# FINAL
# Site Inspection Report
# Camp Atterbury
# Edinburgh, Indiana

Perfluorooctanesulfonic Acid (PFOS) and
Perfluorooctanoic Acid (PFOA) Impacted Sites
ARNG Installations, Nationwide

June 2022

Prepared for:

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## Acronyms and Abbreviations

| | |
|---|---|
| % | percent |
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| µg/kg | micrograms per kilogram |
| 6:2 FTS | 6:2 Fluorotelomer sulfonic acid |
| 8:2 FTS | 8:2 Fluorotelomer sulfonic acid |
| AECOM | AECOM Technical Services, Inc. |
| AFFF | aqueous film forming foam |
| AOI | Area of Interest |
| ARNG | Army National Guard |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CoC | chain of custody |
| CSM | conceptual site model |
| DA | Department of the Army |
| DO | dissolved oxygen |
| DoD | Department of Defense |
| DPT | direct-push technology |
| DQI | data quality indicator |
| DQO | data quality objective |
| DUA | data usability assessment |
| DVR | data validation report |
| EIS | extraction internal standards |
| ELAP | Environmental Laboratory Accreditation Program |
| EM | Engineer Manual |
| ERB | equipment rinsate blank |
| FedEx | Federal Express |
| FRB | field reagent blank |
| GPRS | Ground Penetrating Radar Systems, LLC. |
| HA | Health Advisory |
| HDPE | high-density polyethylene |
| IDEM | Indiana Department of Environmental Management |
| IDW | investigation-derived waste |
| IIS | injection internal standards |
| ITRC | Interstate Technology Regulatory Council |
| LC/MS/MS | liquid chromatography with tandem mass spectrometry |
| LCS | laboratory control spike |
| LCSD | laboratory control spike duplicate |
| LOD | limit of detection |
| LOQ | limit of quantitation |
| MDL | method detection limit |
| MS | matrix spike |
| MSD | matrix spike duplicate |

| | |
|---|---|
| NELAP | National Environmental Laboratory Accreditation Program |
| NEtFOSAA | N-ethyl perfluorooctanesulfonamidoacetic acid |
| ng/L | nanograms per liter |
| NMeFOSAA | N-methyl perfluorooctanesulfonamidoacetic acid |
| NTU | nephelometric turbidity unit |
| ORP | oxidation-reduction potential |
| OSD | Office of the Secretary of Defense |
| PA | Preliminary Assessment |
| PFAS | per- and polyfluoroalkyl substances |
| PFBA | perfluorobutyrate |
| PFBS | perfluorobutanesulfonic acid |
| PFCs | perfluorinated compounds |
| PFDA | perfluorodecanoic acid |
| PFDoA | perfluorododecanoic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |
| PFTeDA | perfluorotetradecanoic acid |
| PFTrDA | perfluorotridecanoic acid |
| PFUdA | perfluoroundecanoic acid |
| PID | photoionization detector |
| PQAPP | Programmatic UFP-QAPP |
| PVC | poly-vinyl chloride |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| QSM | Quality Systems Manual |
| RI | Remedial Investigation |
| RPD | relative percent differences |
| SI | Site Inspection |
| SL | screening level |
| SOP | standard operating procedure |
| TCRA | Time Critical Removal Action |
| TOC | total organic carbon |
| TPP | Technical Project Planning |
| UCMR 3 | Unregulated Contaminant Monitoring Rule 3 |
| 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 |
| USGS | United States Geological Survey |

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# Executive Summary

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at per- and polyfluoroalkyl substances (PFAS)-impacted sites at ARNG facilities nationwide. The objective of the SI at each facility is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutanesulfonic acid (PFBS) at or above screening levels (SLs). An SI was completed at Camp Atterbury Joint Maneuver Training Center (Camp Atterbury) in Edinburgh, Indiana. Camp Atterbury will also be referred to as the "facility" throughout this document.

Camp Atterbury occupies 34,986 acres located off County Road 800 South (also referred to as Old Hospital Road), approximately 3.5 miles west of the City of Edinburgh, Indiana. The facility is currently home to the majority of Indiana ARNG (INARNG) activity within the state of Indiana and provides training to both civilian and military personnel for support in missions both foreign and domestic. In 1988, 650 acres of the facility were licensed to operate an air-to-ground firing range, which is in operation to this day (Parsons, 2007).

During the PA for PFAS, five potential PFAS release areas were identified: Former Fire Station 592, Former Fire Station 325, the Current Fire Station, the Former Tri-Max™ Storage Area, and the Current Tri-Max™ Storage Area (AECOM, 2020). PFAS-containing aqueous film forming foam (AFFF) may have been released during equipment malfunctions at the two Former Fire Stations 592 & 325, drainage of firetruck equipment at the Current Fire Station, or accidental leakage of Tri-Max™ units stored in the Former and Current Tri-Max™ Storage Areas. The potential PFAS release areas were grouped into four AOIs, AOI 1, AOI 2, AOI 3, and AOI 4, which were investigated during the SI. The SI field activities were conducted from 16 to 20 August 2021 and included the collection of soil and groundwater samples.

To fulfill the project Data Quality Objectives set forth in the approved SI Quality Assurance Project Plan Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 PFAS by liquid chromatography with tandem mass spectrometry compliant with Quality Systems Manual 5.3 Table B-15. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.9** of this Report.

The DoD has adopted a policy to retain facilities in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). 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 three compounds: PFOS, PFOA, and PFBS.

The SLs are presented on **Table ES-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain the 18 PFAS analyzed within the boundaries of the facility.

Sample chemical analytical concentrations were compared against the project SLs as described in **Table ES-1**. A summary of the results of the SI data relative to the SLs is as follows:

- PFBS in groundwater at AOI 3 exceeded the SL of 600 nanograms per liter (ng/L), with a concentration of 2,160 ng/L. Based on the results of the SI, further evaluation of AOI 3 is warranted in the Remedial Investigation (RI).

- At AOI 1, AOI 2, AOI 4, and in the existing Camp Atterbury monitoring wells, detected concentrations of PFOA, PFOS, and PFBS in groundwater were below SLs.
- The detected concentrations of PFOA, PFOS, and PFBS in soil at all AOIs were below the SLs.

**Table ES-2** summarizes the SI results for soil and groundwater. Based on the conceptual site models developed and revised in light of the SI findings, there is potential for exposure of on-facility and off-facility receptors caused by DoD activities at the facility.

**Table ES-3** summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOI 3: Former Tri-Max™ Staging Area. The small AFFF release which occurred after the SI at AOI 2: Current Fire Station will also be evaluated during the RI phase.

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

| Analyte | 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** | 130 | 1,600 | 40 |
| **PFOS** | 130 | 1,600 | 40 |
| **PFBS** | 1,900 | 25,000 | 600 |

Notes:

a.) Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 15 September 2021.

## Table ES-2: Summary of Site Inspection Findings

| AOI | Potential PFAS Release Area | Soil – Source Area | Groundwater – Source Area | Groundwater – Facility Boundary |
|---|---|---|---|---|
| 1 | Former Fire Station 592 | ◐ | ◐ | N/A |
| | Former Fire Station 325 | ◐ | ◐ | N/A |
| 2 | Current Fire Station | ◐ | ◐ | N/A |
| 3 | Former Tri-Max™ Staging Area | ◐ | ● | N/A |
| 4 | Current Tri-Max™ Staging Area | ◐ | ◐ | N/A |
| Sitewide Wells[1] | Unknown | N/A[2] | ◐ | N/A |

Legend:

N/A = not applicable

1) Sitewide wells are not associated with a source area.

2) Soil data were not collected at existing wells.

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

## Table ES-3: Site Inspection Recommendations

| AOI | Description | Rationale | Future Action |
|---|---|---|---|
| 1 | Former Fire Station AFFF Discharge | Detections in soil and groundwater but no exceedances of SLs. | No further action |
| 2 | Current Fire Station | Detections in soil and groundwater but no exceedances of SLs. Small AFFF release occurred after the SI was performed. | Evaluate the AFFF release during RI |
| 3 | Former Tri-Max™ Staging Area | Exceedance of SL in groundwater. Detections in soil but no exceedance of SLs. | Proceed to RI |
| 4 | Current Tri-Max™ Staging Area | Detections in soil and groundwater but no exceedances of SLs. | No further action |
| Sitewide Wells | Existing onsite wells | Detection in groundwater but no exceedances of SLs. | No further action |

# 1. Introduction

## 1.1 Project Authorization

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites, ARNG Installations, Nationwide. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor, AECOM Technical Services, Inc. (AECOM), under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017. The ARNG performed this SI at Camp Atterbury in Edinburgh, Indiana. Camp Atterbury 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; 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 including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as per- and polyfluoroalkyl substances (PFAS). The term PFAS is used throughout this report to encompass all PFAS chemicals being evaluated, including PFOA, PFOS, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the task order.

## 1.2 SI Purpose

A PA was performed at Camp Atterbury (AECOM, 2020) that identified five potential PFAS release areas at the facility, which were grouped into four Areas of Interest (AOIs). Additional information obtained after the PA resulted in the relocation of one of the AOIs. The objective of the SI is to identify whether there has been a release to the environment from the AOIs and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

As stated in the *Federal Facilities Remedial Site Inspection Summary Guide* (USEPA, 2005), an SI has five goals:

1. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment;
2. Determine the potential need for a removal action;
3. Collect or develop data to evaluate potential release;
4. Collect data to better characterize the release for more effective and rapid initiation of a Remedial Investigation (RI), if determined necessary; and
5. Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD).

In addition to the USEPA-identified goals of an SI, the ARNG SI also identifies whether there are potential off-facility PFAS sources.

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# 2. Facility Background

## 2.1 Facility Location and Description

Camp Atterbury Joint Maneuver Training Center is the principle ARNG facility in the state of Indiana and comprises approximately 34,986 acres (**Figure 2-1**). This current square footage has been the footprint of Camp Atterbury since 1968, when approximately 7,000 acres of the facility north of Old Hospital Road were transferred to the Indiana Department of Natural Resources Division of Fish and Wildlife. The main gate is located off County Road 800 South (also referred to as Old Hospital Road), approximately 3.5 miles west of the city of Edinburgh.

Camp Atterbury opened in August 1942 as a combat training camp for soldiers during World War II before being deactivated by the US War Department, now called the DA, in 1946. Camp Atterbury was reopened as a training camp in 1950, during the Korean War, before being deactivated again in 1954, and it remained dormant until 1 April 1969, when the Secretary of the Army issued a license for 33,141.76 acres from the total 33,194 acres to be used for National Guard purposes by the Indiana ARNG (INARNG). A 5-year license was issued every 5 years until 1982, when a 25-year license was issued. In July of 1988, the license was amended and made valid for an indefinite period. On 25 August 1988, 650 acres of the facility were licensed for an indefinite period for exclusive use by the Air National Guard to operate an air-to-ground firing range, which is still in operation to this day (Parsons, 2007).

Since serving as a training center for INARNG troops during Vietnam and Operation Desert Storm, Camp Atterbury has continued to provide training to military and civilians into the present day, supporting the stability efforts in the Middle East as well as domestic emergency responses.

## 2.2 Facility Environmental Setting

The facility is located on the border between Central and Southern Indiana. The geography of Central Indiana includes hills and sandstone ravines carved by retreating glaciers (USEPA, 1998). Southern Indiana is known for limestone and is one of the largest limestone quarry regions in the US.

Camp Atterbury lies in Johnson, Brown, and Bartholomew Counties. This area covers New Castle Till Plains and Drainageways in the Central Till Plain Region and the Norman Upland and Scottsburg Lowland Sections in the Southern Hills and Lowlands Region (Gray, 2001). The Scottsburg Lowland Section has alluvial and lacustrine plains that border major streams (Homoya et al., 1985); the major soils are acid to neutral silt loams.

The facility is located in the Loamy High Lime Till Plain, in the Eastern Corn Belt Plains Ecoregion (USEPA, 1998). The terrain is nearly level and originally hosted beech forests, oak-sugar maple forests, and elm-ash swamp forests. Much of the forested area has been replaced by agriculture. The stream chemistry and turbidity are unaffected by corn, soybean, and livestock production in the area, and water sampling has demonstrated water effluent from Camp Atterbury has lower levels of contaminants than the surrounding waterways. The loss of the forest has also meant the decline of species like the tree sparrow. The land has an elevation that ranges from 610 to 930 feet above sea level **(Figure 2-2)**. Some information for the below geologic and hydrogeologic sections was adapted from the Camp Atterbury Operational Range Assessment Phase II Report (AECOM, 2014).

### 2.2.1 Geology

The surficial geology consists predominantly of Quaternary-aged deposits (**Figure 2-3**). The Jessup, Trafalgar, and Atherton formations are the result of past glacial advances through this region, with the most recent glacial period, the Wisconsin glaciation, having occurred 10,000 years ago. The deposits resulting from the Wisconsin glaciation occupy the northeastern third of Camp Atterbury, including the entirety of the area investigated during the SI. The western and southwestern portions of Camp Atterbury are mapped as the bedrock region, consisting of late Devonian and Mississippian siltstones and shales. The modern alluvial deposits of the Martinsville Formation overlay both the glacial deposits and bedrock units, where recent erosional and depositional processes have occurred across Camp Atterbury. The Quaternary-aged geologic strata found at the facility are listed below from youngest to oldest:

- The Martinsville Formation is comprised of fine-grained, poorly sorted materials derived from post-glacial alluvial deposits (Weston, 1993). The formation ranges in thickness up to 15 feet and overlies the glacial deposits and bedrock units across much of the facility where older material has been reworked (US Geological Survey [USGS], 2006).
- Quaternary glacial deposits range in thickness from 0 feet on the southwestern Norman Upland to greater than 150 feet in the northeastern Scottsburg Lowland (Weston, 1993). These deposits typically overlie bedrock in the region. Each glacial formation is described below:
    - The Atherton Formation consists of extraglacial deposits of lacustrine facies and outwash facies. The lacustrine facies are generally well-sorted silts and clays originating as lake deposits. The outwash formations are coarse-grained, moderately to well-sorted sands and gravels.
    - The Trafalgar Formation is also a fine-grained, poorly sorted glacial till from the Wisconsin glaciation.
    - The Jessup Formation is defined as fine-grained, poorly sorted pre-Wisconsin age glacial till.

Bedrock units present at Camp Atterbury include the Borden Group and the New Albany Shale**.** The Borden Group consists of Lower Mississippian siltstone, shale, and sandstone with intermittent patches of limestone. The unit is prevalent in the western and central portions of Camp Atterbury, with joint orientation trending east-west (Weston, 1993). No information is available regarding the thickness of the Borden Group. The New Albany Shale underlies the Borden Group and consists of late Devonian black and greenish-gray shale with significant amounts of organic matter. The unit is exposed in the eastern portions of Camp Atterbury, with joint orientation trending northwest-southeast. At Camp Atterbury, the New Albany Shale is approximately 100 to 110 feet thick (Weston, 1993). Both bedrock units dip to the southwest (Gray et al., 1987). Measurements at two locations less than 1-mile east of the AOIs (i.e., the investigation area) indicate the depth to bedrock may be around 80 to 140 feet below ground surface (bgs) (Indiana Department of Natural Resources, 2020). Bedrock was not encountered during the SI in soil borings completed to depths up to 30 feet bgs.

### 2.2.2 Hydrogeology

Four hydrogeologic regions exist at Camp Atterbury, including the Jessup Till, Trafalgar Till, Atherton Outwash, and Bedrock regions. The AOIs investigated in the SI are located within the Trafalgar Till and the Atherton Outwash regions. All four regions are presented below (USGS, 2006):

- The Trafalgar Till Region is located in the northern portions of Camp Atterbury, roughly north of County Line Road and Wilder Road. Isolated regions also occur on the western

portion of the facility. The southern limits of this region represent the southernmost limits of the Wisconsin glaciation. This region is characterized by the Trafalgar Formation underlain by the Atherton Formation outwash facies and the Jessup Formation. The Trafalgar Formation ranges from 10 to 30 feet thick and overlies the Jessup Formation, which ranges between 25 and 50-feet thick. The outwash facies of the Atherton Formation are generally thin, except north of County Line Road, where the Atherton Formation was recorded as around 40-feet thick. Tills are fine-grained and do not transmit water readily; therefore, they can be considered aquitards.

- The Atherton Outwash Region is characterized by the outwash facies of the Atherton Formation. Over- or underlying lacustrine facies and underlying Jessup Formation may also be present. The Atherton Outwash Region has the highest potential for groundwater yields in this region and is located in the lowland and stream valleys of the Lick, Nineveh, Prince, Mud, and Saddle Creeks and Muddy Branch. Thicknesses of the Atherton Formation vary greatly throughout this region, with the outwash facies ranging from 4 to 25-feet thick and the lacustrine facies ranging up to 20-feet thick. Depth to bedrock ranges from approximately 45 to 125 feet.
- The Jessup Till Region is located in the southeastern portion of Camp Atterbury and is characterized by the Jessup Formation, with interbedded, thin deposits of the Atherton Formation. The fine-grained materials present in the Jessup Till make it a poorly suited for groundwater storage. This region is hydraulically side gradient to the study area.
- The Bedrock Region is located in the southwestern portion of Camp Atterbury. This region consists of unconsolidated Martinsville Formation deposits overlying the bedrock of the Borden Group. Groundwater in this region occurs primarily in the unconsolidated materials in the Martinsville Formation. The Borden Group is largely considered an aquitard, though the secondary porosity created by joints and fractures in the bedrock do yield some groundwater. The Bedrock Region is hydraulically upgradient of the study area.

These hydrogeologic regions are not confined from one another, and groundwater moves vertically from the land surface, through the unsaturated zone and, where present, through low-permeable, semi-confining layers (which are not laterally extensive) to recharge water in glacial or bedrock aquifers. Groundwater-surface water interactions are likely occurring in some of the stream valleys, such as Nineveh and Lick Creeks (USGS, 2006). In dry weather, stream flow and lake levels are maintained by groundwater discharge (USGS, 2004). Based on topography and soil types, the Atherton Outwash and Trafalgar Till regions are identified as recharge areas (USGS, 2006). These recharge areas encompass the much of the northern portion of the facility under which the investigation area lies.

Depths to groundwater vary at Camp Atterbury and previous investigations have shown groundwater depths ranging from approximately 1 to over 50 feet bgs. Prior data from existing wells located closest to the investigation area suggested that groundwater near the AOIs would be encountered from 1 to 20 feet bgs (USGS, 2006). These findings were confirmed by the SI results, as depths to water in the temporary monitoring wells installed during the SI ranged between 4.02 feet bgs and 16.78 feet bgs. Similar measurements were observed in the utilized existing permanent wells, where groundwater depths ranged between 1.33 feet bgs to 19.61 feet bgs. In a number of SI borings, the observed depth to groundwater as identified by saturated soils was deeper than the groundwater level later measured within the temporary well. This finding suggests that in some areas, groundwater transmissivity and flow may be primarily occurring within more permeable zones, an observation that is typical of glacial till.

Groundwater is primarily controlled by local topography and flows from the elevated regions down slope to the valley bottoms. Generally, regional groundwater flow at Camp Atterbury is to the east, toward Driftwood River; however, groundwater at the investigation area has been noted to first flow south-southeast and then to the east and off the facility boundary (USGS, 2006).

Groundwater level measurements collected during the SI support this observation. Groundwater elevations, calculated using depth to groundwater measurements, were generally higher in the north and west parts of the investigation area and decreased towards the south. As a result, the SI findings show an overall southeasterly groundwater flow direction **(Figure 2-4)**. Localized groundwater flow directions within the investigation area vary somewhat but appear to correlate with the surrounding drainage patterns. Groundwater in bedrock flows through preferential pathways, such as bedding planes and fractures. Consequently, localized groundwater flow in the underlying bedrock may differ from the direction of the groundwater flow in the unconsolidated surficial deposits.

According to the Indiana Department of Natural Resources, there may be up to 1,100 groundwater wells within a 4-mile radius of Camp Atterbury (Indiana Department of Natural Resources, 2020), which is a significant increase from the early 1990s, when there were approximately 200 to 300 registered drinking water wells (Weston, 1993). These wells range in depth from approximately 24 to 240 feet; static water depths range from approximately 10 to 70 feet.

Based on a review of Wellhead Protection Plans from Princes Lake Utilities, the Town of Edinburgh, and Eastern Bartholomew Water Corporation, the groundwater flow within the area of their supply wells is flowing in a south-southwest direction, originating from areas greater than 4 miles northeast of Camp Atterbury. The Camp Atterbury Water System purchases groundwater from the Prince's Lake Water Department (Atterbury-Muscatatuck Installation, 2018). Prince's Lakes Water Department pumps its water from a group of groundwater wells within the Scottsburg Lowland Aquifer north of the town of Edinburgh, Indiana, which is located to the northeast of Camp Atterbury. The Town of Edinburgh's water supply is located within 0.25 miles of the Princes Lake supply wells. These wells are screened in the Atherton Outwash deposits along the Big Blue River and Sugar Creek and are screened from approximately 70 to 100 feet bgs.

Based on the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR 3) data, it was indicated that no PFAS were detected in a public water system above the Health Advisory (HA) within 20 miles of the facility (USEPA, 2017a). The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed during the UCMR3 had method detection limits (MDLs) that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

### 2.2.3 Hydrology

Surface water features at Camp Atterbury include streams, lakes, and ponds. Surface water features near the investigation area include several small unnamed creeks that drain into Nineveh Creek, which flows from the northwestern portion of the facility to the east and drains into Driftwood River (**Figure 2-5**). The majority of surface water at Camp Atterbury ultimately flows to the Driftwood River, which runs from north to south along the eastern boundary of the facility. The Driftwood River is not identified for use as a drinking water supply, though two surface water intakes for irrigation use were identified on the river, the nearest of which is approximately 6 miles downstream from the investigation area (Indiana Department of Natural Resources, 2021). The confluence of the Driftwood River, Sugar Creek, and the Big Blue River is at the northeastern corner of Camp Atterbury, at one of the region's lowest points of elevation (Youngs Creek Advisory Group, 2003). The facility spans sections of six different watersheds; however, the investigation area is located within the Nineveh Creek Watershed.

### 2.2.4 Climate

Summer temperatures in Central Indiana range from 65.1 degrees Fahrenheit (°F) to 84.5 °F, while winter temperatures in Central Indiana range from 22.2 °F to 37.9 °F (National Weather Service, 2018). The area experiences significant precipitation year-round, with an average of 42

inches of rain and 26 inches of snow annually. In 2008, the area was impacted by a tornado that destroyed several buildings at Camp Atterbury.

### 2.2.5 Current and Future Land Use

Camp Atterbury is currently home to the majority of INARNG activity within the state of Indiana and provides training to both civilian and military personnel for support in missions both foreign and domestic. Reasonably anticipated future land use is not expected to change from the current land use.

### 2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following birds, plants, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Bartholomew, Brown, and Johnson Counties, Indiana (US Fish and Wildlife Service [USFWS], 2021).

- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Mammals**: Northern long-eared bat, *Myotis septentrionalis* (threatened), Indiana bat, *Myotis sodalis* (endangered)
- **Clams:** Snufflebox mussel, *Epioblasma triquetra*, (endangered), Rayed Bean, *Villosa fabalis*, (endangered)

## 2.3 History of PFAS Use

Five potential PFAS release areas were identified at Camp Atterbury at locations where aqueous film forming foam (AFFF) may have been used or released historically. These areas include: Former Fire Station 592, Former Fire Station 325, the Current Fire Station, the Former Tri-Max™ Storage Area, and the Current Tri-Max™ Storage Area. An additional potential release area was identified in the PA (AECOM, 2020) but was later removed after it was determined that fire response operations at this location terminated prior to AFFF's use by the DoD (AECOM, 2021a).

Foam-containing firefighting equipment was known to have been present at the two Former Fire Stations, 592 & 325, from as early as the 1980s. An unknown type of foam was released from an equipment malfunction at Former Fire Station 592 in the late 1990s. Photographic evidence dating back to the 1980's shows the presence of foam-equipped firetrucks at adjacent Fire Station 325. The Current Fire Station was constructed in 2007 and houses an AFFF-equipped firetruck in addition to being used for the storage of bulk AFFF containers. There is no known release of AFFF at the fire station, but facility personnel noted that equipment was occasionally drained in the grassy area near the building. The Former and Current Tri-Max™ Storage Areas are locations where Tri-Max™ mobile fire extinguishers have been staged long term. No recorded releases or spills of AFFF at either the Former or Current Tri-Max™ Storage Areas have occurred. The potential PFAS release areas were grouped into four AOIs based on proximity to one another and presumed groundwater flow. Descriptions of AOI 1, AOI 2, AOI 3, and AOI 4 are presented in **Section 3.**

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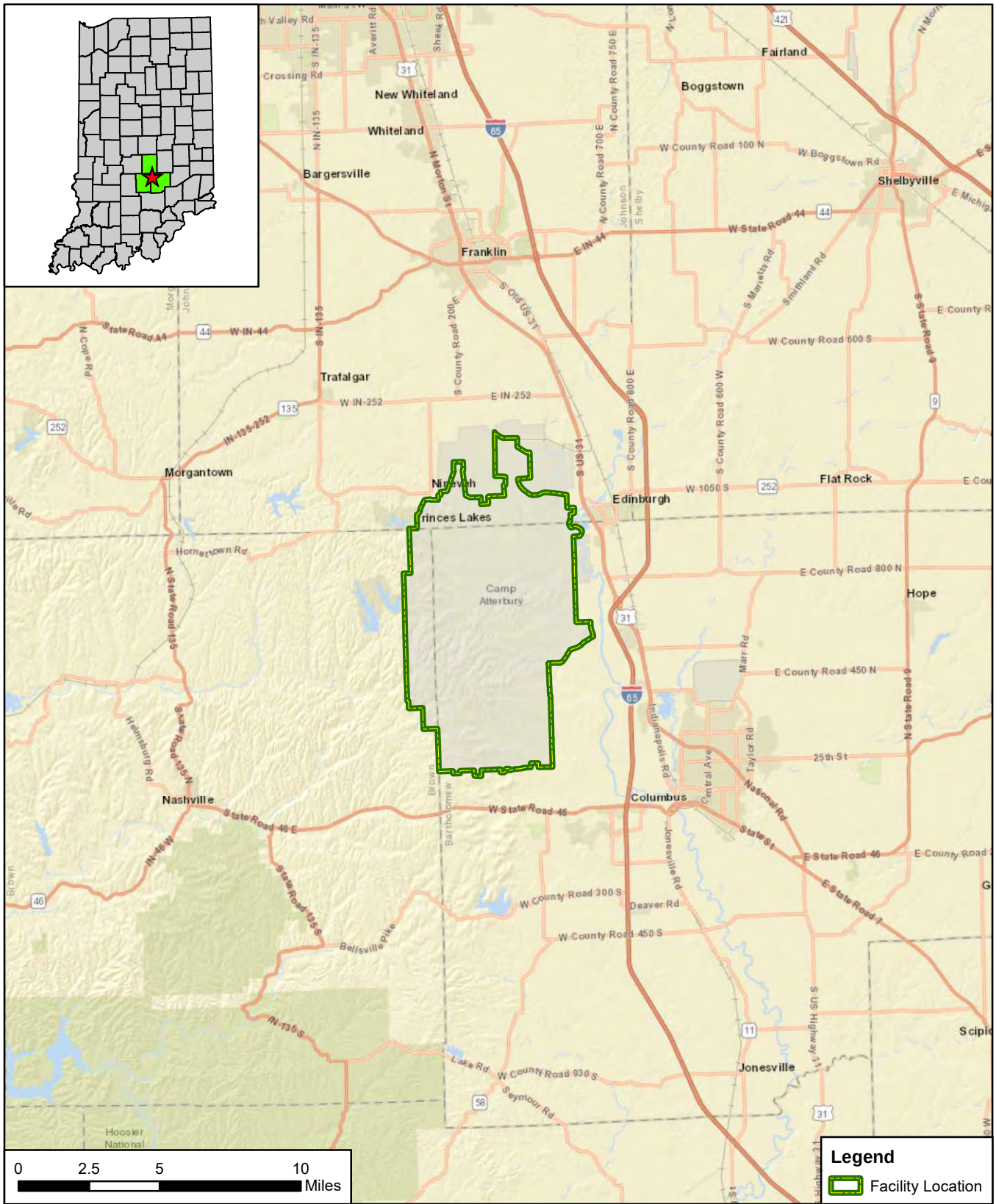


| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| NOTES | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 11/17/2021 | GIS BY | MS | 11/17/2021 |
| SCALE | 1:316,800 | CHK BY | MC | 11/17/2021 |
| Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, | | PM | CM | 11/17/2021 |

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# Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 2-1**

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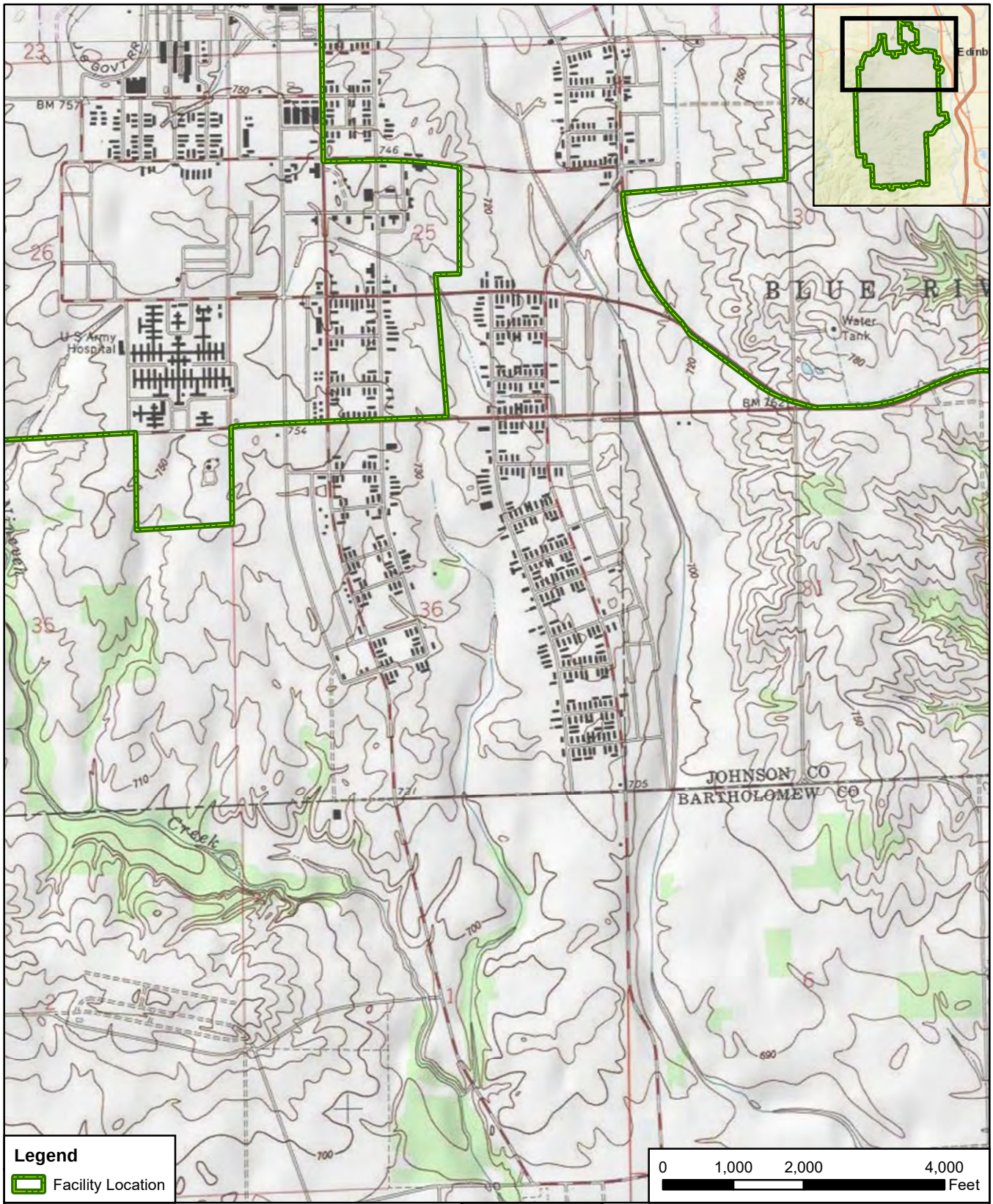


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| NOTES | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 2/28/2022 | GIS BY | MS | 2/28/2022 |
| SCALE | 1:24,000 | CHK BY | MC | 2/28/2022 |
| Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, | | PM | CM | 2/28/2022 |

**Facility Topography**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 2-2**

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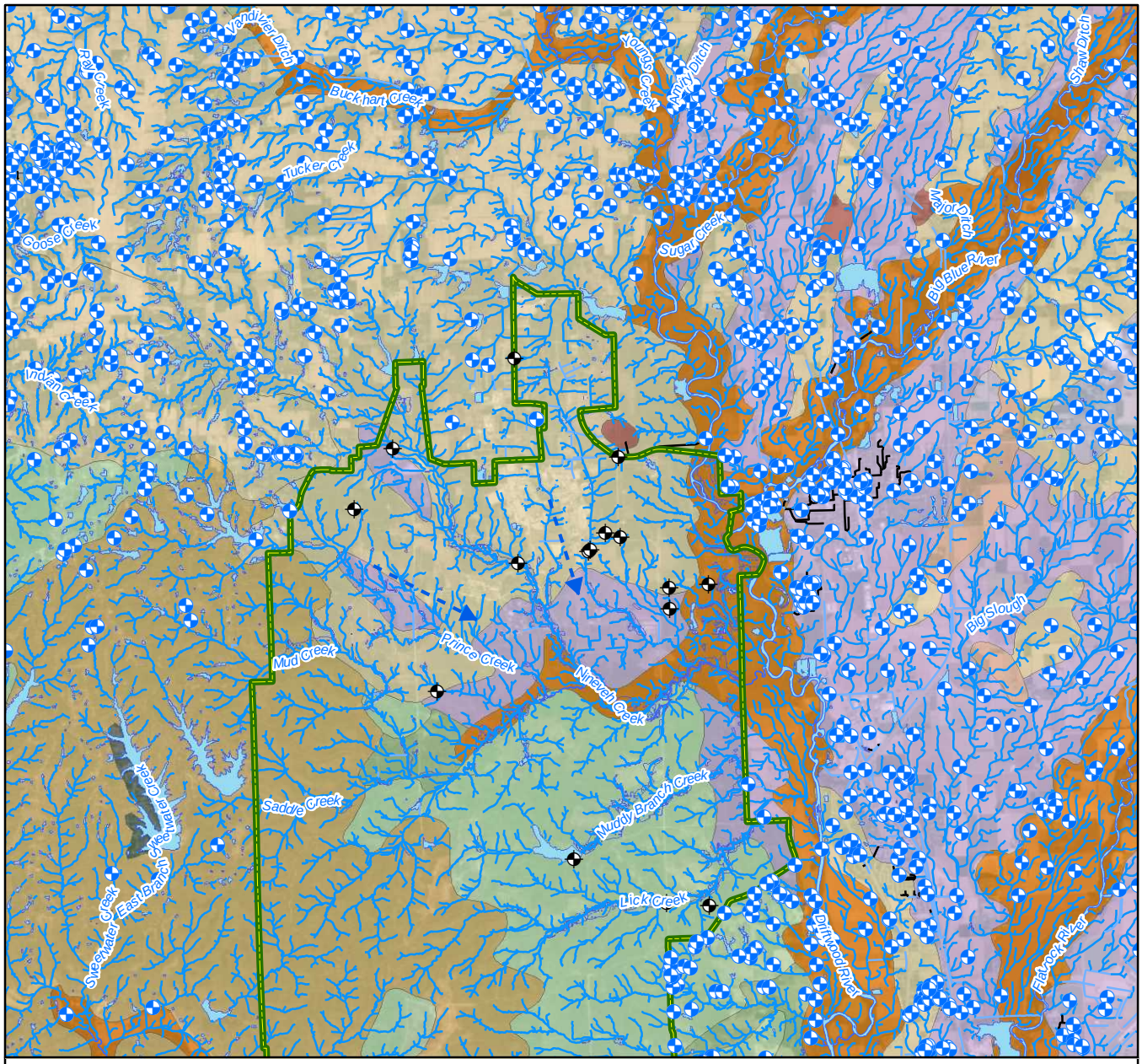


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| SCALE | 1:126,720 | CHK BY | MC | 12/14/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, | | PM | CM | 12/14/2021 |

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# Groundwater Features

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**Figure 2-3**

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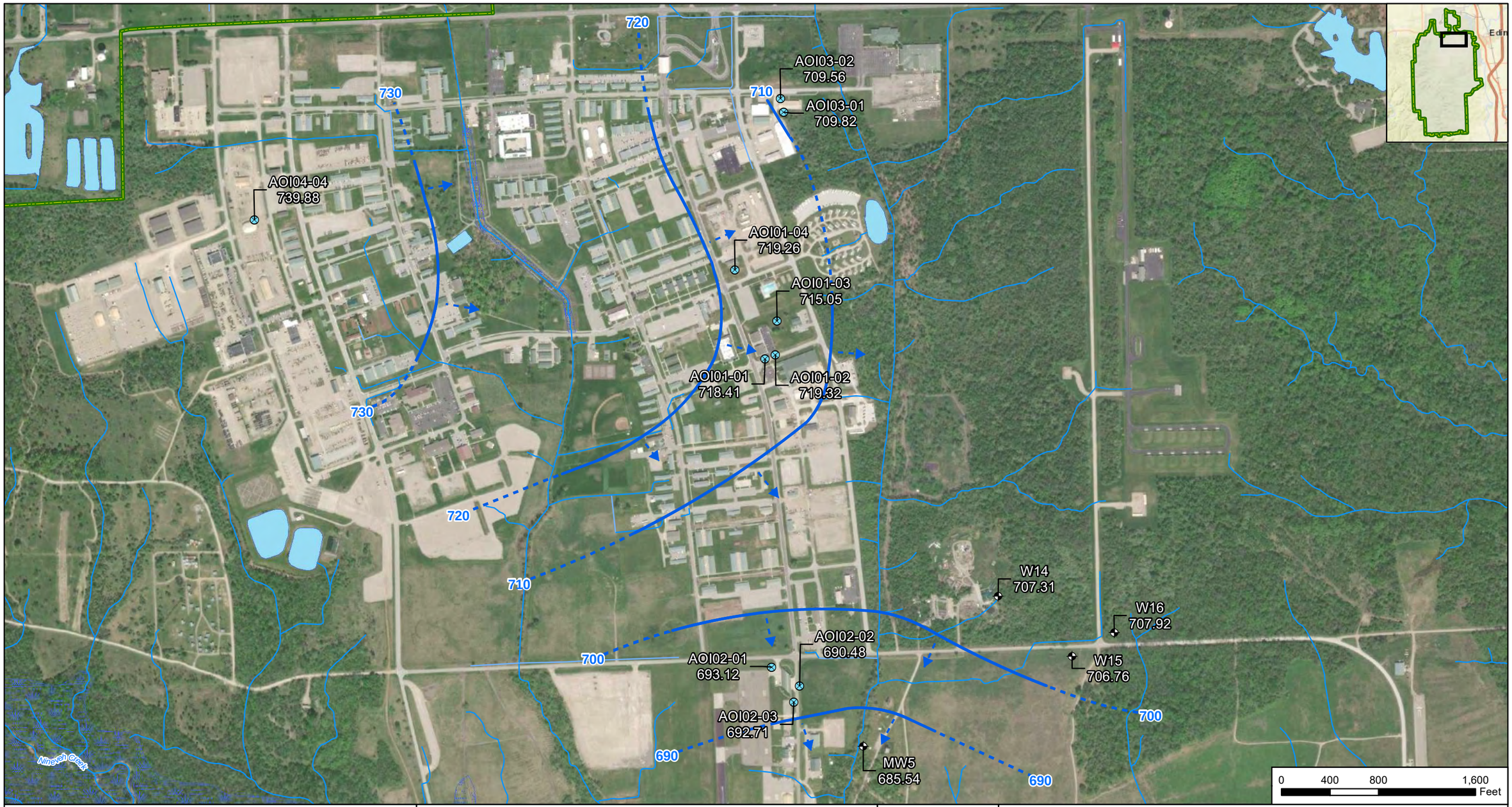


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| REVISED | 12/7/2021 | GIS BY | MS | 12/7/2021 |
| SCALE | 1:592,900 | CHK BY | MC | 12/7/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/7/2021 |

- Temporary Monitoring Well/Soil Boring
- Existing Monitoring Well
- Facility Location
- Water Body
- River/Stream
- Canal/Ditch
- Groundwater Elevation Contour
- Inferred Groundwater Elevation Contour
- Groundwater Flow Direction

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## Groundwater Elevation Contours

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**Figure 2-4**

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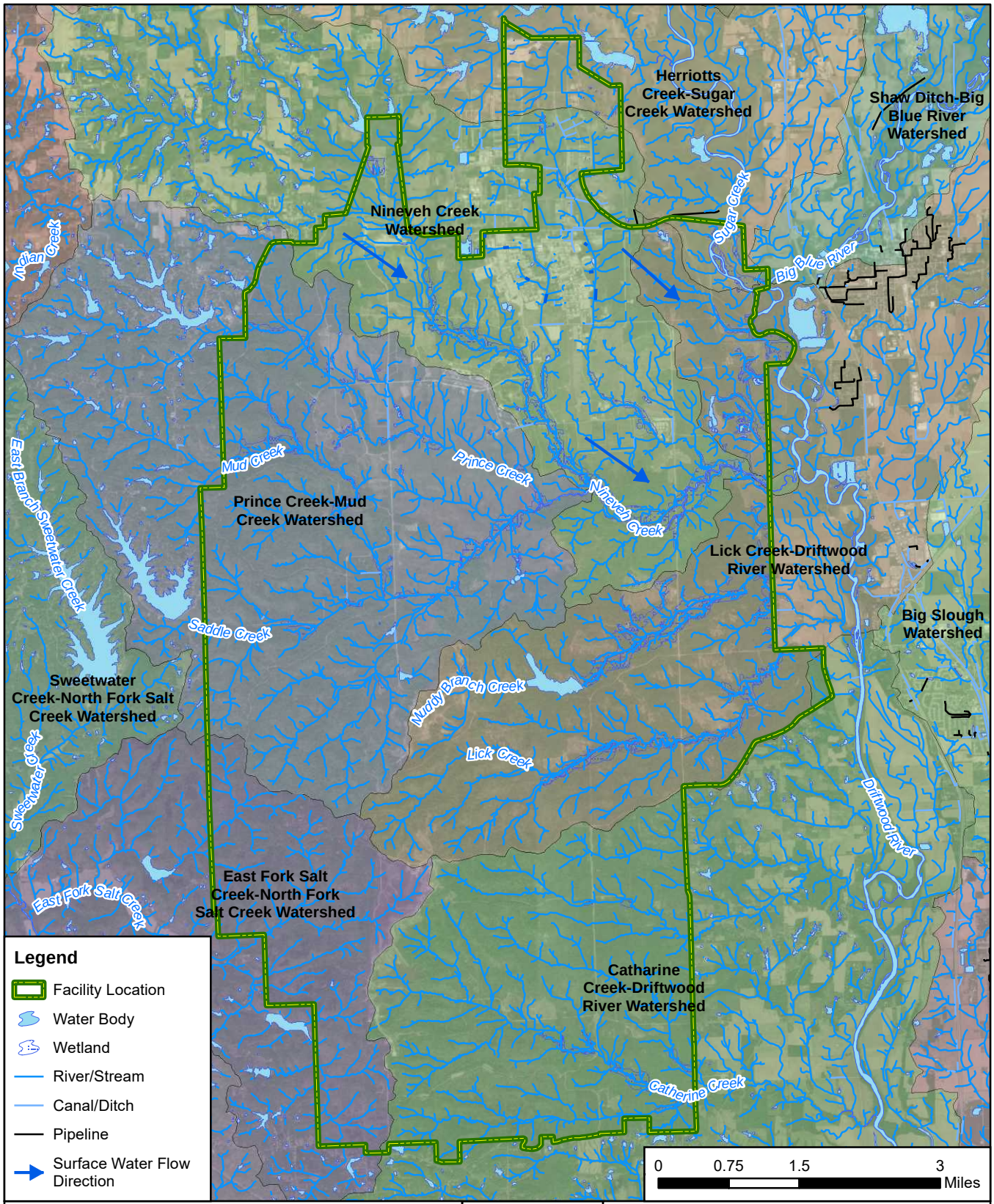


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| CLIENT | ARNG | | | |
| NOTES | Site Inspection for PFAS at Camp Atterbury, IN | | | |
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| SCALE | 1:95,040 | CHK BY | MC | 11/17/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, | | PM | CM | 11/17/2021 |

# Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 2-5**

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# 3. Summary of Areas of Interest

PFAS were potentially released to soil and groundwater within the boundary of Camp Atterbury through accidental discharge and storage of AFFF. Four AOIs were identified based on preliminary data and made up of five potential PFAS release areas: Former Fire Station 592, Former Fire Station 325, the Current Fire Station, the Former Tri-Max™ Storage Area, and the Current Tri-Max™ Storage Area. The potential PFAS release areas are shown on **Figure 3-1**.

## 3.1 AOI 1 Former Fire Station AFFF Discharge

AOI 1 encompasses two adjacent former fire stations located centrally within the Cantonment, Former Fire Station 592 (previously referred to in the PA report as Building 244, or Former Fire Station 244) and Former Fire Station 325. Information obtained during the PA indicated that foam-containing firefighting equipment was present at Camp Atterbury as early as the 1980s. While information dating back to this time period is limited in detail regarding type of foam or known use of AFFF, evidence suggests that AFFF was likely present at both former fire stations.

