FINAL
Site Inspection Report
Jefferson City AASF
Jefferson City, Missouri

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

July 2023

Prepared for:

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

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
AOI	Area of Interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	direct push technology
DQO	data quality objective
DUA	data usability assessment
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
GPS	Global positioning system
GPRS	Ground Penetrating Radar Systems
GSE	Ground Service Equipment
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MIL-SPEC	military specification
MOARNG	Missouri Army National Guard
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
ORP	oxidation-reduction potential
OSD	Office of the Secretary of Defense
OWS	oil/water separator
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid

PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WWTP	wastewater treatment plant

Executive Summary

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

The PA identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at the Jefferson City Army Aviation Support Facility (AASF) in Jefferson City, Missouri and determined further investigation is warranted for AOI 1: West Ramp Nozzle Testing, Firetruck Storage, and Aqueous Film Forming Foam (AFFF) Storage; AOI 2: Outdoor Wash Rack Fire Training Area (FTA) and Ground Service Equipment (GSE) Building; and AOI 3: East Ramp Nozzle Testing. The Jefferson City AASF will also be referred to as the "facility" throughout this document.

Jefferson City AASF is in Callaway County, central Missouri. The Jefferson City AASF occupies 17 acres adjacent to the Jefferson City Memorial Airport and is accessible from the north via highway US-94 (Bluff Road). The AASF has been operated by the Missouri ARNG (MOARNG) since 1975. Currently, the facility operates as a military aircraft maintenance facility for the MOARNG. The facility includes an aircraft hangar, two petroleum oil and lubricant storage buildings, a drive-on secondary containment structure, a wash rack, taxiways, and aircraft parking pads (AECOM Technical Services, Inc. [AECOM], 2020).

The PA identified three AOIs for investigation during the SI phase. SI sampling results from the three AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation for AOI 1: West Ramp Nozzle Testing, Firetruck Storage, and AFFF Storage; AOI 2: Outdoor Wash Rack FTA and GSE Building; and AOI 3: East Ramp Nozzle Testing.

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

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

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

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

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	West Ramp Nozzle Testing, Firetruck Storage, and AFFF Storage	●	●	●	Proceed to RI
2	Outdoor Wash Rack FTA and GSE Building	●	●	●	Proceed to RI
3	East Ramp Nozzle Testing	●	●	●	Proceed to RI

Legend:
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

1. Introduction

1.1 Project Authorization

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

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

1.2 SI Purpose

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

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

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2. Facility Background

2.1 Facility Location and Description

Jefferson City AASF is in Callaway County, central Missouri (**Figure 2-1**). The AASF is approximately 1.5 miles from the city center of Jefferson City and is approximately 100 miles west of St. Louis, Missouri. The AASF is adjacent to the Jefferson City Memorial Airport and is accessible from the north via highway US-94 (Bluff Road). The facility currently operates as a military aircraft maintenance facility for the Missouri ARNG (MOARNG). The major facility features consist of an aircraft hangar, two petroleum oil and lubricant storage buildings, a drive-on secondary containment structure, a wash rack, taxiways, and aircraft parking pads.

The AASF is constructed on an approximately 17-acre parcel of land that has been operated by the MOARNG since 1975. The land is owned by the City of Jefferson and leased to the State of Missouri Office of the Adjutant General for the construction of the MOARNG AASF. The term of the lease is for an indefinite time and began in 1975. The AASF includes hangars, storage buildings, and administrative offices.

2.2 Facility Environmental Setting

Jefferson City is located in Cole County and Callaway County, which are separated by the Missouri River, and the facility is located at the river's northern side. Regionally, the facility is situated on the far northern edge of the Ozark Plateau, with its boundary along the southern side of the Missouri River, in a geographic region known as the Mid-Missouri. The Ozark Plateau region is composed of Paleozoic sedimentary rocks. On the northern region of the plateau, rocks form an asymmetrical low dome, while the eastern side has a steep slope, and the western side has a shallow grade (National Park Service, 2018). Locally, the facility sits atop the alluvial deposits of the Missouri River Valley, and the surrounding topography has low relief (**Figure 2-2**).

2.2.1 Geology

The Jefferson City AASF is underlain by alluvial deposits that partially fill an entrenched bedrock valley. These sediments consist of sand, gravel, silt, and clay, with fine-grained material, such as silt and clay, generally found at the upper portion, and coarse-grained material more commonly found at the lower parts. The alluvial sediments average 90 feet in thickness but can be as thick as 160 feet (Miller and Appel, 1997). The alluvium is underlain by sedimentary bedrock, the Cotter Dolomite, and Jefferson City Dolomite (**Figure 2-3**; Starbuck, 2017; Missouri Geological Survey, 2020). The Cotter Dolomite is composed of gray to light brown, medium to finely crystalline, cherty dolomite that forms in thin to medium beds with interbedded shale and sandstone. The average thickness of the unit is 200 feet but can be up to 450 feet thick. The Jefferson City Dolomite is very similar to the Cotter Dolomite, and they are often mapped undivided. The Jefferson City Dolomite ranges from 124 to 350 feet in thickness (Howe, 1961).

Soil borings completed during the SI found silt and poorly graded sand as the dominant lithology of the unconsolidated sediments below Jefferson City AASF. The borings were completed at depths between 5 and 32 feet below ground surface (bgs). Unlike all other locations, AOI01-05 was terminated at 5 feet bgs due to the presence of very shallow groundwater. In most borings, surface and shallow subsurface soil were dominated by silt with lesser amounts of clay. Some of the logs also reported varying percentages of limestone gravel included in the silt. Poorly graded sand was observed to begin between 9 and 24 feet bgs across borings. Some variation in lithology was observed at AOI03-03, which was located in a lower-lying, waterlogged area where surface water runoff collects. Isolated layers of clay, silty sand to sandy silt, and well-graded sand were

also observed in the borings. Clay layers were observed at thicknesses ranging from 5 inches to 4.2 feet.

2.2.2 Hydrogeology

Jefferson City AASF is underlain by a stream-valley aquifer (sometimes called the Missouri River alluvial aquifer) that resides in the alluvial material deposited by the Missouri River. The aquifer consists of clay, silt, sand, and gravel, with finer clay and silt-laden flood deposits generally located near the surface, and layers of sand and gravel filling the deeper parts of the valley (Miller and Appel 1997). Wells screened in the Missouri River alluvial aquifer produce yields ranging from less than 100 to 3,000 gallons per minutes (Miller and Appel, 1997). Alluvial materials in the aquifer have an average saturated thickness of 80 feet. Recharge to the aquifer occurs from precipitation infiltration, stream-aquifer interaction, and from upward movement from underlying bedrock aquifers (Mesko and Berkas, 1987; Miller and Appel, 1997). Static water levels in groundwater wells located near the facility range from 3 to 25 feet bgs. Inferred groundwater flow direction within the stream-valley aquifer at the facility is to the south-southwest, towards the Missouri River, flowing downstream to the east-southeast within the localized region of the facility (**Figure 2-3**) (Missouri Geological Survey, 2020; Missouri Department of Natural Resources, 2020). Fluctuations in the Missouri River elevation, due to flooding or rain events, may have potential to cause groundwater transport in the upgradient direction.

The Ozark Plateaus aquifer system underlies the Missouri River alluvial aquifer and consists of the Springfield Plateau, Ozark, and St. Francois aquifers. At the facility, the Ozark aquifer and the St. Francois aquifer are present and are separated by a confining unit. The Ozark aquifer resides in Ordovician-aged rocks underlying the facility, including the Cotter Dolomite, the Jefferson City Dolomite, and the Roubidoux Formation. Geologic formations in the Kinderhookian Series act as an upper confining unit for the Ozark aquifer; however, these units are not present at the facility (Miller and Appel, 1997; Missouri Department of Natural Resources, 2020). Groundwater flow in the Ozark Plateaus aquifer system is inferred to flow eastwards with the Missouri River (Miller and Appel, 1997).

No potable water wells are located within the boundary of the AASF; however, one irrigation well and one well with an unknown use are in the inferred downgradient direction of the facility, and multiple domestic, monitoring, and irrigation wells are located approximately 1.3 miles of the inferred side-gradient direction of the facility (**Figure 2-3**). Drinking water for the AASF is supplied by Jefferson City, which obtains its public water supply from the deep groundwater wells (Public Water Supply District No. 1 of Cole County, 2018).

Depths to water measured in February 2022 during the SI ranged from 13.43 to 27.19 feet bgs, with one additional location within a small runoff gully also measured at 4.48 feet bgs. Based on excluding groundwater elevations in this small gully (AOI01-05) and possible anomalous readings noted in two other boring locations (AOI01-02 and AOI02-02), groundwater flow direction is generally to the south. Groundwater elevation contours from the SI are presented on **Figure 2-4**.

2.2.3 Hydrology

Jefferson City is split by the Missouri River, which separates Cole County to the south and Callaway County to the north. The AASF is less than 1 mile north of the Missouri River. There are no permanent, naturally occurring surface water bodies at Jefferson City AASF; however, an unnamed stream is located northeast of the facility. Also, during severe rain, ponding of surface water may occur at the ramp and grassy areas – the apparent path of surface runoff and the footprint of ponding was observed during field activities, south of AOI 3. The direction of surface water flow is to the southeast of the site (**Figure 2-5**).

2.2.4 Climate

The average temperature in Jefferson City is 55.25 degrees Fahrenheit (°F), with the average high reported at 65.8 °F and the average low reported at 44.7 °F. The warmest month is reported as July, with an average high of 88 °F, and the coldest month is reported as January, with an average low of 21 °F. Precipitation in the form of rainfall was recorded at an annual average of 43.11 inches per year. Approximately of 12 inches of snowfall are reported each year (World Climate, 2022).

2.2.5 Current and Future Land Use

The AASF is a controlled-access facility with public roads and is adjacent to the Jefferson City Memorial Airport. The Jefferson City Memorial Airport is owned and operated by Jefferson City and provides commercial and general air service. Reasonably anticipated future land use is not expected to change from the current land use.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following birds, clams, fishes, flowering plants, insects, and mammals are federally endangered, threatened, proposed, and/ or are listed as candidate species in Callaway County, Missouri (US Fish and Wildlife Service [USFWS], 2022).

- **Birds:** Red knot, *Calidris canutus rufa* (threatened); Least tern, *Sterna antillarum* (recovery)
- **Clams:** Scaleshell mussel, *Leptodea leptodon* (endangered)
- **Fishes:** Topeka shiner, *Notropis topeka (=tristis)* (endangered); Pallid sturgeon, *Scaphirhynchus albus* (endangered)
- **Flowering Plants:** Eastern prairie fringed orchid, *Platanthera leucophaea* (threatened); Running buffalo clover, *Trifolium stoloniferum* (recovery)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate); Regal fritillary, *Speyeria idalia* (under review)
- **Mammals**: Gray bat, *Myotis grisescens* (endangered); Tricolored bat, *Perimyotis subflavus* (under review); Little brown bat, *Myotis lucifugus* (under review); Indiana bat, *Myotis sodalist* (endangered); Northern Long-Eared Bat, *Myotis septentrionalis* (threatened)

2.3 History of PFAS Use

Three AOIs were identified in the PA where AFFF may have been used, stored, disposed, or released historically at the Jefferson City AASF (AECOM, 2020). Between 1985 and 2002, annual nozzle testing was conducted for a firetruck that contained AFFF, followed by washing of the firetruck at the outdoor wash rack. Between 1999 and 2016, annual fire training exercises occurred at the outdoor wash rack. AFFF units used during fire training were refilled at the Ground Service Equipment (GSE) building near the wash rack. The potential release areas were grouped into three AOIs based on proximity to one another and presumed groundwater flow. A description of each AOI is presented in **Section 3**.

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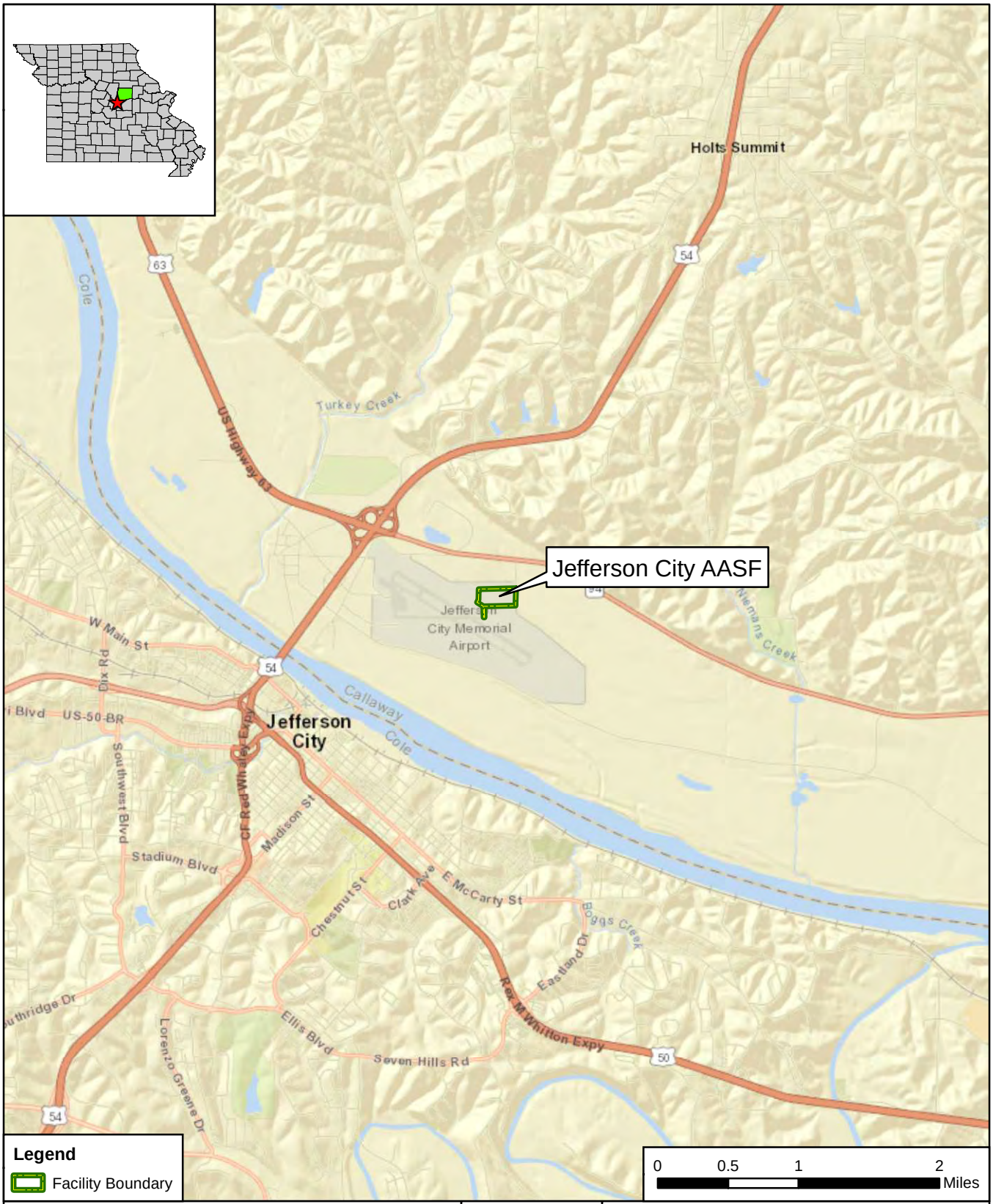

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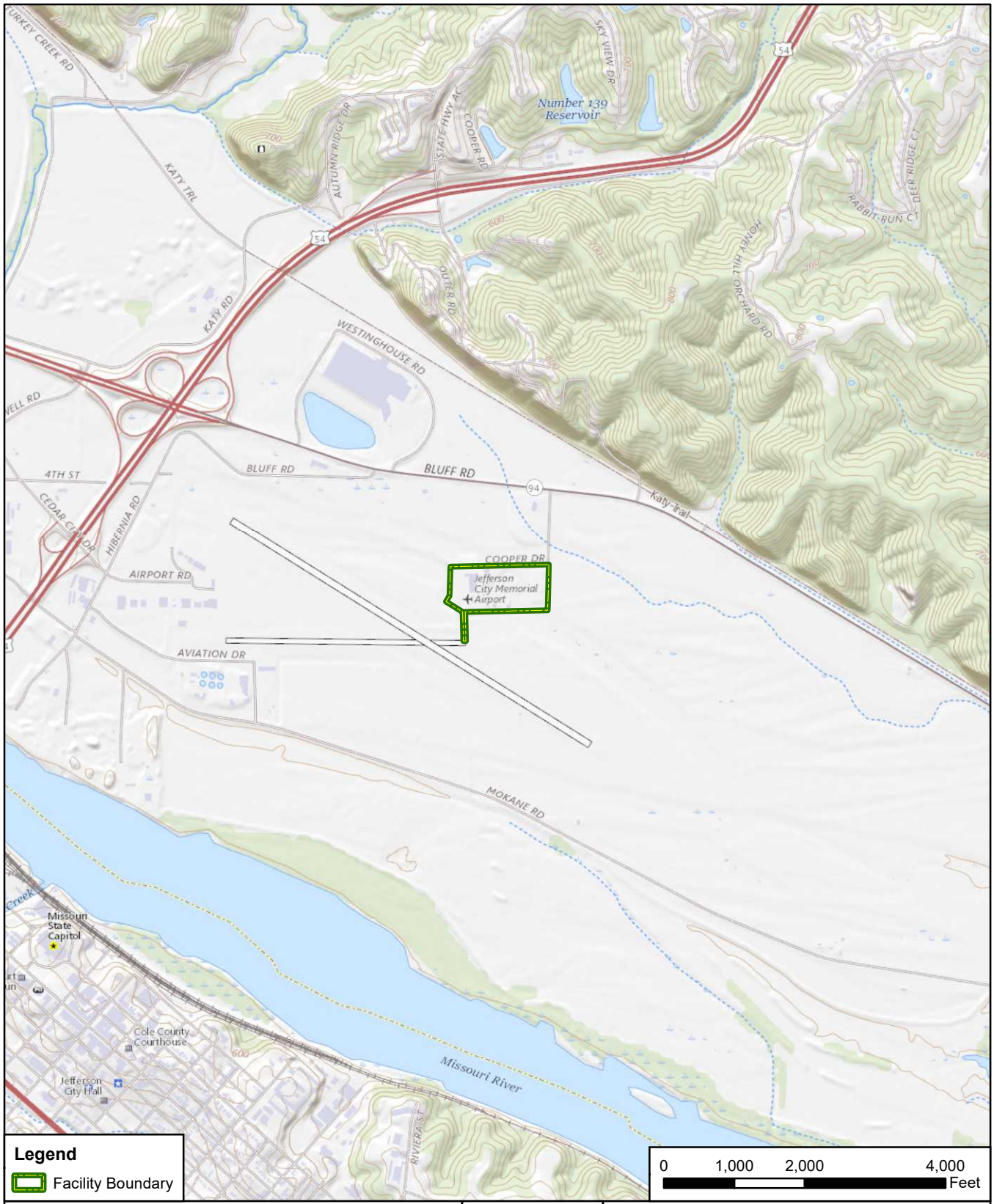
SCALE	1:63,360	CHK BY	SI	8/25/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	8/25/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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SCALE	1:24,000	CHK BY	MB	11/15/2022
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	11/15/2022

