FINAL
Site Inspection Report
Gary Army Aviation Support Facility
Gary, Indiana

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

October 2023

Prepared for:

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

UNCLASSIFIED

This page intentionally left blank

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
%	percent
µg/kg	microgram(s) per kilogram
µg/L	microgram(s) per liter
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film forming foam
amsl	above mean sea level
ANG	Air National Guard
AOI	Area of Interest
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
bmsl	below mean sea level
btoc	below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain of custody
CSM	Conceptual Site Model
DA	Department of the Army
DoD	Department of Defense
DOT	Department of Transportation
DPT	direct-push technology
DQI	data quality indicator
DQO	Data Quality Objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EB	equipment blank
EDR	Environmental Data Resources
EIS	extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineers Manual
FB	field blank
FedEx	Federal Express
ft	foot (feet)
FTA	fire training area
HDPE	high-density polyethylene
HQ	Hazard Quotient

HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
INARNG	Indiana Army National Guard
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography tandem mass spectrometry
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOQ	limit of quantification
MIDCO II	Midwest Solvent Recovery Co., Inc.
MIL-SPEC	military specification
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NFPA	National Fire Protection Association
ng/L	nanogram(s) per liter
No.	Number
NPL	National Priority List
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	remedial investigation
RPD	relative percent difference
SI	Site Inspection
SL	Screening Level
SOP	Standard Operating Procedures

TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment & Infrastructure Inc.

EXECUTIVE SUMMARY

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

The PA identified one Area of Interest (AOI) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for the AOI description). The objective of the SI is to identify whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on a comparison of SI results to SLs for the relevant compounds. This SI was completed at the Gary Army Aviation Support Facility (AASF) in Gary, Indiana and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1. The Gary AASF is also referred to as the "Facility" throughout the document.

The Gary AASF, operated by the Indiana ARNG (INARNG), encompasses approximately 17 acres in Gary, Indiana. The Facility is located at the Gary/Chicago Airport in Gary, Lake County, Indiana, approximately 25 miles southeast from Chicago, Illinois, and 1.5 miles south of Lake Michigan. The Environmental Data Resources (EDR®) Report showed that the Facility was built on a brownfield site that was formerly an Army Nike Missile battery. The Facility opened in 2008 for the purpose of supporting rotary aircraft operations and as an Armory Readiness Center for the INARNG. It is leased from the Gary/Chicago International Airport Authority. A Joint Use Agreement was negotiated between the Gary AASF and the Gary/Chicago International Airport Authority that addresses firefighting and crash rescue services (AECOM, 2020).

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

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

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

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

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

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

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

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area	Soil Facility Boundary	Groundwater Downgradient Boundary	Future Action
1	AFFF Suppression System/Discharge Area/Fire Training Area/Trimax-60/AFFF Storage	●	●	●	●	Proceed to RI

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

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

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

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

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Gary AASF (AECOM Technical Services, Inc. [AECOM], 2020) that identified one AOI where PFAS-containing materials may have been used, stored, disposed, or released historically. Prior to the SI field work mobilization, AOI 1 was expanded to include AFFF Suppression Systems, Fire Training Area, and the Trimax-60/AFFF Storage. The objective of the SI is to identify whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

This page intentionally left blank

2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The Facility, operated by the Indiana ARNG (INARNG), encompasses approximately 17 acres in Gary, Indiana (**Figure 2-1**). The Facility is located at the Gary/Chicago Airport in Gary, Lake County, Indiana, approximately 25 miles southeast from Chicago, Illinois, and 1.5 miles south of Lake Michigan. The Environmental Data Resources (EDR®) Report showed that the Facility was built on a brownfield site that was formerly an Army Nike Missile battery. The Facility opened in 2008 for the purpose of supporting rotary aircraft operations and as an Armory Readiness Center for the INARNG. It is leased from the Gary/Chicago International Airport Authority. A Joint Use Agreement was negotiated between the Gary AASF and the Gary/Chicago International Airport Authority that addresses firefighting and crash rescue services (AECOM, 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

The Facility is located within the Valparaiso Morainal Complex along the Lake Michigan border. Valparaiso Morainal Complex is situated in the Northern Moraine and Lake Region. Lake County is bordered by Lake Michigan to the north, by Illinois to the west, by Porter County to the east, and by Jasper and Newton Counties to the south. Northern Indiana is mostly flat terrain with higher and hillier terminal moraines and glacial kettle lakes. Northwest Indiana is characteristically moist and marsh-like. A variety of fauna grow in the mineral-rich soils in normally unforested areas (AECOM, 2020).

The Facility is located in a heavily industrialized area of the Chicago Lake Plain, in the Central Corn Belt Plains Ecoregion. The Chicago Lake Plain ecoregion is a coastal strip with marshes and sand dunes, and it differs from other areas in that it has a climate moderated by the lake and native beach-dune plant communities. The Chicago Lake Plain ecoregion has lower dunes, less woodland, and more urban-industrial activity than surrounding areas (AECOM, 2020).

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

2.2.1 Geology

The Gary AASF has bedrock of mostly Devonian age and some Silurian age. Devonian age bedrock is carbonaceous shale in the upper portion, and limestone, dolomite, and shale in the lower portion. Lake County consists of bedrock from the Cambrian through middle Silurian ages. The bedrock is covered with unconsolidated Pleistocene age glacial drift that forms the terrain. This glacial drift supplies groundwater in unconsolidated materials. The depth to bedrock in the area ranges from about 100 to 150 feet (ft) below the ground surface (bgs).

The overlying surficial geology is typical of the physiographic region known as the Calumet Lacustrine Plain, with deposits of unconsolidated sediment and facies of the Atherton Formation.

Sediments in the plain consist of fine lake silt and clay, paludal deposits of muck and peat, expansive sand beaches with dunes, sand and fine gravel from glacial outwash, and clay-rich till inclusions. Before urban development, the topography of the area was dominated by a series of linear beach ridges and intersecting swales consistent with dune-swale landscapes. The topography has since become fragmented, but can still be observed in small, isolated areas. Elevations across the Facility range from 580 to 600 ft above mean sea level (amsl), with a general slope from the north of the Grand Calumet River to the south (AECOM, 2020).

During the SI field work, 13 borings were advanced between 8 to 10 ft bgs. The soil was classified as being predominantly a poorly graded fine to medium sand throughout the borings; however, silty sand was observed in the borings adjacent to the wetlands (GAASF-01, GAASF-02, AOI01-06). Samples for grain size analyses were collected at two locations, GAASF-02 and GAASF-03, and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The grain size analysis conducted on the soil samples collected from GAASF-03 confirms the field observation of poorly graded fine to medium sand. Furthermore, the soil sample collected from GAASF-02 confirms the field observation of a silty sand. The results indicate that the soil samples are comprised primarily of sand (37.3% to 99.3%), silt (4% to 37.3%) and clay (4%). These results and Facility observations are consistent with the reported depositional environment of the region. Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

Regional groundwater supplies primarily originate from the dolomite and dolomitic limestone of the Middle Silurian age. The Middle Silurian age deposits are overlain by a thin layer of dolomitic limestone from the Middle Devonian age that thickens eastward and is overlain by a layer of Late Devonian age shale. The Gary AASF is located within the eastern portion of the surficial Calumet aquifer. Deposits of dune, beach, and lacustrine silts, sands, and clays make up the surficial aquifer. Significant areas of the aquifer near the AASF are urbanized and have been modified with fill deposits. Within the aquifer, thousands of acres of man-made land are situated near the shoreline of Lake Michigan. Fill materials in these areas mainly consist of steel mill slag and coal ash, but also include municipal wastes, industrial wastes, construction debris, dredging spoil, ash, and cinders. Biological sludges have been used to cover and fill swampy areas as well. The aquifer is unconfined throughout its extent with the exception of small portions where fragmented layers of peat, muck, and organic deposits confine the sands. The units underneath the aquifer are the unconsolidated Quaternary Lake Border and Wheeler Till sequences. The thickness of these units varies from 50 ft to over 150 ft. There is an east-west trending divide in the groundwater gradient located between the east branch of the Grand Calumet River and Lake Michigan, just north of the AASF. Groundwater at the Facility generally flows south toward the Grand Calumet River located about 0.5 miles away. Groundwater south of the Grand Calumet River flows towards the north where it seeps into the river. The water table is shallow, with depth to groundwater near the Facility ranging from 5 to 15 ft bgs. Groundwater onsite according to the PA generally flows from the North to the South; however, after discussing with the airport environmental team, the onsite ditch is believed to intercept the water table and influence flow. As a result, groundwater flow is anticipated to be towards the ditch but may exhibit temporal variation.

The water balance of the aquifer is heavily influenced by industrial and residential development. Natural recharge occurs primarily through infiltration of precipitation. Anthropogenic sources of recharge include sanitary sewers, septic systems, and water supply lines. Estimates of recharge rates throughout the aquifer range from 2 to 17 inches per year (Fenelon and Watson, 1993). Discharge occurs through constructed drainage ditches, seepage into sanitary and storm sewers, and pumping-induced downward flow through the clay unit to the underlying bedrock. Groundwater seepage into the Grand Calumet River is very low because more than 90% of the flow in the river comes from municipal and industrial effluent. The groundwater contribution to the river is estimated to be less than 36 cubic ft per second (Fenelon and Watson, 1993).

In the northwestern portion of the aquifer, oil refineries may pump groundwater from the aquifer for industrial use. However, this aquifer system is not generally used for municipal or industrial water supply. EDR® Reports did not indicate the presence of any public wells in the direction of groundwater flow from the Gary AASF and did not identify any public wells within a 1-mile radius of the Facility. Water at the Facility is supplied by Indiana American Water – Northwest Operations, using the greater Gary area system which draws its water directly from Lake Michigan. As part of the PA, an EDR® report, along with other sources, was used to conduct a well search within a 1-mile radius surrounding the Facility. Two wells designated for home-use were identified south of the Grand Calumet River, within a 1-mile radius of the Facility (**Figure 2-3**). It is unknown whether these are used for private drinking water; however, neither well is located downgradient from the Facility based on the inferred hydraulic gradient.

Prior to the SI field work, it was expected that shallow groundwater at the Facility would flow radially due to the presence of the surface water bodies (e.g., wetlands and drainage ditches) surrounding the Facility. Based on the groundwater gauging, conducted on the temporary wells, it was confirmed that groundwater was flowing radially at the Facility. Depth to groundwater at the Facility was observed to range from 3 to 5 ft bgs, during drilling. Groundwater elevation contours from the SI are presented on **Figure 2-5**.

2.2.3 Hydrology

The Grand Calumet and Little Calumet Rivers run through Porter and Lake Counties. North of Lake County is Lake Michigan, a large body of water formed from the Wisconsin age ice sheet. The Gary AASF is located in the Headwaters Grand Calumet River Watershed. The Grand Calumet River originates in Miller Beach, Indiana and runs from west to east within one mile of the Gary AASF. The river empties into Lake Michigan through the Indiana Harbor Ship Canal. Baseflow makes up a very small portion of total streamflow in the Grand Calumet River, with the remainder of the flow coming from industrial cooling and processing water as well as waste treatment effluents. Stormwater at the Facility is diverted into a series of channels and ditches around the perimeter of the Facility that ultimately discharge into the Grand Calumet River. Additionally, several wet swales and ponds are located to the north of the Facility. Floor drains in the hangar of the Facility are connected to oil/water separators that discharge to two drainage swales adjacent to the Facility. Remaining interior drains at the Facility are connected to the public sanitary sewer system, which is shown in detail in the engineering as-built drawings for the Facility (AECOM, 2020).

2.2.4 Climate

The climate of Gary, Indiana is variable and influenced by its proximity to Lake Michigan, with an average temperature of 49 degrees Fahrenheit (°F). Summers tend to be humid, with average monthly temperatures between 59 °F and 74 °F. Average monthly winter temperatures range from 22 °F to 37 °F. The city experiences an average of 38 inches of rain and 37 inches of snow per year according to the National Oceanic and Atmospheric Administration. The wettest month of the year is August with an average of 4.6 inches of precipitation, while the driest month is March with an average of 2.24 inches of precipitation (AECOM, 2020).

2.2.5 Current and Future Land Use

The Gary AASF is currently a controlled access Facility and is adjacent to the Gary/Chicago International Airport. The AASF supports rotary aircraft operations and is an Armory Readiness Center for the INARNG. The Facility is leased by the INARNG from the Gary/Chicago International Airport Authority; however, the buildings are owned by the INARNG. The airport is owned and operated by the City of Gary and provides commercial and general air service to the Chicago area. Reasonably anticipated future land use is not expected to change from the current land use (AECOM, 2020). The Facility is fenced and has restricted access.

2.2.6 Sensitive Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the Facility, and the Facility does not have any significant areas of habitat. The following species have not been identified at the Facility but may be present in the surrounding area.

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Lake County, Indiana (USFWS, 2020):

- Insects: Karner Blue Butterfly (*Lycaeides melissa samuelis*), Monarch Butterfly (*Danaus plexippus*)
- Mammals: Indiana Bat (*Myotis sodalis*), Northern Long-eared Bat (*Myotis septentrionalis*)

2.3 HISTORY OF PFAS USE

One potential PFAS release area was identified at the Facility during the PA (AECOM, 2020). The PA noted that the Rotary Aircraft Hangar was equipped with a fire suppression that was charged with 3% AFFF. The Interviews and records obtained during the PA indicated that in 2018, there was a release of 3% AFFF that resulted in the cleanup of approximately 900 gallons of diluted AFFF solution that was removed and treated off-site. The Rotary Aircraft Hangar AFFF suppression system tank is located in a boiler room in the southwestern corner of the Facility. The room contains the AFFF storage tank for the suppression system along with other water utilities. Additionally, the PA noted a Trimax-60 cart stored in the Rotary Aircraft Hangar AFFF that contained 3% AFFF.