Former Fire Station 325 was used until the 1990s, prior to the use of Former Fire Station 592. Photographic records dating to the 1980s show foam-equipped firetrucks at Former Fire Station 325. In the late 1990s, fire equipment stored in Former Fire Station 592 malfunctioned and released firefighting foam within the building. The details of the release, such as type of foam and volume, are unknown, as are any cleanup efforts. It is unknown if the building was constructed with floor drains; however, it is considered likely that the discharged foam may have been physically pushed and rinsed out of the building. Former Fire Station 592 was replaced by the Current Fire Station and was destroyed shortly afterward by a tornado in 2008. An office building and paved lot has since been constructed at the location of Former Fire Station 592. Former Fire Station 325 has been repurposed as a facility vehicle fleet garage.

## 3.2 AOI 2 Current Fire Station

AOI 2 is the Current Fire Station for Camp Atterbury. The fire station was constructed in 2007 and is located adjacent to the Himsel Army Airfield. The Current Fire Station houses a 2011 Oshkosh firetruck that holds 420 gallons of AFFF. Additionally, eight 55-gallon drums of 3 percent (%) Chemguard AFFF are staged within the Current Fire Station bays. There was no evidence of AFFF leaks or accidental spills at AOI 2 with either the firetruck or stored AFFF. The PA Report noted that no testing, training, or other AFFF discharges of any kind were conducted with the firetruck since it was acquired in 2011. However, information obtained by Camp Atterbury personnel since the PA Report was finalized indicated that historically, the firetruck's equipment was occasionally drained on the grassy area immediately northwest of the Fire Station. Personnel were not able to confirm whether only water was drained from the equipment or if it contained AFFF. No information was available regarding the volume discharged or frequency of these events. An AFFF release occurred at the Current Fire Station in May 2022, after the SI was performed. Approximately 1 gallon of Ansulite 3% AFFF was noted to have been released to the riprap-lined drainage ditch at the northwest corner of the Fire Station building. The AFFF was rinsed with roughly 20 gallons of water.

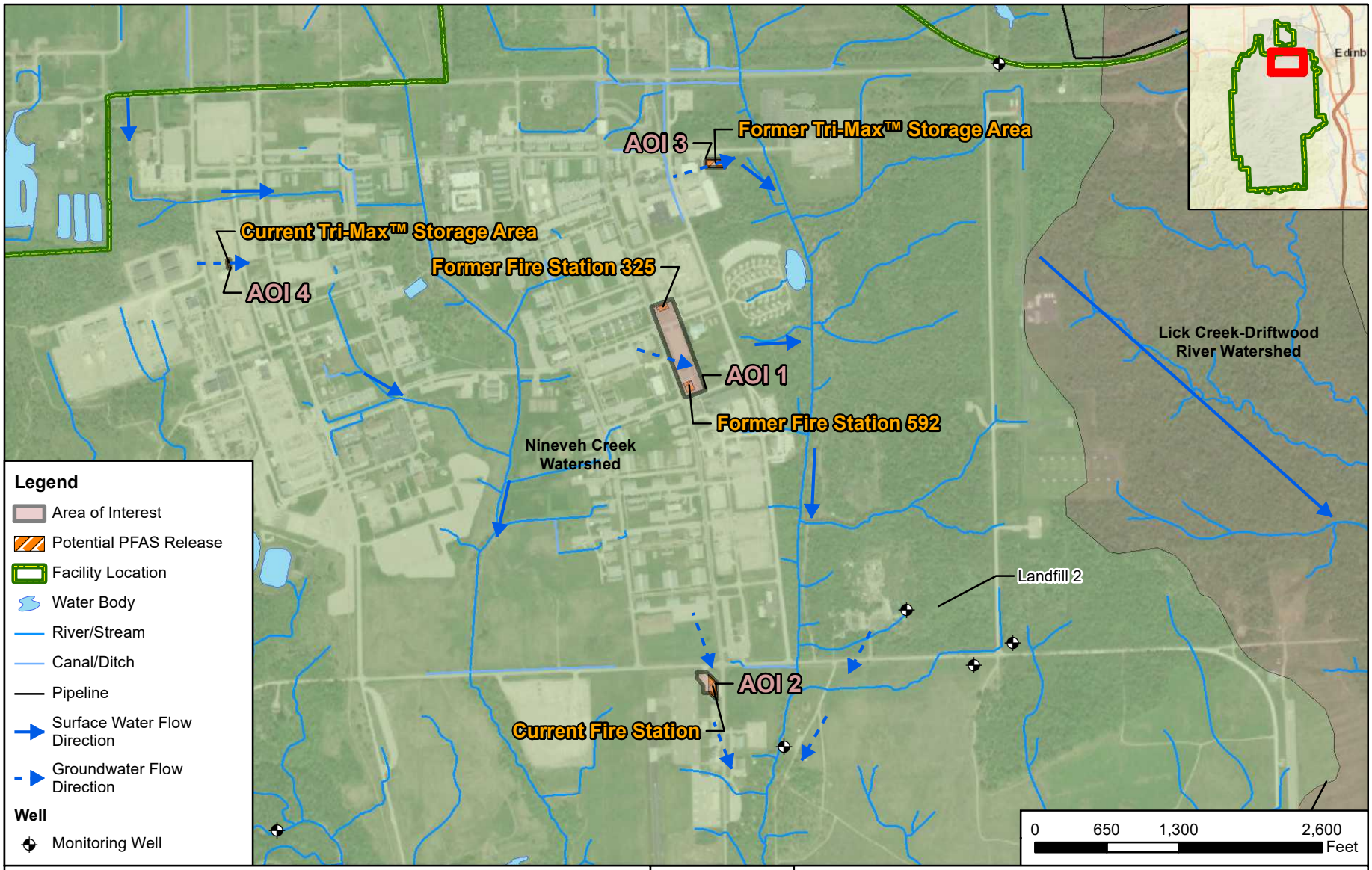
## 3.3 AOI 3 Former Tri-Max™ Storage Area

AOI 3 is the Former Tri-Max™ Storage Area, which is a soft-sided, framed storage building located in the northern part of the Cantonment. AOI 3 is the previous staging location of four Tri-Max™-30 emergency response crash carts containing expired 3% AFFF. The Tri-Max™-30 units were acquired in 2004 from Shelbyville Army Aviation Support Facility and were maintained full of AFFF

at this location until 2020. During that time, there were no recorded releases or spills of AFFF at the Former Tri-Max™ Storage Area. The PA report previously identified AOI 3 as the Tri-Max™ Storage Area, which was consistent with the findings of the 2018 site visit. However, information provided by facility personnel since the submittal of the PA indicated that the Tri-Max™-30 units were relocated in 2020 to another location. Details of the current disposition of the Tri-Max™-30 units are discussed later for AOI 4.

## 3.4 AOI 4 Current Tri-Max™ Storage Area

AOI 4 is the Current Tri-Max™ Storage Area, located in the salvage yard at the western side of the Cantonment. In 2020, the four Tri-Max™-30 units that were previously stored at AOI 3 were moved to this location. The Tri-Max™-30 units are currently staged in two separate pairs on the open gravel lot. There are no recorded releases or spills of AFFF at the Current Tri-Max™ Storage Area, and visual observations indicate that the units are still filled with expired 3% AFFF. The relocation of the Tri-Max™-30 units was not identified until after the PA report was finalized; therefore, this area was not listed as an AOI in the PA report.

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| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 12/8/2021 | GIS BY | MS | 12/8/2021 |
| SCALE | 1:15,600 | CHK BY | MC | 12/8/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/8/2021 |

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TITLE

**Areas of Interest**

AECOM

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Germantown, MD 20876

**Figure 3-1**

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# 4. Project Data Quality Objectives

Project Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support the project decision-making process. The specific DQOs established for this facility are described below. These DQOs were developed in accordance with the USEPA's seven-step iterative process (USEPA, 2006).

## 4.1 Problem Statement

The following problem statement was developed during project planning:

The presence of PFAS, which may pose a risk to human health or the environment, in environmental media at the facility is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve.

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 Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI with which the sample is associated will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS.

The SLs are presented in **Section 6.1** of this Report.

The following quotes from the DA policy documents form the basis for this project (DA, 2016; DA, 2018):

- "The Army will research and identify locations where PFOS- and/or PFOA-containing products, such as AFFF, are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider FTAs, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas.".
- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination.".
- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA HA levels." (USEPA, 2016a; USEPA, 2016b).

## 4.2 Goals of the Study

The following goals were established for this SI:

1. Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.

2. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
3. Determine the potential need for a Time Critical Removal Action (TCRA) (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.
4. Collect data to better characterize the release areas for more effective and rapid initiation of a RI (if determined necessary).
5. If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the facility as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).
6. Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.

## 4.3 Information Inputs

Primary information inputs included:

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

## 4.4 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-1**). 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).

## 4.5 Analytical Approach

Samples were analyzed for PFAS by LC/MS/MS compliant with Table B-15 of DoD QSM 5.3 by Pace Analytical Gulf Coast, accredited under the 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 and decision rules as defined in the SI QAPP Addendum (AECOM, 2021a). These rules governed response actions based on the results of the SI sampling effort.

The decision rules described in the **Worksheet #11** of the SI QAPP Addendum identify actions based on the following:

Groundwater:

- Is there a human receptor within 4 miles of the facility?
- What is the concentration of PFOA, PFOS, and PFBS at the potential release areas?

- What is the concentration of PFOA, PFOS, and PFBS at the facility boundary upgradient and downgradient of the potential release areas?
- What does the conceptual site model (CSM) suggest in terms of source, pathway and receptor?

Soil:

- What is the concentration of PFOA, PFOS, and PFBS in shallow surface soil (0 to 2 feet bgs)?
- What is the concentration of PFOA, PFOS, and PFBS in deep soil (i.e., capillary fringe)?
- What does the CSM suggest in terms of source, pathway, and receptor?

Soil and groundwater samples were collected from each of the potential release areas. Groundwater was encountered at approximately 1.33 to 19.61 feet bgs.

## 4.6 Data Usability Assessment

The Data Usability Assessment (DUA) 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.

Data Quality Indicators (DQIs) (Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity) are important components in assessing data usability. These DQIs were evaluated in the subsequent sections and demonstrate that the data presented in this SI report are of high quality. Although the SI data are considered reliable, some degree of uncertainty can be associated with the data collected. Specific factors that may contribute to the uncertainty of the data evaluation are described below. The Data Validation Report (DVR) (**Appendix A**) presents explanations for all qualified data in greater detail.

### 4.6.1 Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate relative percent differences (RPD); laboratory precision is measured with calibration verification, internal standard recoveries, laboratory control spike (LCS) and matrix spike (MS) duplicate RPD.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established quality control (QC) criteria. No associated calibration verifications displayed results outside the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

LCS/LCS duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

MS/MS duplicate (MSD) samples were prepared, analyzed, and reported for all preparation batches. MS/MSD samples demonstrated that the analytical system was in control for the matrix

being tested. MS/MSD samples were submitted to the laboratory for analysis at a rate of 5%. The MS/MSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a) with limited exceptions. The MS/MSD performed on parent sample AOI03-01-SB-00-02 displayed RPDs greater than the established precision limits for 6:2 fluorotelomer sulfonic acid (6:2 FTS) and perfluorohexanoic acid (PFHxA). These results were associated with recoveries outside the control limits and were flagged for percent recovery anomalies, which were determined to cause the imprecision.

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for PFAS and general chemistry parameters. The field duplicate samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a) with several exceptions. The field duplicate performed on parent samples AOI03-02-SB-14-16 and W14-081721 displayed a positive result for several analytes, while the associated field duplicates displayed non-detect results. The field duplicate pair results associated with the duplicate imprecision were qualified as estimate and should be considered usable as qualified. The field duplicate performed on parent sample AOI02-03-GW displayed an RPD greater than the established precision limit presented in the QAPP Addendum (AECOM, 2021a). The associated field duplicate pair results were qualified as estimate and should be considered usable as qualified.

### 4.6.2 Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in the LCS/LCSD, MS/MSD, and surrogates.

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis. The LCS/LCSD samples were within the project established accuracy limits presented in the QAPP Addendum (AECOM, 2021a).

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. The MS/MSD samples were within the project established control limits presented in the QAPP Addendum (AECOM, 2021a) with limited exceptions. The MS/MSD performed on parent sample AOI03-01-SB-00-02 displayed percent recoveries greater than the upper QC limits for PFOS, 6:2 FTS, and PFHxA. The positive field sample result associated with the percent recovery exceedances was qualified as estimate with a high bias and should be considered usable as qualified. The remaining field sample results were non-detect and should be considered usable as reported.

Extraction internal standards (EIS) were added by the laboratory during sample extraction to measure relative responses of target analytes and used to correct for bias associated with matrix interferences and sample preparation efficiencies, injection volume variances, mass spectrometry ionization efficiencies, and other associated preparation and analytical anomalies. Field sample AOI01-03-SB-00-02 displayed EIS area counts greater than the project established limits presented in the QAPP Addendum (AECOM, 2021a) for two EIS. In both cases, the associated field sample results were non-detect and should be considered usable as reported.

Injection internal standards (IIS) were added by the laboratory after sample extraction and prior to analysis as a legacy requirement of DoD QSM 5.1 to measure relative responses of target analytes. Even though not required under the current DoD QSM 5.3 analysis, the IIS are still

added to the sample after extraction as an additional QC measure. The IIS percent recoveries were within the established precision limits presented in the QAPP Addendum (AECOM, 2021a).

### 4.6.3 Representativeness

Representativeness qualitatively expresses the degree to which data accurately reflect site conditions. Factors that affect the representativeness of analytical data include appropriate sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences.

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with DoD Quality Systems Manual (QSM) Table B-15, including the specific preparation requirements (i.e. ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in Table B-15 were monitored, standards that contained both branched and linear isomers when available were used, and isotopically labeled standards were used for quantitation.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. The laboratory used approved standard methods in accordance with the QAPP Addendum (AECOM, 2021a) for all analyses. All preservation techniques were followed by the field staff, and all technical and analytical holding times were met by the laboratory with limited exceptions. The holding time for pH analysis is considered ‘immediate’, so all pH sample results have been qualified as estimate.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. Several PFAS instrument blanks and one method blank displayed concentrations greater than the detection limit for multiple target analytes. Two field sample results were qualified “U” during data validation due to associated detections in instrument and/or method blanks. The reported numerical result values were adjusted to be equal to the limit of detection (LOD) or the LOD was elevated to the concentration of the blank detection in instances where the blank concentration was greater than the LOD. The results are usable as qualified but should be considered false positives and are treated as non-detect.

Field blanks and equipment blanks were also collected for groundwater and soil samples. The blank sample results were non-detect and should be considered usable as reported.

A sample of the water used for decontamination of the drill rig was collected in advance of the field effort. The decontamination samples, ATT-DECON-02 and ATT-DECON-03, each displayed a concentration greater than the detection limit for perfluorobutyrate (PFBA). The associated field sample results were either non-detect or displayed a concentration greater than five times the blank detection. The results should be considered usable as reported.

Overall, the data are usable for evaluating the presence or absence of PFAS at the facility. Sufficient usable data were obtained to meet the objectives of the SI.

### 4.6.4 Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures help ensure comparability. Standard field sampling and typical laboratory protocols were used during the SI and are considered comparable to ongoing investigations.

### 4.6.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per parameter is as follows and reflects the exclusion of “X/UX” flagged data, if applicable:

- PFAS in aqueous media by DoD QSM Table B-15 at 100%
- PFAS in solid media by DoD QSM Table B-15 at 100%
- pH in soil by USEPA Method 9045D at 100%
- Total organic carbon (TOC) by USEPA Method 9060 at 100%

### 4.6.6 Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a method detection limit (MDL) study, and calibration standards at the limit of quantitation (LOQ). In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the QAPP Addendum (AECOM, 2021a). The laboratory provided the requested MDL studies and provided applicable calibration standards at the LOQ. In order to achieve the DQOs for sensitivity outlined in the QAPP Addendum (AECOM, 2021a), the laboratory reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the detection limit were reported and qualified “J” as estimated values by the laboratory.

# 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 Preliminary Assessment Report, Camp Atterbury, Edinburgh, Indiana,* dated September 2020 (AECOM, 2020);
- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan* dated March 2018 (AECOM, 2018a);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Camp Atterbury, Edinburgh, Indiana,* dated August 2021 (AECOM, 2021a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b); and
- *Final Site Safety and Health Plan, Camp Atterbury, Edinburgh, Indiana,* dated May 2021 (AECOM, 2021b).

The SI field activities were conducted from 16 to 20 August 2021 and consisted of utility clearance, direct-push borings, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, low-flow groundwater sampling of existing monitoring wells, and field surveying. Field activities were conducted in accordance with the SI 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 PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 to fulfill the project DQOs:

- Thirty-five (35) soil samples from fifteen (15) boring locations;
- Ten (10) grab groundwater samples from ten (10) temporary well locations;
- Four low-flow groundwater samples from four existing monitoring wells
- Ten (10) quality assurance (QA) samples.

**Figure 5-1** provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**. A Field Change Report is provided in **Appendix B3**. Field survey data 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 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

quantitative and qualitative DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 27 May 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, INARNG, and personnel from Camp Atterbury, USACE, and the Indiana Department of Environmental Management. 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, 2021a).

A TPP Meeting 3 was held on 7 June 2022 after the field event to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

### 5.1.2 Utility Clearance

Both AECOM and their drilling subcontractor, Cascade Technical Services, LLC, contacted Indiana 811 one-call utility clearance contractor prior to mobilization to notify them of intrusive work. Because Indiana 811 locators do not locate private utilities, such as those belonging to Camp Atterbury, AECOM contracted Ground Penetrating Radar Systems, LLC. (GPRS) to perform utility clearance for private utilities at all boring locations. GPRS performed the utility clearance under the oversight of the AECOM field team on 16 August 2021 using industry standard methods in addition to ground-penetrating radar. Additionally, the first 5 feet of the direct-push borings were advanced using hand augering methods, as conditions allowed, to visually verify utility clearance in the shallow subsurface where utilities would typically be encountered.

### 5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be acceptable for use in a PFAS investigation prior to the start of field activities. Source water samples were collected from two potable water sources (spigots) at Camp Atterbury on 29 June 2021, prior to SI mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample are provided in **Appendix F**. A discussion of the results is presented in **Section 4.6.3**.

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

## 5.2 Soil Borings and Soil Sampling

Soil samples were collected using a combination of hand auger and direct-push technology (DPT) drilling methods, in accordance with the SI QAPP Addendum (AECOM, 2021a). A hand auger was used to collect surface soil samples in addition to soil from the top 5 feet of the ten direct-push soil borings where temporary wells were installed, except at locations within AOI 4 where hard-packed gravel prevented the use of a hand auger. A GeoProbe® 7822DT dual-tube sampling system was used to collect continuous soil cores below 5 feet bgs to the target depth, and at all locations in AOI 4. The soil boring locations are shown on **Figure 5-1.** Sample depth intervals are provided in **Table 5-1**, and total boring depths are provided in **Table 5-2**.

Soils samples were collected at each location for chemical analysis. Surface soil samples were generally collected over a target interval of 0-2 feet bgs. Where the surface was paved (AOI01-01), the surface soil sample was collected from just beneath the improved surface to 2 ft bgs. At each deeper soil boring, three discrete soil samples were collected from the observed vadose (unsaturated); one soil sample was collected from the shallow surface soil (0 to 2 feet bgs), one subsurface soil sample approximately 1 foot above the observed groundwater table, and one subsurface soil sample at the mid-point between the surface and the observed groundwater table. The surface soil samples at locations outside of AOI 4 were collected using a hand auger. Subsurface soil samples and surface soil samples at AOI 4 were collected directly from the dedicated acetate dual-tube liners used for DPT drilling.

The soil cores were continuously logged for lithological descriptions by a 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, moisture, color (using a Munsell soil color chart), and texture (using the USCS) were recorded. The boring logs are provided in **Appendix E**.

SI soil boring depths ranged from 13 to 30 feet bgs. Borings consisted primarily of grading sequences of lean clay and silt alternating with intervals of poorly graded sand. Trace amounts of gravel were found over narrow intervals within both the fines and sands. Well-graded sand and gravel were noted in only one boring. Soil samples collected for grain size analysis at AOI 1 and AOI 2 support the logs and show soils comprised of predominantly silt, with the secondary grain size being either very fine sand or clay. The grain size samples were collected from several borings, at a depth of around 7 to 9 feet bgs, typically where a transition to finer grained material was observed. These lithological observations are consistent with the understood depositional environment of the near surface geology at Camp Atterbury. The silt and clay are typical of less permeable glacial till, while increasing amount of sand may mark the transition towards higher energy outwash facies, characterized by well graded sand and gravel. The upper sequences observed, particularly those in low-lying areas near major drainages, may also be representative of the alluvial deposits of the Martinsville Formation.

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 for PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15), TOC (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (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. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, equipment rinsate blanks (ERBs) 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.

The DPT boreholes were converted to temporary wells, as described in **Section 5.3**, and then subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) at the completion of sampling activities. The ground surface at each boring location was restored to match surrounding cover.

## 5.3 Temporary Well Installation and Groundwater Grab Sampling

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

Sufficient time was allowed for groundwater accumulation in the temporary wells before proceeding with collection of groundwater samples. Wells were purged using a peristaltic pump with PFAS-free HDPE tubing to remove sediment to the extent reasonable in an effort to minimize the turbidity of the samples. Purging was considered complete when one of the following conditions was met; the turbidity was ≤ 25 nephelometric turbidity units (NTU), the turbidity stabilized at a level above 25 NTU, or for a maximum duration of one hour, whichever occurs first. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen [DO], and oxidation-reduction potential [ORP]) were measured throughout purging using a water quality meter and recorded on the field sampling form (**Appendix B2**). The temporary wells were purged at a rate to minimize draw down prior. After purging was complete, groundwater samples were collected using the peristaltic pump and PFAS-free HDPE tubing. Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. 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.

Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021a).

Field duplicate, MS/MSD, and field reagent blank (FRB) sample counts were based on the total number of groundwater samples collected during the SI, including the samples from the existing monitoring wells described in **Section 5.4**. 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 FRB was collected in accordance with the Programmatic UFP-QAPP (PQAPP) (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Temporary wells were abandoned at the completion of sampling in accordance with the SI QAPP Addendum (AECOM, 2021a) by removing the PVC and backfilling the hole with bentonite chips. The ground surface at each boring location was restored to match surrounding cover.

## 5.4 Existing Well Low-flow Groundwater Sampling

During the SI, additional groundwater samples were collected from four existing permanent monitoring wells. The existing wells are not associated with a specific AOI, but were sampled for being readily available, additional data points to assess groundwater at the facility. The locations of the existing wells are shown on **Figure 5-1**. Well screen intervals for the existing wells are provided in **Table 5-3**.