Facility Topography

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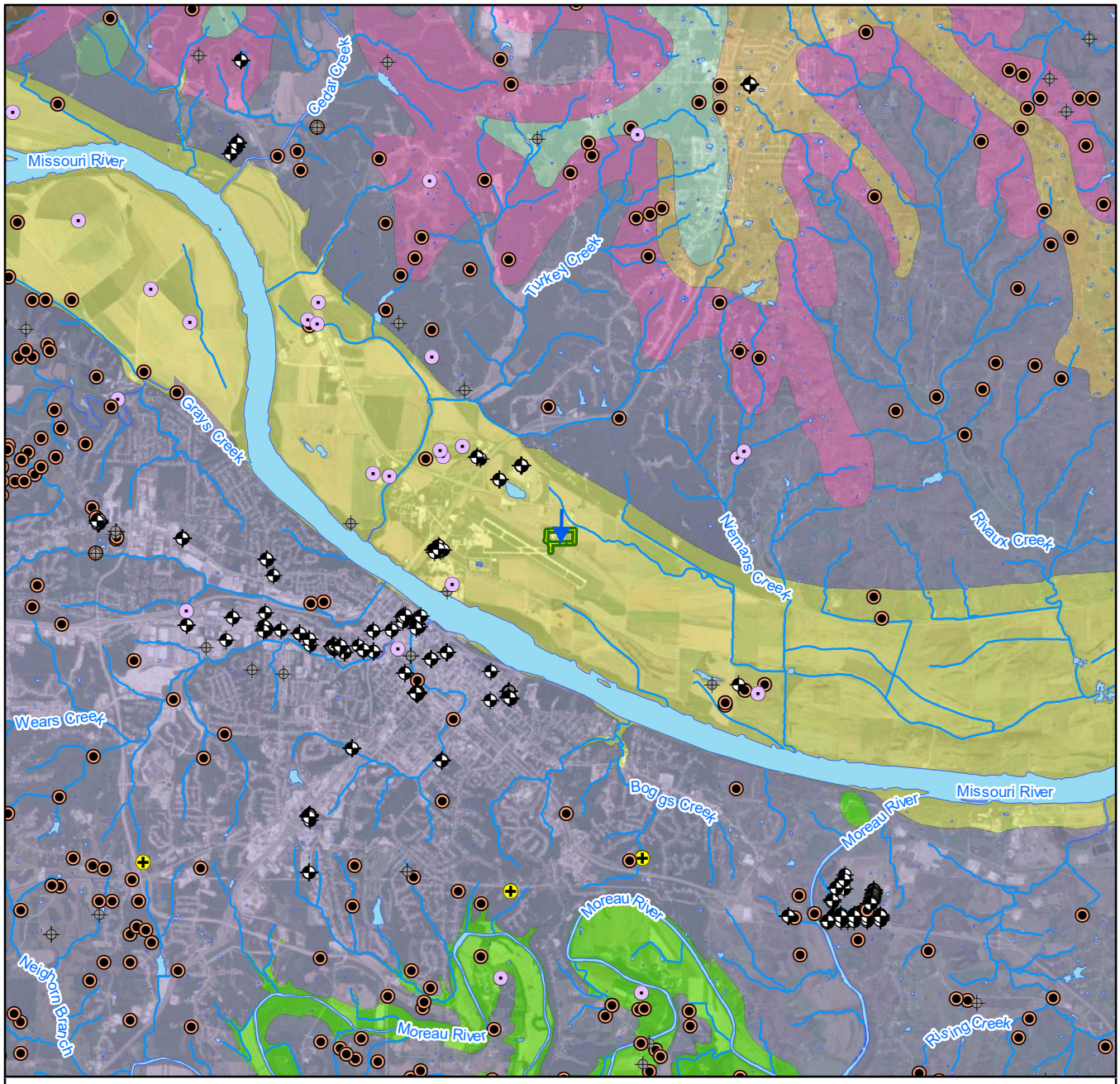
Figure 2-2



Legend

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

0 0.75 1.5 3 Miles

Geology

- Alluvium
- Cherokee Group
- Osagean Series
- Kinderhookian Series
- Holts Summit Sandstone, Snyder Creek Shale, and Cedar Valley Limestone
- St. Peter Sandstone and Everton Formation
- Smithville, Powell, Cotter, and Jefferson City dolomites
- Roubidoux Formation

Wells

- Monitoring Well
- Domestic Well
- Irrigation Well
- Public Well
- Other/Unknown Well

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:95,040	CHK BY	MB	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

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Groundwater Features

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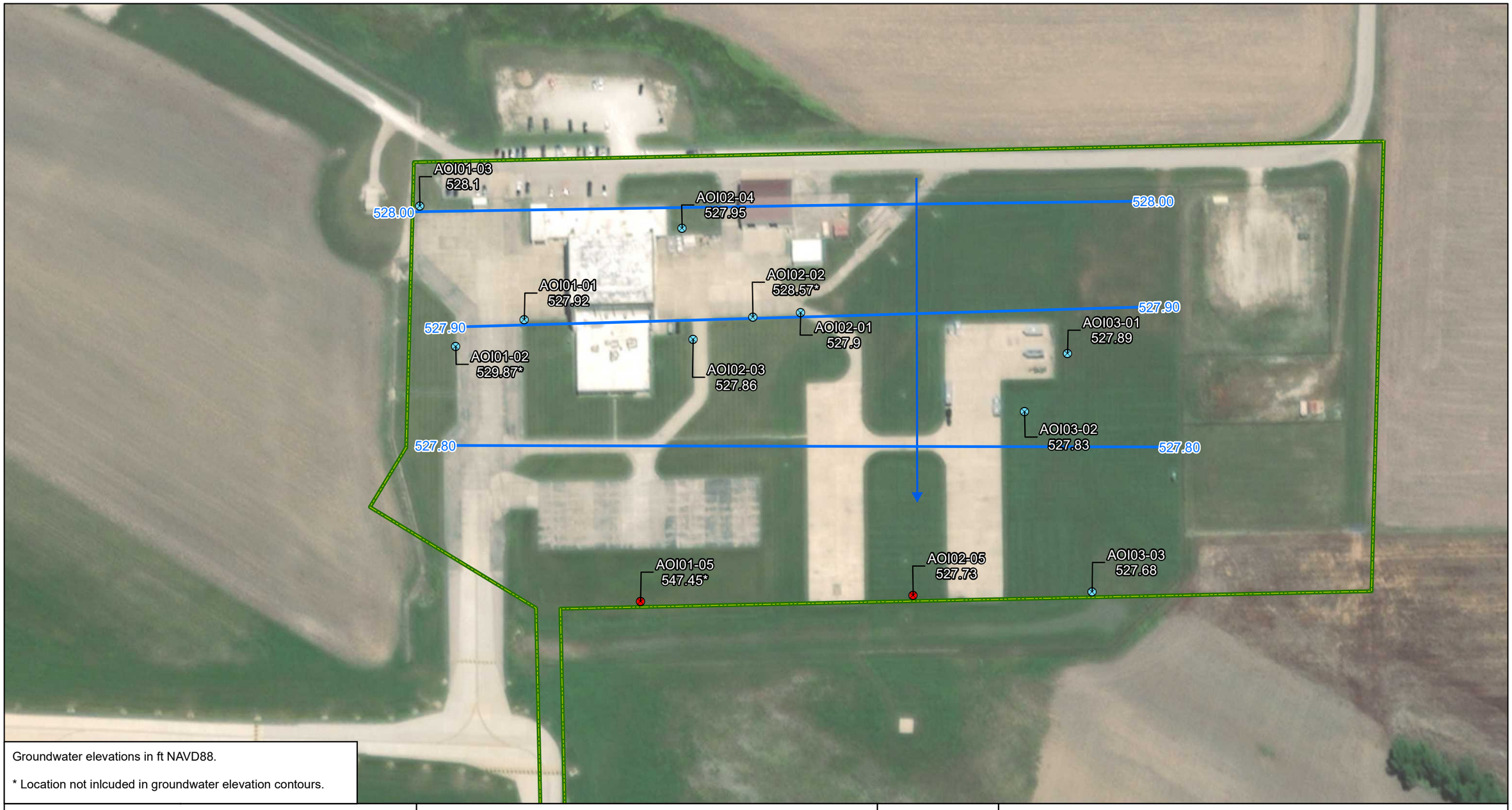
Figure 2-3



Groundwater elevations in ft NAVD88.

* Location not inlcuded in groundwater elevation contours.

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
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SCALE	1:1,680	CHK BY	MB	11/21/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	11/21/2022

- Soil Boring/Temporary Monitoring Well
- Temporary Monitoring Well
- Facility Boundary
- Groundwater Elevation Contour
- Groundwater Flow Direction

0 70 140 280 Feet

N

Groundwater Elevations, February 2022

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Figure 2-4

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	8/25/2022	GIS BY	MS	8/25/2022
SCALE	1:18,000	CHK BY	MB	8/25/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/25/2022

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Surface Water Features

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Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, five potential release areas were identified at Jefferson City AASF and grouped into three AOIs (AECOM, 2020). The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 West Ramp Nozzle Testing, Firetruck Storage, AFFF Storage

From 1985 to 2002, a firetruck with the capacity to hold three 50-gallon AFFF tanks was located at the AASF. Nozzle testing was conducted annually at the west ramp area. AOI 1 does not have drains, and the AFFF was allowed to flow off the concrete, onto the adjacent grassy areas, and naturally dissipate. The amount and concentration of AFFF dispensed during nozzle testing are unknown. The firetruck was stored in a building, located at the northeast of the west ramp area, that is equipped with floor drains that lead to an oil/water separator (OWS) and then to the sanitary wastewater treatment plant (WWTP). There were no reports of any leaks or spills from the vehicle. Approximately 200-220 gallons of bulk AFFF were held in reserve and stored in the upper-level mezzanine of same building. The dispositions of the firetruck and bulk AFFF are unknown.

3.2 AOI 2 Outdoor Wash Rack FTA and GSE Building

From 1999 to 2016, annual fire training exercises with one Tri-Max30™ fire extinguisher occurred at the outdoor wash rack on the east side of the hangar. During each training event, one Tri-Max30™ extinguisher would be emptied to put out a small fire. The unit would then be refilled with AFFF at the outdoor wash rack area. In 2019, AFFF from three Tri-Max30™ extinguishers was discharged to the ground at the wash rack and refilled with climate-controlled AFFF concentrate to avoid freezing. The units were refilled at the GSE building on the northwest side of the wash rack. The GSE building and wash rack each have a drain that leads to an OWS and eventually to the city sanitary WWTP. Additionally, the firetruck was washed at the Outdoor Wash Rack fire FTA after nozzle testing, which occurred from 1985 to 2002.

3.3 AOI 3 East Ramp Nozzle Testing

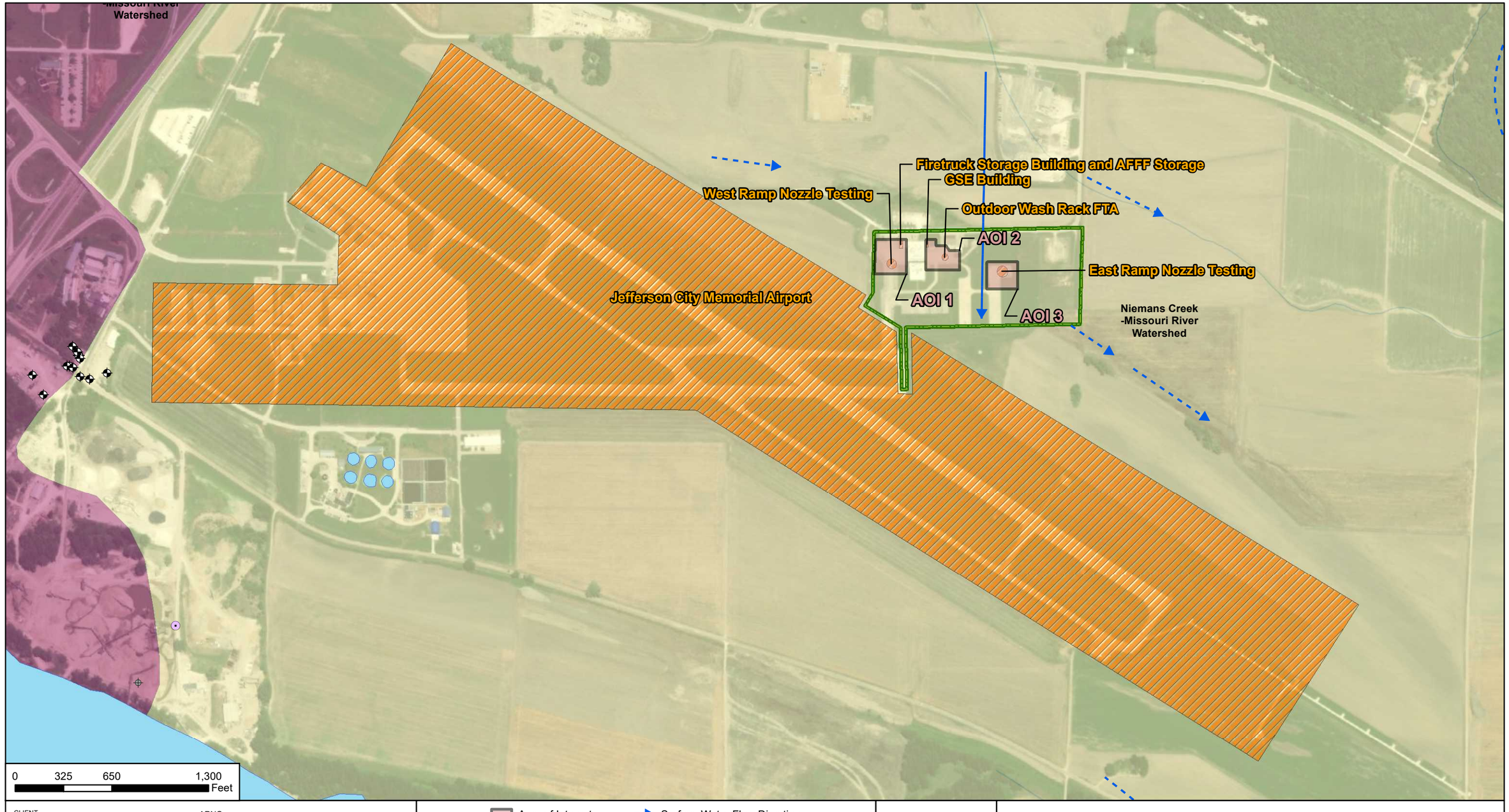
As performed at AOI 1, nozzle testing for the firetruck was also conducted annually at the far east ramp area. AOI 3 does not have drains, and the AFFF was allowed to flow off the concrete, onto the adjacent grassy areas, and naturally dissipate. The amount and concentration of AFFF dispensed during nozzle testing are unknown.

3.4 Adjacent Sources

One off-facility, potential source was identified adjacent to the facility during the PA and are not associated with ARNG activities. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and will not be investigated as part of this SI.

3.4.1 Jefferson City

The Jefferson City Memorial Airport geographic coordinates are 38°35'34.74"N; 92°9'55.95"W. The Jefferson City Memorial Airport was constructed in 1947 and is owned and operated by Jefferson City. The AASF is east and adjacent to the Jefferson City Memorial Airport. There is not a fire department at the airport. There are several public, corporate, and private aircraft hangars located at the Jefferson City Memorial Airport. It is unknown if the aircraft hangars have fire suppression systems or if AFFF is present in the hangars.



CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
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SCALE	1:7,800	CHK BY	MB	11/18/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	11/18/2022

- Area of Interest
- Potential Release Area
- Facility Boundary
- Water Body
- River/Stream
- Surface Water Flow Direction
- Groundwater Flow Direction
- Monitoring Well
- Domestic Well
- Irrigation Well
- Other/Unknown Well

N

Areas of Interest

AECOM
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Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

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

4.1 Problem Statement

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

4.2 Information Inputs

Primary information inputs included:

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

4.3 Study Boundaries

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

4.4 Analytical Approach

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

4.5 Data Usability Assessment

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

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

5. Site Inspection Activities

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

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Jefferson City AASF, Jefferson City, Missouri* dated March 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Jefferson City AASF, Jefferson City, Missouri* dated October 2021 (AECOM, 2021); and
- *Final Site Safety and Health Plan, Jefferson City AASF, Jefferson City, Missouri* dated January 2022 (AECOM, 2022).

The SI field activities were conducted from 14 to 19 February 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021), except as noted in **Section 5.8**.

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

- Thirty-three (33) soil samples from 15 boring locations;
- Eleven (11) grab groundwater samples from 12 temporary well locations;
- Twenty (20) quality assurance (QA)/quality control (QC) samples.

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, a Field Change Request is provided in **Appendix B3**, land survey data are provided in **Appendix B4**, and investigation-derived waste (IDW) polygons are provided in **Appendix B5**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

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

defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 8 June 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, MOARNG, USACE, Missouri Department of Natural Resources, 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 SI QAPP Addendum (AECOM, 2021).

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 the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM placed a ticket with Missouri One Call System, the local utility clearance provider, to notify them of intrusive work on 3 February 2022. However, because the AASF is a private facility, the participating utility locators did not clear utilities at the entire facility. Therefore, AECOM contracted Ground Penetrating Radar Systems (GPRS), LLC, a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 14 February 2022 with input from the AECOM field team and Jefferson City AASF facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

One potable water source at Jefferson City AASF was sampled on 22 October 2021 to assess usability for decontamination of drilling equipment. Results of the sample confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. Specifically, the samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the potable water source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

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

5.2 Soil Borings and Soil Sampling

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

In general, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample

approximately 2 feet above the groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table. In borings where groundwater was encountered at 6 feet bgs or shallower, only two soil samples were collected per boring, in accordance with the QAPP Addendum (AECOM, 2021).

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

During the SI, soil borings were generally completed at depths between 16 and 32 feet bgs, with the exception of AOI01-05, which was completed at 5 feet bgs due to the presence of very shallow groundwater. Silt and poorly graded sand were observed as the dominant lithology of the unconsolidated sediments below Jefferson City AASF. In most borings, surface and shallow subsurface soil were dominated by silt with lesser amounts of clay. Some of the logs also reported varying percentages of limestone gravel included in the silt. Poorly graded sand was observed to begin between 9 and 24 feet bgs across borings. Some variation in lithology was observed at AOI03-03, which was located in a lower-lying, waterlogged area where surface water runoff collects. Isolated layers of clay, silty sand to sandy silt, and well-graded sand were also observed in the borings. Clay layers were observed at thicknesses ranging from 5 inches to 4.2 feet.