There is no documentation of any confirmed releases or testing from associated with the Rotary Aircraft Hangar fire suppression system from 2008 to 2011. The PA interviewees stated that testing was unknown and assumed that the manufacturer handled testing. The floor drains in the hangar discharge into an oil/water separator that then leads to two separate drainage areas located northeast and northwest of the hangar. These two drainage areas are potential secondary AFFF source areas and were incorporated into AOI 1 for the SI.

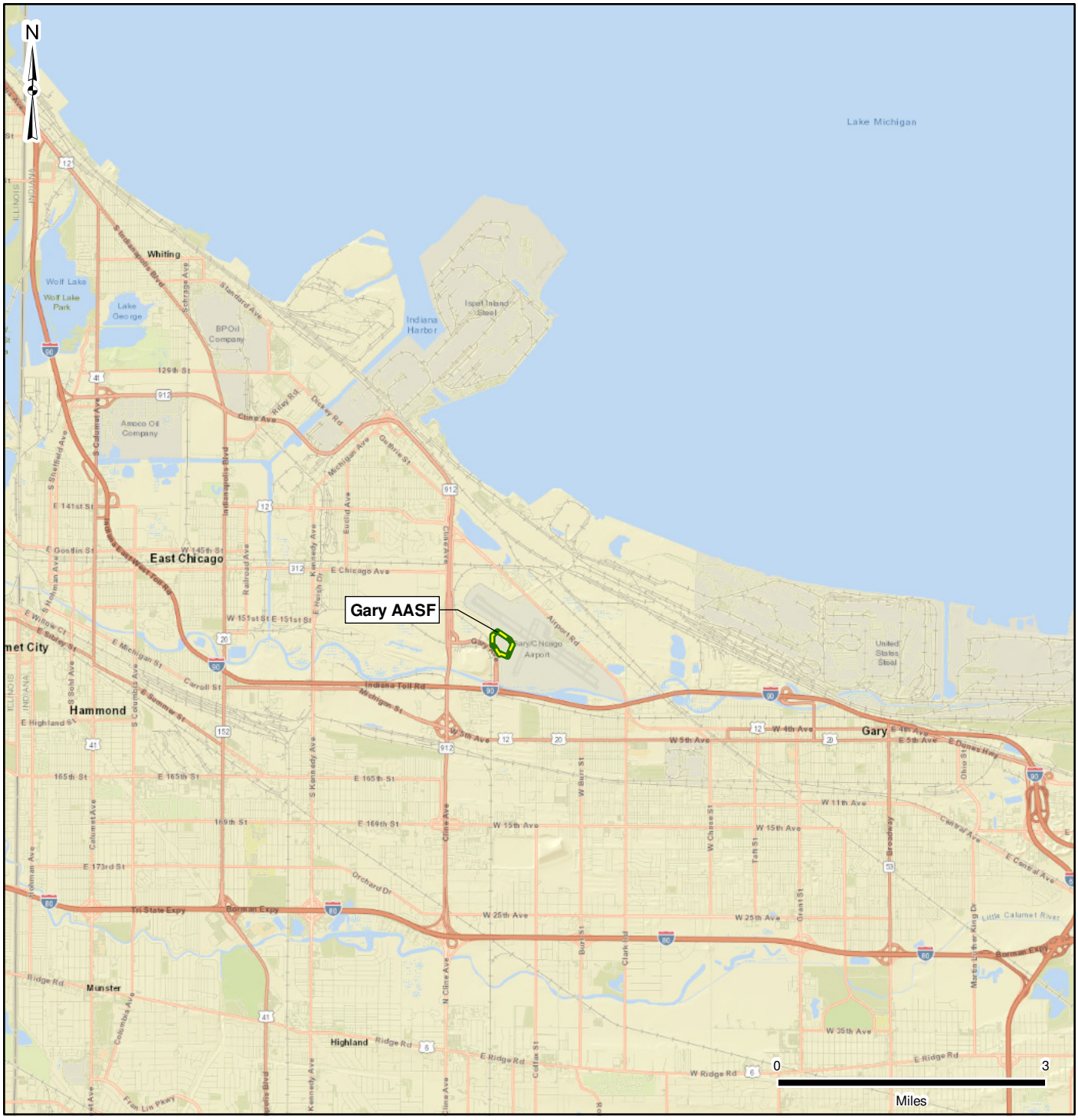
Based on PA interviews, the Facility parking lot (located southwest of the Rotary Aircraft Hangar) had been used annually by INARNG as a live-fire fire training area (FTA) since 2008. Interviewees stated that training activities were only conducted using ABC (dry chemical) extinguishers using clean fuels such as pallets and straw; AFFF had never been used for training exercises. Due to the historic use of AFFF at FTAs in general, it was incorporated into AOI 1 for the SI.

A description of AOI 1 is presented in **Section 3**.

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 2-1
Facility Location



Facility Boundary

Data Sources:
ESRI 2020

Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary,IN.SiteInspectionReport\Figure 2-1 Facility Location.mxd - megan.cameron - 3/30/2023 - 10:31:27 AM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 2-2
Site Topography

Facility Boundary
Water Body
Water Well
Elevation Contour (10 ft. interval, NAVD88 datum)
Canal/ Ditch
River/Stream

Data Sources:
ESRI 2020

Date:.....September 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary,IN.SiteInspectionReport\Figure 2-2 SiteTopography.mxd - megan.cameron - 3/30/2023 - 10:34:51 AM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 2-3
Groundwater Features

Facility Boundary
Wetland
MileBuffer
Water Body
Canal/ Ditch
River/Stream
Water Well
Groundwater Flow Direction (February, 2022)

Data Sources:
ESRI 2020

Date:.....September 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary,IN.SiteInspectionReport\Figure 2-3 Groundwater Features.mxd - megan.cameron - 3/30/2023 - 10:50:15 AM

This page intentionally left blank

Army National Guard Site Inspections
Site-Specific Quality Assurance Project Plan
Gary AASF, Indiana

Figure 2-4
Surface Water Features

Facility Boundary
Potential PFAS Release
Wetland
Water Body
Surface Water Flow Direction
Canal/ Ditch
River/Stream
Water Well

Data Sources:
ESRI 2020

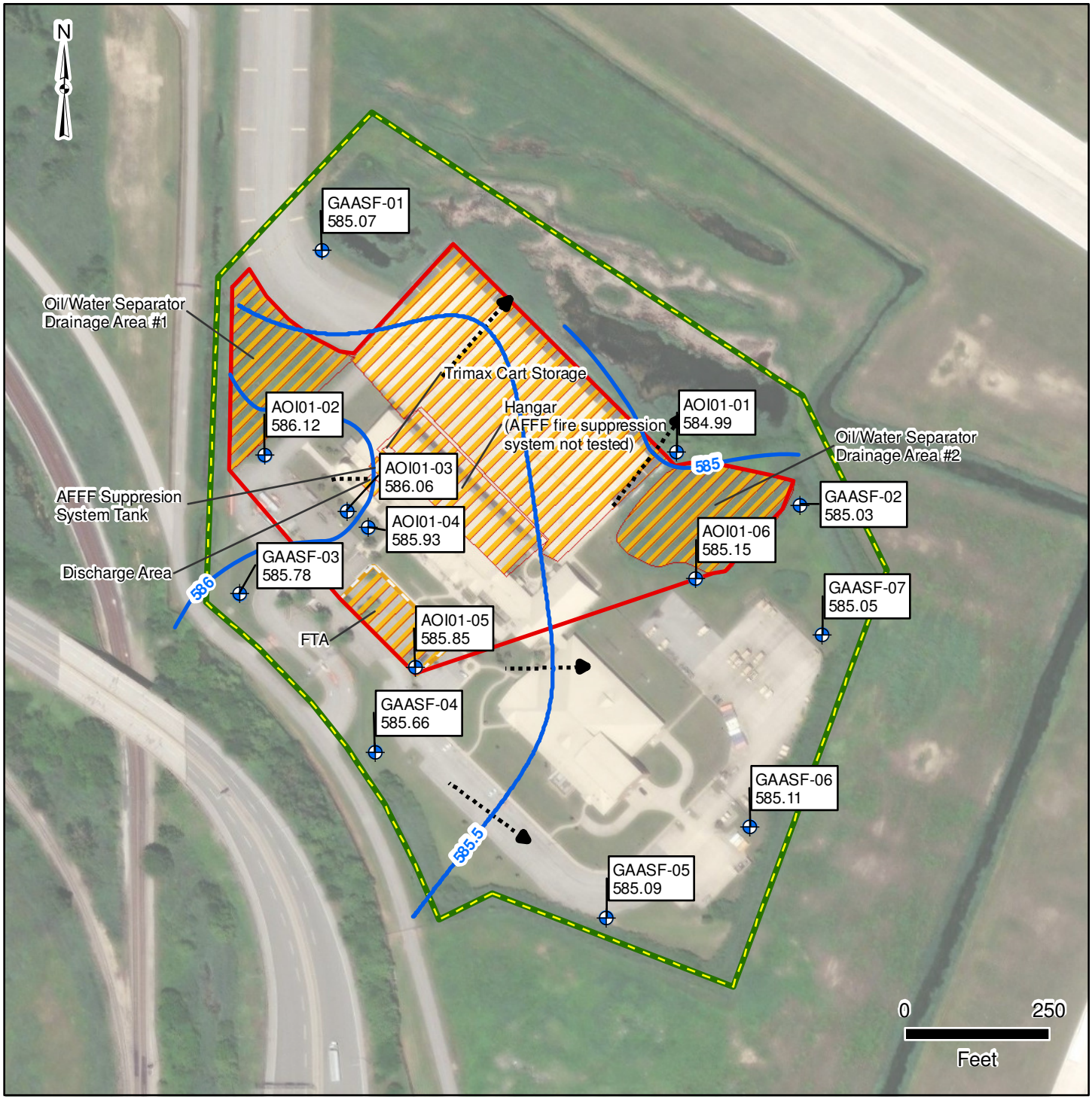
Date:.....September 2023
Prepared By:.....WOOD
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 2-4 Surface Water Features.mxd - megan.cameron - 3/30/2023 - 10:42:31 AM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF #1, Indiana

Figure 2-5
Groundwater Elevations, February 2022



Facility Data
- Facility Boundary
- Potential PFAS Release
- Fire Training Area

Sample Location
- Temporary Well Location

Hydrology
- Groundwater Flow Direction

Data Sources:
ESRI 2020

Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 2-5 GroundwaterElevations.mxd - megan.cameron - 3/30/2023 - 10:48:15 AM

This page intentionally left blank

3. SUMMARY OF AREAS OF INTEREST

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Four potential release areas were identified at Gary AASF and grouped into one AOI. The AOI is shown on **Figure 3-1**.

3.1 AOI 1 – AFFF SUPPRESSION SYSTEMS/FIRE TRAINING AREA/TRIMAX-60/AFFF STORAGE

The PA report identified one potential release area at the Facility: the AFFF Suppression System Tank and Discharge Area, which was determined to be an AOI (AOI 1) during the PA (AECOM, 2020); however, prior to the SI field work, AOI 1 was expanded to include three additional areas including the AFFF suppression system, the FTA, and the TriMax60™/AFFF storage area. The AOI is comprised of all four areas.

AOI 1 includes the Rotary Aircraft Hangar AFFF suppression system tank that is located in a boiler room in the southwestern corner of the hangar. The room contains the AFFF storage tank for the suppression system along with other water utilities. At the time of the PA, the storage tank was filled to its 770-gallon maximum capacity with 3% AFFF (AECOM 2020). At the time of the PA, there was a Trimax-60 cart stored in the hangar that contained 3% AFFF. In early February 2018, a valve malfunction caused 3% AFFF concentrate to leak from the tank into "cold storage lines" and mix with the water in them. Shortly after the initial malfunction in the boiler room, some of this diluted foam mixture flowed from the "cold storage lines" through an interconnected discharge pipe that leads to a cement sidewalk outside the boiler room. This discharge was first observed as a puddle on the sidewalk on 6 February 2018. On 7 February 2018, INARNG contracted Covanta Environmental Solutions to clean up and dispose of the AFFF mixture in the "cold storage lines" and the puddle outside the building. It is unclear exactly how much of this solution leaked onto the sidewalk prior to cleanup, but interviewees estimated the volume of the puddle to be approximately 30 gallons and indicated that this puddle was completely confined to the cement area. According to clean up documents, 900 gallons of the dilute AFFF solution were removed and treated off-Facility with solidification at a treatment facility in Portage, Indiana. It is not known if or how much of the dilute AFFF mixture was released to the environment. There is no indication that the leak continued following the initial malfunction (AECOM 2020).

On 27 August 2019, Koorsen Fire and Security, was contracted to complete inspections of the AFFF suppression system. According to Koorsen, during their inspection there was a small amount of foam discharged on the ground so a foam sample could be collected but there was no full discharge of the foam system. The remaining foam, after they collected the sample, was diluted and flushed down the sewer drain. Gary AASF, however, reported dead grass and two trees dying in the front of the building just outside of the concrete pad. Koorsen reported that there was foam present during the flush of the main drain, due to a malfunction of the system bladder, causing the foam concentrate to mix with the sprinkler system.

There is no documentation of any confirmed releases or testing from associated with the Rotary Aircraft Hangar fire suppression system from 2008 to 2011. The PA interviewees stated that testing was unknown and assumed that the manufacturer handled testing. The hangar's floor

drains discharge into an oil/water separator that then leads to two separate drainage areas located northeast and northwest of the hangar. These two drainage areas are potential secondary AFFF source areas and were incorporated into AOI 1 for the SI.

