FINAL
Site Inspection Report
Fort Custer Training Center, Augusta, Michigan

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

July 2023

Prepared for:

Army National Guard Bureau
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Arlington, VA 22204

UNCLASSIFIED

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Acronyms and Abbreviations

%	percent
˚C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
ANG	Air National Guard
AOI	Area of Interest
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	direct-push technology
DQI	data quality indicator
DQO	data quality objective
DUA	data usability assessment
EGLE	Michigan Department of Environment, Great Lakes, and Energy
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FCRA	Fort Custer Recreational Area
FCTC	Fort Custer Training Center
FedEx	Federal Express
FTA	fire training area
GPRS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MDMVA	Michigan Department of Military and Veterans Affairs
MIARNG	Michigan Army National Guard
MIL-SPEC	military specification
mph	miles per hour
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
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
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
ROTC	Reserve Officer Training Corps
SI	Site Inspection
SSI	Supplemental Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordinance
VA	United States Department of Veterans Affairs

Executive Summary

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

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at the Fort Custer Training Center (FCTC) in Augusta, Michigan and determined no further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1 and AOI 2. FCTC will also be referred to as the "facility" throughout this document.

FCTC occupies approximately 7,570 acres and is located in Augusta, Michigan; it covers portions of Calhoun and Kalamazoo counties. FCTC is home to the Fort Custer Training Site Command, one of six Senior Commands within the Michigan ARNG. FCTC supports various Department of Defense (DoD) organizations, including the ARNG/Air National Guard, Active and Reserve forces, Reserve Officer Training Corps (ROTC), Junior ROTC, Civil Air Patrol, Naval Sea Cadets, and Young Marines. FCTC also supports foreign military services from Canada and Latvia. Currently, 7,396 acres of FCTC are designated as operational range. Land formerly within the borders of FCTC to the north, east, and west of the facility's current borders has been designated as a Formerly Used Defense Site (URS Group, Inc., 2013). The USACE, Louisville District has formally leased the property for use as FCTC since 1989; the lease states that FCTC may use the land indefinitely (AECOM Technical Services, Inc. [AECOM], 2020c).

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the two AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, AOI 1 is not attributed to a DoD release, and no further evaluation under CERCLA by ARNG G-9 is warranted at this time. No further evaluation under CERCLA is warranted in a Remedial Investigation (RI) for AOI 2.

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

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

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

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

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Semi-Truck Crash Storage Area and FCTC Wetland	◐	●	◐	No further action
2	Geo-Grid Fire	◐	◐	N/A	No further action

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

1. Introduction

1.1 Project Authorization

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

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

1.2 SI Purpose

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

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

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2. Facility Background

2.1 Facility Location and Description

FCTC occupies approximately 7,570 acres and is located in Augusta, Michigan; it covers portions of Calhoun and Kalamazoo counties (**Figure 2-1**). Interstate 94 borders the facility to the south, and the Fort Custer Recreational Area (FCRA) and the Kalamazoo River are located to the northwest. The nearest metropolitan area is Battle Creek, which is less than 2 miles east of FCTC. The facility is 100 miles west of Detroit, Michigan and 150 miles northeast of Chicago, Illinois.

FCTC occupies a portion of the land that was formerly part of Camp Custer, which was established in 1917 as a training and staging facility for World War I troops. In 1940, the post became a permanent military facility and was renamed Fort Custer. The US Army then acquired an additional 6,100 acres of land, bringing total acreage to approximately 14,400. The facility was used for the training and organization of the 5th Infantry Division for World War II and the equipping of the 94th Infantry Division. Fort Custer was also used as a processing center for prisoners of war. In 1947, 625 acres were transferred to the US Department of Veterans Affairs (VA) to develop the VA National Cemetery and the VA Medical Center. By 1953, the facility was no longer used for active US Army training; however, US Army Reserve forces and area college US Army Reserve Officer Training Corps (ROTC) units continued to use the facility. In 1985, Fort Custer was officially renamed FCTC and used for training units from the Michigan ARNG (MIARNG) and other US Army Reserve forces in southern Michigan, northern Ohio, Indiana, and Illinois (Michigan Department of Military and Veterans Affairs [MDMVA], 2012; Argonne National Laboratory, 1993). From 1971 to 1973, 3,033 acres were transferred to the state of Michigan to develop the FCRA. In the early 1970s, nearly 2,600 acres located to the northeast of the facility were acquired by the City of Battle Creek to develop an industrial park. In addition, approximately 112 acres were relinquished to various municipalities and private interests between 1960 and 1985. Currently, the facility occupies 7,570 acres, with approximately 7,396 acres designated as operational range. Land formerly within the borders of FCTC to the north, east, and west of the facility's current borders has been designated as a Formerly Used Defense Site (URS Group, Inc., 2013). The USACE, Louisville District has formally leased the property for use as FCTC since 1989; the lease states that FCTC may use the land indefinitely to support and train various Department of Defense (DoD) organizations, including the ARNG/Air National Guard (ANG), Active and Reserve forces, ROTC, Junior ROTC, Civil Air Patrol, Naval Sea Cadets, and Young Marines, along with foreign military services from Canada and Latvia.

2.2 Facility Environmental Setting

According to the 2012 Integrated Natural Resources Management Plan for FCTC, the facility is located within the Humid Temperate Domain, Hot Continental Division, Eastern Broadleaf Forest, Great Lakes moderated climate, within the Southern Lower Michigan ecological section, and the Kalamazoo Interlobate subsection (MDMVA, 2012). The entirety of FCTC lies within the ecological unit known as the Battle Creek Outwash Plain, which is characterized by outwash deposits, coarse-textured moraines, and ice contact topography. The elevation of the facility is approximately 900 feet above mean sea level. The moraines are low ridges, with the areas between made up of flatter outwash plain sediments. The southern portion of the facility is hilly, while the northern portion of the facility is relatively flat (URS Group, Inc., 2013) (**Figure 2-2**).

2.2.1 Geology

FCTC lies within the Central Lowlands province, along the southwestern portion of the Michigan Basin. The Central Lowlands province is composed of an unconsolidated Pleistocene glacial veneer (i.e. glacial drift) that is underlain by a greater than 12,000-foot sequence of Paleozoic

sedimentary rocks. Ultimately, this sedimentary sequence is underlain by a floor of ancient Precambrian rock. The sedimentary rocks were formed by the deposition of marine sediments from overlying seas and by sediments eroding from surrounding highlands. The depositional regime was interspersed with periods of volcanic and intrusive activity. During the accumulation of sedimentary layers, the underlying rocks subsided, forming a bowl-shaped basin with each successive layer out from the center increasing in age (URS Group, Inc., 2013).

The regional bedrock overlying the Precambrian bedrock is composed of Paleozoic sedimentary rocks consisting of the Mississippian aged Coldwater Shale and Marshall Sandstone formations (**Figure 2-3**). The Marshall Sandstone, which comprises primarily sandstone and forms an important aquifer in the Michigan Basin (URS Group, Inc., 2013), underlies only two townships in the northeastern part of Kalamazoo County, below the glacial sediments. The Marshall Sandstone has been eroded away in the remainder of the county, allowing the Coldwater Shale Formation to subcrop below the glacial sediments instead. The Coldwater Shale formation consists primarily of shale, and because of its thickness and areal extent, it effectively forms an impermeable barrier between overlying glacial deposits and underlying coarser-grained bedrock units, limiting available freshwater to glacial deposits in the county.

Soil borings completed during Mobilization 1 and Mobilization 2 of the SI found poorly graded and well-graded sand as the dominant lithology of the unconsolidated sediments below the FCTC. The borings were completed at depths between 20 and 80 feet below ground surface (bgs). Isolated layers of clay to silty sand were also observed in the boring logs, at thicknesses ranging from a few inches to 3 feet. Many of the logs also reported varying percentages of gravel included in the sand packages. These facility observations are consistent with the understood glacial drift material and glaciofluvial depositional environment. Samples for grain size analyses were collected at two locations, AOI01-01 and AOI02-12, and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of sand (69.54 percent [%] to 82.11%) and gravel (4.24% to 25.49%). These facility observations are consistent with the understood glacial drift material and glaciofluvial depositional environment. Boring logs are presented in **Appendix E**, and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

The glacial and surficial geologic features of FCTC area consist primarily of glacial outwash sand and gravel, post glacial alluvium, and end moraines of coarse textured glacial till (DLZ, 2018). The thickness of the glacial drift is estimated as ranging from 100 to 200 feet, and the uppermost bedrock formations are the Coldwater Shale and the Marshall Sandstone of Mississippian age (Western Michigan University, 1981 and Malcolm Pirnie, 2008).

The surface and subsurface hydrology are interconnected, and the groundwater flow conforms roughly to surface water flow patterns; therefore, regional groundwater flow as shown on **Figure 2-3** is mainly to the north-northwest, toward the Kalamazoo River – the regional sink, which flows west toward the City of Kalamazoo and then north and northwest, towards Lake Michigan. Along the southern boundary of the FCTC, surficial water flow is generally to the south, into the FCTC Wetland, where groundwater flow is still generally to the north-northwest. The Portage River Watershed acts as the master recharge area that discharges, in part, to the FCTC to the north, suppling the groundwater that feeds into various wetlands, fens, and lakes (Li, 2015).

Groundwater recharge is generally rapid due to the high permeability of the sandy soils. Precipitation moves readily down through the glacial drift aquifer and into the principle regional aquifer, the Marshall Sandstone Formation. The depth to this formation is highly variable, ranging in several hundred feet even across short horizontal distances (MDMVA, 2012).

Available monitoring well logs indicate the aquifer consists primarily of sand and gravel, with depth to groundwater ranging from 8 to 56 feet bgs (DLZ, 2019). However, some discontinuous clay layers are present in the subsurface. The stratigraphic cross-section from the 2018 Annual Groundwater Monitoring Report indicates that in the northern portion of FCTC, near Eagle Lake, the uppermost 20 to 25 feet of subsurface soil consists of sand and gravel that are underlain by a sandy clay or silt layer that is approximately 10 feet thick. Groundwater elevations from a cluster of monitoring wells located in the northern area of FCTC show that the clay layer may be associated with a perched water table to the east. The depth to groundwater in eastern monitoring wells is approximately 30 to 40 feet higher than groundwater elevations in western monitoring wells, closer to Eagle Lake, where the clay layer was not encountered, as shown on **Figure 2-3** (DLZ, 2018).

No potable water wells are located within FCTC, only monitoring wells. Off-facility, domestic, public supply, and irrigation wells exist within 4 miles of the facility. A query of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Wellogic System database showed household supply wells along the southern and western boundaries of FCTC (EGLE Wellogic System, 2019). Public supply wells are also located within FCRA, northwest of the facility. Drinking water for FCTC is supplied by the town of Augusta. The town of Augusta relies solely on groundwater as a water source for its residents (Kalamazoo County Government, 2019).

Depths to water measured in November 2020 and September through October 2021 during the SI ranged from 5.08 to 75.08 feet bgs. Groundwater elevation contours from Mobilization 1 and Mobilization 2 are presented on **Figure 2-4** and **Figure 2-5**; respectively. Based on the SI findings, groundwater flow direction at AOI 1 and AOI 2 is generally to the north-northwest.

2.2.3 Hydrology

Groundwater seeps and springs primarily feed the majority of lakes and streams at FCTC. Groundwater recharge is facilitated by large areas of very permeable Oshtemo complex soils lying over the northern third of the facility. These seeps, as well as local surficial flow, feed several large wetland complexes that contain outflow streams. These outflow streams control the general northwest flow of surficial water in this region, except along the southern boundary of FCTC. Water flows from the interior of the facility northwest into several public use lakes, namely, Eagle, Whitford, and Lawler Lakes, located within FCRA, and eventually into the Kalamazoo River (MDMVA, 2012; Snell Environmental Group, Inc, 2000; Malcolm Pirnie, 2008). Along the southern boundary of the FCTC, surficial water flows into the FCTC Wetland. Surficial water from I-94 drains to the north, into the FCTC culvert, and eventually into the FCTC Wetland (**Figure 2-6**).

The Kalamazoo River lies to north and west of the FCTC. The areas to the south of the facility are characterized by interconnected streams and wetlands that are tributaries within the Portage River watershed in southern Kalamazoo County. The eastern portion of the facility contains wetlands associated with the Kalamazoo River Valley, as well as wetlands associated with an unnamed creek that serves as a tributary to the Kalamazoo River. To facilitate flood control, a network of open ditches, infiltration impoundments, and underground storm sewers have been installed throughout the area, diverting surface runoff from developed areas to the adjacent swamps and lakes (Argonne National Laboratory, 1993 and Malcolm Pirnie, 2008).

FCTC lies almost entirely within a subwatershed of the Kalamazoo River between Battle Creek and Galesburg. The surface water discharging from the facility does so through land controlled by other landowners (Snell Environmental Group, Inc, 2000). The majority of surface water at FCTC drains into the Kalamazoo River through small streams that flow north and northwest. These streams originate in wetlands or small hillside seeps and then flow into nearby lakes before emptying into the Kalamazoo River. Whitman Lake, one of six lakes on the facility, is located on the eastern portion of the facility. An unnamed lake located to the northeast of Whitman Lake, just

along the facility's boundary, was created as an additional wildlife habitat for waterfowl and shorebirds during their migration periods. Harts Lake, owned by the city of Battle Creek, is on the eastern border of the facility. Eagle Lake, Jackson Hole Lake, Lawler Lake, and Whitford Lake are located in FCRA, just west of the facility (**Figure 2-6**. Several seasonal ponds occur in the south-central portion of the facility (MDMVA, 2012; Snell Environmental Group, Inc, 2000; Malcolm Pirnie, 2008; LI, 2015).

2.2.4 Climate

The climate at FCTC is temperate forest with moderate daily temperature fluctuations and an average temperature of 48.1 degrees Fahrenheit (°F). Seasonally, temperatures vary from summer highs of 82 °F to winter lows of 16 °F (World Climate, 2022). Average total precipitation is 35.2 inches of rain and 71.4 inches of snow, seasonally (MDMVA, 2012). Factors affecting the climate include the Great Lakes and prevailing winds. In winter, the relatively warmer lakes increase cloud formation and precipitation and moderate the overall temperatures. The prevailing wind is from a southwesterly direction (URS Group, Inc., 2013). The prevailing wind averages 13.4 miles per hour (mph), with gusts of up to 40 mph (World Climate, 2022).

2.2.5 Current and Future Land Use

FCTC is home to the Fort Custer Training Site Command, one of six Senior Commands within the MIARNG. The facility supports various DoD organizations, including the ARNG/ANG, Active and Reserve forces, ROTC, Junior ROTC, Civil Air Patrol, Naval Sea Cadets, and Young Marines. The facility also supports foreign military services from Canada and Latvia. Future land use is not anticipated to change (MDMVA, 2012 and Malcolm Pirnie, 2008).

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

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

The following clams, plants, insects, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Kalamazoo County, Michigan (US Fish and Wildlife Service [USFWS], 2022.

- **Clams:** Snuffbox mussel**,** *Epioblasma triquetra* (endangered)
- **Flowering plants:** Eastern prairie fringed orchid, *Platanthera leucophaea* (threatened)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate); Mitchell's satyr butterfly, *Neonympha mitchellii mitchellii* (endangered)
- **Mammals**: Northern long-eared bat, *Myotis septentrionalis* (threatened); Indiana bat, *Myotis sodalist* (Endangered)
- **Reptiles:** Copperbelly water snake, *Nerodia erythrogaster neglecta* (threatened); Eastern Massasauga rattlesnake, *Sistrurus catenatus* (threatened)

2.3 History of PFAS Use

Two AOIs were identified in the PA where AFFF may have been used, stored, disposed, or released historically at FCTC (AECOM, 2020c). One potential release was from the storage of a semi-truck that caught fire in 2015 on I-94. It is unknown if AFFF were used during the fire or if any AFFF remained on the truck when it moved to FCTC for storage. The other release area was

from an emergency response as a result of a geo-grid catching fire from a prescribed burn being conducted in the area. Foam was reportedly used by the Battle Creek fire department to suppress the fire; however, the type of firefighting foam used is unknown. It is possible that the foam may have been AFFF. The potential release areas were grouped into two AOIs based on preliminary data and presumed groundwater flow directions. A description of each AOI is presented in **Section 3**.