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

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

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021) using bentonite chips or concrete slurry at completion of sampling activities. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.3 Temporary Well Installation and Groundwater Grab Sampling

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

Groundwater samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. After the recharge

period, groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, 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. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021) by removing the PVC and backfilling the hole with bentonite chips or concrete slurry. Temporary wells were installed in grass areas to avoid disturbing concrete or asphalt.

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 18 February 2022. Groundwater elevation measurements were collected from the 12 new temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. Groundwater flow direction is discussed in **Section 2.2.2**. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-2**.

5.5 Surveying

The northern side of each well casing was surveyed by Missouri-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021). Survey data from the newly installed wells on the facility were collected on 18 February 2022 in the applicable Universal Transverse Mercator zone projection with World Geodetic System 84 datum (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B4**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were left in place at the point of the source. The soil cuttings were distributed on the ground surface on the downgradient side of the boring. The soil IDW was not sampled and assumes the PFAS characteristics of the associated soil samples collected from that source location.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were discharged directly to the ground surface slightly downgradient of the source. The liquid IDW was not sampled and assumes the PFAS characteristics of the associated groundwater samples collected from that source location.

Geographic coordinates were collected using a Global positioning system (GPS) around each location where IDW was placed (i.e., an IDW polygon). The IDW polygons are displayed on the figure in **Appendix B5**.

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

5.7 Laboratory Analytical Methods

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

5.8 Deviations from SI QAPP Addendum

Three deviations from the SI QAPP Addendum were identified during review of the field documentation. These deviations are noted below and documented in a Field Change Request Form (**Appendix B3**):

- During the site walk on 14 February 2022, AOI01-03 and AOI03-03 were relocated from their originally proposed locations. AOI01-03 was moved approximately 55 feet south, due to presence of utilities (high-pressure natural gas, electric, communications). Additionally, soil sampling was added at AOI01-03, which was originally proposed as a temporary monitoring well only, based on the apparent drainage of the adjacent concrete slab towards the relocated sample location. AOI03-03 was moved approximately 45 feet east, due to the apparent path of surface runoff drainage, to be closer to the area of water impoundment. Based on field observations, the footprint of the apparent area of water impoundment extends further than originally assumed based on aerial imagery, towards the revised location of AOI03-03. AOI03-03 was originally scoped as a temporary well with no soil samples; however, based on this new observation, soil sampling was added to AOI03-03.
- Due to a laboratory error, the grain size sample collected at locations AOI01-01 and AOI02-02 could not be analyzed. This deviation was documented in a nonconformance and corrective action report provided in Appendix B3.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Jefferson City AASF, Missouri

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-00-02	2/16/2022 9:50	0 - 2	x	x	x		
AOI01-01-SB-00-02-D	2/16/2022 9:50	0 - 2	x				FD
AOI01-01-SB-00-02-MS	2/16/2022 9:51	0 - 2	x				MS
AOI01-01-SB-00-02-MSD	2/16/2022 9:51	0 - 2	x				MSD
AOI01-01-SB-08-09	2/16/2022 11:00	8 - 9	x				
AOI01-01-SB-09-10	2/16/2022 11:05	9 - 10				x	
AOI01-01-SB-24-25	2/16/2022 10:05	24 - 25	x				
AOI01-02-SB-00-02	2/16/2022 11:50	0 - 2	x				
AOI01-02-SB-08-09	2/16/2022 12:35	8 - 9	x				
AOI01-02-SB-12-13	2/16/2022 16:05	12 - 13				x	
AOI01-02-SB-15-16	2/16/2022 12:30	15 - 16	x				
AOI01-03-SB-00-02	2/14/2022 15:26	0 - 2	x				
AOI01-03-SB-12-13	2/14/2022 15:35	12 - 13	x				
AOI01-03-SB-23-24	2/14/2022 15:40	23 - 24	x				
AOI01-04-SB-00-02	2/14/2022 15:45	0 - 2	x				
AOI02-01-SB-00-02	2/17/2022 12:45	0 - 2	x				
AOI02-01-SB-10-11	2/17/2022 13:40	10 - 11	x				
AOI02-01-SB-21.5-22.5	2/17/2022 13:35	21.5 - 22.5	x				
AOI02-02-SB-00-02	2/16/2022 15:40	0 - 2	x				
AOI02-02-SB-00-02-D	2/16/2022 15:40	0 - 2	x				FD
AOI02-02-SB-00-02-MS	2/16/2022 15:40	0 - 2	x				MS
AOI02-02-SB-00-02-MSD	2/16/2022 15:40	0 - 2	x				MSD
AOI02-02-SB-09-10	2/16/2022 16:20	9 - 10	x				
AOI02-02-SB-17-18	2/16/2022 16:15	17 - 18	x				
AOI02-03-SB-00-02	2/16/2022 14:00	0 - 2	x	x	x		
AOI02-03-SB-00-02-D	2/16/2022 14:00	0 - 2		x	x		FD
AOI02-03-SB-00-02-MS	2/16/2022 14:02	0 - 2		x	x		MS
AOI02-03-SB-00-02-MSD	2/16/2022 14:02	0 - 2		x	x		MSD
AOI02-03-SB-12-13	2/16/2022 14:50	12 - 13	x				
AOI02-03-SB-22-23	2/16/2022 14:45	22 - 23	x				
AOI02-04-SB-00-02	2/18/2022 10:10	0 - 2	x				
AOI02-04-SB-11-12	2/18/2022 12:20	11 - 12	x				
AOI02-04-SB-24-25	2/18/2022 12:15	24 - 25	x				
AOI03-01-SB-00-02	2/15/2022 16:10	0 - 2	x				
AOI03-01-SB-08-09	2/15/2022 16:35	8 - 9	x				
AOI03-01-SB-13-14	2/15/2022 16:30	13 - 14	x				
AOI03-02-SB-00-02	2/15/2022 14:00	0 - 2	x				
AOI03-02-SB-06-07	2/15/2022 14:47	6 - 7	x				
AOI03-02-SB-16-16.75	2/15/2022 14:40	16 - 16.75	x				
AOI03-03-SB-00-02	2/15/2022 12:40	0 - 2	x				
AOI03-03-SB-07-08	2/15/2022 12:58	7 - 8	x				
AOI03-03-SB-10-11	2/15/2022 12:55	10 - 11	x				
AOI03-04-SB-00-02	2/16/2022 8:50	0 - 2	x	x	x		
AOI03-04-SB-00-02-D	2/16/2022 8:50	0 - 2	x				FD
AOI03-04-SB-00-02-MS	2/16/2022 8:52	0 - 2	x				MS
AOI03-04-SB-00-02-MSD	2/16/2022 8:52	0 - 2	x				MSD
AOI03-05-SB-00-02	2/15/2022 13:37	0 - 2	x				
Groundwater Samples							
AOI01-01-GW	2/16/2022 13:30	NA	x				
AOI01-02A-GW	2/19/2022 14:20	NA	x				

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Jefferson City AASF, Missouri

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
AOI01-03A-GW	2/19/2022 12:45	NA	x				
AOI01-03A-GW-D	2/19/2022 12:45	NA	x				FD
AOI01-05-GW	2/15/2022 13:13	NA	x				
AOI02-01-GW	2/18/2022 16:40	NA	x				
AOI02-01-GW-D	2/18/2022 16:40	NA	x				FD
AOI02-01-GW-MS	2/18/2022 16:40	NA	x				MS
AOI02-01-GW-MSD	2/18/2022 16:40	NA	x				MSD
AOI02-03-GW	2/16/2022 15:50	NA	x				
AOI02-04-GW	2/18/2022 13:51	NA	x				
AOI02-05-GW	2/16/2022 11:14	NA	x				
AOI03-01-GW	2/16/2022 9:26	NA	x				
AOI03-02-GW	2/15/2022 17:00	NA	x				
AOI03-03-GW	2/15/2022 14:56	NA	x				
Quality Control Samples							
JC-DECON-01	10/22/2021 11:30	NA	x				source water
JC-DECON-02	2/16/2022 9:15	NA	x				decon water from drill rig
JC-DECON-03	2/19/2022 10:50	NA	x				decon water from drill rig with replaced valve
JC-ERB-01	2/16/2022 8:35	NA	x				hand auger
JC-ERB-02	2/16/2022 8:40	NA	x				cutting shoe
JC-ERB-03	2/19/2022 10:55	NA	x				2nd cutting shoe
JC-FRB-01	2/16/2022 8:45	NA	x				field reagent blank

Notes:
AASF = Army Aviation Support Facility
AOI = area of interest
ASTM = American Society for Testing and Materials
bgs = below ground surface
DECON = decontamination
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
NA = not applicable
QSM = Quality Systems Manual
SB = soil boring
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Jefferson City AASF, Missouri

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-01	28	23 - 28	555.87	554.98	27.95	27.06	527.92
	AOI01-02	24	19 - 24	554.87	553.76	25.00	23.89	529.87
	AOI01-02A	30	24.7 - 29.7	NM	NM	26.40	NM	NM
	AOI01-03	28	23 - 28	556	553.19	27.90	25.09	528.1
	AOI01-03A	30	24.9 - 29.9	NM	NM	25.48	NM	NM
	AOI01-04	2	NA	NA	554.02	NA	NA	NA
	AOI01-05	5	0 - 5	552.06	551.93	4.61	4.48	547.45
2	AOI02-01	28	23 - 28	555.17	553.18	27.27	25.28	527.9
	AOI02-02	28	22.9 - 27.9	556.94	554.85	28.37	26.28	528.57
	AOI02-03	32	27 - 32	557.62	555.05	29.76	27.19	527.86
	AOI02-04	28	23 - 28	557.69	555.08	29.74	27.13	527.95
	AOI02-05	20	14.95 - 19.75	543.49	543.29	15.76	15.56	527.73
3	AOI03-01	20	14.2 - 19.2	546.26	545.61	18.37	17.72	527.89
	AOI03-02	20	15 - 20	546.51	546.24	18.68	18.41	527.83
	AOI03-03	16	11 - 16	543.26	541.11	15.58	13.43	527.68
	AOI03-04	2	NA	NA	546.61	NA	NA	NA
	AOI03-05	2	NA	NA	541.93	NA	NA	NA

Notes:
[1] Temporary well screen set above total depth to capture groundwater interface
[2] Temporary wells AOI01-02A and AOI01-03A are redrilled locations due to lack of groundwater in original wells. Redrilling occurred after well survey.

AASF = Army Aviation Support Facility
AOI = area of interest
bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988
NM = not measured

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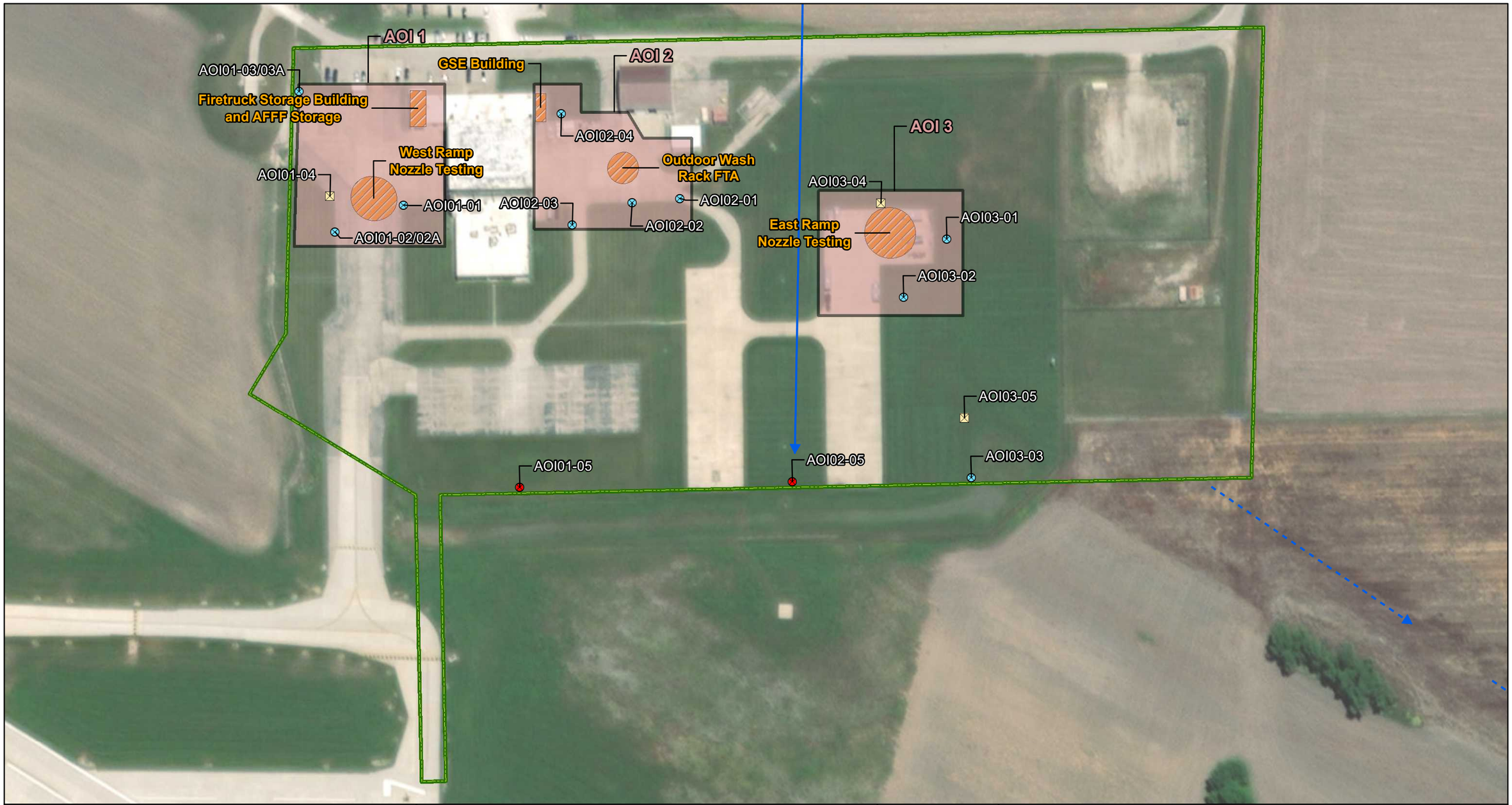

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	11/15/2022	GIS BY	MS	11/15/2022
SCALE	1:1,680	CHK BY	MB	11/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	11/15/2022

- Soil Boring/Temporary Monitoring Well
- Temporary Monitoring Well
- Surface Soil Sample
- Area of Interest
- Potential Release Area
- Facility Boundary
- Surface Water Flow Direction
- Groundwater Flow Direction

0 70 140 280 Feet

N

Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.5**. **Table 6-2** through **Table 6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

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

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

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

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

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

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

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

6.2 Soil Physicochemical Analyses

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important 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: West Ramp Nozzle Testing, Firetruck Storage, and AFFF Storage. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI01-01 through AOI01-04. Soil was also sampled from shallow subsurface soil (8 to 13 feet bgs) and deep subsurface soil intervals (15 to 25 feet bgs) from boring locations AOI01-01 through AOI01-03. PFOS exceeded the SL in surface soil. PFOA, PFBS, PFHxS, and PFNA were detected in soil at concentrations at least one order of magnitude below the SLs.

In surface soil, PFOS exceeded the SL of 13 micrograms per kilogram (µg/kg) at AOI01-01, AOI01-02, and AOI01-04 at concentrations of 75.2 µg/kg, 50.8 µg/kg, and 20.4 µg/kg, respectively. PFOA, PFBS, PFHxS, and PFNA were detected in surface soil at concentrations at least one order of magnitude below the SLs. The maximum concentration of these four compounds was PFHxS, which was detected at 2.30 µg/kg at AOI01-01.

In shallow subsurface soil, PFNA was not detected. PFOA, PFOS, PFBS, and PFHxS were only detected at AOI01-01 (8 to 9 feet bgs), at least two orders of magnitude below their SLs. The maximum detected concentration among the four detected compounds was PFOS, which was detected at 0.761 J µg/kg.

PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in deep subsurface soil. The maximum detected concentration among the five compounds was PFOS, which was detected at 23.7 µg/kg at AOI01-03 (23 to 24 feet bgs).

6.3.2 AOI 1 Groundwater Analytical Results

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

Groundwater was sampled from temporary monitoring wells AOI01-01, AOI01-02A, AOI01-03A, and AOI01-05. The following exceedances were reported:

- PFOA was detected above the SL of 6 nanograms per liter (ng/L), at concentrations of 454 ng/L at AOI01-01, 729 ng/L at AOI01-02A, and 181 ng/L at AOI01-03A.
- PFOS was detected above the SL of 4 ng/L, at concentrations of 8,370 ng/L at AOI01-01, 282 ng/L at AOI01-02A, and 12,700 ng/L at AOI01-03A.
- PFHxS was detected above the SL of 39 ng/L, at concentrations of 4,060 ng/L at AOI01-01, 3,090 ng/L at AOI01-02A, and 423 ng/L at AOI01-03A.
- PFNA was detected above the SL of 6 ng/L, at concentrations of 189 ng/L at AOI01-01, 27.5 ng/L at AOI01-02A, and 401 ng/L at AOI01-03A.

PFBS was detected below the SL of 601 ng/L in all four wells, with the maximum PFBS concentration detected at 495 ng/L at AOI01-02A.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOS was detected in surface soil above the SL. PFOA, PFHxS, PFNA, and PFBS were detected in soil, at concentrations at least one order of magnitude below their SLs. PFOA, PFOS, PFHxS, and PFNA were detected in groundwater at concentrations above their SLs. Based on the exceedances of the SLs in soil and groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

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

6.4.1 AOI 2 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (9 to 13 feet bgs), and deep subsurface soil (17 to 25 feet bgs) from boring locations AOI02-01 through AOI02-04. PFOS exceeded the SL in surface soil. PFOA, PFBS, PFHxS, and PFNA were detected in soil at concentrations at least one order of magnitude below the SLs.

In surface soil, PFOS exceeded the SL of 13 µg/kg at AOI02-02, AOI02-03, and AOI02-04, at concentrations of 14.6 µg/kg, 27.9 µg/kg, and 58.2 µg/kg, respectively. PFOA, PFBS, PFHxS, and PFNA were detected in surface soil, at concentrations below the SLs. The maximum detected concentration of these four compounds was PFNA at 2.44 µg/kg at AOI02-04.

In shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were detected at concentrations at least one order of magnitude below the SLs. The maximum concentration among the detected compounds was PFOS at 15.6 µg/kg at AOI02-03 (12 to 13 feet bgs).

PFOA, PFOS, PFBS, and PFHxS were detected in deep subsurface soil. The maximum detected concentration among the five compounds was PFOS at 1.69 µg/kg at AOI02-01 (21.5 to 22.5 feet bgs). PFNA was not detected in deep subsurface soil.