Based on PA interviews, the Facility parking lot (located southwest of the Rotary Aircraft Hangar) had been used annually by INARNG as a live-fire FTA since 2008. Interviewees stated that training activities were only conducted using ABC (dry chemical) extinguishers using clean fuels such as pallets and straw; AFFF had never been used for training exercises. Due to the historic use of AFFF at FTAs in general, it was incorporated into AOI 1 for the SI.

3.2 ADJACENT SOURCES

Nine potential off-facility sources of PFAS are adjacent to the Facility and are not under the control of the INARNG. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and were not investigated as part of this SI.

3.2.1 Gary/Chicago International Airport

The Gary/Chicago International Airport is located directly adjacent to the northern and eastern boundaries of the Gary AASF. The airport had several known AFFF releases from National Fire Protection Association (NFPA)-compliance testing and two AFFF releases from emergency responses. This area is located hydraulically cross-gradient of the Facility.

3.2.2 Airport Fire Station

The airport fire station is located directly northeast of the airport terminal. The fire station battalion chief reported during interviews that all AFFF at the airport is stored within the fire station. This includes about 800 to 900 gallons of 3% AFFF stored in 55-gallon barrels. Additionally, there are two Oshkosh firetrucks parked in the fire station with 210 gallons of 3% AFFF stored in each truck at all times.

All fire training at the airport is conducted with water only and does not involve ignited fires. The airport has a Boeing 737 modified specifically for simulation and training purposes. Airport fire department personnel travel to Chicago O'Hare International Airport and South Bend, Indiana for ignited-fire training. The interviewee stated that no outside agencies have trained with AFFF at Gary/Chicago International Airport or at the Gary AASF. This area is located hydraulically cross-gradient of the Facility.

3.2.3 Airport Emergency Responses Areas

The Battalion Fire Chief identified two emergency response areas at the airport where AFFF was used. The first emergency response occurred around 2008, when the grass near the railroad tracks in the northeastern portion of the airport caught fire. An estimated 50 to 100 gallons of 3% AFFF were used to extinguish the fire The second emergency response occurred around 2013, when a deicing truck caught fire on the flight line. An estimated 20 to 30 gallons of 3% AFFF were used to extinguish the fire. This area is located hydraulically upgradient of the Facility.

3.2.4 Midwest Solvent Recovery Co., Inc. (MIDCO II)

The Midwest Solvent Recovery Co., Inc. is a 7-acre United States Environmental Protection Agency (USEPA) National Priority List (NPL) site (known as MIDCO II) that is located approximately 1/2-mile northeast of the Gary AASF. It is not known if AFFF was used to extinguish the 1977 chemical fire or if PFAS contamination from metals manufacturing processes wastes is present. As such, the MIDCO II NPL site may be an adjacent potential source of PFAS. This area is located hydraulically upgradient of the Facility.

3.2.5 Former DuPont Facility

A former DuPont facility occupies 440 acres along the Grand Calumet River and is located approximately1.5 miles west of the Gary AASF. It is unknown if PFAS were associated with the manufacturing processes at this facility. This area is located hydraulically cross-gradient of the Facility.

3.2.6 Gary Development Landfill

The Gary Development Landfill is located approximately 1/4-mile west-southwest of the Gary AASF. Because it is not known what types of waste were disposed of at the landfill, it is a potential adjacent source of PFAS. This area is located hydraulically downgradient of the Facility.

3.2.7 Open Dump Site

An open dump site is located approximately 1/4-mile north of the Gary AASF. Due to the unknown waste types and the industrial land use of the surrounding area, it is possible that the open dump site is a potential source of PFAS contamination. This area is located hydraulically upgradient of the Facility.

3.2.8 Roland Dump Site

The Roland Dump Site is located approximately 1/4-mile east-northeast of the Gary AASF. Due to the unknown waste types and the industrial land use of the surrounding area, it is possible that the Roland Dump Site is a potential source of PFAS contamination. This area is located hydraulically upgradient of the Facility.

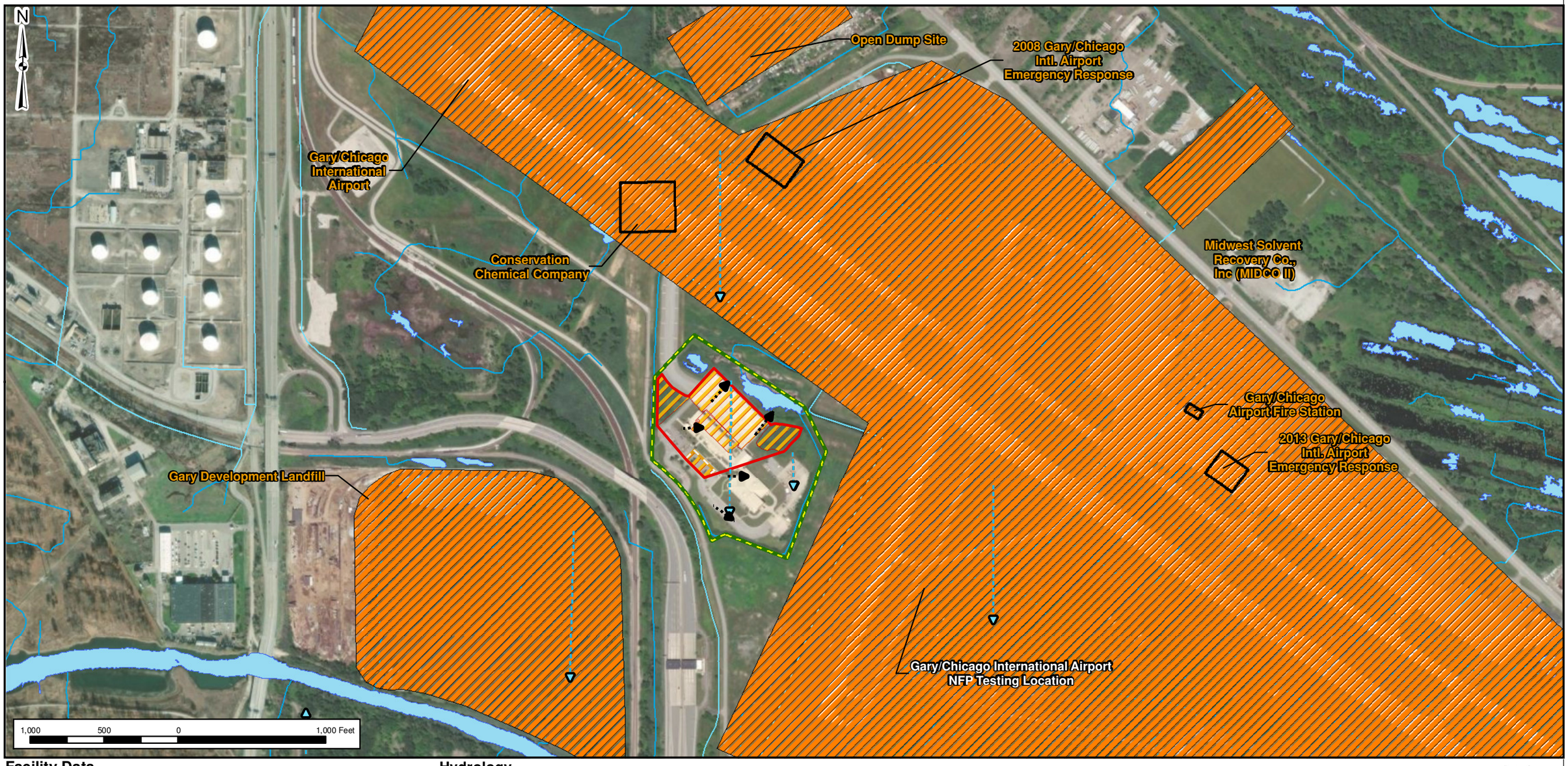
3.2.9 Former Conservation Chemical Company of Illinois

The Conservation Chemical Company of Illinois property is comprised of approximately 4.0 acres of land. A clay cap was placed on the property and the runway was extended over the cap. The former property is located approximately 1/4-mile to the northwest of the Gary AASF and is hydraulically upgradient of the Facility.

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 3-1
Area of Interest



Facility Data

- Facility Boundary
- AOI
- Potential PFAS Offisite
- Potential PFAS Release
- Fire Training Area

Hydrology

- Shallow Groundwater Flow (February, 2022)
- Inferred Deep Groundwater Flow Direction
- Canal/ Ditch
- River/Stream
- Wetland
- Water Body

Data Sources:
ESRI 2020

Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 3-1 AOI_V4.mxd - megan.cameron - 3/30/2023 - 11:09:15 AM

This page intentionally left blank

4. PROJECT DATA QUALITY OBJECTIVES

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

4.1 PROBLEM STATEMENT

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

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for Gary AASF (AECOM, 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP –QAPP Addendum (EA/Wood, 2021a);
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figures 2-1** and **2-2**). Off-Facility sampling was not included in the scope of this SI. If future off-Facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). The scope of the SI was bounded vertically by the depth of soil borings and temporary monitoring wells installed (maximum depth of 10 ft bgs). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 1.01) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 021). Data were compared to applicable SLs and decision rules as defined in the UFP-QAPP Addendum (EA/Wood, 2021a).

4.5 DATA USABILITY ASSESSMENT

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

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

5. SITE INSPECTION ACTIVITIES

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

- *Final Preliminary Assessment Report*, *Gary Army Aviation Support Facility, Indiana* (AECOM, 2020);
- *Final Programmatic Uniform Federal Policy Quality Assurance Project Plan Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide* (EA, 2020a);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum*, *Gary Army Aviation Support Facility, Indiana* (EA/Wood, 2021a);
- *Final Programmatic Accident Prevention Plan* (EA, 2020b); and
- *Final Accident Prevention Plan/Site Safety and Health Plan Addendum*, *Gary Army Aviation Support Facility, Indiana* (EA/Wood, 2021b).

The SI field activities were conducted from 21 to 24 February 2022 and consisted of utility clearance, direct-push technology (DPT) boring installation, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2021a), except as noted in **Section 5.8**.

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

- Thirty-four (34) soil samples from 13 boring locations;
- Thirteen (13) grab groundwater samples from 13 temporary well locations;
- Twelve (12) quality assurance (QA)/QC samples.

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

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 01 November 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 included ARNG, INARNG, USACE, Indiana Department of Environmental Management, and representatives familiar with the Facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the UFP-QAPP Addendum (EA/Wood, 2021a).

A TPP Meeting (No. 3) was held 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

WSP USA Environment & Infrastructure Inc. (WSP), previously doing business as Wood Environment & Infrastructure Solutions, Inc., contacted the Indiana 811 to notify them of intrusive work at the Facility. WSP contracted GPRS LLC., a private utility location service, to perform utility clearance at the Facility. Utility clearance was performed at each of the proposed boring locations on 21 February 2022 with input from the WSP field team. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 ft of each boring was pre-cleared by WSP's drilling subcontractor, Job Site Services, using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to meet acceptability criteria, as defined in the UFP-QAPP Addendum, prior to the start of field activities. A sample from a potable water source at the Facility was collected on 09 November 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 (DoD, 2020). The results of the sample of the potable water source used for decontamination of drilling equipment during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling

environment was provided in the Standard Operating Procedures appendix to the Programmatic UFP-QAPP (PQAPP) (EA, 2020).

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA, 2020). A Geoprobe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top 5 ft of the boring in compliance with utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. Several boring locations were adjusted within a 50-ft offset for reasons including drill rig access, utility avoidance and bias toward sampling within observed drainage features.

Up to three discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was to be collected approximately 1 ft above the groundwater table and one subsurface soil sample was to be collected at the midpoint between the surface and the groundwater table (not to exceed 15 ft bgs). Groundwater was encountered at depths ranging from 3 to 5 ft bgs during drilling, therefore, only two soil samples were collected at five of the boring locations and three soil samples were collected from the remainder of the boring locations, as provided in **Table 5-1**. Total boring completion depths, to accommodate temporary well installation, ranged from 8 to 10 ft bgs.

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

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

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

DPT borings were converted to temporary wells, which were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA/Wood, 2021a). After removal of the casings, boreholes were abandoned using bentonite chips. 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, a temporary well was constructed of a 5-ft section of 1-inch Schedule 40 polyvinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen interval. 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 in a separate container. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

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

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. Three field blanks (FBs) were collected in accordance with the UFP-QAPP Addendum (EA/Wood, 2021a). A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI UFP-QAPP Addendum (EA/Wood, 2021a) by removing the PVC and backfilling the hole with bentonite chips.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

A synoptic groundwater gauging event was performed on 24 February 2022. Groundwater elevation measurements were collected from the 13 new temporary monitoring wells. Water level measurements were taken from the survey mark on the northern side of the well casing.

Groundwater elevation data is provided in **Table 5-3**. A groundwater flow contour map is provided as **Figure 2-4**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a Leica GS-18 GNSS base/rover RTK system. Positions were collected in the applicable Indiana State Plane Coordinates (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected on 24 February 2022 and are provided in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

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

Soil IDW (i.e., soil cuttings) generated during the SI activities were contained in labeled, 55-gallon Department of Transportation (DOT)-approved steel drums and left at the Facility in a designated waste storage area. The soil IDW was not sampled and assumes the 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 contained in labeled, 55-gallon DOT-approved steel drums, and left at the Facility in a designated waste storage area. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples collected from that source location.

The solid and liquid IDW will be sampled and disposed of offsite in a Resource Conservation and Recovery Act Subtitle C landfill. Specifics on the disposal of solid and liquid IDW will be addressed in a Technical Memorandum for Investigation Derived Waste Management and Disposal.

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

5.7 LABORATORY ANALYTICAL METHODS

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

Soil samples were also analyzed for TOC using EPA Method 9060A, pH by EPA Method 9045D, and grain size using ASTM Method D-422.