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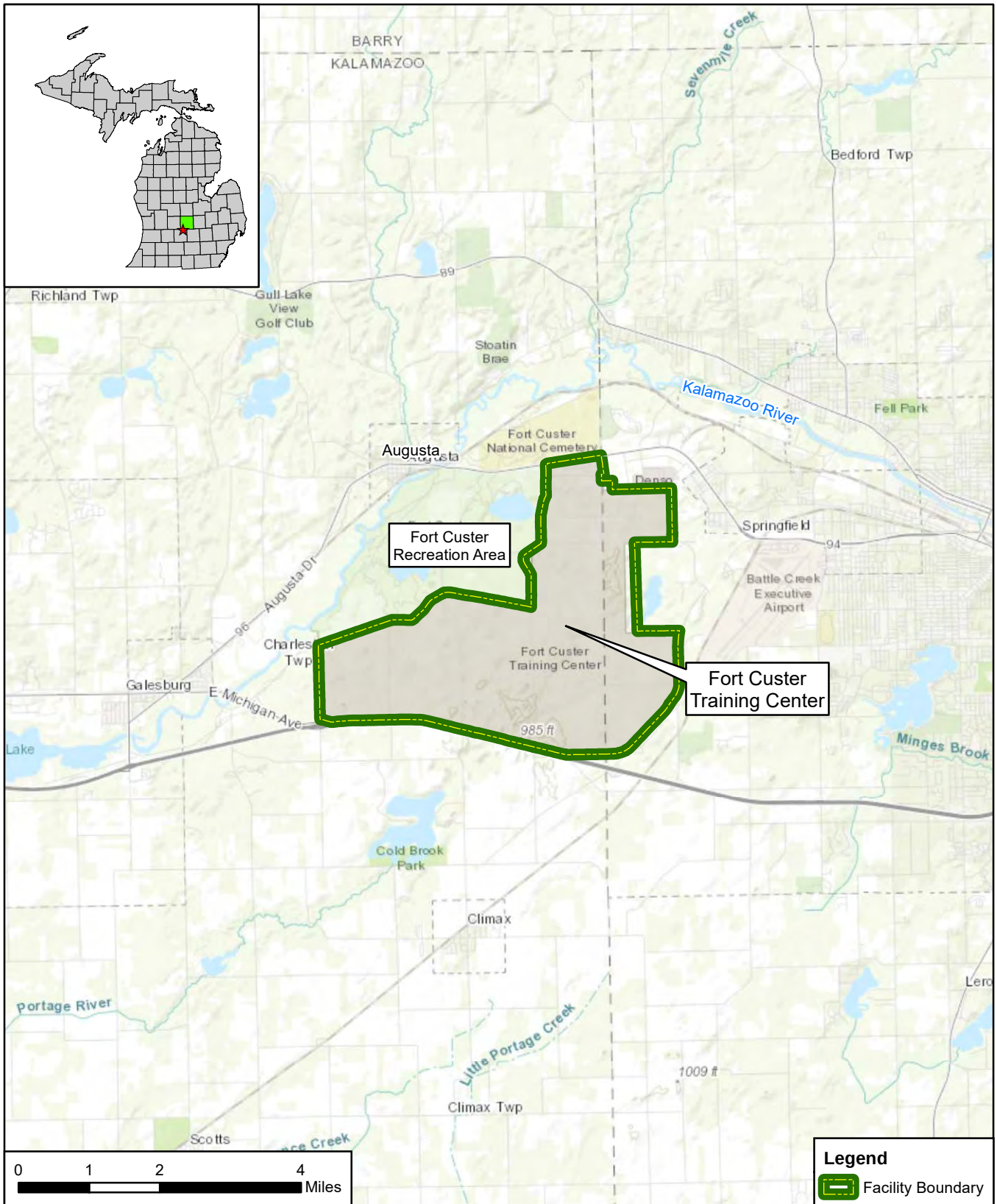

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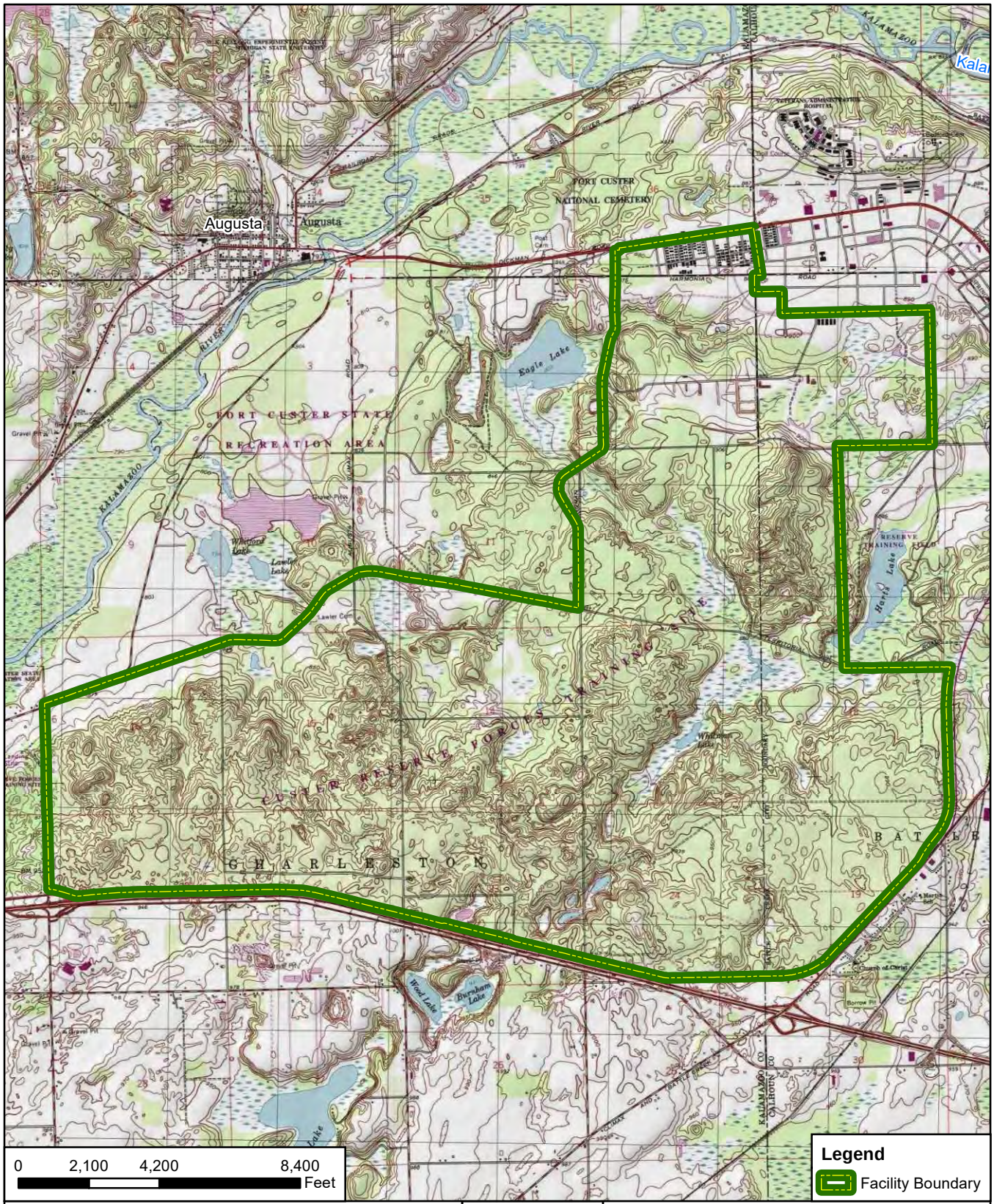
Base Map: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN,		PM	RG	8/18/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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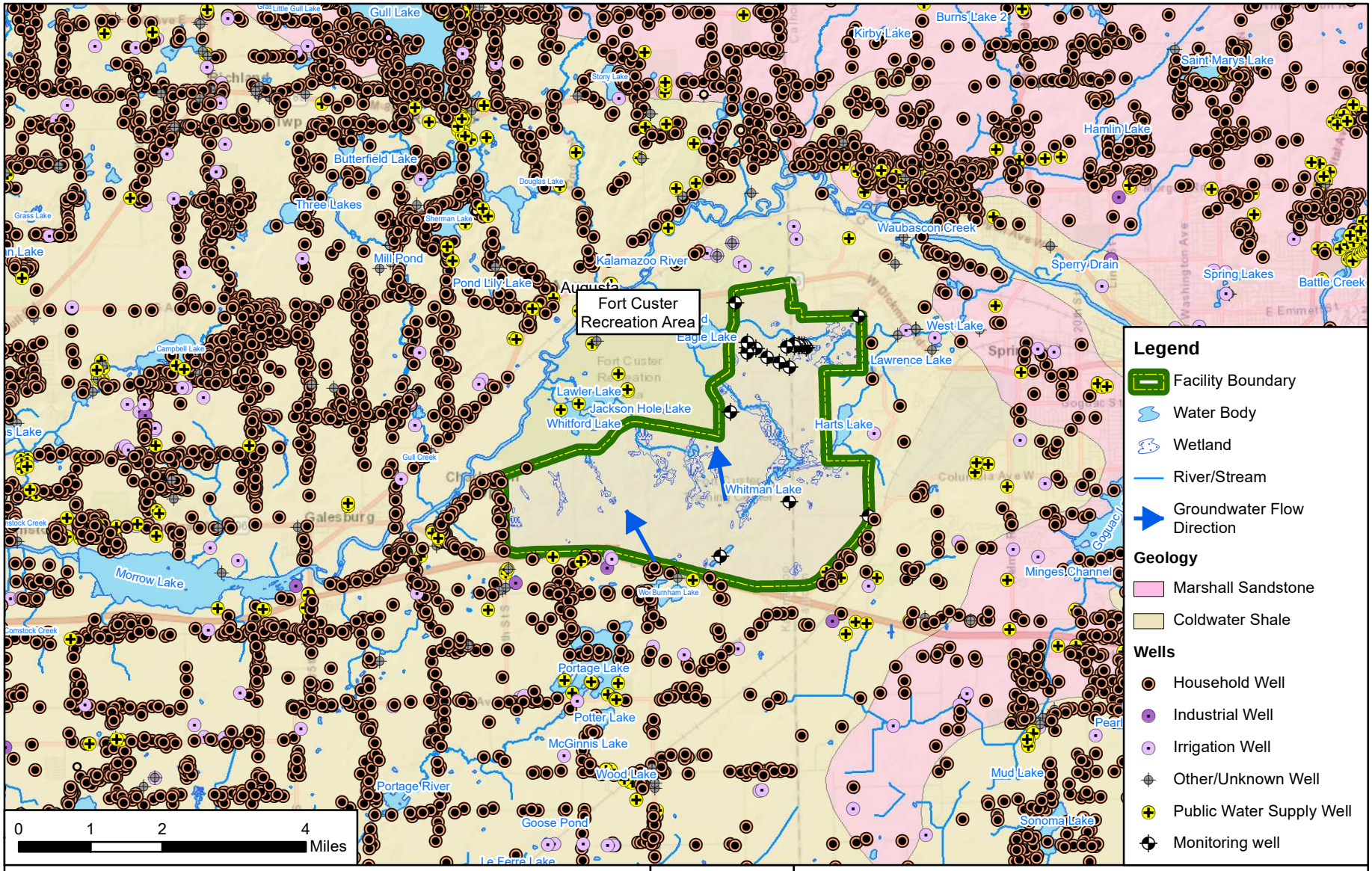
Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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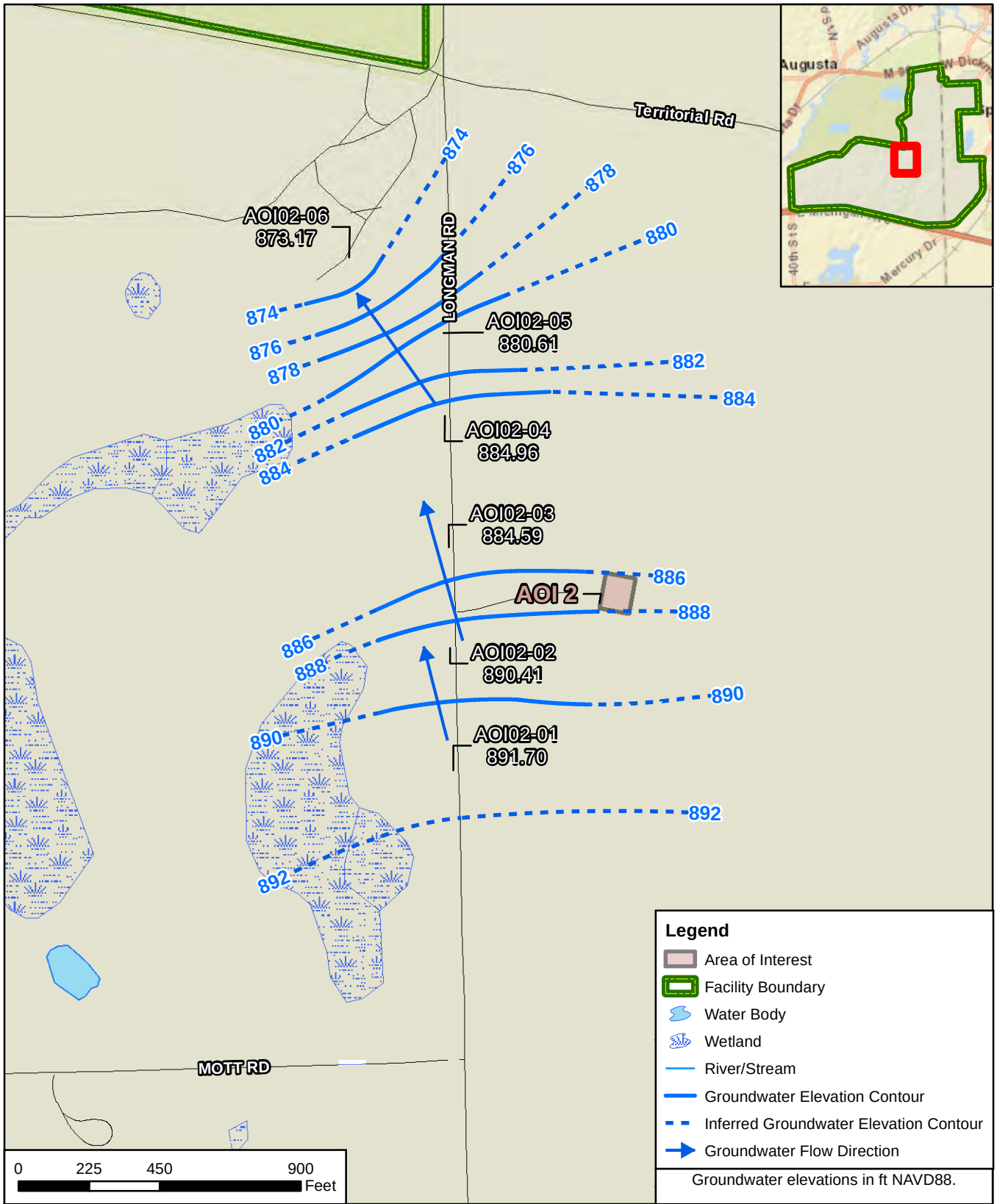
Groundwater Features

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3



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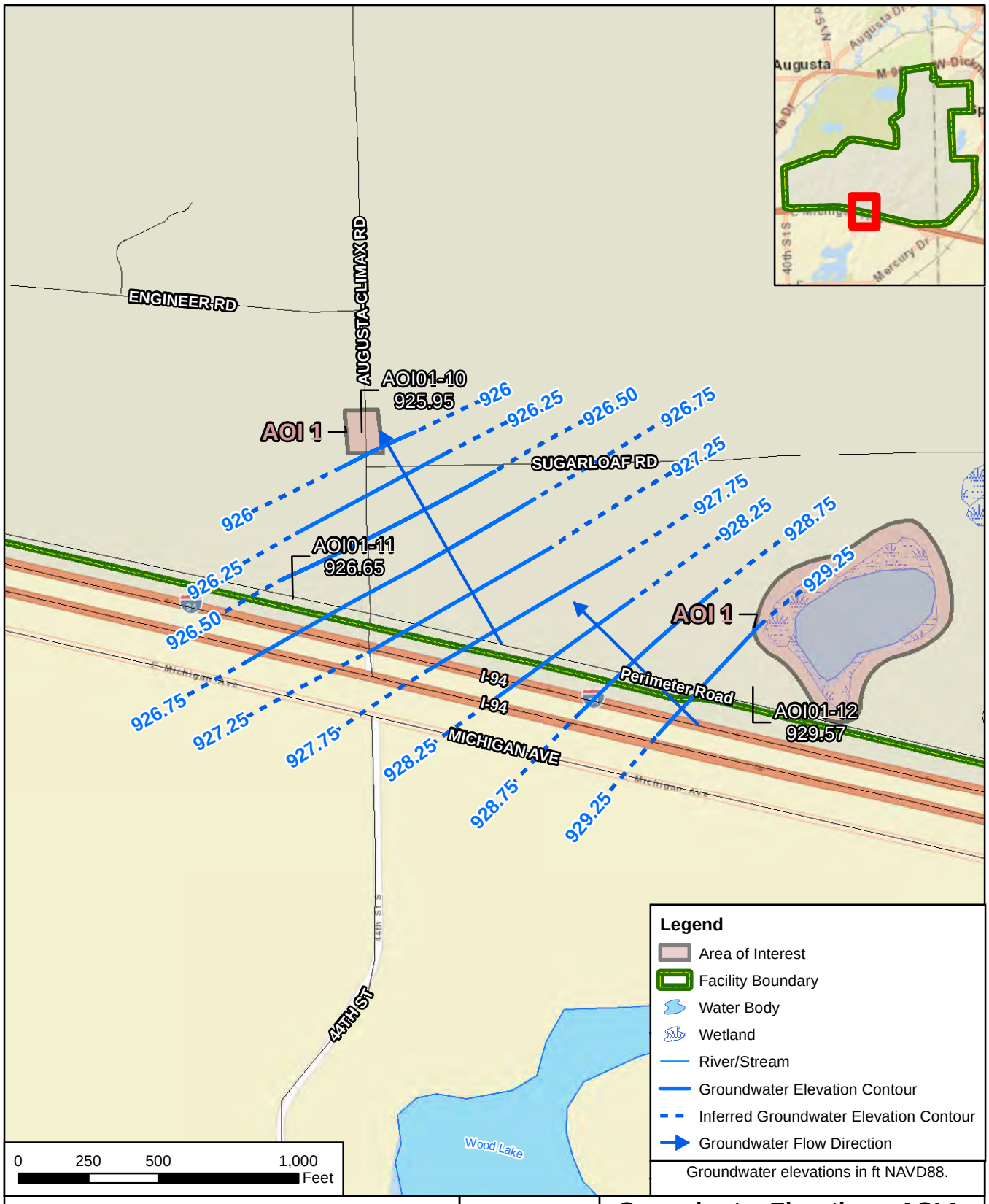
Groundwater Elevations, AOI 2, Mobilization 1, November 2020

