FINAL PRELIMINARY ASSESSMENT AND SITE INSPECTION OF PER- AND POLYFLUOROALKYL SUBSTANCES

Letterkenny Army Depot, Pennsylvania

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Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

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EXECUTIVE SUMMARY

The United States Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations nationwide. The PA identifies areas of potential interest (AOPIs) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. The SI includes multi-media sampling at AOPIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. This Letterkenny Army Depot (LEAD) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense policy and guidance.

LEAD is located on the western side of the Cumberland Valley, in the central part of Franklin County, 5 miles North of Chambersburg, Pennsylvania. Chambersburg is the county seat, and based on the 2010 Census, is the largest town in Franklin County with 17,862 inhabitants. LEAD is divided into two major operational areas, which are the Ammunition Disposal and Storage Area, and the Industrial Area. The Industrial Area contains two National Priorities List sites, which are the Property Disposal Office Area and the Southeast Area. This PA/SI focuses on the Industrial Area of LEAD, which is located in the southeast corner of LEAD and comprises 1,692 acres and serves as repair and modernization of Air and Missile Defense and precision fire systems to enable multi-domain operations for United States Allied Forces.

The LEAD PA identified 12 AOPIs, including three Base Realignment and Closure Areas, for investigation during the SI phase. SI sampling results from the 12 AOPIs were compared to risk-based screening levels calculated by the Office of the Secretary of Defense (OSD) for PFOS, PFOA, and PFBS. PFOS, PFOA, and/or PFBS were detected in groundwater, soil, surface water, and/or sediment at all 12 AOPIs; six of the 12 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels. The LEAD PA/SI identified the need for further study in a CERCLA remedial investigation. **Table ES-1** below summarizes the PA/SI sampling results and provides recommendations for further study in a remedial investigation or no action at this time at each AOPI.

Table ES-1. Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at LEAD, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Former Area B Fire Training Area (LEAD-009)	No	No	NS	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Property Disposal Office Area - Oil Burn Pit (LEAD-010)	Yes	NS	NS	NS	Further study in a remedial investigation
Former Concrete Lined Fire Training Area (LEAD-063)	Yes	No	NS	NS	Further study in a remedial investigation
Industrial Wastewater Sewer Lines (LEAD-005 Aqueous Film-Forming Foam Release) (LEAD-074)	No	ND	NS	NS	No action at this time
Current Fire Department Station	Yes	No	ND	NA	Further study in a remedial investigation
Base Realignment and Closure Area Building 2291 – Former Hazardous Materials Building	Yes	ND	NS	NS	No action at this time; will be addressed under the Property Disposal Office Area - Oil Burn Pit (LEAD-010) AOPI
Former Chrome Plating (LEAD-003)	Yes	NS	NS	NS	Further study in a remedial investigation
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	No	NS	NA	NA	No action at this time
Sludge Application Area – Vehicle Test Track Southern Lobe (LEAD-016)	No	No	NS	NS	No action at this time
Base Realignment and Closure Area – Government Vehicle Storage Area	No	ND	ND	ND	No action at this time
Past Aqueous Film-Forming Foam Storage Area	No	ND	NS	NS	No action at this time
Low Temperature Thermal Volatilization Site	Yes	ND	NS	NS	Further study in a remedial investigation

Notes:

Light gray shading – detection greater than the OSD risk screening level

GW – groundwater

NA – not applicable (PFOS, PFOA, or PFBS detected, but comparison to OSD Risk Screening Levels is not applicable for surface water and sediment)

ND – non-detect
NS – not sampled
SE – sediment
SO – soil
SW – surface water

1 INTRODUCTION

The United States (U.S.) Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The Army is the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Executive Order 12580 and is conducting the PA/SI consistent with its authority under CERCLA, 42 United States Code §§ 9600, et seq. (as amended), and the Defense Environmental Restoration Program, 10 United States Code §§ 2701, et seq. The PFAS PA/SI included two distinct efforts. The PA identified locations that are areas of potential interest (AOPIs) at Letterkenny Army Depot (LEAD), Pennsylvania, based on the use, storage and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release has occurred, and the PFOS, PFOA, and PFBS results were compared to the Office of the Secretary of Defense (OSD) PFOS, PFOA, and PFBS risk screening levels to determine whether further investigation is warranted. This report provides the PA/SI for LEAD and was completed in accordance with CERCLA and The National Oil and Hazardous Substances Pollution Contingency Plan.

1.1 Project Background

PFAS are a class of compounds that have been used in a wide range of industrial applications and commercial products due to their unique surface tension/leveling properties. Due to industry and regulatory concerns about the potential health effects and adverse environmental impacts, there has been a reduction in the manufacture and use of PFAS worldwide. In the U.S., significant reductions in the production, importation, and use of PFOS and PFOA (two individual compounds in the PFAS class) occurred between 2001 and 2015 (Interstate Technology Regulatory Council 2017). PFBS replaced PFOS in some applications and is currently used and manufactured in the U.S.

In 2016, the United States Environmental Protection Agency (USEPA) established a Lifetime Health Advisory of 70 nanograms per liter (ng/L) in drinking water for PFOS or PFOA and for the sum of PFOS and PFOA when both are present (USEPA 2016). On 15 October 2019, the OSD provided guidance on the investigation of PFOS, PFOA, and PFBS at Department of Defense (DoD) restoration sites (OSD 2019). The DoD guidance provides risk screening levels for PFOS, PFOA, and PFBS in tap water and soil, calculated using the USEPA's Regional Screening Level (RSL) calculator for residential and industrial/commercial worker receptor scenarios. Following the issuance of the 2019 OSD memo, on 08 April 2021, USEPA published an updated toxicity assessment for PFBS (USEPA 2021). Based on the updated toxicity assessment for PFBS, the OSD issued a memorandum on 15 September 2021 to include updated PFBS risk screening levels. The September 2021 Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program is provided for reference as **Appendix A**. The OSD risk screening levels for tap water (also used to evaluate groundwater or surface water used as drinking water sources) are 40 ng/L for PFOS and PFOA, and 600 ng/L for PFBS. The PFOS and PFOA soil screening levels for the residential and industrial/commercial scenarios are

0.13 milligrams per kilogram (mg/kg) (residential) and 1.6 mg/kg (industrial/commercial). The soil screening levels for PFBS are 1.9 mg/kg (residential) and 25 mg/kg (industrial/commercial). These screening criteria are discussed further in **Section 6.5**.

1.2 PA/SI Objectives

This PA/SI was conducted consecutively because the results of the PA yielded AOPIs that necessitated continuing onto the SI phase in accordance with CERCLA. Consequently, this report provides the combined objectives of both PA and SI reports.

1.2.1 PA Objectives

During the PA, investigators collect readily available information and conduct site reconnaissance. This PA will evaluate and document areas where PFAS-containing materials were used, stored, and/or disposed, so the Army can distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation.

1.2.2 SI Objectives

An SI is conducted when the PA determines an AOPI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOPIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required.

Installation-specific data quality objectives (DQOs) and the sampling design and rationale are summarized in **Sections 6.1** and **6.2**.

1.3 PA/SI Process Description

For LEAD, PA/SI development followed the process as described below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for LEAD. The PA and SI processes are documented in the PA/SI Quality Control Checklist included as **Appendix B**.

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact (POCs) from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), LEAD, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 21 May 2019 before the site visit on 26 to 27 June 2019 to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

Records review was conducted before the site visit to obtain electronically available documents from the installation and external sources for review. The purpose of the records research was to identify any area

on the installation that may have been a location where PFAS-containing materials were used, stored, and/or disposed, as well as to gather information on the physical setting and site history at LEAD.

A read-ahead package was prepared and submitted to the appropriate POCs 2 weeks before the site visit. The read-ahead package contains the following information:

- The Army Materiel Command (AMC) operation order
- The Army PA Operations Security requirements package, which includes the antiterrorism/operations security review cover sheet (**Appendix C**)
- The PFAS PA kickoff call minutes
- An information paper on the PA portion of the Army's PFAS PA/SI
- Contact information for key POCs
- A list of the data sources requested and reviewed
- A list of preliminary locations identified during the kickoff call and pre-site visit records review to be evaluated for use, storage, and/or disposal of PFAS-containing materials, where additional information on those areas will be collected through personnel interviews, additional document review, and site reconnaissance.
- A list of roles for the installation POC to consider when recommending potential interviewees.

1.3.2 Preliminary Assessment Site Visit

The site visit was conducted on 26 to 27 June 2019. An in-brief meeting was held to provide installation staff with the objectives of the site visit and team introductions. **Section 3** includes information regarding personnel interviewed.

Personnel interviews were conducted with individuals having significant historical knowledge at LEAD. The interviews focused on confirming information discussed in historical documents, collecting information that may have not been in historical documents, corroborating other interviewees' information.

Site reconnaissance included visual surveys that assessed the points of potential use, storage, and/or disposal of PFAS-containing materials, as well as potential secondary impacts, and the migration potential from each AOPI (e.g., stormwater drains, building drains and sumps, cracks in the floor/pavement). Physical attributes of the preliminary locations were documented, including local slope and ground and floor conditions (i.e., paved, unpaved, visual staining), surface water bodies and surface flow, potential receptors, and the distance to the installation boundary. Access to existing groundwater monitoring wells, if present, were also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling. Photo documentation of the preliminary locations was collected, and access limitations or advantages related to potential future sampling activities were noted.

An exit briefing was offered to installation personnel at the conclusion of the site visit to raise any items identified during the site visit, discuss any follow-up items, and review the schedule for submitting deliverables. The exit briefing was conducted on 27 June 2019 with the installation, USAEC, and USACE to discuss preliminary findings of the PA site visit.

1.3.3 Post-Site Visit

Information collected before, during, and after the site visit was reviewed and corroborated by cross-referencing records and reviewing interview details and observations noted during site visit reconnaissance. A site visit trip report was completed and provided to the installation POC, applicable USAEC POCs, and USACE regional POCs following the site visit. The information collected during the pre-site visit and site visit activities was compiled to develop the installation-specific PA portion of the PA/SI report (**Section 3**). Site data obtained during the PA were used to develop preliminary conceptual site models (CSMs) for each AOPI, which serve as the basis for developing the SI scope of work presented in an installation-specific Quality Assurance Project Plan (QAPP) Addendum.

1.3.4 Site Inspection Planning and Field Work

The SI process was initiated at the installation to evaluate PFOS, PFOA, and PFBS presence or absence at each AOPI and determine whether further investigation is warranted. First, an SI kickoff teleconference was held between the Army PA team and LEAD on 06 January 2020.

The objectives of the SI kickoff teleconference were to:

- discuss the AOPIs selected for sampling
- account for regulatory involvement (USEPA and Pennsylvania Department of Environmental Protection [PADEP]), including specific agency requirements or preferences
- discuss general SI deliverable and field work schedule information and logistics

Following development of the SI sampling technical approach, an SI scoping teleconference was held on 11 February 2020 to obtain concurrence on the SI sampling plan from USAEC, USACE, and the installation. Additional discussion topics included:

- identify overlapping unexploded ordnance or cultural resource areas
- confirm the plan for investigation-derived waste (IDW) handling and disposal
- identify specific installation access requirements and potential schedule conflicts
- provide an updated SI deliverable and field work schedule.

A Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP) was developed and finalized in October 2019 for the USAEC PFAS PA/SI (Arcadis 2019). The PQAPP details general planning processes for collecting data and describes the implementation of quality assurance (QA) and quality control (QC) activities for the SI portion for Army installations nationwide. Additionally, an installation-specific QAPP Addendum was developed to define the DQOs, present the sampling design and rationale, and provide qualifications for project personnel. The SI field work was completed in accordance with the PQAPP (Arcadis 2019) and the approved installation-specific QAPP Addendum. A Site Safety and Health Plan (SSHP) was also developed as an attachment to the QAPP Addendum to identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHP was designed to supplement the Accident Prevention Plan (Arcadis 2018), which was developed for Army installations nationwide. The QAPP Addendum and SSHP were submitted to the installation and finalized before commencement of field work.

The DQOs, sampling design and rationale, and field methods employed for the SI are summarized from the QAPP Addendum developed for LEAD (Arcadis 2020) in **Sections 6.1** through **6.3**.

After finalization of the QAPP Addendum and SSHP, field planning and coordination with the installation and subcontractors was completed. Once the schedule was determined, field teams mobilized to the installation to complete the scope of work defined in the QAPP Addendum.

1.3.5 Data Analysis, Validation, and Reporting

Environmental samples collected during the SI were submitted to a laboratory which is DoD Environmental Laboratory Accreditation Program (ELAP)-accredited for PFOS, PFOA, and PFBS analysis by liquid chromatography with tandem mass spectrometry and compliant with the DoD Quality Systems Manual (QSM) 5.1.1, Table B-15 (DoD 2018) for the SI data collected in November 2020, and QSM 5.3, Table B-15 (DoD and Department of Energy 2019) for the SI data collected in January and March 2022. Laboratory analytical results were then validated and verified by a project chemist to assess the usability of the data collected. Validated analytical results were summarized in the context of OSD risk screening levels (defined in **Section 6.5**).