6.4.2 AOI 2 Groundwater Analytical Results

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

Groundwater was sampled from temporary monitoring wells AOI02-01, AOI02-03, AOI02-04, and AOI02-05. PFOA, PFOS, PFHxS, and PFNA exceeded their SLs in groundwater at all four well locations:

- PFOA was detected above the SL of 6 ng/L, at concentrations of 157 ng/L at AOI02-01, 158 ng/L at AOI02-03, 437 ng/L at AOI02-04, and 156 ng/L at AOI02-05.
- PFOS was detected above the SL of 4 ng/L, at concentrations of 3,130 ng/L at AOI02-01, 101 ng/L at AOI02-03, 2,630 ng/L at AOI02-04, and 1,250 ng/L at AOI02-05.
- PFHxS was detected above the SL of 39 ng/L, at concentrations of 669 ng/L at AOI02-01, 1,180 ng/L at AOI02-03, 742 ng/L at AOI02-04, and 526 ng/L at AOI02-05.
- PFNA was detected above the SL of 6 ng/L, at concentrations of 14.0 ng/L at AOI02-01, 11.5 ng/L at AOI02-03, 147 ng/L at AOI02-04, and 26.4 ng/L at AOI02-05.

PFBS was detected below the SL of 601 ng/L in all four wells, with the maximum PFBS concentration detected at 206 ng/L at AOI02-03.

6.4.3 AOI 2 Conclusions

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

6.5 AOI 3

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 3: East Ramp Nozzle Testing. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.5.1 AOI 3 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI03-01 through AOI03-05. Soil was also sampled from shallow subsurface soil (6 to 14 feet bgs) from boring locations AOI03-01 through AOI03-03, and deep subsurface soil (16 to 16.75 feet bgs) from boring location AOI03-02. PFOS exceeded the SL in surface soil. PFOA, PFBS, PFHxS, and PFNA were detected in soil, at concentrations at least one order of magnitude below the SLs.

PFOS was detected above the SL of 13 µg/kg in surface soil at AOI03-03, with a concentration of 14.5 µg/kg. PFOA, PFHxS, and PFNA were detected in surface soil, at concentrations below the SLs. The maximum detected concentration of these four compounds was PFNA at 0.312 J µg/kg at AOI03-03. PFBS was not detected in surface soil.

In shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were detected at least one orders of magnitude below their SLs. The maximum detected concentration among the four

detected compounds was PFOS, which was detected at 6.74 µg/kg at AOI03-03 (10 to 11 feet bgs).

PFOA, PFOS, PFBS, and PFNA were not detected in the deep subsurface soil sample collected at AOI 3. PFHxS was detected at a concentration of 0.110 J µg/kg.

6.5.2 AOI 3 Groundwater Analytical Results

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

Groundwater was sampled from temporary monitoring wells AOI03-01, AOI03-02, and AOI03-03. The following exceedances of the SLs were reported:

- PFOA was detected above the SL of 6 ng/L, at a concentration of 31.3 ng/L at AOI03-03.
- PFOS was detected above the SL of 4 ng/L, at a concentration of 1,190 ng/L at AOI03-03.
- PFHxS was detected above the SL of 39 ng/L at all three wells, at concentrations of 181 ng/L at AOI03-01, 156 ng/L at AOI03-02, and 119 ng/L at AOI03-03.
- PFNA was detected above the SL of 6 ng/L, at a concentration of 8.67 ng/L at AOI03-03.

PFBS was detected below the SL of 601 ng/L at all three wells, with a maximum concentration of 41.1 ng/L at AOI03-01.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOS was detected in surface soil above the SL. PFOA, PFHxS, PFNA, and PFBS were detected in soil at concentrations below their SLs. PFOA, PFOS, PFHxS, and PFNA were detected in groundwater, at concentrations above their SLs. Based on the exceedances of the SLs in soil and groundwater, further evaluation at AOI 3 is warranted.

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

	Area of Interest	AOI01		AOI01		AOI01		AOI01		AOI01		AOI02		AOI02		AOI02		AOI02		AOI02	
	Sample ID	AOI01-01-SB-00-02		AOI01-01-SB-00-02-D		AOI01-02-SB-00-02		AOI01-03-SB-00-02		AOI01-04-SB-00-02		AOI02-01-SB-00-02		AOI02-02-SB-00-02		AOI02-02-SB-00-02-D		AOI02-03-SB-00-02		AOI02-04-SB-00-02	
	Sample Date	02/16/2022		02/16/2022		02/16/2022		02/14/2022		02/14/2022		02/17/2022		02/16/2022		02/16/2022		02/16/2022		02/18/2022	
	Depth	0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	1900	0.046	J	0.043	J	0.036	J	ND	U	ND	U	ND	U	ND	UJ	0.026	J	0.044	J	ND	U
PFHxS	130	2.28		2.30		1.09		0.568	J	0.178	J	0.202	J	0.261	J	0.378	J	0.937	J	0.371	J
PFNA	19	1.25		1.38		1.22		0.463	J	0.217	J	0.124	J	0.621	J	0.948	J	0.772	J	2.44	
PFOA	19	0.467	J	0.561	J	0.494	J	0.550	J	0.131	J	0.308	J	0.626	J	0.953	J	0.619	J	1.32	
PFOS	13	65.5	J	75.2		50.8		3.15		20.4		4.04		12.3		14.6		27.9		58.2	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest		AOI03											
Sample ID		AOI03-01-SB-00-02		AOI03-02-SB-00-02		AOI03-03-SB-00-02		AOI03-04-SB-00-02		AOI03-04-SB-00-02-D		AOI03-05-SB-00-02	
Sample Date		02/15/2022		02/15/2022		02/15/2022		02/16/2022		02/16/2022		02/15/2022	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)													
PFBS	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	0.061	J	ND	U	0.205	J	0.084	J	0.076	J	0.084	J
PFNA	19	0.233	J	ND	U	0.312	J	0.113	J	0.086	J	0.072	J
PFOA	19	0.133	J	ND	U	0.176	J	0.144	J	0.122	J	ND	U
PFOS	13	6.48		0.167	J	14.5		3.69		2.83		1.59	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest		AOI01						AOI02								AOI03					
Sample ID		AOI01-01-SB-08-09		AOI01-02-SB-08-09		AOI01-03-SB-12-13		AOI02-01-SB-10-11		AOI02-02-SB-09-10		AOI02-03-SB-12-13		AOI02-04-SB-11-12		AOI03-01-SB-08-09		AOI03-01-SB-13-14		AOI03-02-SB-06-07	
Sample Date		2/16/2022		02/16/2022		02/14/2022		02/17/2022		02/16/2022		02/16/2022		02/18/2022		02/15/2022		02/15/2022		02/15/2022	
Depth		8-9 ft		8-9 ft		12-13 ft		10-11 ft		9-10 ft		12-13 ft		11-12 ft		8-9 ft		13-14 ft		6-7 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	25000	0.046	J	ND	U	ND	U	0.089	J	0.308	J	0.081	J	0.044	J	0.032	J	ND	U	ND	U
PFHxS	1600	0.674	J	ND	U	ND	U	4.18		0.180	J	1.56		0.422	J	0.661	J	0.183	J	0.575	J
PFNA	250	ND	U	ND	U	ND	U	0.105	J	ND	U	0.178	J	ND	U	ND	U	ND	U	ND	U
PFOA	250	0.094	J	ND	U	ND	U	0.210	J	ND	U	0.286	J	0.230	J	ND	U	ND	U	ND	U
PFOS	160	0.761	J	ND	U	ND	U	7.41		0.104	J	15.6		ND	U	0.337	J	0.086	J	0.068	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

	Area of Interest	AOI03			
	Sample ID	AOI03-03-SB-07-08		AOI03-03-SB-10-11	
	Sample Date	02/15/2022		02/15/2022	
	Depth	7-8 ft		10-11 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)					
PFBS	25000	ND	U	ND	U
PFHxS	1600	0.156	J	0.068	J
PFNA	250	0.038	J	0.039	J
PFOA	250	0.119	J	ND	U
PFOS	160	2.29		6.74	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest	AOI01						AOI02							
Sample ID	AOI01-01-SB-24-25		AOI01-02-SB-15-16		AOI01-03-SB-23-24		AOI02-01-SB-21.5-22.5		AOI02-02-SB-17-18		AOI02-03-SB-22-23		AOI02-04-SB-24-25	
Sample Date	02/16/2022		02/16/2022		02/14/2022		02/17/2022		02/16/2022		02/16/2022		02/18/2022	
Depth	24-25 ft		15-16 ft		23-24 ft		21.5-22.5 ft		17-18 ft		22-23 ft		24-25 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)														
PFBS	ND	U	0.094	J	ND	U	ND	U	0.047	J	0.159	J	ND	U
PFHxS	ND	U	0.580	J	0.278	J	0.383	J	0.109	J	ND	U	0.604	J
PFNA	ND	U	ND	U	1.12		ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	0.246	J	0.146	J	ND	U	ND	U	0.101	J
PFOS	0.102	J	ND	U	23.7		1.69		ND	U	ND	U	0.698	J

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest	AOI03	
Sample ID	AOI03-02-SB-16-16.75	
Sample Date	02/15/2022	
Depth	16-16.75 ft	
Analyte	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table		
PFBS	ND	U
PFHxS	0.110	J
PFNA	ND	U
PFOA	ND	U
PFOS	ND	U

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Jefferson City AASF

Area of Interest		AOI01										AOI02							
Sample ID		AOI01-01-GW		AOI01-02A-GW		AOI01-03A-GW		AOI01-03A-GW-D		AOI01-05-GW		AOI02-01-GW		AOI02-01-GW-D		AOI02-03-GW		AOI02-04-GW	
Sample Date		02/16/2022		02/19/2022		02/19/2022		02/19/2022		02/15/2022		02/18/2022		02/18/2022		02/16/2022		02/18/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																			
PFBS	601	187		495		22.0		22.6		0.685	J	126		148		206		47.5	
PFHxS	39	4060		3090		404		423		ND	U	582		669		1180		742	
PFNA	6	189		27.5		389		401		ND	U	11.3		14.0		11.5		147	
PFOA	6	454		729		178		181		ND	U	138		157		158		437	
PFOS	4	8370		282		11700		12700		1.97	J	2630		3130		101		2630	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Jefferson City AASF

	Area of Interest	AOI02		AOI03					
	Sample ID	AOI02-05-GW		AOI03-01-GW		AOI03-02-GW		AOI03-03-GW	
	Sample Date	02/16/2022		02/16/2022		02/15/2022		02/15/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)									
PFBS	601	9.57		41.1		29.8		17.2	
PFHxS	39	526		181		156		119	
PFNA	6	26.4		ND	U	ND	U	8.67	
PFOA	6	156		5.20		ND	U	31.3	
PFOS	4	1250		3.20	J	0.911	J	1190	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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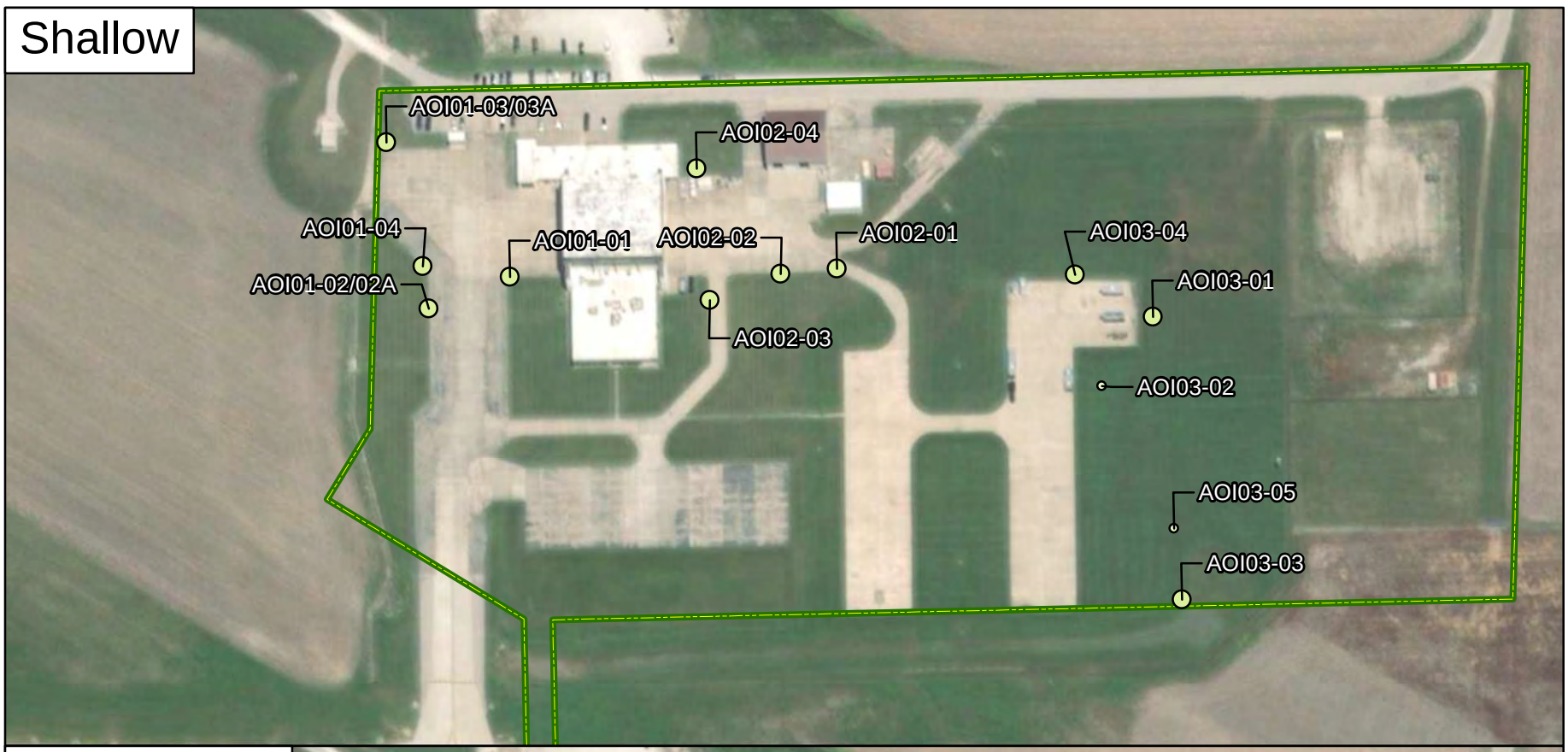
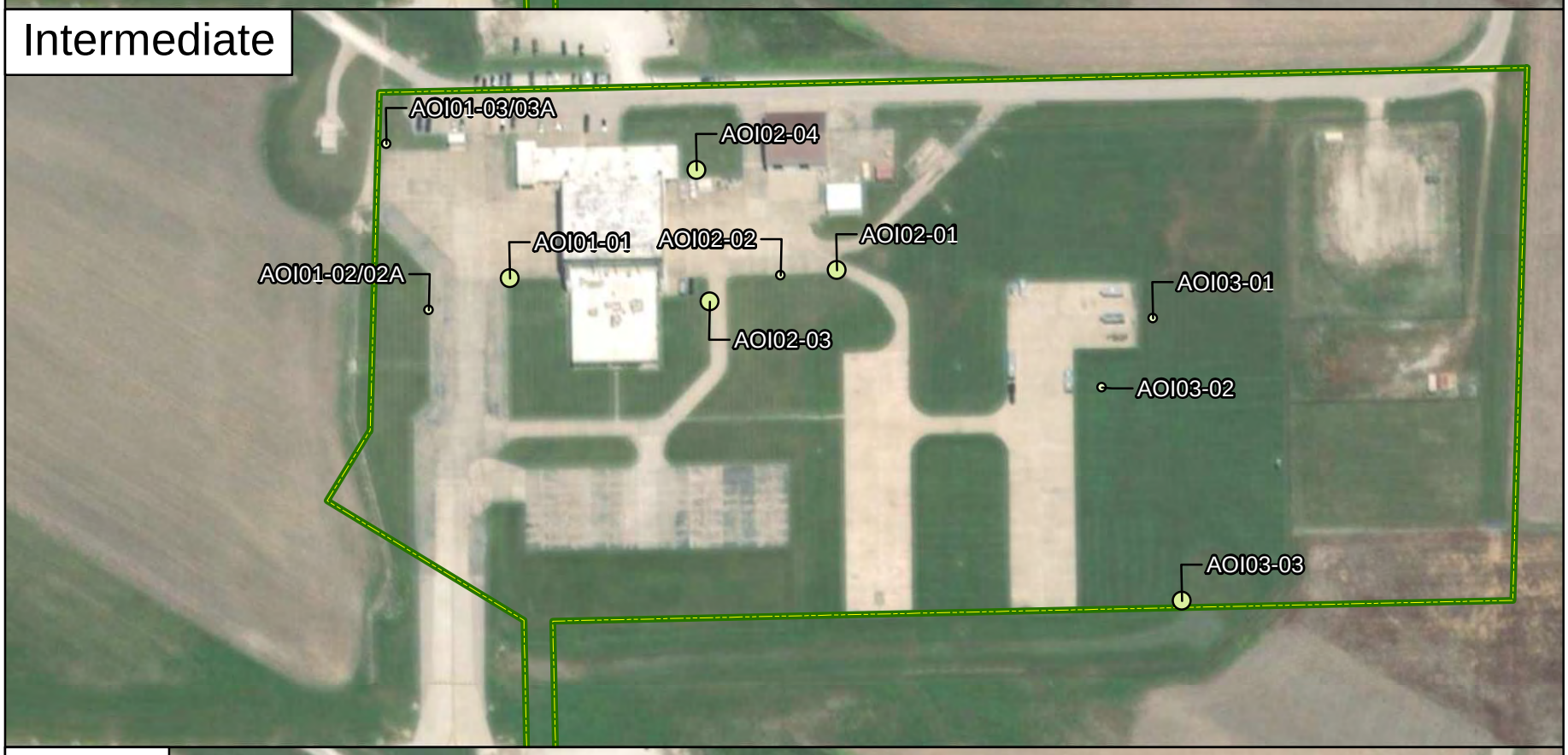
Shallow