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4



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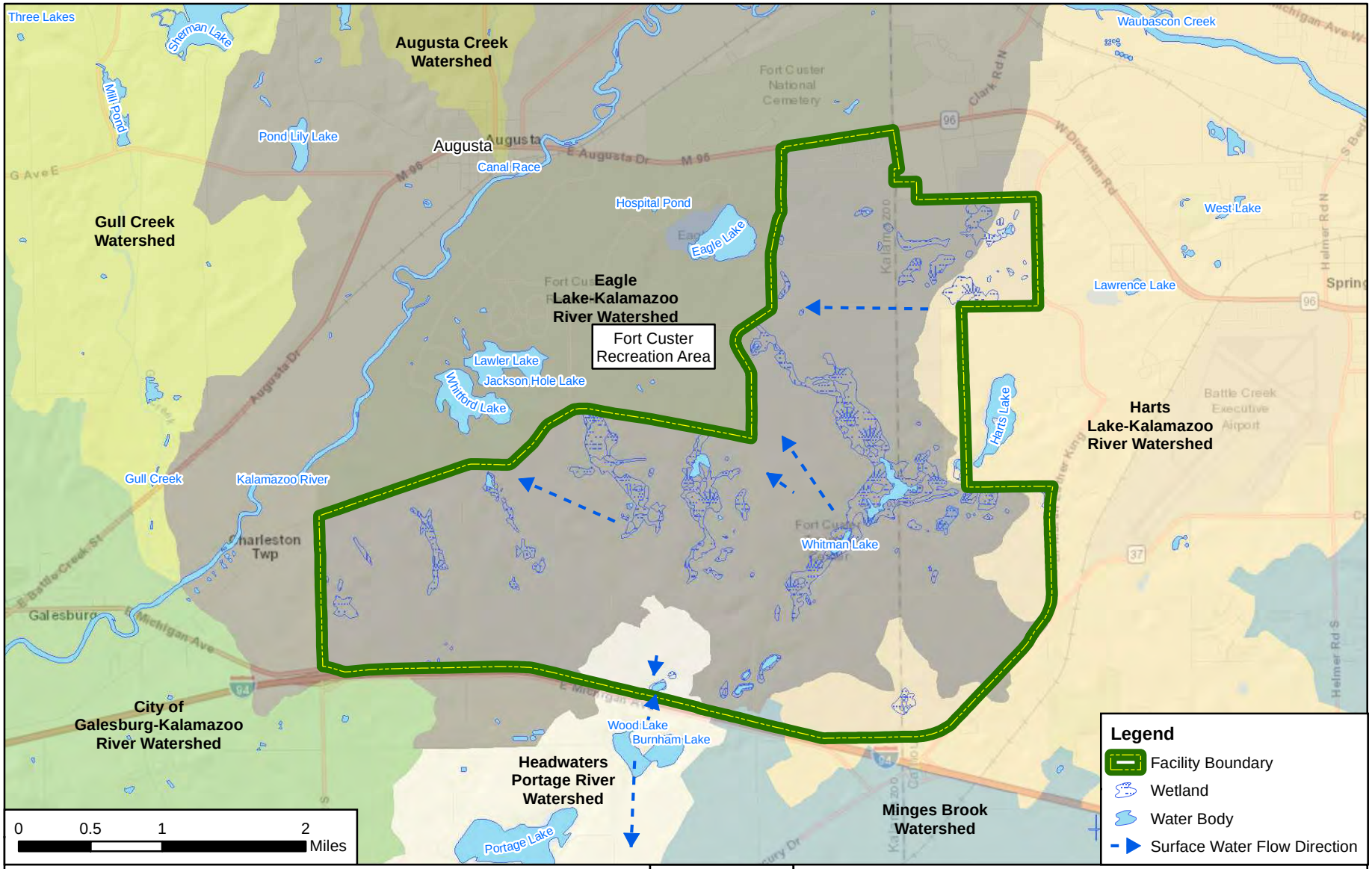
Groundwater Elevations, AOI 1, Mobilization 2, October 2021

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5



CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:63,360	CHK BY	CH	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

N

Surface Water Features

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 2-6

3. Summary of Areas of Interest

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

3.1 AOI 1

AOI 1 consists of two potential release areas. The potential release areas are described below.

3.1.1 Semi-Truck Storage Area and FCTC Wetland Area

In January 2015, a semi-truck carrying fireworks was involved in an accident on I-94, immediately adjacent to the outside of the southern border of FCTC. The crash occurred at or near mile marker 90, directly south of FCTC, near Augusta-Climax Road. The fireworks within the truck reportedly exploded as a result of the crash and caught the truck on fire. Multiple sources noted that emergency response was dispatched from multiple cities. According to interviewees, foam was used to control and extinguish the fire at the location of the accident on I-94. Due to the intense response from multiple municipalities, it is not known what type of foam was used or by whom. Because of the fuel sources and the intensity of the fire, AFFF may have been used. After the fire was extinguished, the semi-truck was towed onto FCTC property through the gate located at the south end of Augusta-Climax Road and stored at a location on the western side of Augusta-Climax Road, approximately halfway between Perimeter Road and Engineer Road. According to interviewees, the burnt truck remained at this location for several weeks. It is unknown whether any firefighting activities continued once the semi-truck was relocated onto FCTC property; however, residual foam may have remained on the truck, after it was transported, and subsequently released to the ground surface at the storage location.

A culvert that reportedly collects runoff from the median of I-94 is present near the initial accident location. This culvert appears to be hydraulically connected to a wetland area located at FCTC, directly north of the culvert and Perimeter Road. Foam used to extinguish the fire may have drained from the initial accident location (off-facility) to the wetland located within the FCTC boundary via the culvert; this FCTC wetland may be a secondary source of PFAS.

3.2 AOI 2

AOI 2 consists of one potential release area. The potential release area is described below.

3.2.1 Geo-Grid Fire

AOI 2 is where a geo-grid caught on fire as a result of a prescribed burn being conducted in the area in 2005. A geo-grid, which is a plastic material used to stabilize the ground surface for construction activities, was stored in an open area located off Longman Road, within the central portion of FCTC and within the FCTC South Impact Area, where unexploded ordinance (UXO) may be present below the ground surface. The Battle Creek fire department was called to the scene to respond to the fire, and foam was reportedly used by the fire department to suppress the fire; however, the type of firefighting foam used is unknown. It is possible that the foam may have been AFFF. Several unsuccessful attempts were made during the PA to determine the type of foam used during the incident. Foam used on the fire would have flowed off the geo-grid and onto soil within the storage area.

3.3 Adjacent Sources

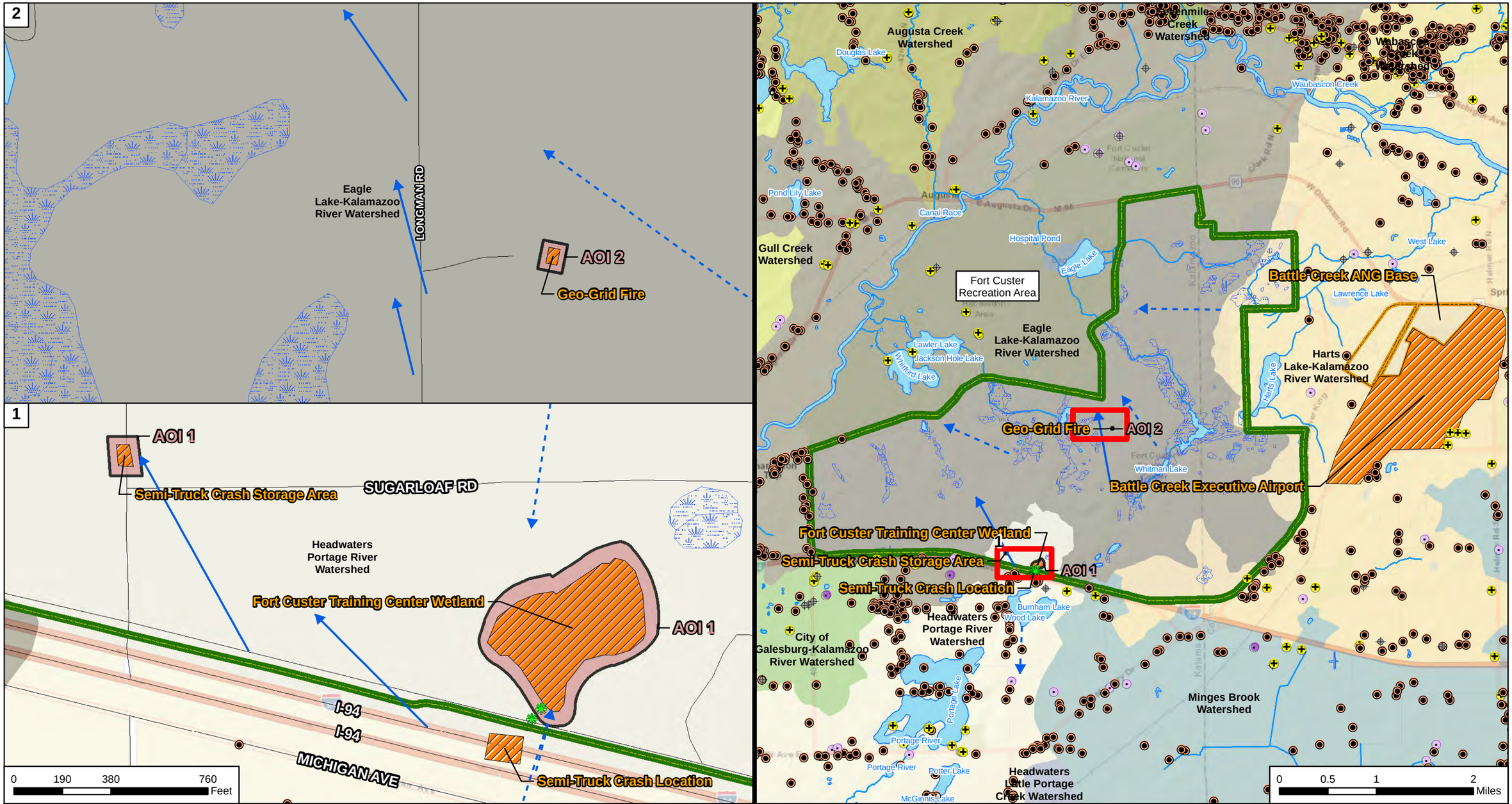
Two potential, off-facility sources, located adjacent to FCTC, not under the control of ARNG, were identified during the PA. A description of each adjacent source is presented below for informational purposes only and will not be investigated as part of this SI. The adjacent sources are shown on **Figure 3-1**.

3.3.1 Battle Creek ANG Base

The Battle Creek ANG Base is located approximately 1.5-miles east of the eastern boundary of FCTC, adjacent to the northwestern end of Battle Creek Executive Airport, formerly W.K. Kellogg Regional Airport. A PA for PFAS was conducted by the ANG in 2016. Thirteen areas were identified at the base as potential AFFF release areas and recommended for further investigation via an SI (BB&E, 2016). The SI was completed in October 2018; other than one soil sample, PFAS were detected in all groundwater, soil, surface water, and sediment samples analyzed (AECOM, 2020c). The northeastern corner of FCTC is situated downgradient from the Battle Creek ANG Base; the remaining majority of FCTC property is located side-gradient of the ANG releases **(Figure 3-1)**.

3.3.2 Battle Creek Executive Airport (Formerly W.K. Kellogg Regional Airport)

Battle Creek Executive Airport, formerly W.K. Kellogg Regional Airport, is located immediately to the east of FCTC. Municipal Airport personnel were not interviewed during the PA because the focus of the assessment was to evaluate potential PFAS related activities and sources at MIARNG properties, not formally assess adjacent sources. Therefore, it is not known if AFFF is currently or were historically used or stored at the airport. Because the presence of AFFF at the airport cannot be confirmed, Battle Creek Executive Airport has been identified as a potential off-facility source area. **Figure 3-1** shows the location of Battle Creek Executive Airport (as a potential source area) in relation to FCTC.



CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	6/13/2023	GIS BY	MS	6/13/2023
SCALE	1:4,560	CHK BY	CH	6/13/2023
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	6/13/2023

- Area of Interest
- Potential Release
- Facility Boundary
- ANG Facility Boundary
- Water Body
- Wetland
- River/Stream
- Surface Water Flow Direction
- Groundwater Flow Direction
- Culvert
- Household Well
- Industrial Well
- Irrigation Well
- Other/Unknown Well
- Public Water Supply Well

N

Area of Interest

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

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

4.1 Problem Statement

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

4.2 Information Inputs

Primary information inputs included:

- The PA for FCTC (AECOM, 2020c);
- Analytical data from groundwater, sediment, and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2020a) and Supplemental SI (SSI) QAPP Addendum (AECOM, 2021a);
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling; and
- Analytical data collected as part of the SI environmental sampling efforts at Battle Creek ANG Base (AECOM, 2020c).

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s).

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 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 SI QAPP Addendum for both Mobilization 1 and 2 (AECOM, 2020a; AECOM, 2021a).

5. Site Inspection Activities

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

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Fort Custer Training Center, Augusta, Michigan* dated December 2020 (AECOM, 2020a);
- *Final Site Safety and Health Plan, Fort Custer Training Center, Augusta, Michigan* dated October 2020 (AECOM, 2020b);
- *Final Preliminary Assessment Report, Fort Custer Training Center, Augusta, Michigan* dated February 2020 (AECOM, 2020c);
- *Final Site Inspection Uniform Federal Policy-Supplemental Quality Assurance Project Plan Addendum, Fort Custer Training Center, Augusta, Michigan* dated September 2021 (AECOM, 2021a); and
- *Final Site Safety and Health Plan Mobilization 2, Fort Custer Training Center, Augusta, Michigan* dated September 2021(AECOM, 2021b).

The SI field activities were conducted in two different mobilizations. Mobilization 1 was from 18 to 25 November 2020 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, sediment sample collection, and land surveying. Mobilization 2 was from 28 September to 6 October 2021 and consisted of utility clearance, rotary sonic borings, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2020a) and SSI QAPP Addendum (AECOM, 2021a), except as noted in **Section 5.9**.

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

- Nineteen (19) soil samples from 11 boring locations;
- Ten (10) grab groundwater samples from 10 temporary well locations;
- Four sediment samples from four locations; and
- Twenty-two (22) quality assurance (QA) and quality control (QC) samples.

Figure 5-1 and **Figure 5-2** provide the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, land survey data are provided in **Appendix B3**, and investigation-derived waste (IDW) polygons are provided in **Appendix B4**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 19 August 2020, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, MIARNG, USACE, MDMVA, and representatives familiar with the facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2020a).

A TPP Meeting 3 was held on 15 May 2023 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 and UXO Clearance

AECOM's drilling subcontractor, Cascade Technical Services, LLC. placed a ticket with the USA north 811 "MISS DIG 811" Michigan utility clearance provider to notify them of intrusive work on 5 November 2020 and again on 17 September 2021. A joint site walk was performed between the MISS DIG 811 utility locator and AECOM personnel on 12 November 2020 and 23 September 2021 in order to mark out existing utilities at AOI 1 and AOI 2. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance for both mobilizations. GPRS performed utility clearance of the proposed boring locations on 12 November 2020 and 23 September 2021 with input from the AECOM field team and FCTC facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Due to the location of AOI 2 within the FCTC South Impact Area and the potential for UXO to be present at or near AOI 2, all ingress, egress, and sampling at AOI 2 surface soil sampling locations within the South Impact Area east of Longman Road were conducted in coordination with UXO personnel.

5.1.3 Source Water and Sampling Equipment Acceptability

One potable water source at FCTC was sampled on 5 April 2021 to assess usability for decontamination of drilling equipment. Results of the sample collected from the overhead spigot (FCTC-PW-01) confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. Specifically, the samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the overhead spigot source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM, 2021a). Prior to the start of field work each day, a Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Borings were installed in grass areas where applicable, to avoid disturbing concrete or asphalt surfaces. Soil samples were collected via direct-push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2020a) during Mobilization 1. A GeoProbe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. Soil samples were collected via rotary sonic, in accordance with the SSI QAPP Addendum (AECOM, 2021a) during Mobilization 2. A Boart Longyear® LS250 continuous core 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 feet of the boring, in accordance with AECOM utility clearance procedures. The Mobilization 1 and Mobilization 2 soil boring locations for AOI 1 and AOI 2 are shown on **Figure 5-1** and **Figure 5-2**, respectively. Soil sample collection depths are provided in **Table 5-1**.

In general, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table. In borings where groundwater was encountered at 6 feet bgs or shallower, only two soil samples were collected per boring, in accordance with the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM 2021a). Furthermore, in borings where groundwater was not encountered, a soil sample was collected at the termination depth, in accordance with the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM 2021a). Soil samples were not collected at AOI 2 during Mobilization 1 and AOI 1 during Mobilization 2.

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

Soil borings completed during the SI found poorly graded and well-graded sand as the dominant lithology of the unconsolidated sediments below the FCTC. The borings were completed at depths between 20 and 80 feet bgs. Isolated layers of clay to silty sand were also observed in the boring logs at thicknesses ranging from a few inches to 3 feet. Many of the logs also reported varying percentages of gravel included in the sand packages. These facility observations are consistent with the understood glacial drift material and glaciofluvial depositional environment.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the SI and SI QAPP Addendum (AECOM, 2020a; AECOM, 2021a).

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

DPT and rotary sonic borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM, 2021a) using bentonite chips at completion of sampling activities. Borings were installed in grass and gravel 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 and Boart Longyear® LS250 continuous core sampling system. Once the borehole was advanced to the desired depth, wherever conditions allowed, a temporary well was constructed of a 5-foot section of either 1-inch or 2-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe and screen were used to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. After the recharge period, groundwater samples were collected using a peristaltic pump and bladder pump with PFAS-free HDPE tubing. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2020a; AECOM, 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. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 °C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM, 2021a) by removing the PVC and backfilling the hole with 3/8-inch hydrated bentonite chips. Upon completion of well abandonment, the ground surface at each location was patched to match existing surrounding conditions.

5.4 Sediment Sampling

Sediment samples were collected in accordance with the SI QAPP Addendum (AECOM, 2020a). The culvert was dry during sampling and as a result, no surface water samples were collected.