2 INSTALLATION OVERVIEW

The following subsections provide general information about LEAD, including the location and layout, the installation mission(s) over time, a brief site history, current and projected land use, climate, topography, geology, hydrogeology, surface water hydrology, potable wells within a 5-mile radius of the installation, and applicable ecological receptors.

2.1 Site Location

LEAD is located on the western side of the Cumberland Valley, in the central part of Franklin County, 5 miles North of Chambersburg, Pennsylvania. **Figure 2-1** depicts the site location and **Figure 2-2** depicts the installation layout of LEAD. LEAD fronts on Pennsylvania State Highway 997. Chambersburg is the county seat and based on the 2010 Census, is the largest town in Franklin County with 17,862 inhabitants. Surrounding population centers with populations greater than 9,000 include Greene Township (12,284), Guilford Township (13,100), Waynesboro (9,614), and Antrim Township (12,504). LEAD is located within the boundaries of three townships: Greene, Letterkenny, and Hamilton (Weston Solutions, Inc. 2012).

LEAD is divided into two major operational areas, the Ammunition Disposal and Storage Area and the Industrial Area. The Industrial Area contains two National Priorities List sites, the Property Disposal Office (PDO) Area and the Southeast Area. This PA/SI focuses on the Industrial Area of LEAD, which is located in the southeast corner of LEAD and comprises 1,692 acres and serves as repair and modernization of Air and Missile Defense and precision fire systems to enable multi-domain operations for U.S. Allied Forces.

2.2 Mission and Brief Site History

Before the purchase in 1942 of 20,508 acres in Letterkenny Township and in small portions of Hamilton and Greene Townships, the property of LEAD, formerly known as the Letterkenny Ordnance Depot (LKOD) (LKOD was renamed Letterkenny Army Depot in 1962), had been home to generations of farmers which used the land for grazing and growing crops. The area was predominantly single-family farms used for both subsistence and commercial purposes.

Acquisition of land for dams and easements and sale of excess land over the years has resulted in 18,486 acres of land available for depot activities. The construction of LKOD began in 1942 for the storage of ammunition, general warehousing, and administrative buildings. Construction of administration buildings and living quarters was also initiated in 1942.

During World War II, LKOD acted as an ammunition supply dump for the European War Theatre, and in 1944 it became the site of an Italian Prisoner of War camp. At the end of World War II, LKOD was used as a vehicle storage area and motor rebuilding operation site. From 1948 to 1951, 169 petroleum storage tanks were converted to store vehicles, resulting in the “Tin-Can Farm.” In 1957 a reservoir and dam located on 148 acres of recently purchased land in Horse Valley were opened for use. LKOD provided supplies for the Korean War and in 1959 was expanded to provide initial supply and support of guided missiles, ballistic missiles, and rocket material. In 1962 LKOD was reorganized under the U.S. Department of the Army Materiel Development and Readiness Command and renamed the Letterkenny

Army Depot. Numerous land transfers and sales occurred in the intervening years: in 1965 and 1969, 41 and 40 acres, respectively, were sold as excess; in 1973, 1,100 acres were transferred to Pennsylvania for use as a state forest; in 1987, 214.12 acres of land were transferred from LEAD to the Pennsylvania Game Commission; in 1995 the Base Realignment and Closure (BRAC) plan called for the closure of 1,235 acres, which was later reduced to 1,100 acres after the BRAC excess footprint was revised. As of April 2021, 1,084 of the 1,235 acres have been transferred under BRAC to the Local Reuse Authority.

LEAD repairs and modernizes Air and Missile Defense and precision fire systems to enable multi-domain operations for U.S. Allied Forces.

2.3 Current and Projected Land Use

The area around LEAD is served by Interstate 81, U.S. Highway No. 11 (US 11), and U.S. Highway No. 30. Direct access to LEAD is provided by State Route (SR) 997 and SR 433. The intersection of these two routes is at the primary entrance to LEAD. In addition, the Pennsylvania Turnpike is 14 miles north of the facility via SR 997. The LEAD boundaries consist of a non-deer-proof chain-link and wire fence (Tetra Tech, Inc. 2013).

The installation is surrounded by agricultural lands, except for the state forest and state game management land to the west. More than 40 percent (%) of the land in Franklin County is wooded. Several scattered unincorporated residential and commercial developments exist within a mile of the installation boundary, primarily to the southeast of the installation. A commercial strip along US 11 services the residential areas near LEAD and Chambersburg.

LEAD has fostered ties with the surrounding communities by initiating partnerships with Penn State University's Applied Research Laboratory and the Applied Technology Center at Hagerstown Junior College, and by supporting the growth and development of the local community through its active participation in community planning. Local community planning groups that LEAD is part of the Chambersburg Area Development Corporation, Franklin County Area Development Corporation, and Chambersburg 2000 Partnership.

The Letterkenny Industrial Development Authority is continuing to develop the property in the cantonment area that was transferred following the 1995 BRAC Commission recommendations. The community's reuse plan consists of a mixture of land use activities similar to the activities performed by the Army. The excess area will consist of several land use districts that can accommodate the following types of use: industrial, office, administrative, community/open space; warehouse/distribution; light industrial; and highway-oriented industrial distribution. The community reuse plan has been developed to ensure that future uses of the excess property will be compatible with LEAD's remaining mission. The build-out for the property is planned to occur over 20 years or more.

Land use immediately bordering LEAD is primarily forest and pasture/grassland. LEAD is bordered by Pennsylvania State Game Lands to the northwest and the Buchanan State Forest to the west. Portions of the farmland to the north/northeast of LEAD are permanently protected as agricultural land under the Agricultural Easement program. East of LEAD along SR 997 and between SR 433 and US 11 is high-intensity, non-residential land use (industrial and commercial, including the Cumberland Valley Business Park). Low and medium density residential development is located to the northeast of LEAD along SR

533 at the intersections with SR 997 and 433; east of LEAD along US 11; and to the south toward Chambersburg (Tetra Tech, Inc. 2013).

2.4 Climate

LEAD is in the Lower Susquehanna climatic division. The climate is classified as humid continental, with a mean annual temperature of 53 degrees Fahrenheit (°F). Temperature averages at LEAD range between a high of 85 °F in July during the summer, and a low of 22 °F in January during the winter. Most days have some cloud cover, with 70 days per year being overcast. Prevailing winds are northwesterly at 6 miles per hour. A growing season of 160 to 170 days is consistent throughout the valley. Average annual snowfall is 31 inches, with an average of 8 days per winter with 1 inch or more. Average total precipitation is 41 inches, with 44 days per year with 0.5 inch or more. May through August are the wettest months (Tetra Tech, Inc. 2013).

2.5 Topography

LEAD is in the Susquehanna-Potomac Segment of the Middle Section of the Ridge and Valley Province, on a drainage divide between the Susquehanna drainage flowing northward and the Potomac drainage flowing southward. **Figure 2-3** depicts the topography of the installation. The extreme western portion of LEAD crosscuts Broad Mountain, and the remainder is contained by the Cumberland Valley, where elevations vary between 700 and 730 feet above mean sea level (amsl). The Cumberland Valley trends northeast to southwest through central Pennsylvania and is bordered to the west by the Appalachian Mountains. The South Mountain section of the Blue Ridge Province is east of Chambersburg and marks the eastern edge of the Cumberland Valley. The Cumberland Valley is characterized predominantly by southwest-trending limestone ridges and valleys. Shales, siltstones, and sandstones make up much of the western part of the valley, where the surface is rolling and hilly. Less resistant limestones and dolostones present in the eastern part of the valley have eroded to a broad, flat lowland perforated with sinkholes and caves. Weathering of the folded and faulted underlying geologic formations imparts an overall gently rolling aspect to the local topography. Surface elevations throughout LEAD range from approximately 600 to 800 feet amsl, except for the northwest portion of the installation, where the elevation increases abruptly to more than 2,300 feet amsl in the vicinity of Broad Mountain. A portion of the depot includes 2,900 acres of mountainous, wooded land along Blue or North Mountain with elevations ranging from 700 feet to 2,300 feet amsl; the majority of the area is approximately 700 feet to 800 feet amsl. In the mountainous areas, slopes rise in excess of 40 feet per 100 feet. The mountain ridges west of LEAD have some effect on local conditions, tending to shelter LEAD from the full effects of northern air in winter. There is also some evidence that precipitation along Broad Mountain, the area generally west of Massachusetts Avenue, may amount to several inches more per year than elsewhere on LEAD, but this orographic effect has not been well documented (Tetra Tech, Inc. 2013).

2.6 Geology

LEAD straddles two major geologic structural features: the South Mountain Anticlinorium to the east and the Massanutten Synclinorium to the west. The eastern section of LEAD is underlain primarily by carbonate rocks (limestones and dolomites) and is part of the South Mountain Anticlinorium. The western

section of LEAD is underlain primarily by shales and is part of the Massanutten Synclinorium. These regional geologic structures were formed as a result of folding that occurred during the Paleozoic era (225 million to 570 million years ago). In the eastern section of LEAD, high-angle reverse faulting accompanied the folding. As a result, several major faults, which strike north to northeast and dip to the southeast at steep angles, occur on LEAD. The PDO Area is cut by the Letterkenny Fault, which dips to the west, the Pinola Fault, which dips to the east and is west of the Letterkenny Fault, and at least one unnamed fault occurs in the excess area.

LEAD is underlain by five Ordovician-aged geologic formations (430 million to 500 million years old) of the Great Valley. The formations underlying the depot include carbonate rocks of the Rockdale Run formation, Pinesburg Station formation, St. Paul Group, Chambersburg formation, and the shales and sandstones of the Martinsburg formation. The Rockdale Run formation is middle Ordovician in age, approximately 2,200 to 3,000 feet thick (thickens to the east) and dominated by medium-gray limestone. The Pinesburg formation is middle Ordovician in age, approximately 250 to 800 feet thick (thickens to the west) and dominated by medium-gray dolomite. The St. Paul Group limestones are middle Ordovician in age, approximately 800 to 1,000 feet thick (thicken to the east) and consist of the New Market and the Row Park formations. The formations are made up of dark gray, thin-bedded limestones with some minor interbeds of dolomite. The Chambersburg formation is middle Ordovician in age, approximately 300 to 750 feet thick (thickens to the east) and consists of a dark gray bedded limestone that weathers into cobbles. The beds of the formation are nearly vertical and are subject to extensive solution weathering. The St. Paul Group is jointed and fractured with the dolomites jointing on the order of feet and the limestones jointing on the order of several feet. A secondary joint system occurs nearly normal to the major joint system in the formations. Solution weathering occurs in the joint systems, with subsequent healing occurring in most of the joints. As a result of solution weathering, the carbonate rocks of the St. Paul Group and the Chambersburg formation have karst features such as sinkholes and solution channels associated with them. These solution features are evidenced by the presence of several sinkholes that occur in the excess area. The Martinsburg formation is late Ordovician in age, approximately 1,500 to 3,000 feet thick (thickens to the east), and consists of thin-bedded, black, steeply inclined, extensively fractured shales. The formation contains interbedded layers of sandstones, siltstones, and some carbonates. The Martinsburg formation is more resistant to erosion than the limestones and dolomites of the St. Paul Group and Chambersburg formation and forms the gently rolling hills of LEAD. Limited information is available regarding petroleum or mineral resources on the installation. To date, no petroleum or mineral resources have been found on the installation, and no mining activities have occurred (Tetra Tech, Inc. 2013).

2.7 Hydrogeology

There is no demand for groundwater on the depot because LEAD's drinking water supply is provided by Letterkenny Reservoir, located about 4 miles north of the depot. LEAD is largely underlain by shales and some graywacke (Martinsburg formation), although carbonate rocks (limestone) do occur in the Rowe and Conococheague drainages and in a narrow belt along the base of Broad Mountain. The Martinsburg formation is generally a good aquifer yielding water of decent quality, although high iron and manganese concentrations can occur. Hydrogen sulfide gas occasionally occurs and degrades the water quality. Sustained well yields of 100 gallons per minute can be expected, though there is a close relationship between well yield and topography. Wells in the area of low topographic expression have significantly

greater yields than wells on upland locations. Geologically, wells along fracture traces also have higher yields. Yield from the carbonate aquifers also is directly related to topographic expression and fracture trace occurrence. Secondary porosity in the carbonate/limestone formations due to solution activity is important and results in a wide range of yields, ranging from 0.01 to 950 gallons per minute. Higher yielding locations in the St. Paul group will produce 150 to 200 gallons per minute, but the Chambersburg formation produces only about 40 gallons per minute. Calcium and magnesium deposits can occur from water sourced from carbonate aquifers, making this water unsuitable for certain industrial uses.

Several hazardous-waste site investigation and remediation projects have been conducted or are in progress at LEAD. Some projects have involved groundwater contamination investigations and remediation, particularly in the vicinity of the cantonment area. These projects have indicated the presence of volatile organic compound (VOC) contamination in groundwater. Because the installation does not use groundwater as a water resource, the principal issue of concern with respect to natural resource management at LEAD is recharge of contaminated groundwater to surface water bodies of LEAD. These issues have been investigated as part of ongoing CERCLA and Resource Conservation and Recovery Act studies, and the results indicate that these problems are confined to the immediate vicinity of the Industrial Area (Tetra Tech, Inc. 2013).