5.8 Deviations from SI UFP-QAPP Addendum

Deviations from the UFP-QAPP Addendum (EA/Wood, 2021a) occurred based on conditions encountered during field activities. These deviations were discussed between EA/Wood, ARNG, and USACE. Two deviations from the UFP-QAPP Addendum are noted below:

- Only two soil samples, rather than the three prescribed in the UFP-QAPP Addendum, were collected at the following boring locations due to shallow occurrence of groundwater: AOI01-02, GAASF-02, GAASF-04, GAASF-05, GAASF-07.

- The UFP-QAPP Addendum contained an error with regard to the soil extraction holding time. The PFAS extraction holding time for soil should have been identified as 28 days, consistent with the Programmatic UFP-QAPP. Holding times for soil (as corrected) were met.

Table 5-1. Site Inspection Samples by Medium
Gary Army Aviation Support Facility, Gary, Indiana
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
AOI01-01-SB-0-2	02/22/2022	0-2	X				
AOI01-01-SB-2-3	02/22/2022	2-3	X				
AOI01-01-SB-3-4	02/22/2022	3-4	X				
AOI01-02-SB-0-2	02/22/2022	0-2	X				
AOI01-02-SB-2-3	02/22/2022	2-3	X				
AOI01-03-SB-0-2	02/22/2022	0-2	X				
AOI01-03-SB-2-3	02/22/2022	2-3	X				
AOI01-03-SB-3-4	02/22/2022	3-4	X				
AOI01-04-SB-0-2	02/22/2022	0-2	X				
AOI01-04-SB-2-3	02/22/2022	2-3	X				
AOI01-04-SB-3-4	02/22/2022	3-4	X				Parent sample of GAASF-SB-DUP03
AOI01-05-SB-0-2	02/23/2022	0-2	X				
AOI01-05-SB-2-3	02/23/2022	2-3	X				
AOI01-05-SB-3-4	02/23/2022	3-4	X				
AOI01-06-SB-0-2	02/23/2022	0-2	X				MS/MSD collected
AOI01-06-SB-2-3	02/23/2022	2-3	X				
AOI01-06-SB-3-4	02/23/2022	3-4	X				
GAASF-01-SB-0-2	02/22/2022	0-2	X				
GAASF-01-SB-2-3	02/22/2022	2-3	X				Parent sample of GAASF-SB-DUP02
GAASF-01-SB-3-4	02/22/2022	3-4	X				
GAASF-02-SB-0-2	02/23/2022	0-2	X	X	X	X	
GAASF-02-SB-2-3	02/23/2022	2-3	X				Parent sample of GAASF-SB-DUP04
GAASF-03-SB-0-2	02/22/2022	0-2	X	X	X	X	
GAASF-03-SB-2-3	02/22/2022	2-3	X				
GAASF-03-SB-3-4	02/22/2022	3-4	X				
GAASF-04-SB-0-2	02/21/2022	0-2	X				
GAASF-04-SB-2-3	02/21/2022	2-3	X				
GAASF-05-SB-0-2	02/21/2022	0-2	X				Parent sample of GAASF-SB-DUP01
GAASF-05-SB-2-3	02/21/2022	2-3	X				
GAASF-06-SB-0-2	02/21/2022	0-2	X				MS/MSD collected
GAASF-06-SB-2-3	02/21/2022	2-3	X				
GAASF-06-SB-3-4	02/21/2022	3-4	X				
GAASF-07-SB-0-2	02/23/2022	0-2	X				
GAASF-07-SB-2-3	02/23/2022	2-3	X				
GAASF-SB-DUP01	02/21/2022		X				Field duplicate
GAASF-SB-DUP02	02/22/2022		X				Field duplicate

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
GAASF-SB-DUP03	02/22/2022		X				Field duplicate
GAASF-SB-DUP04	02/23/2022		X				Field duplicate
Groundwater Samples							
AOI01-01-GW	02/22/2022		X				
AOI01-02-GW	02/22/2022		X				
AOI01-03-GW	02/23/2022		X				
AOI01-04-GW	02/22/2022		X				
AOI01-05-GW	02/23/2022		X				
AOI01-06-GW	02/23/2022		X				
GAASF-01-GW	02/22/2022		X				
GAASF-02-GW	02/23/2022		X				
GAASF-03-GW	02/22/2022		X				
GAASF-04-GW	02/21/2022		X				
GAASF-05-GW	02/21/2022		X				Parent sample of GAASF-DUP01-GW
GAASF-06-GW	02/22/2022		X				MS/MSD collected
GAASF-07-GW	02/23/2022		X				Parent sample of GAASF-DUP02-GW
GAASF-DUP01-GW	02/21/2022		X				Field duplicate
GAASF-DUP02-GW	02/23/2022		X				Field duplicate
Blank Samples							
GAASF-EB-HOSE	02/21/2022		X				EB collected from hose used to fill up drillers water tank
GAASF-EB-HA-01	02/21/2022		X				EB collected from hand auger
GAASF-EB-HA-02	02/22/2022		X				EB collected from hand auger
GAASF-EB-HA-03	02/23/2022		X				EB collected from hand auger
GAASF-WLM-01	02/22/2022		X				EB collected from water level meter
GAASF-WLM-02	02/23/2022		X				EB collected from water level meter
GAASF-FB-01	02/21/2022		X				Field blank
GAASF-FB-02	02/22/2022		X				Field blank
GAASF-FB-03	02/23/2022		X				Field blank

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

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Gary Army Aviation Support Facility, Gary, Indiana
Site Inspection Report

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AOI01-01	10	5-10
	AOI01-02	8	3-8
	AOI01-03	10	5-10
	AOI01-04	10	5-10
	AOI01-05	10	5-10
	AOI01-06	10	5-10
	GAASF-01	10	5-10
	GAASF-02	8	3-8
	GAASF-03	10	5-10
	GAASF-04	9	4-9
	GAASF-05	8	3-8
	GAASF-06	10	5-10
	GAASF-07	8	3-8

Notes:
bgs = below ground surface
ft = feet

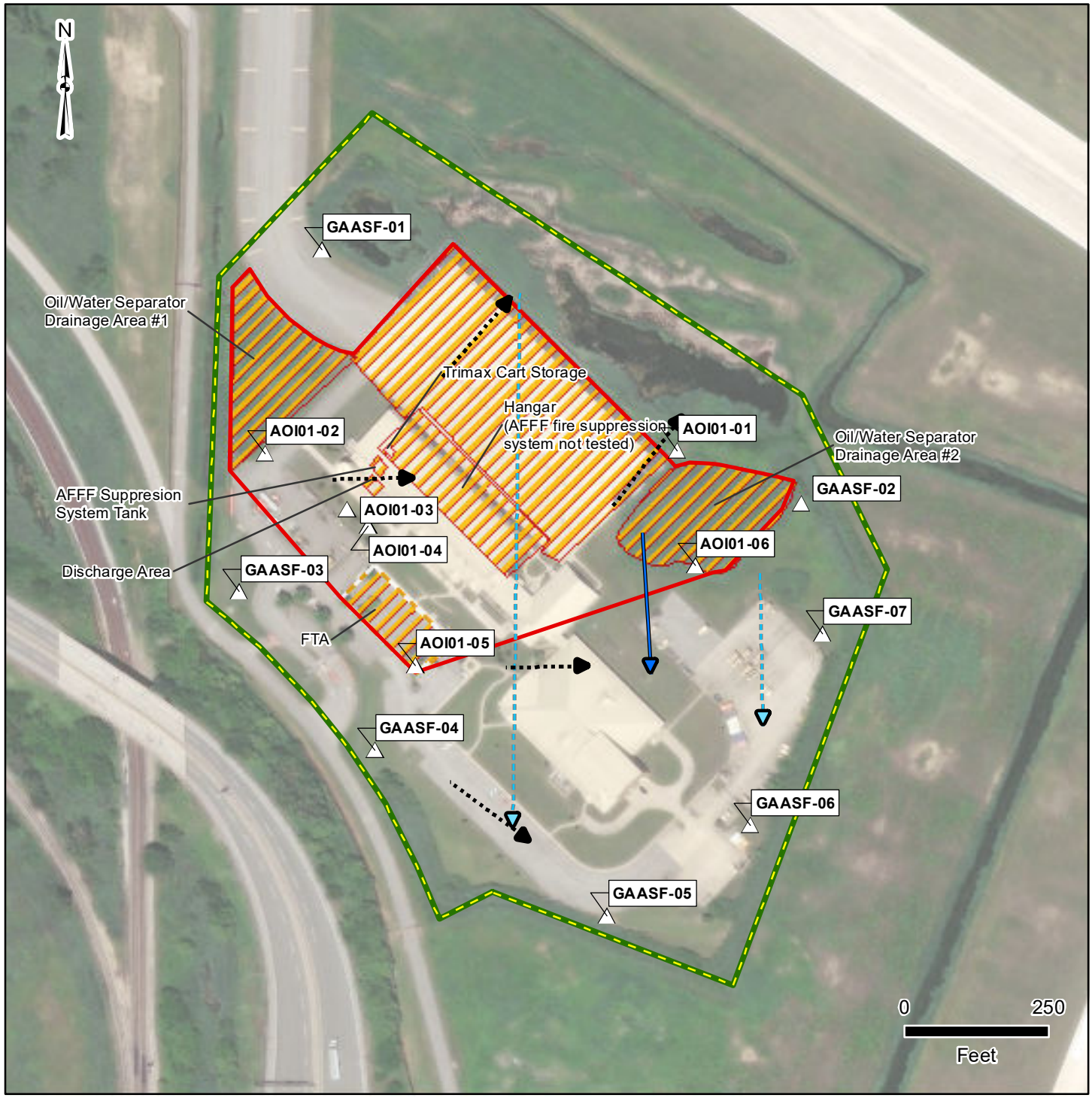
Table 5-3. Groundwater Elevation
Gary Army Aviation Support Facility, Gary, Indiana
Site Inspection Report

Monitoring Well ID	Top of Casing Elevation (ft NAVD88)	Depth to Water (ft bgs)	Depth to Water (ft btoc)	Groundwater Elevation (ft NAVD 88)	Ground Surface Elevation (ft NAVD88)
AOI01-01	590.793	4.64	5.80	584.99	589.63
AOI01-02	590.129	3.05	4.01	586.12	589.17
AOI01-03	591.708	4.52	5.65	586.06	590.58
AOI01-04	591.421	4.47	5.49	585.93	590.406
AOI01-05	589.763	3.43	3.91	585.85	589.286
AOI01-06	586.037	0.09	0.89	585.15	585.239
GAASF-01	591.025	4.61	5.95	585.07	589.688
GAASF-02	586.751	0.25	1.72	585.03	585.278
GAASF-03	590.605	4.00	4.82	585.78	589.785
GAASF-04	587.557	1.04	1.90	585.66	586.7
GAASF-05	588.960	2.22	3.87	585.09	587.307
GAASF-06	589.506	4.26	4.40	585.11	589.367
GAASF-07	588.306	1.94	3.26	585.05	586.991

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

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 5-1
Site Inspection Sample Locations



Facility Data
- Facility Boundary
- Potential PFAS Release
- Fire Training Area

Sample Location
- Soil Boring & Temporary Groundwater Well Location

Hydrology
- Surface Water Flow Direction
- Shallow Groundwater Flow Direction (February, 2022)
- Inferred Deep Groundwater Flow Direction

Data Sources: ESRI 2020

Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 16N

G:\ANG\a_MXD\Gary, IN\SiteInspectionReport\Figure 5-1 Site Inspection Sample Locations.mxd - USDJ716516 - 9/12/2023 - 12:40:19 PM

This page intentionally left blank

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** and **Table 6-1**. A discussion of the results for the AOI is provided in **Section 6.3**. **Table 6-2** through **Table 6-4** present results in soil and 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 (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**.

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

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

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

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

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the Facility: the residential scenario is applied to surface soil results (0 to 2 ft bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil

results (2 to 15 ft bgs). The SLs are not applied to deep subsurface soil results (>15 ft bgs) because 15 ft is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

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

The grain size analysis conducted on the soil samples collected from GAASF-03 confirms the field observation of poorly graded fine to medium sand. Furthermore, the soil sample collected from GAASF-02 confirms the field observation of a silty sand. The results indicate that the soil samples are comprised primarily of sand (37.3% to 99.3%), silt (4% to 37.3%) and clay (4%). TOC reported in soil sample AOI01-01-SB-5-8 was 5,600 mg/kg, and the pH was 7.5 Standard Units.

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

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes the AFFF suppression systems, FTA, and the Trimax-60/AFFF storage area. The soil and groundwater results are summarized in **Table 6-2** through **Table 6-4**. Soil and groundwater results are presented on **Figures 6-1** through **Figure 6-5.**

6.3.1 AOI 1 Soil Analytical Results

Soil samples were collected from 13 boring locations associated with AOI 1 during the SI; six of the boring locations were in and around AOI 1 and seven were located around the Facility boundary. **Table 6-2** and **Table 6-3** summarize the detected compounds in soil. **Figure 6-1** through **Figure 6-5** present the ranges of detections for PFOS, PFOA, PFBS, PFHxS, and PFNA in soil.

Surface soil (0 to 2 ft bgs) was sampled from boring locations AOI01-01 through AOI01-06 and GAASF-01 through GAASF-07 as shown on **Table 6-2**. Soil was sampled from shallow subsurface soil/midpoint (2 to 3 ft bgs) from boring locations AOI01-01 through AOI01-06 and GAASF-01 through GAASF-07. Soil was also sampled from a deeper subsurface soil interval (3

to 4 ft bgs) from boring locations AOI01-01, AOI01-03 through AOI01-06, GAASF-01, GAASF-03, and GAASF-06. As all subsurface soil samples were collected 2 to 4 ft bgs, the results are shown on **Table 6-3**, and the results are presented below as shallow subsurface soil results.

