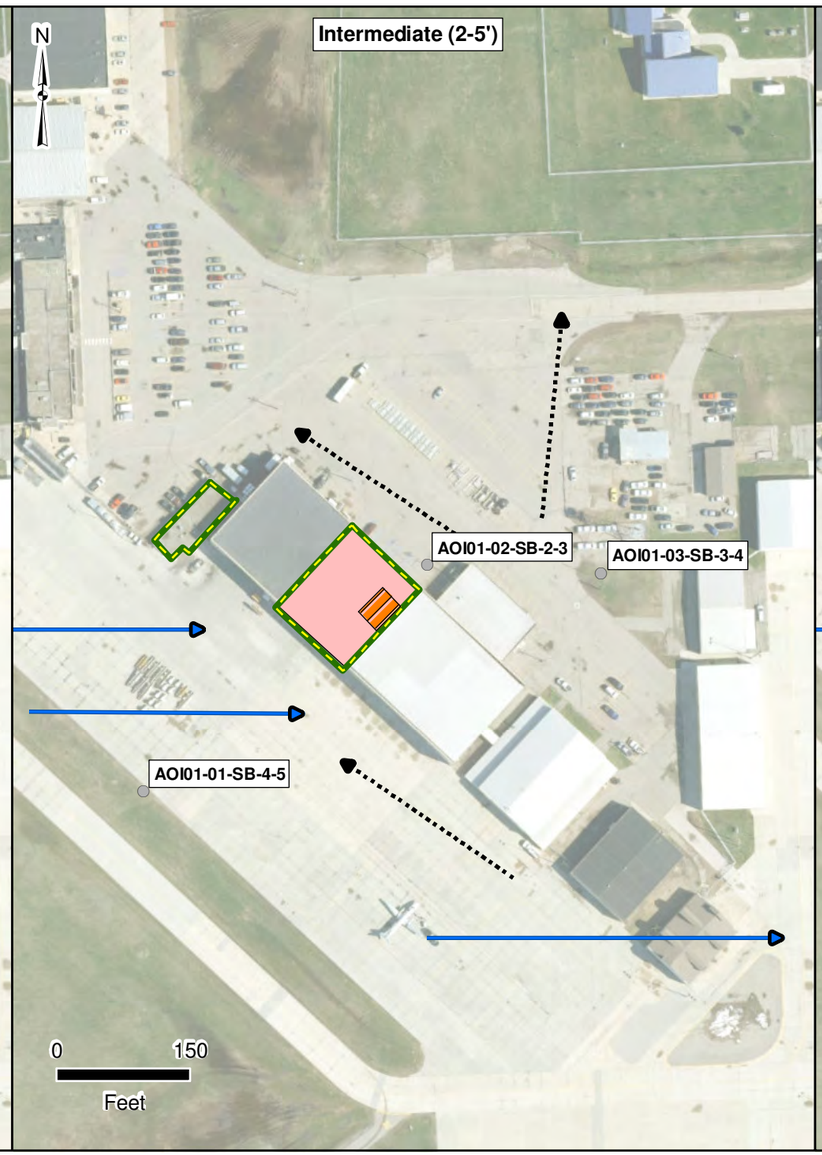
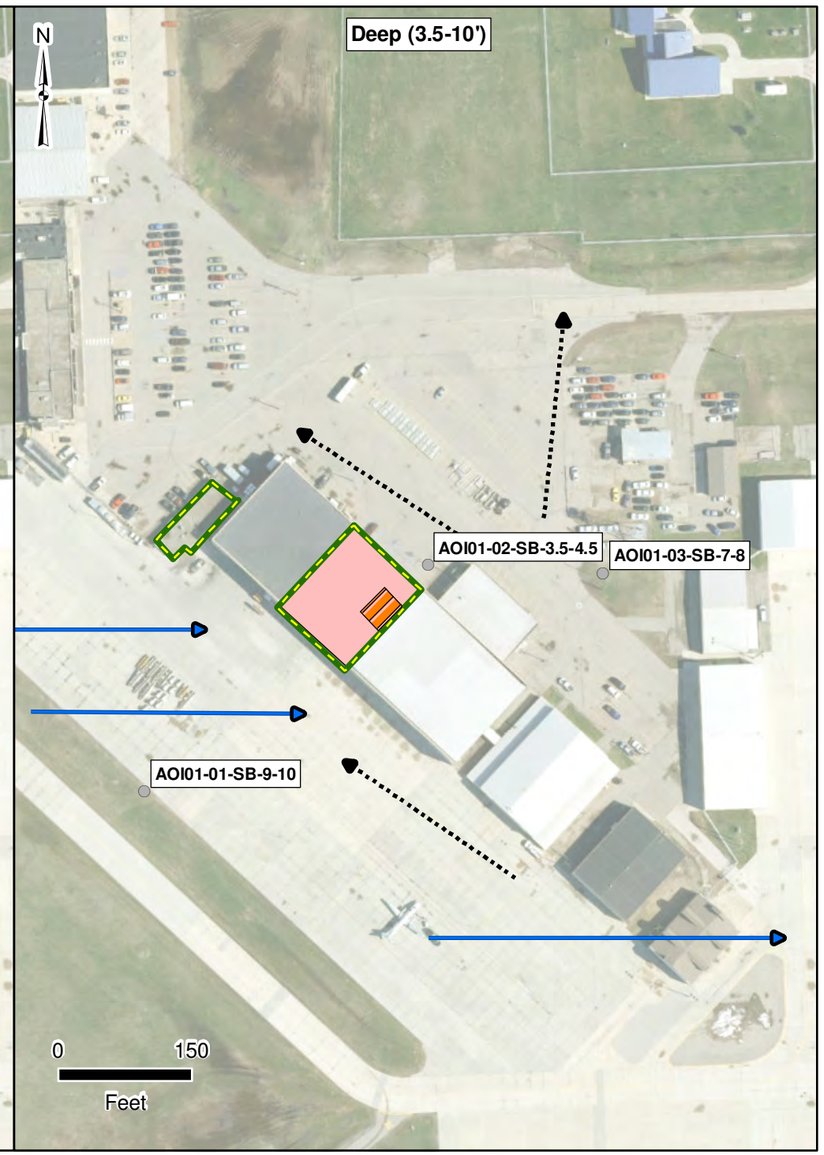
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 6-2
PFOA Detections in Soil