Sediment samples were collected from AOI 1, along the Perimeter Road culvert that discharges into the FCTC Wetland and along the southern portion of the FCTC Wetland itself.

A sediment coring device (hand auger) was used to collect the sediment sample from the first 1 foot of sediment. The sediment was transferred to a Zip-loc™ bag, where the sample was homogenized, and stones in excess of 1 centimeter were removed. After collection of the sediment samples from each location, field observations, such as predominant lithology, moisture content, color, and entrained debris, were recorded on the field sampling form (**Appendix B2**). The sediment sample locations are shown on **Figure 5-1**, and sample depths are provided in **Table 5-1**.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory for analysis by LC/MS/MS compliant with QSM 5.1 Table B-15. Sediment samples were also analyzed for TOC (USEPA Method 9060A) and pH (USEPA Method 9045D), in accordance with the SI QAPP Addendum (AECOM, 2020a).

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. In instances when non-dedicated sampling equipment was used, equipment rinsate blank samples were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 °C during shipment.

5.5 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 25 November 2020, 29 September 2021, and 5 October 2021. Groundwater elevation measurements were collected from the 10 new temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4** and **Figure 2-5**. Groundwater elevation data are provided in **Table 5-2**.

5.6 Surveying

The northern side of each well casing was surveyed by Michigan-licensed land surveyors following guidelines provided in the SOPs provided in the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM, 2021a). Survey data from the newly installed wells on the facility were collected on 25 November 2020, 29 September 2021, and 5 October 2021 in the applicable Universal Transverse Mercator zone projection with World Geodetic System 84 datum (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B3**.

5.7 Investigation-Derived Waste

As of the date of this report, the disposal of IDW is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI and SSI QAPP Addendum (AECOM, 2020a; AECOM, 2021a) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

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

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

Geographic coordinates were collected using a global positioning system around each location where IDW was placed (i.e., an IDW polygon). The IDW polygons are displayed on the figure in **Appendix B4**. 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.

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.

5.8 Laboratory Analytical Methods

Samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A, pH by USEPA Method 9045D and grain size by ASTM Method D-422.

5.9 Deviations from SI QAPP Addendum

One deviation from the SI QAPP Addendum was identified during review of the field documentation.

- Three borings (AOI01-01, AOI01-02, and AOI01-03) were advanced up to 50 feet bgs, 40 feet bgs, and 45 feet bgs, respectively, without encountering water. These three locations were at a higher ground surface elevation than the majority of the soil borings, and the lithology was a sand/gravel mix (glacial drift). The drillers reached the limitations of the direct-push drill rig, and the boring could not be advanced further, so a temporary well was not installed at these three locations during Mobilization 1. Three subsurface soil samples each were collected at AOI01-01 (0-2, 13-15 and 48-50 feet bgs), AOI01-02 (0-2, 13-15 and 38-40 feet bgs), and at AOI01-03 (0-2, 13-15 and 38-40 feet bgs). Since attempts to collect groundwater samples were not successful at AOI 1 during Mobilization 1, three groundwater samples were collected at AOI 1 during Mobilization 2 sampling activities (AOI01-10, AOI01-11, and AOI01-12).

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Fort Custer Training Center, Michigan

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-0-2	11/18/2020 12:20	0-2	x	x			
AOI01-01-SB-0-2-FD	11/18/2020 12:20	0-2		x			FD
AOI01-01-SB-13-15	11/24/2020 9:00	13-15	x			x	
AOI01-01-SB-13-15-MS	11/24/2020 9:00	13-15	x				MS
AOI01-01-SB-13-15-MSD	11/24/2020 9:00	13-15	x				MSD
AOI01-01-SB-48-50	11/24/2020 10:30	48-50	x				
AOI01-02-SB-0-2	11/25/2020 9:15	0-2	x				
AOI01-02-SB-13-15	11/25/2020 9:30	13-15	x				
AOI01-02-SB-13-15-FD	11/25/2020 9:30	13-15	x				FD
AOI01-02-SB-38-40	11/25/2020 11:45	38-40	x				
AOI01-03-SB-0-2	11/24/2020 11:25	0-2	x				
AOI01-03-SB-13-15	11/24/2020 11:35	13-15	x				
AOI01-03-SB-38-40	11/24/2020 16:15	38-40	x				
AOI01-04-SS-0-2	11/19/2020 10:30	0-2	x				
AOI01-04-SS-0-2-FD	11/19/2020 10:30	0-2	x				FD
AOI01-05-SS-0-2	11/19/2020 10:00	0-2	x				
AOI02-07-SS-0-2	9/28/2021 14:27	0-2	x	x	x		
AOI02-07-SS-0-2-D	9/28/2021 14:29	0-2		x	x		FD
AOI02-08-SS-0-2	9/28/2021 15:09	0-2	x				
AOI02-09-SS-0-2	9/28/2021 16:23	0-2	x	x	x		
AOI02-09-SS-0-2-MS	9/28/2021 16:23	0-2		x	x		MS
AOI02-09-SS-0-2-MSD	9/28/2021 16:23	0-2		x	x		MSD
AOI02-10-SS-0-2	9/28/2021 16:23	0-2	x				
AOI02-10-SS-0-2-D	9/28/2021 16:23	0-2	x				FD
AOI02-11-SS-0-2	9/28/2021 15:45	0-2	x				
AOI02-12-SB-0-2	9/29/2021 9:20	0-2	x				
AOI02-12-SB-13-15	9/29/2021 10:20	13-15	x				
AOI02-12-SB-13-15-MS	9/29/2021 10:20	13-15	x				MS
AOI02-12-SB-13-15-MDS	9/29/2021 10:20	13-15	x				MSD
AOI02-12-SB-73-74	9/29/2021 12:10	73-74	x			x	
Sediment Samples							
AOI01-06-SD-0-1	11/18/2020 12:35	0-1	x				
AOI01-06-SD-0-1-FD	11/18/2020 12:35	0-1	x				FD
AOI01-06-SD-0-1-MS	11/18/2020 12:35	0-1	x				MS
AOI01-06-SD-0-1-MSD	11/18/2020 12:35	0-1	x				MSD
AOI01-07-SD-0-1	11/18/2020 13:20	0-1	x				
AOI01-08-SD-0-1	11/18/2020 13:50	0-1	x				
AOI01-09-SD-0-1	11/18/2020 14:10	0-1	x				

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Fort Custer Training Center, Michigan

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Groundwater Samples							
AOI01-10-GW	10/6/2021 11:00	NA	x				
AOI01-11-GW	10/5/2021 13:33	NA	x				
AOI01-11-GW-D	10/5/2021 13:33	NA	x				FD
AOI01-12-GW	10/5/2021 16:30	NA	x				
AOI02-01-GW	11/24/2020 9:20	NA	x				
AOI02-01-GW-MS	11/24/2020 9:20	NA	x				MS
AOI02-01-GW-MDS	11/24/2020 9:20	NA	x				MSD
AOI02-02-GW	11/23/2020 14:40	NA	x				
AOI02-02-GW-FD	11/23/2020 14:40	NA	x				FD
AOI02-03-GW	11/23/2020 13:10	NA	x				
AOI02-04-GW	11/23/2020 11:10	NA	x				
AOI02-05-GW	11/20/2020 14:20	NA	x				
AOI02-06-GW	11/20/2020 13:30	NA	x				
AOI02-12-GW	9/30/2021 17:25	NA	x				
AOI02-12-GW-MS	9/30/2021 17:25	NA	x				MS
AOI02-12-GW-MSD	9/30/2021 17:25	NA	x				MSD
Quality Control Samples							
FCTC-FRB-01	11/24/2020 11:30	NA	x				
FCTC-FRB-02	10/1/2021 10:45	NA	x				
FCTC-ERB-01	11/18/2020 12:00	NA	x				From DPT Shoe
FCTC-ERB-02	11/18/2020 12:45	NA	x				From HA
FCTC-ERB-03	11/24/2020 9:40	NA	x				From SP-16 Screen
FCTC-ERB-04	10/1/2021 10:25	NA	x				From Bladder Pump
FCTC-ERB-05	10/1/2021 10:30	NA	x				From HA
FCTC-ERB-06	10/1/2021 12:50	NA	x				From Sonic Drill Shoe

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
DPT = direct push technology
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
HA = hand auger
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
pH = potential of hydrogen
QSM = Quality Systems Manual
SB = soil boring
SS = surface soil
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Fort Custer Training Center, Michigan

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-10	85	64-69[1]	985.97	984.82	60.02	58.87	925.95
	AOI01-11	80	70-80	1002.00	1001.73	75.35	75.08	926.65
	AOI01-12	20	2.2-10[1]	936.74	934.65	7.17	5.08	929.57
2	AOI02-01	35	30-35	921.31	920.54	29.61	28.84	891.70
	AOI02-02	40	35-40	924.98	924.96	34.57	34.55	890.41
	AOI02-03	40	35-40	921.02	920.76	36.43	36.17	884.59
	AOI02-04	40	35-40	920.60	916.97	35.64	32.01	884.96
	AOI02-05	35	30-35	910.20	909.48	29.59	28.87	880.61
	AOI02-06	25	20-25	894.46	891.61	21.29	18.44	873.17
	AOI02-12	80	75-80	961.64	959.13	73.01	70.50	888.63

Notes:

[1] Temporary well screen set above total depth to capture groundwater interface

bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988

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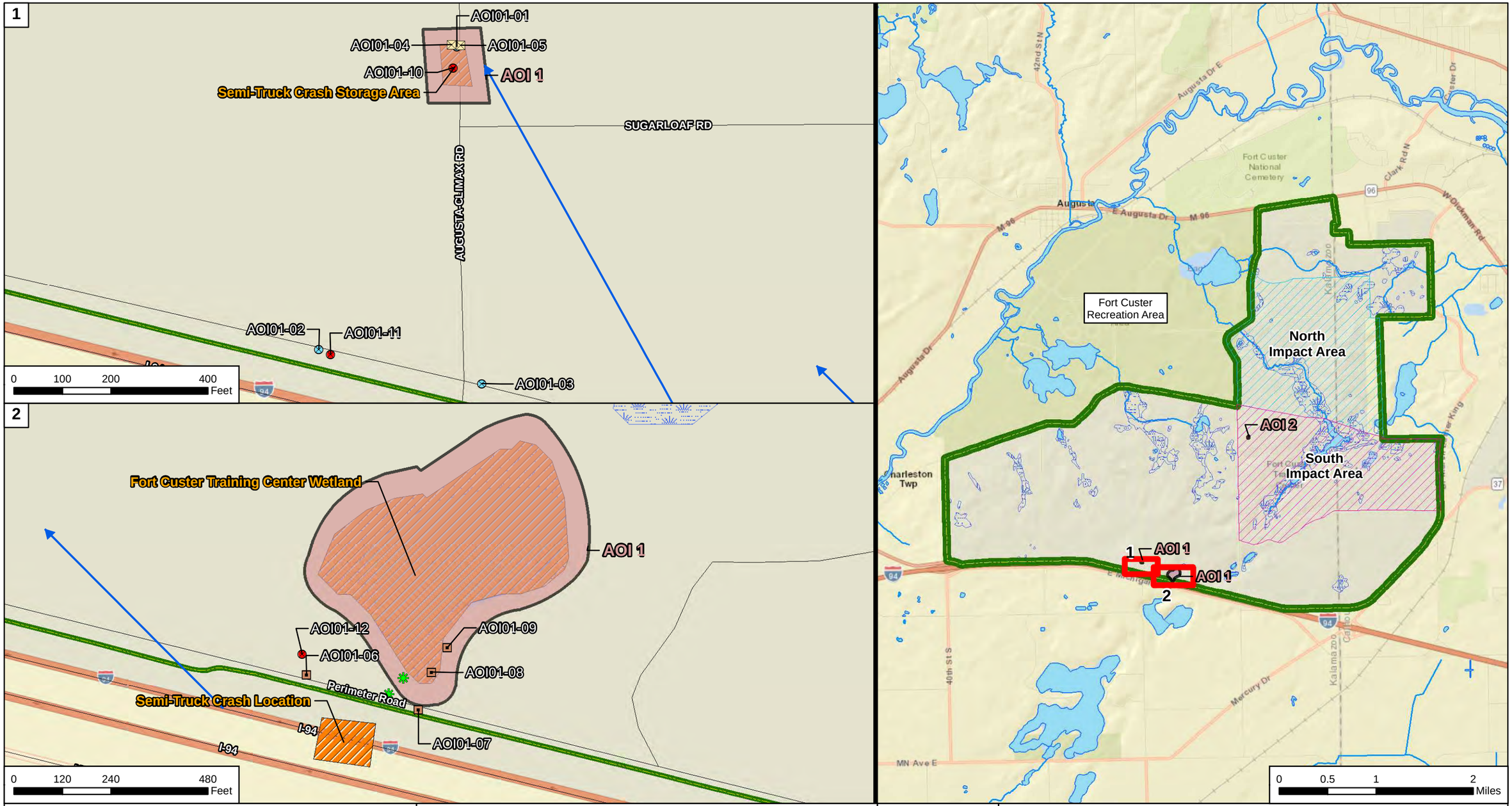


CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:2,880	CHK BY	CH	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

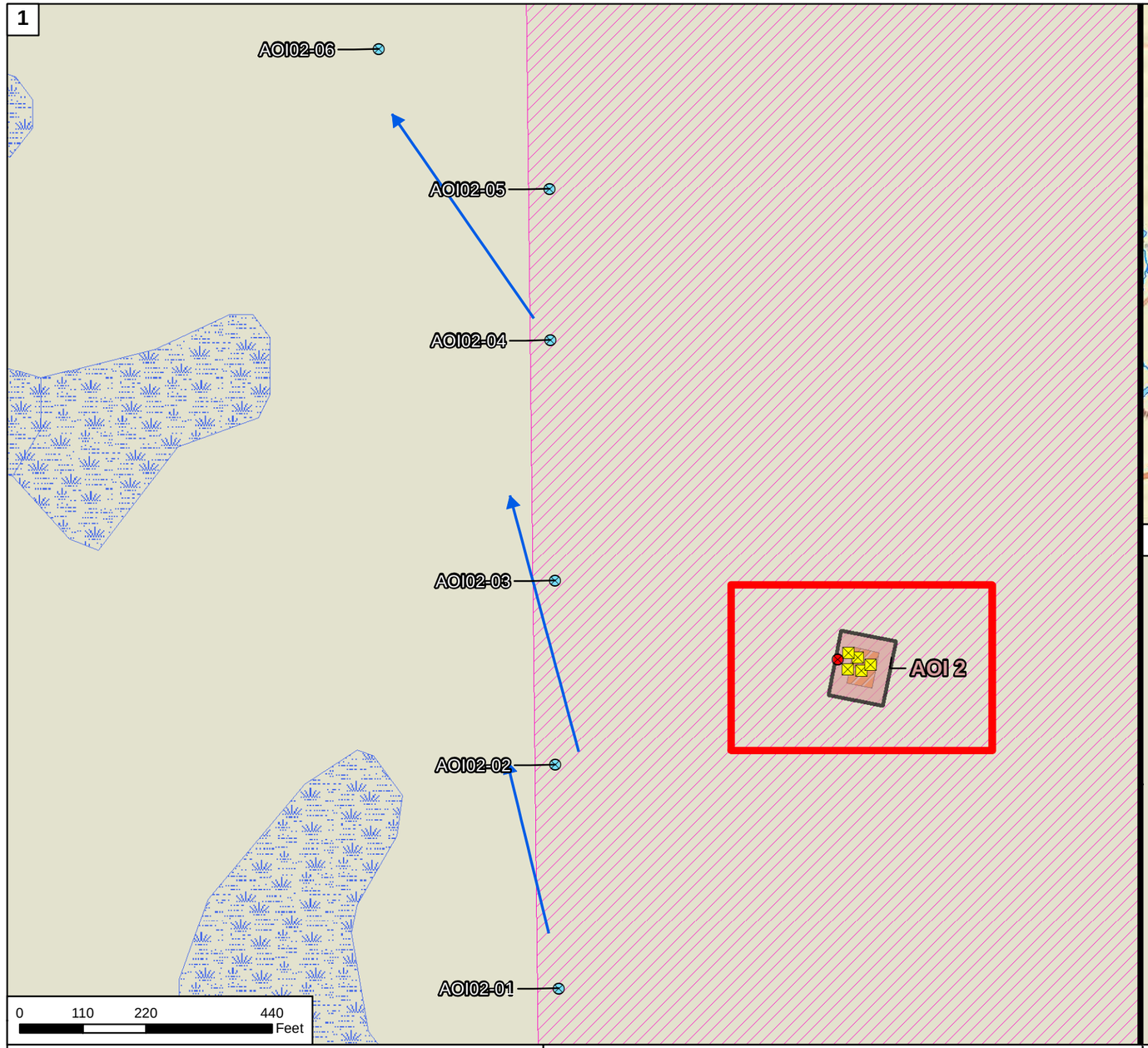
- Soil Boring/Temporary Well (Mobilization 1)
- Sediment Sample (Mobilization 1)
- Surface Soil Sample (Mobilization 1)
- Soil Boring/Temporary Well (Mobilization 2)
- Area of Interest
- Potential Release Area
- Facility Boundary
- Water Body
- Wetland
- River/Stream
- Groundwater Flow Direction
- Culvert

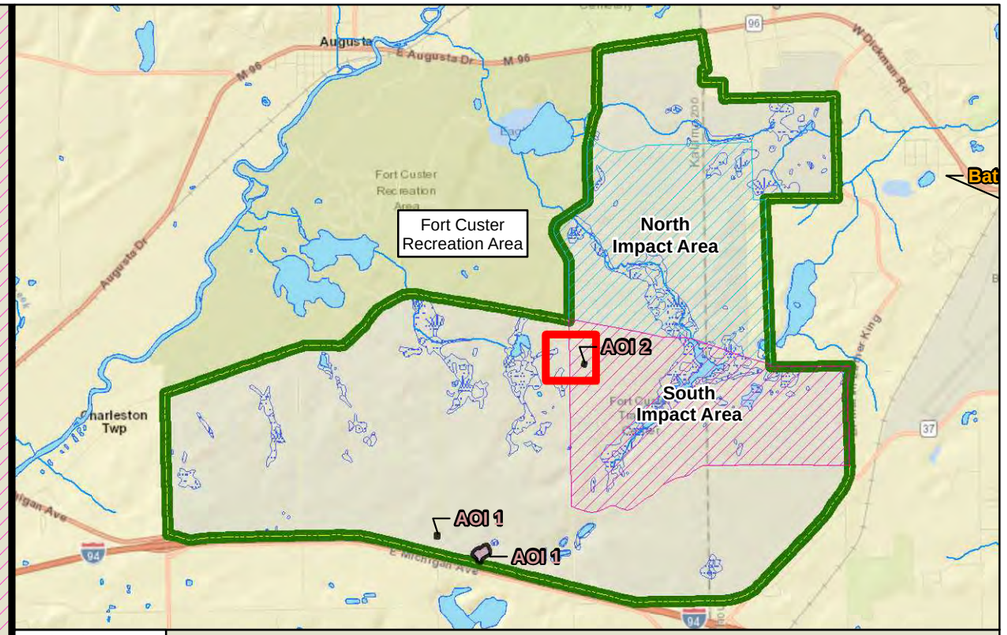
N

AOI 1 Site Inspection Sample Locations, Mobilization 1 and Mobilization 2

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 5-1





AOI 2 Inset

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:2,640	CHK BY	CH	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

- Soil Boring/Temporary Well (Mobilization 1)
- Soil Boring/Temporary Well (Mobilization 2)
- Surface Soil Sample (Mobilization 2)
- North Impact Area
- South Impact Area
- Area of Interest
- Potential Release Area
- Facility Boundary
- Water Body
- Wetland
- River/Stream
- Groundwater Flow Direction

N

AOI 2 Site Inspection Sample Locations, Mobilization 1 and Mobilization 2

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 5-2

6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.4**. **Table 6-2** through **Table 6-6** present results in soil, groundwater, or sediment for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

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

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

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

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

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

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

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

6.2 Soil Physicochemical Analyses

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

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Semi-Truck Crash Storage Area and FCTC Wetland. The soil, sediment, and groundwater results are summarized on **Table 6-2** through **Table 6-6**. Soil results are presented on **Figure 6-1** through **Figure 6-5.** Sediment results are presented on **Figure 6-6** and **Figure 6-7**. Groundwater results are presented on **Figure 6-8** and **Figure 6-9**.