Intermediate



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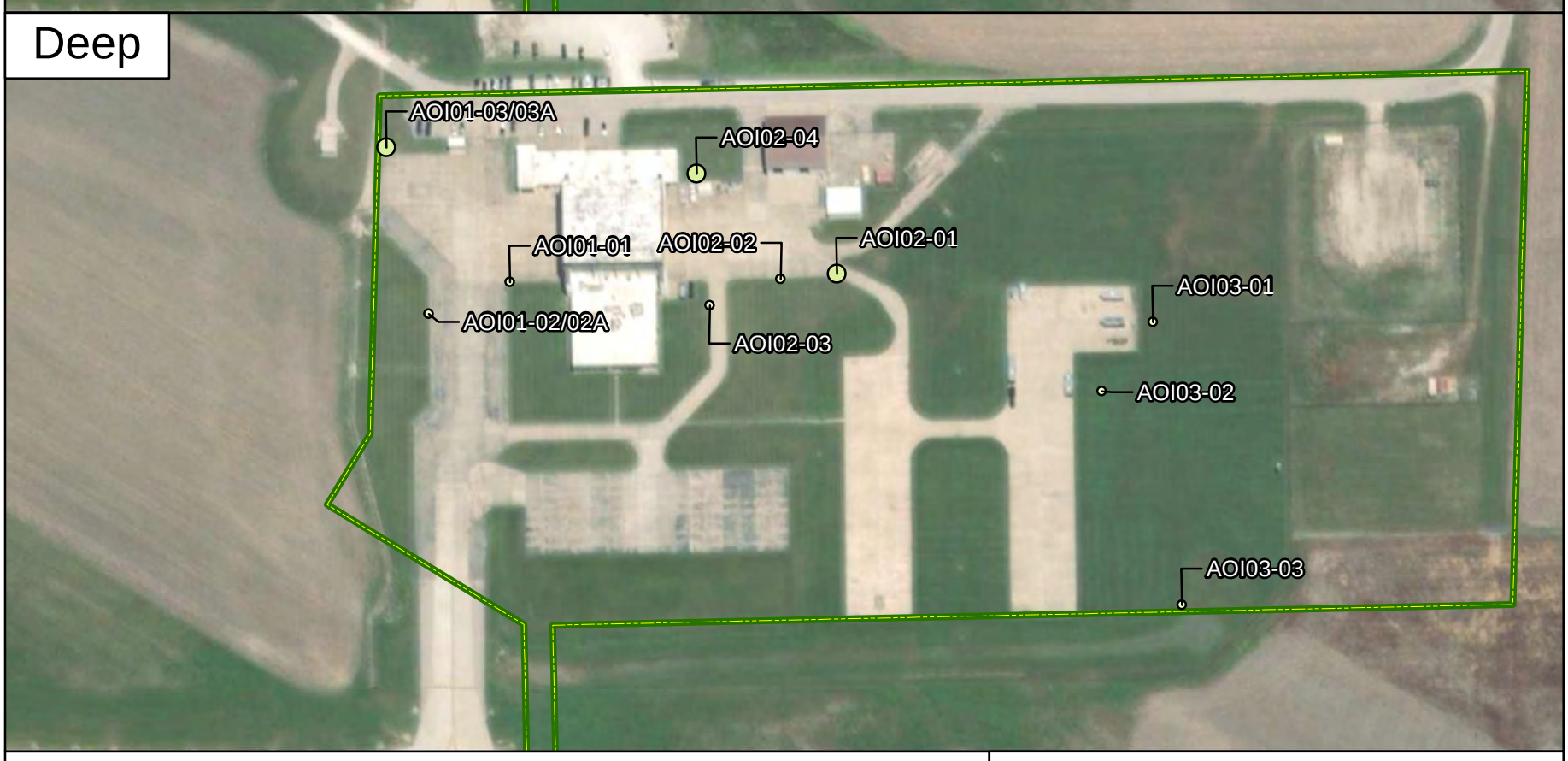

Facility Boundary

PFOA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 100 200 400 Feet

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

PFOA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:2,400	CHK BY	MB	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

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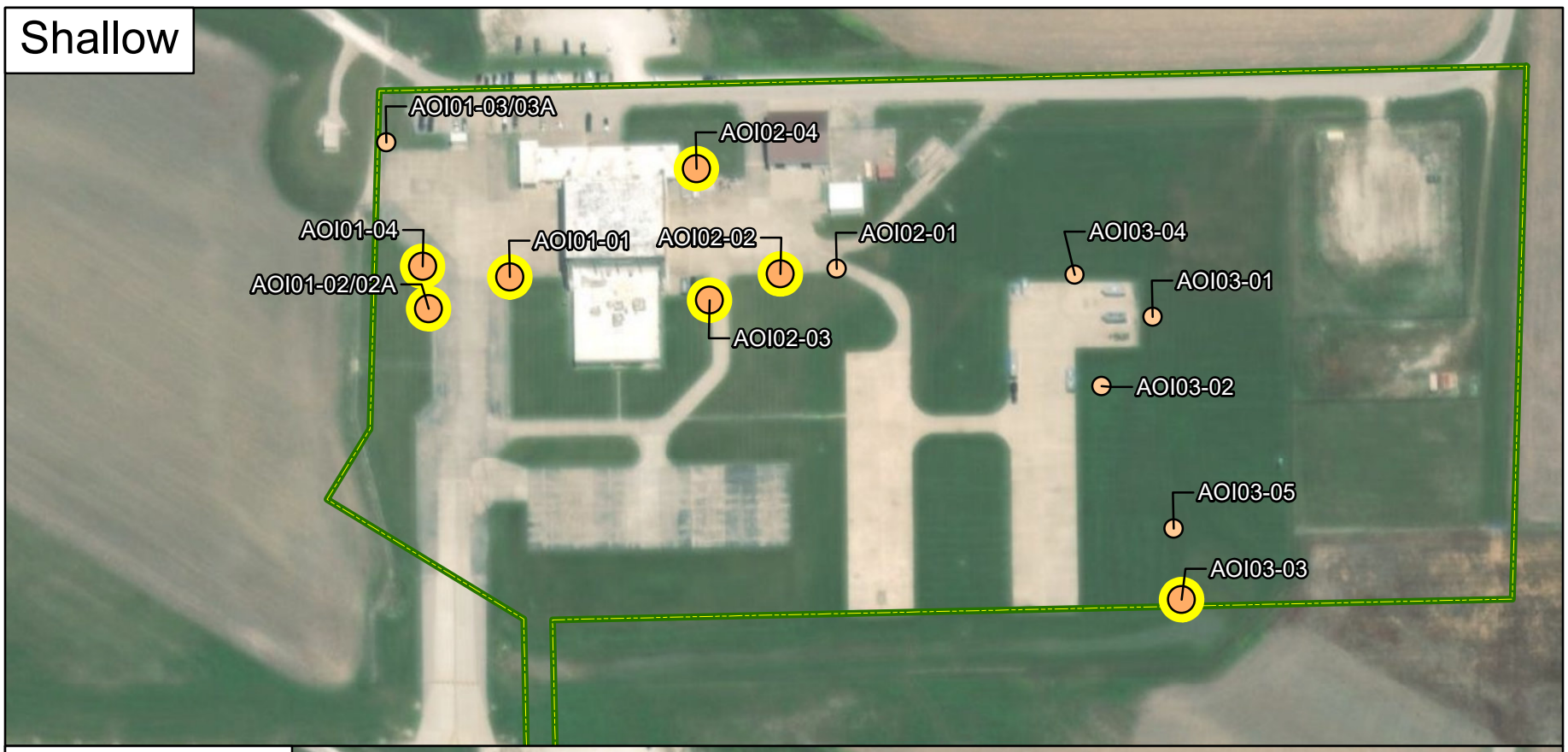
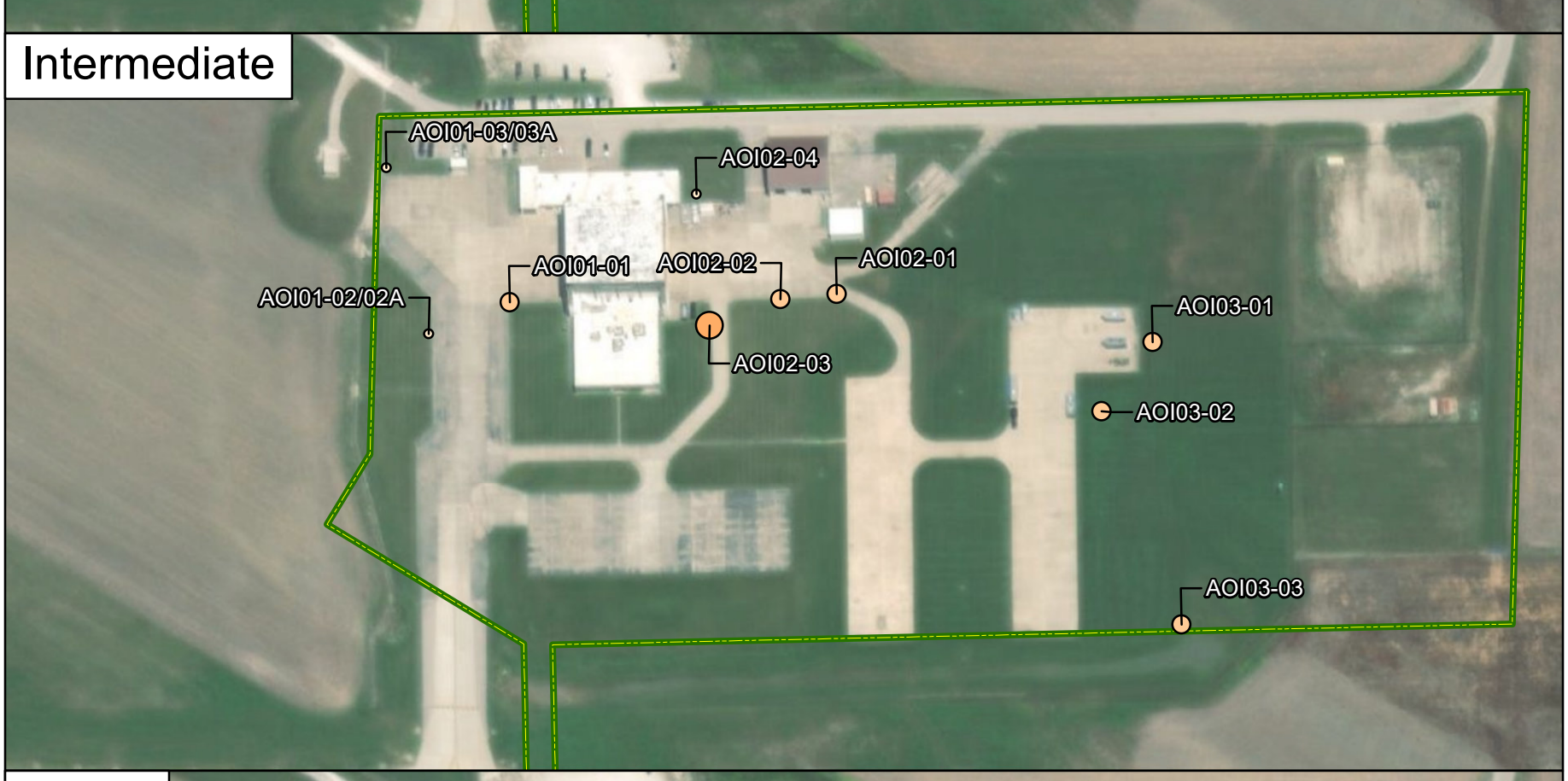
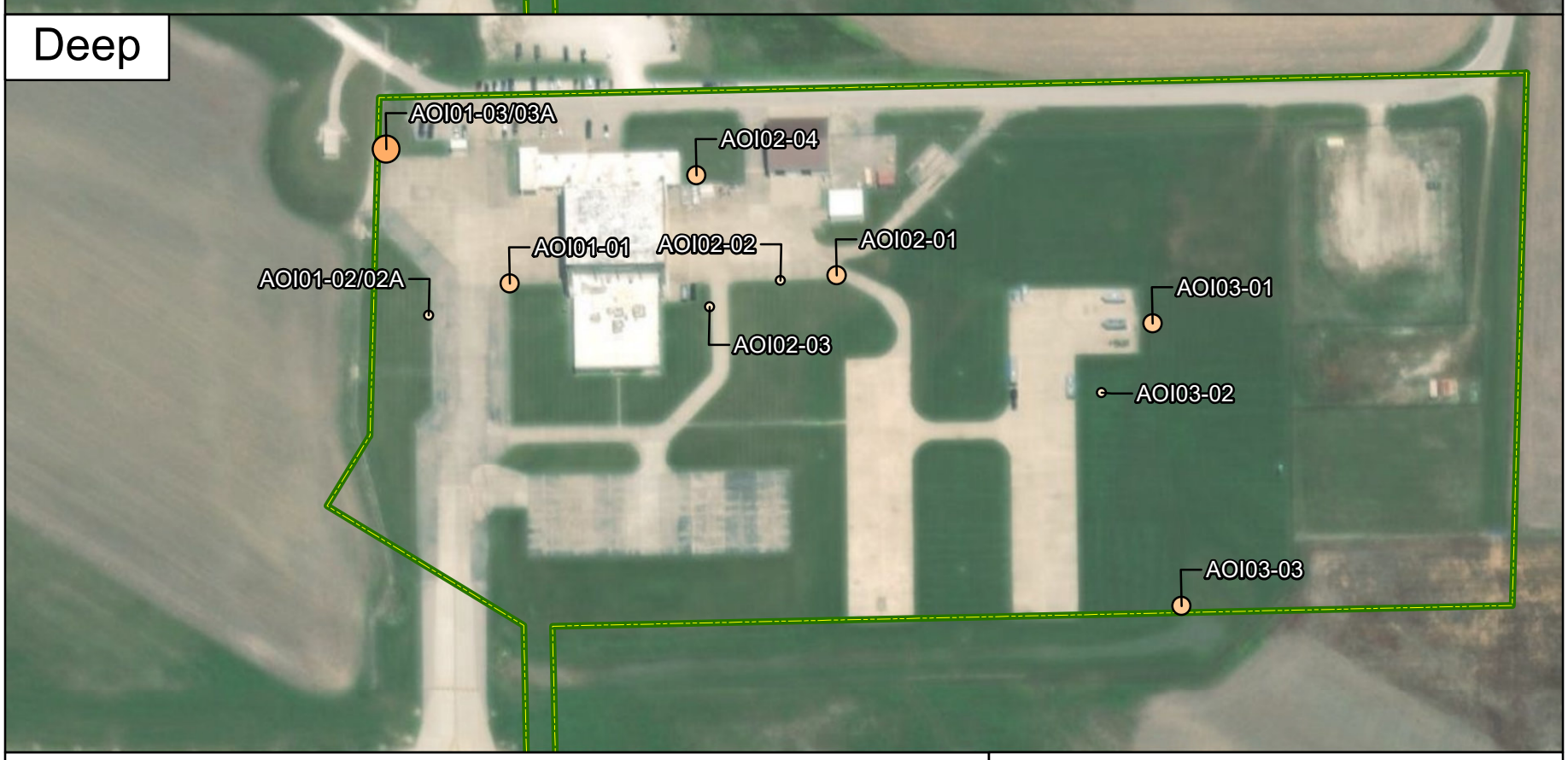
Figure 6-1







Facility Boundary

PFOS Results (µg/Kg)

- ND
- >ND - 13
- >13 - 160
- >160 - 1,600
- >1,600

N

0 100 200 400 Feet

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

PFOS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	5/19/2023	GIS BY	MS	5/19/2023
SCALE	1:2,400	CHK BY	MB	5/19/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	5/19/2023

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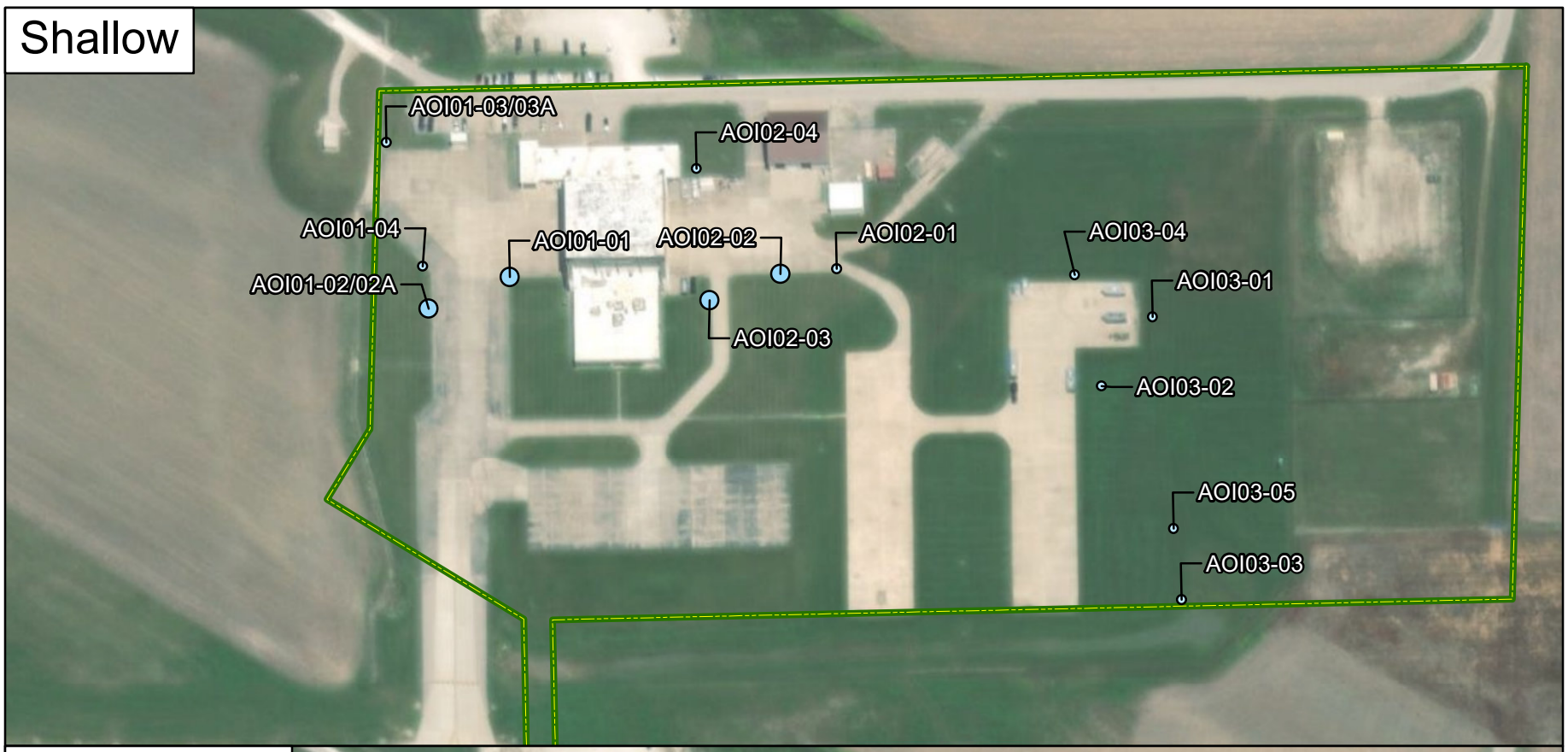
Figure 6-2



Facility Boundary

PFBS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

N

0 100 200 400 Feet

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

PFBS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	5/19/2023	GIS BY	MS	5/19/2023
SCALE	1:2,400	CHK BY	MB	5/19/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	5/19/2023