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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

PFOA Results (µg/Kg)
- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFOA = perfluorooctanoic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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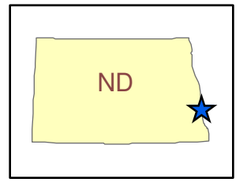
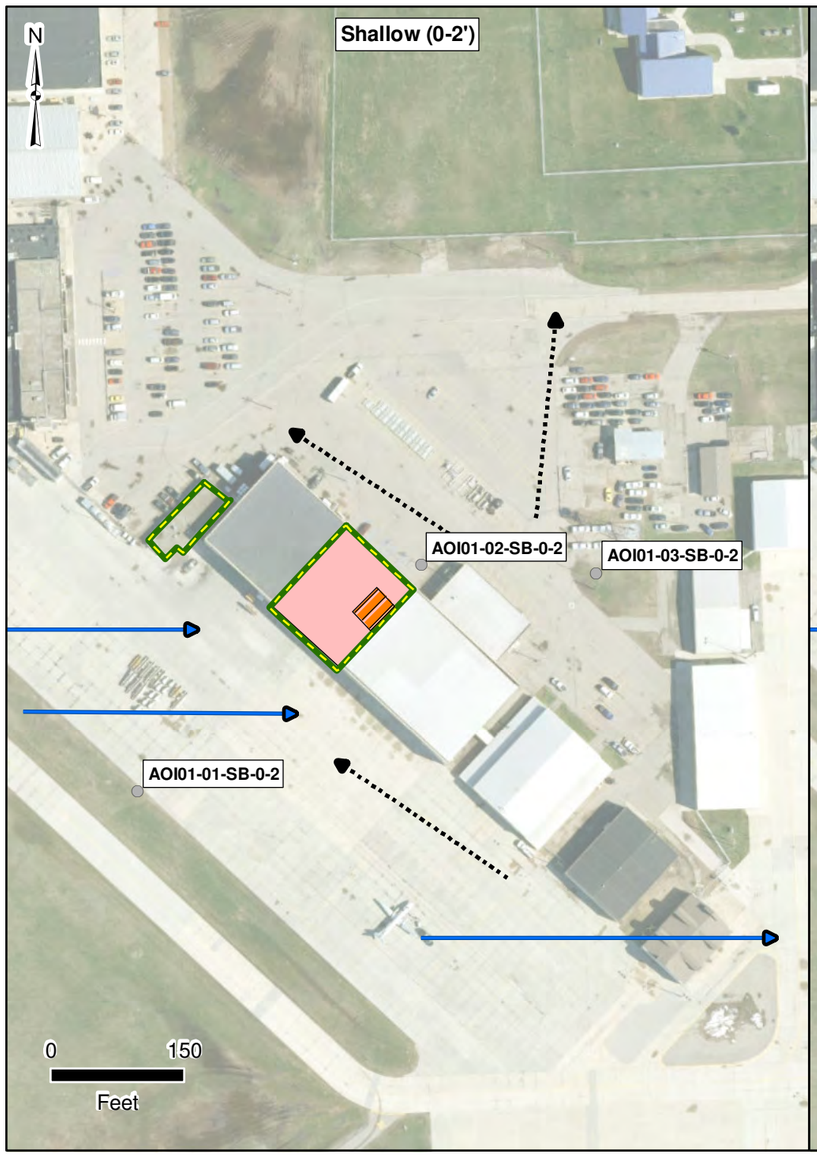
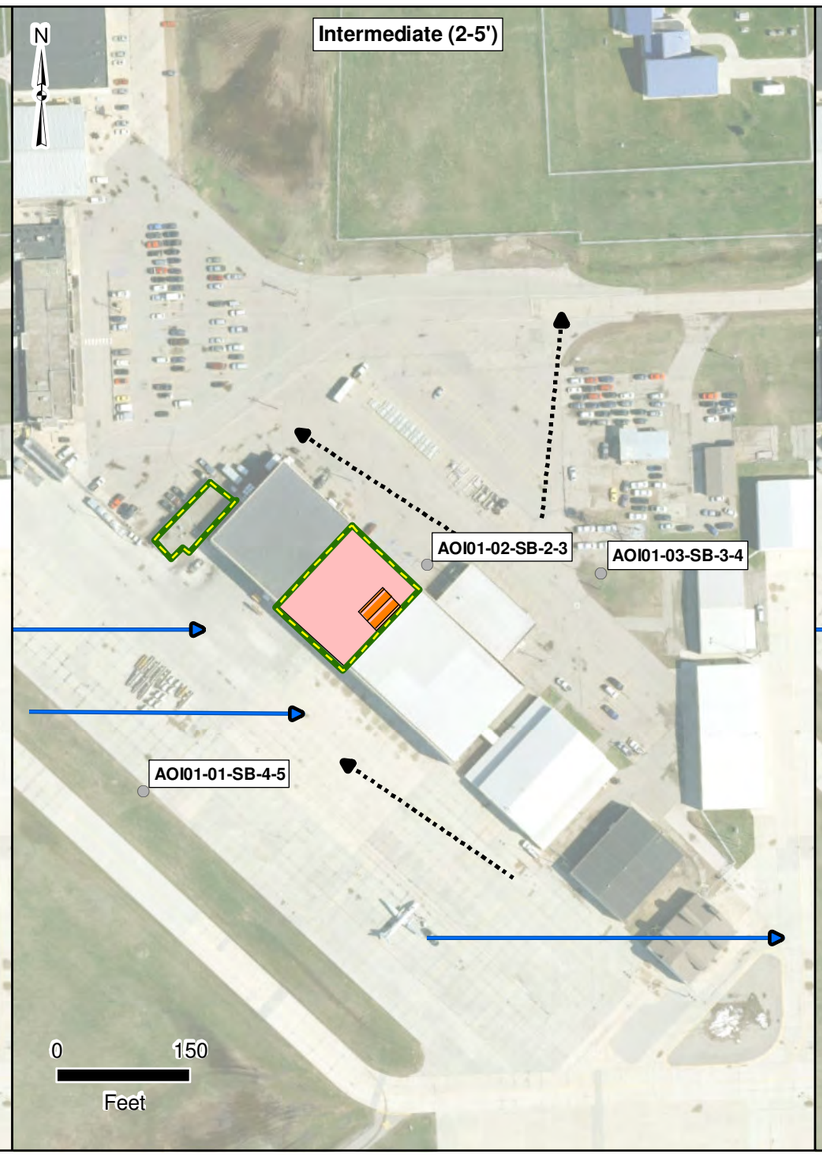
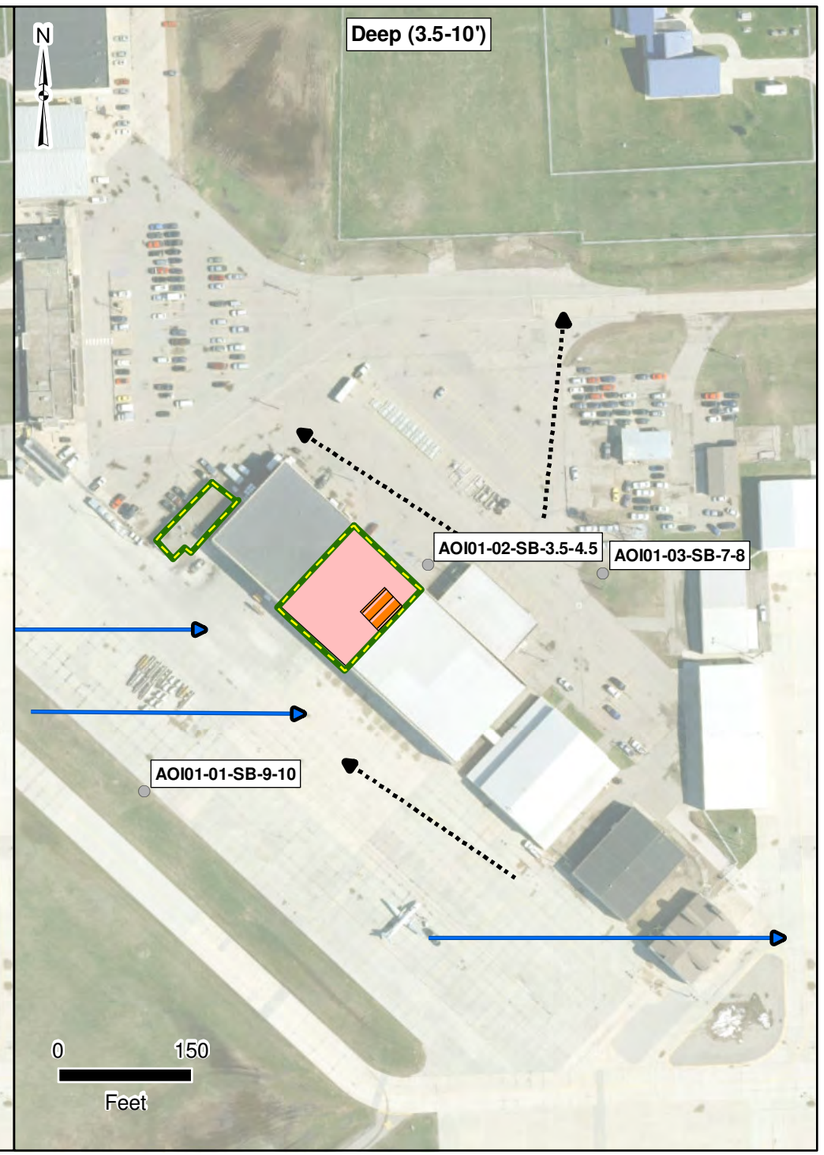
Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 6-3
PFBS Detections in Soil