2.8 Surface Water Hydrology

LEAD is located directly on the drainage divide between the Susquehanna River to the northeast and Potomac River to the southwest, both of which drain to the Chesapeake Bay. Because of the headwater location, drainages on the depot are short, and streams are small. Streams cutting through the limestone terrain of the Chambersburg formation and St. Paul group on LEAD flow through broad, open valleys and are ephemeral or intermittent, carrying water only in winter and spring, or after heavy rains. In contrast to this, streams cutting through the upper shale units of the Martinsburg formation usually meander in small, steep-walled valleys and are perennial. Natural surface water features at LEAD include several named and unnamed streams. Lehman Run, Keasey Run (a tributary of Lehman Run), Muddy Run, and Rowe Run are in the northeastern portion of LEAD and drain to the Susquehanna River. Dennis Creek, Back Creek, Rocky Spring Branch, and Conococheague Creek are in the southwest portion of the installation and drain to the Potomac River. The main channels on LEAD, Lehman Run, Keasey Run, Muddy Run, and Rocky Spring Branch, are perennial (Tetra Tech, Inc. 2013). Meghan McKenzie Run (MMR), another stream present in the southeastern portion of the installation, is most prominent off-installation and is a tributary of Lehman Run. Rocky Spring Lake and Lake Letterkenny are both manmade waterbodies within the PDO Area and the Ammunition Storage Area, respectively. Rocky Spring Lake is the center of a developed recreational site (Tetra Tech, Inc. 2013).

2.9 Relevant Utility Infrastructure

The following subsections provide general information regarding the installation's stormwater and wastewater management systems, as well as information on how the utility infrastructures may influence the fate and transport of PFAS constituents at LEAD.

2.9.1 Stormwater Management System Description

Two major stormwater drain systems serve the Southeast Area of LEAD and contribute to local surface drainage. One system serves the area north of Coffey Avenue and discharges near the industrial waste treatment plant (IWTP) into the IWTP outfall (located north of the IWTP), which discharges to Rowe Run. The other system serves the southeast warehouse area. Water drains into the storm drain system via sheet flow or drainage ditches, and is discharged through the storm drain outfall, joining another surface runoff flowing southward to Conococheague Creek.

Surface water drainage in the PDO Area of LEAD is divided into three storm water drainage areas consisting of sheet flow and drainage ditches with some underground storm sewer lines. The topographic high ridge line for the PDO Area is near Georgia Avenue, near the MMR/PDO drainage divide that marks the surface water and groundwater divide between MMR to the north, the Southeast Area to the southeast, and the PDO/Rocky Spring Drainage System to the southwest. The MMR flows north, the Southeast Area flows to Rowe Spring, and the PDO/Rocky Spring Drainage System flows to Rocky Spring Lake.

2.9.2 Sewer System Description

The primary sanitary waste treatment facility within the industrial Southeast and PDO Areas of LEAD is the main sewage treatment plant (STP). This plant started operations in 1971, and effluent from the STP is discharged to Rocky Spring Branch (United States Army Toxic and Hazardous Materials Agency 1980).

In addition to the main STP, multiple industrial wastewater sewers (IWWS) carry waste from various buildings in the Southeast Area to the IWTP. The IWTP and IWWS were constructed in approximately 1954 to receive industrial wastewater from major industrial buildings. The original IWWS in the northern Southeast Industrial Area consisted entirely of gravity sewers. In 1970, the IWWS was expanded to receive effluent from southern Southeast Industrial Area buildings via a force main system incorporating five lift stations (pump stations) (Flour Daniel, Inc. 1998). The IWWS collection system malfunctioned soon after it was installed in the mid-1950s. The malfunction allowed VOC-contaminated wastewater to infiltrate directly into the soils and bedrock, causing VOC groundwater contamination. Remedial investigation field work in 1992 and 1993 led to emergency repairs in 1994 and 1995. An emergency removal of IWWS VOC-contaminated soils was conducted in 1997 (Weston Solutions, Inc. 2012). Prior to installation and connection to the IWTP, industrial wastewaters from the Southeast Area at LEAD were discharged untreated to the LEAD stormwater sewer system.

Sludge waste generated at the LEAD IWTP was historically stored within a series of lagoons bordering the northern portion of the IWTP plant. The IWTP lagoons were originally constructed between 1954 and 1957 as one unlined earthen impoundment with a capacity of 1 million gallons. It was designed to contain sludges, oils and industrial wastes processed through the IWTP. Development of sinkholes in the lagoons resulted in structural failure and leakage of wastes into the subsoils during operation. As a result of these failures, the lagoons were reconstructed in 1967. The two newer lagoons (designated 361 and 362) were constructed within the original lagoon perimeter. Both IWTP Sludge Holding Lagoon parcels were closed between 1986 and 1988. The lagoon materials were excavated, decontaminated via low temperature thermal volatilization (LTTV), reapplied to the lagoon parcels as fill and capped in 1992.

2.10 Potable Water Supply and Drinking Water Receptors

There are no potential on-post drinking water sources or on-post supply wells used to provide LEAD with potable water. The LEAD Master Plan prohibits use of groundwater for any purpose on-post at LEAD (Weston Solutions, Inc. 2017a). Since 1957, potable water for LEAD has been supplied by a reservoir located off-post of LEAD. LEAD obtains its drinking water from the Franklin County General Authority (FCGA). FCGA utilizes the reservoir as its water supply, located approximately 8 miles north of the closest identified AOPI. Water supplied by the FCGA was sampled for PFOS and PFOA in 2016 by the AMC. No PFOS or PFOA was detected in any of the collected water samples. Information detailing the type of water sample collected (e.g., pre-treated or treated water) was not reported. Rocky Spring is classified as an Institutional Water Supply Source by the Pennsylvania Groundwater Information System (PAGWIS) but is not currently used as a potable water source.

Multiple potable wells surrounding LEAD and downgradient of all identified AOPIs at LEAD were identified from Environmental Data Resources, Inc. (EDR) and PADEP data sources. An EDR report includes search results from a variety of environmental, state, city, and other publicly available databases for a referenced property. Off-post private and public wells within a 5-mile radius of LEAD were evaluated following review of the EDR report generated for LEAD (**Appendix D**), as well as PADEP's online well repository. **Figure 2-4** shows the locations of identified off-post wells.

2.11 Ecological Receptors

The PA team collected information regarding ecological receptors that was available in the installation documents. The following information is provided for future reference should the Army decide to evaluate exposure pathways relevant to the ecological receptors.

According to the U.S. Forest Service, LEAD is in the Central Appalachian Broadleaf Forest – Coniferous Forest – Meadow Province ecoregion. This ecoregion is in the Hot Continental Division of the Humid Temperate Domain and occupies approximately 68,100 square miles. The climate is temperate, with distinct summer and winter. Vertical vegetative zonation is present, with the valleys supporting a mixed oak-pine forest. The next zone consists of northeastern hardwood forest and spruce-fir forest, and meadows are found in the highest zone.

A variety of wildlife habitats exist at LEAD, including 35 species of mammals, 100 avian species,19 species of reptiles, and 24 species of amphibians and fish. Surveys for threatened and endangered listed species have been conducted on LEAD. No federally listed species have been documented to occur on LEAD and four state-listed species have been found on LEAD in the past (Tetra Tech, Inc. 2013).

2.12 Previous PFAS Investigations

Previous (i.e., pre-PA) PFAS investigations relative to LEAD, including both those conducted and not conducted by the Army, are summarized to provide full context of available PFAS data for LEAD. However, only data collected by the Army will be used to make recommendations for further investigation. In October 2011, a historical investigation and process review was conducted by LEAD personnel to evaluate the use of aqueous film-forming foam (AFFF) at LEAD. Furthermore, several LEAD Fire Department former firefighters provided information on historical AFFF use at LEAD via emails, phone

interviews and questionnaires. Based on these interviews, various foams and detergents were identified for training usage including the following: protein-based foam, AFFF, and soap/detergent that behaved like AFFF but was an inexpensive training option.

As a result of the historical investigation, seven operational areas connected to AFFF usage were identified at LEAD:

- Current Fire Department Fire Station
- Area B Former Fire Training Area
- PDO Area - Oil Burn Pit
- Former Concrete Lined Fire Training Area
- The Building 400 Series
- Building 2291
- Building 663

The historical investigation identified three of the seven areas as areas of potential concern: the Area B Former Fire Training Area, the PDO Area – Oil Burn Pit, and the Current Fire Department Fire Station. One area, the Former Concrete Lined Fire Training Area was eliminated from consideration and subsequent sampling events conducted between 2013 and 2019 due to a removal action that was completed in 1990 (LEAD 2011). However, based on information collected during this PA, the Former Concrete Lined Fire Training Area was identified as an AOPI and sampled as part of the 2020 SI. The remaining sites were eliminated due to the lack of AFFF use, storage, and disposal.

In 2013, groundwater sampling was performed at the three previously identified areas of potential concern. Following the detection of PFOS and PFOA in groundwater at the Former Oil Burn Pit in 2013, a sampling program to complete the delineation of the nature and extent of PFAS contamination was ordered in 2017 for Operable Unit (OU) 4, the OU associated with the Former Oil Burn Pit. Further PFAS sampling was performed in 2019 to continue the investigation into the nature and extent of PFAS contamination at OU 4. Previous investigation results for PFOS, PFOA, and PFBS are shown in **Tables 2-1** to **2-3** (bolded values indicate detections). PFAS analysis of samples collected during the 2013, 2017, and 2019 investigations was completed using the USEPA 537 MOD method. No information detailing the QSM used during this investigation was provided in the published reports.

Historical sample locations from previous investigations are shown on **Figure 2-5** and maximum PFOS, PFOA, and PFBS results for those sample locations are presented on **Figures 2-6 and 2-7**.

In response to the third Unregulated Contaminant Monitoring Rule (UCMR3), potable water from the FCGA Public Water System, which provides LEAD with its potable drinking water, was sampled in August 2016. Sampling results from this event indicated that PFOS and PFOA were not detected above the laboratory limits of detection (LOD) of 40 ng/L and 20 ng/L, respectively. The laboratory that analyzed samples under UCMR3 met the USEPA's UCMR3 Laboratory Approval Program application and Proficiency Testing criteria for USEPA Method 537 Version 1.1.

3 SUMMARY OF PA ACTIVITIES

To document areas where any potential current and/or historical PFAS-containing materials were used, stored and/or disposed at LEAD, data was collected from three principal sources of information and are described in the subsections below:

1. Records review
2. Personnel interviews
3. Site reconnaissance.

Preliminary locations of potential use, storage, and/or disposal of PFAS-containing materials were then evaluated in the PA (during records review, personnel interviews, and/or site reconnaissance) and were categorized as AOPIs or as areas not retained for further investigation at this time based on a combination of information collected (e.g., records reviewed, personnel interviews, internet searches). A summary of the observations made, and data collected through records reviews (**Appendix E**), installation personnel interviews (**Appendix F**), site reconnaissance photos (**Appendix G**) and site reconnaissance logs (**Appendix H**) during the PA process for LEAD is presented in **Section 4**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.1**, and further discussion regarding categorizing areas as AOPIs is presented in **Section 5.2**.

3.1 Records Review

The records reviewed for this PA included, but were not limited to, various Installation Restoration Program (IRP) administrative record documents, compliance documents, LEAD fire department documents, LEAD directorate of public works (DPW) documents, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. A list of the specific documents reviewed for LEAD is provided in **Appendix E**.

3.2 Personnel Interviews

Interviews were conducted during the PA site visit. If a previously identified interviewee was not available during the site visit, attempts were made to complete the interview via telephone before or following the site visit or by contacting an alternate interviewee identified by the installation POC.

The list of roles for the installation personnel interviewed during the PA process for LEAD is presented below (affiliation is with LEAD unless otherwise noted).

- LEAD DPW, Environmental Chief (2017 to present)
- LEAD DPW, IRP Manager (2011 to present)
- LEAD Fire Department, Current Fire Chief (2010 to present)
- LEAD Fire Department, Retired Fire Chief (1997 to 2007)
- LEAD Fire Department, Retired Fire Chief (unknown, 19 years)
- LEAD Fire Department, Fire inspector (1980 to 2005)/Safety Specialist (2005 to present)

- LEAD DPW, Hazardous Waste Specialist (unknown to present)
- Letterkenny Munitions Center, Explosives Safety Specialist (2016 to present)
- LEAD Engineering Department, Production Engineering Chief (2007 to present)

The compiled interview logs are provided in **Appendix F**.

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at LEAD during the records review process, the installation in-brief meeting, and/or during the installation personnel interviews. A photo log from the site reconnaissance is provided in **Appendix G**; photos were used to assist in verification of qualitative data collected in the field. The site reconnaissance logs are provided in **Appendix H**.