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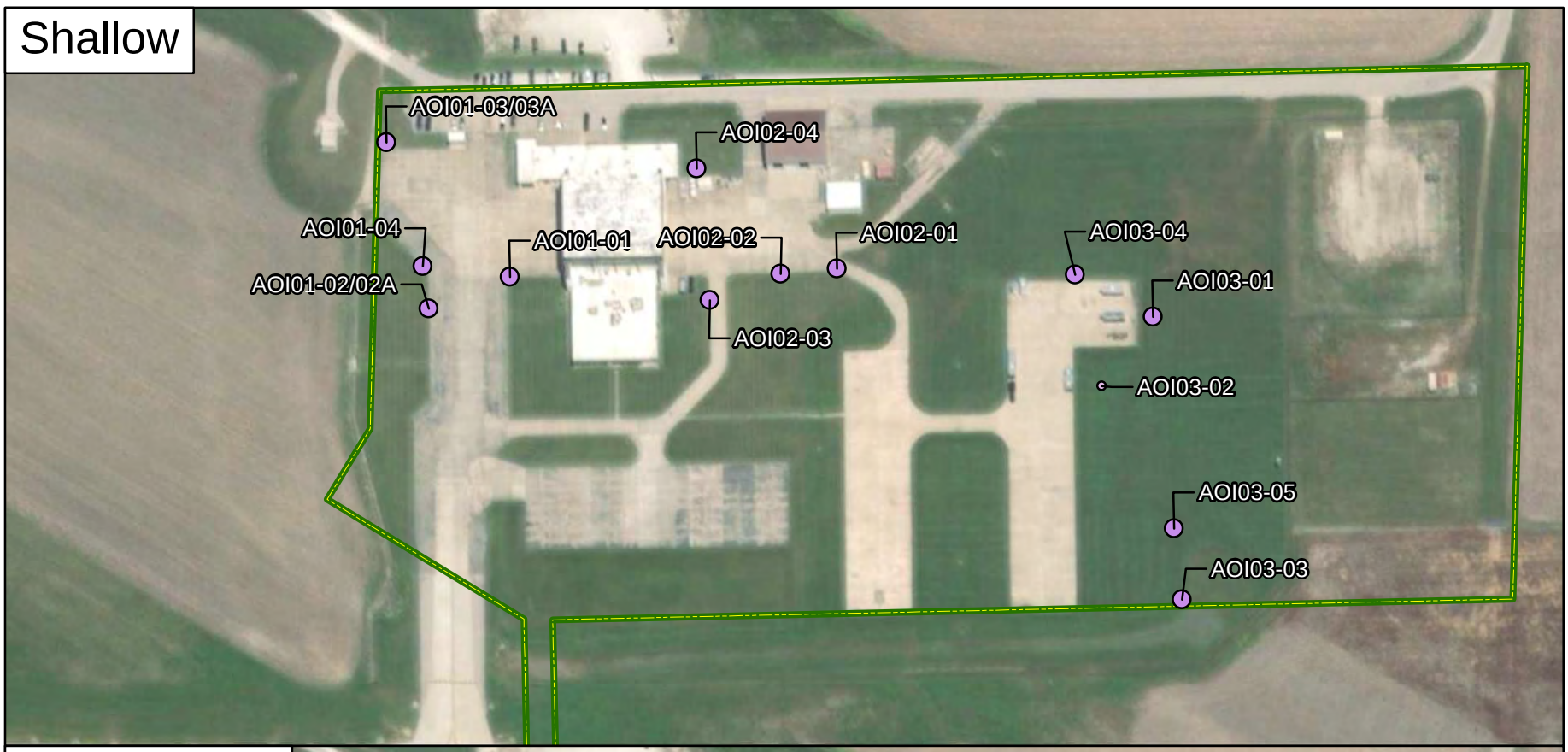
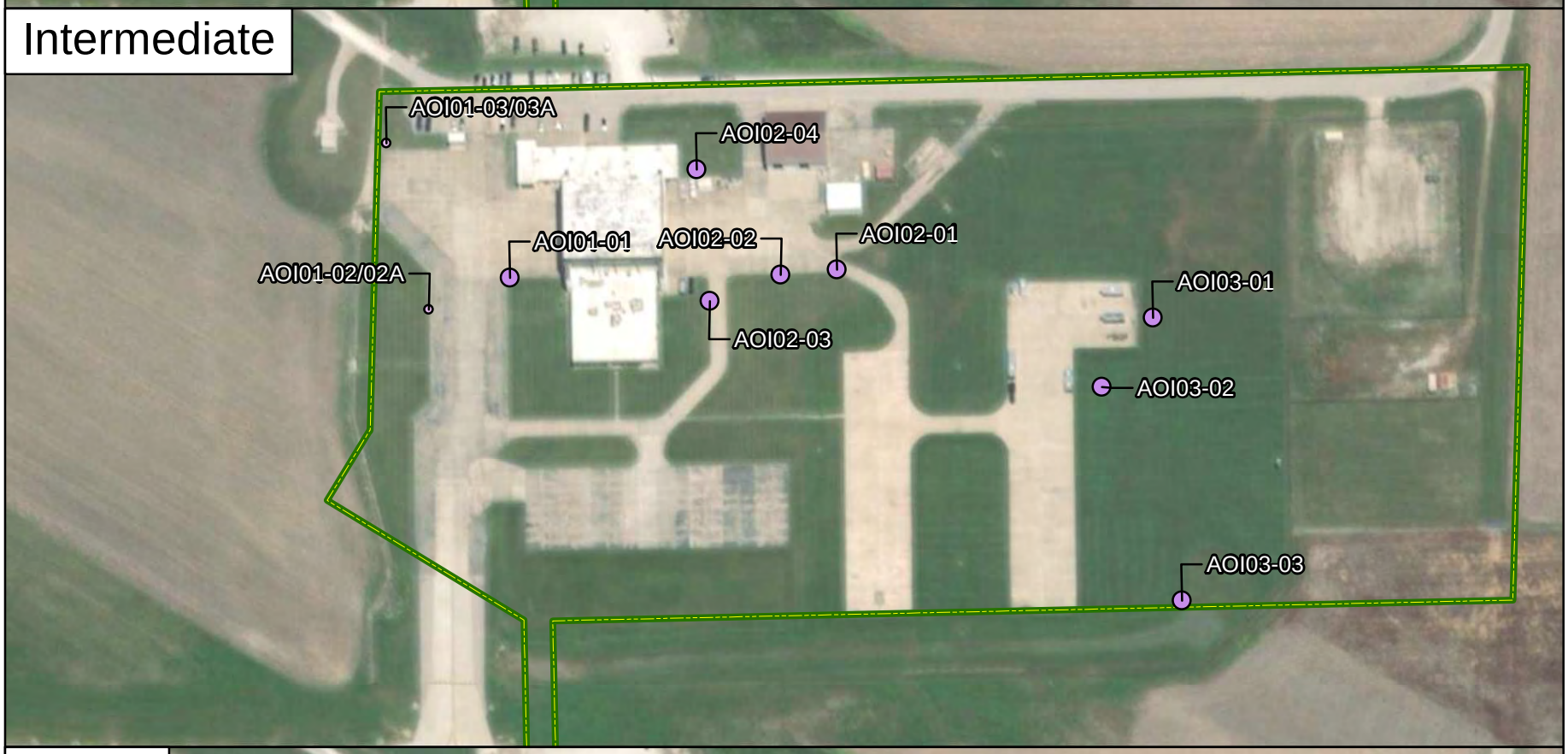
Figure 6-3

Shallow



Intermediate



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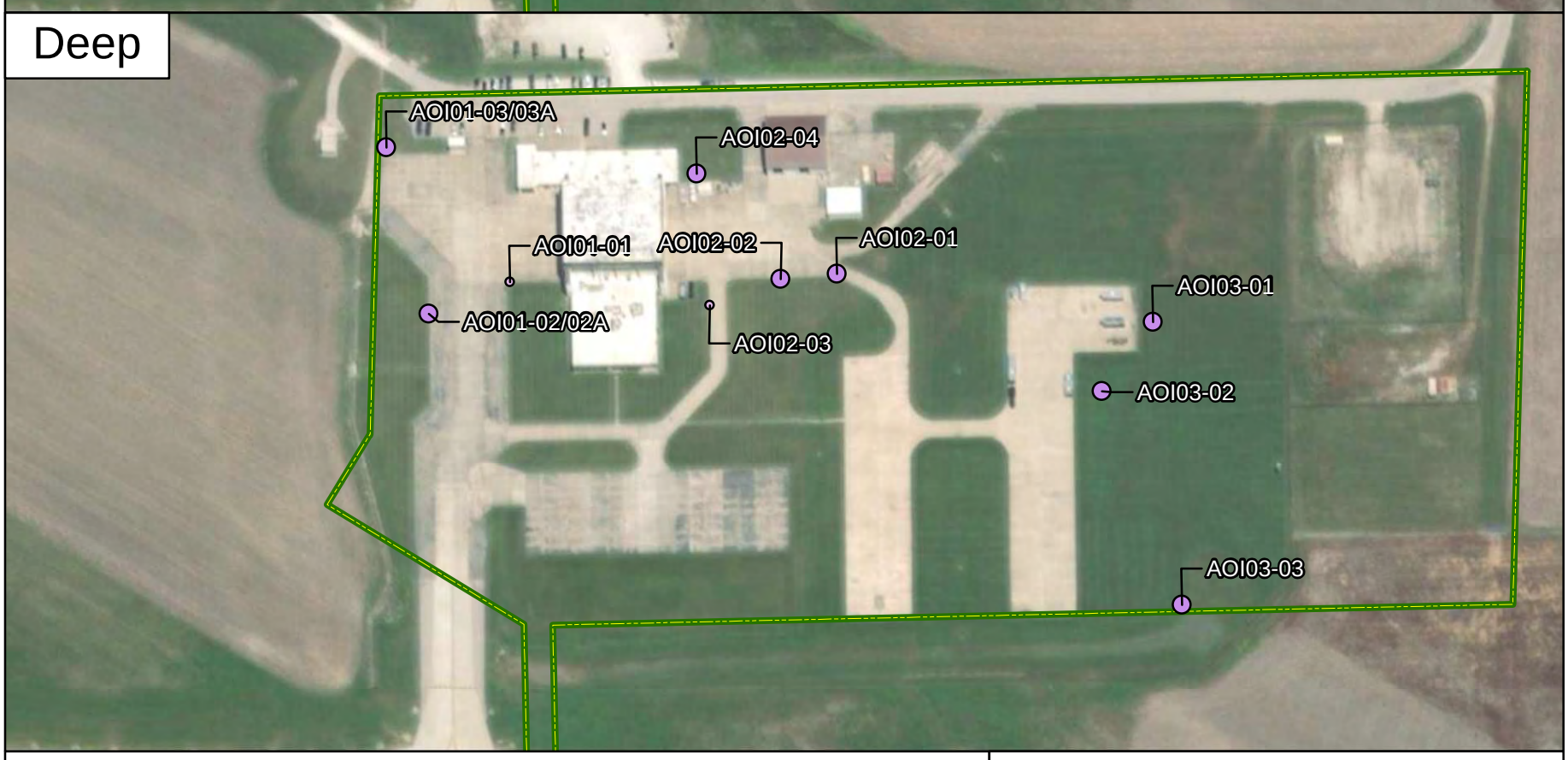

Facility Boundary

PFHxS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 130
- >130 - 1,600
- >1,600

N

0 100 200 400 Feet

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

PFHxS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:2,400	CHK BY	MB	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

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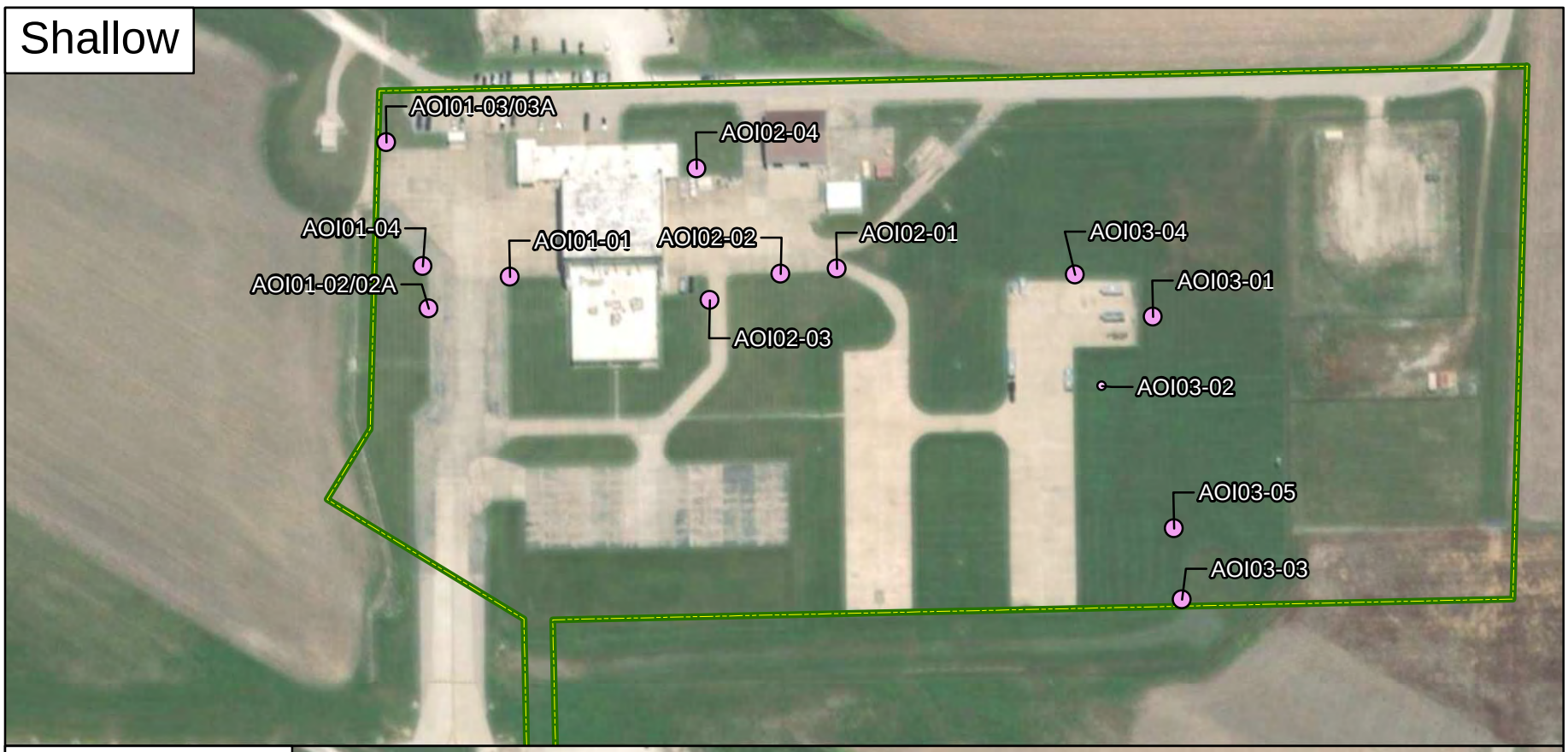
Figure 6-4

Shallow



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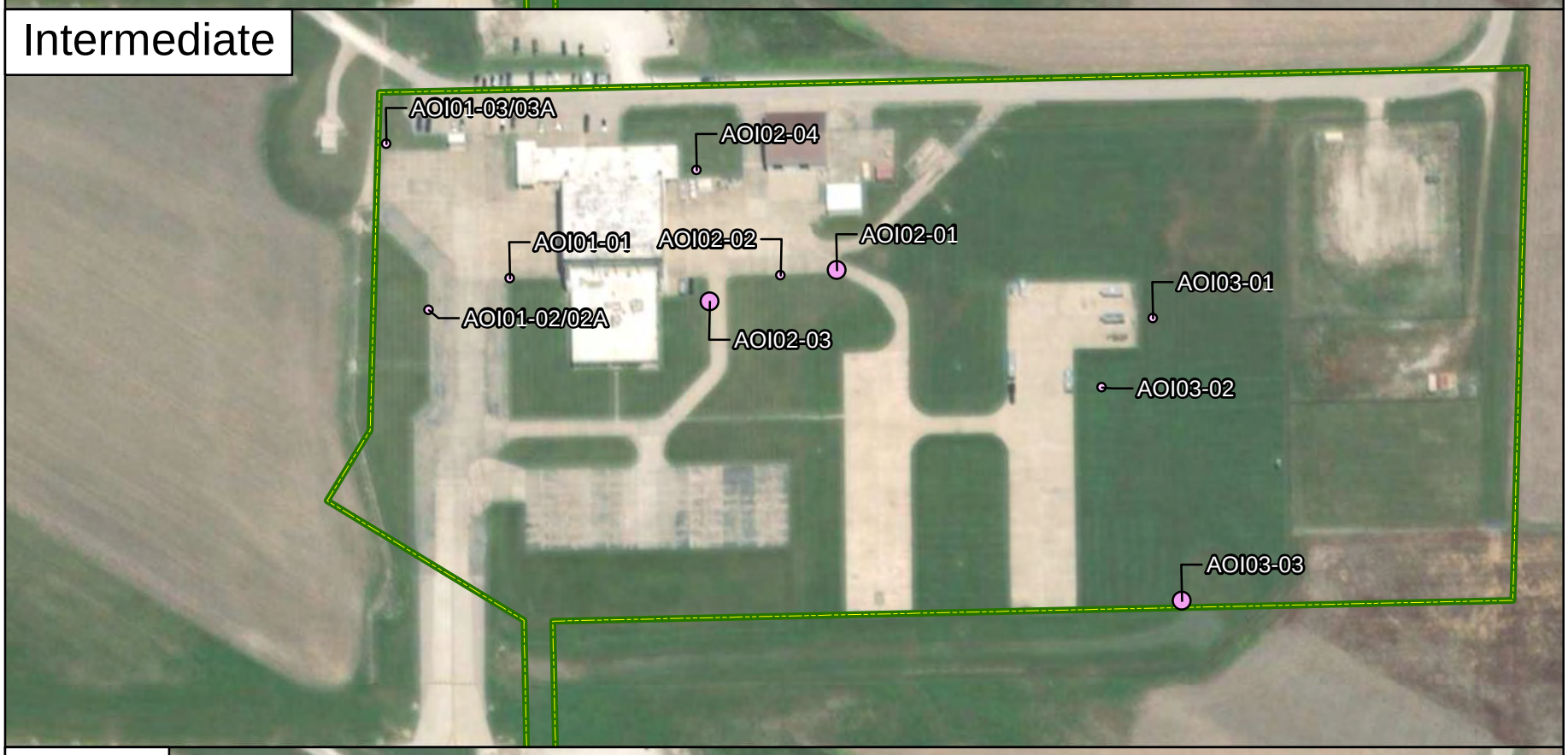