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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

PFBS Results (µg/Kg)
- ND
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFBS =perfluorobutanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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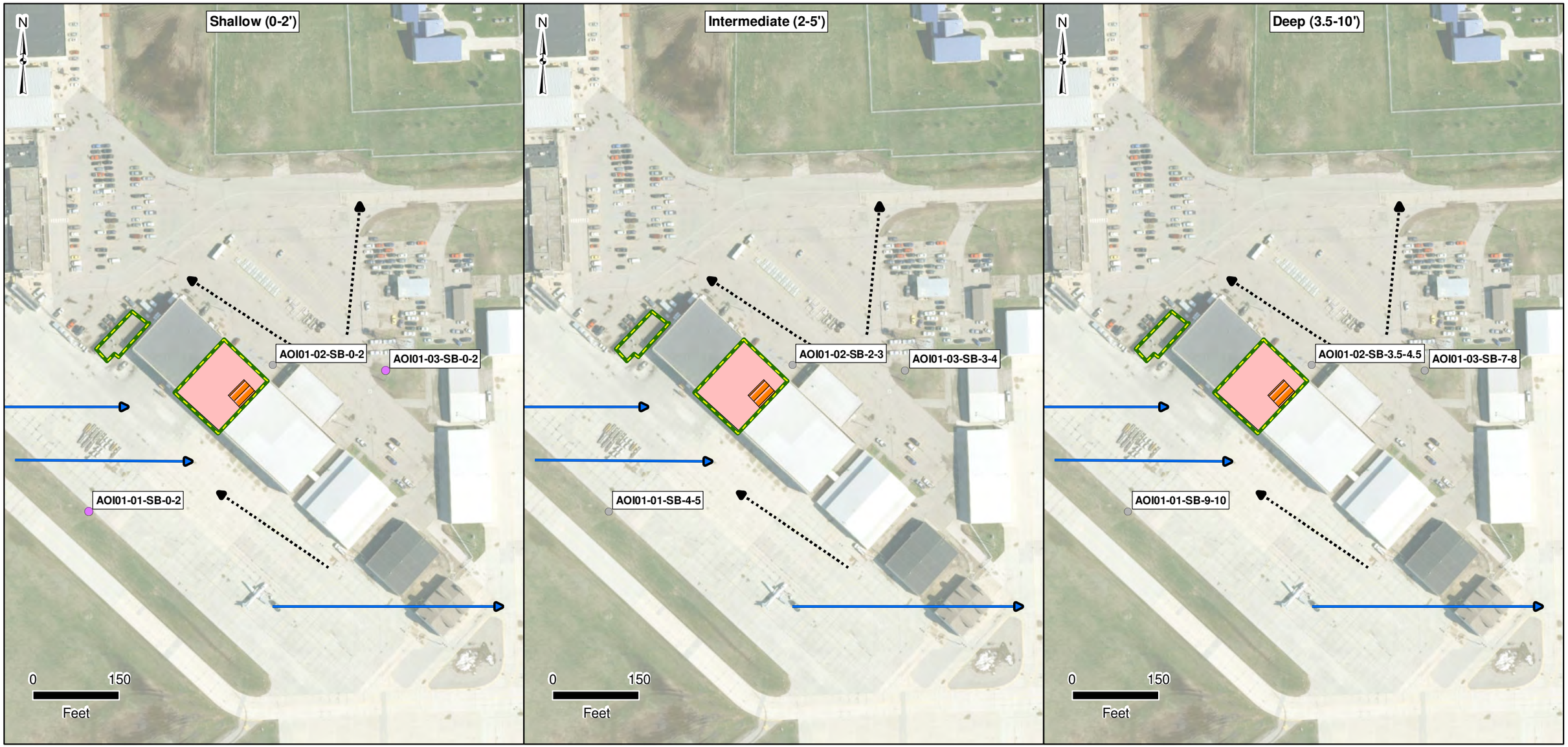
Site Inspection Report
Fargo AASF #2, North Dakota