Access to existing groundwater monitoring wells, if present, were also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling.

4 POTENTIAL PFAS USE, STORAGE, AND/OR DISPOSAL AREAS

LEAD was evaluated for all potential current and historical use, storage, and/or disposal of PFAS-containing materials. There are a variety of PFAS-containing materials used in relation to current and historical Army operations. However, the use, storage, and/or disposal of AFFF is the most prevalent potential source of PFAS chemicals at DoD facilities. As such, this section is organized to summarize the AFFF-related uses first, and all remaining potential PFAS-containing materials in the subsequent section.

4.1 AFFF Use, Storage, and Disposal Areas

AFFF was developed in the mid-1960s in response to a need for firefighting foams better suited to extinguish Class B, fuel-based fires. AFFF formulations consist of water, an organic solvent, up to 5% hydrocarbon surfactants, and 1 to 3% PFAS (Interstate Technology Regulatory Council 2020). AFFF concentrate is designed to be diluted with water to become a 1, 3, or 6% foam. AFFF releases at DoD facilities may have occurred during firefighter training, emergency response actions, equipment testing, or accidental releases. The military still primarily uses AFFF for Class B fires; however, the current formulations of AFFF contain significantly lower amounts of PFOS, PFOA, and their precursors, and significant operational changes have been implemented to restrict uncontrolled releases and non-essential use of PFAS-containing foams. Army installations may still house AFFF, commonly stored in closed containers (e.g., 55-gallon drums, 5-gallon buckets), within designated storage buildings or at firehouses.

As part of the *AMC Field Activity Report Related to Perfluorinated Compounds at U.S. Army Materiel Command Installations with Aqueous Fire Fighting Foam* authored by Tetrahedron in January 2017, AFFF inventories were collected for 13 AMC installations, including LEAD. According to the report, seventeen 5-gallon buckets of National Foam Universal Gold were removed from the site and disposed off site in 2016. An interviewed fire chief stated that the AFFF in storage was sent to the past AFFF storage building and disposed of as hazardous waste, however; review of the waste profile dated 09 December 2015 indicates that the containerized AFFF was disposed of as non-Resource Conservation and Recovery Act non-regulated waste.

Army-wide installation AFFF inventory records provided by USAEC were reviewed prior to the PA site visit. The inventory file titled AMC AFFF Survey Updated reported 100 gallons of 3% National Foam as being in storage at LEAD. The inventory file documented that all AFFF on-hand was from late 2015.

At the time of this PA, the LEAD Fire Department stores AFFF inside the building. During the PA visit on 27 June 2019, a wooden cabinet was observed containing fourteen 5-gallon totes of Universal Gold 1%/3% Alcohol Resistant AFFF. No evidence of AFFF leaks from the cabinet were observed during the PA site reconnaissance trip. The Current Fire Department Station, a leased-back BRAC area, had the discharge of residual AFFF to the fire-station driveway, as well as a one-time, 15 to 30-gallon discharge of AFFF to the fire station's engine bay floor drains, that eventually discharged to an off-post pond south of the fire station.

Following personnel interviews, site reconnaissance trips, and document research, it has been concluded that the sole use of AFFF at LEAD was to assist with LEAD Fire Department operations, including

training. A retired LEAD fire chief stated in an interview that LEAD first received AFFF between 1979 and 1980. During this timeframe, AFFF totes were briefly stored in several tin huts located north of the Current Fire Department Station. The LEAD Fire Department retired the tin huts as a storage location and moved their AFFF stockpile to the Current Fire Department Station. The interviewed retired fire chief could not recall any spills of AFFF within or surrounding the tin huts during the time the totes were stored there.

A retired LEAD fire chief stated in an interview that AFFF was disposed of on one occasion into the LEAD-005 IWTP sewer inlet sometime in the late 1980s. According to a retired DPW Division Chief interviewed following the PA site-visit, the sewer lines connecting LEAD-005 to the IWTP were replaced due to suspected line leaks sometime between 1987 to 1988. It cannot be confirmed whether the sewer lines connecting LEAD-005 to the IWTP were repaired prior to the discharge of AFFF into the sewer system. No emergency fire or crash responses that required the use of AFFF were identified on post.

The Former Area B Fire Training Area (LEAD-009) was reported to have used AFFF as part of fire training exercises in the late 1970s and early 1980s. The former fire training area (FTA) was historically constructed out of clay. Interviewed personnel reported that the training area was filled with oil and set ablaze for fire training exercises. The area is currently being used as depot storage and was sampled for PFOS and PFOA in 2013.

The PDO Area - Oil Burn Pit (LEAD-010) was reported to have uses of AFFF by LEAD Fire Department and neighboring fire department personnel as part of fire training exercises between the years of 1978 and 1983. Interviewed personnel reported that the training area was filled with used solvents and oil then set ablaze for fire training exercises. Residual burn waste from this AOPI was regularly removed and disposed of at the LEAD IWTP. This area was identified in 2011 by LEAD personnel as the second FTA operated at LEAD by fire department personnel. The area is currently vacant, and this site and the surrounding area were sampled for PFOS and PFOA in 2013, 2017, and 2019.

The Former Concrete Lined Fire Training Area (LEAD-063) was reported to have uses of AFFF by LEAD Fire Department and neighboring fire department personnel as part of fire training exercises between the years of 1983 and 1987. Interviewed personnel reported that the training area was filled with used solvents and oil, then set ablaze for fire training exercises. Residual burn waste from this AOPI was regularly removed and disposed of at the LEAD IWTP. The FTA was excavated in the 1990s, and the surrounding environment now consists entirely of gravel. The location serves as depot storage. This area was identified in 2011 by LEAD personnel as the third and final FTA operated at LEAD by fire department personnel. This site and the surrounding area were sampled for PFOS and PFOA in 2013, 2017, and 2019.

The BRAC Area Building 2291 – Former Hazardous Materials Building was historically equipped with an AFFF suppression system and a retired fire chief and fire inspector stated in an interview conducted during the PA that the Flammable Liquids Storage Room within Building 2291 contained a fire suppression system that utilized AFFF. An accidental discharge reportedly occurred in 1995 while testing the suppression system. It could not be confirmed whether AFFF from the discharge was pushed out into the surrounding environment via doorways or confined to secondary containment.

The BRAC Area – Government Vehicle Storage Area was used as a fire station support building and parking area for government vehicles. A fire chief stated in an interview conducted during the PA that

three government vehicles are regularly parked at this location, including one government vehicle stocked with AFFF.

The Past AFFF Storage Area was used as a staging ground for empty AFFF drums scheduled for off-site disposal.

Other areas that were investigated to determine the use, storage, and/or disposal of AFFF but were not identified as using, storing, and/or disposing of AFFF are discussed below.

Building 663 was used historically for annual fire training exercises by the LEAD Fire Department and various Franklin County fire companies according to an interview with a retired fire chief and former fire inspector. It was confirmed by the retired fire chief that dish soap was used to simulate AFFF during training at this location. In 2009 or 2010, the LEAD Fire Department responded to a fire at Building 44 but a current fire chief confirmed that only Class A, non-PFAS-containing foam was used in response to this fire. The Building 400 series was identified in previous reports as a FTA but a retired fire chief confirmed that only Class A, non-PFAS-containing foam was used at this location. Since 1945, two burning grounds (Burning Ground 1 and Burning Ground 2) were used to burn items of explosive nature, wood, paper, and other items that cannot be salvaged. Demolition grounds, one used from 1945 to 1980 (Demolition Ground 1) and the other used since 1945 (Demolition Ground 2), were used for the demolition of obsolete munitions. From 1958 to 1965, a neutralization pit was used for the destruction of inhibited red fuming nitric acid (IRFNA), hydrazine, SP-4, aniline, and furfural alcohol. Multiple burn pits in the Southeast Area of the installation operated until at least 1978 and were used to incinerate uncontaminated trash. Retired and current LEAD Fire Department personnel confirmed that AFFF was not used at the burning grounds, demolition grounds, neutralization pit, or burn pits. Before 1970, Building 247 was used as a fire station but retired LEAD Fire Department personnel confirmed that this station was closed prior to the introduction of AFFF at the installation.

4.2 Other PFAS Use, Storage, and/or Disposal Areas

Following document research, personnel interviews, and site reconnaissance at LEAD, metal plating areas and pesticides were also identified as preliminary locations for use, storage, and/or disposal of PFAS-containing materials. A summary of information gathered in the PA for each of these preliminary locations is described below. Specific discussion regarding areas not retained for further investigation is presented in **Section 5.1** and specific discussion regarding areas retained as AOPIs is presented in **Section 5.2**.

Plating operations were historically conducted at LEAD-003. Plating operations at LEAD-003 started in the early 1940s and continued until operations ceased in 2000. An interviewed Production Engineering Specialist stated that chemical mist-suppressants suspected to have contained PFAS were tested at two plating tanks within LEAD-003 for a short duration in the early 1980s. Following this test period, the use of chemical mist-suppressants was abandoned, and LEAD-003 personnel instead began regularly using polytetrafluoroethylene (Teflon®) balls for mist-suppressant purposes until plating operations ceased. Based on document research and personnel interviews, it was confirmed that there are no current chromium metal plating operations at LEAD.

Plating wastes and mist-suppressant chemicals from the former chrome plating facility were discharged to sewer lines feeding directly into the IWTP located on post at LEAD. In the 1990s, it was determined that

the IWTP sewer lines had ruptured in multiple locations. Emergency repairs to the lines were conducted in 1995. Additionally, waste sludges generated at the IWTP were stockpiled within two exterior industrial wastewater sludge lagoons located directly north of the IWTP. These lagoons were officially closed in 1988.

The Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) had historical discharge and processing of FTA AFFF wastes, PFAS-containing mist-suppressants from sewage wastes originating at LEAD-003, AFFF from a single discharge into an entry gate of the industrial waste sewer line system at LEAD-005 (**Section 4.1**), and historical storage of sludges generated at the LEAD-013 IWTP suspected to have contained AFFF and PFAS-containing mist-suppressant waste. The Sludge Application Area – Vehicle Test Track (VTT) Southern Lobe (LEAD-016) reportedly had historical application of possible PFAS-containing sludges generated at the IWTP between the years of 1978 and 1983. The Low Temperature Thermal Volatilization (LTTV) Site was used for LTTV treatment on soil excavated from the Former Lagoons 361 and 362 suspected to have PFAS-containing materials.

It was noted during a discussion with a USAEC Pest Management Consultant that the larger group of pesticides are generally not of PFAS concern. Specifically, products containing Sulfluramid (i.e., associated with insecticides) may have contained PFAS and were phased out in 1996. LEAD has records of pesticides used and stored and did not identify the installation as having used or stored PFAS-containing pesticides/insecticides.

Other areas that were investigated to determine the use, storage, and/or disposal of AFFF but were not identified as using, storing, and/or disposing of AFFF are discussed below.

From 1966 to the early 1970s, an acid burn pit was used to neutralize IRFNA and unsymmetrical dimethyl hydrazine but the Letterkenny Munitions Center Deputy to the Commander confirmed that IRFNA was an oxidizer. Since 1971, the main STP handles non-hazardous sanitary waste from the industrial and administrative areas of LEAD, and the Digested Sludge Disposal Area applied sludge from the main STP; however, no PFAS-containing materials have been discharged into the sanitary sewer system. The residue burial site was used for the disposal of sewage grit from the main STP but the grit would not have contained PFAS-containing materials. From a time unknown until present, the small STP received waste from various, outlying buildings that could not be easily connected to the main STP. One of which was a laundry facility, but the chemical inventory indicated no evidence of PFAS-containing products. Landfills #4 and #5, used from 1956 to 1964 and 1964 to 1976, respectively, were used primarily for disposal of trash and IWTP sludge but the years of operation did not coincide with the use, storage, and/or disposal of PFAS-containing materials. Building 57, used from a time unknown to at least 2008, and the motorpool, used since at least 2008, conducted minor government vehicle maintenance but fire department personnel confirmed that maintenance on PFAS-containing materials related apparatuses is conducted off-post by a contractor. The VTT Maintenance Area was identified as an active maintenance facility but government vehicle maintenance was not conducted there. From a time unknown until present, the Auto Shop and Truck Storage building and the Government Vehicle Maintenance Area were identified by a current fire chief as a fire station support building but the current fire chief confirmed that PFAS-containing materials were not used, stored, or disposed of at these locations. The 99th United States Army Reserve (USAR) operates as a tenant at LEAD and a hazardous materials inventory was requested by Program Management but not received. Pesticide storage buildings at LEAD (Building 2325, Building 2329, and

the Current Pesticide Storage building) were investigated but the LEAD pesticide inventory indicated no evidence of any PFAS-containing pesticides.

4.3 Readily Identifiable Off-Post PFAS Sources

An exhaustive search to identify all potential off-post PFAS sources (i.e., not related to operations at LEAD) is not part of the PA/SI. However, potential off-post PFAS sources within a 5-mile radius of the installation that were identified during the records search and site visit are described below.