PFOS was detected in surface soil at concentrations exceeding the SL. PFOS was detected in surface soil at nine locations at concentrations ranging from 1.1 J+ µg/kg (GAASF-01) to 280 µg/kg (GAASF-07). PFOS concentrations in surface soil exceeded the SL at five locations (AOI01-05, AOI01-06, GAASF-02, GAASF-06 and GAASF-07). PFNA, PFOA, and PFHxS were detected in surface soil at concentrations below their respective SLs. PFNA was detected in surface soil at six locations at concentrations ranging from 0.27 J µg/kg (AOI01-06) to 1.2 µg/kg (AOI01-01, GAASF-02 and GAASF-07). PFOA was detected in surface soil at seven locations at concentrations ranging from 1.3 J+ µg/kg (GAASF-06) to 9.6 J+ µg/kg (GAASF-02). PFHxS was detected in one surface soil sample at GAASF-02 with a concentration of 1.8 J+ µg/kg. PFBS was not detected in the surface soil.

PFOS was detected in shallow subsurface soil at concentrations exceeding the SL. PFOS was detected in shallow subsurface soil at ten locations at concentrations ranging from 0.75 J+ µg/kg (GAASF-01) to 290 µg/kg (GAASF-02). PFOS exceeded the SL at two locations (GAASF-02 and GAASF-07). PFNA, PFOA, and PFHxS were detected in shallow subsurface soil at concentrations below the SLs. PFNA was detected at four locations at concentrations ranging from of 0.23 J µg/kg (GAASF-03) to 1.2 µg/kg (GAASF-02). PFOA was detected at six locations at concentrations ranging from 0.83 J+ µg/kg (AOI01-05) to 11 J+ µg/kg (GAASF-02). PFHxS was only detected at one location (GAASF-02) at concentration of 1.4 J+ µg/kg (1.6 J+ µg/kg in duplicate). PFBS was not detected in the shallow subsurface soil.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater samples were collected from 13 temporary wells during the SI. **Figure 6-6** and **Figure 6-7** present the ranges of detections for PFOS, PFOA, PFBS, PFHxS, and PFNA. **Table 6-4** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring well locations AOI01-01 through AOI01-06 and GAASF-01 through GAASF-07. PFHxS, PFNA, PFOS, and PFOA were detected at concentrations exceeding their respective SLs.

PFHxS was detected at ten locations at concentrations ranging from 1.8 J+ ng/L (GAASF-01) to 360 ng/L (GAASF-02); PFHxS exceeded the SL at four locations (GAASF-02, GAASF-03, GAASF-06 and GAASF-07).

PFNA was detected at 12 locations at concentrations ranging from 0.62 J ng/L (GAASF-06) to 56 ng/L(GAASF-02); PFNA exceeded the SL at eight locations (AOI01-01, AOI01-04, AOI01-06, GAASF-01, GAASF-02, GAASF-03, GAASF-04, and GAASF-07).

PFOS was detected at 12 locations at concentrations ranging from 4.9 J+ ng/L (AOI01-03) to 3,700 ng/L (GAASF-02); PFOS exceeded the SL at all 12 locations (AOI01-01, AOI01-02, AOI01-03, AOI01-05, AOI01-06, and GAASF-01 through GAASF-07).

PFOA was detected and exceeded the SL at all 13 locations at concentrations ranging from 8.1 J+ ng/L (AOI01-03) to 2,300 ng/L (GAASF-02).

PFBS was detected at concentrations below its SL. PFBS was detected at eight locations at concentrations ranging from 2.0 J+ ng/L (GAASF-05) to 250 ng/L (GAASF-02).

6.3.3 Conclusions

Based on the results of the SI, PFHxS, PFNA, PFOS, and PFOA were detected at concentrations exceeding their respective SLs in groundwater, and PFOS was detected at concentrations exceeding the SL in surface and subsurface soil samples. PFBS was detected in groundwater below the SL, and PFOA, PFNA and PFHxS were detected in soil below their respective SLs. Based on the exceedances of the SLs in groundwater and soil, further evaluation at AOI 1 is warranted.

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

Area of Interest		AOI1															
Location ID		AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06		GAASF-01		GAASF-02	
Sample Name		AOI01-01-SB-0-2		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI01-05-SB-0-2		AOI01-06-SB-0-2		GAASF-01-SB-0-2		GAASF-02-SB-0-2	
Lab ID		AOI01-01-SB-0-2-02222022		AOI01-02-SB-0-2-02222022		AOI01-03-SB-0-2-02222022		AOI01-04-SB-0-2-02222022		AOI01-05-SB-0-2-02232022		AOI01-06-SB-0-2-02232022		GAASF-01-SB-0-2-02222022		GAASF-02-SB-0-2-02232022	
Parent Sample ID																	
Depth (feet below ground surface)		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Sample Date		2/22/2022		2/22/2022		2/22/2022		2/22/2022		2/23/2022		2/23/2022		2/22/2022		2/23/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																	
PFBS	1,900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	1.8	J+
PFNA	19	1.2		ND	U	ND	U	ND	U	0.29	J	0.27	J	ND	U	1.2	
PFOS	13	4.3	J+	1.2	J+	ND	U	ND	U	26		56		1.1	J+	270	
PFOA	19	3.7	J+	ND	U	ND	U	ND	U	1.5	J+	4.8	J+	ND	U	9.6	J+

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

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

Area of Interest		AOI1											
Location ID		GAASF-03		GAASF-04		GAASF-05		GAASF-05		GAASF-06		GAASF-07	
Sample Name		GAASF-03-SB-0-2		GAASF-04-SB-0-2		GAASF-05-SB-0-2		GAASF-SB-DUP01		GAASF-06-SB-0-2		GAASF-07-SB-0-2	
Lab ID		GAASF-03-SB-0-2-02222022		GAASF-04-SB-0-2-02212022		GAASF-05-SB-0-2-02212022		GAASF-SB-DUP01-02212022		GAASF-06-SB-0-2-02212022		GAASF-07-SB-0-2-02232022	
Parent Sample ID								GAASF-05-SB-0-2					
Depth (feet below ground surface)		0-2		0-2		0-2		0-2		0-2		0-2	
Sample Date		2/22/2022		2/21/2022		2/21/2022		2/21/2022		2/21/2022		2/23/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)													
PFBS	1,900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	19	ND	U	ND	U	ND	U	ND	U	0.39	J+	1.2	
PFOS	13	4.8	J+	ND	U	ND	U	ND	U	100	J	280	
PFOA	19	ND	U	2.2	J+	ND	U	ND	U	1.3	J+	4	J+

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
PFAS	per- and polyfluoroalkyl substances
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Agency
µg/kg	micrograms/kilogram

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

Area of Interest		AOI 1									
Location ID		AOI01-01		AOI01-01		AOI01-02		AOI01-03		AOI01-03	
Sample Name		AOI01-01-SB-2-3		AOI01-01-SB-3-4		AOI01-02-SB-2-3		AOI01-03-SB-2-3		AOI01-03-SB-3-4	
Lab ID		AOI01-01-SB-2-3-02222022		AOI01-01-SB-3-4-02222022		AOI01-02-SB-2-3-02222022		AOI01-03-SB-2-3-02222022		AOI01-03-SB-3-4-02222022	
Parent Sample ID											
Depth (feet below ground surface)		2-3		3-4		2-3		2-3		3-4	
Sample Date		2/22/2022		2/22/2022		2/22/2022		2/22/2022		2/22/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)											
PFBS	25,000	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	0.64		ND	U	ND	U	ND	U	ND	U
PFOS	160	2.5	J+	ND	U	1.7	J+	ND	U	ND	U
PFOA	250	9.8	J+	5.6	J+	ND	U	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

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

Area of Interest		AOI 1									
Location ID		AOI01-04		AOI01-04		AOI01-04		AOI01-05		AOI01-05	
Sample Name		AOI01-04-SB-2-3		AOI01-04-SB-3-4		GAASF-DUP03		AOI01-05-SB-2-3		AOI01-05-SB-3-4	
Lab ID		AOI01-04-SB-2-3-02222022		AOI01-04-SB-3-4-02222022		GAASF-DUP03-02222022		AOI01-05-SB-2-3-02232022		AOI01-05-SB-3-4-02232022	
Parent Sample ID						AOI01-04-SB-3-4					
Depth (feet below ground surface)		2-3		3-4		3-4		2-3		3-4	
Sample Date		2/22/2022		2/22/2022		2/22/2022		2/23/2022		2/23/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)											
PFBS	25,000	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	0.86	J+	ND	U	ND	U	25		7.0	J+
PFOA	250	ND	U	ND	U	ND	U	0.83	J+	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

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

Area of Interest		AOI 1									
Location ID		AOI01-06		AOI01-06		GAASF-01		GAASF-01		GAASF-01	
Sample Name		AOI01-06-SB-2-3		AOI01-06-SB-3-4		GAASF-01-SB-2-3		GAASF-SB-DUP02		GAASF-01-SB-3-4	
Lab ID		AOI01-06-SB-2-3-02232022		AOI01-06-SB-3-4-02232022		GAASF-01-SB-2-3-02222022		GAASF-SB-DUP02-02222022		GAASF-01-SB-3-4-02222022	
Parent Sample ID								GAASF-01-SB-2-3			
Depth (feet below ground surface)		2-3		3-4		2-3		2-3		3-4	
Sample Date		2/23/2022		2/23/2022		2/22/2022		2/22/2022		2/22/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)											
PFBS	25,000	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	29		59		0.75	J+	0.78	J+	0.97	J+
PFOA	250	1.2	J+	2.4	J+	ND	U	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

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

Area of Interest		AOI 1									
Location ID		GAASF-02		GAASF-02		GAASF-03		GAASF-03		GAASF-04	
Sample Name		GAASF-02-SB-2-3		GAASF-SB-DUP04		GAASF-03-SB-2-3		GAASF-03-SB-3-4		GAASF-04-SB-2-3	
Lab ID		GAASF-02-SB-2-3-02232022		GAASF-SB-DUP04-02232022		GAASF-03-SB-2-3-02222022		GAASF-03-SB-3-4-02222022		GAASF-04-SB-2-3-02212022	
Parent Sample ID				GAASF-02-SB-2-3							
Depth (feet below ground surface)		2-3		2-3		2-3		3-4		2-3	
Sample Date		2/23/2022		2/23/2022		2/22/2022		2/22/2022		2/21/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)											
PFBS	25,000	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	1.4	J+	1.6	J+	ND	U	ND	U	ND	U
PFNA	250	1.2		1.2		0.23	J	ND	U	ND	U
PFOS	160	290		260		6.4	J+	1.4	J+	ND	U
PFOA	250	11	J+	9.9	J+	ND	U	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

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

Area of Interest		AOI 1							
Location ID		GAASF-05		GAASF-06		GAASF-06		GAASF-07	
Sample Name		GAASF-05-SB-2-3		GAASF-06-SB-2-3		GAASF-06-SB-3-4		GAASF-07-SB-2-3	
Lab ID		GAASF-05-SB-2-3-02212022		GAASF-06-SB-2-3-02212022		GAASF-06-SB-3-4-02212022		GAASF-07-SB-2-3-02232022	
Parent Sample ID									
Depth (feet below ground surface)		2-3		2-3		3-4		2-3	
Sample Date		2/21/2022		2/21/2022		2/21/2022		2/23/2022	
Analyte	**OSD Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)									
PFBS	25,000	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	0.82	
PFOS	160	ND	U	1.1	J+	1.6	J+	180	
PFOA	250	ND	U	1.4	J+	ND	U	2.8	J+

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = The result is an estimated quantity, but the result may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

This page intentionally left blank

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Gary AASF, Gary, Indiana

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06	
	Sample Name	AOI01-01-GW		AOI01-02-GW		AOI01-03-GW		AOI01-04-GW		AOI01-05-GW		AOI01-06-GW	
	Lab ID	AOI01-01-GW-02222022		AOI01-02-GW-02222022		AOI01-03-GW-02232022		AOI01-04-GW-02222022		AOI01-05-GW-02232022		AOI01-06-GW-02232022	
	Parent Sample ID												
	Sample Date	2/22/2022		2/22/2022		2/23/2022		2/22/2022		2/23/2022		2/23/2022	
Analyte	**OSD Screening Level** [1]	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)													
PFBS	601	ND	U	ND	U	ND	U	ND	U	3.4	J+	26	
PFHxS	39	6.0		ND	U	ND	U	ND	U	9.0		34	
PFNA	6	11		5.6		1.1	J	34		ND	U	9.7	J
PFOS	4	17		15		4.9	J+	ND	U	23		670	
PFOA	6	140		9.2	J+	8.1	J+	100		61		470	

Notes

Grey Fill	Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = Estimated concentration, bias high.
J- = Estimated concentration, bias low

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Gary AASF, Gary, Indiana

	Location ID	GAASF-01		GAASF-02		GAASF-03		GAASF-04		GAASF-05		GAASF-DUP01	
	Sample Name	GAASF-01-GW		GAASF-02-GW		GAASF-03-GW		GAASF-04-GW		GAASF-05-GW		GAASF-DUP01-GW	
	Lab ID	GAASF-01-GW-02222022		GAASF-02-GW-02232022		GAASF-03-GW-02222022		GAASF-04-GW-02212022		GAASF-05-GW-02212022		GAASF-DUP01-GW-02212022	
	Parent Sample ID											GAASF-05	
	Sample Date	2/22/2022		2/23/2022		2/22/2022		2/21/2022		2/21/2022		2/21/2022	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)													
PFBS	601	ND	U	250		3.7		2.2	J+	2.0	J+	ND	U
PFHxS	39	1.8	J+	360		62		2.9	J+	11	J	11	J
PFNA	6	7.1		56		14		6.3		2.0		1.9	
PFOS	4	39		3700		540	J	22		49	J	48	J
PFOA	6	27		2300		130		110		80		78	