Figure 6-4
PFHxS Detections in Soil



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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

PFHxS Results (µg/Kg)
- ND
- >ND - 10
- >10 - 130
- >130 - 1,600
- >1,600

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFHxS =perfluorohexanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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Army National Guard Site Inspections
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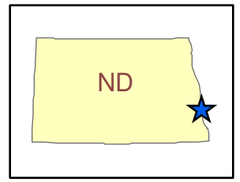
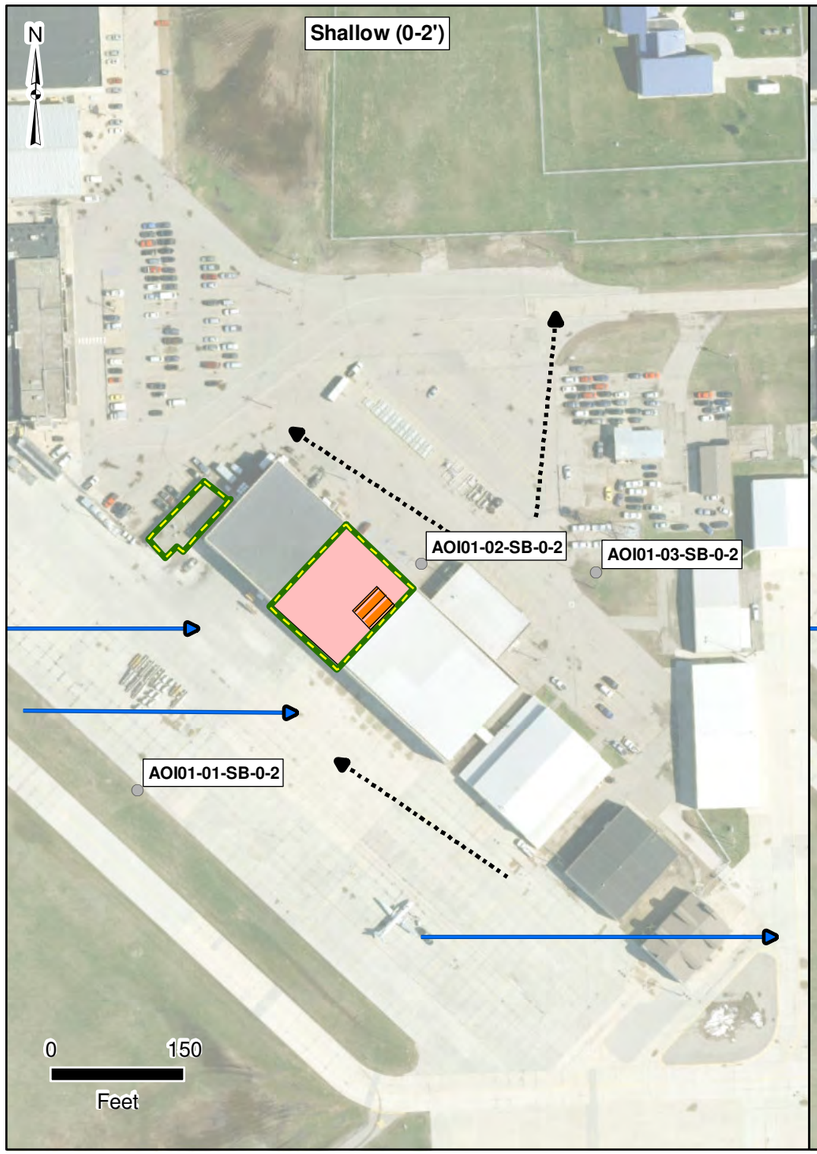
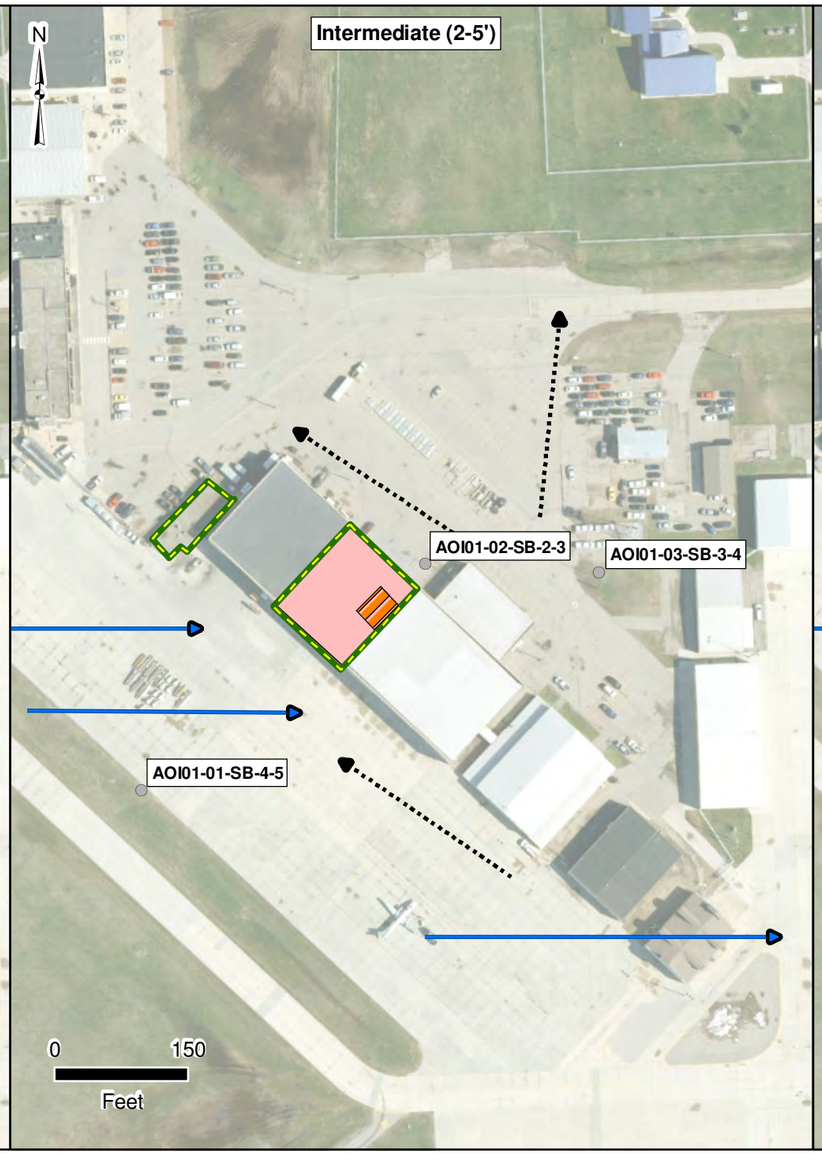
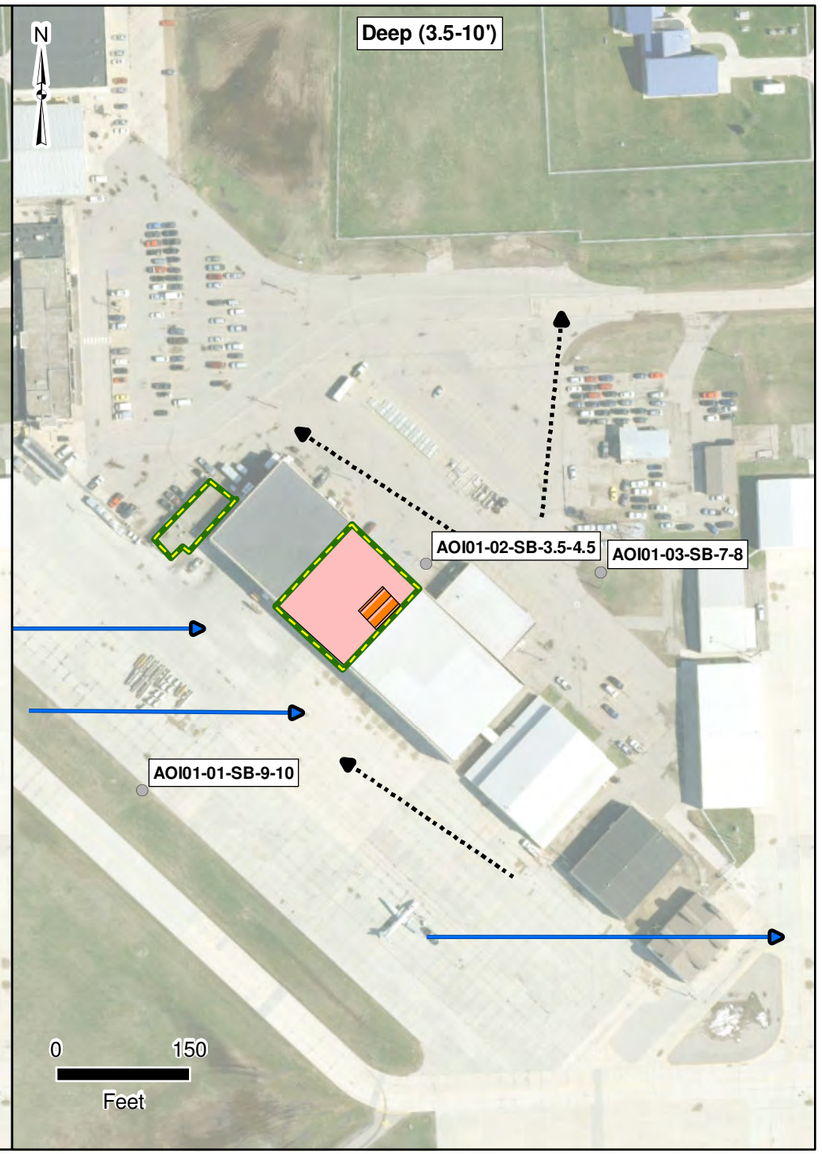
Fargo AASF #2, North Dakota