AFFF stored within firefighting vehicles was reportedly containerized at the Current Fire Department Station, sent to the past AFFF storage building, and disposed of off-site as hazardous waste. The AFFF was shipped to Tradebe Treatment & Recycling, LLC in East Chicago, Indiana.

Interviews with LEAD Fire Department personnel identified one occasion where AFFF was possibly used by neighboring fire departments in response to an off-post fire within 5-miles of LEAD. In the early 1970s, a retired LEAD fire chief recalled a radio call requesting AFFF suppression in response to a gasoline tanker fire on Radio Hill along Route 30 towards the west of Chambersburg, Pennsylvania. The retired fire chief could not recall who responded to the fire and whether AFFF was used.

Nearby community fire departments could potentially be off-post PFAS sources within close proximity of LEAD if they use AFFF.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage, and/or disposal of PFAS-containing materials at LEAD were further refined during the PA process and identified either as an area not retained for further investigation or as an AOPI. In accordance with the established process for the PA/SI, 12 areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

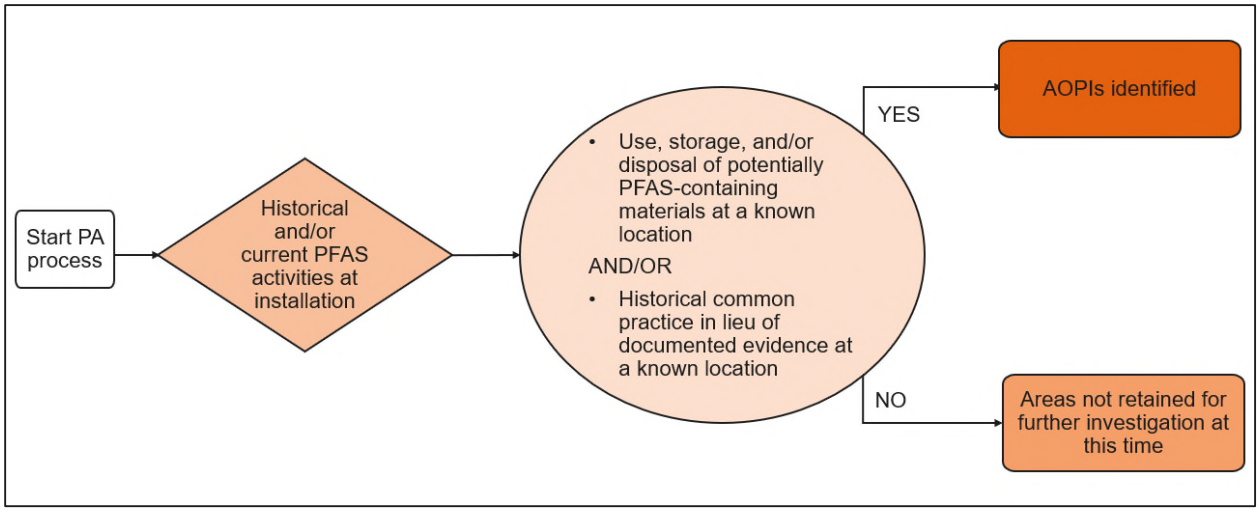

Figure 5-1: AOPI Decision Flowchart

The areas not retained for further investigation are presented in **Section 5.1**. The areas retained as AOPIs are presented in **Section 5.2**.

Data limitations for this PA/SI at LEAD are presented in **Section 9**.

5.1 Areas Not Retained for Further Investigation

Through the evaluation of information obtained during records review, personnel interviews, and/or site reconnaissance, the areas described below were categorized as areas not retained for further investigation at this time.

A brief site history and rationale for areas not retained for further investigation are presented in **Table 5-1**, below.

Table 5-1. Installation Areas Not Retained for Further Investigation

Area Description	Dates of Operation	Relevant Site History	Rationale
Building 663 – Former Joint Fire Training Area	Unknown	Per interview with a retired fire chief and former fire inspector, the Building 663 area was used for annual fire training exercises by the LEAD Fire Department and various Franklin County fire companies.	Retired Fire Chief confirmed that Dawn® soap was used to simulate AFFF during training at this location. Additionally, records reviewed and internet searches performed as part of the PA also did not identify this area for PFAS-containing materials use storage, and/or disposal.
Building 44 – Building Fire	2009 or 2010	LEAD Fire Department responded to a fire at this building.	Current Fire Chief confirmed that only Class A, non-PFAS-containing foam was used in response to this fire. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Building 400 Series – Former Fire Training Area	Unknown	Area was identified in previous reports as a fire/exercise training area.	Retired fire chief confirmed that only Class A non-PFAS-containing protein foam was used for training at this location. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Acid Burn Pit	1966 to early 1970s	Burn pit was reportedly used to neutralize IRFNA	Eliminated after confirming IRFNA was an oxidizer with Letterkenny

Area Description	Dates of Operation	Relevant Site History	Rationale
		and unsymmetrical dimethyl hydrazine.	Munitions Center Deputy to the Commander. The fuel was usually unsymmetrical dimethyl hydrazine. Letterkenny Munitions Center confirmed none of those chemicals have been onsite since the 1970s. IRFNA was disposed of via discharge from a tank into a pit lined with limestone rip-rap sized rocks. A neutralization reaction took place once the IRFNA came into contact with the rocks. The LEAD Fire Department was not involved in this operation. No accelerant was used in this operation. Current and retired LEAD Fire Department personnel also confirmed that PFAS-containing materials were not used, stored, and/or disposed of in this burn area.

Area Description	Dates of Operation	Relevant Site History	Rationale
Burning Ground 1 and 2	1945 to Present	Two burning grounds located in the southwestern portion of LEAD were used to burn items of explosive nature, wood, paper, and other items that cannot be salvaged.	Eliminated following confirmation from retired and current LEAD Fire Department personnel that AFFF was not used at this burn area. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Demolition Ground 1 and 2	1945 to 1980s (Demolition Ground 1) 1945 to Present (Demolition Ground 2)	Demolition grounds located in the southwestern portion of LEAD were used for the demolition of obsolete munitions.	Eliminated following confirmation from retired and current LEAD Fire Department personnel that AFFF was not used at this burn area. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Former Neutralization Pit	1958 to 1965	Used for the destruction of IRFNA, hydrazine, SP-4, aniline, and furfural alcohol. A small leaching pit, located at the site, was occasionally used to neutralize the acid with limestone.	Eliminated following confirmation from retired and current LEAD Fire Department personnel that AFFF was not used at this burn area. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.

Area Description	Dates of Operation	Relevant Site History	Rationale
Various Southeast Area Former Burn Pits	Unknown. Operated until at least 1978.	These burn pits were used to incinerate uncontaminated trash throughout the 1970s.	Eliminated following confirmation from retired and current LEAD Fire Department personnel that AFFF was not used at this burn area. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Main STP	1971 to Present	On post STP handles non -hazardous sanitary waste from the industrial and administrative areas of LEAD.	PFAS-containing materials would not have been discharged into the sanitary sewer system at LEAD.
Small Sewage Treatment Plant	Unknown to Present	Small STP received sanitary waste from various outlying buildings that could not be easily connected to the main STP. One of these buildings included a laundry facility.	Review of the laundry facility chemical inventory indicated PFAS-containing products were not used.
Laundry Facility	Unknown to Present	This laundry facility operates within LEAD and handles laundry for chemical contaminated clothing.	No PFAS-containing chemicals were identified following review of the facilities' chemical inventory.
Digested Sludge Disposal Area	1971 to Unknown	Digested sludge from the Main STP was applied on post at this location.	AFFF or any other PFAS-containing wastes would not have been discharged into the sanitary sewer system at LEAD.
Residue Burial Site	Unknown	This site was used for the disposal of sewage grit from the Main STP.	Determined during the PA site visit that sewage grit would not have comprised PFAS-containing materials.

Area Description	Dates of Operation	Relevant Site History	Rationale
Landfill #4	1956 to 1964	This landfill was used for the disposal of trash, garbage, cans, empty pesticide cans, and medicines. Sludge from the IWTP and sediment dredged from an outfall ditch in 1973 were also spread in this area.	The years of operation for this landfill do not coincide with the use, storage, and/or disposal of PFAS-containing materials or chrome plating mist suppressants at LEAD.
Landfill #5	1964 to 1976	This landfill was used to dispose of trash, burning pit residue and IWTP sludge.	The years of operation for this landfill do not coincide with the use of PFAS-containing materials or chrome-plating mist suppressants at LEAD.
Building 57	Unknown to at least 2008.	Minor government vehicle maintenance including oil and battery changes were conducted here until at least 2008.	Confirmed during interviews with fire department personnel that maintenance on PFAS-containing materials related apparatuses is conducted offpost by a contractor. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Motorpool	At least 2008 to Present	Minor government vehicle maintenance including oil and battery changes are conducted here.	Confirmed during interviews with fire department personnel that maintenance on PFAS-containing materials related apparatuses is conducted offpost by a contractor. Additionally, records reviewed, and internet searches performed as part of the PA also did

Area Description	Dates of Operation	Relevant Site History	Rationale
			not identify this area for PFAS-containing materials use storage, and/or disposal.
VTT Maintenance Area	Unknown	Identified as an active vehicle maintenance area prior to the PA site visit.	Confirmed during the PA site visit that government vehicle maintenance was not conducted at this location.
Auto Shop and Truck Storage	Unknown to Present	Identified by current LEAD fire chief as a fire station support building. Government vehicle is mostly parked at this location for storage/use.	Confirmed with the current LEAD fire chief that PFAS-containing materials was not used or stored at this location. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
Government Vehicle Maintenance Area	Unknown to Present	Identified by current LEAD fire chief as a fire station support building. Government vehicle is occasionally parked at this location for storage/use.	Confirmed with the current LEAD fire chief that PFAS-containing materials was not used or stored at this location. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.
99th USAR	Unknown	The 99th USAR operates as a tenant at LEAD. Their mission includes transportation, maintenance and storage management for USAR materials. LEAD handles the disposal of their	A hazardous materials inventory for the USAR was requested but not received. Use, storage, and/or disposal of PFAS-containing materials could not be confirmed for this location.

Area Description	Dates of Operation	Relevant Site History	Rationale
		hazardous waste materials.	
Building 2325 – Former Pesticide Storage	Unknown	Former pesticide storage building for LEAD.	No PFAS-containing pesticides were identified following review of LEAD's pesticide inventory.
Building 2329 – Former Pesticide Storage	Unknown to early 2000s	Current pesticide storage building for LEAD.	No PFAS-containing pesticides were identified following review of LEAD's pesticide inventory.
Current Pesticide Storage	Early 2000s to Present	Former pesticide storage building for LEAD.	No PFAS-containing pesticides were identified following review of LEAD's pesticide inventory.
Building 247 – Former Fire Station	Pre-1970s	Identified during the site-visit as the former LEAD fire station.	Confirmed with retired Fire Department personnel that this fire station was closed prior to the introduction of AFFF at LEAD. Additionally, records reviewed, and internet searches performed as part of the PA did not identify this area for PFAS-containing materials use storage, and/or disposal.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Eight of the AOPIs overlap with LEAD IRP sites and/or Headquarters Army Environmental System (HQAES) sites (**Figure 5-2**). The AOPI, overlapping IRP site identifier, HQAES number, and current site status are discussed within each AOPI subsection presented below. At the time of this PA, seven of the LEAD IRP sites have historically been investigated or are currently being investigated for the possible presence of PFAS.

The AOPI locations are shown on **Figure 5-2**. The approximate extent of the use, storage, or disposal of PFAS-containing materials (if applicable) are presented on **Figures 5-3** through **5-14** and include active monitoring wells in the vicinity of each AOPI.

5.2.1 Former Area B Fire Training Area (LEAD-009)

The Former Area B Fire Training Area (LEAD-009) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the historical use of AFFF as part of fire training exercises at this location in the late 1970s and early 1980s (**Figure 5-3**). The AOPI is located at the intersection of East Patrol Road and Mortar Road in the Southeast Area of LEAD. The surrounding environment consists of weathered roads (either paved or made of dirt) and grassed and treed areas over rolling karst terrain. The former FTA was historically constructed out of clay. Interviewed personnel reported that the training area was filled with oil and set ablaze for fire training exercises. The area is currently being used as depot storage. Based on review of aerial photography, topographic contours, and existing stormwater maps, there are no surface water bodies or stormwater management systems within the vicinity of this AOPI. Surface water and groundwater flow northeast and offpost through the northeastern boundary of LEAD before discharging to Rowe Spring, located approximately 1.43 miles northeast of this AOPI.

This AOPI falls within the boundary of the LEAD IRP Site LEAD-009 Clay Lined FTA (Area B). Under the IRP, this site was investigated for VOC contamination. This site, along with LEAD-079 and LEAD-105 make up the Southeast OU 5. An interim remedial action was completed for LEAD-105 soil in fiscal year 1997. Land use controls restricting site usage to commercial/industrial land use was the selected remedy for this location. This area was identified in 2011 by LEAD personnel as the first FTA operated at LEAD by fire department personnel. It was sampled for PFOS and PFOA in 2013 (**Figure 5-3**).