6.3.1 AOI 1 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil collected during Mobilization 1. **Table 6-2** through **Table 6-4** summarize the soil results. Surface soil, subsurface soil, and deep subsurface soil were not collected at AOI 1 during Mobilization 2.

During Mobilization 1 within the Semi-Truck Crash Storage Area, soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (between 38 to 50 feet bgs) from boring locations AOI01-01 through AOI01-03. Soil was also sampled from surface soil (0 to 2 feet bgs) from locations AOI01-04 and AOI01-05. PFOA, PFNA, and PFBS were not detected in surface soil.

- PFOS was detected in surface soil, at concentrations lower than the SL. In the surface soil interval, PFOS was detected at locations AOI01-02 through AOI01-05, with concentrations ranging from 0.220 J micrograms per kilogram (µg/kg) to 4.84 µg/kg, respectively.
- PFHxS was detected at location AOI01-04, at several magnitudes lower than the SL.

PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in the shallow subsurface and deep subsurface soil at AOI 1.

6.3.2 AOI 1 Sediment Analytical Results

This section presents the analytical results for sediment for AOI 1, which includes the culvert that discharges into the FCTC Wetland and from the FCTC Wetland. Sediment samples were collected only during Mobilization 1. There are no established SLs for sediment; therefore, these results are presented for informational purposes only. The detected compounds in sediment are summarized in **Table 6-6**. The detections of PFOA, PFOS, PFHxS, PFNA, and PFBS in sediment

are presented on **Figure 6-6** and **Figure 6-7**. Surface water was not collected during both mobilizations at AOI 1.

Sediment was sampled from locations AOI01-06, upgradient of the culvert that discharges into the FCTC Wetland and AOI01-07, downgradient from the culvert that discharges into the FCTC Wetland, and AOI01-08 and AOI01-09 from the FCTC Wetland itself.

- PFOA was detected at one location, AOI01-06, with a concentration of 0.352 J µg/kg.
- PFOS was detected at three of the four sediment sampling locations at the culvert and FCTC Wetland: AOI01-06, AOI01-07, and AOI01-09, with concentrations ranging from 2.13 µg/kg to 76.1 J+ µg/kg, with the maximum concentration occurring at AOI01-06.
- PFHxS was detected at one location, AOI01-06, with a concentration of 9.15 J+ µg/kg.
- PFNA was detected at one location, AOI01-06, with a concentration of 0.231 J µg/kg.
- PFBS was not detected at any of the sediment sampling locations.
- PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected at AOI01-08.

6.3.3 AOI 1 Groundwater Analytical Results

Groundwater was not collected from AOI 1 during Mobilization 1. **Figure 6-8** and **Figure 6-9** present the ranges of detections in groundwater collected during Mobilization 2. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring wells AOI01-10 through AOI01-12.

- PFHxS was detected above the SL of 39 ng/L at AOI01-10, with a concentration of 62.8 ng/L.
- PFOA, PFOS, and PFBS were detected below respective SLs in all three wells. The highest concentration of PFOA, PFNA and PFBS occurred at location AOI01-10, with concentrations of 3.86 ng/L, 3.02 ng/L, and 11.5 ng/L, respectively.
- PFNA was not detected in any of the wells.

6.3.4 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil below their SLs. PFHxS was detected in groundwater, at concentrations above its SL. The release at AOI 1 is attributed to emergency response activities conducted off-facility on I-94 by multiple non-DoD entities. Since the groundwater exceedance is not associated with a DoD release, no further evaluation by ARNG G-9 at AOI 1 is warranted at this time. PFOA, PFOS, and PFHxS were detected in sediment, but since there are no established SLs for sediment, these results are presented for informational purposes only.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2: Geo-Grid Fire. The results in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-10** through **Figure 6-16**. Soil samples were not collected during Mobilization 1 at AOI 2. Surface water and sediment samples were not collected during either mobilization at AOI 2.

6.4.1 AOI 2 Soil Analytical Results

Figure 6-10 through **Figure 6-14** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Surface soil, shallow subsurface soil, and deep subsurface soil were not collected at locations AOI02-01 through AOI02-06 during Mobilization 1. During Mobilization 2, soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI02-07 through AOI02-12. Shallow subsurface soil (13 to 15 feet bgs) and deep subsurface soil (73 to 74 feet bgs) were sampled from boring location AOI02-12.

PFOA, PFOS, and PFNA were detected in soil at concentrations of at least one order of magnitude below their SLs in surface soil. PFHxS and PFBS were not detected in surface soil at any location at AOI 2.

- PFOA was detected at one location, AOI02-07, with a concentration of 0.217 J µg/kg.
- PFOS was detected at all six locations, with concentrations ranging from 0.080 J µg/kg to 0.245 J µg/kg, with the maximum concentration occurring at AOI02-10.
- PFNA was detected at three of the six locations, AOI02-09, AOI02-10, and AOI02-12, with concentrations ranging from 0.023 J µg/kg to 0.069 J µg/kg, with the maximum concentration occurring at AOI02-10.

PFOS was detected in shallow subsurface soil at a concentration of at least three orders of magnitude below the SL. PFOS was detected at one location, AOI02-12, with a concentration of 0.079 J µg/kg. PFOA, PFHxS, PFNA, and PFBS were not detected in shallow subsurface soil at AOI 2. PFOA, PFOS, PFHxS, PFNA, and PFBS were also not detected in deep subsurface soil at AOI 2.

6.4.2 AOI 2 Groundwater Analytical Results

Figure 6-15 and **Figure 6-16** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

During Mobilization 1, groundwater was sampled from temporary monitoring wells AOI2-01 through AOI2-06. PFOA, PFHxS, PFNA, and PFBS were not detected in any of the wells at AOI 2 during Mobilization 1.

- PFOS was detected below the SL of 4 ng/L at AOI02-04 and AOI02-05, at concentrations of 2.06 J ng/L and 2.77 J ng/L, respectively. PFOS was not detected in the other temporary wells at AOI 2.

During Mobilization 2, groundwater was sampled from one temporary monitoring well location, AOI02-12. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected at AOI02-12.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFNA were detected in soil, at concentrations below their SLs. PFOS was detected in groundwater, at a concentration below the SL; therefore, further evaluation at AOI 2 is not warranted.

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Fort Custer Training Center

Area of Interest		AOI01												AOI02							
Sample ID		AOI01-01-SB-0-2		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SS-0-2		AOI01-04-SS-0-2-FD		AOI01-05-SS-0-2		AOI02-07-SS-0-2		AOI02-08-SS-0-2		AOI02-09-SS-0-2		AOI02-10-SS-0-2	
Sample Date		11/18/2020		11/25/2020		11/24/2020		11/19/2020		11/19/2020		11/19/2020		09/28/2021		09/28/2021		09/28/2021		09/28/2021	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	1900	ND	U	ND	U	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	0.203	J	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	19	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.023	J	0.069	J
PFOA	19	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.217	J	ND	U	ND	U	ND	U
PFOS	13	ND	U	0.543	J	0.220	J	3.19		4.84		0.306	J	0.110	J	0.084	J	0.084	J	0.245	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Fort Custer Training Center

Area of Interest		AOI02					
Sample ID		AOI02-10-SS-0-2-D		AOI02-11-SS-0-2		AOI02-12-SB-0-2	
Sample Date		09/28/2021		09/28/2021		09/29/2021	
Depth		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	1900	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U
PFNA	19	ND	UJ	ND	U	0.037	J
PFOA	19	ND	U	ND	U	ND	U
PFOS	13	ND	UJ	0.080	J	0.171	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, Fort Custer Training Center

Area of Interest		AOI01								AOI02	
Sample ID		AOI01-01-SB-13-15		AOI01-02-SB-13-15		AOI01-02-SB-13-15-FD		AOI01-03-SB-13-15		AOI02-12-SB-13-15	
Sample Date		11/24/2020		11/25/2020		11/25/2020		11/24/2020		09/29/2021	
Depth		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)											
PFBS	25000	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
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	ND	UJ	ND	U	ND	U	ND	U	0.079	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, Fort Custer Training Center

Area of Interest	AOI01						AOI02	
Sample ID	AOI01-01-SB-48-50		AOI01-02-SB-38-40		AOI01-03-SB-38-40		AOI02-12-SB-73-74	
Sample Date	11/24/2020		11/25/2020		11/24/2020		09/29/2021	
Depth	48-50 ft		38-40 ft		38-40 ft		73-74 ft	
Analyte	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)								
PFBS	ND	U	ND	U	ND	U	ND	U
PFHxS	ND	U	ND	U	ND	U	ND	U
PFNA	ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U
PFOS	ND	U	ND	U	ND	U	ND	U

Interpreted Qualifiers

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Fort Custer Training Center

Area of Interest		AOI01								AOI02									
Sample ID		AOI01-10-GW		AOI01-11-GW		AOI01-11-GW-D		AOI01-12-GW		AOI02-01-GW		AOI02-02-GW		AOI02-02-GW-FD		AOI02-03-GW		AOI02-04-GW	
Sample Date		10/06/2021		10/05/2021		10/05/2021		10/05/2021		11/24/2020		11/23/2020		11/23/2020		11/23/2020		11/23/2020	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																			
PFBS	601	11.5		1.30	J	1.12	J	5.05		ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	39	62.8		3.29	J	3.63	J	26.1		ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	6	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	6	3.86	J	1.14	J	1.16	J	1.98	J	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	4	3.02	J	1.36	J	1.81	J	2.06	J	ND	U	ND	U	ND	U	ND	U	2.06	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Fort Custer Training Center

	Area of Interest	AOI02					
	Sample ID	AOI02-05-GW		AOI02-06-GW		AOI02-12-GW	
	Sample Date	11/20/2020		11/20/2020		09/30/2021	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)							
PFBS	601	ND	U	ND	U	ND	U
PFHxS	39	ND	U	ND	U	ND	U
PFNA	6	ND	U	ND	U	ND	U
PFOA	6	ND	U	ND	U	ND	U
PFOS	4	2.77	J	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-6
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Sediment
Site Inspection Report, Fort Custer Training Center

Area of Interest	AOI01									
Sample ID	AOI01-06-SD-0-1		AOI01-06-SD-0-1-FD		AOI01-07-SD-0-1		AOI01-08-SD-0-1		AOI01-09-SD-0-1	
Sample Date	11/18/2020		11/18/2020		11/18/2020		11/18/2020		11/18/2020	
Depth	0-1 ft		0-1 ft		0-1 ft		0-1 ft		0-1 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Sediment, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)										
PFBS	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	9.15	J+	8.21	J+	ND	U	ND	U	ND	U
PFNA	0.231	J	0.161	J	ND	U	ND	U	ND	U
PFOA	0.352	J	0.287	J	ND	U	ND	U	ND	U
PFOS	76.1	J+	72.2	J+	0.481	J	ND	U	2.13	

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

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

Chemical Abbreviations

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

Acronyms and Abbreviations

AOI	Area of Interest
DL	detection limit
FD	duplicate
ft	feet
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	interpreted qualifier
SD	sediment
µg/kg	micrograms per kilogram

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CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFOA Detections in Soil, AOI 1, Mobilization 1

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Germantown, MD 20876

Figure 6-1

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFOS Detections in Soil, AOI 1, Mobilization 1

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Germantown, MD 20876

Figure 6-2

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFBS Detections in Soil, AOI 1, Mobilization 1

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Figure 6-3

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFHxS Detections in Soil, AOI 1, Mobilization 1

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Figure 6-4

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFNA Detections in Soil, AOI 1, Mobilization 1

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Figure 6-5

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,200	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 50 100 200 Feet