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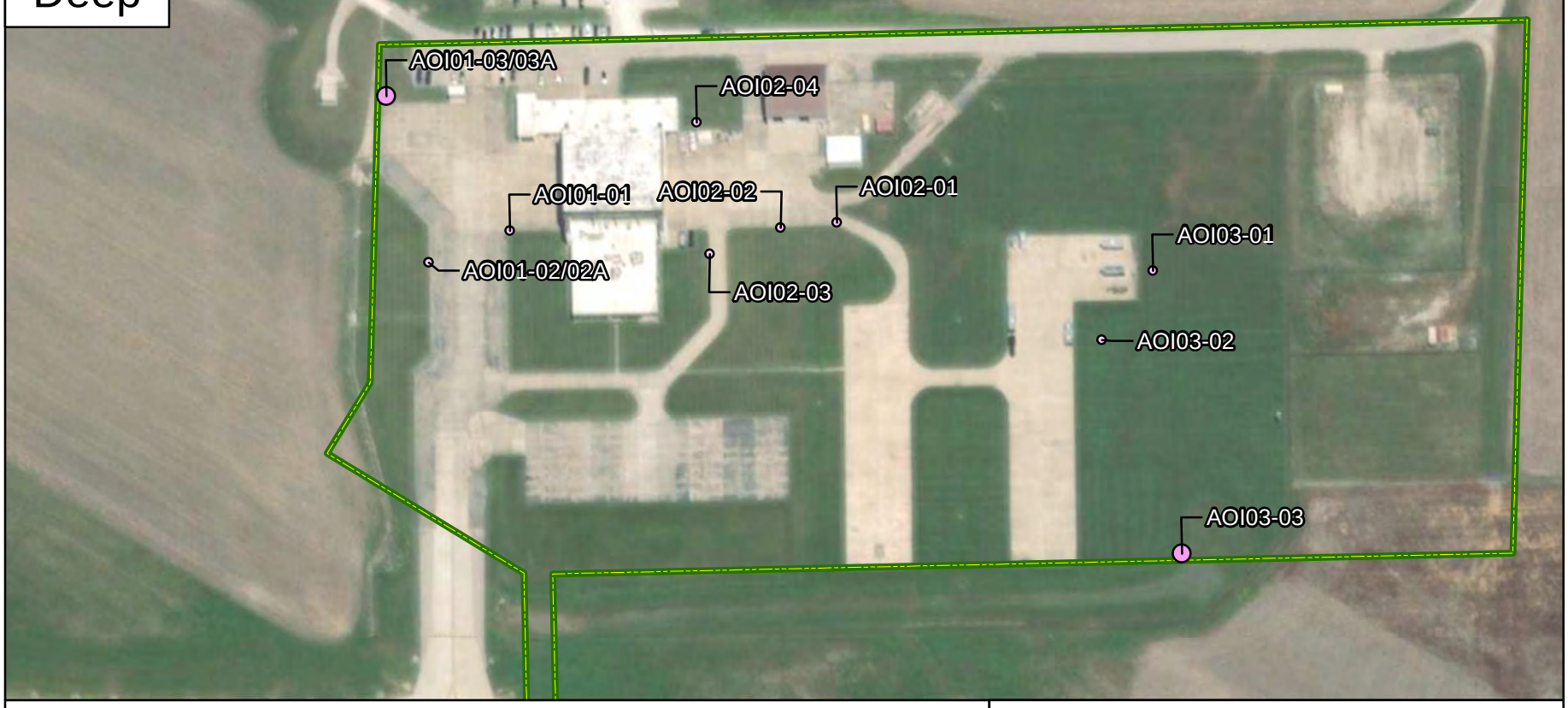

Facility Boundary

PFNA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 100 200 400 Feet

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

PFNA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:2,400	CHK BY	MB	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

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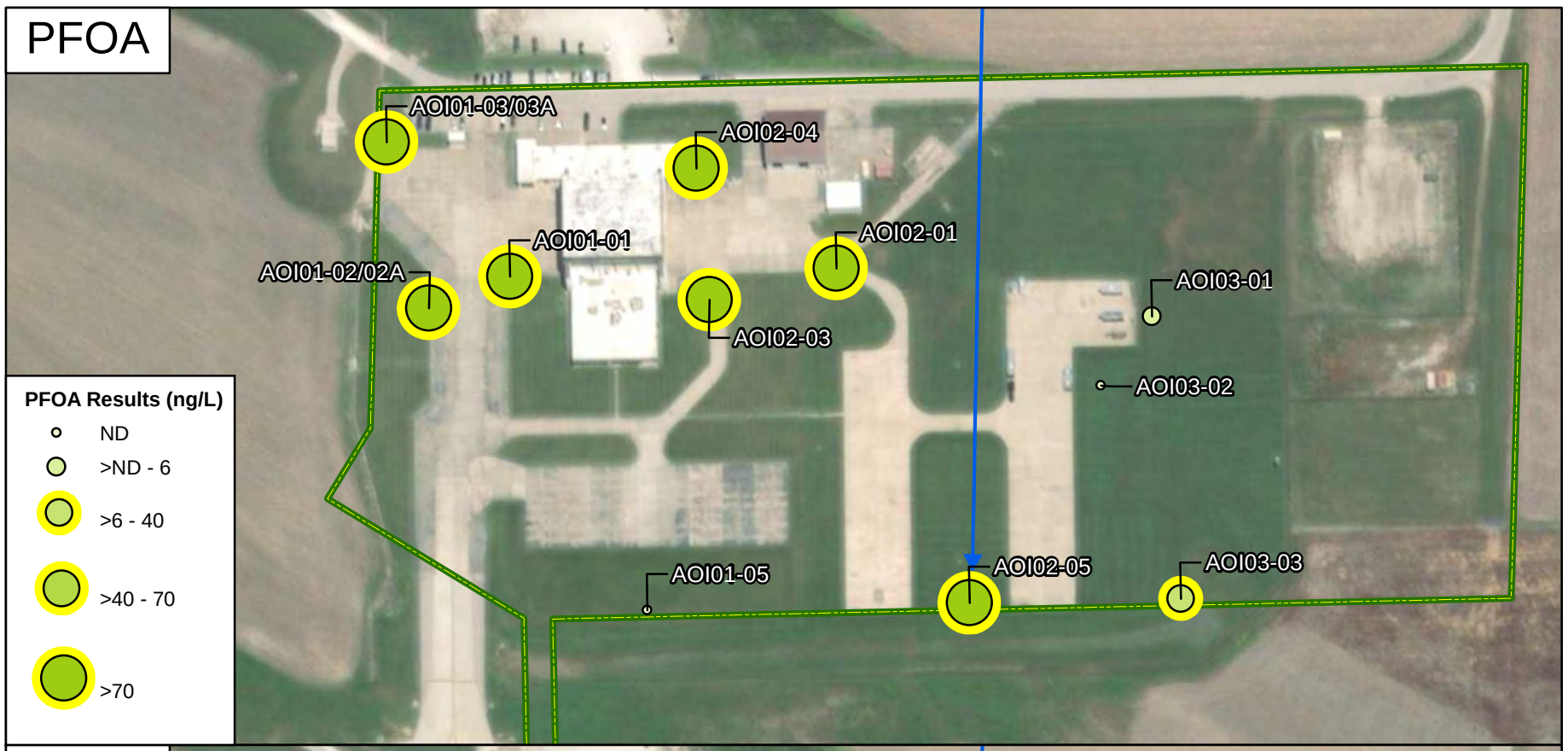
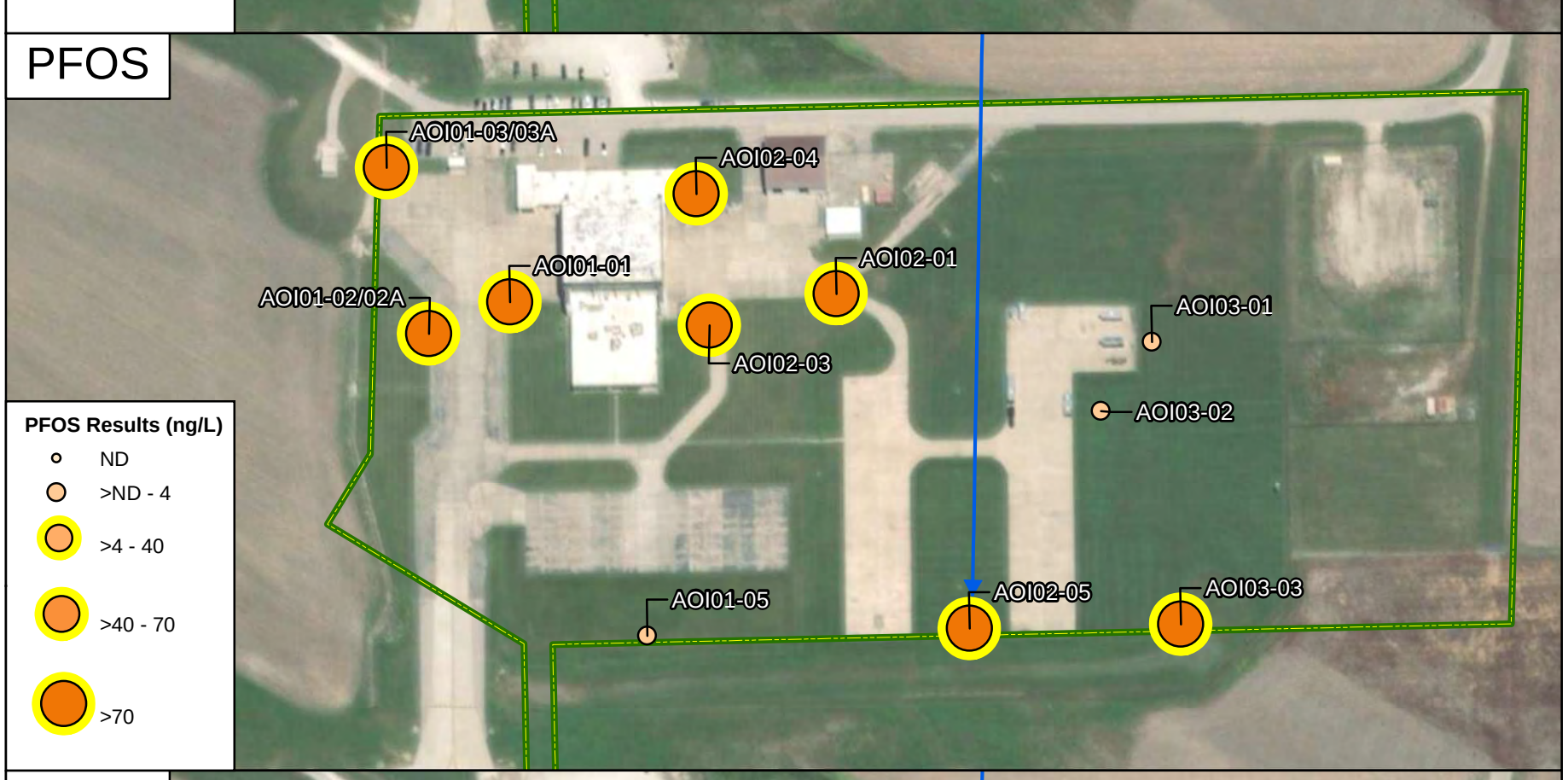
Figure 6-5

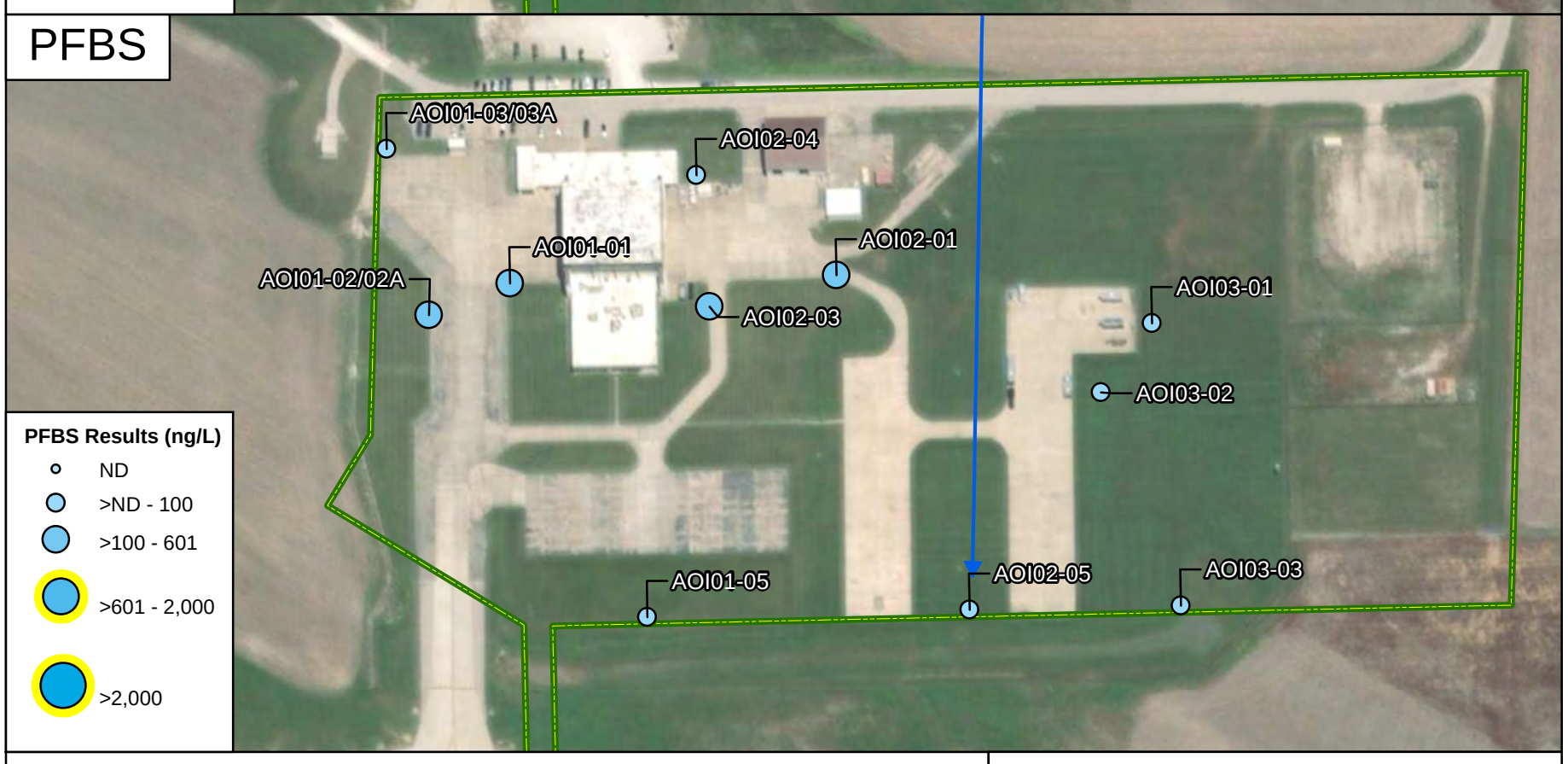
PFOA



PFOS



PFBS



Facility Boundary

Groundwater Flow Direction

N

0 100 200 400 Feet

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

PFOA, PFOS, and PFBS Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:2,400	CHK BY	MB	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

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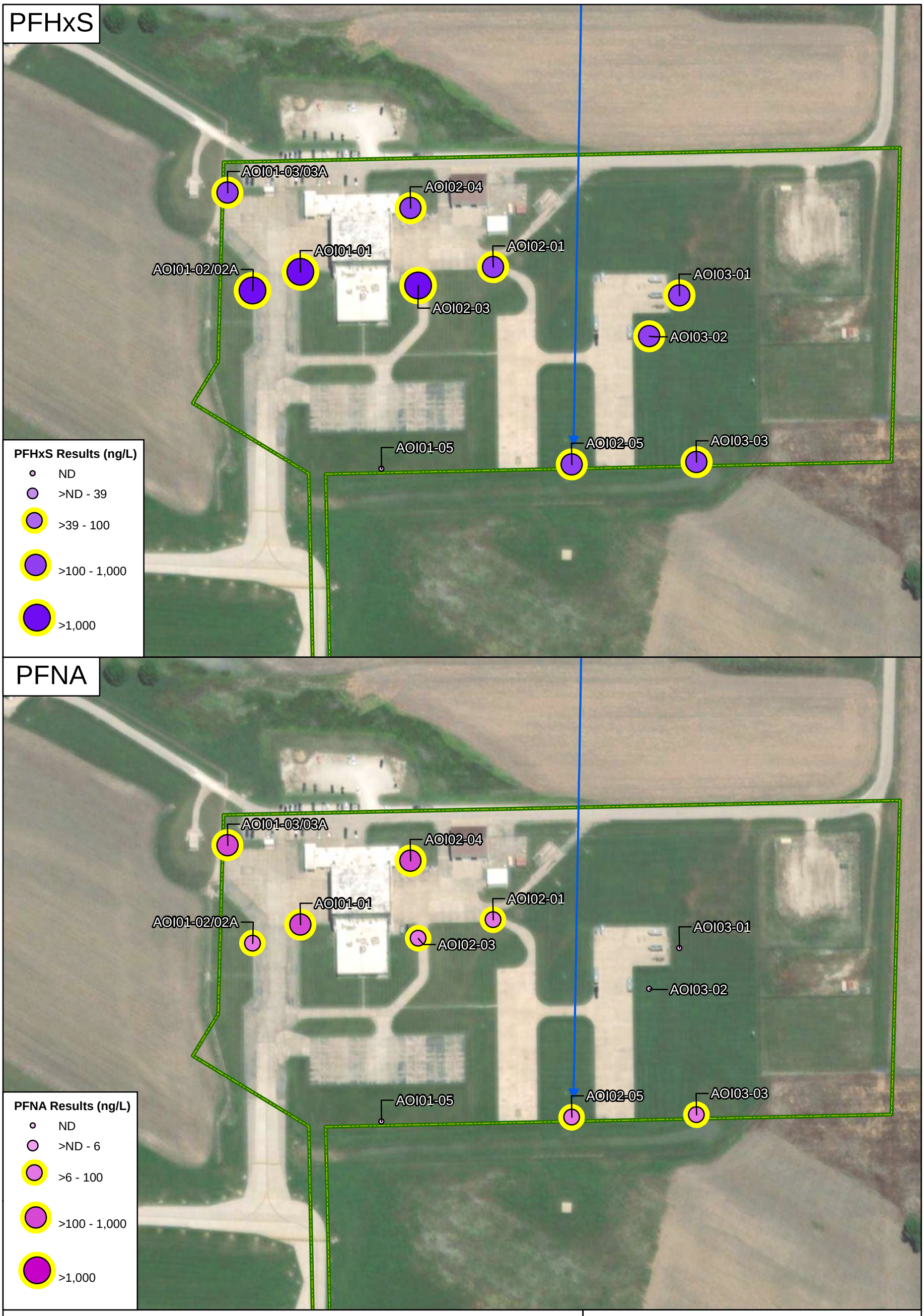
Figure 6-6



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

PFHxS and PFNA Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at Jefferson City AASF, MO			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:2,400	CHK BY	MB	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

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Figure 6-7

7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **Figure 7-3**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

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

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers (though unlikely due to restricted access), residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1, AOI 2, and AOI 3 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the West Ramp Nozzle Testing, Firetruck Storage, and AFFF Storage, where firetruck nozzle testing was conducted annually at the west ramp area as early as 1985 until 2002.