Figure 6-5
PFNA Detections in Soil









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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

PFNA Results (µg/Kg)
- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFNA = perfluorononanoic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

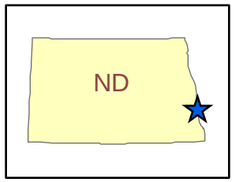

Figure 6-6
PFOA, PFOS, and PFBS Detections in Groundwater

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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
PFBS =perfluorobutanesulfonic acid
ND = Non-Detect
(ng/L) = nanogram(s) per Liter
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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Army National Guard Site Inspections
Site Inspection Report
Fargo AASF #2, North Dakota

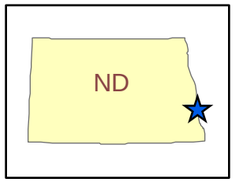
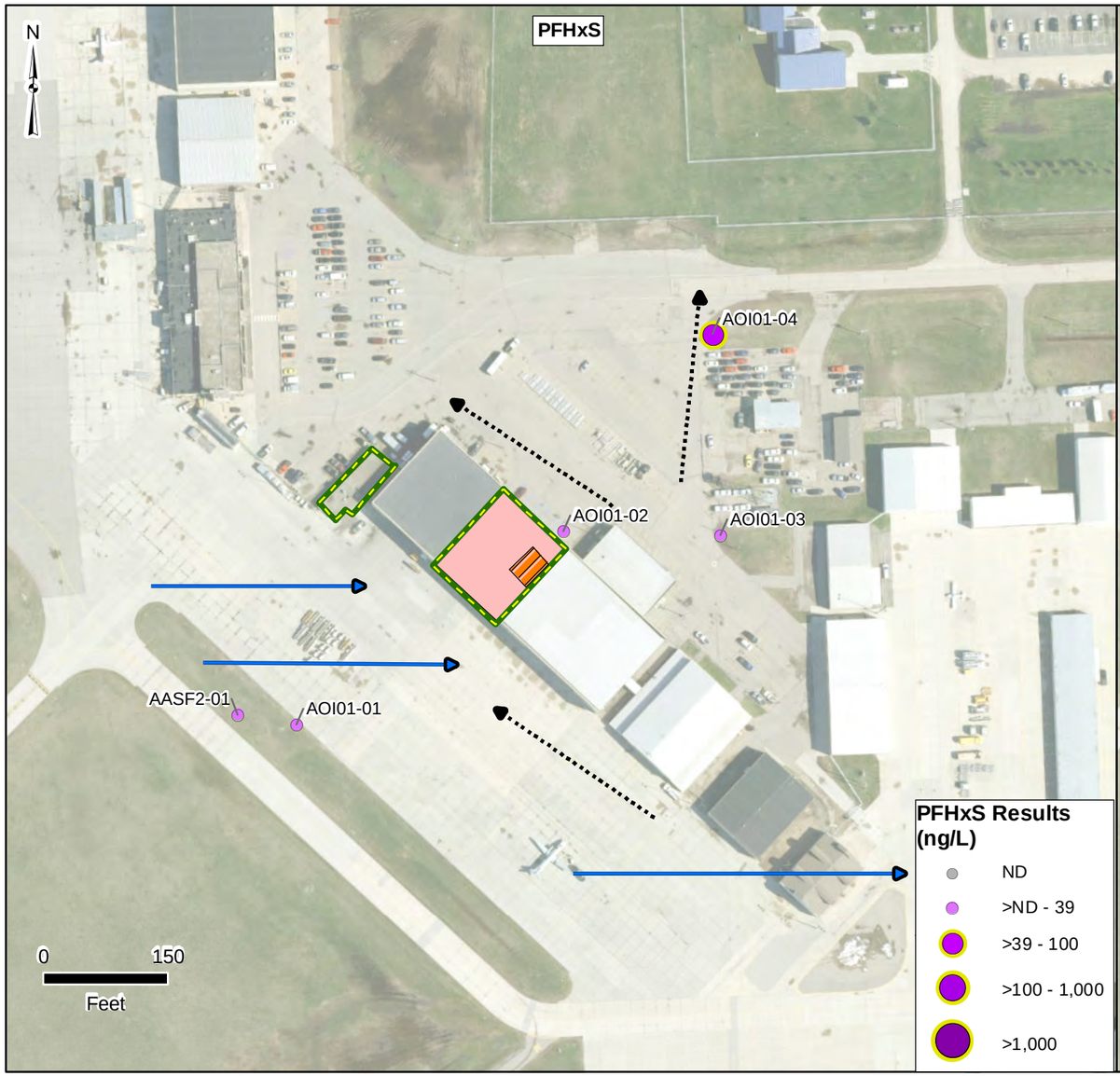
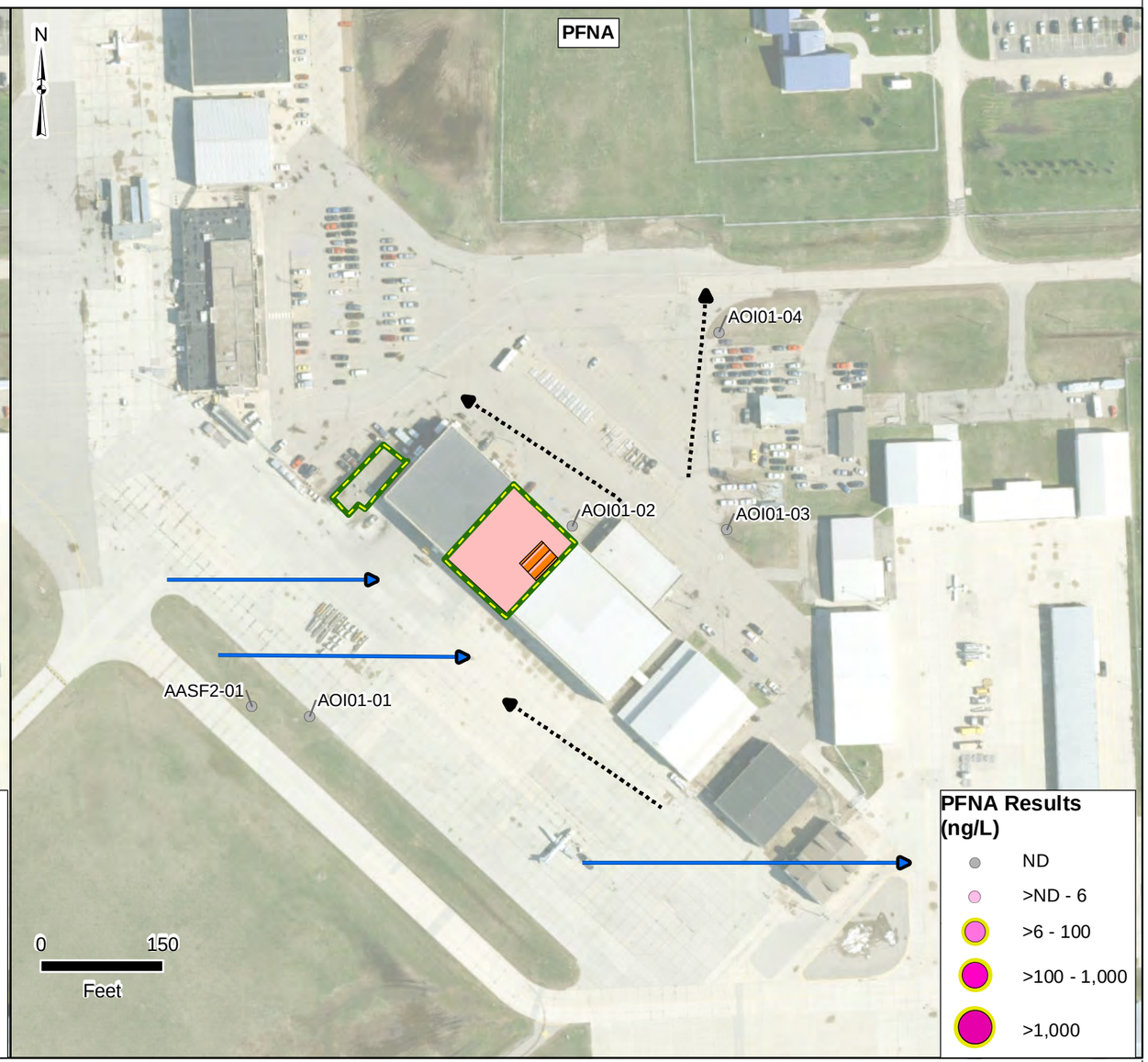