Notes

Grey Fill	Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = Estimated concentration, bias high.
J- = Estimated concentration, bias low

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Gary AASF, Gary, Indiana

	Location ID	GAASF-06		GAASF-07		GAASF-DUP02	
	Sample Name	GAASF-06-GW		GAASF-07-GW		GAASF-DUP02-GW	
	Lab ID	GAASF-06-GW-02222022		GAASF-07-GW-02232022		GAASF-DUP02-GW-02232022	
	Parent Sample ID					GAASF-07-GW	
	Sample Date	2/22/2022		2/23/2022		2/23/2022	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)							
PFBS	601	5.8		ND	U	15	
PFHxS	39	44		40		31	
PFNA	6	0.62	J	13	J	12	
PFOS	4	63	J-	720		570	
PFOA	6	110		280		290	

Notes

Grey Fill	Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration
J+ = Estimated concentration, bias high.
J- = Estimated concentration, bias low

Chemical Abbreviations

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Acronyms and Abbreviations

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

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 6-1
PFOS Detections in Soil

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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

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

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

Data Sources:
ESRI 2020
AECOM 2020

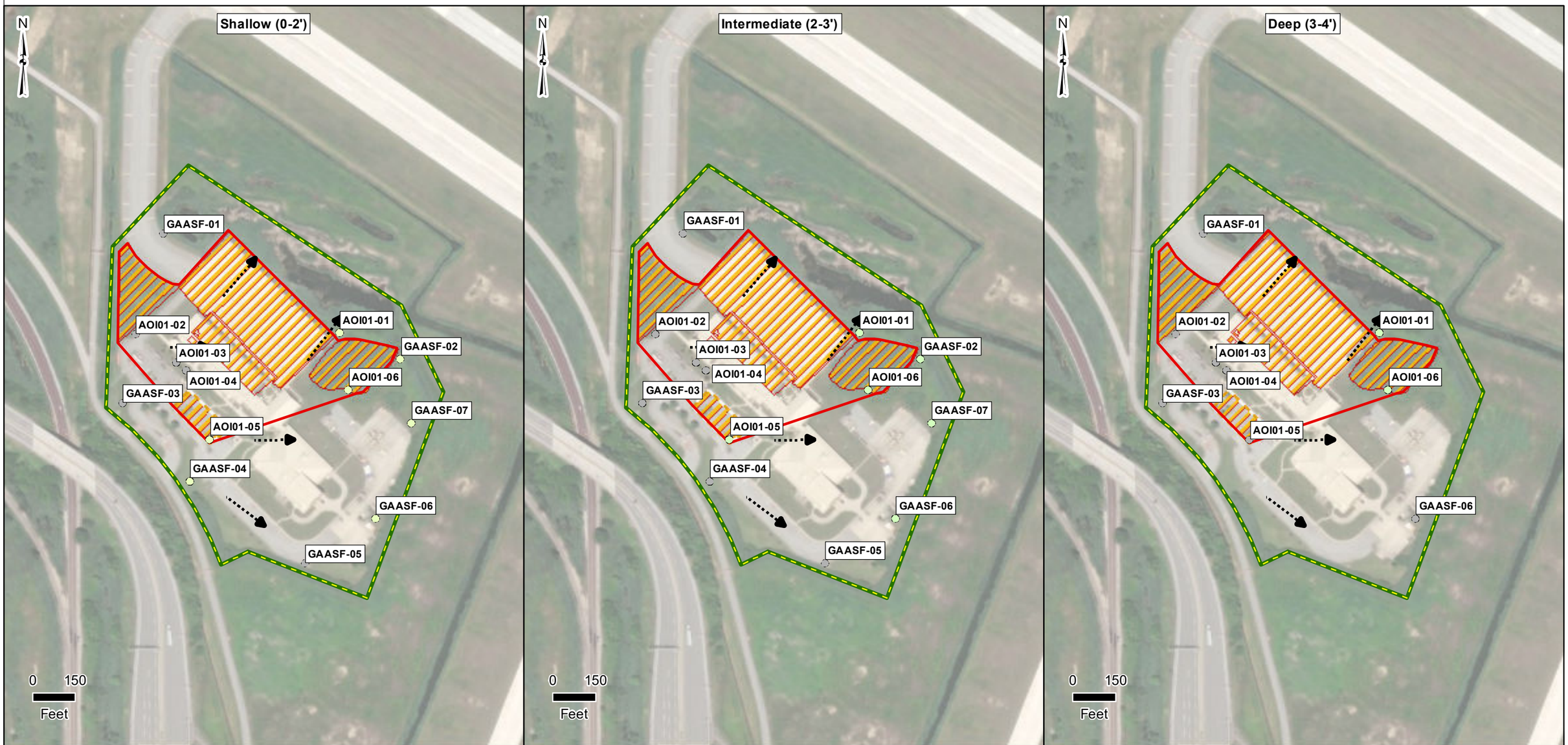
Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure PFOS Detections in Soil1.mxd - dylan.jones - 5/30/2023 - 11:46:29 AM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 6-2
PFOA Detections in Soil



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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

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

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

Data Sources:
ESRI 2020
AECOM 2020

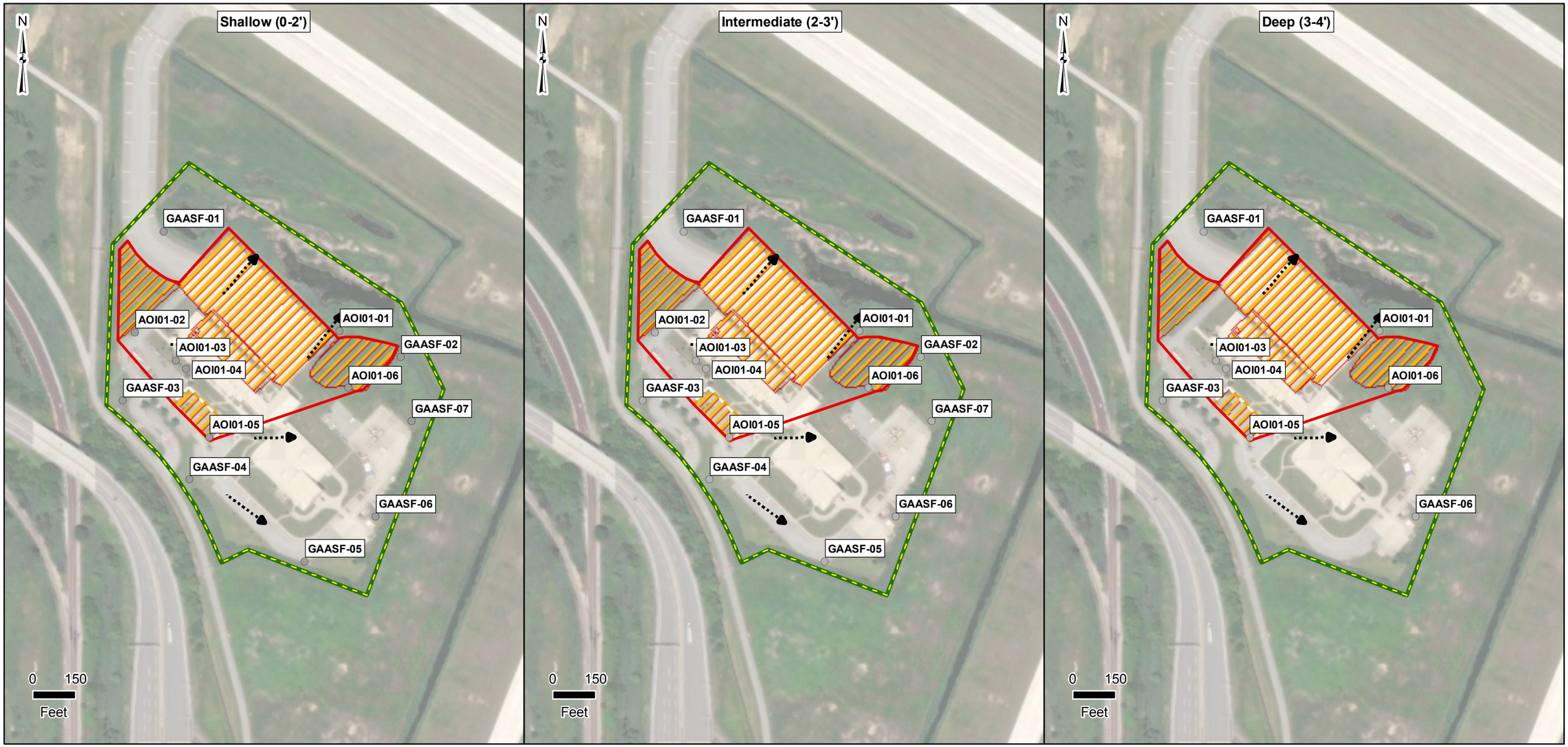
Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure PFOA Detections in Soil.mxd - USDJ716516 - 9/12/2023 - 12:58:01 PM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 6-3
PFBS Detections in Soil



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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

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

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

Data Sources:
ESRI 2020
AECOM 2020

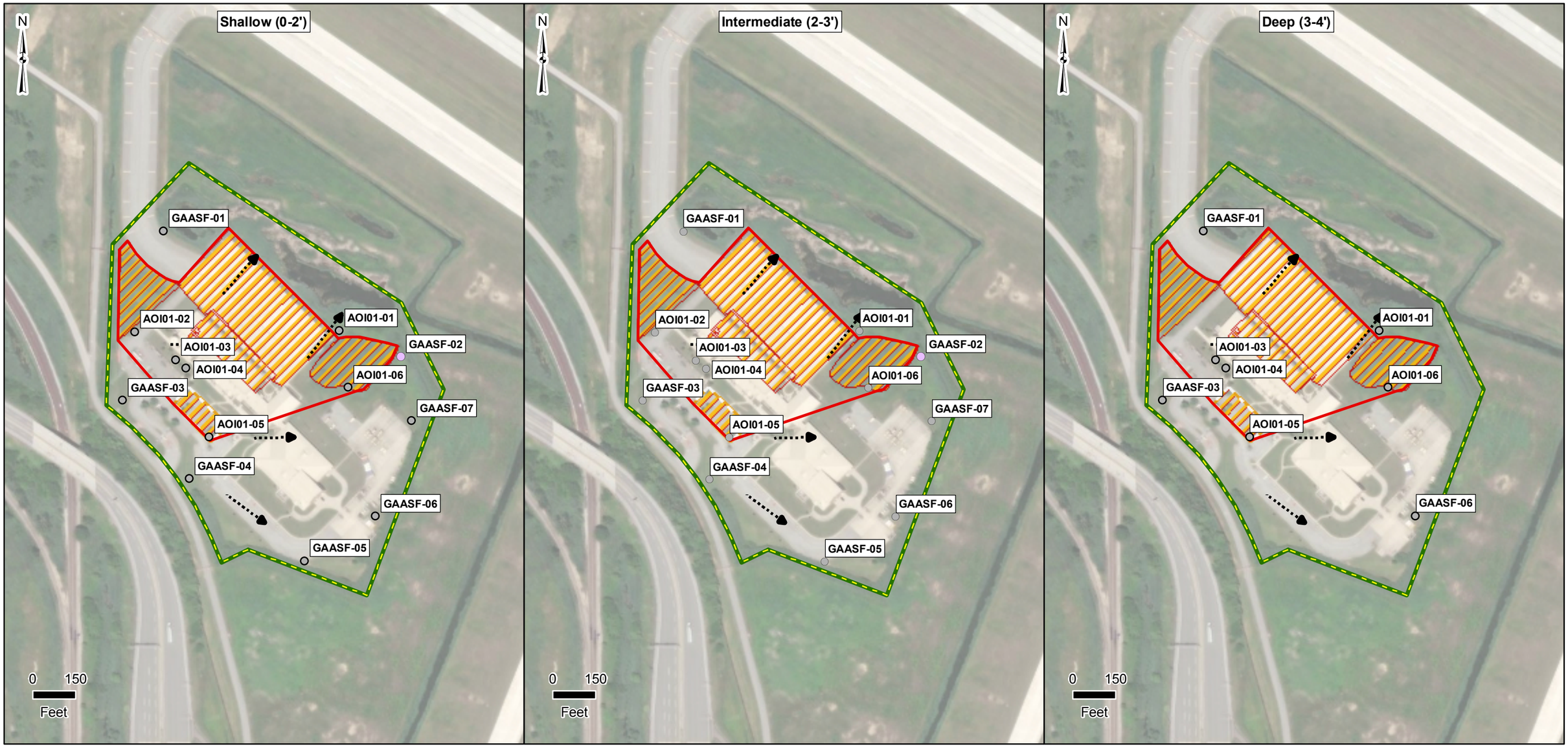
Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 6-3 PFBS Detections in Soil.mxd - dylan.jones - 5/30/2023 - 12:59:04 PM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 6-4
PFHxS Detections in Soil



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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