Low-flow groundwater sampling was completed in accordance with the SI QAPP Addendum (AECOM, 2021a). The existing monitoring wells were sampled using a peristaltic pump with disposable PFAS-free, HDPE tubing. New, dedicated tubing was used at each well. The wells were purged at a rate determined in the field to reduce draw down prior to sampling. Water quality

parameters (e.g., temperature, specific conductance, pH, DO, and ORP) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**). Purging was performed until stabilization of the parameters was achieved. Water levels were measured to the nearest 0.01 foot and recorded. Additionally, shaker tests were performed to identify if there was 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 for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021a).

Field duplicate, MS/MSD, and FRB sample counts were based on the total number of groundwater samples collected during the SI, including the samples from the temporary wells. 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 FRB was collected in accordance with the PQAPP (AECOM, 2021a). 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 20 August 2021. Groundwater elevation measurements were collected from the ten (10) new temporary monitoring wells and four existing 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**. Groundwater elevation data are provided in **Tables 5-2** and **5-3**.

## 5.6 Surveying

The northern side of each well casing was surveyed by an Indiana-licensed land surveyor, following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed wells on the facility were collected on 20 August 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 B4**.

## 5.7 Investigation-Derived Waste

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

Soil IDW (i.e., soil cuttings) were generated during the SI activities from the ten soil boring locations. No soil IDW was generated at the surface soil sample locations. Due to the minimal amount of soil IDW generated, all soil IDW were containerized in single labeled 55-gallon drum and stored within the storage container near the Camp Atterbury trash and recycling facility, as designated by INARNG, pending laboratory analysis. ARNG will land-spread all soil IDW with PFAS concentrations below the relevant state criteria (Indiana Department of Environmental Management [IDEM], 2020) on-facility in accordance with IDEM's Uncontaminated Soil Policy (IDEM, 2015).

Liquid IDW generated during SI activities (i.e., purge water and decontamination fluids) were containerized in labeled 55-gallon drums. Due to the minimal amount of IDW generated, liquid IDW from all locations was consolidated into two drums and stored within the storage container

near the Camp Atterbury trash and recycling facility, as designated by INARNG, pending laboratory analysis. ARNG will manage and dispose of the liquid IDW under a separate contract in accordance with SOP No. 042A for Treating Liquid Investigation-Derived Material (Purge water, drilling water, and decontamination fluids) (EA Engineering, Science, and Technology, Inc., 2021). ARNG will land-spread all liquid IDW with PFAS concentrations below the relevant state criteria (IDEM, 2020) on-facility.

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 for a subset of 18 PFAS 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. The 18 PFAS analyzed as part of the ARNG SI program include the following:

- (6:2 FTS)
- 8:2 fluorotelomer sulfonic acid (8:2 FTS)
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- Perfluorobutyrate (PFBA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanoic acid (PFHxA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluoropentanoic acid (PFPeA)
- Perfluorotetradecanoic acid (PFTeDA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluoroundecanoic acid (PFUdA)

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

## 5.9 Deviations from SI QAPP Addendum

One deviation from the SI QAPP Addendum was made during the SI field activities. The deviation was made to add data quality to the SI results and is noted below and is documented in Field Change Request Forms (**Appendix B3**):

- The SI QAPP Addendum originally proposed four surface soil samples at AOI 4. The collection of surface soil only was considered sufficient because of the short amount of time the Tri-Max™ units had been staged at AOI 4 and because of the absence of any release. During the SI field activities, it was determined that converting one of the four surface soil samples into a soil and groundwater boring would benefit the DQOs by allowing for vertical characterization of soil and evaluation of groundwater at AOI 4. Sample location AOI04-04 was subsequently converted from single soil sample location to a soil boring location with collection of three soil samples and a groundwater sample.

**Table 5-1**
**Site Inspection Samples by Medium**
**Site Inspection Report, Camp Atterbury, Indiana**

| Sample Identification | Sample Collection Date/Time | Sample Depth (feet bgs) | PFAS by 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-01-02 | 8/17/2021 15:55 | 1-2 | x | x | x | | |
| AOI01-01-SB-01-02-D | 8/17/2021 15:55 | 1-2 | | x | x | | Duplicate |
| AOI01-01-SB-08-10 | 8/17/2021 16:20 | 8-10 | x | | | | |
| AOI01-01-SB-08-10-MS | 8/17/2021 16:20 | 8-10 | x | | | | MS/MSD |
| AOI01-01-SB-08-10-MSD | 8/17/2021 16:20 | 8-10 | x | | | | MS/MSD |
| AOI01-01-SB-15-17 | 8/17/2021 16:40 | 15-17 | x | | | | |
| AOI01-02-SB-00-02 | 8/18/2021 7:35 | 0-2 | x | | | | |
| AOI01-02-SB-2.5-4.5 | 8/18/2021 7:40 | 2.5-4.5 | x | | | | |
| AOI01-02-SB-2.5-4.5-D | 8/18/2021 7:40 | 2.5-4.5 | x | | | | Duplicate |
| AOI01-02-SB-07-09 | 8/18/2021 8:20 | 7-9 | x | | | x | |
| AOI01-03-SB-00-02 | 8/17/2021 13:40 | 0-2 | x | | | | |
| AOI01-03-SB-6.5-8.5 | 8/17/2021 14:05 | 6.5-8.5 | x | | | | |
| AOI01-03-SB-13-15 | 8/17/2021 14:30 | 13-15 | x | | | | |
| AOI01-04-SB-00-02 | 8/17/2021 11:10 | 0-2 | x | | | | |
| AOI01-04-SB-6.5-8.5 | 8/17/2021 14:05 | 6.5-8.5 | x | x | x | | |
| AOI01-04-SB-6.5-8.5-D | 8/17/2021 14:05 | 6.5-8.5 | x | | | | Duplicate |
| AOI01-04-SB-6.5-8.5-MS | 8/17/2021 14:05 | 6.5-8.5 | x | x | x | | MS/MSD |
| AOI01-04-SB-6.5-8.5-MSD | 8/17/2021 14:05 | 6.5-8.5 | x | x | x | | MS/MSD |
| AOI01-04-SB-07-09 | 8/17/2021 11:21 | 7-9 | | | | x | |
| AOI01-04-SB-13-15 | 8/17/2021 11:30 | 13-15 | x | | | | |
| AOI02-01-SB-00-02 | 8/16/2021 13:02 | 0-2 | x | x | x | | |
| AOI02-01-SB-6.5-8.5 | 8/16/2021 14:30 | 6.5-8.5 | x | | | | |
| AOI02-01-SB-12-14 | 8/16/2021 14:35 | 12-14 | x | | | | |
| AOI02-02-SB-00-02 | 8/16/2021 15:10 | 0-2 | x | | | | |
| AOI02-02-SB-00-02-D | 8/16/2021 15:10 | 0-2 | x | | | | Duplicate |
| AOI02-02-SB-7.5-9.5 | 8/16/2021 15:45 | 7.5-9.5 | x | | | x | |
| AOI02-02-SB-14-16 | 8/16/2021 15:50 | 14-16 | x | | | | |
| AOI02-03-SB-00-02 | 8/17/2021 8:08 | 0-2 | x | | | | |
| AOI02-03-SB-6.5-8.5 | 8/17/2021 8:32 | 6.5-5.5 | x | | | | |
| AOI02-03-SB-12-14 | 8/17/2021 8:55 | 12-14 | x | | | | |
| AOI03-01-SB-00-02 | 8/18/2021 10:33 | 0-2 | x | x | x | | |
| AOI03-01-SB-00-02-MS | 8/18/2021 10:33 | 0-2 | | x | x | | MS/MSD |
| AOI03-01-SB-00-02-MSD | 8/18/2021 10:33 | 0-2 | | x | x | | MS/MSD |
| AOI03-01-SB-4.5-6.5 | 8/18/2021 10:40 | 4.5-6.5 | x | | | | |
| AOI03-01-SB-08-10 | 8/18/2021 10:50 | 8-10 | x | | | | |
| AOI03-02-SB-00-02 | 8/18/2021 11:29 | 0-2 | x | | | | |
| AOI03-02-SB-7.5-9.5 | 8/17/2021 11:45 | 7.5-9.5 | x | | | | |
| AOI03-02-SB-14-16 | 8/17/2021 12:20 | 14-16 | x | | | | |
| AOI03-02-SB-14-16-D | 8/17/2021 12:20 | 14-16 | x | | | | Duplicate |
| AOI03-03-SB-00-02 | 8/19/2021 9:30 | 0-2 | x | | | | |
| AOI03-04-SB-00-02 | 8/19/2021 9:10 | 0-2 | x | | | | |
| AOI04-01-SB-00-02 | 8/18/2021 16:20 | 0-2 | x | | | | |
| AOI04-02-SB-00-02 | 8/18/2021 16:40 | 0-2 | x | | | | |
| AOI04-03-SB-00-02 | 8/18/2021 17:00 | 0-2 | x | | | | |
| AOI04-04-SB-00-02 | 8/18/2021 14:20 | 0-2 | x | x | x | | |
| AOI04-04-SB-3.5-5.5 | 8/18/2021 15:25 | 3.5-5.5 | x | | | | |
| AOI04-04-SB-06-08 | 8/18/2021 15:30 | 6-8 | x | | | | |

**Table 5-1**
**Site Inspection Samples by Medium**
**Site Inspection Report, Camp Atterbury, Indiana**

| Sample Identification | Sample Collection Date/Time | Sample Depth (feet bgs) | PFAS by 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** | | | | | | | |
| AOI01-01-GW | 8/18/2021 16:20 | NA | x | | | | |
| AOI01-02-GW | 8/18/2021 18:25 | NA | x | | | | |
| AOI01-03-GW | 8/19/2021 9:27 | NA | x | | | | |
| AOI01-04-GW | 8/19/2021 17:29 | NA | x | | | | |
| AOI02-01-GW | 8/18/2021 9:44 | NA | x | | | | |
| AOI02-02-GW | 8/18/2021 11:31 | NA | x | | | | |
| AOI02-03-GW | 8/18/2021 13:32 | NA | x | | | | |
| AOI02-03-GW-D | 8/18/2021 13:32 | NA | x | | | | Duplicate |
| AOI02-03-GW-MS | 8/18/2021 13:32 | NA | x | | | | MS/MSD |
| AOI02-03-GW-MSD | 8/18/2021 13:32 | NA | x | | | | MS/MSD |
| AOI03-01-GW | 8/19/2021 14:11 | NA | x | | | | |
| AOI03-02-GW | 8/19/2021 15:50 | NA | x | | | | |
| AOI04-04-GW | 8/19/2021 16:54 | NA | x | | | | |
| W14-081721 | 8/17/2021 17:45 | NA | x | | | | |
| W14-081721-D | 8/17/2021 17:45 | NA | x | | | | Duplicate |
| W15-081621 | 8/16/2021 15:59 | NA | x | | | | |
| W16-081621 | 8/16/2021 12:07 | NA | x | | | | |
| MW5-081721 | 8/17/2021 15:13 | NA | x | | | | |
| **Quality Control Samples** | | | | | | | |
| ATT-FRB-01 | 8/16/2021 17:30 | NA | x | | | | FRB |
| ATT-ERB-01 | 8/18/2021 7:15 | NA | x | | | | ERB |
| ATT-ERB-02 | 8/18/2021 12:40 | NA | x | | | | ERB |

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
ERB = equipment rinsate blank
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
PFAS = per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
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, Camp Atterbury, Indiana**

| Area of Interest | Boring Location | Soil Boring Depth (feet bgs) | Temporary Well Screen Interval (feet bgs) | Top of Casing Elevation (feet NAVD88) | Ground Surface Elevation (feet NAVD88) | Depth to Water (feet btoc) | Depth to Water (feet bgs) | Groundwater Elevation (feet NAVD88) |
|---|---|---|---|---|---|---|---|---|
| 1 | AOI01-01 | 30 | 20 - 30 | 724.56 | 723.71 | 6.15 | 5.30 | 718.41 |
| | AOI01-02 | 25 | 5 - 15 | 723.89 | 723.34 | 4.57 | 4.02 | 719.32 |
| | AOI01-03 | 15 | 5 - 15 | 721.01 | 720.95 | 5.96 | 5.90 | 715.05 |
| | AOI01-04 | 24 | 14 - 24 | 725.18 | 725.09 | 5.92 | 5.83 | 719.26 |
| 2 | AOI02-01 | 20 | 15 - 20 | 709.91 | 709.90 | 16.79 | 16.78 | 693.12 |
| | AOI02-02 | 20 | 15 - 20 | 702.34 | 702.30 | 11.86 | 11.82 | 690.48 |
| | AOI02-03 | 20 | 15 - 20 | 701.99 | 701.26 | 9.28 | 8.55 | 692.71 |
| 3 | AOI03-01 | 15 | 10 - 15 | 716.64 | 715.86 | 6.82 | 6.04 | 709.82 |
| | AOI03-02 | 18.5 | 13.5 - 18.5 | 716.26 | 715.16 | 6.70 | 5.60 | 709.56 |
| 4 | AOI04-04 | 13 | 8 - 13 | 745.66 | 744.96 | 5.78 | 5.08 | 739.88 |

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

**Table 5-3**
**Depths to Water and Groundwater Elevations in Existing Permanent Wells**
**Site Inspection Report, Camp Atterbury, Indiana**

| Location ID | Permanent 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) |
|---|---|---|---|---|---|---|
| MW5 | 24-28 | 693.33 | 689.53 | 7.79 | 3.99 | 685.54 |
| W14 | 19.3-29.3 | 711.76 | 708.64 | 4.45 | 1.33 | 707.31 |
| W15 | NA | 719.71 | 716.65 | 12.95 | 9.89 | 706.76 |
| W16 | NA | 730.50 | 727.53 | 22.58 | 19.61 | 707.92 |

Notes:

*data from USGS, 2006

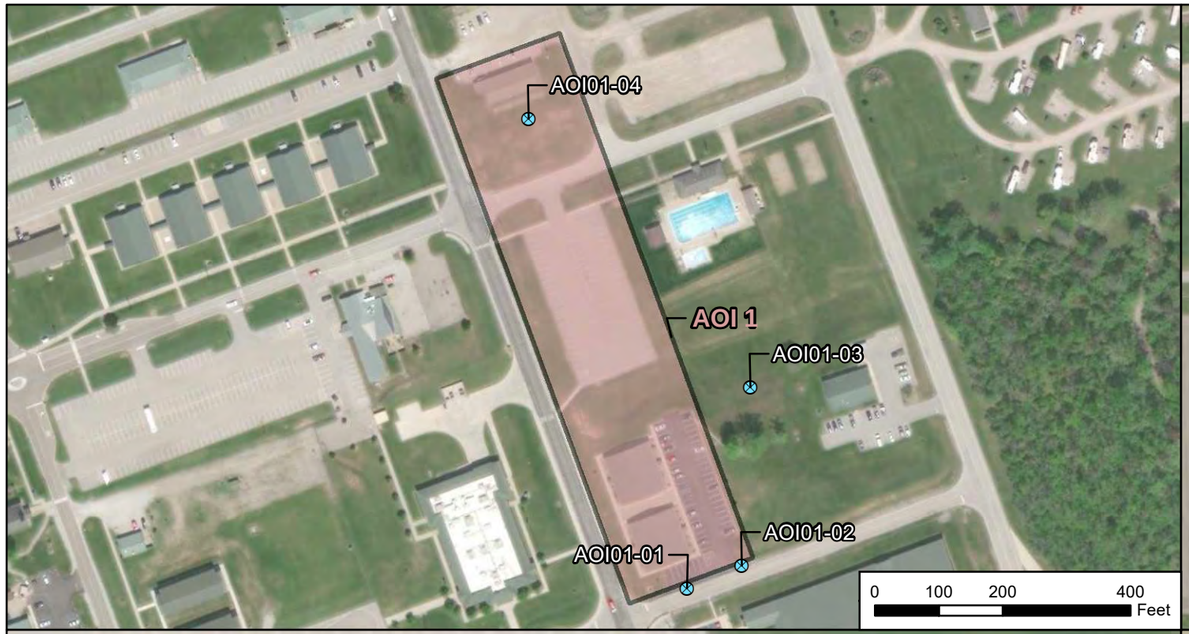
bgs - below ground surface

btoc = below top of casing

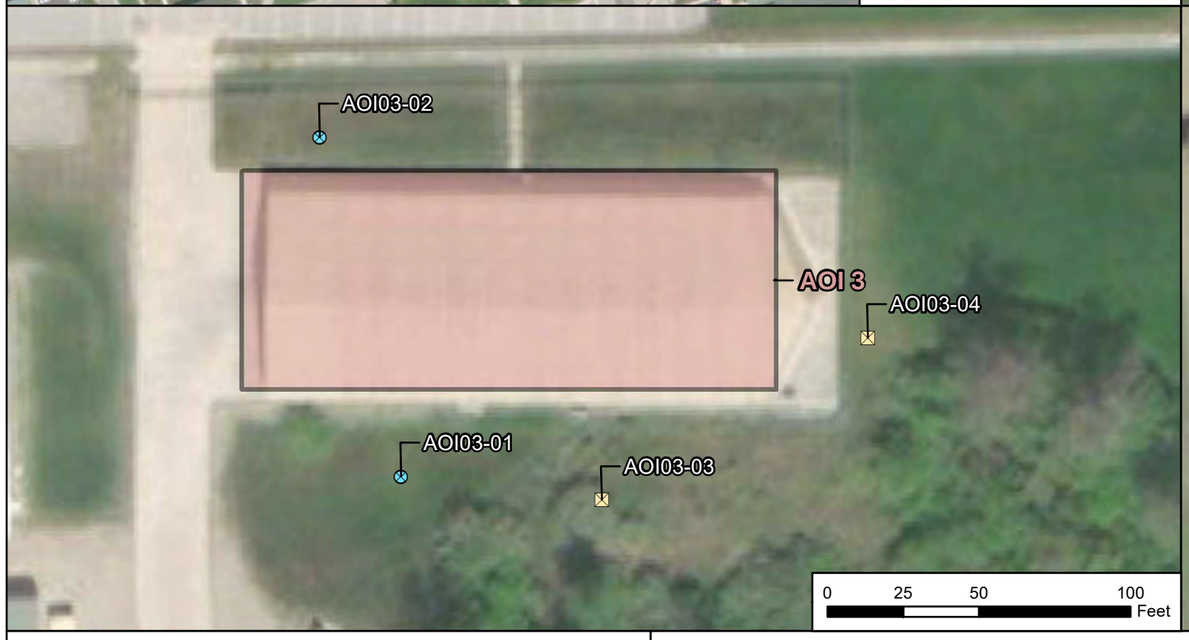
ID = identification

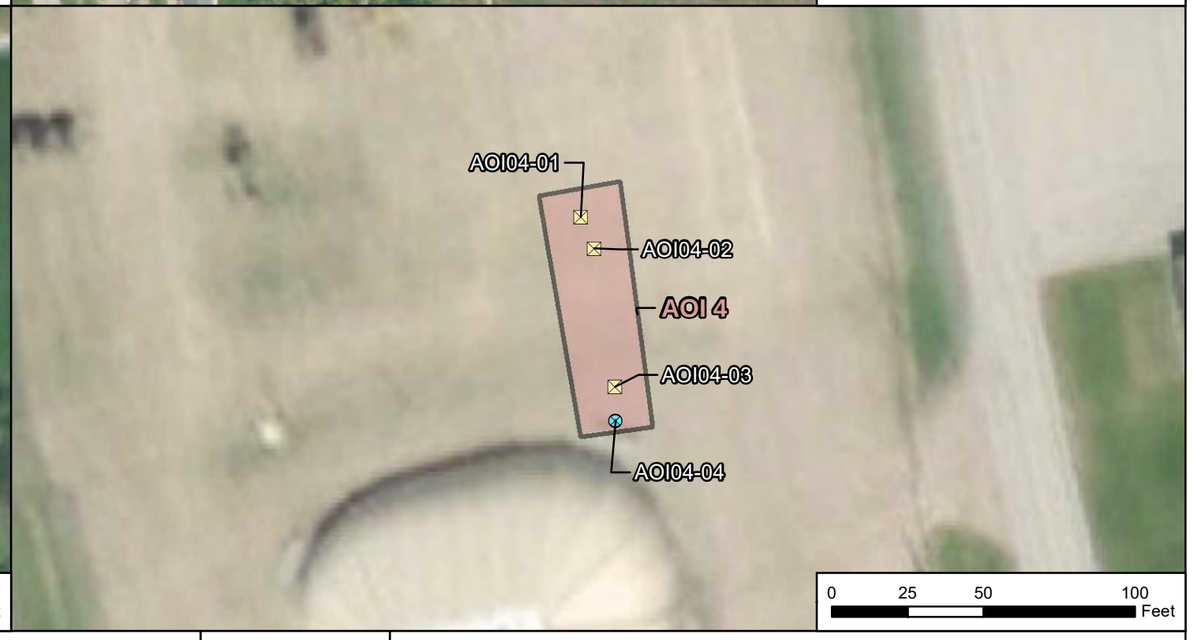
NA = not available

NAVD88 = North American Vertical Datum 1988








| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 12/7/2021 | GIS BY | MS | 12/7/2021 |
| SCALE | 1:592,900 | CHK BY | MC | 12/7/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/7/2021 |

- Temporary Monitoring Well/Soil Boring
- Existing Monitoring Well
- Surface Soil Sample
- Area of Interest
- Facility Location

N

## Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 5-1**

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# 6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.6**. **Table 6-2** through **Table 6-5** present PFAS results for samples with detections in soil or groundwater; only constituents detected in one or more samples are included. 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 15 September 2021 (Assistant Secretary of Defense, 2021). 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 three compounds: PFOS, PFOA, and PFBS.

The SLs are presented on **Table 6-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain PFAS within the boundaries of the facility.

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

| Analyte | 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** | 130 | 1,600 | 40 |
| **PFOS** | 130 | 1,600 | 40 |
| **PFBS** | 1,900 | 25,000 | 600 |

Notes:

a.) Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 15 September 2021.

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

## 6.2 Soil Physicochemical Analyses

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

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

## 6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to the respective PFOS, PFOA, and PFBS SLs at AOI 1, which includes two former fire stations identified as potential PFAS release areas: Former Fire Station 592 and Former Fire Station 325. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater at AOI 1 are presented on **Figure 6-1, Figure 6-3, Figure 6-5, and Figure 6-7**.

### 6.3.1 AOI 1 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed their respective SLs in soil at AOI 1. Soil was sampled at four soil boring locations; AOI01-01 and AOI01-02 near Former Fire Station 592, AOI01-04 near Former Fire Station 325, and AOI01-03 located centrally downgradient of AOI 1. Three soils samples were collected at each AOI 1 boring location: the shallow surface interval (0 to 2 feet bgs), the deep interval (just above groundwater), and the intermediate interval (the midpoint). Depths of the intermediate and deep soil sample intervals varied between locations depending on the observed depth of saturated soil in the boring.