N

PFOA, PFOS, and PFBS Detections in Sediment

AECOM

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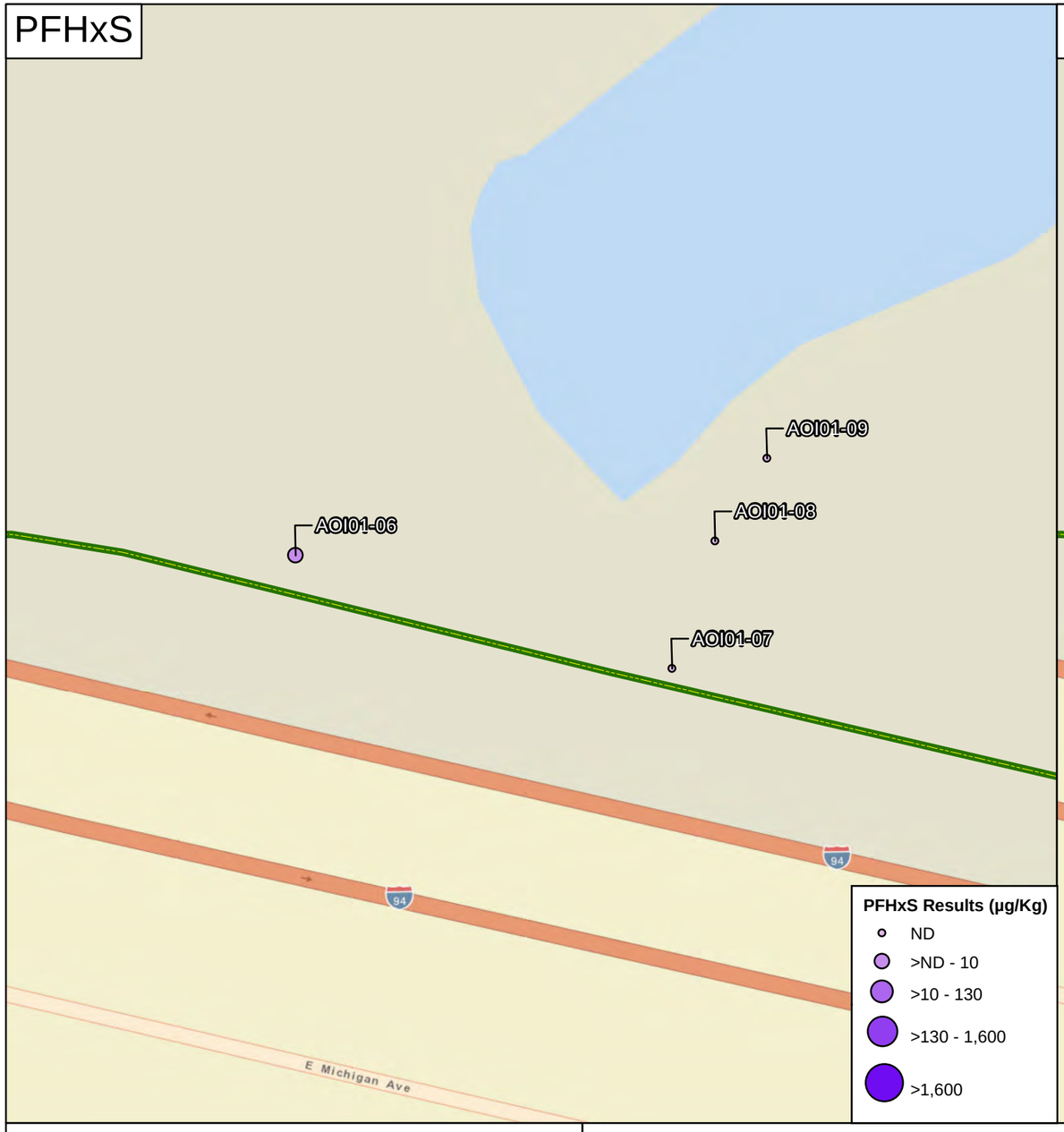
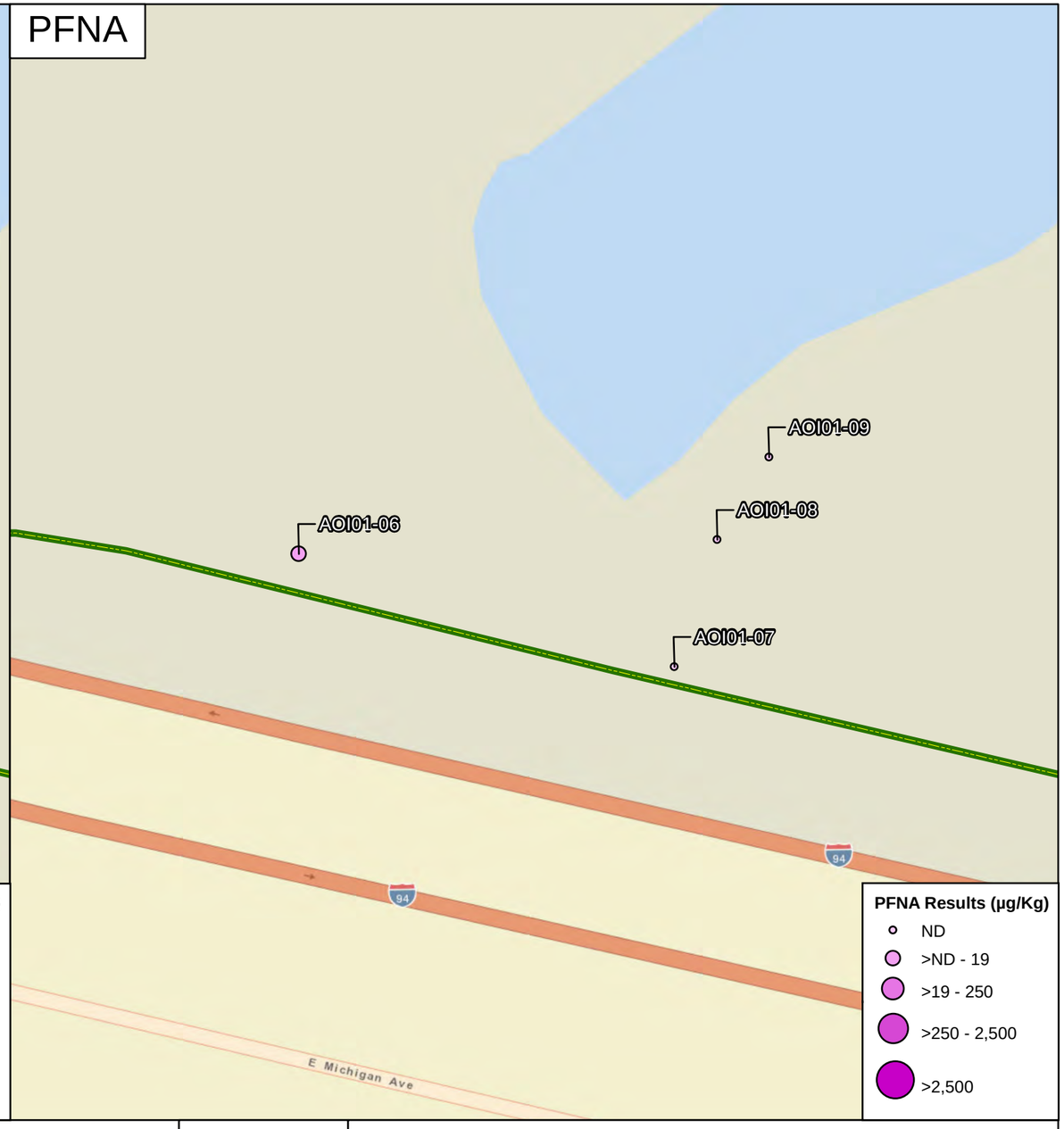
Figure 6-6





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PROJECT	Site Inspection at Fort Custer, MI			
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SCALE	1:1,200	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 50 100 200 Feet

N

PFHxS and PFNA Detections in Sediment

AECOM

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Germantown, MD 20876

Figure 6-7

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:4,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

- Facility Boundary
- Water Body
- Wetland
- Groundwater Flow Direction

0 200 400 800 Feet

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

N

PFOA, PFOS, and PFBS Detections in Groundwater, AOI 1, Mobilization 2

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Germantown, MD 20876

Figure 6-8

PFHxS

PFNA

ENGINEER RD

AUGUSTA-CLIMAX RD

AOI01-10

SUGARLOAF RD

AOI01-11

Perimeter Road

I-94

I-94

E Michigan Ave

MICHIGAN AVE

AOI01-12

44th St S

44TH ST

Wood Lake

PFHxS Results (ng/L)

- ND
- >ND - 39
- >39 - 100
- >100 - 1,000
- >1,000

PFNA Results (ng/L)

- ND
- >ND - 6
- >6 - 100
- >100 - 1,000
- >1,000

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:4,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

- Facility Boundary
- Water Body
- Wetland
- Groundwater Flow Direction

0 200 400 800 Feet

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

N

PFHxS and PFNA Detections in Groundwater, AOI 1, Mobilization 2

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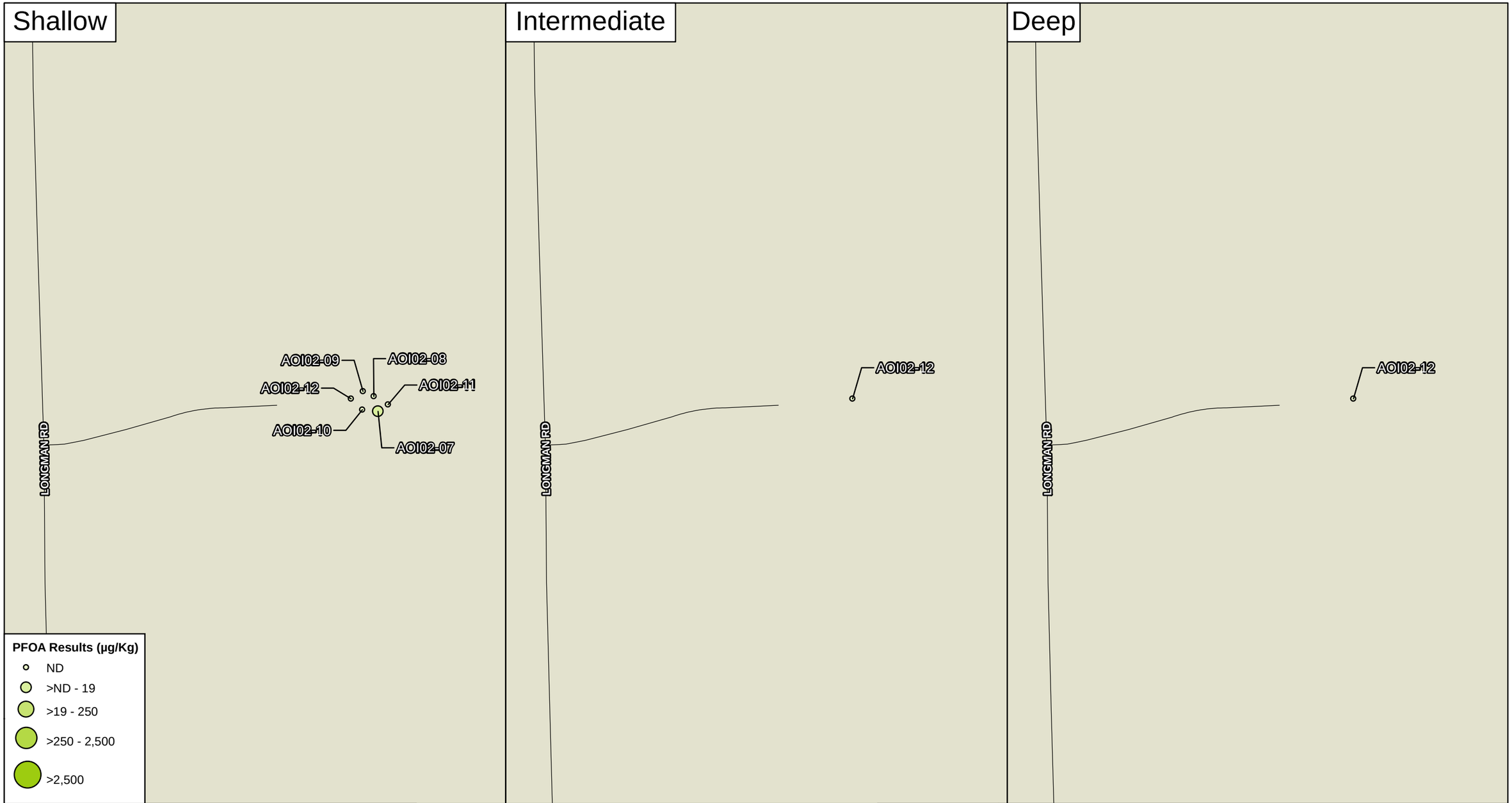
Figure 6-9



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Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFOA Detections in Soil, AOI 2, Mobilization 2

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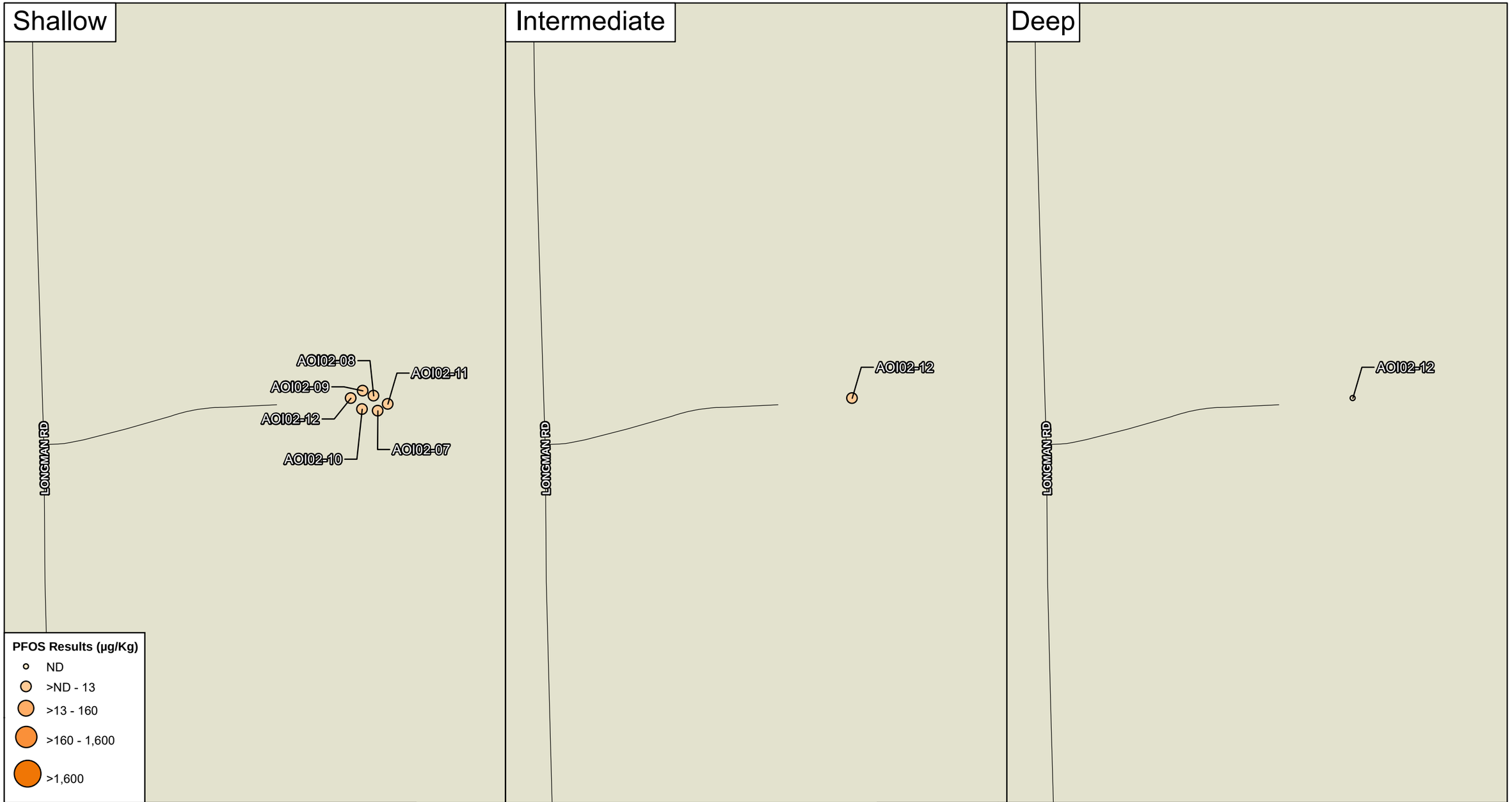
Figure 6-10



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PROJECT	Site Inspection at Fort Custer, MI			
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Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFOS Detections in Soil, AOI 2, Mobilization 2

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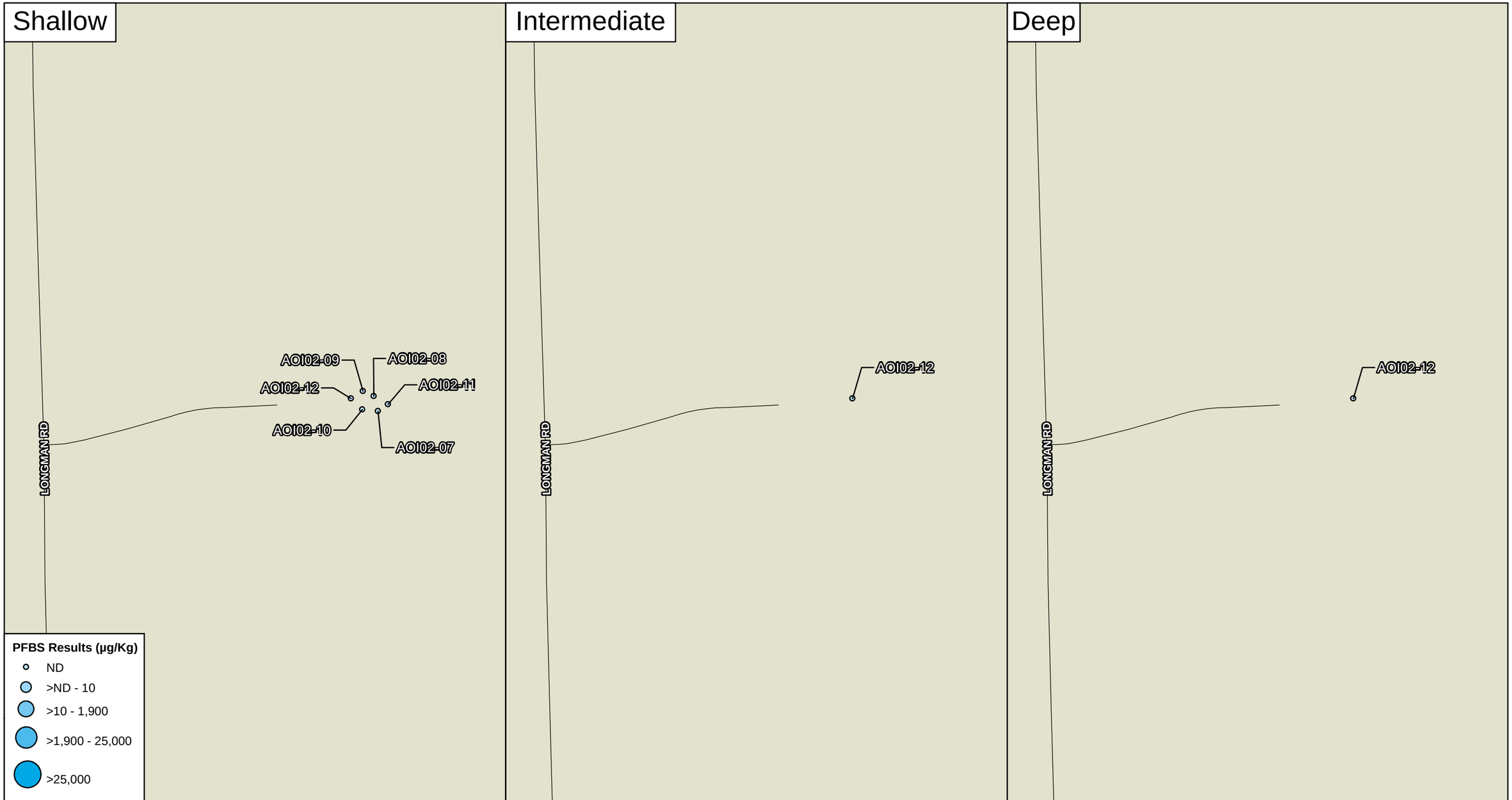
Figure 6-11



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PROJECT	Site Inspection at Fort Custer, MI			
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SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFBS Detections in Soil, AOI 2, Mobilization 2