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

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

Data Sources:
ESRI 2020
AECOM 2020

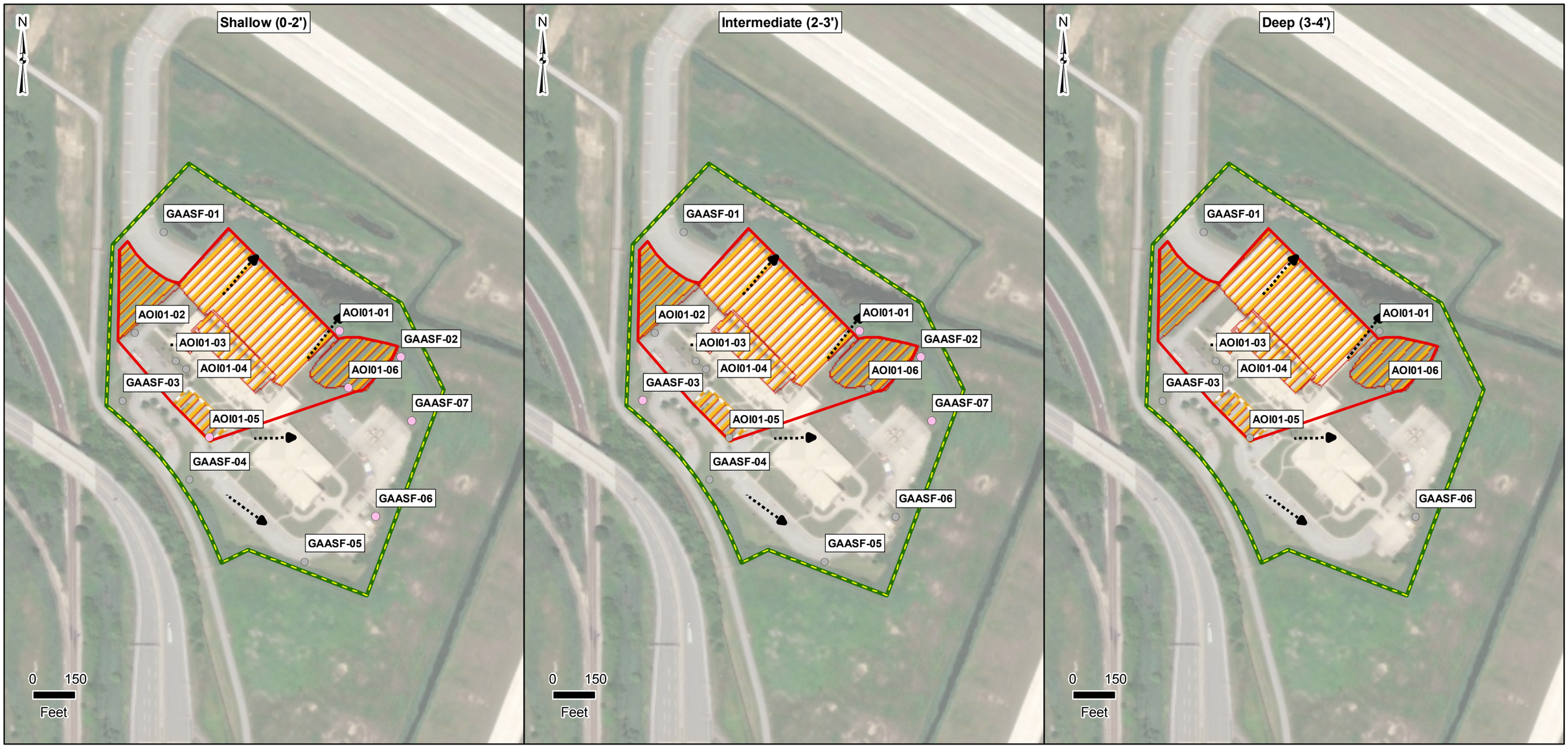
Date:..... March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 6-4 PFHxS Detections in Soil.mxd - dylan.jones - 5/30/2023 - 1:07:45 PM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 6-5
PFNA Detections in Soil



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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

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

NOTES:
PFNA = perfluorononanoic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram

Data Sources:
ESRI 2020
AECOM 2020

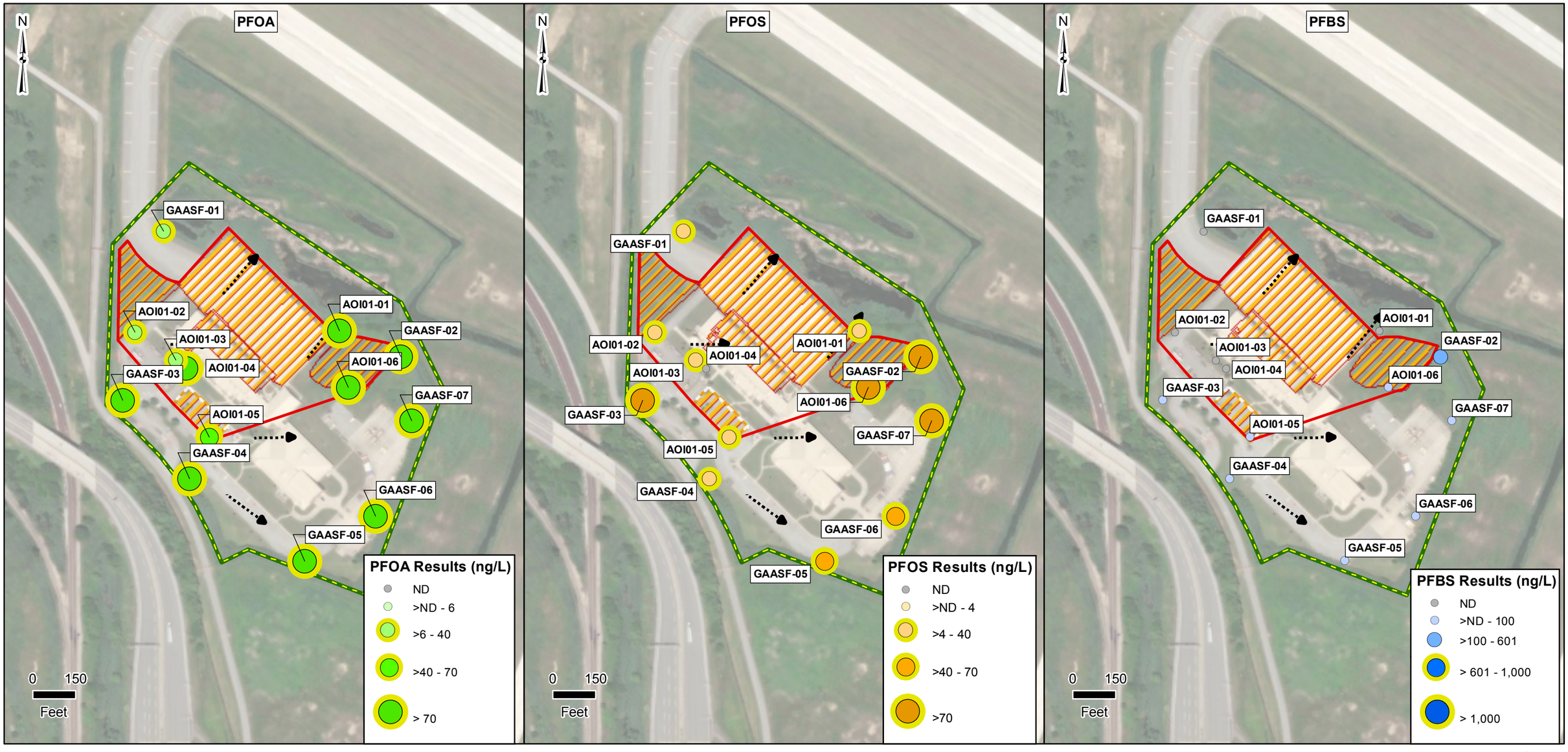
Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 6-5 PFNA Detections in Soil.mxd - dylan.jones - 5/30/2023 - 1:11:34 PM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

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



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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

NOTES:
PFOS = perfluorooctanesulfonic acid
PFOA = perfluorooctanoic acid
PFBS = perfluorobutanesulfonic acid
ND = Non-Detect
ng/L = nanograms per liter
Exceedances of the OSD SL are depicted with a yellow halo

Data Sources:
ESRI 2020
AECOM 2020

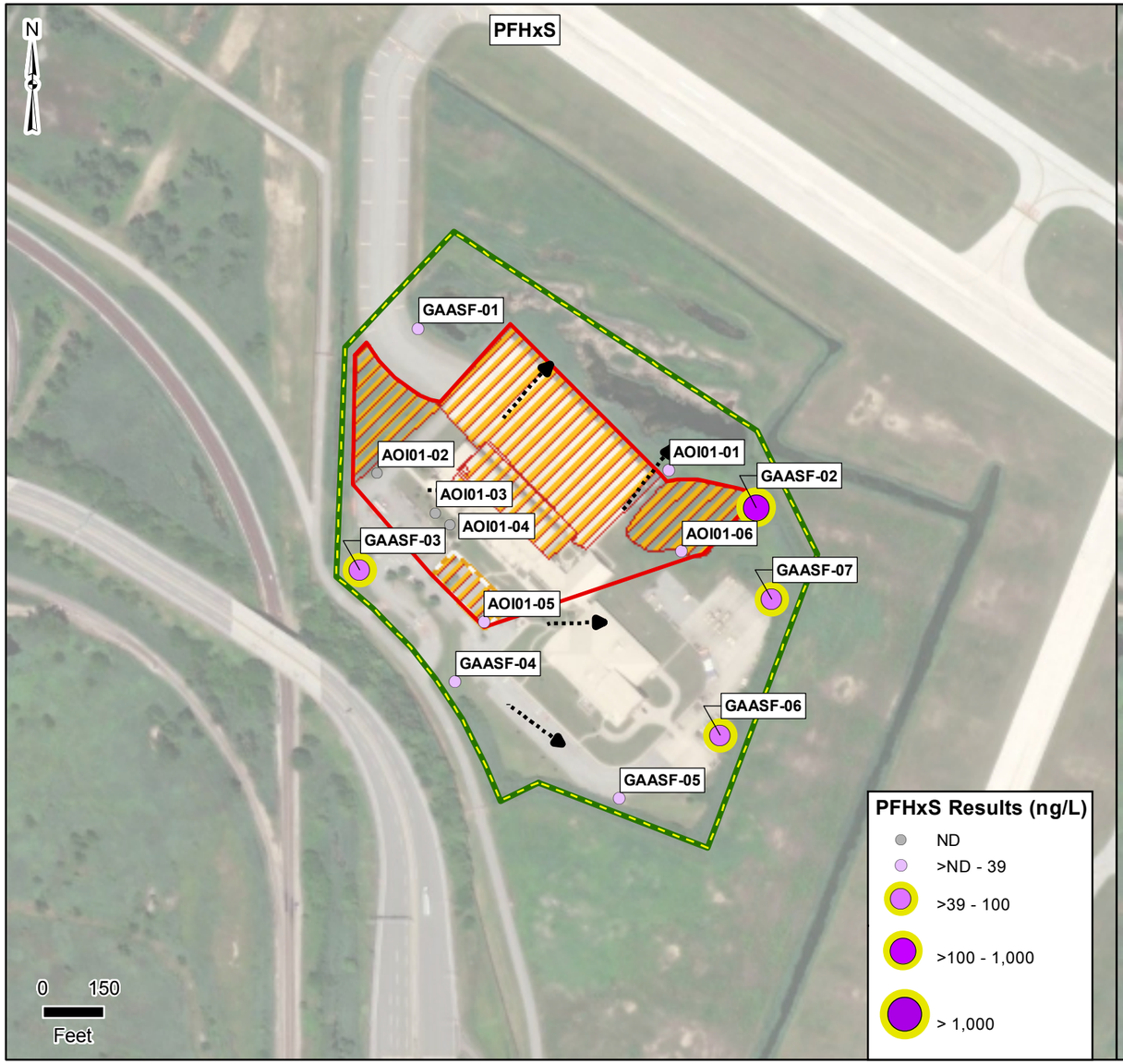
Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

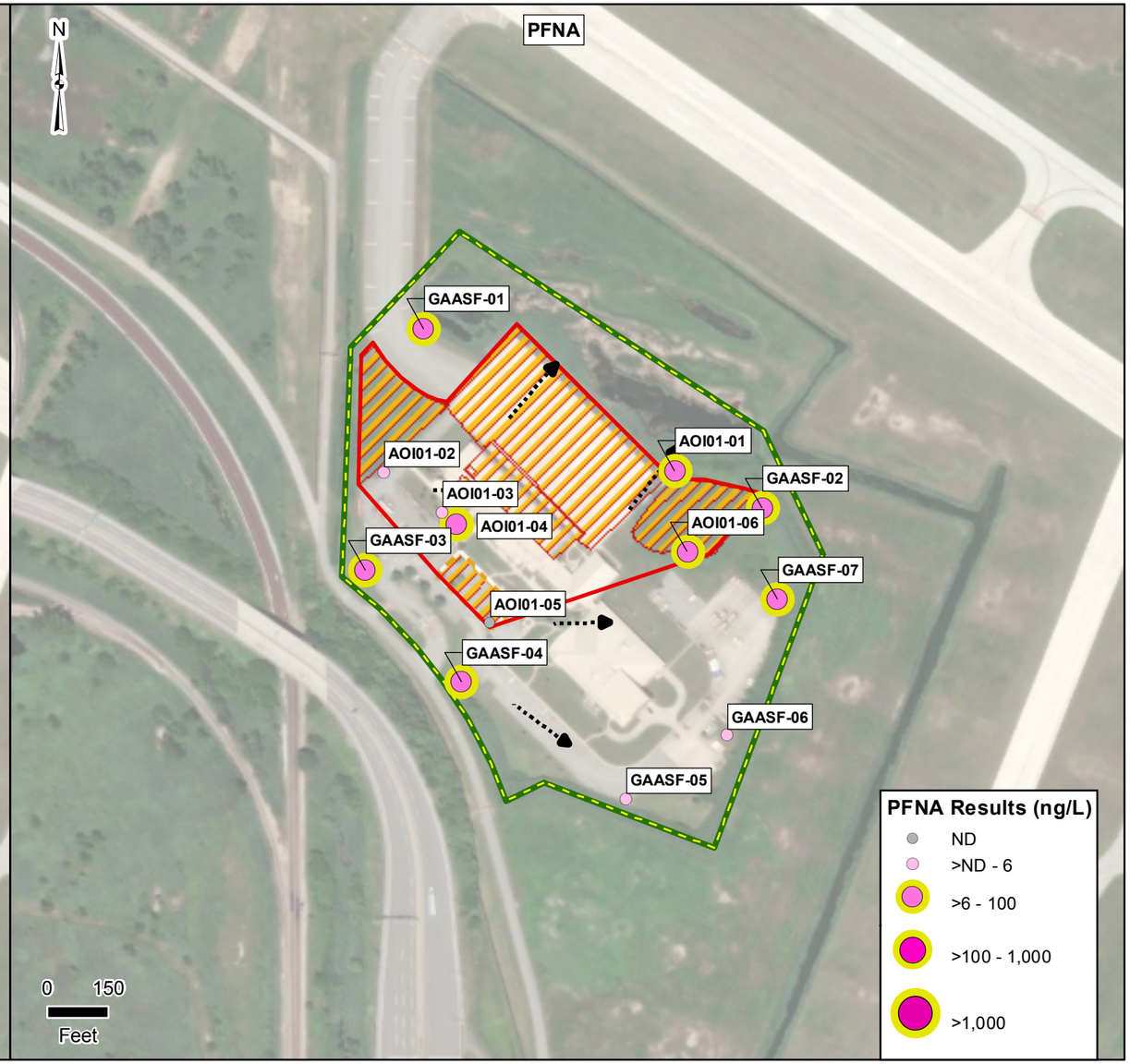
G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 6-6 Detections in GW.mxd - dylan.jones - 5/31/2023 - 10:02:35 AM