PFOA, PFOS, and PFBS were detected in soil at concentrations several orders of magnitude lower than their respective SLs. In the surface and shallow subsurface soil, PFOA was detected at AOI01-01 and AOI01-02, with concentrations ranging from 0.112 J micrograms per kilogram (µg/kg) to 0.628 J µg/kg. PFOS was detected at locations AOI01-02 and AOI01-04, at concentrations ranging from 0.173 J µg/kg to 1.32 µg/kg. PFBS was detected within the surface soil only, at locations AOI01-02 and AOI01-04, at concentrations ranging from 0.023 J µg/kg to 0.025 J µg/kg. The maximum observed concentrations of PFOA and PFOS occurred at AOI01-02, and the maximum observed concentration for PFBS was observed at AOI01-04.

PFOA, PFOS, and PFBS were not detected in soil at AOI01-03. These compounds were also not observed in the deep subsurface soil at AOI 1.

### 6.3.2 AOI 1 Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in groundwater at AOI 1. Groundwater samples were collected from temporary wells installed at each of the four soil boring locations discussed above.

PFOA, PFOS, and PFBS were detected in groundwater at AOI 1 by at least one order of magnitude lower than their respective SLs. PFOA and PFBS were detected in groundwater only at location AOI01-02, at concentrations of 5.62 nanograms per liter (ng/L) and 2.47 ng/L, respectively. PFOS was detected in groundwater at AOI01-02 and AOI01-03, at 1.88 J ng/L and 0.833 J ng/L, respectively. The maximum observed concentrations of PFOA, PFOS, and PFBS

occurred at AOI01-02, which is situated near the location of Former Fire Station 592, and where the maximum concentrations of PFOA and PFOS were detected in soil.

PFOA, PFOS, and PFBS were not detected at locations AOI01-01 or AOI01-04.

### 6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 1; however, concentrations did not exceed their respective SLs for soil or groundwater. Further, the detected concentrations were several orders of magnitude lower than the soil SLs and at least one order of magnitude lower than the groundwater SLs. Based on these findings, further evaluation of soil and groundwater at AOI 1 is not warranted.

## 6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to the respective PFOA, PFOS, and PFBS SLs at AOI 2: Current Fire Station. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater at AOI 2 are presented on **Figure 6-1, Figure 6-3, Figure 6-5, and Figure 6-7**.

### 6.4.1 AOI 2 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed their respective SLs in soil at AOI 2. Soil was sampled at three soil boring locations surrounding the Current Fire Station: AOI02-01, AOI02-02, and AOI02-03. Three soils samples were collected at each AOI 2 boring location: the shallow surface interval (0 to 2 feet bgs), the deep interval (just above groundwater), and the intermediate interval (the midpoint). Depths of the intermediate and deep soil sample intervals varied between locations depending on the observed depth of saturated soil in the boring.

PFOS was detected at concentrations several orders of magnitude lower than the SL in the surface soil at AOI02-01 and AOI02-03, at concentrations of 0.132 J µg/kg to 0.147 J µg/kg, respectively. PFOS was not detected in the deep subsurface soil at AOI 2. The maximum PFOS concentration was observed in surface soil at AOI02-03, located in the drainage ditch downslope from the Current Fire Station.

PFOA and PFBS were not detected in soil at AOI 2.

### 6.4.2 AOI 2 Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in groundwater at AOI 2. Groundwater samples were collected from temporary wells installed at each of the three soil boring locations discussed above.

PFOA, PFOS, and PFBS were detected in groundwater at AOI 2 by at least one order of magnitude lower than the SLs. PFOA and PFOS were detected in groundwater only at location AOI02-03, at maximum concentrations of 1.46 J ng/L and 1.27 J ng/L, respectively. PFBS was detected in groundwater at AOI02-02 and AOI02-03, at 4.40 ng/L and 8.31 ng/L, respectively. The maximum observed concentrations of PFOA, PFOS, and PFBS occurred at AOI02-03, which correlate with the maximum concentration of PFOS detected in soil at the same location.

PFOA, PFOS, and PFBS were not detected in groundwater at location AOI02-01, where fire equipment had been reportedly drained in the past.

### 6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA and PFBS were not detected in soil at AOI 2, and PFOS was detected at concentrations below the SL. PFOA, PFOS, and PFBS were detected in groundwater at several AOI 2 sample locations; however, the detected concentrations were at least one order of magnitude lower than their respective groundwater SLs. Based on these findings, further evaluation of soil and groundwater at AOI 2 is not warranted.

## 6.5 AOI 3

This section presents the analytical results for soil and groundwater in comparison to the respective PFOS, PFOA, and PFBS SLs at AOI 3: Former Tri-Max™ Storage Area. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater at AOI 3 are presented on **Figure 6-2, Figure 6-4, Figure 6-6, and Figure 6-8**.

### 6.5.1 AOI 3 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at AOI 3. Soil was sampled at two soil boring locations and two surface soil locations surrounding the Former Tri-Max™ Storage Area building. At each of the two AOI 3 boring locations, AOI03-01 and AOI03-02, three soils samples were collected: the shallow surface interval (0 to 2 feet bgs), the deep interval (just above groundwater), and the intermediate interval (the midpoint). Depths of the intermediate and deep soil sample intervals varied between locations depending on the observed depth of saturated soil in the boring. At the two remaining locations, AOI03-03 and AOI03-04, a sample was collected from only the surface soil interval (0 to 2 feet bgs).

PFOA, PFOS, and PFBS were detected in soil at AOI 3, at concentrations several orders of magnitude lower than their respective SLs. PFOA was detected only in surface soil, at locations AOI03-03 and AOI03-04, at concentrations of 0.155 J µg/kg to 0.123 J µg/kg, respectively. PFOS was detected in the surface soil at locations AOI03-02 and AOI03-03, and in subsurface soil at AOI03-02, with a maximum observed concentration of 0.416 J µg/kg in the shallow subsurface soil interval. PFBS was detected in the surface soil at all four AOI 3 locations and in the shallow subsurface at AOI03-01, with a maximum observed concentration of 1.00 J µg/kg in the surface soil at AOI03-01. The maximum PFOA, PFOS, and PFBS concentrations were observed at separate locations surrounding the Former Tri-Max™ Storage Area.

### 6.5.2 AOI 3 Groundwater Analytical Results

PFBS exceeded the groundwater SL at location AOI03-01. PFOA and PFOS did not exceed their respective SLs for groundwater at AOI 3. Groundwater samples were collected from temporary wells installed at the two soil boring locations, AOI03-01 and AOI03-02, which were located in the grass adjacent to where the Tri-Max™ units were previously stored.

PFBS was detected in groundwater at both temporary well locations at AOI 3. At AOI03-01, located south of the Former Tri-Max™ Storage Area, PFBS was detected at a concentration of 2,160 ng/L, exceeding the OSD SL of 600 ng/L. PFBS was detected at a lower concentration of 1.20 J ng/L at AOI03-02, located north of the Former Tri-Max™ Storage Area. The exceedance of the PFBS groundwater SL observed at AOI03-01 correlates with the maximum concentration of PFBS detected in soil at the same location.

PFOA and PFOS were not detected in groundwater at AOI 3.

### 6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil at AOI 3; however, the detected concentrations were at least two orders of magnitude lower than their respective soil SLs. PFOA and PFOS were not detected in groundwater at AOI 3; however, PFBS was detected in groundwater, at a concentration exceeding the SL of 600 ng/L at one location. Based on the exceedance of the SL for PFBS in groundwater, further evaluation at AOI 3 is warranted.

## 6.6 AOI 4

This section presents the analytical results for soil and groundwater in comparison to the respective PFOS, PFOA, and PFBS SLs at AOI 4: Current Tri-Max™ Storage Area. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater at AOI 4 are presented on **Figure 6-2, Figure 6-4, Figure 6-6, and Figure 6-8**.

### 6.6.1 AOI 4 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at AOI 4. Soil was sampled at one soil boring location and three surface soil locations at the Current Tri-Max™ Storage Area. Each sample location corresponded to one of four Tri-Max™-30 units stored in the open salvage yard. Only the surface soil interval (0 to 2 feet bgs) was sampled at locations AOI04-01, AOI04-02, and AOI04-0303-04. At the single AOI 4 boring location, AOI04-04, three soils samples were collected: the shallow surface interval (0 to 2 feet bgs), the deep interval (just above groundwater), and the intermediate interval (the midpoint). Depths of the intermediate and deep soil sample were determined by the observed depth of saturated soil in the boring.

PFOS and PFBS were detected in surface soil at AOI 4, at concentrations several orders of magnitude lower than their respective SLs. PFOS was detected at locations AOI04-01 and AOI04-04, with a maximum observed concentration of 0.309 J µg/kg at AOI04-04. PFBS was detected only at location AOI04-01, at a concentration of 0.029 J µg/kg. These detections of PFOS and PFBS were observed at both pairs Tri-Max™-30 units at the storage area. PFOS and PFBS were not detected in subsurface soil at AOI 4.

PFOA was not detected in soil at AOI 4.

### 6.6.2 AOI 4 Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in groundwater at AOI 4. One groundwater sample was collected from the temporary well installed at soil boring location AOI04-04.

PFBS was the only compound detected in groundwater at AOI 4, observed at a concentration of 1.07 J ng/L at AOI04-04, which is two orders of magnitude below the SL. This PFBS detection correlates with the location of the maximum PFBS concentration observed in soil at AOI 4.

PFOA and PFOS were not detected in groundwater at AOI 4.

### 6.6.3 AOI 4 Conclusions

Based on the results of the SI, PFOA was not detected in soil at AOI 4. PFOS and PFBS were detected at concentrations below their respective soil SLs. Only PFBS was detected in groundwater at AOI 4; however, the detected concentration was also below the groundwater SL. Based on these findings, further evaluation of soil and groundwater at AOI 4 is not warranted.

## 6.7 Sitewide Existing Monitoring Wells

This section presents the analytical results for groundwater samples collected at four existing monitoring wells at Camp Atterbury in comparison to the respective SLs for PFOA, PFOS, and PFBS. The existing monitoring wells are not associated with any particular AOI but were added to the SI sampling plan as additional sitewide data points. All four wells were located east of the AOIs. Groundwater elevations calculated using water levels measured during the SI suggest that the existing monitoring wells may be side-gradient to the AOIs. The detected compounds in groundwater are summarized on **Table 6-5**. The detections of PFOA, PFOS, and PFBS in groundwater are presented on **Figure 6-7**.

### 6.7.1 Sitewide Wells Soil Analytical Results

Soil samples were not collected at the existing well locations. These locations are not within the AOIs and were used for evaluation of groundwater only.

### 6.7.2 Sitewide Wells Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in groundwater at the four existing monitoring well locations.

PFOS was the only compound detected in groundwater at the sitewide well locations. PFOS was detected in one well, W14, at a concentration of 1.16 J ng/L, which is one order of magnitude below the 40 ng/L SL. Monitoring well W14 is located near Landfill 2. Based on the groundwater elevations measured during the SI, W14 is likely side-gradient from the AOIs and on the opposite side of the primary north-south drainage in the Cantonment from the AOIs.

### 6.7.3 Sitewide Wells Conclusions

Based on the results of the SI, PFOS was detected in groundwater at monitoring well W14. PFOA and PFBS were not detected in groundwater at any sitewide well location. No exceedances of groundwater SLs were observed at any of the sitewide locations. Further evaluation of soil and groundwater at these sitewide locations is not warranted.

**Table 6-2**
**PFAS Detections in Surface Soil**
**Site Inspection Report, Camp Atterbury**

| Area of Interest | | AOI01 | | | | | | | | AOI02 | | | | | | | | AOI03 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | AOI01-01-SB-01-02 | | AOI01-02-SB-00-02 | | AOI01-03-SB-00-02 | | AOI01-04-SB-00-02 | | AOI02-01-SB-00-02 | | AOI02-02-SB-00-02 | | AOI02-02-SB-00-02-D | | AOI02-03-SB-00-02 | | AOI03-01-SB-00-02 | | AOI03-02-SB-00-02 | |
| Sample Date | | 08/17/2021 | | 08/18/2021 | | 08/17/2021 | | 08/17/2021 | | 08/16/2021 | | 08/16/2021 | | 08/16/2021 | | 08/17/2021 | | 08/18/2021 | | 08/18/2021 | |
| Depth | | 1 - 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, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)** | | | | | | | | | | | | | | | | | | | | | |
| PFBA | - | ND | | 0.093 | J | ND | | 0.087 | J | 0.080 | J | ND | | ND | | ND | | 0.133 | J | 0.058 | J |
| PFBS | 1900 | ND | | 0.023 | J | ND | | 0.025 | J | ND | | ND | | ND | | ND | | 1.00 | J | 0.358 | J |
| PFDA | - | ND | | 0.119 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFDoA | - | ND | | 0.039 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHpA | - | ND | | 0.288 | J | ND | | 0.042 | J | ND | | ND | | ND | | 0.051 | J | ND | | ND | |
| PFHxA | - | ND | | 0.553 | J | ND | | 0.095 | J | 0.077 | J | 0.055 | J | 0.041 | J | 0.122 | J | 0.030 | J+ | 0.048 | J |
| PFHxS | - | 0.035 | J | 0.214 | J | ND | | 0.146 | J | 0.043 | J | ND | | ND | | 0.084 | J | ND | | ND | |
| PFNA | - | ND | | 0.185 | J | ND | | 0.082 | J | 0.054 | J | ND | | ND | | ND | | ND | | ND | |
| PFOA | 130 | 0.173 | J | 0.628 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOS | 130 | ND | | 1.32 | | ND | | 0.514 | J | 0.132 | J | ND | | ND | | 0.147 | J | ND | UJ | 0.061 | J |
| PFPeA | - | ND | | 0.367 | J | ND | | 0.042 | J | 0.073 | J | 0.033 | J | 0.030 | J | 0.115 | J | 0.029 | J | 0.029 | J |
| PFUnDA | - | ND | | 0.073 | J | ND | | 0.026 | J | 0.027 | J | ND | | ND | | ND | | ND | | ND | |

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

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

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFDA | perfluorodecanoic acid |
| PFDoA | perfluorododecanoic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |
| PFUnDA | perfluoro-n-undecanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| ft | feet |
| HQ | hazard quotient |
| 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 |
| - | not applicable |

**Table 6-2**
**PFAS Detections in Surface Soil**
**Site Inspection Report, Camp Atterbury**

| Area of Interest | | AOI03 | | | | AOI04 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | AOI03-03-SB-00-02 | | AOI03-04-SB-00-02 | | AOI04-01-SB-00-02 | | AOI04-02-SB-00-02 | | AOI04-03-SB-00-02 | | AOI04-04-SB-00-02 | |
| Sample Date | | 08/19/2021 | | 08/19/2021 | | 08/18/2021 | | 08/18/2021 | | 08/18/2021 | | 08/18/2021 | |
| Depth | | 0 - 2 ft | | 0 - 2 ft | | 0 - 2 ft | | 0 - 2 ft | | 0 - 2 ft | | 0 - 2 ft | |
| Analyte | OSD Screening Level [a] | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual |
| **Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)** | | | | | | | | | | | | | |
| PFBA | - | 0.184 | J | 0.113 | J | ND | | 0.073 | J | 0.060 | J | ND | |
| PFBS | 1900 | 0.916 | J | 0.125 | J | 0.029 | J | ND | | ND | | ND | |
| PFDA | - | ND | | ND | | ND | | ND | | ND | | ND | |
| PFDoA | - | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHpA | - | 0.051 | J | 0.046 | J | 0.042 | J | 0.036 | J | 0.030 | J | ND | |
| PFHxA | - | 0.069 | J | 0.084 | J | 0.040 | J | 0.062 | J | 0.069 | J | 0.023 | J |
| PFHxS | - | 0.051 | J | ND | | 0.051 | J | ND | | ND | | ND | |
| PFNA | - | 0.148 | J | ND | | ND | | ND | | ND | | 0.022 | J |
| PFOA | 130 | 0.155 | J | 0.123 | J | ND | | ND | | ND | | ND | |
| PFOS | 130 | 0.295 | J | ND | | 0.081 | J | ND | | ND | | 0.309 | J |
| PFPeA | - | 0.059 | J | 0.283 | J | ND | | ND | | 0.048 | J | 0.020 | J |
| PFUnDA | - | 0.072 | J | ND | | ND | | ND | | ND | | 0.030 | J |

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

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

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFDA | perfluorodecanoic acid |
| PFDoA | perfluorododecanoic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |
| PFUnDA | perfluoro-n-undecanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| ft | feet |
| HQ | hazard quotient |
| 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 |
| - | not applicable |

**Table 6-3**
**PFAS Detections in Shallow Subsurface Soil**
**Site Inspection Report, Camp Atterbury**

| Area of Interest | | AOI01 | | | | | | | | | | | | | | | | | | AOI02 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | AOI01-01-SB-08-10 | | AOI01-02-SB-2.5-4.5 | | AOI01-02-SB-2.5-4.5-D | | AOI01-02-SB-07-09 | | AOI01-03-SB-6.5-8.5 | | AOI01-03-SB-13-15 | | AOI01-04-SB-6.5-8.5 | | AOI01-04-SB-6.5-8.5-D | | AOI01-04-SB-13-15 | | AOI02-01-SB-6.5-8.5 | |
| Sample Date | | 08/17/2021 | | 08/18/2021 | | 08/18/2021 | | 08/18/2021 | | 08/17/2021 | | 08/17/2021 | | 08/17/2021 | | 08/17/2021 | | 08/17/2021 | | 08/16/2021 | |
| Depth | | 8 - 10 ft | | 2.5 - 4.5 ft | | 2.5 - 4.6 ft | | 7 - 9 ft | | 6.5 - 8.5 ft | | 13 - 15 ft | | 6.5 - 8.5 ft | | 6.5 - 8.5 ft | | 13 - 15 ft | | 6.5 - 8.5 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, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)** | | | | | | | | | | | | | | | | | | | | | |
| PFBA | - | ND | | 0.050 | J | 0.048 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFBS | 25000 | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHpA | - | ND | | 0.075 | J | 0.063 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHxA | - | 0.023 | J | 0.193 | J | 0.167 | J | 0.027 | J | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHxS | - | ND | | 0.053 | J | 0.047 | J | ND | | ND | | ND | | ND | | ND | | ND | | 0.046 | J |
| PFNA | - | ND | | 0.032 | J | 0.031 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOA | 1600 | ND | | 0.122 | J | 0.112 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOS | 1600 | ND | | 0.182 | J | 0.173 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFPeA | - | ND | | 0.189 | J | 0.164 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | |

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| ft | feet |
| HQ | hazard quotient |
| 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 |
| - | not applicable |

**Table 6-3**
**PFAS Detections in Shallow Subsurface Soil**
**Site Inspection Report, Camp Atterbury**

| Area of Interest | | AOI02 | | | | | | | | | | AOI03 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | AOI02-01-SB-12-14 | | AOI02-02-SB-7.5-9.5 | | AOI02-02-SB-14-16 | | AOI02-03-SB-6.5-8.5 | | AOI02-03-SB-12-14 | | AOI03-01-SB-4.5-6.5 | | AOI03-01-SB-08-10 | | AOI03-02-SB-7.5-9.5 | | AOI03-02-SB-14-16 | | AOI03-02-SB-14-16-D | |
| Sample Date | | 08/16/2021 | | 08/16/2021 | | 08/16/2021 | | 08/17/2021 | | 08/17/2021 | | 08/18/2021 | | 08/18/2021 | | 08/17/2021 | | 08/17/2021 | | 08/18/2021 | |
| Depth | | 12 - 14 ft | | 7.5 - 9.5 ft | | 14 - 16 ft | | 6.5 - 8.5 ft | | 12 - 14 ft | | 4.5 - 6.5 ft | | 8 - 10 ft | | 7.5 - 9.5 ft | | 14 - 16 ft | | 14 - 16 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, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)** | | | | | | | | | | | | | | | | | | | | | |
| PFBA | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFBS | 25000 | ND | | ND | | ND | | ND | | ND | | 0.641 | J | 0.572 | J | ND | | ND | | ND | |
| PFHpA | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHxA | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | 0.042 | J | ND | UJ |
| PFHxS | - | 0.047 | J | ND | | ND | | ND | | ND | | ND | | ND | | ND | | 0.073 | J | ND | UJ |
| PFNA | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOA | 1600 | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOS | 1600 | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | UJ | 0.416 | J |
| PFPeA | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | 0.023 | J | ND | UJ |

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| ft | feet |
| HQ | hazard quotient |
| 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 |
| - | not applicable |

**Table 6-3**
**PFAS Detections in Shallow Subsurface Soil**
**Site Inspection Report, Camp Atterbury**

| Area of Interest | | AOI04 | | | |
|---|---|---|---|---|---|
| Sample ID | | AOI04-04-SB-3.5-5.5 | | AOI04-04-SB-06-08 | |
| Sample Date | | 08/18/2021 | | 08/18/2021 | |
| Depth | | 3.5 - 5.5 ft | | 6 - 8 ft | |
| Analyte | OSD Screening Level [a] | Result | Qual | Result | Qual |
| **Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)** | | | | | |
| PFBA | - | ND | | ND | |
| PFBS | 25000 | ND | | ND | |
| PFHpA | - | ND | | ND | |
| PFHxA | - | ND | | ND | |
| PFHxS | - | ND | | ND | |
| PFNA | - | ND | | ND | |
| PFOA | 1600 | ND | | ND | |
| PFOS | 1600 | ND | | ND | |
| PFPeA | - | ND | | ND | |

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| ft | feet |
| HQ | hazard quotient |
| 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 |
| - | not applicable |

**Table 6-4**
**PFAS Detections in Deep Subsurface Soil**
**Site Inspection Report, Camp Atterbury**

| | | |
|---|---|---|
| **Area of Interest** | AOI01 | |
| **Sample ID** | AOI01-01-SB-15-17 | |
| **Sample Date** | 08/17/2021 | |
| **Depth** | 15 - 17 ft | |
| **Analyte** | **Result** | **Qual** |
| **Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)** | | |
| 8:2 FTS | 0.033 | J |

Interpreted Qualifiers
J = Estimated concentration

Chemical Abbreviations

| | |
|---|---|
| 8:2 FTS | 8:2 fluorotelomer sulfonate |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| ft | feet |
| 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**
**PFAS Detections in Groundwater**
**Site Inspection Report, Camp Atterbury**

| Area of Interest | | | AOI01 | | | | | | | | AOI02 | | | | | | | | AOI03 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | AOI01-01-GW | | AOI01-02-GW | | AOI01-03-GW | | AOI01-04-GW | | AOI02-01-GW | | AOI02-02-GW | | AOI02-03-GW | | AOI02-03-GW-D | | AOI03-01-GW | |
| Sample Date | | | 08/18/2021 | | 08/19/2021 | | 08/19/2021 | | 08/19/2021 | | 08/18/2021 | | 08/18/2021 | | 08/18/2021 | | 08/18/2021 | | 08/19/2021 | |
| Analyte | OSD Screening Level [a] | USEPA HA [b] | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual |
| **Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)** | | | | | | | | | | | | | | | | | | | | |
| PFBA | - | - | ND | | 47.3 | | ND | | ND | | 2.77 | J | 2.38 | J | 14.3 | | 9.13 | | 14.2 | |
| PFBS | 600 | - | ND | | 2.47 | J | ND | | ND | | ND | | 4.40 | | 8.31 | | 5.32 | | 2160 | |
| PFHpA | - | - | ND | | 10.5 | | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHxA | - | - | ND | | 47.1 | | ND | | ND | | ND | | 1.97 | J | 2.89 | J | 1.89 | J | 0.999 | J |
| PFHxS | - | - | ND | | 1.84 | J | ND | | ND | | 1.85 | J | 12.2 | | 33.6 | | 21.1 | | ND | |
| PFOA | 40 | 70 | ND | | 5.62 | | ND | | ND | | ND | | ND | | 1.46 | J | 1.06 | J | ND | |
| PFOS | 40 | 70 | ND | | 1.88 | J | 0.833 | J | ND | | ND | | ND | | 1.27 | J | 0.876 | J | ND | |
| PFPeA | - | - | 1.13 | J | 57.3 | | ND | | ND | | ND | | 2.79 | J | ND | | 1.45 | J | 1.51 | J |
| Total PFOA+PFOS | - | 70 | ND | | 7.50 | | 0.833 | | ND | | ND | | ND | | 2.73 | | 1.94 | | ND | |

| | |
|---|---|
| Grey Fill | Detected concentration exceeded OSD Screening Levels |
| **Bold Font** | Detected concentration exceeded USEPA HA Screening Levels |

References


a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

b. USEPA, 2016. Drinking Water Health Advisory for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.


Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| GW | groundwater |
| HA | Health Advisory |
| HQ | hazard quotient |
| 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 |
| - | not applicable |

**Table 6-5**
**PFAS Detections in Groundwater**
**Site Inspection Report, Camp Atterbury**

| | Area of Interest | AOI03 | | AOI04 | | Sitewide | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample ID | AOI03-02-GW | | AOI04-04-GW | | MW5-081721 | | W14-081721 | | W14-081721-D | | W15-081621 | | W16-081621 | |
| | Sample Date | 08/19/2021 | | 08/19/2021 | | 08/17/2021 | | 08/17/2021 | | 08/17/2021 | | 08/16/2021 | | 08/16/2021 | |
| Analyte | OSD Screening Level [a] | USEPA HA [b] | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual | Result | Qual |
| **Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)** | | | | | | | | | | | | | | | | |
| PFBA | - | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFBS | 600 | - | 1.20 | J | 1.07 | J | ND | | ND | | ND | | ND | | ND | |
| PFHpA | - | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHxA | - | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFHxS | - | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOA | 40 | 70 | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| PFOS | 40 | 70 | ND | | ND | | ND | | 1.16 | J | ND | UJ | ND | | ND | |
| PFPeA | - | - | ND | | ND | | ND | | ND | | ND | | ND | | ND | |
| Total PFOA+PFOS | - | 70 | ND | | ND | | ND | | 1.16 | | ND | | ND | | ND | |

| | |
|---|---|
| Grey Fill | Detected concentration exceeded OSD Screening Levels |
| **Bold Font** | Detected concentration exceeded USEPA HA Screening Levels |

References


a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

b. USEPA, 2016. Drinking Water Health Advisory for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.


Interpreted Qualifiers

J = Estimated concentration

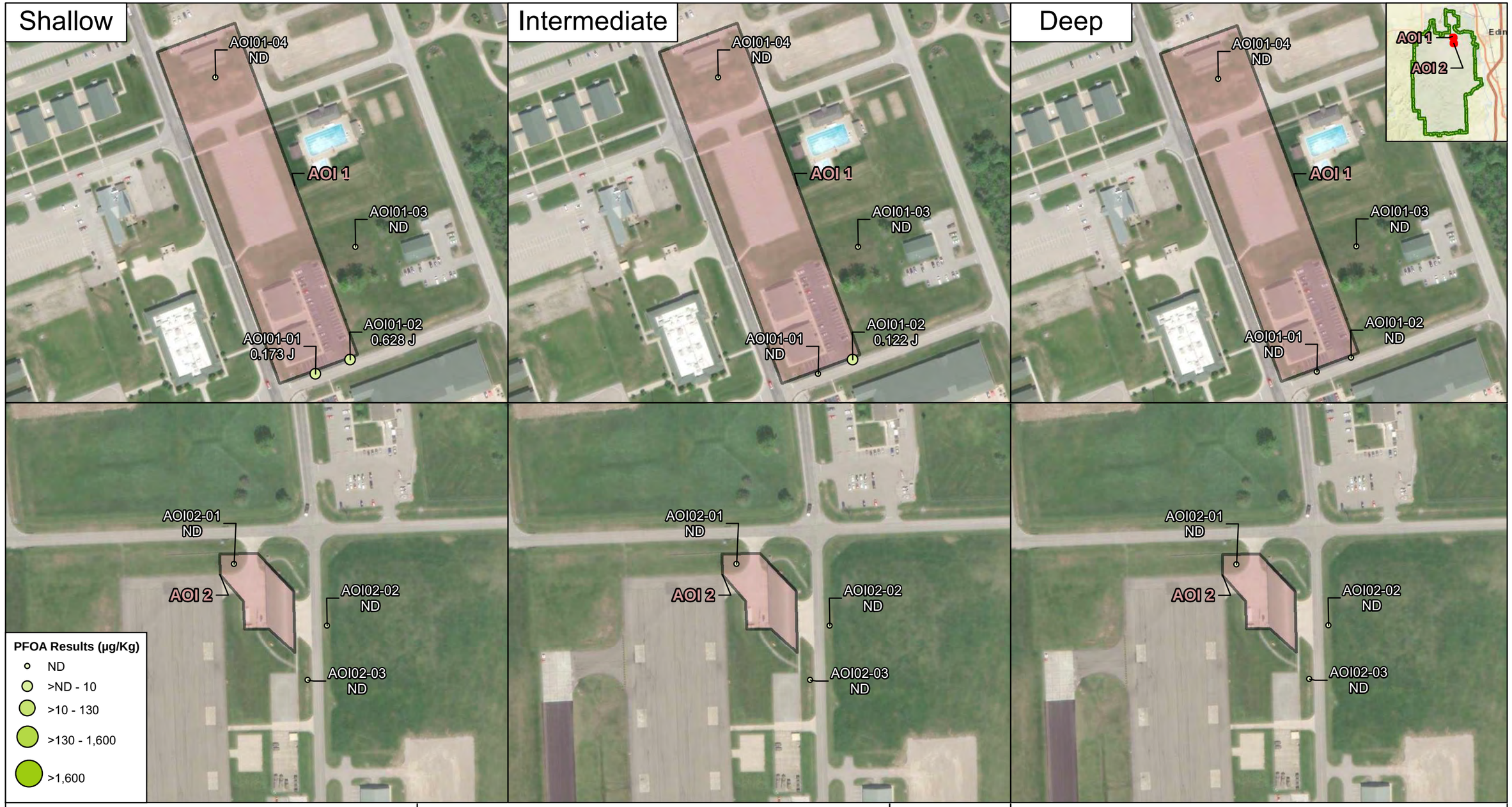
UJ = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL). However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

| | |
|---|---|
| PFBA | perfluorobutanoic acid |
| PFBS | perfluorobutanesulfonic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFPeA | perfluoropentanoic acid |

Acronyms and Abbreviations

| | |
|---|---|
| AOI | Area of Interest |
| D | duplicate |
| GW | groundwater |
| HA | Health Advisory |
| HQ | hazard quotient |
| 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 |
| - | not applicable |




| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 12/8/2021 | GIS BY | MS | 12/8/2021 |
| SCALE | 1:592,900 | CHK BY | MC | 12/8/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/8/2021 |

**Legend**

- Area of Interest
- Facility Location

0 120 240 480 Feet

J = Estimated concentration

N

**PFOA Detections in Soil - AOI 1 and AOI 2**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-1**

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| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 12/8/2021 | GIS BY | MS | 12/8/2021 |
| SCALE | 1:592,900 | CHK BY | MC | 12/8/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/8/2021 |

**Legend**

- Area of Interest
- Facility Location

0 50 100 200 Feet

J = Estimated concentration

N

**PFOA Detections in Soil - AOI 3 and AOI 4**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-2**

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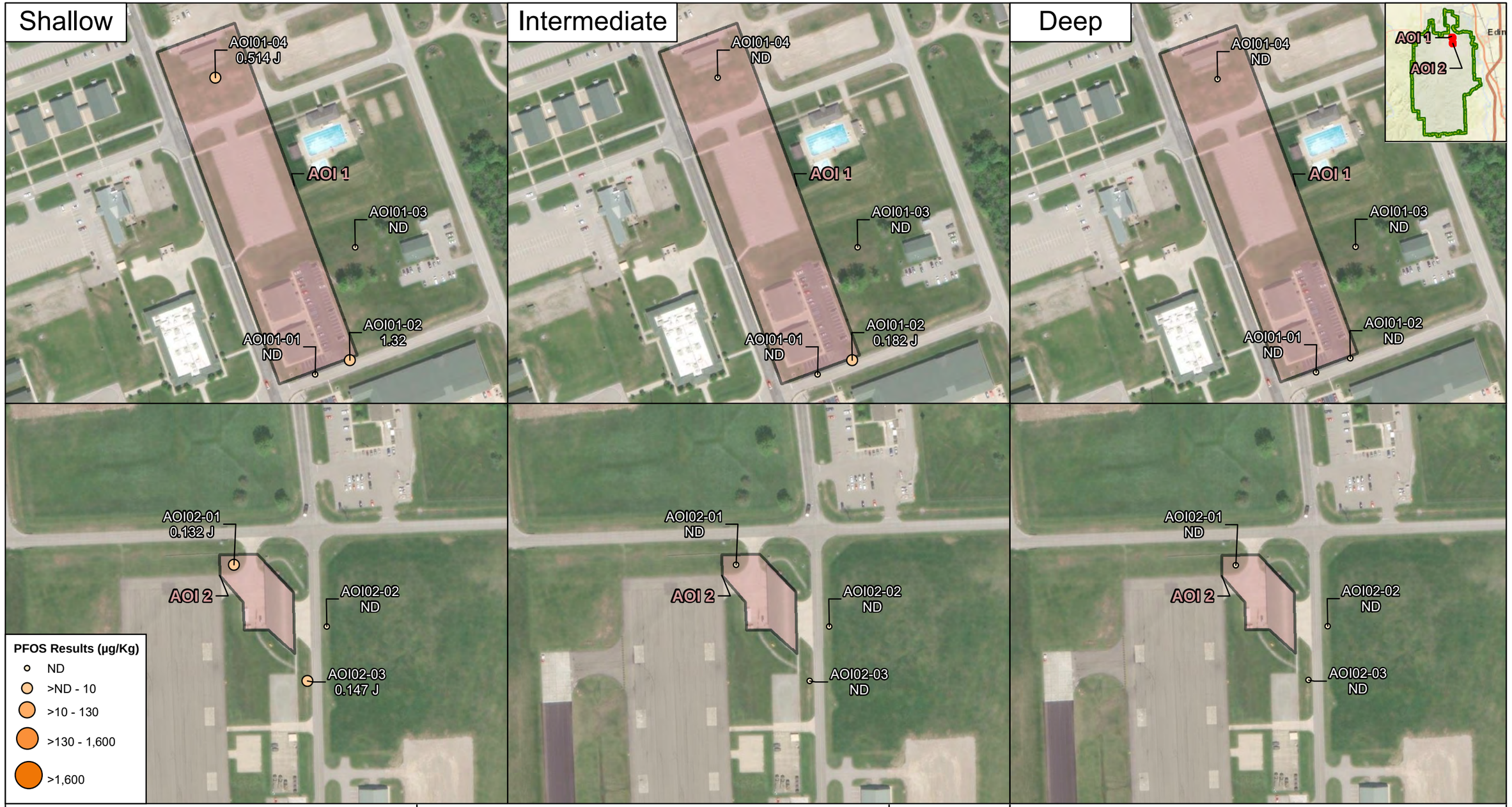


| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 2/28/2022 | GIS BY | MS | 2/28/2022 |
| SCALE | 1:592,900 | CHK BY | MC | 2/28/2022 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 2/28/2022 |

**Legend**

Area of Interest

Facility Location

0 120 240 480 Feet

J = Estimated concentration

N

**PFOS Detections in Soil - AOI 1 and AOI 2**

AECOM 12420 Milestone Center Drive Germantown, MD 20876

**Figure 6-3**

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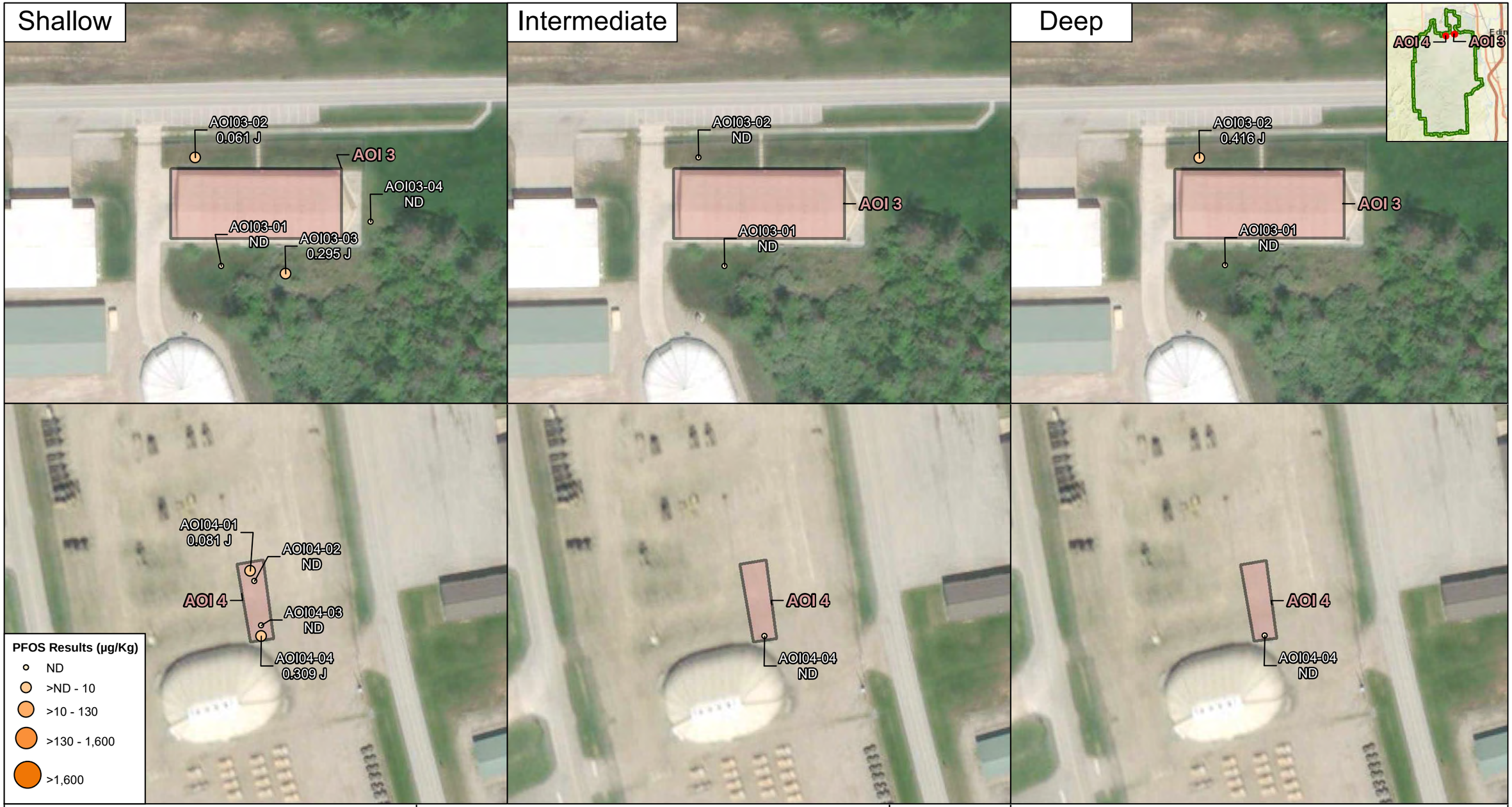


| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 12/8/2021 | GIS BY | MS | 12/8/2021 |
| SCALE | 1:592,900 | CHK BY | MC | 12/8/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/8/2021 |

**Legend**

Area of Interest

Facility Location

0 50 100 200 Feet

J = Estimated concentration

N

**PFOS Detections in Soil - AOI 3 and AOI 4**

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-4**

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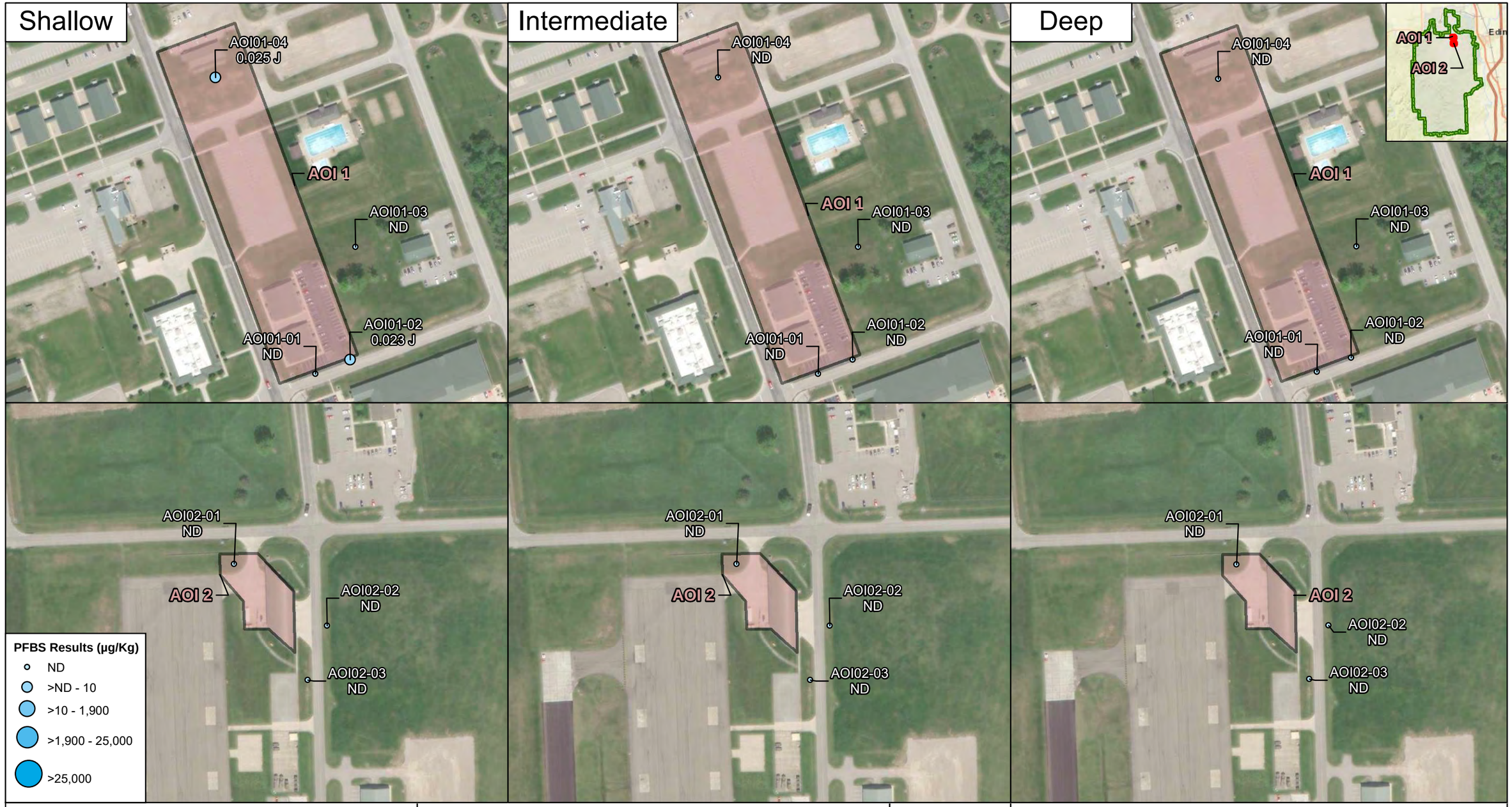


| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 12/8/2021 | GIS BY | MS | 12/8/2021 |
| SCALE | 1:592,900 | CHK BY | MC | 12/8/2021 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 12/8/2021 |

**Legend**

Area of Interest

Facility Location

0 120 240 480 Feet

J = Estimated concentration

N

# PFBS Detections in Soil - AOI 1 and AOI 2

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-5**

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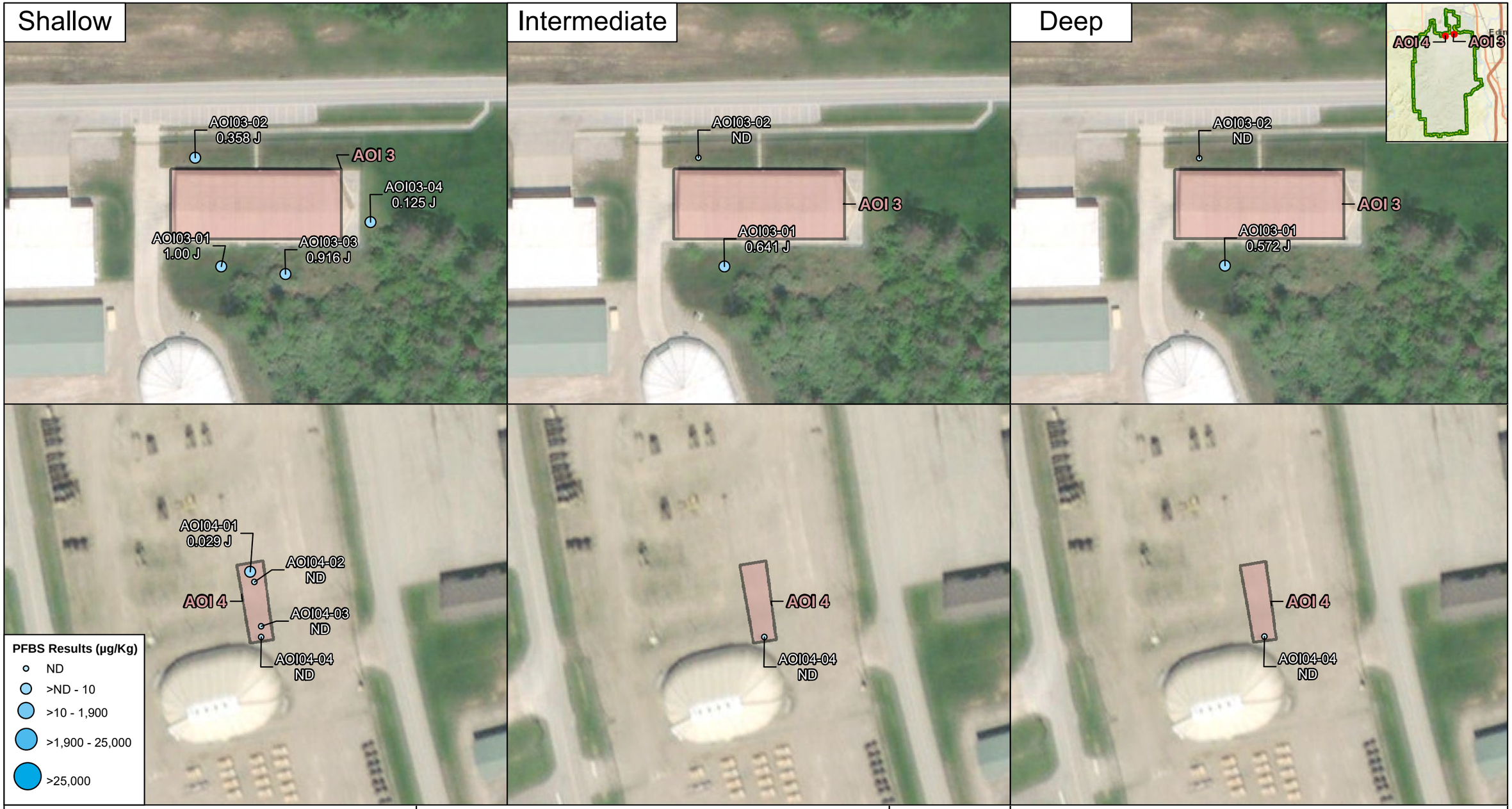


| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 2/28/2022 | GIS BY | MS | 2/28/2022 |
| SCALE | 1:592,900 | CHK BY | MC | 2/28/2022 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 2/28/2022 |