Figure 6-7
PFHxS and PFNA Detections in Groundwater





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

Hydrology
- General Regional Groundwater Flow Direction
- Shallow Local Groundwater Flow Direction from SI

NOTES:
PFAS = per- and polyfluoroalkyl substances
PFHxS = perfluorohexanesulfonic acid
PFNA = perfluorononanoic acid
ND = Non-Detect
(ng/L) = nanogram(s) per Liter
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

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7. EXPOSURE PATHWAYS

The Conceptual Site Model (CSM) for AOI 1, 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. SLs are presented in Section 6.1 of this report.

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

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if 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 the relevant compounds above the SLs. Areas with an identified potentially complete pathway and a complete pathway may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in a 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 EPA guidance for risk screening (EPA 2001). Receptors at the Facility include site workers (e.g., Facility staff and visiting soldiers), construction workers, off-site residents, off-site recreational users, and potential trespassers.

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1

AOI 1 is comprised of the Hangar portion of the Facility, which is a portion of a larger complex not operated by NDARNG. One Tri-Max™ 30 fire extinguisher was found in the Hangar during the visual site inspection conducted during the PA. PFOA and PFHxS were detected in surface soil at concentrations below their respective SLs. PFHxS was detected at two sampling locations (AOI01-01 and AOI01-03), PFOA was detected at sampling location AOI01-03. Based on the results of the SI, direct contact with surface soil outside of AOI 1 could result in site worker, construction worker, and/or trespasser exposure to PFOA and PFHxS via inhalation of dust or incidental ingestion of soil particles. Relevant compounds were not detected in the shallow and deep subsurface soil samples collected outside of AOI 1; therefore, the subsurface soil exposure pathway for construction works is incomplete. The CSM for AOI 1 is presented in **Figure 7-1.**

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1

AOI 1 is comprised of the Hangar portion of the Facility, a portion of a larger complex not operated by NDARNG. One Tri-Max™ 30 fire extinguisher was found in the Hangar during the visual site inspection conducted during the PA. PFOS, PFOA, and PFHxS were detected in groundwater at concentrations that exceeded their respective SLs. PFOS was detected in the groundwater at one sample locations (AOI01-01) and exceeded the SL. PFOA was detected in groundwater at four sample locations (AOI01-01, AOI01-02 [and its duplicate], AOI01-04 and AASF2-01) and exceeded the SL at two locations (AOI01-01 and AOI01-02). PFHxS was detected in groundwater at all five sample locations and exceeded the SL at AOI01-04. PFBS was detected in groundwater at all five sample locations at concentrations that were below the SL. Based on the results of the SI, the exposure pathway via ingestion is potentially complete for the construction worker, off-site resident, and site worker. Ground disturbing activities that extend to the water table (approximately 2 ft bgs) could result in construction worker exposure to relevant compounds via incidental ingestion. As there are domestic wells located downgradient of the AOI (based on the calculated local groundwater flow direction), there is potential for exposure to the off-site residents using these wells. As shallow groundwater may mix with the Red River, which is a known municipal drinking water source for the City of Fargo, there is the potential for exposure to users of municipal drinking water, which includes both site workers and off-site residents. Additionally, there is the potential for exposure to recreational users of the Red River. The CSM for AOI 1 is presented in **Figure 7-1**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

There is no surface water located at the AASF, however, stormwater at the Facility is managed via the Hector International Airport's stormwater system using a series of storm sewers, culverts, and ditches that ultimately flow to the Red River, which is located approximately 2 miles east of the Facility (ANG, 2019). Stormwater has the potential to transport AFFF or PFAS-impacted

soils to water bodies. There are no screening levels for surface water or sediments and the information included on the CSM for these pathways is informational only. No surface water or sediment samples were collected as part of this SI.

7.3.1 AOI 1

There were no documented releases of PFAS to the ground surface outside the Hangar, but PFAS-containing fire suppressants were stored at the Facility, and there is a potential for PFAS releases inside and immediately surrounding the Hangar. PFAS are considered to be very mobile, and when present in soil, may leach into the subsurface or be transported with sediment and may ultimately reach offsite water bodies, including the Red River. PFOA and PFHxS were detected at the surface soil outside of AOI 1. PFHxS was detected at two soil sampling locations (AOI01-01 and AOI01-03), PFOA was detected at one location (AOI01-03). Based on the detections of relevant compounds in surface soil, the exposure pathway via ingestion is potentially complete for the recreational user of the Red River, off-site resident, and site worker. There is the potential for exposure to recreational users by incidental ingestion of surface water. As the Red River is a known municipal drinking water source for the City of Fargo, there is the potential for exposure to users of municipal drinking water, which includes both site workers and off-site residents. The CSM for AOI 1 is presented in **Figure 7-1**.