This page intentionally left blank

Army National Guard Site Inspections
Site Inspection Report
Gary AASF, Indiana

Figure 6-7
PFHxS and PFNA Detections in Groundwater





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

Hydrology
- Shallow Groundwater Flow Direction (February, 2022)

NOTES:
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
ND = Non-Detect
ng/L = nanograms per liter
Exceedances of the OSD SL are depicted with a yellow halo

Data Sources:
ESRI 2020
AECOM 2020

Date:.....March 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 State Plane

G:\ANG\a_MXD\Gary,IN\SiteInspectionReport\Figure 6-7 Detections in GW pt.2.mxd - dylan.jones - 5/31/2023 - 10:00:15 AM

This page intentionally left blank

7. EXPOSURE PATHWAYS

The Conceptual Site Model (CSM) for the AOI, revised based on the SI findings, is presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the Facility 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 no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of the relevant compounds above the SLs. Areas with an identified potentially complete pathway and a complete pathway may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in a RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

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

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1

AOI 1 encompasses the AFFF suppression system and tank, AFFF discharge area, FTA, and TriMax60™/AFFF storage area. PFNA, PFOS, PFOA and PFHxS were detected in soil at

AOI 1, and PFOS was detected above the SL in surface and subsurface soil. Site workers, construction workers, and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, construction workers and trespassers is potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion and inhalation of dust; therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 1 is presented in **Figure 7-1**.

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1

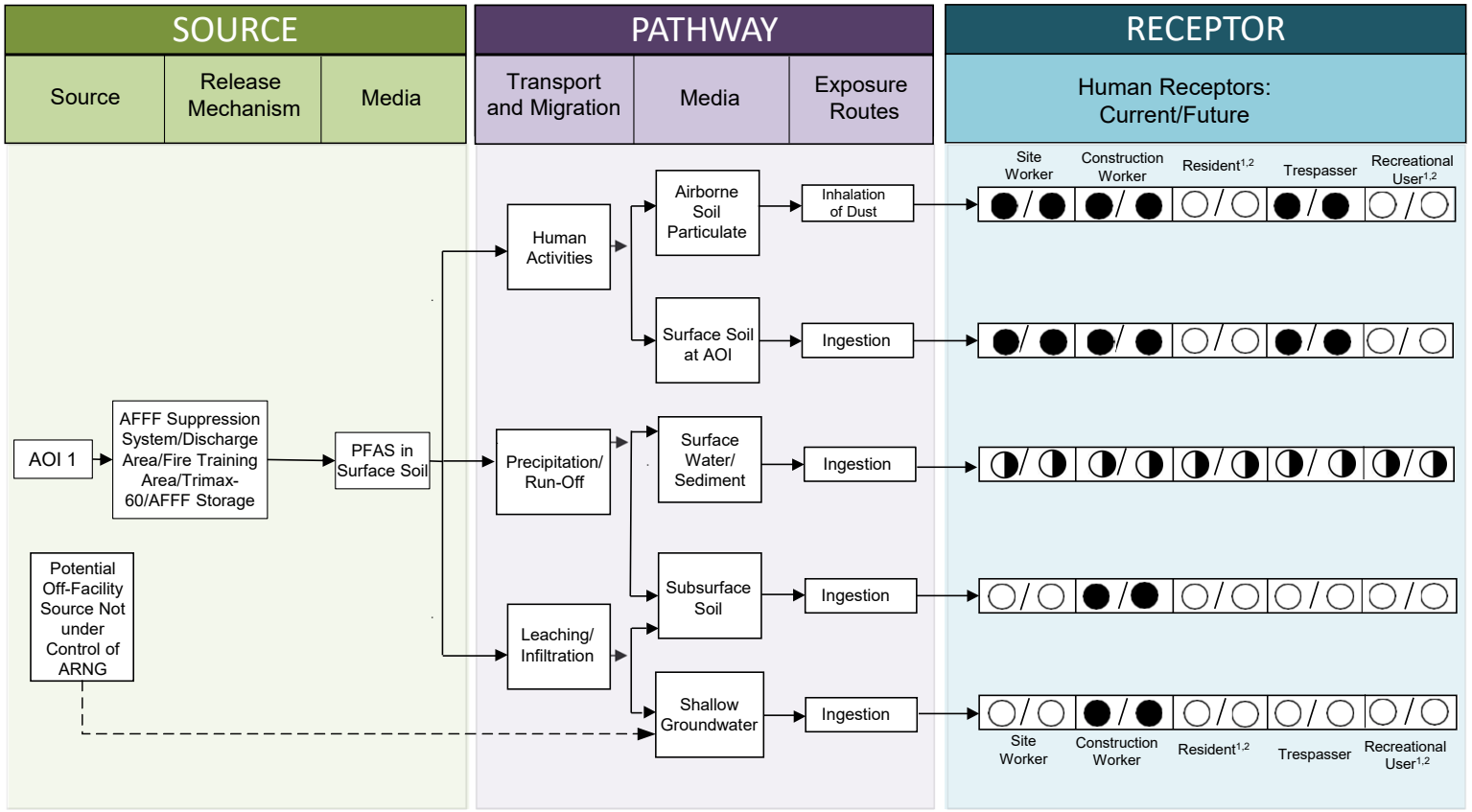
PFNA, PFOS, PFOA, and PFHxS were detected above their respective SLs in groundwater samples collected at AOI 1. Drinking water for the Facility is supplied by the City of Gary; therefore, the pathway for ingestion of shallow groundwater by a site worker or trespasser is incomplete. Public and private wells are located within a 1-mile radius of the Facility; however, there are none located downgradient of the AASF. The residential exposure pathway is incomplete. Depths to water measured at AOI 1 in February 2022 ranged from 3 ft to 5 ft bgs. Therefore, the ingestion exposure pathway for future construction workers is considered potentially complete. The CSM is presented in **Figure 7-1**. ,

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

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because PFOA, PFOS, PFHxS, and PFNA were detected in soil and groundwater at AOI 1, and PFBS was detected in groundwater at AOI 1, it is possible that these compounds may have migrated from soil or groundwater to the wetlands in the north of the Facility via groundwater discharge or the stormwater detention system outfall. Because this wetland area extends off-Facility there is potential for exposure to off-Facility residents. Therefore, the surface water and sediment ingestion exposure pathway for site workers, construction workers, trespassers, and off-Facility resident is considered potentially complete.



LEGEND

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

Notes:

1. The resident and recreational user refers to off-site receptors.
2. Inhalation of dust for off-site receptors is highly unlikely.

Figure 7-1
Conceptual Site Model, AOI 1
Gary AASF, Indiana

This page intentionally left blank

8. SUMMARY AND OUTCOME

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

8.1 SI ACTIVITIES

The SI field activities at the Facility were conducted from 21 to 24 February 2022. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2021), except as previously noted in **Section 5.8**.

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

- Thirty-four (34) soil samples from 13 boring locations;
- Thirteen (13) grab groundwater samples from 13 temporary well locations;
- Twelve (12) quality assurance (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 each AOI to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSM was refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOI, which is described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA is warranted in an RI for AOI 1 (see **Table 8-1**). Based on the CSM developed and revised based on the SI findings, there is potential for exposure to receptors on and off the Facility from AOI 1 from sources on the Facility resulting from historical DoD activities.

Sample analytical concentrations collected during the SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data at AOI 1 relative to SLs is as follows:

- PFBS, PFHxS, PFNA, PFOS, and PFOA were detected in groundwater in the source areas at AOI 1. PFHxS exceeded the SL in groundwater at four of the 13 temporary wells with a maximum concentration of 360 ng/L. PFNA exceeded the SL in groundwater eight of the 13 temporary wells with a maximum concentration of 56 ng/L. PFOS exceeded the SL in groundwater in 12 of the 13 temporary wells with a maximum concentration of 3,700 ng/L. PFOA exceeded the SL in groundwater in all 13 temporary wells with a

maximum concentration of 2,300 ng/L. PFBS did not exceed the SLs. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.

- PFOS exceeded the SL in surface soil at five locations with a maximum concentration of 280 µg/kg. and subsurface soil. PFOS exceeded the SL in subsurface soil at two locations with a maximum concentration of 290 µg/kg. PFHxS, PFNA, PFOS, and PFOA were detected in surface and subsurface soil.

The highest concentrations of PFOS in soil and groundwater were observed at the locations that were thought to be downgradient of AOI 1(GAASF-02, GAASF-06, and GAASF-07), indicating that the source area needs to be delineated during the RI phase.

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	Soil Facility Boundary	Groundwater Downgradient Boundary	Future Action
1	AFFF Suppression System/Discharge Area/Fire Training Area/Trimax-60/AFFF Storage	●	●	●	●	Proceed to RI

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

9. REFERENCES

AECOM. 2020. *Final Preliminary Assessment Report, Gary, Indiana.* August.

Assistant Secretary of Defense. 2022. Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. United States Department of Defense. 6 July.

Department of the Army (DA). 2016a. *Department of Army Guidance to Address Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) Contamination*. Memorandum DAIM-IS. August.

DA. 2016b. Environmental Quality: Technical Project Planning Process. Publication EM-200-1-2. 29 February.

DA. 2018. *Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances*. Memorandum DAIM-ISE. September.

Department of Defense (DoD). 2019. *General Data Validation Guidelines.* Environmental Data Quality Workgroup. 4 November.

DoD. 2020. *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15.* May.

Department of Defense and Department of Energy (DoD/DOE). 2019. *Department of Defense (DoD) Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories. Version 5.3*. May.

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

EA. 2020b. *Final Programmatic Accident Prevention Plan, Revision 1*, ARNG Installations, Nationwide. November.

EA. 2021a. *Final Accident Prevention Plan / Site Safety and Health Plan Addendum, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide*, *Gary Army Aviation Support Facility, Indiana*. April.

EA. 2021b. *SOP No. 042A for Treating Liquid Investigation – Derived Material (purge water, drilling water and decontamination fluids)*. September.

EA Engineering, Science, and Technology, PBC and Wood Environment & Infrastructure Solutions, Inc. (EA/Wood). 2021a. *Final Site Inspection Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) Addendum, Gary Army Aviation Support Facility,*

Indiana, Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide. December.

EA/Wood. 2021b. *Accident Prevention Plan/Site Safety and Health Plan Addendum, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide, Gary Army Aviation Support Facility, Indiana, Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide*. Revision 0, April.

Guelfo, J.L. and C.P. Higgins. 2013. "Subsurface transport potential of perfluoroalkyl acids and aqueous film-forming foam (AFFF)-impacted sites." *Environmental Science and Technology* 47(9):4164-71.

Higgins, C.P., and R.G. Luthy. 2006. "Sorption of perfluorinated surfactants on sediments." *Environmental Science and Technology* 40 (23): 7251-7256.

Interstate Technology Regulatory Council (ITRC). 2018. *Environmental Fate and Transport for Per- and Polyfluoroalkyl Substances*. March.

U.S. Environmental Protection Agency (EPA). 1980. *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*. 11 December.

EPA. 1994. *National Oil and Hazardous Substances Pollution Contingency Plan (Final Rule).* 40 Code of Federal Regulations Part 300; 59 Federal Register 47384. September.

EPA. 2001. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). December.

EPA. 2005. *Federal Facilities Remedial Site Inspection Summary Guide*. 21 July.

EPA. 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process USEPA/240/B-06/001. February.

EPA. 2017. *National Functional Guidelines for Organic Superfund Data Review*. OLEM 9355.0-136, EPA-540-R-2017-002. Office of Superfund Remediation and Technology Innovation. January.

U.S. Fish and Wildlife Service (USFWS). 2021. *Endangered Species.* Available at: http://ecos.fws.gov/ipac/. Accessed 28 June.

Xiao, F., M. F. Simcik, T.R. Halbach, and J.S Gulliver. 2015. "Perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) in soils and groundwater of a U.S. metropolitan area: Migration and implications for human exposure." *Water Research* 72:64-74. April.