**Legend**

Area of Interest

Facility Location

0 50 100 200 Feet

J = Estimated concentration

N

# PFBS Detections in Soil - AOI 3 and AOI 4

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-6**

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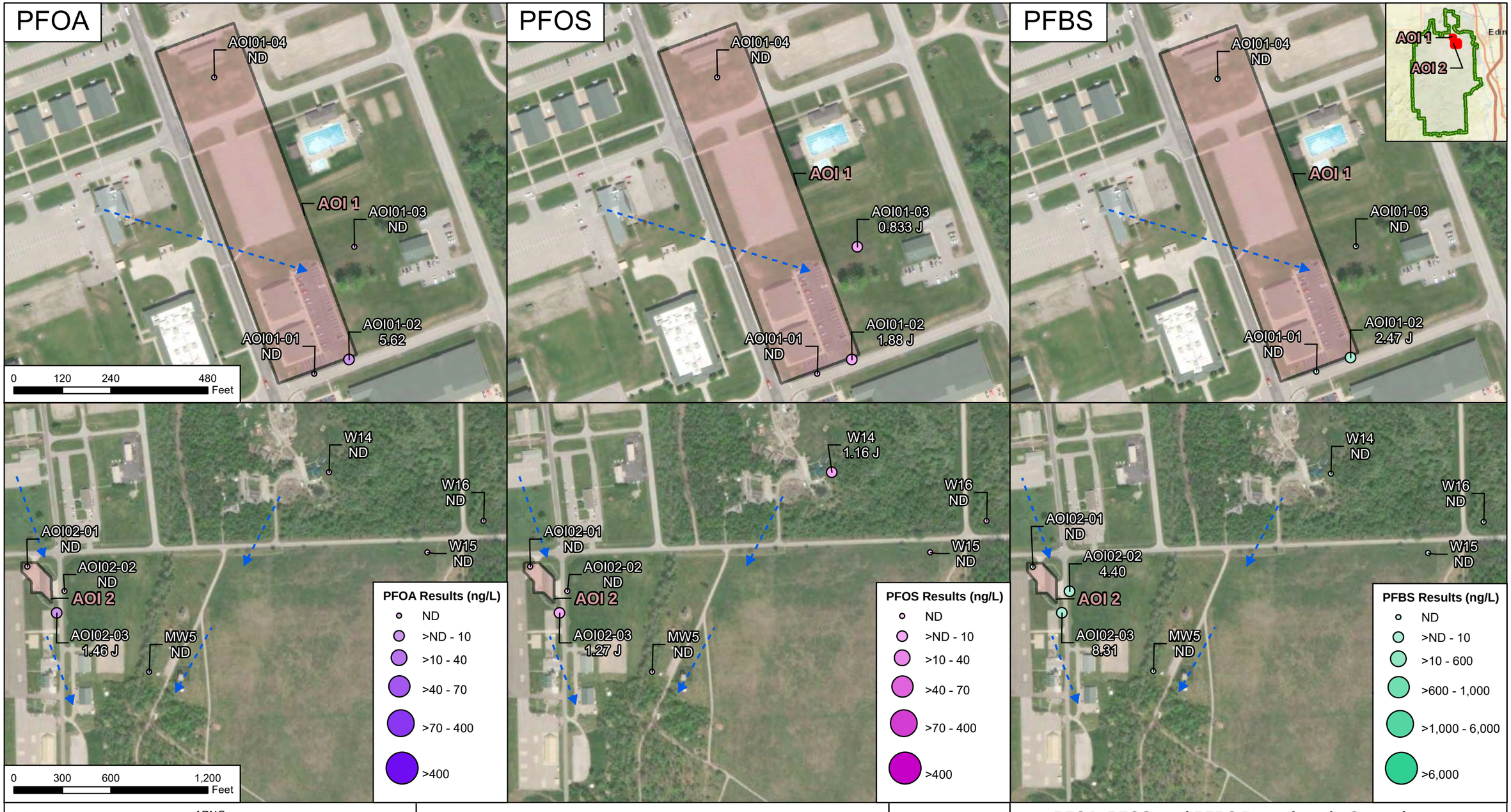


| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 2/25/2022 | GIS BY | MS | 2/25/2022 |
| SCALE | 1:592,900 | CHK BY | MC | 2/25/2022 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 2/25/2022 |

**Legend**

- Area of Interest
- Facility Location
- Groundwater Flow Direction

J = Estimated concentration

N

# PFOA, PFOS, and PFBS Detections in Groundwater - AOI 1, AOI2, and Sitewide Existing Monitoring Wells

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-7**

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PFOA

AOI03-02
ND

AOI 3

AOI03-01
ND

PFOS

AOI03-02
ND

AOI 3

AOI03-01
ND

PFBS

AOI 4
AOI 3

AOI03-02
1.20 J

AOI 3

AOI03-01
2160

AOI 4

AOI04-04
ND

AOI 4

AOI04-04
ND

AOI 4

AOI04-04
1.07 J

**PFOA Results (ng/L)**
- ND
- >ND - 10
- >10 - 40
- >40 - 70
- >70 - 400
- >400

**PFOS Results (ng/L)**
- ND
- >ND - 10
- >10 - 40
- >40 - 70
- >70 - 400
- >400

**PFBS Results (ng/L)**
- ND
- >ND - 10
- >10 - 600
- >600 - 1,000
- >1,000 - 6,000
- >6,000

| | | | | |
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection for PFAS at Camp Atterbury, IN | | | |
| REVISED | 2/25/2022 | GIS BY | MS | 2/25/2022 |
| SCALE | 1:592,900 | CHK BY | MC | 2/25/2022 |
| Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | | PM | CM | 2/25/2022 |

**Legend**
- Area of Interest
- Facility Location
- Groundwater Flow Direction

0 50 100 200 Feet

J = Estimated concentration

N

# PFOA, PFOS, and PFBS Detections in Groundwater - AOI 3 and AOI 4

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 6-8**

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# 7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **Figure 7-4**. 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 PFOA, PFOS, or PFBS 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 PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway may warrant further investigation.

In general, the potential routes of exposure to PFAS 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 PFAS toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers (though unlikely due to restricted access at Camp Atterbury), residents outside the facility boundary, and recreational users outside of the facility boundary.

## 7.1 Soil Exposure Pathway

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

### 7.1.1 AOI 1

In the late 1990s, a malfunction with the fire equipment stored in Former Fire Station 592 resulted in a discharge of an unknown type and quantity of firefighting foam. Details regarding the fate of the foam are unknown, but it is likely that the foam was rinsed and pushed out of the building and onto the surface soil. Additionally, there is photographic evidence, which dates to the 1980s, of foam-equipped firetrucks parked at the adjacent Former Fire Station 325.

PFOA, PFOS, and PFBS were detected in soil at AOI 1, at the boring locations near Former Fire Station 325 and Former Fire Station 592. These PFAS compounds were detected at concentrations below their respective soil SLs; however, the results confirm the release of PFAS to soil. Ground-disturbing activities of the surface soil could potentially result in site worker, trespasser, or future construction worker exposure to PFOA, PFOS, and PFBS via inhalation of

dust and ingestion of surface soil. Additionally, on-facility recreational users at the nearby campground may potentially be exposed to PFOA, PFOS, and PFBS via inhalation of dust caused by on-facility ground disturbing activities, although this exposure is likely insignificant. Ground-disturbing activities in subsurface soil could also result in future construction worker exposure to PFOA and PFOS via ingestion and inhalation of dust since there is no current construction work at AOI 1. AOI 1 is within the Camp Atterbury Cantonment and is not located adjacent to residential areas; therefore, the residential exposure pathway is considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

### 7.1.2 AOI 2

The Current Fire Station houses a firetruck equipped with an AFFF tank in addition to storing eight 55-gallon drums of 3% Chemguard AFFF. No confirmed releases of AFFF were noted to have occurred prior to the SI, although recent information obtained from Camp Atterbury fire personnel indicated that fire equipment was occasionally drained on the grass area northwest of the fire station building. It is not known if only water was drained or if the equipment contained AFFF.

PFOS was detected in soil at two of the three sample locations. Both detections were below the PFOS soil SL. PFOA and PFBS were not detected at AOI 2. Ground-disturbing activities could potentially result in site worker, trespasser, and future construction worker exposure to PFOS via inhalation of dust or ingestion of surface soil. Additionally, ground-disturbing activities could potentially result in future construction worker exposure to PFOS in subsurface soil. No current construction is occurring at AOI 2. AOI 2 is not located adjacent to residential areas; therefore, the residential exposure pathway is considered incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

### 7.1.3 AOI 3

Four Tri-Max™-30 emergency response crash carts were acquired from another INARNG facility in 2004 and were stored at AOI 3 until being relocated elsewhere on Camp Atterbury in 2020. There are no recorded leaks, spills, or discharges of AFFF while the Tri-Max™-30 units were at AOI 3.

PFOA, PFOS, and PFBS were detected in surface soil at AOI 3, at concentrations below the respective soil SLs. Ground-disturbing activities of surface soil may result in potential exposure of PFAS via ingestion and inhalation of dust to site workers, trespassers, and future construction workers. Additionally, on-facility recreational users at the nearby campground may potentially be exposed to PFOA, PFOS, and PFBS via inhalation of dust caused by on-facility ground disturbing activities, although this exposure is likely insignificant. PFOS and PFBS were detected in the subsurface, meaning deeper ground-disturbing activities could result in future construction worker exposure to PFOS and PFBS via ingestion and inhalation of dust in subsurface soil. There is no ongoing construction at AOI 3. AOI 3 is not located adjacent to offsite residential areas; therefore, the residential exposure pathway is considered incomplete. The CSM for AOI 3 is presented on **Figure 7-3**.

### 7.1.4 AOI 4

The four Tri-Max™-30 units, which had been stored at the Former Tri-Max™ Storage Area (AOI 3), were moved to the salvage yard at AOI 4 in 2020. The Tri-Max™-30 units are staged in two pairs on the uncovered gravel lot. There are no recorded leaks, spills, or discharges of AFFF at AOI 4.

PFOS and PFBS were detected in surface soil at AOI 4, at concentrations below their respective SLs. Ground-disturbing activities of surface soil may result in potential exposure of PFOS and

PFBS via ingestion and inhalation of dust to site workers and future construction workers. There is also potential for exposure of these compounds in surface soil to trespassers; however, that risk is less likely since the salvage yard is within a secondary secured area on Camp Atterbury. There were no detections of PFAS in the subsurface soil at AOI 4, but it is possible that PFAS may have infiltrated into the subsurface soil; therefore, ground-disturbing activities could result in future construction worker exposure to PFOS and PFBS via ingestion and inhalation of dust. AOI 4 is not located adjacent to offsite residential areas; therefore, the residential exposure pathway is considered incomplete. The CSM for AOI 4 is presented on **Figure 7-4**.

## 7.2 Groundwater Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 based on the aforementioned criteria.

### 7.2.1 AOI 1

PFOA, PFOS, and PFBS were detected in groundwater at AOI 1, at concentrations below the SLs. The maximum concentrations observed were at sample location AOI01-02, downgradient from Former Fire Station 592; however, they were still at least one order of magnitude below the SLs. Drinking water at Camp Atterbury is provided by the local municipality, which supplies its water from several deeper wells located northeast, upgradient of the facility (Atterbury-Muscatatuck Installation, 2018). Additionally, the decontamination water samples (**Appendix F**), which were collected from the Camp Atterbury water supply at several locations, had no detections of PFOA, PFOS, or PFBS; therefore, the ingestion pathway for the site worker is considered incomplete. Groundwater was encountered in borings at AOI 1, at depths between 4 and 6 feet bgs. As a result, the ingestion pathway for future construction workers is potentially complete. The ingestion pathway for offsite residents is also potentially complete since numerous groundwater supply wells were identified within the vicinity of Camp Atterbury; however, the risk is likely insignificant due to the distance to these receptors along the groundwater flow direction, presence of major surface water bodies between AOI 1 and the receptors (i.e., Driftwood River), and likelihood that many of the supply wells are screened below the surficial aquifer. The CSM for AOI 1 is presented on **Figure 7-1**.

### 7.2.2 AOI 2

PFOA, PFOS, and PFBS were detected in groundwater at AOI 2, at concentrations below the SLs. The site worker ingestion pathway is considered incomplete since Camp Atterbury is supplied with public water sourced from several deep supply wells upgradient from the facility (Atterbury-Muscatatuck Installation, 2018). Additionally, decontamination water samples collected from the Camp Atterbury water supply did not have detections of PFOA, PFOS, of PFBS. The ingestion pathway for future construction workers is considered potentially complete because groundwater at AOI 2 was observed at depths between 8 and 17 feet bgs. Due to the presence of offsite potable wells, the ingestion pathway for offsite residents is also potentially complete; however, the risk is considered insignificant due to the distance of these receptors from AOI 2, presence of potentially interfering surface water bodies, and likelihood that the potable wells are screened in a deeper aquifer. The CSM for AOI 2 is presented on **Figure 7-2**.

### 7.2.3 AOI 3

PFBS was detected in groundwater at both AOI 3 temporary well locations and exceeded the PFBS SL at location AOI03-01. PFOA and PFOS were not detected at AOI 3. The site worker ingestion pathway is considered incomplete since Camp Atterbury is supplied with public water

sourced from several deep supply wells upgradient from the facility. Additionally, decontamination water samples collected from the Camp Atterbury water supply did not have detections of PFOA, PFOS, or PFBS. The ingestion pathway for future construction workers is considered potentially complete because groundwater at AOI 3 was observed at depths between about 5 and 6 feet bgs. Due to the presence of offsite potable wells, the ingestion pathway for offsite residents is also potentially complete; however, the risk is likely less significant due to the distance of these receptors from AOI 3, presence of potentially interfering surface water bodies, and likelihood that the potable wells are screened in a deeper aquifer. The CSM for AOI 3 is presented on **Figure 7-3**.

### 7.2.4 AOI 4

PFBS was detected in groundwater at AOI 4, at a concentration below the SL. PFOA and PFOS were not detected at AOI 4. The site worker ingestion pathway is considered incomplete since Camp Atterbury is supplied with public water sourced from several deep supply wells upgradient from the facility. Additionally, decontamination water samples collected from the Camp Atterbury water supply did not have detections of PFOA, PFOS, of PFBS. The ingestion pathway for future construction workers is considered potentially complete because groundwater at AOI 4 was observed at a depth of approximately 6 feet bgs. Due to the presence of offsite potable wells, the ingestion pathway for offsite residents is also potentially complete; however, the risk is considered insignificant due to the distance of these receptors from AOI 4, presence of potentially interfering surface water bodies, and likelihood that the potable wells are screened in a deeper aquifer. The CSM for AOI 4 is presented on **Figure 7-4**.

### 7.2.5 Sitewide Wells

PFOS was detected in groundwater at W14, at a concentration below the SL. PFOA and PFBS were not detected in the existing monitoring wells. The site worker ingestion pathway is considered incomplete since Camp Atterbury is supplied with public water sourced from several deep supply wells upgradient from the facility. Additionally, decontamination water samples collected from the Camp Atterbury water supply did not have detections of PFOA, PFOS, or PFBS. The ingestion pathway for future construction workers is considered potentially complete because groundwater in these wells was observed at depths as shallow as 1.33 feet bgs. Due to the presence of offsite potable wells, the ingestion pathway for offsite residents is also potentially complete; however, the risk is likely less significant due to the distance to these receptors, the presence of potentially interfering surface water bodies, and likelihood that the potable wells are screened in a deeper aquifer. The CSM for groundwater pathway for the site wells is the same as for the AOIs presented on **Figure 7-1, 7-2,** and **Figure 7-4**.

## 7.3 Surface Water and Sediment Exposure Pathway

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

### 7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to sediment and surface water via leaching and run-off. Overland surface water run-off at AOI 1 is eventually conveyed by surface drainages to an unnamed creek east of the Camp Atterbury cantonment. Because PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 1, it is possible that those compounds may have migrated to the unnamed creek from soil via surface runoff or potentially via groundwater discharge where groundwater is shallow. Therefore, the surface water and sediment

ingestion exposure pathway for site workers, future construction workers, and trespassers is considered potentially complete.

The unnamed creek drains to Nineveh Creek and later discharges to the Driftwood River further downstream. The Driftwood River is the primary surface water drainage for Camp Atterbury and area to the east. The Driftwood River is not used as drinking water sources but is used for recreation (e.g., fishing and swimming). Therefore, the ingestion exposure pathways for surface water and sediment are potentially complete for offsite recreational users of the Driftwood River but incomplete for off-facility residents. The CSM for AOI 1 is presented on **Figure 7-1**.

### 7.3.2 AOI 2

Surface water run-off at AOI 2 flows from paved and grass covered areas into constructed drainage ditches surrounding the fire station and is eventually conveyed east into the same unnamed Creek identified near AOI 1. PFOS detected in soil AOI 2 could potentially migrate from surface soil to sediment and surface water via runoff or leaching. Further, PFOA, PFOS, and PFBS were detected in groundwater at AOI 2 and could potentially migrate to surface water via groundwater discharge where groundwater is shallow. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, and trespassers is considered potentially complete. The unnamed creek drains to Nineveh Creek and later discharges to the Driftwood River further downstream, making the ingestion exposure pathways for surface water and sediment potentially complete for offsite recreational users of the Driftwood River, but incomplete for off-facility residents since the Driftwood River is not identified as drinking water source downstream of the facility. The CSM for AOI 2 is presented on **Figure 7-2**.

### 7.3.3 AOI 3

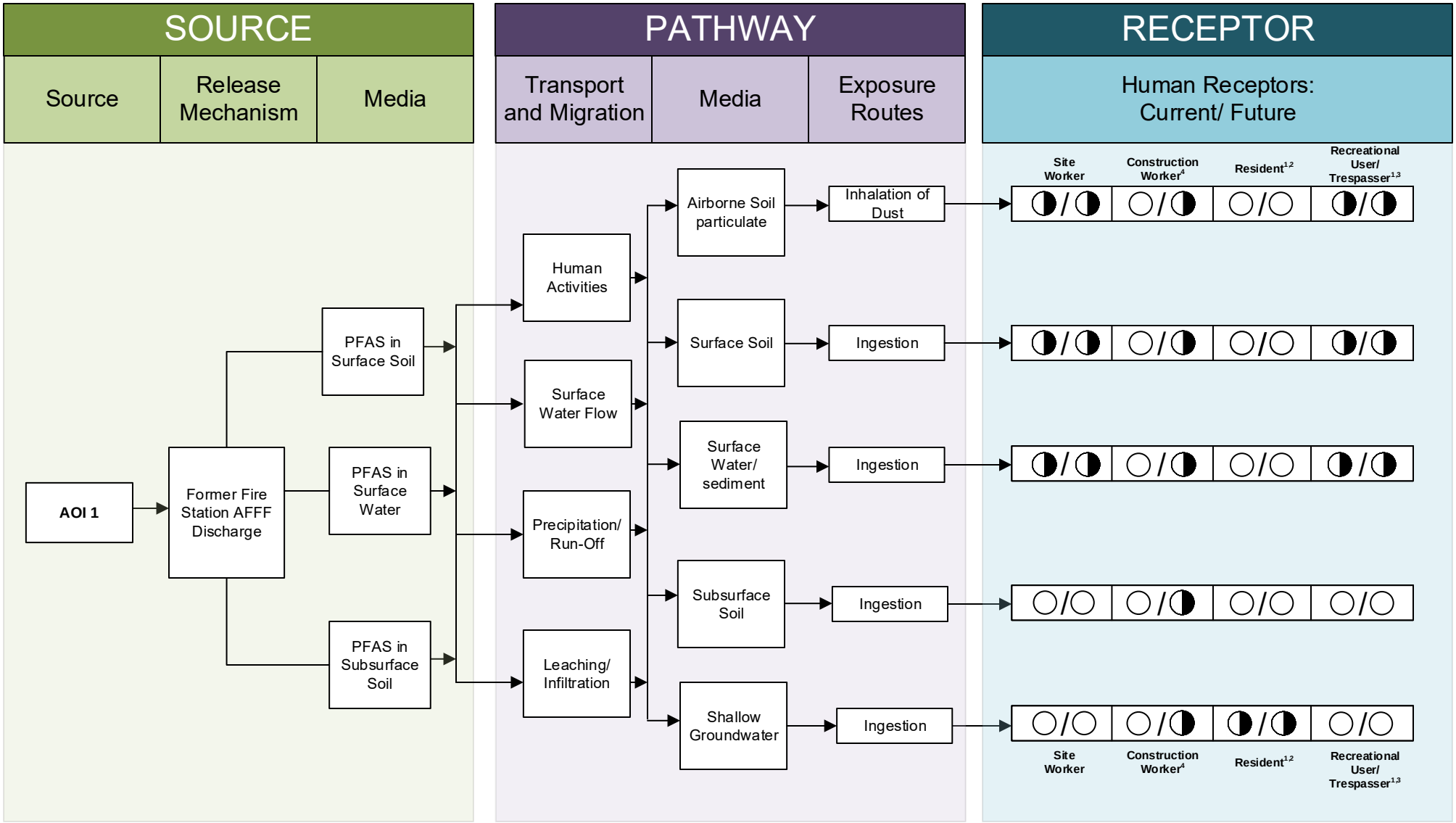
Surface water run-off at AOI 3 flows overland via grassy swales east into the same unnamed creek identified for AOI 1 and AOI 2. AOI 3 is the closest of the three locations to the creek and is upstream relative to the other AOIs. Due to detections of PFOA, PFOS, and PFBS in soil AOI 3, the ingestion pathway for surface water and sediment is potentially complete for site workers, future construction workers, and trespassers. PFBS was detected in groundwater above the SL at AOI 3, resulting in a potentially complete exposure pathway for site workers, future construction workers, and trespassers via sediment and surface water where the potential for groundwater discharge to surface water exists. Additionally, consistent with AOI 1 and AOI 2, the ingestion exposure pathways for surface water and sediment are potentially complete for offsite recreational users of the Driftwood River and incomplete for off-facility residents. The CSM for AOI 3 is presented on **Figure 7-3**.