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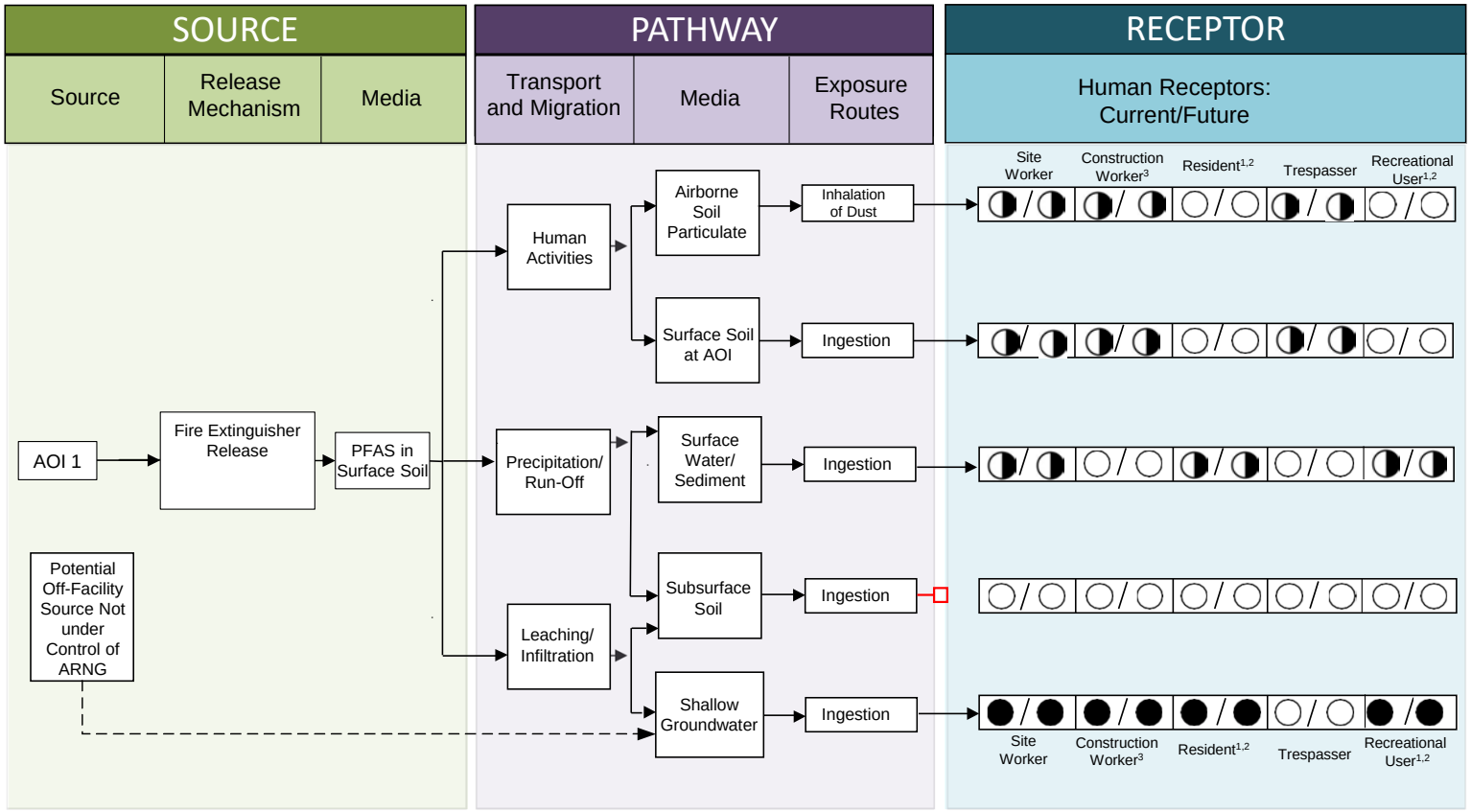

LEGEND

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

Notes:

1. The resident refers to off-site receptors
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the Facility

Figure 7-1
Conceptual Site Model, AOI 1
Fargo AASF #2

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8. SUMMARY AND OUTCOME

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

8.1 SI ACTIVITIES

The SI field activities at the Facility were conducted from 09 to 11 May 2022. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

To fulfill the project DQOs set forth in the approved SI UFP-QAPP Addendum (EA/Wood, 2022), samples were collected and analyzed for a subset of PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

Nine (9) soil grab samples from three boring locations
Five (5) grab groundwater samples from five temporary well locations
Eight (8) QA/QC samples.

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

8.2 OUTCOME

Based on the results of the SI, further evaluation of the contamination of groundwater confirmed at the Facility is warranted. However, surface soil data suggests the source(s) of contamination is not the result of NDARNG activities at the Facility. Therefore, no further investigation by DoD (ARNG G-9) is warranted at this time.

No evidence was found indicating the TriMax™ fire extinguisher at the Facility has been used either inside or outside of the Hangar. Facility personnel were unaware that the TriMax™ fire extinguisher was present inside the Hanger, and interviews of Facility personnel during the PA had first-hand knowledge that the TriMax™ fire extinguisher has not been used by NDARNG for training or emergency response throughout the entire period of the Facility lease.

Several potential adjacent sources are located on the airport. The Hector Field ANG Base, which is located northeast of the Facility, has several potential release areas that were investigated as part of a 2019 SI. This includes a former fire station that is located approximately 700 ft northeast of the Facility. Surface soil samples taken from locations around the former fire station had detections of PFOS as high as 1,200 J µg/kg. Groundwater samples collected from locations

around the former fire station had concentrations of PFHxS as high as 79,000 J ng/L, PFOS as high as 58,000 J ng/L, and PFOA as high as 16,000 J ng/L (ANG, 2019). Additionally, AFFF use on the Hector Field International Airport is possible.

Sample analytical concentrations collected during the SI at the Facility 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:

At AOI 1:

- PFOS, PFOA, and PFHxS were detected in groundwater in areas intended to assess AOI 1. PFOS exceeded the SL in groundwater in one of the five temporary wells with a maximum concentration of 7.7 ng/L (AOI01-01). PFOA exceeded the SL in groundwater in two of the temporary wells with a maximum concentration of 11 ng/L (AOI01-01 and AOI01-02). PFHxS exceeded the SL in groundwater in one of the five temporary wells with a maximum concentration of 55 ng/L (AOI01-04). PFBS was detected in groundwater in five temporary wells but did not exceed the SL. PFNA was not detected in groundwater in the temporary wells.
- PFOA and PFHxS were detected in surface soil at AOI 1 at low concentrations, several orders of magnitude below the SLs. No relevant compounds were detected in shallow or deep subsurface soil samples.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI, as screening values were established after SI planning and execution. However, ARNG will add HFPO-DA to the list of constituents sampled during the next phase of CERCLA if warranted. **Table 8-1** summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

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

AOI	Potential Release Area	Soil – Adjacent to Potential Source Area[1]	Groundwater – Adjacent to Potential Source Area[1,2]	Future Action
1	Hangar	◐	●	No Further Action

Legend:
● = Detected; exceedance of screening levels
◐ = Detected; no exceedance of screening levels
○ = Not detected
1 All samples collected to assess AOI were collected adjacent to the potential source area and were located off-Facility.
2 Groundwater exceedance not associated with DoD release; no further action by ARNG G-9.

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