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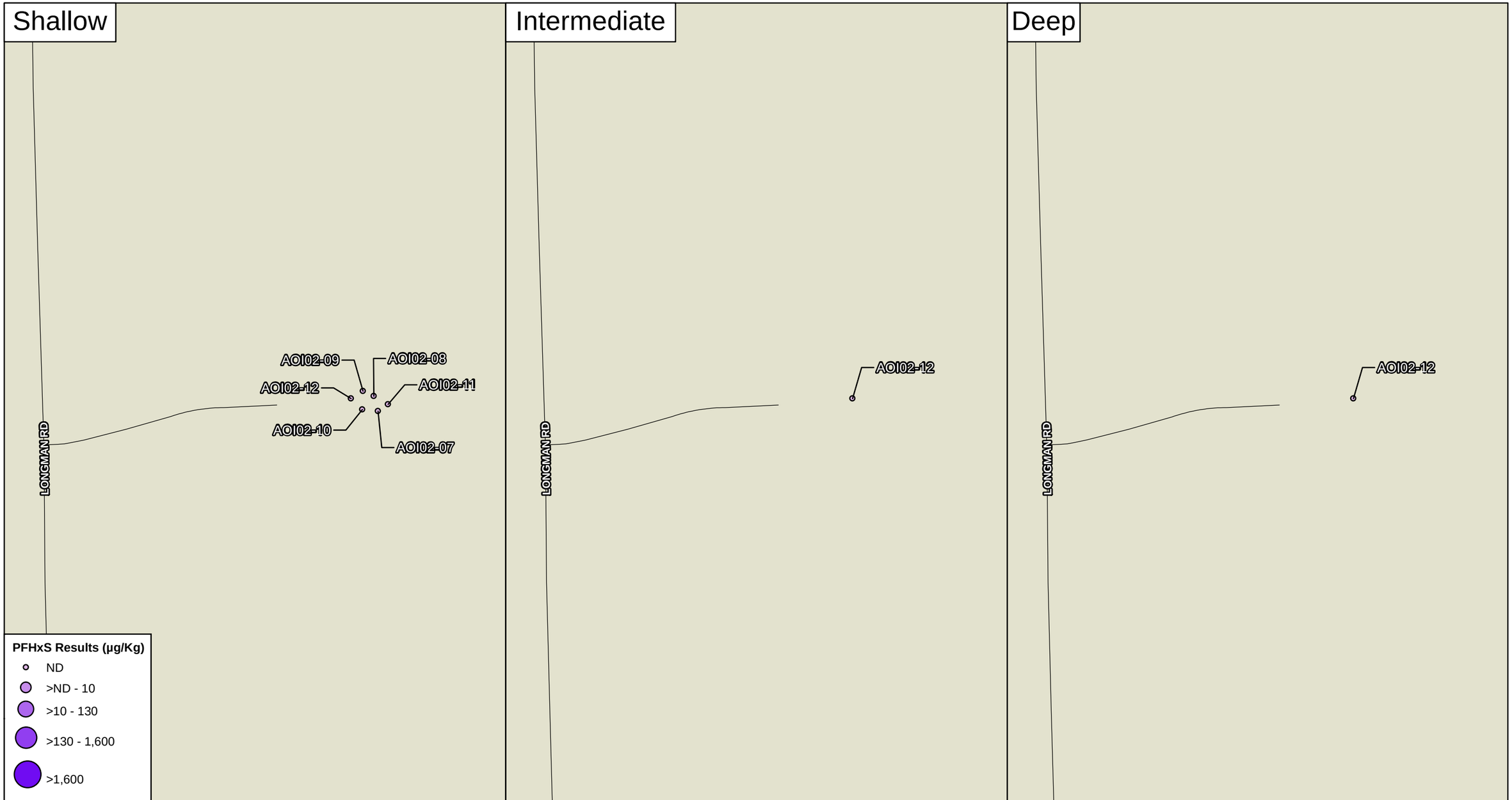
Figure 6-12



CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFHxS Detections in Soil, AOI 2, Mobilization 2

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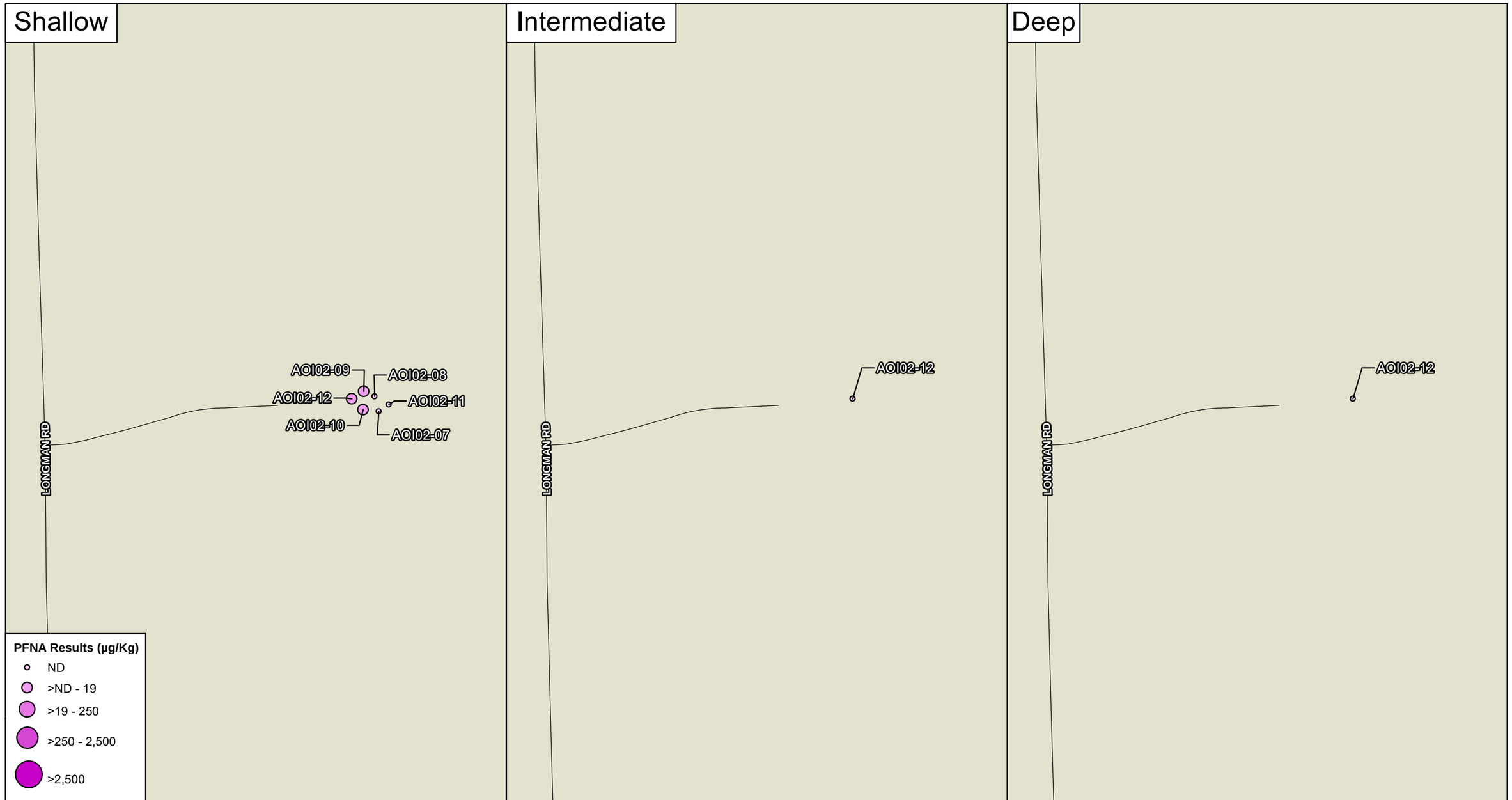
Figure 6-13



CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
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SCALE	1:1,800	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

Facility Boundary

0 75 150 300 Feet

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

N

PFNA Detections in Soil, AOI 2, Mobilization 2

AECOM
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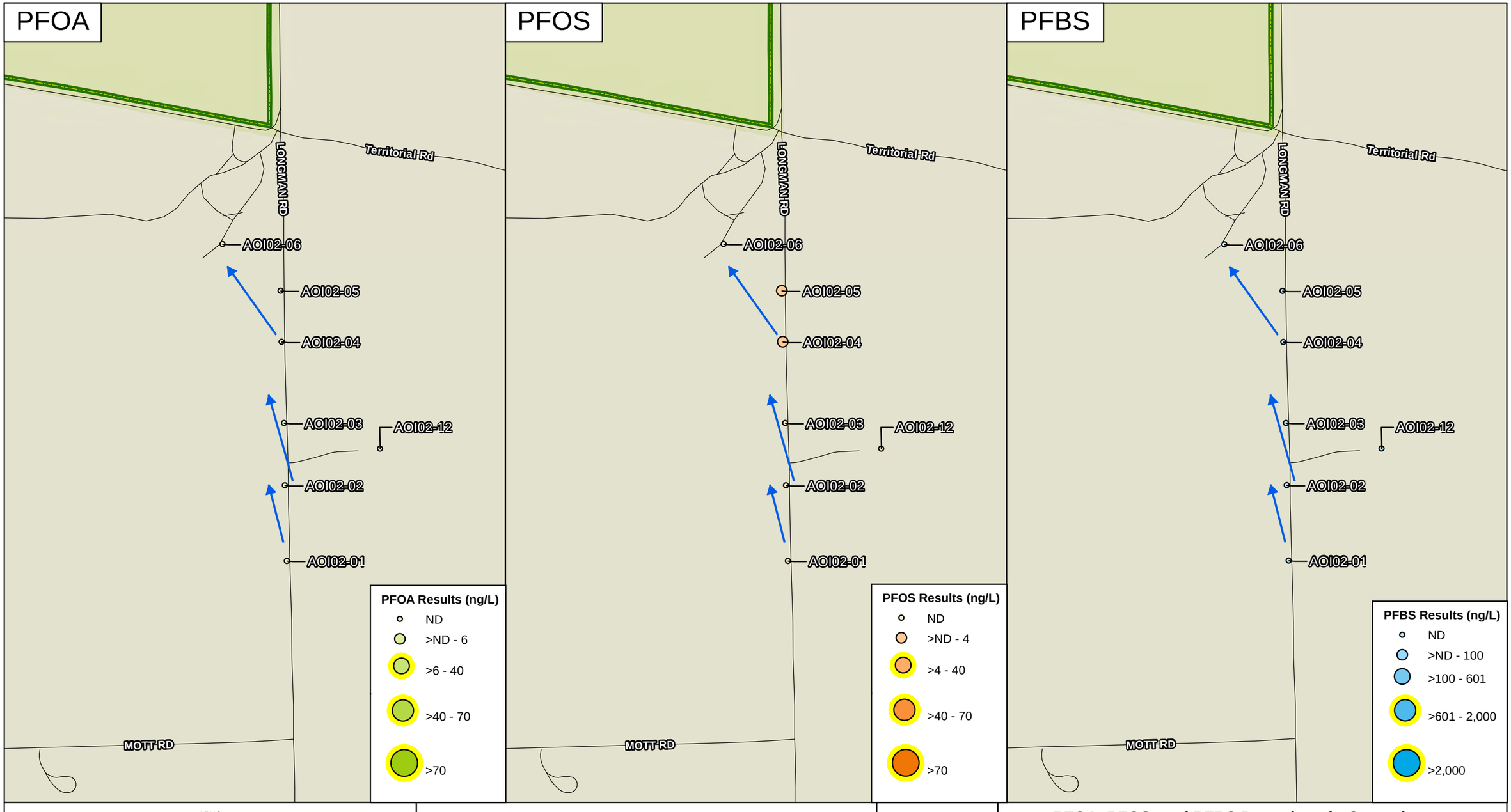
Germantown, MD 20876

Figure 6-14

PFOA

PFOS

PFBS



PFOA Results (ng/L)
- ND
- >ND - 6
- >6 - 40
- >40 - 70
- >70

PFOS Results (ng/L)
- ND
- >ND - 4
- >4 - 40
- >40 - 70
- >70

PFBS Results (ng/L)
- ND
- >ND - 100
- >100 - 601
- >601 - 2,000
- >2,000

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:6,000	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend
- Facility Boundary
- Groundwater Flow Direction

0 250 500 1,000 Feet

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

N

PFOA, PFOS, and PFBS Detections in Groundwater, AOI 2, Mobilization 1 & 2

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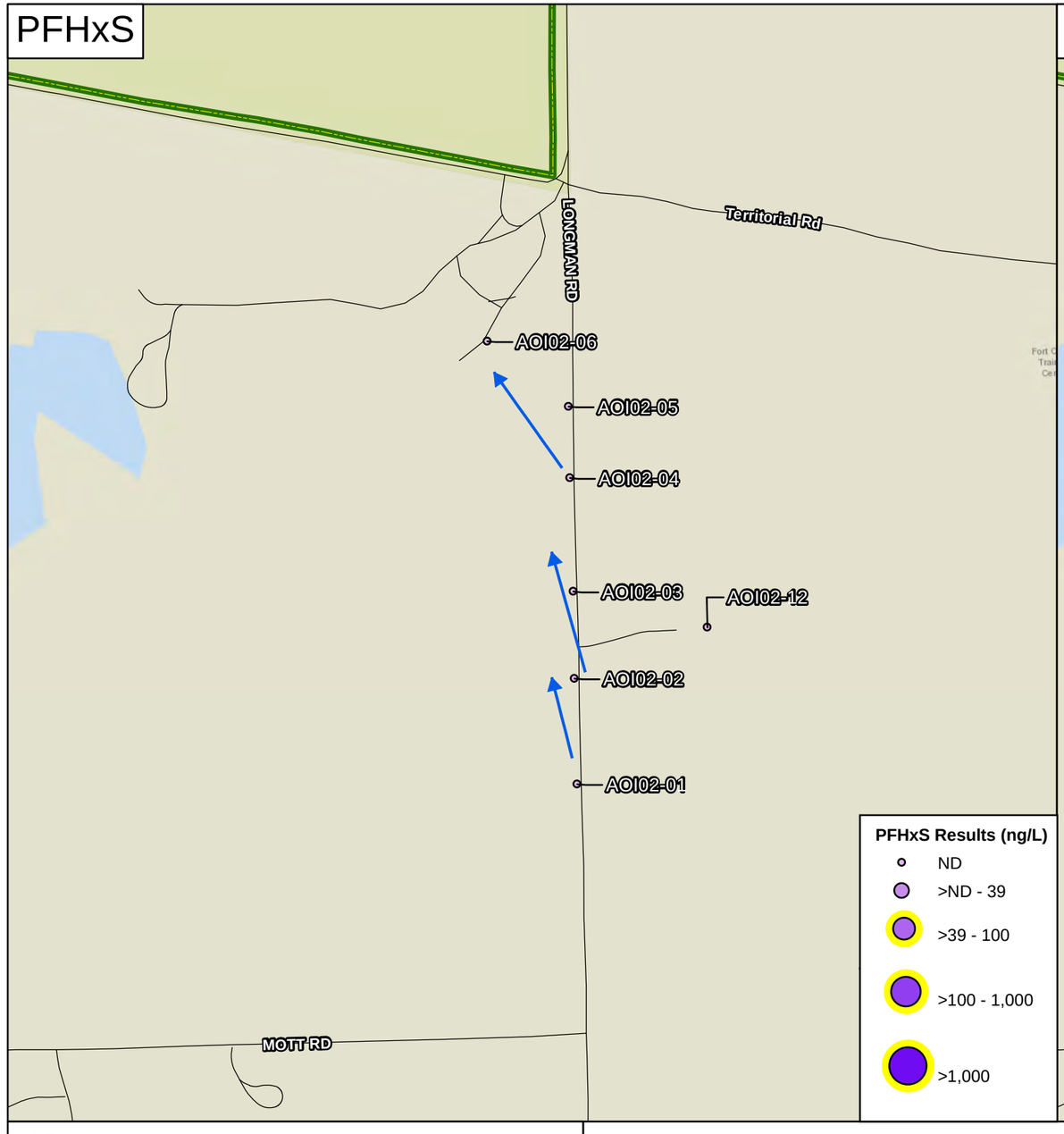
Germantown, MD 20876

Figure 6-15

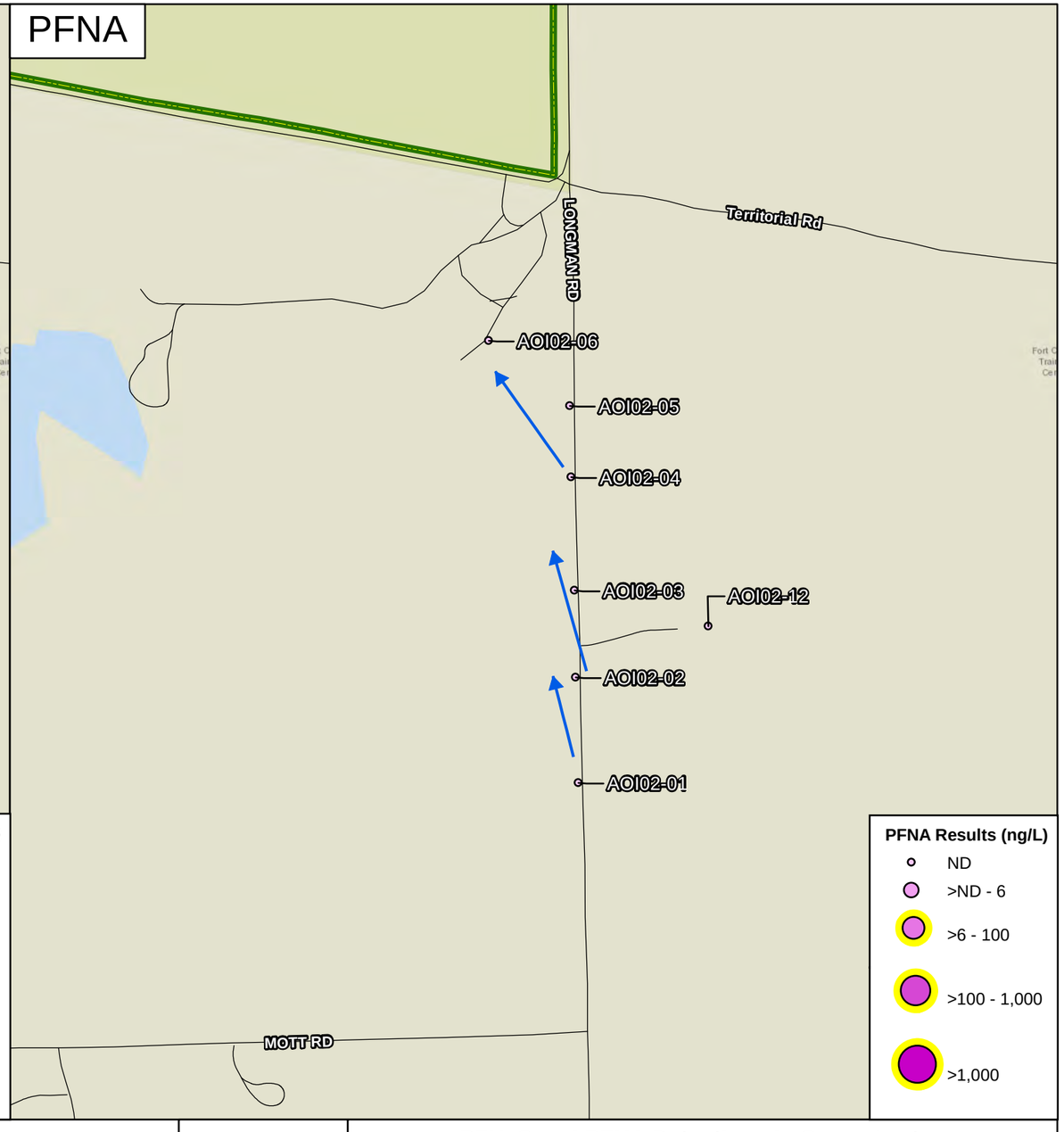
PFHxS



PFHxS Results (ng/L)