### 7.3.4 AOI 4

Surface water that does not infiltrate into the gravel at AOI 4 runs-off into either of two drainage ditches along the east and west side of the salvage lot and is eventually conveyed to an unnamed drainage located centrally within the cantonment. PFOS and PFBS detected in soil AOI 4 could potentially migrate from surface soil to sediment and surface water via runoff or leaching. PFBS was detected in groundwater at AOI 4 and could potentially migrate to surface water via groundwater discharge where groundwater is shallow. As a result, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, and trespassers is considered potentially complete. The unnamed drainage east of AOI 4, while not the same that was identified at the other AOIs, also drains to Nineveh Creek and eventually to the Driftwood River. Consistent with the other AOIs, the ingestion exposure pathways for surface water and sediment are potentially complete for offsite recreational users of the Driftwood River and incomplete for off-facility residents. The CSM for AOI 4 is presented on **Figure 7-4**.

### 7.3.5 Sitewide Wells

PFOS was detected in groundwater in existing monitoring well W14 and could potentially migrate to surface water via groundwater discharge. This migration is more likely to occur near W14 than other locations due to the shallow depth to water measured in the well during the SI. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, and trespassers is considered potentially complete. The unnamed creek west of W14, located between W14 and AOIs 1 through 3, drains to Nineveh Creek and eventually the Driftwood River. Consistent with the AOIs, the ingestion exposure pathways for surface water and sediment are potentially complete for offsite recreational users of the Driftwood River and incomplete for off-facility residents. The CSM for the surface water and sediment pathways for the site wells is the same as for the AOIs presented on **Figure 7-1** through **Figure 7-4**.



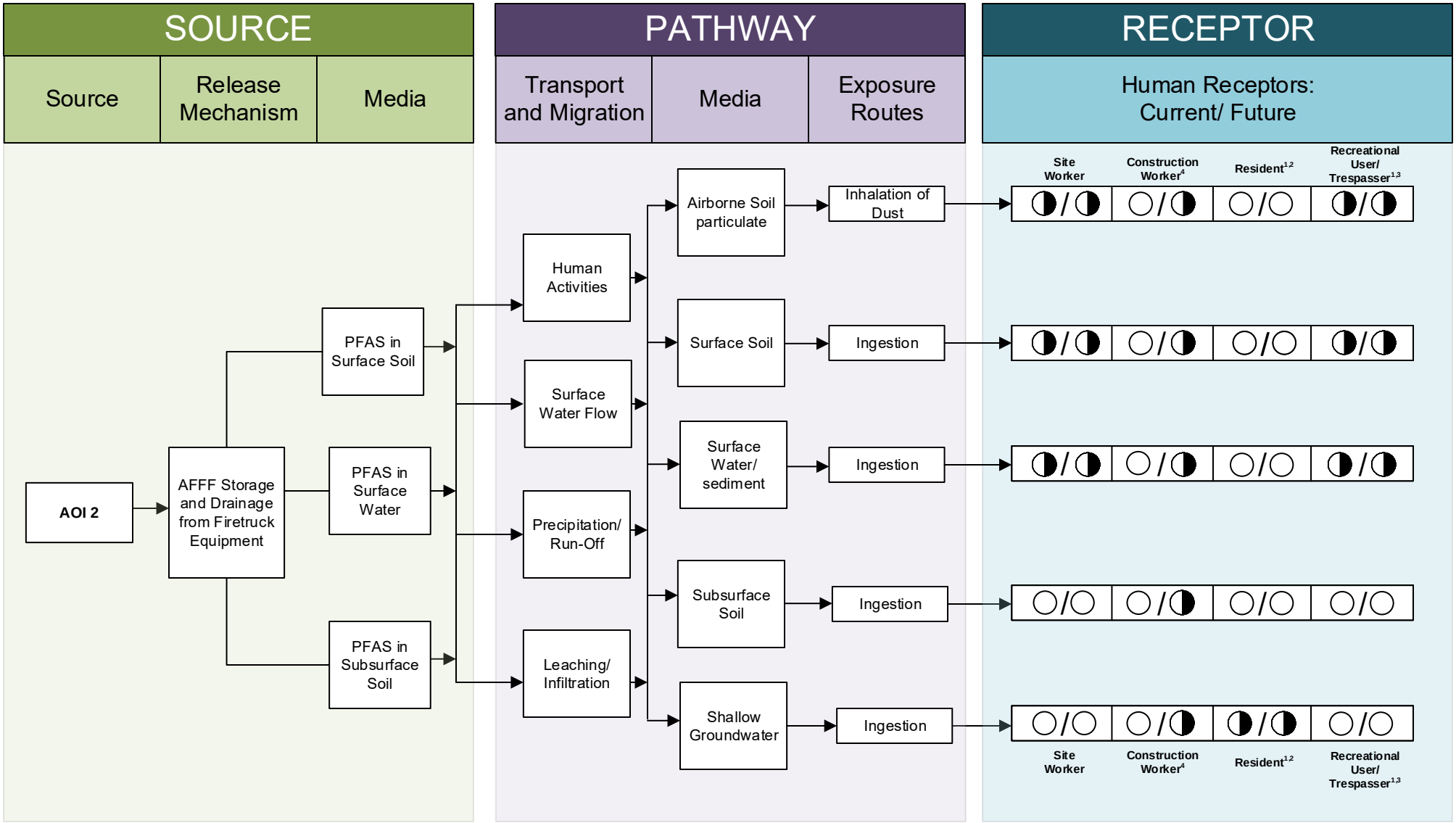

**LEGEND**

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

**NOTES**

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. Human consumption of fish potentially affected by PFAS is possible.
4. No current active construction within AOI 1 was occurring as of the date of SI field work.

**Figure 7-1**
Conceptual Site Model, AOI 1
Former Fire Station AFFF Discharge



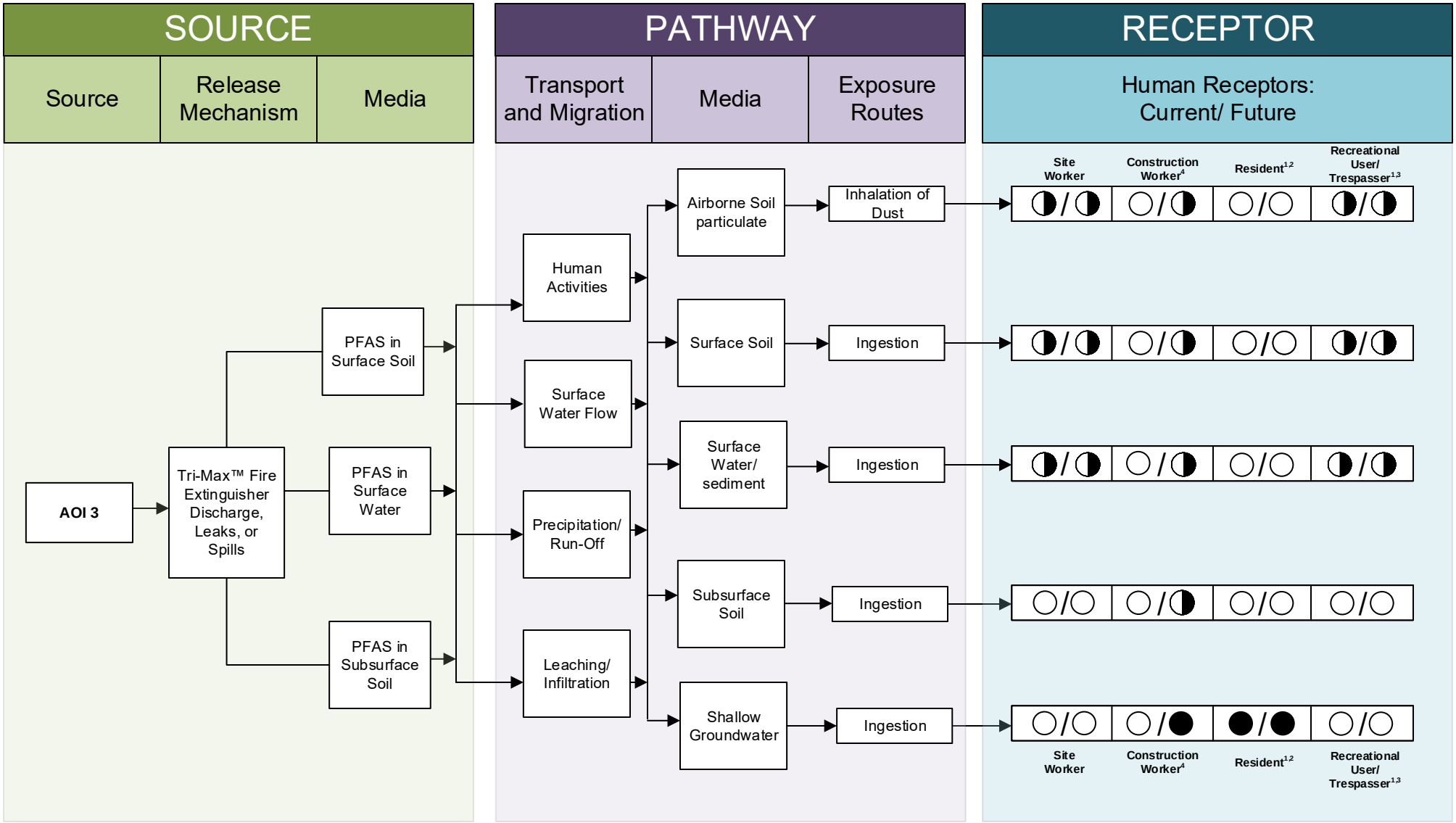

**LEGEND**

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

**NOTES**

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. Human consumption of fish potentially affected by PFAS is possible.
4. No current active construction within AOI 2 was occurring as of the date of SI field work.

**Figure 7-2**
Conceptual Site Model, AOI 2
Current Fire Station



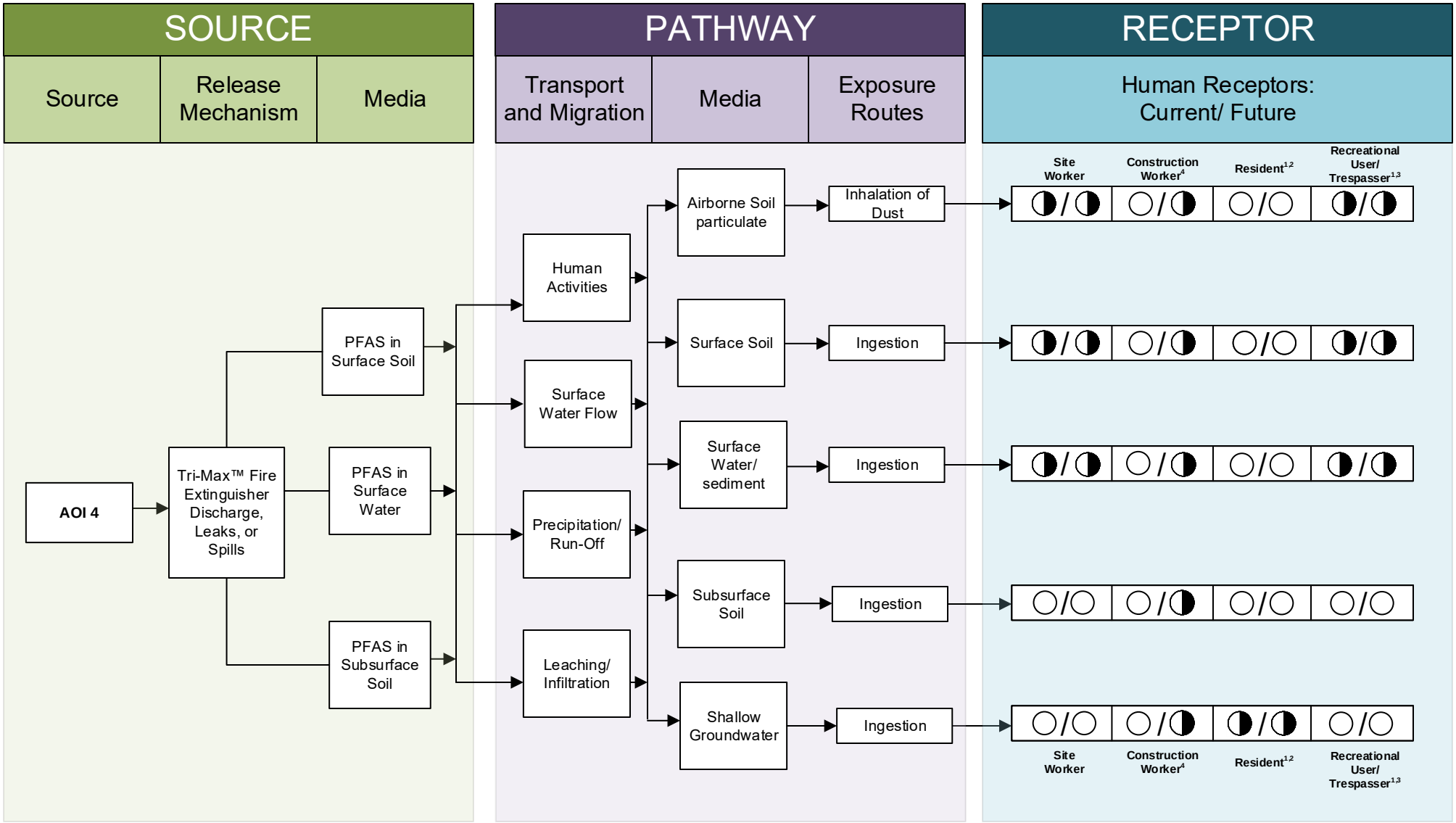

**LEGEND**

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

**NOTES**

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. Human consumption of fish potentially affected by PFAS is possible.
4. No current active construction within AOI 3 was occurring as of the date of SI field work.

**Figure 7-3**
Conceptual Site Model, AOI 3
Former Tri-Max™ Storage Area




**LEGEND**

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

**NOTES**

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. Human consumption of fish potentially affected by PFAS is possible.
4. No current active construction within AOI 4 was occurring as of the date of SI field work.

**Figure 7-4**
Conceptual Site Model, AOI 4
Current Tri-Max™ Storage Area

# 8. Summary and Outcome

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

## 8.1 SI Activities

The SI field activities were conducted from 16 to 20 August 2021 and consisted of utility clearance, direct-push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, low-flow groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), 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 PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.8** of this Report.

- Thirty-five (35) soil samples from 15 boring locations;
- Ten (10) grab groundwater samples from 10 temporary well locations;
- Four low-flow groundwater samples from four existing monitoring wells
- Ten (10) QA samples.

The information gathered during this investigation was used to determine if PFOA, PFOS, and/or PFBS were present at or above SLs. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure to PFOA, PFOS, and PFBS at the AOIs, which are described in **Section 7**.

## 8.2 SI Goals Evaluation

As described in **Section 4.2**, the SI activities were designed to achieve six main goals or DQOs. This section describes the SI goals and the conclusions that can be made for each based on the data collected during this investigation.

1. *Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.*

   PFOA, PFOS, and PFBS were detected at the facility in soil and groundwater. The only exceedance of an SL occurred in groundwater at AOI 3, where PFBS was detected at 2,160 ng/L, which is over the SL of 600 ng/L. Detections of PFOA, PFOS, and PFBS were observed in soil and groundwater elsewhere within and near the source areas, and in groundwater at one existing monitoring well location on-facility.

2. *Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.*

   Two AOIs, comprised of a total of three potential PFAS release areas, were removed from further consideration based on the groundwater and soil data collected during this SI: Former Fire Station 592 and Former Fire Station 325, which comprise AOI 1, and the Current Tri-Max™ Storage Area at AOI 4. PFOA, PFOS, and PFBS were not detected in groundwater and/ or soil above their respective SLs in any of these areas; therefore, based on the criteria discussed in Section 4.1, these areas are removed from further

consideration as they are considered to pose no significant threat to human health or the environment. Soil and groundwater results for PFOA, PFOS, and PFBS at AOI 2: Current Fire Station were also below the respective SLs; however, further evaluation of AOI 2 is now warranted because of the AFFF release that occurred in May 2022, after the SI was performed.

3. *Determine the potential need for a TCRA (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.*

   Based on the data collected during this SI, there is not a complete pathway between source and on-facility drinking water receptors. Drinking water for Camp Atterbury is purchased from a local municipality, which sources its water from several deeper wells located northeast, upgradient of the facility (Atterbury-Muscatatuck Installation, 2018). Additionally, PFOA, PFOS, and PFBS were not detected in the decontamination water samples collected from the Camp Atterbury water supply in June 2021 as part of preparations for the SI activities.

   Due to the PFAS detections in groundwater and the presence of offsite potable wells, a potentially complete pathway exists between source and off-facility residential drinking water receptors. However, the risk is not likely significant due to the distance of these receptors from the release areas in the direction of groundwater flow, the presence of surface water bodies which may disrupt groundwater flow between the source and receptors, and the likelihood that the offsite potable wells are screened in deeper aquifers. A TCRA is not considered necessary.

4. *Collect data to better characterize the release areas for more effective and rapid initiation of a RI (if determined necessary).*

   The geological data collected as part of the SI indicate the presence of poorly graded soils dominated by silt and varying amounts of very fine sand and clay, resulting in hydrogeological conditions characterized by moderate permeability and conductivity. Trace amounts of sand and gravel found over occasional narrow intervals mark more highly transmissive zones.

   These facility observations are consistent with the known glacial depositional history and hydrogeological regions present at Camp Atterbury. The finer grained and poorly sorted soils encountered throughout the majority of the boring sections are representative of the Trafalgar Till Formation that underlies nearly all of the investigation area, and in some instances, the post-glacial alluvial deposits of the Martinsville Formation. Much less prevalent, the trace amounts of coarser sand and gravel that were found in narrow intervals, as well as the layer of well graded sand and gravel encountered in one boring, are suggestive of the higher energy outwash facies more common within the Atherton Formation, which becomes more dominant just south of the investigation area.

   Surface water infiltration at the release areas is expected due to the moderate permeability of the soils observed in SI borings and the relatively shallow topography. The presence of continuous clay layers, which might act as an aquitard inhibiting downward migration within the subsurface, were not observed. Therefore, groundwater migration beneath the facility is expected within the till material; however, it may be controlled by the more highly transmissive outwash deposits, as suggested by water level observations within some of the soil borings. Groundwater-surface water interactions have been documented at Camp Atterbury, particularly in the larger surface water bodies like Nineveh Creek, which crosses south of the AOIs (USGS, 2006).

Depth to water in the investigation area was observed between around 1 and 20 feet bgs during the SI. Groundwater flow direction is variable but is generally east-southeast in the northern part of the investigation area and turns to the south moving towards AOI 2. SI findings and previous investigations (USGS, 2006) suggest that groundwater flow is similar to surface water drainage patterns. These geologic and hydrogeologic observations inform development of technical approach for the RI.

5. *If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities)*

   Based upon the evaluation of groundwater and soil results in comparison to SLs, in combination with the groundwater flow direction analysis, the results of the SI indicate that the source of detected concentrations of PFOA, PFOS, and PFBS at the facility is likely attributable to ARNG activities.

6. *Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.*

   Detections of PFOA, PFOS, and PFBS in soil and groundwater at source areas indicate there is a potentially complete pathway between source and on-facility receptors as a result of ARNG activities. A potentially complete pathway also exists between sources and potential off-facility receptors as a result of these detections; however, this exposure is likely insignificant due to the distance between source and receptor along the migration pathways.

## 8.3 Outcome

Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure from sources on facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared against the project SLs for PFOA, PFOS, and PFBS 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:

- PFBS in groundwater at AOI 3 exceeded the SL of 600 ng/L, with a concentration of 2,160 ng/L. Based on the results of the SI, further evaluation of AOI 3 is warranted in the RI.
- At AOI 1, AOI 2, AOI 4, and in the existing Camp Atterbury monitoring wells, detected concentrations of PFOA, PFOS, and PFBS in groundwater were below their respective SLs.
- The detected concentrations of PFOA, PFOS, and PFBS in soil at all AOIs were below their respective SLs.

**Table 8-1** summarizes the SI results for soil and groundwater. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure of on-facility and off-facility receptors caused by DoD activities at the facility.

**Table 8-2** summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOI 3: Former Tri-Max™ Staging Area. The small AFFF release which occurred after the SI at AOI 2: Current Fire Station will also be evaluated during the RI phase.

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## Table 8-1: Summary of Site Inspection Findings

| AOI | Potential PFAS Release Area | Soil – Source Area | Groundwater – Source Area | Groundwater – Facility Boundary |
|---|---|---|---|---|
| 1 | Former Fire Station 592 | ◐ | ◐ | N/A |
| | Former Fire Station 325 | ◐ | ◐ | N/A |
| 2 | Current Fire Station | ◐ | ◐ | N/A |
| 3 | Former Tri-Max™ Staging Area | ◐ | ● | N/A |
| 4 | Current Tri-Max™ Staging Area | ◐ | ◐ | N/A |
| Sitewide Wells[1] | Unknown | N/A[2] | ◐ | N/A |

Legend:
N/A = Not applicable
1) Sitewide wells are not associated with a source area.
2) Soil data were not collected at existing wells.

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

**Table 8-2: Site Inspection Recommendations**

| AOI | Description | Rationale | Future Action |
|---|---|---|---|
| 1 | Former Fire Station AFFF Discharge | Detections in soil and groundwater but no exceedances of SLs. | No further action |
| 2 | Current Fire Station | Detections in soil and groundwater but no exceedances of SLs. Small AFFF release occurred after the SI was performed. | Evaluate the AFFF release during RI |
| 3 | Former Tri-Max™ Staging Area | Exceedance of SL in groundwater. Detections in soil but no exceedance of SLs. | Proceed to RI |
| 4 | Current Tri-Max™ Staging Area | Detections in soil and groundwater but no exceedances of SLs. | No further action |
| Sitewide Wells | Existing onsite wells | Detection in groundwater but no exceedances of SLs. | No further action |

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