5.2.2 PDO Area - Oil Burn Pit (LEAD-010)

The PDO Area - Oil Burn Pit (LEAD-010) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the historical use of AFFF at this location by LEAD Fire Department and neighboring fire department personnel as part of fire training exercises between the years of 1978 and 1983 (**Figure 5-4**). The AOPI is located within the PDO Area of LEAD east of the intersection between Georgia Avenue and Scale House Road. The surrounding environment is forested and heavily vegetated. Interviewed personnel reported that the training area was filled with used solvents and oil then set ablaze for fire training exercises. Residual burn waste from this AOPI was regularly removed and disposed of at the LEAD IWTP. The area is currently vacant. Based on review of aerial photography, topographic contours, and existing stormwater maps, there are no surface water bodies within the vicinity of this AOPI. One major and one minor surface water and groundwater divide exist beneath this AOPI. Surface water and groundwater north of this AOPI flow northeast and discharge to MMR, while surface water and groundwater south of the AOPI flow southwest through karst pathways off post to Rocky Spring.

This AOPI falls within the boundary of the LEAD PDO OU 4 IRP Site LEAD-010 Oil Burn Pit. Under the IRP, this site was investigated for VOC contamination. In 1998, interim soil remedial action was completed using chemical oxidation. One small, shallow area of soil with elevated trichloroethene contamination reportedly remains. Electrical resistance heating was the proposed remedy to address

VOCs trapped in the bedrock matrix and residual soil contamination. This area was identified in 2011 by LEAD personnel as the second FTA operated at LEAD by fire department personnel. This site and the surrounding area were sampled for PFOS and PFOA in 2013, 2017, and 2019 (**Figure 5-4**).

5.2.3 Former Concrete Lined Fire Training Area (LEAD-063)

The Former Concrete Lined Fire Training Area (LEAD-063) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the historical use of AFFF at this location by LEAD Fire Department and neighboring fire department personnel as part of fire training exercises between the years of 1983 and 1987 (**Figure 5-5**). The AOPI is located within the PDO Area of LEAD west of the intersection between Georgia Avenue and Scale House Road. Interviewed personnel reported that the training area was filled with used solvents and oil, then set ablaze for fire training exercises. Residual burn waste from this AOPI was regularly removed and disposed of at the LEAD IWTP. The FTA was excavated in the 1990s, and the surrounding environment now consists entirely of gravel. The location serves as depot storage. Based on review of aerial photography, topographic contours, and existing stormwater maps, there are no surface water bodies within the vicinity of this AOPI. A minor surface water and groundwater drainage divide exists beneath this AOPI. Surface water and groundwater north of this AOPI flow northeast and discharge to MMR, while surface water and groundwater south of the AOPI flow southwest through karst pathways off post to Rocky Spring.

This AOPI falls within the boundary of the former LEAD IRP Site LEAD-063 Firemen's Training Area. Under the IRP, the contents of the concrete lined pit were pumped out and disposed. The concrete pit was broken up, excavated, and disposed of offsite along with some underlying stained soil as residual waste. The contents of the Fire Training Pit and the concrete pit itself were disposed at a landfill currently owned by Waste Management in Greencastle, Pennsylvania. The issued Response Complete date for this action was September 1992. This area was identified in 2011 by LEAD personnel as the third and final FTA operated at LEAD by fire department personnel. This site and the surrounding area were sampled for PFOS and PFOA in 2013, 2017, and 2019.

5.2.4 IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)

The IWWS Lines (LEAD-005 AFFF Release) (LEAD-074) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the historical discharge of AFFF into an IWWS sewer inlet connected to the IWWS by LEAD Fire Department personnel sometime in the late 1980s (**Figure 5-6**). A retired DPW Division Chief stated that the IWWS lines connecting LEAD-005 to the LEAD-013 IWTP were replaced due to suspected line leaks sometime between 1987 and 1988. The AOPI resides within Southeast OU 11, which is within the Southeast Area of the Industrial Area at LEAD. The area surrounding the AOPI is highly developed and consists of industrial buildings. Review of aerial photography, topographic contours, and stormwater maps shows no man-made surface features managing surface water run off at this location. Surface water and groundwater from this area flow northeast and discharge off post to Rowe Run, located approximately 1.3 miles northeast of the AOPI and into the Susquehanna River watershed.

5.2.5 Current Fire Department Station

The Current Fire Department Station is identified as a leased-back BRAC AOPI following records research, personnel interviews, and site reconnaissance due to the discharge of residual AFFF to the fire-station driveway, as well as a one-time, 15 to 30-gallon discharge of AFFF to the fire station's engine bay floor drains, that eventually discharged to an off-post pond south of the fire station (**Figure 5-7**). Currently, the LEAD Fire Department stores AFFF inside the building. During the PA visit on 27 June 2019, a wooden cabinet was observed containing fourteen 5-gallon totes of Universal Gold 1%/3% Alcohol Resistant AFFF. No evidence of AFFF leaks from the cabinet were observed during the PA site reconnaissance trip. The AOPI is located within the Southeast Area of LEAD and Southeast OU 13. The fire station building is located at the intersection of Coffey Avenue and Innovation Way. The environment surrounding the building is primarily grass and pavement over rolling karst terrain. A large field and topographic low lies to the southeast. Review of aerial photography, topographic contours, and stormwater maps show that storm water drains originating from the fire station driveway and engine bay discharge to an on-post surface water channel located approximately 800 feet to the southeast. This surface water channel eventually discharges to an off-post retention pond. A minor surface water and groundwater divide is located directly northwest of the fire station building. This divide directs surface water and groundwater towards the southeast, discharging into Hawbaker Spring located approximately 1.5 miles south of the AOPI, and eventually draining into the Potomac River Watershed via Conococheague Creek. There are currently no installation IRP identifiers or HQAES numbers associated with this site.

5.2.6 BRAC Area Building 2291 – Former Hazardous Materials Building

The BRAC Area Building 2291 – Former Hazardous Materials Building is identified as a BRAC AOPI with the potential for AFFF release to the environment following records research and personnel interviews indicating that the building was historically equipped with an AFFF suppression system (**Figure 5-8**). The building is located directly west of the Sludge Application Area –VTT Southern Lobe AOPI (**Section 5.2.9**) at the intersection of Scale House Road and Development Avenue and resides within a Phase VIII BRAC parcel slated for excess sometime between 2023 and 2024. A LEAD retired fire chief and fire inspector stated in an interview conducted during the PA that the Flammable Liquids Storage Room within Building 2291 contained a fire suppression system that utilized AFFF. An accidental discharge reportedly occurred in 1995 while testing the suppression system. It could not be confirmed whether AFFF from the discharge was pushed out into the surrounding environment via doorways or confined to secondary containment. The building was transferred to another owner in 1997.

The building is primarily surrounded by grass and pavement over rolling karst terrain, with a dense tree line bordering the building envelope to the northwest. A large field and topographic low lies to the southeast. Review of aerial photography shows a large stormwater culvert and drain approximately 220 feet due east of the eastern building corner along Scale House Road. The stormwater culvert appears to curve westward running along Development Avenue before terminating at a driveway leading to the building parking lot. The building resides to the west of a major surface water and groundwater divide. This divide directs surface water and groundwater towards the southwest, discharging to Rocky Spring located approximately 1.85 miles southwest of the AOPI, before eventually draining into the Potomac

River Watershed via the Rocky Branch Spring System. There are currently no installation IRP identifiers or HQAES numbers associated with this site.

5.2.7 Former Chrome Plating (LEAD-003)

The Former Chrome Plating (LEAD-003) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the use of PFAS-containing mist-suppressants at this location for a short duration in the early 1980s (**Figure 5-9**). Following this test period, mist-suppressants were retired, and chromium plating personnel began to use polytetrafluoroethylene (Teflon®) balls for mist-suppressant purposes until the site's closure in 2000. The area surrounding LEAD-003 was investigated for chromium contamination in 1989. Chromium and hexavalent chromium were detected at three wells in concentrations below the water quality criteria established by the PADEP and below the maximum contaminant level for chromium established by the USEPA. The building has since been redeveloped. The AOPI resides within an industrial portion of the Southeast Area of LEAD, within Southeast OU 10. The area surrounding the AOPI is highly developed and consists entirely of industrial buildings and grass lawns. Review of aerial photography, topographic contours, and stormwater maps shows no stormwater utility lines or management systems surrounding the AOPI. Based on review of historical dye trace studies conducted in the vicinity of the LEAD 003 – Former Chrome Plating area (Shaw 2004), surface water and groundwater from this area flows toward the south. Southerly flow discharges to Hawbaker Spring, located approximately 2.2 miles south of the AOPI and into the Potomac River Watershed via Conococheague Creek.

This AOPI falls within the boundary of the former LEAD Southeast OU 10 IRP Site LEAD-003. Under the IRP, the area surrounding the building was investigated for chromium contamination. Results of the investigation did not warrant any additional action. The IRP site was closed out in 1993.

5.2.8 Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)

The Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the historical discharge and processing of FTA AFFF wastes, PFAS-containing mist-suppressants from sewage wastes originating at LEAD-003, AFFF from a single discharge into an entry gate of the industrial waste sewer line system at LEAD-005 (as discussed in **Section 4.1**), and historical storage of sludges generated at the LEAD-013 IWTP suspected to have contained AFFF and PFAS-containing mist-suppressant waste (**Figure 5-10**).

The AOPI resides within an industrial portion of the Southeast Area of LEAD, within Southeast OU 11. The area surrounding the AOPI is highly developed and consists of industrial buildings and grass lawns. A site reconnaissance conducted during the PA site visit showed the IWTP infrastructure to be in good condition. The capped remnants of the IWTP Sludge Holding Lagoons are located directly to the north of the IWTP. No cracks or evidence of discharge to the environment were observed. Both IWTP Sludge Holding Lagoon parcels were closed between 1986 and 1988. The lagoon materials were excavated, decontaminated via LTTV, reapplied to the lagoon parcels as fill and capped in 1992. Surface runoff from the lagoon liner drains to the stormwater outfall and IWWS outfall drainage ditch. Stormwater from the Southeast Area of LEAD and the LEAD-013 IWTP effluent both discharge to this drainage ditch. Surface

water from this stream, as well as groundwater beneath the AOPI, flow northeast and discharge off post to Rowe Run, located approximately 1.3 miles northeast of the AOPI and into the Susquehanna River watershed.

5.2.9 Sludge Application Area –VTT Southern Lobe (LEAD-016)

The Sludge Application Area – VTT Southern Lobe (LEAD-016) is identified as an AOPI following personnel interviews, and site reconnaissance due to the historical application of possible PFAS-containing sludges generated at the IWTP between the years of 1978 and 1983 (**Figure 5-11**). The AOPI resides within the southern lobe of the VTT, located in the Southeast Area of LEAD and Southeast OU 3B. The area surrounding the AOPI consists of grassed and paved areas used for depot storage. Review of aerial photography, topographic contours, and stormwater maps shows a series of storm water pipes that direct stormwater runoff away from the AOPI. Surface water and groundwater from this area flow northeast and discharge off post to Rowe Run, located approximately 2.0 miles northeast of the AOPI and into the Susquehanna River watershed.

5.2.10 BRAC Area – Government Vehicle Storage Area

The BRAC Area – Government Vehicle Storage Area is identified as a BRAC AOPI following records research and personnel interviews due to the use of the area as a fire station support building and parking area for government vehicles (**Figure 5-12**). The building is located at the intersection of Indiana Avenue and Opportunity Avenue in the industrial Southeast Area of LEAD and resides within a BRAC excessed portion of LEAD. A fire chief stated in an interview conducted during the PA that three government vehicles are regularly parked at this location, including one government vehicle stocked with AFFF.

The building resides within a heavily developed industrial area. Small plots of grass surround the building on all sides transected only by walkways and driveways. The greater area surrounding the building is dominated by roadways and other warehouses. Review of aerial photography and stormwater maps show multiple stormwater management lines bordering the east and west of the building. Review of historical drainageway figures indicate that stormwater collected from the Southeast Area storm-sewer lines are discharged via an outfall located in the southeastern most corner of the former installation boundary. Stormwater discharged from this outfall eventually drains to Conococheague Creek via the Southeast Drainageway. The building resides south of a major surface water and groundwater divide. This divide directs surface water and groundwater towards the south, discharging to Hawbaker Spring located approximately 1.8 miles south of the AOPI before eventually draining into the Potomac River Watershed via the Southeast Drainageway and Conococheague Creek. There are currently no installation IRP identifiers or HQAES numbers associated with this site.

5.2.11 Past AFFF Storage Area

The Past AFFF Storage Area is identified as an AOPI following personnel interviews due to the use of the area as a staging ground for empty AFFF drums scheduled for off-site disposal (**Figure 5-13**). The AOPI resides within an industrial portion of the Southeast Area of LEAD, within Southeast OU 11. The area surrounding the AOPI is highly developed and consists of industrial buildings and grass lawns. The AOPI is located directly southeast of the Former Buildings 361 and 362 – IWTP and Former Sludge Holding

Lagoons AOPI. Review of aerial photography and stormwater maps did not indicate the presence of any major stormwater management components. Surface water from this area, as well as groundwater beneath the AOPI, flow northeast and discharge off post to Rowe Run, located approximately 1.3 miles northeast of the AOPI and into the Susquehanna River watershed.