- ND
- >ND - 39
- >39 - 100
- >100 - 1,000
- >1,000

PFNA



PFNA Results (ng/L)

- ND
- >ND - 6
- >6 - 100
- >100 - 1,000
- >1,000

CLIENT	ARNG			
PROJECT	Site Inspection at Fort Custer, MI			
REVISED	10/21/2022	GIS BY	MS	10/21/2022
SCALE	1:6,000	CHK BY	SS	10/21/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/21/2022

Legend

- Facility Boundary
- Groundwater Flow Direction

0 250 500 1,000 Feet

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

N

PFHxS and PFNA Detections in Groundwater, AOI 2, Mobilization 1 & 2

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-16

7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **Figure 7-2**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

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

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

7.1 Soil Exposure Pathway

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

7.1.1 AOI 1

AOI 1 is the location at FCTC where a semi-truck potentially containing residual AFFF was pulled onto the facility following a fire response from an adjacent location. The semi-truck initially caught fire on I-94, outside the southern border of FCTC. Fire response from multiple cities reportedly used firefighting foam to control and extinguish the fire at that location on I-94. Given the response from multiple municipalities, the use of AFFF, the volume of foam expended, and which

municipalities were involved in the response are unknown. A culvert that discharges into the FCTC Wetland is located near the semi-truck crash site.

PFOS and PFHxS were detected in surface soil at AOI 1. Site workers, future construction workers, trespassers (though unlikely due to restricted access), and on-facility recreational users could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, trespassers (though unlikely due to restricted access), and on-facility recreational users are potentially complete. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in subsurface soil at AOI 1; therefore, all exposure pathways are considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is where a geo-grid, a plastic material used for soil stabilization, caught on fire as a result of a prescribed burn. The Battle Creek fire department responded to the scene and reportedly extinguished the fire with fire fighting foam; it is unknown if the foam used was AFFF. AOI 2 is located east of Longman Road and within the FCTC South Impact Area, where UXO may be present below the ground surface.

PFOA, PFOS, and PFNA were detected in surface soil at AOI 2. Site workers, future construction workers, trespassers (though unlikely due to restricted access), and on-facility recreational users could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, trespassers (though unlikely due to restricted access), and on-facility recreational users are potentially complete.

PFOS was detected in subsurface soil at AOI 2. Future construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.2 Groundwater Exposure Pathway

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

7.2.1 AOI 1

PFHxS was detected above the SL in the groundwater sample AOI01-10. AOI 1 is located in a small section of FCTC that lies within the Headwaters Portage River watershed, a separate watershed from which the majority of the facility drains.

Several off-facility residential wells exist upgradient from AOI 1. No residential wells are known between the facility boundary and the Kalamazoo River; however, several public water supply wells are identified in that area. Therefore, the pathway via ingestion of groundwater by residents is considered potentially complete. No potable water wells are located within FCTC. FCTC receives its potable water from the Town of Augusta; therefore, the ingestion exposure pathway for site workers, trespassers (though unlikely due to restricted access), and on-facility recreational receptors is considered incomplete.

Depths to water measured from September through October 2021 during the SI ranged from 5.08 to 75.08 feet bgs. Groundwater may be encountered during construction activities occurring closer to the FCTC Wetland but the depth to water at location AOI01-10, where the exceedance occurred, was 58.87 bgs. The ingestion exposure pathway for future construction workers is

considered incomplete due to groundwater existing deeper than 15 feet bgs and construction worker contact being unlikely. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOS was detected below the SL in groundwater samples, AOI02-04 and AOI02-05, collected downgradient of AOI 2 and used to characterize groundwater at AOI 2. PFOA, PFHxS, PFNA, and PFBS were not detected in any of the wells at AOI 2 during Mobilization 1 or Mobilization 2.

Several off-facility residential wells exist upgradient from AOI 2. No residential wells are known between the facility boundary and the Kalamazoo River; however, several public water supply wells are identified in that area. Therefore, the pathway via ingestion of groundwater by residents is considered potentially complete. No potable water wells are located within FCTC. FCTC receives its potable water from the Town of Augusta; therefore, the ingestion exposure pathway for site workers, trespassers (though unlikely due to restricted access), and on-facility recreational receptors is considered incomplete.

Depths to water measured in November 2020 and September through October 2021 during the SI and SSI ranged from 18.44 to 70.05 feet bgs. The ingestion exposure pathway for future construction workers is considered incomplete due to groundwater existing deeper than 15 feet bgs and construction worker contact being unlikely. The CSM for AOI 2 is presented on **Figure 7-2**.

7.3 Sediment Exposure Pathway

The SI results in sediment were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI. At AOIs where surface water and sediment samples were not collected, data from downgradient AOIs or 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. There are no established SLs for sediment; therefore, these results are presented for informational purposes only.

7.3.1 AOI 1

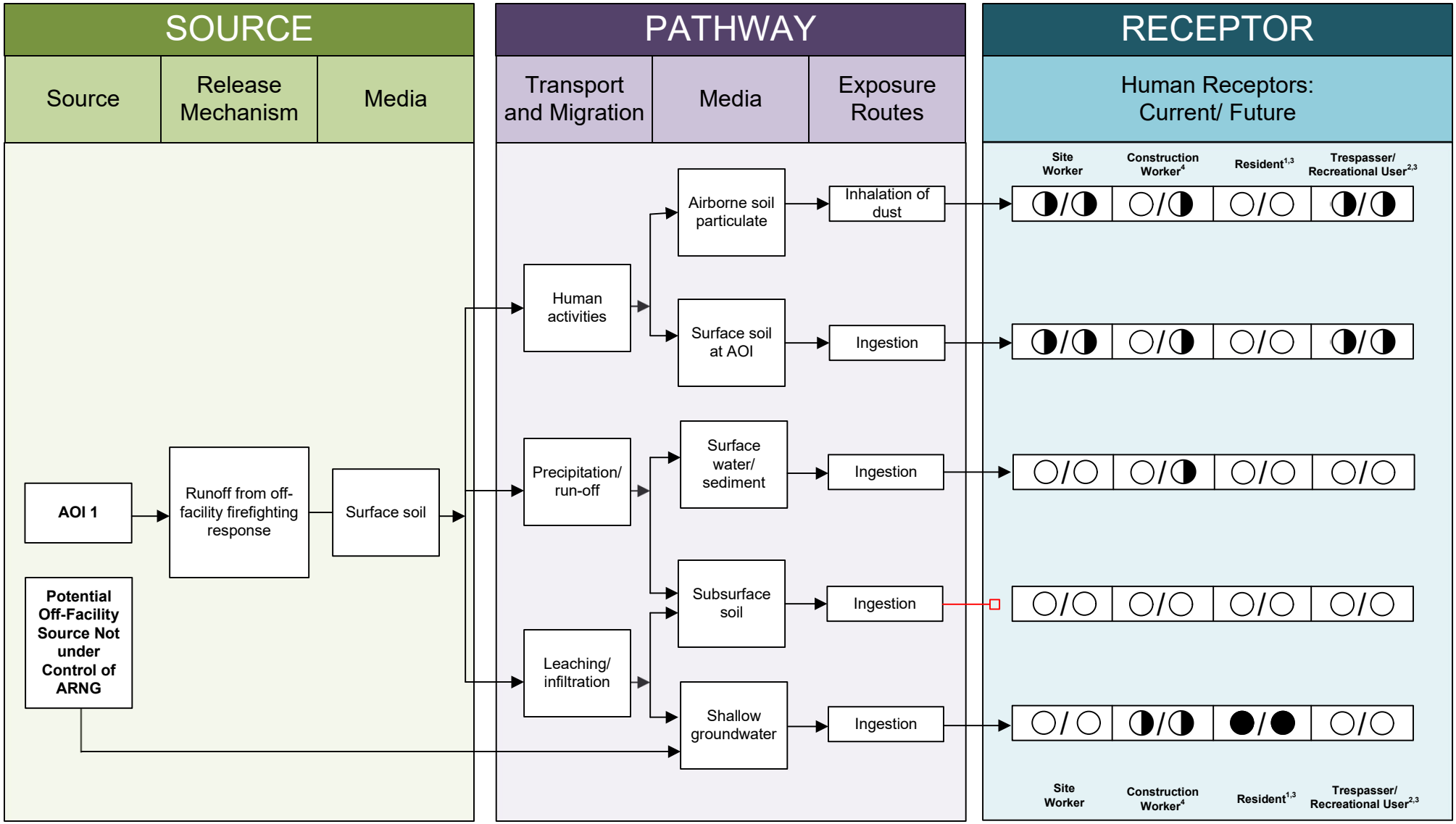
PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. In this area, FCTC is drained to the south and I-94, which boarders FCTC to the south, drains to the north into the FCTC culvert and eventually into the FCTC Wetland. Because PFOS and PFHxS were detected in soil at AOI 1, it is possible that those compounds may have migrated from soil to the FCTC Wetland via surface runoff.

PFOA, PFOS, PFHxS, and PFNA were also detected in sediment samples collected from the culvert and directly from the FCTC Wetland. The culvert is part of the drainage system for the highway where the accident occurred and drains into the FCTC property and Wetland. Surface water samples were not collected during either Mobilization 1 or Mobilization 2.

Future construction workers could contact constituents in surface water and sediment via incidental ingestion. Therefore, the surface water and sediment ingestion exposure pathway for future construction workers is considered potentially complete. Facility workers, trespassers (though unlikely due to restricted access), and on-facility recreational users are unlikely to access the FCTC Wetland, so the exposure pathway is considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

FCTC is drained to the northwest at AOI 2, into an unnamed body of water nearly 0.5 miles from AOI 2. PFOA, PFOS, and PFNA were detected in soil and PFOS was detected in groundwater at AOI 2, but the likelihood that the constituent may have migrated from soil and groundwater to the unnamed body of water via surface runoff or groundwater discharge is unlikely, considering the distance between AOI 2 and the body of water. Therefore, the surface water and sediment ingestion exposure pathway for site workers, construction workers, or trespassers (though unlikely due to restricted access) is considered incomplete. Surface water and sediment samples were not collected during either Mobilization 1 or Mobilization 2. The CSM for AOI 2 is presented on **Figure 7-2**.



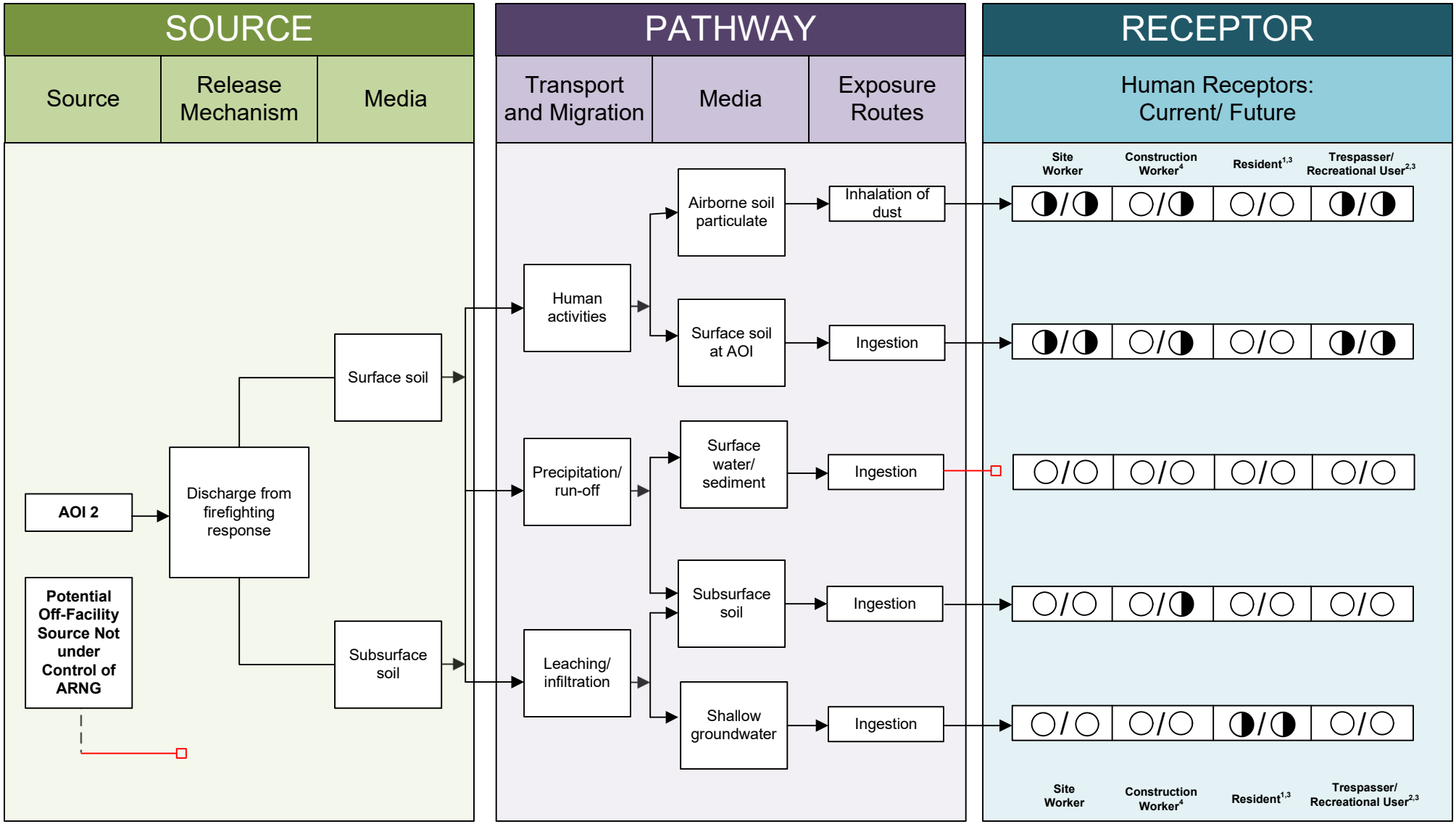
LEGEND

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

Notes:

1. The resident user refers to off-facility receptors.
2. Recreational user refers to on and off-facility receptors.
3. Inhalation of dust for off-site receptors is likely insignificant.
4. No current active construction at the facility.

Figure 7-1
Conceptual Site Model, AOI 1
Fort Custer Training Center, MI



LEGEND

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

Notes:

1. The resident user refers to off-facility receptors.
2. Recreational user refers to on and off-facility receptors.
3. Inhalation of dust for off-site receptors is likely insignificant.
4. No current active construction at the facility.

Figure 7-2
Conceptual Site Model, AOI 2
Fort Custer Training Center, MI

8. Summary and Outcome

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

8.1 SI Activities

The SI field activities were conducted in two mobilizations. Mobilization 1 included the collection of soil, sediment, and groundwater samples from 18 to 25 November 2020 and Mobilization 2 included the collection of soil and groundwater samples from 28 September to 10 October 2021. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2020a), except as previously noted in **Section 5.9**.

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

- Nineteen (19) soil samples from 11 boring locations;
- Ten (10) grab groundwater samples from 10 temporary well locations;
- Four sediment samples from four locations; and
- Twenty-two (22) QA/QC samples.

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

8.2 Outcome

Based on the results of this SI, no further evaluation under CERCLA by ARNG G-9 is warranted for each of the two AOIs at this time (see **Table 8-1**). Based on the CSMs developed and revised in light of the SI findings, there is a potential for exposure to drinking water receptors from sources on the facility resulting from a fire response from an adjacent location, outside of ARNG/DoD boundary limits. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
  - The detected concentrations of PFOA, PFOS, PFHxS, PFNA, and PFBS in soil were below their SLs.
  - PFHxS in groundwater exceeded the SL. PFHxS was detected above the SL of 39 ng/L at AOI01-10, with a concentration of 62.8 ng/L. The release at AOI 1 is attributed to emergency response activities being conducted off-facility on I-94 by multiple non-DoD entities. Since the groundwater exceedance is not associated with a DoD release, no further evaluation by ARNG G-9 at AOI 1 is warranted.

- At AOI 2:
  - The detected concentrations of PFOA, PFOS, PFHxS, PFNA, and PFBS in soil were below their SLs.
  - Detected concentrations in groundwater were below SLs. Based on the results of the SI, no further evaluation of AOI 2 is warranted.

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Semi-Truck Crash Storage Area and FCTC Wetland	◐	●	◐	Groundwater exceedance not associated with DoD release; no further action by ARNG G-9
2	Geo-Grid Fire	◐	◐	N/A	No further action

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

9. References

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