In the surface soil, PFOS was detected above the SL. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore,

these surface soil exposure pathways for site workers and construction workers are potentially complete with exceedance of SL. In shallow subsurface soil, PFOA, PFOS, PFBS, and PFHxS were detected below the SLs, and PFNA was not detected. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is the Outdoor Wash Rack FTA and GSE Building, where controlled AFFF releases through familiarization training occurred annually potentially as early as 1992 until 2016. In 2019, AFFF from three Tri-Max30™ extinguishers was discharged to the ground at the wash rack. The units were refilled at the GSE building on the northwest side of the wash rack.

In the surface soil, PFOS was detected above the SL. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, these surface soil exposure pathways for site workers and construction workers are potentially complete with exceedance of SL. In shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were detected below the SLs. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.1.3 AOI 3

AOI 3 is the East Ramp Nozzle Testing, where firetruck nozzle testing was conducted annually at the east ramp area as early as 1985 until 2002.

In the surface soil, PFOS was detected above the SL. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, these surface soil exposure pathways for site workers and construction workers are potentially complete with exceedance of SL. In shallow subsurface soil, PFOA, PFOS, PFBS, PFHxS, and PFNA were detected below the SLs. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 3 is presented on **Figure 7-3**.

7.2 Groundwater Exposure Pathway

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

7.2.1 AOI 1

PFOA, PFOS, PFHxS, and PFNA were detected in groundwater, at concentrations above their SLs. An irrigation well is located 1.3 miles to the cross-gradient of the facility. Based on the gradient of the well in relation to the facility, the pathway for exposure to this well is considered incomplete. Because the location of Jefferson City groundwater wells that may serve the AASF are unknown, the pathway for exposure to site workers, residents, and recreational workers via ingestion of groundwater is considered potentially complete with exceedance of SL.

Groundwater was encountered at depths ranging between 23.89 to 27.06 feet bgs at AOI 1, with one additional location within a small runoff gully also measured at 4.48 feet bgs. The construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Based on the depths to groundwater encountered at AOI 1, the ingestion exposure pathway for future

construction workers is considered potentially complete with exceedance of SL. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA, PFOS, PFHxS, and PFNA were detected in groundwater, at concentrations above their SLs. Because the location of Jefferson City groundwater wells that may serve the AASF are unknown, the pathway for exposure to site workers, residents, and recreational workers via ingestion of groundwater is considered potentially complete with exceedance of SL.

Groundwater was encountered at depths ranging between 15.56 to 27.19 at AOI 2. The construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Based on the depths to groundwater encountered at AOI 2, the ingestion exposure pathway for future construction workers is considered incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.2.3 AOI 3

PFOA, PFOS, PFHxS, and PFNA were detected in groundwater, at concentrations above their SLs. Because the location of Jefferson City groundwater wells that may serve the AASF are unknown, the pathway for exposure to site workers, residents, and recreational workers via ingestion of groundwater is considered potentially complete with exceedance of SL.

Groundwater was encountered at depths ranging between 13.43 to 18.41 feet bgs at AOI 3. The construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Based on the depths to groundwater encountered at AOI 1, the ingestion exposure pathway for future construction workers is considered potentially complete with exceedance of SL. The CSM for AOI 3 is presented on **Figure 7-3**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

7.3.1 AOI 1, AOI 2, and AOI 3

Jefferson City is split by the Missouri River, separating Cole County to the south and Callaway County to the north. The AASF is less than 1 mile north and generally upgradient of the Missouri River.

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and groundwater at all three AOIs, it is possible that these compounds may have migrated from soil and groundwater to downgradient Missouri River. Residential structures are located along the southern shoreline of the Missouri River, and the river is used for boating and fishing (Missouri Department of Conservation, 2022). Therefore, the surface water and sediment ingestion exposure pathway for off-facility residents and recreational users is considered potentially complete. Ephemeral surface water bodies were observed at the facility; therefore, the exposure pathway for site workers and construction workers is considered potentially complete. The CSMs for AOI 1, AOI 2, and AOI 3 are presented on **Figure 7-1**, **Figure 7-2**, and **Figure 7-3**, respectively.

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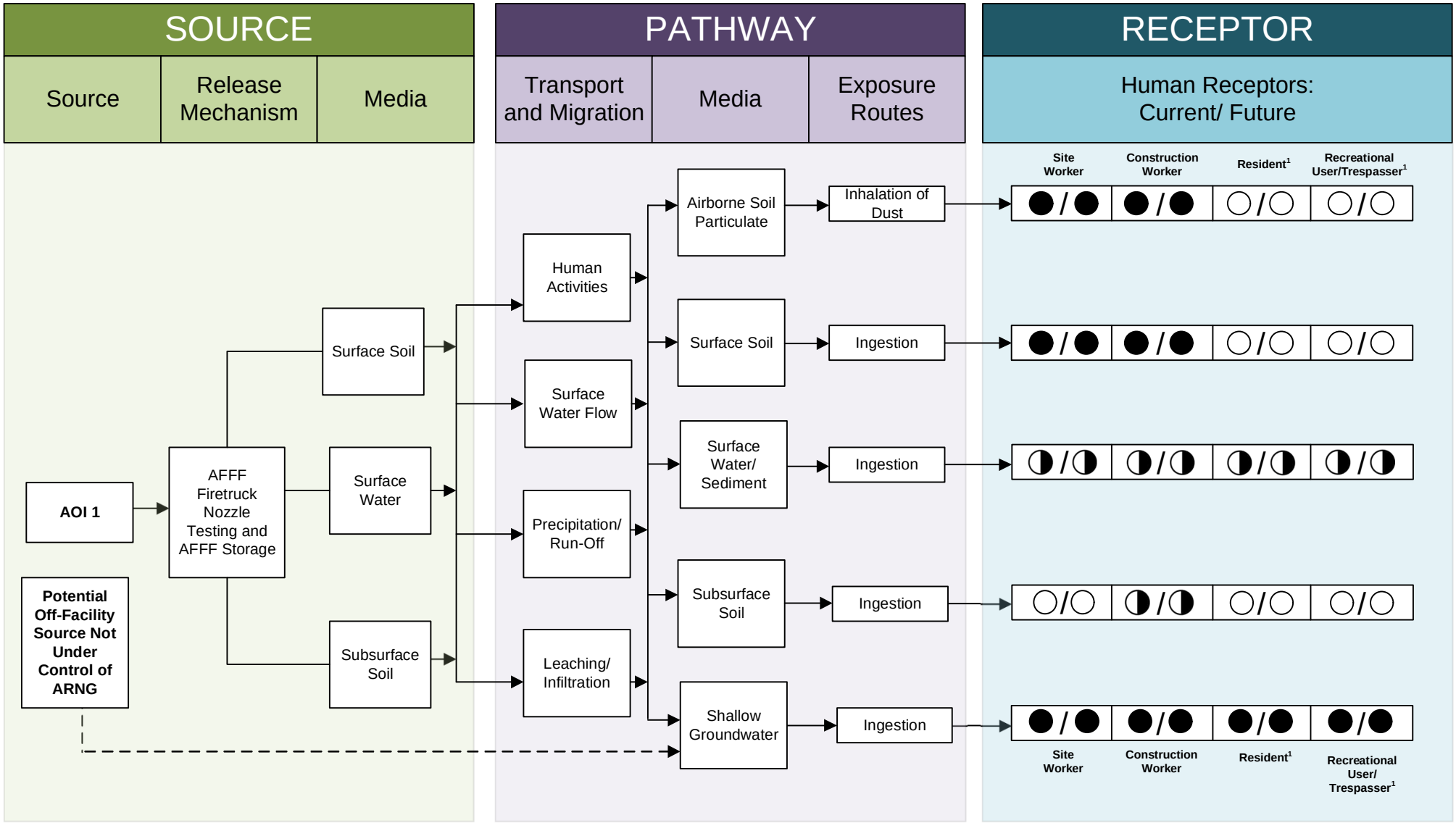


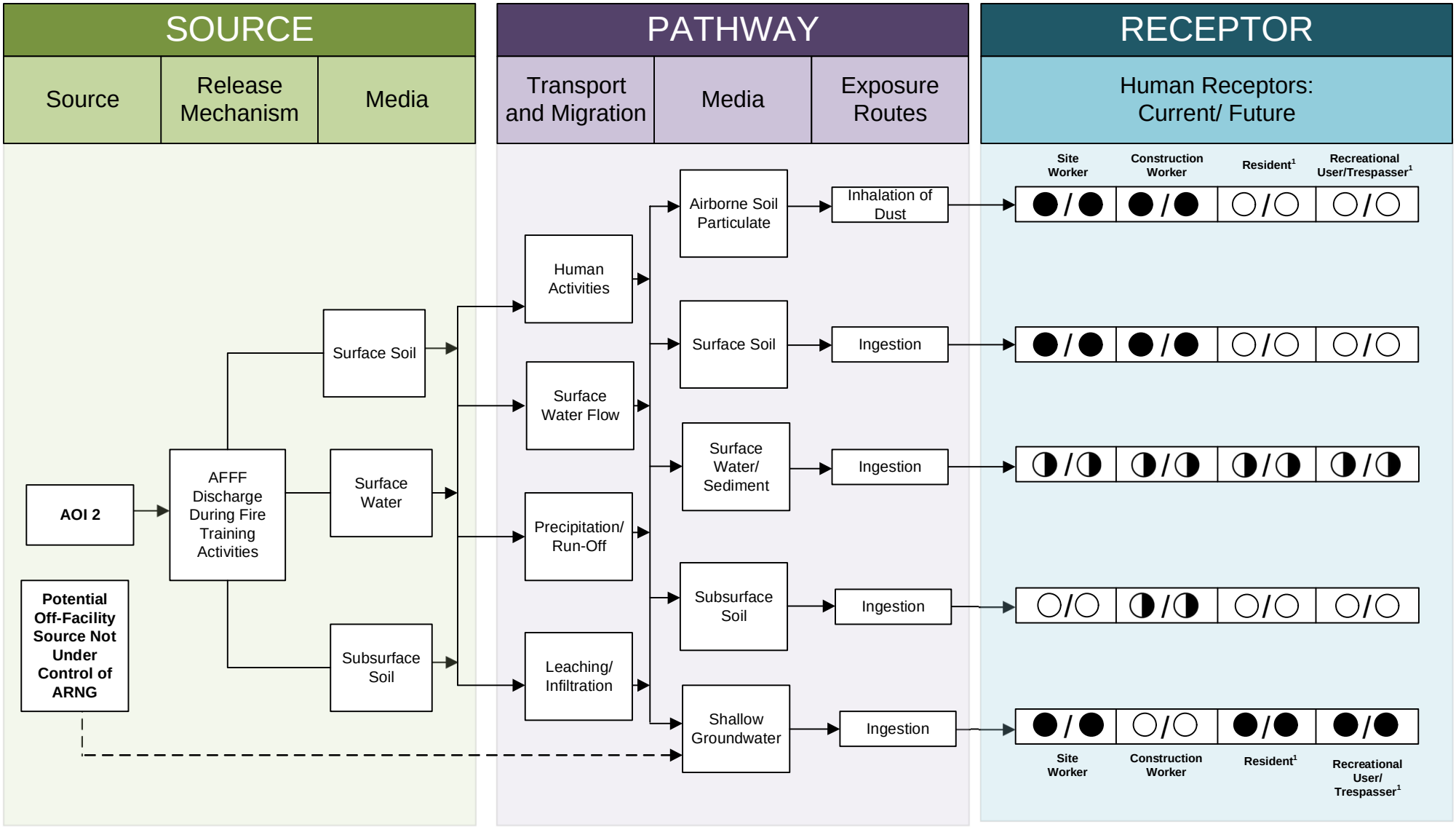
LEGEND

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

NOTES

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

Figure 7-1
Conceptual Site Model, AOI 1
Jefferson City AASF, Jefferson City, Missouri



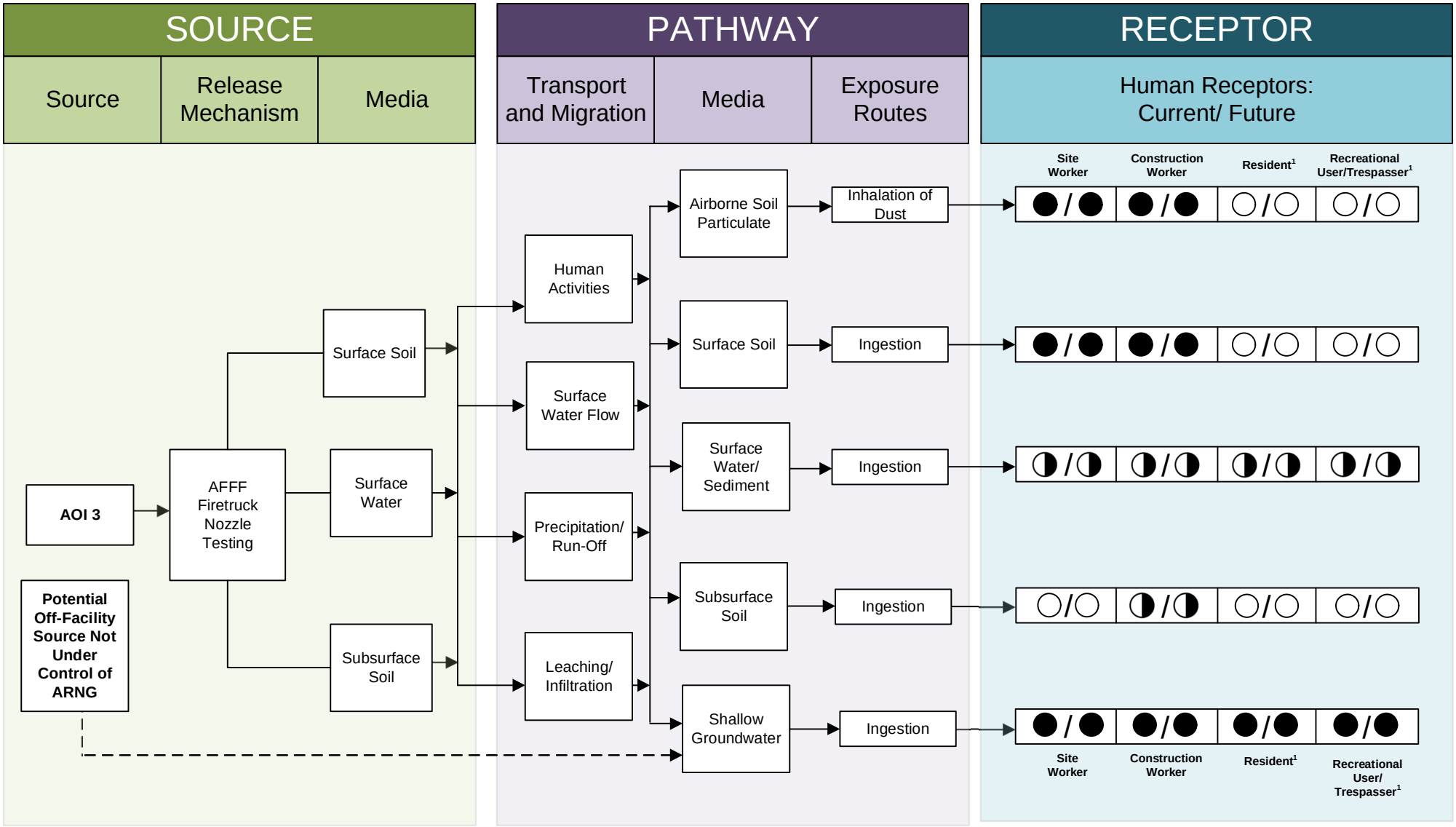
LEGEND

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

NOTES

1. The resident and recreational users refer to off-site receptors.
2. Groundwater was encountered at depths greater than 15 feet bgs at AOI 2.

Figure 7-2
Conceptual Site Model, AOI 2
Jefferson City AASF, Jefferson City, Missouri



LEGEND

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

NOTES

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

Figure 7-3
Conceptual Site Model, AOI 3
Jefferson City AASF, Jefferson City, Missouri

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8. Summary and Outcome

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

8.1 SI Activities

The SI field activities were conducted from 14 to 19 February 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021), except as previously noted in **Section 5.8**.

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

- Thirty-three (33) soil samples from 15 boring locations;
- Eleven (11) grab groundwater samples from 12 temporary well locations;
- Twenty (20) QA/QC samples.

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

8.2 Outcome

Based on the results of this SI, further evaluation is warranted in an RI for AOI 1: West Ramp Nozzle Testing, Firetruck Storage, and AFFF Storage; AOI 2: Outdoor Wash Rack FTA and GSE Building; and AOI 3: East Ramp Nozzle Testing. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to drinking water receptors from AOI 1, AOI 2, and AOI 3 from sources on the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - In surface soil, PFOS exceeded the SL of 13 µg/kg, with the maximum concentration of 75.2 µg/kg at AOI01-01. The detected concentrations of PFOA, PFBS, PFHxS, and PFNA in soil were below the SLs.
    - PFOA, PFOS, PFHxS, and PFNA in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with the maximum concentration of 729 ng/L at AOI01-02. PFOS exceeded the SL of 4 ng/L, with the maximum concentration of 12,700 ng/L at AOI01-03A. PFHxS exceeded the SL of 39 ng/L, with the maximum concentration of 4,060 ng/L at AOI01-01. PFNA exceeded the SL of 6 ng/L, with the maximum concentration of 401 ng/L at AOI01-03A. PFBS in groundwater was below the SL.

- At AOI 2:
    - In surface soil, PFOS exceeded the SL of 13 µg/kg, with the maximum concentration of 58.2 µg/kg at AOI02-04. The detected concentrations of PFOA, PFBS, PFHxS, and PFNA in soil were below the SLs.
    - PFOA, PFOS, PFHxS, and PFNA in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 437 ng/L at AOI02-04. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 3,130 ng/L at AOI02-01. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 1,180 ng/L at AOI02-03. PFNA exceeded the SL of 6 ng/L, with a maximum concentration of 147 ng/L at AOI02-04. PFBS in groundwater was below the SL.
- At AOI 3:
    - PFOS exceeded the SL of 13 µg/kg in surface soil at one location, AOI03-03, with a concentration of 14.5 µg/kg. The detected concentrations of PFOA, PFBS, PFHxS, and PFNA in soil were below the SLs.
    - PFOA, PFOS, PFHxS, and PFNA in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L at one location, AOI03-03, a concentration of 31.3 ng/L. PFOS exceeded the SL of 4 ng/L at one location, AOI03-03, at a concentration of 1,190 ng/L. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 181 ng/L at AOI03-01. PFNA exceeded the SL of 6 ng/L at one location, AOI03-03, a concentration of 8.67 ng/L. PFBS in groundwater was below the SL.

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	West Ramp Nozzle Testing, Firetruck Storage, and AFFF Storage	●	●	●	Proceed to RI
2	Outdoor Wash Rack FTA and GSE Building	●	●	●	Proceed to RI
3	East Ramp Nozzle Testing	●	●	●	Proceed to RI

Legend:

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

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