5.2.12 Low Temperature Thermal Volatilization (LTTV) Site

The Low Temperature Thermal Volatilization (LTTV) Site is identified as an AOPI following records research and personnel interviews due to use of the area for LTTV treatment on soil excavated from the Former Lagoons 361 and 362 suspected to have PFAS-containing materials (**Figure 5-14**). The AOPI is located at the intersection of East Patrol Road and North Patrol Road in the Southeast Area of LEAD, due west of the Former Area B Fire Training Area (LEAD-009). The site is comprised of pavement and loose gravel. The northern portion of the site is currently being used for depot storage. Mounds of dirt and other stock-piled material are visible in aerial photography in the southeastern portion of the site. The surrounding environment consists of weathered roads, grassed and treed areas over rolling karst terrain. Based on review of aerial photography, topographic contours, and existing stormwater maps, there are no surface water bodies or stormwater management systems within the vicinity of this AOPI. Surface water and groundwater flow northeast and off post through the northeastern boundary of LEAD before discharging to Rowe Spring, located approximately 1.43 miles northeast of this AOPI.

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at LEAD, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at LEAD at all 12 AOPIs (including both BRAC Areas) to evaluate presence or absence of PFOS, PFOA, and PFBS in comparison with the OSD risk screening levels. As such, an installation-specific QAPP Addendum (Arcadis 2020) was developed to supplement the general information provided in the PQAPP (Arcadis 2019) and to detail the site-specific proposed scopes of work for the SI. A preliminary CSM was prepared for each of the installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified seven soil, groundwater, surface water, and/or sediment pathways as potentially complete which guided the SI sampling. The QAPP Addendum details the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed in November 2020, January 2022, and March 2022 through the collection of field data and analytical samples.

The SI field work was completed in accordance with the standard operating procedures (SOPs), technical guidance instructions (TGIs), sampling design, and QA/QC requirements as detailed in the QAPP Addendum (Arcadis 2020) and PQAPP (Arcadis 2019). The subsections below summarize the DQOs, sampling design and rationale, sampling activities and methods, and data analyses procedures for the SI phase at LEAD. Non-conformances to the prescribed procedures in the PQAPP and QAPP Addendum are described in **Section 6.3.4**. Analytical results obtained through SI field activities are summarized in **Section 7**.

6.1 Data Quality Objectives

As identified during the DQO process and outlined in the site-specific QAPP Addendum (Arcadis 2020), the objective of the SI is to identify whether there has been a release to the environment at the AOPIs identified in the PA and to determine if further investigation is warranted. This SI evaluated groundwater, soil, surface water, and sediment for PFOS, PFOA, and PFBS presence or absence at each of the sampled AOPIs.

6.2 Sampling Design and Rationale

The rationale for sampling at each AOPI is illustrated on **Figure 6-1** below.

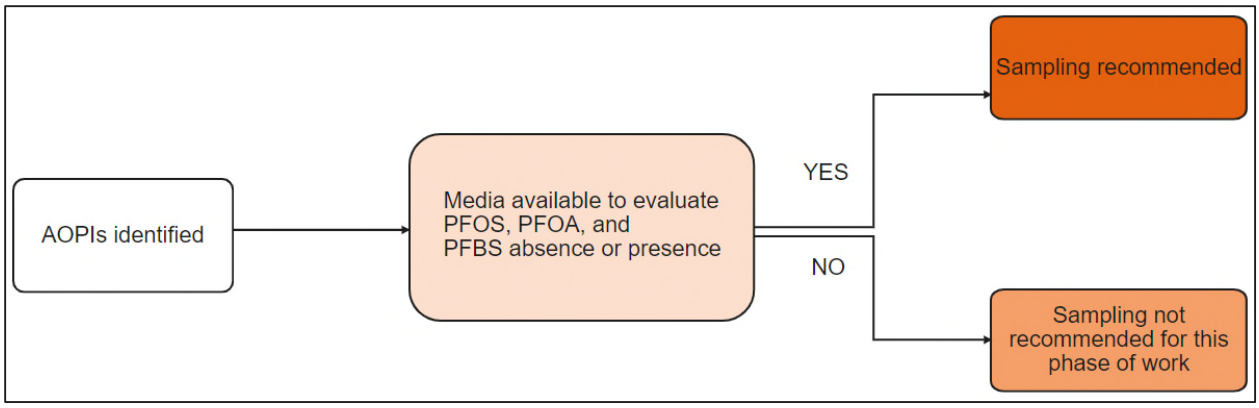

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at LEAD is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). Samples were collected at locations of known or suspected use, storage, and/or disposal of PFAS-containing materials, potential release or source areas, and downgradient locations if exact use, storage, or disposal location was unknown. Sample locations were chosen based on site-specific historical evidence, suspected groundwater flow conditions, as well as surface runoff/surface conditions observed in the field at each sampled AOPI. Sample media types (e.g., surface soil, groundwater, surface water, sediment) collected for each sampled AOPI were based on media most likely to confirm the presence or absence of PFOS, PFOA, and PFBS directly related to the AOPI. Two AOPI's did not have soil samples collected due to site specific historical evidence indicated impacted soil was previously removed or not impacted by PFAS-containing materials.

The sampling depths at existing monitoring wells were at approximately the center of the saturated screened interval. **Table 6-1** includes the monitoring well construction details for the wells sampled during the SI (if available).

6.3 Sampling Methods and Procedures

Environmental data were collected and analyzed in accordance with the PQAPP (Arcadis 2019), the SOPs and TGIs included as Appendix A to the PQAPP, the QA/QC requirements identified in Worksheet #20 of the PQAPP, the approved scope and sampling methods outlined in the site-specific QAPP Addendum (Arcadis 2020), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHP (Arcadis 2020). The sampling methods described in the SOPs and TGIs establish equipment requirements, procedures for preparing equipment and containers before sampling, sampling procedures under various conditions, and procedures for storing samples to ensure that sample contamination does not occur during collection, and transport. In general, sampling techniques used in the SI were consistent with conventional sampling techniques used in the environmental industry, but special considerations were made regarding PFAS-containing materials and equipment and cross-contamination potential.

The sampling methods employed during the SI are detailed in the PQAPP (Arcadis 2019) and QAPP Addendum (Arcadis 2020). The subsections below provide a summary of the field methods and procedures utilized to complete the SI scope of work. Field notes and field forms (i.e., soil boring logs,

groundwater purging logs, equipment calibration forms, tailgate health and safety forms, and sample collection logs) documenting the SI sampling activities are included in **Appendices I** and **J**, respectively. Photographs of the sampling activities are included in **Appendix K**.

6.3.1 Field Methods

The field methods for the first mobilization (completed in November 2020) are described as follows. Groundwater samples were collected from existing monitoring wells using the modified Type II method (15 total samples), formulated by the Army and USEPA for LEAD in November 2002 (Weston Solutions, Inc. 2017b). The modified Type II method consists of removing one to two well volumes, adjusting according to well yield so that water levels do not drop below pump depth, lowering the purge rate to 0.5 gallon per minute, and sampling after field parameters stabilize. The groundwater samples were collected using PFAS-free, low-flow pumps (monsoon pump or bladder pump depending on depth to water of the well) and high-density polyethylene tubing. Soil samples were collected using a stainless-steel hand auger at 0 to 2 feet below ground surface (bgs) (24 samples from this interval) and via direct-push technology (DPT) drilling at 11.5 to 13.5 feet bgs (three samples from this interval). At sampling locations where boreholes were advanced using DPT, dual-tube drill casing was advanced using a top-down sampling method to minimize cross-contamination at depth. Soil samples were collected in PFAS-free acetate liners. Surface water samples were collected using direct-fill methods just below the water surface and field parameters were recorded before sampling (three total samples). Sediment samples were collected from the upper 10 centimeters using a decontaminated Lexan™ tube and stainless-steel trowel (four total samples); sediment samples were decanted before bottling for laboratory analysis. Coordinates for soil, surface water, and sediment sample locations were recorded using a handheld global positioning system locator.

The field methods for the second mobilization (Phase II) (completed in January and March 2022) are described as follows. Four groundwater samples were collected from existing monitoring wells (two samples) and temporary wells (two samples). Groundwater was collected from existing monitoring wells using either a HydraSleeve™ or the modified Type II method (see above). Groundwater was collected from temporary wells installed via sonic drilling using grab sample methods. **Appendices I** and **J** include details regarding the depth intervals where the temporary screens were installed for the grab groundwater sample collection. Grab groundwater samples were collected at first encountered groundwater from both temporary borehole locations; first groundwater was encountered in the overburden at one location and bedrock at one location. The groundwater samples were collected using PFAS-free, low-flow pumps (monsoon pump or bladder pump depending on depth to water of the well) and high-density polyethylene tubing. Coordinates for groundwater sample locations were recorded using a handheld global positioning system locator.

Decontamination procedures for non-dedicated equipment used during both mobilizations are described in **Section 6.3.5**.

6.3.2 Quality Assurance/Quality Control

Worksheets #20 of the PQAPP and QAPP Addendum provide QA/QC requirements for field duplicates, matrix spike/matrix spike duplicates, equipment blanks (EBs), source blanks for water used in the

decontamination of equipment, and field blanks for laboratory-supplied water used in the final decontamination step.

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020), typically at a rate of 1 per 20 parent samples. Field duplicates and matrix spike/matrix spike duplicate samples were collected for media sampled for PFOS, PFOA, and PFBS, and total organic carbon (TOC) only. EBs were collected for media sampled for PFOS, PFOA, and PFBS at a frequency of one per piece of relevant equipment for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which EBs were collected include a water level meter (LEAD-EB-1-110320, LEAD-EB-8-012522, and LEAD-EB-11-032222), hand auger (LEAD-EB-2-110220), drill casing (LEAD-EB-3-110320, and LEAD-EB-12-032222), bladder pump (LEAD-EB-4-110320-B, LEAD-EB-6-012522, and LEAD-EB-10-032222), monsoon pump (LEAD-EB-4-110320-M, LEAD-EB-7-012522, and LEAD-EB-13-032222), and hand shovel (LEAD-EB-5-110320) as applicable to the sampled media. Source blanks were collected from the water used to decontaminate equipment. Analytical results for blank samples are discussed in **Section 7.16**.

6.3.3 Dedicated Equipment Background

Dedicated equipment background (DEB) samples were collected when dedicated, down-hole equipment was encountered in existing monitoring wells that could not be removed during sampling. DEBs were collected at a frequency of one DEB per AOPI, per equipment type (i.e., if pump types are varied across wells sampled at the AOPI) and analyzed for PFAS, including PFOS, PFOA, and PFBS. When collecting samples from monitoring wells with dedicated, down-hole equipment, a water sample was collected from the monitoring well. The DEB sample was collected from the first water produced through the pump and tubing and was used to evaluate whether the dedicated equipment may be impacting the PFOS, PFOA, and/or PFBS results, as it is unknown if the dedicated equipment was comprised of PFAS-containing components. PFOS, PFOA, and/or PFBS concentrations in the DEBs reflect concentrations of stagnant groundwater, and they may be biased high by contributions from equipment that contains PFOS, PFOA, and/or PFBS components. The parent sample was collected after the well was purged until the field parameters stabilized. The DEB collection procedure was performed in accordance with the PFAS TGI (P-13 in Appendix A to the PQAPP). One DEB was collected at well 00-PDO-02 (BRAC Area Building 2291 – Former Hazardous Materials Building) due to an unexpected, existing bailer found in the well. Another DEB was collected at well 01-DA-04 (LTTV Site AOPI) due to an unexpected, existing transducer found in the well. Further DEB analysis is included in **Section 7.13**.

6.3.4 Field Change Reports

No instances of major scope modifications (i.e., those that may have had a significant impact on the project scope and/or data usability/quality, or required stop-work, and warranted discussion with USACE) were encountered during the LEAD SI work.

In some cases, clarifications to the established scope of work were needed but do not necessarily constitute a non-conformance from the sampling plans described in the QAPP Addendum. Minor modifications from and clarifications for the procedures and scope of work detailed in the QAPP Addendum and PQAPP and that did not affect DQOs are documented in Field Change Reports (FCRs) included as **Appendix L** and are summarized below:

- FCR-LEAD-01: Monitoring well 04-PDO-3 at the PDO Area – Oil Burn Pit (LEAD-010) AOPI was sampled in place of proposed well, 94-PDO-1, which contained unexpected, dedicated equipment, as well as petroleum product in the well.
- FCR-LEAD-02: An additional EB was collected from a monsoon pump that was used to collect the groundwater samples, due to a change in scope (groundwater collected at existing monitoring wells using the modified Type II method, the approved groundwater sampling method for LEAD).
- FCR-LEAD-02: A DEB was collected due to an unexpected piece of dedicated equipment (bailer) found in well 00-PDO-02 at BRAC Area Building 2291 – Former Hazardous Materials Building.
- FCR-LEAD-02: A DEB was collected due to an unexpected piece of dedicated equipment (transducer) found in well 01-DA-04 at the LTTV Site AOPI.
- FCR-LEAD-03: Monitoring well 96-NSIA-5 at the Past AFFF Storage Area AOPI was sampled for groundwater in place of well 82-2 due to 82-2 containing no water. Monitoring well 96-NSIA-5 was sampled using the TGI for PFAS Sampling Procedures and Low-Flow Groundwater Purging for Monitoring Wells (P-11 in Appendix A to the PQAPP, Arcadis 2019) instead of the Modified Type II method due to the equipment capabilities designed for the original scope. The bladder pump that was used for this sampling event was not able to pump water at depths greater than 150 feet bgs.
- FCR-LEAD-04: An additional SI sampling event (Phase II) was conducted at LEAD to determine presence or absence of PFOS, PFOA, and PFBS in groundwater at Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) and the Current Fire Department Station AOPIs.

6.3.5 Decontamination

Non-dedicated reusable sampling equipment (e.g., water level meter, hand auger, drill casing, monsoon pump, bladder pump, and hand shovel) that came into direct contact with sampling media was decontaminated before first use, between sampling locations/intervals, and before demobilization in accordance with P-09, TGI - Groundwater and Soil Sampling Equipment Decontamination (Arcadis 2019, Appendix A).

6.3.6 Investigation-Derived Waste

Liquid IDW, including groundwater purged during sampling and water from decontamination of drill tooling, was containerized and stored at a staging area located at the PDO Area - Oil Burn Pit (LEAD-010) AOPI. The containerized water was then treated via a portable granular activated carbon unit and discharged to the ground surface at the staging area in accordance with procedures for sampling PFOS, PFOA, and PFBS at LEAD. Solid IDW (i.e., soil cuttings generated during soil boring activities) was placed back into the originating hole. Non-IDW wastes were disposed of on-site in municipal waste receptacles upon completion of each day’s field activities.

6.4 Data Analysis

The subsections below summarize the laboratory analytical methods and the methodology used to evaluate data collected during the SI through data verification and usability assessments (as completed by a project chemist, independent of the project team).

6.4.1 Laboratory Analytical Methods

Analytical samples collected during the SI were submitted to Eurofins Lancaster Laboratories Environmental, an ELAP-accredited laboratory for PFAS analysis, including PFOS, PFOA, and PFBS, by liquid chromatography with tandem mass spectrometry. Laboratory analyses associated with the SI were completed in accordance with Worksheets #12.1 through #12.5 in the PQAPP (Arcadis 2019). Eighteen PFAS-related compounds, including PFOS, PFOA, and PFBS were analyzed for in groundwater, soil, surface water, and sediment samples using an analytical method that is ELAP-accredited and compliant with QSM 5.1.1, Table B-15 (DoD 2018) for the SI data collected in November 2020, and QSM 5.3, Table B-15 (DoD and Department of Energy 2019) for the SI data collected in January 2022 and March 2022.

Additionally, the following general chemistry and physical characteristic analyses were completed for select soil and sediment samples in accordance with Worksheet #18 of the QAPP Addendum (Arcadis 2020) by the analytical method noted:

- TOC by Solid Waste Test Method 846 9060A
- Grain size analysis by American Society for Testing and Materials D422-63
- pH by Solid Waste Test Method 846 9045D.

These data are collected as they may be useful in future fate and transport studies.

The laboratory LOD is defined as “the lowest concentration for reliable reporting of a non-detect of a specific analyte in a specific matrix with a specific method at 99 percent confidence” (DoD 2017). The lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias is known as the limit of quantitation (LOQ; DoD 2017). Concentrations detected between the LOD and LOQ, therefore, are considered estimates and are qualified as such on laboratory analytical reports. Instrument-specific detection limits (e.g., the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration with 99 percent confidence; DoD 2017), as provided for each analyte by the laboratory, are reported along with the LODs and LOQs in the laboratory analytical reports included in the Data Usability Summary Report (DUSR) (**Appendix M**).

6.4.2 Data Validation

All analytical data generated during the SI, except grain size and data generated from IDW profiling, were verified, and validated in accordance with the data verification procedures described in Worksheets #34 through #36 of the PQAPP (Arcadis 2019). Each laboratory data package/sample delivery group underwent Stage 3 data validation in accordance with DoD QSM 5.1.1, Table B-15 (DoD 2018) for the SI data collected in November 2020, and QSM 5.3, Table B-15 (DoD and Department of Energy 2019) for the SI data collected in January 2022 and March 2022. Additionally, 10% of the data underwent Stage 4 data validation. Copies of the data validation reports for each sample delivery group are included as

attachments to the DUSR in **Appendix M**. The Level IV analytical reports are included within **Appendix M** in the final electronic deliverable only.

6.4.3 Data Usability Assessment and Summary

A data usability assessment was completed for all analytical data associated with SI sampling at LEAD. Documentation generated during the data usability assessments, which were compiled into a DUSR (**Appendix M**), was prepared in accordance with the USACE Engineer Manual 200-1-10 (USACE 2005), the Final DoD General Data Validation Guidelines (DoD 2019) and the Final DoD Data Validation Guidelines Module 3: Data Validation Procedure for Per-and Polyfluoroalkyl Substances Analysis by QSM Table B-15 (DoD 2020), that reviewed precision, accuracy, completeness, representativeness, comparability, and sensitivity. A statement of overall data usability is included in the DUSR.

Based on the final data usability assessment, the environmental data collected at LEAD during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUSR and its associated data validation reports (**Appendix M**), and as indicated in the full analytical tables (**Appendix N**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and LEAD QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at LEAD are provided in the data tables, data validation reports, and the Data Usability Summary Table located at the end of DUSR. Qualifiers for data shown on figures are defined in the notes of figures.

6.5 Office of the Secretary of Defense Risk Screening Levels

The OSD risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) and soil were calculated using the USEPA's RSL calculator for residential and industrial/commercial worker receptor scenarios and current toxicity values. These risk screening levels are shown in **Table 6-2**.

Table 6-2 OSD Risk Screening Levels Calculated for PFOS, PFOA, and PFBS in Tap Water and Soil Using USEPA's Regional Screening Level Calculator

Chemical	Residential Scenario Risk Screening Levels Calculated Using USEPA RSL Calculator		Industrial/Commercial Scenario Risk Screening Levels Calculated Using USEPA RSL Calculator
	Tap Water (ng/L or ppt) [1]	Soil (mg/kg or ppm) [1,2]	Soil (mg/kg or ppm) [1,2]
PFOS	40	0.13	1.6
PFOA	40	0.13	1.6
PFBS	600	1.9	25

Notes:

1. Risk screening levels for tap water and soil provided by the OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15 (**Appendix A**).

2. All soil data will be screened against both the Residential Scenario and Industrial/Commercial risk screening levels (if collected from less than 2 feet bgs), regardless of the current and projected land use of the AOPI. Soil samples collected from greater than 2 feet but less than 15 feet bgs will be compared to the Industrial/Commercial risk screening levels only.
mg/kg = milligram per kilogram
ng/L = nanograms per liter
ppm = parts per million
ppt = parts per trillion

The OSD residential tap water risk screening levels will be used to compare all groundwater data for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at LEAD are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil concentrations. OSD residential tap water risk screening levels may be applicable for comparison to surface water if it is an expression of groundwater (i.e., springs/seeps) or if surface water is used as a drinking water source nearby. The OSD risk screening levels for soil may be applicable to sediment if it is collected from a dry streambed or intermittent drainage. These scenarios do not apply to the surface water and sediment samples collected at the LEAD AOPIs; therefore, the OSD risk screening levels are not applicable to the surface water and sediment data collected at LEAD.

The data from the SI sampling event are compared to the OSD risk screening levels in **Section 7**. If concentrations of PFOS, PFOA, or PFBS are detected greater than the applicable OSD risk screening levels, further study in a remedial investigation is recommended in **Section 9**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

This section summarizes the analytical results obtained from samples collected during the SI at LEAD (field duplicate results are provided in the associated tables). Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the QAPP Addendum (Arcadis 2020). The sample results discussion below focuses on the PFOS, PFOA, and PFBS analytical results because they have OSD risk screening levels. The Army will make subsequent investigation decisions based on these constituents' concentrations relative to the OSD risk screening levels.

Tables 7-1 through **7-4** provide a summary of the groundwater, soil, surface water, and sediment analytical results for PFOS, PFOA, and PFBS. **Table 7-5** summarizes AOPIs and whether their SI results exceed the OSD risk screening levels. **Appendix N** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at LEAD with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-13** show the PFOS, PFOA, and PFBS analytical results in groundwater, soil, surface water, and sediment for each AOPI. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and/or PFBS greater than the applicable OSD risk screening levels are highlighted in summary tables and on figures. Final qualifiers applied to the data by the laboratory and the project chemist (as defined in **Section 6.4.3**) are presented on the analytical tables. Groundwater and surface water data collected during the SI are reported in ng/L, or parts per trillion, and soil and sediment data are reported in mg/kg, or parts per million.

Field parameters measured for groundwater during purging, which was completed using the modified Type II method, and sample collection, and for surface water during sample collection are provided on the field forms in **Appendix J**. Soil and sediment descriptions are provided on the field forms in **Appendix J**. The results of the SI are grouped by AOPI and discussed for each medium as applicable.

Table 7-5 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Former Area B Fire Training Area (LEAD-009)	No
PDO Area - Oil Burn Pit (LEAD-010)	Yes
Former Concrete Lined Fire Training Area (LEAD-063)	Yes
IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)	No
Current Fire Department Station	Yes
BRAC Area Building 2291 – Former Hazardous Materials Building	Yes
Former Chrome Plating (LEAD-003)	Yes
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	No
Sludge Application Area – VTT Southern Lobe (LEAD-016)	No

AOPI Name	OSD Exceedances (Yes/No)
BRAC Area – Government Vehicle Storage Area	No
Past AFFF Storage Area	No
Low Temperature Thermal Volatilization (LTTV) Site	Yes

7.1 Former Area B Fire Training Area (LEAD-009)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Area B Fire Training Area (LEAD-009).

7.1.1 Groundwater

One groundwater sample was collected from existing monitoring well 94-17-OBP, which is located down gradient (in relation to groundwater flow) of the area where AFFF was suspected to be used at the Former Area B Fire Training Area (LEAD-009) (LEAD-94-17-OBP; **Figure 7-2**). The groundwater sample was collected mid-screen at approximately 60 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS and PFOA were detected below the OSD risk screening level of 40 ng/L at LEAD-94-17-OBP (6.1 ng/L and 2.5 M [manually integrated compound] ng/L, respectively). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-94-17-OBP (1.2 JM [LOQ is approximate and may be inaccurate or imprecise] ng/L).

7.1.2 Soil

Soil samples were collected via hand auger from two locations at the Former Area B Fire Training Area located within the area of suspected AFFF use (LEAD-009) [LEAD-Area-B-FTA-1-SO-(0-2) and LEAD-Area-B-FTA-2-SO-(0-2); **Figure 7-2**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS was detected below the residential OSD risk screening level of 0.13 mg/kg at LEAD-Area-B-FTA-2-SO-(0-2) (0.00071 mg/kg) and was not detected at LEAD-Area-B-FTA-1-SO-(0-2). PFOA and PFBS were not detected in either of the soil samples.

7.2 PDO Area - Oil Burn Pit (LEAD-010)

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with PDO Area - Oil Burn Pit (LEAD-010). Soil samples were not collected in this area during the SI because appropriately located soil samples had been collected previously (discussed in **Section 2.12**).

7.2.1 Groundwater

One groundwater sample was collected from existing monitoring well 04-PDO-3, which is located down gradient (in relation to groundwater flow) of the area where AFFF was suspected to be used at PDO Area - Oil Burn Pit (LEAD-010) (LEAD-04-PDO-3; **Figure 7-3**). The groundwater sample was collected mid-screen at approximately 30 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected above the OSD risk screening level of 40 ng/L at LEAD-04-PDO-3 (400 D [analyte was analyzed at dilution] ng/L). PFOA was detected below the OSD risk screening level of 40 ng/L at LEAD-04-PDO-3 (33 M ng/L). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-04-PDO-3 (9.3 M ng/L).

7.3 Former Concrete Lined Fire Training Area (LEAD-063)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Concrete Lined Fire Training Area (LEAD-063).

7.3.1 Groundwater

One groundwater sample was collected from existing monitoring well 17-PDO-3, which is located down gradient (in relation to groundwater flow) of the area where AFFF was suspected to be used at the Former Concrete Lined Fire Training Area (LEAD-063) (LEAD-17-PDO-3; **Figure 7-4**). The groundwater sample was collected from the middle of the open hole at approximately 45 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS and PFOA were detected above the OSD risk screening level of 40 ng/L at LEAD-17-PDO-3 (1,000 D ng/L and 74 M ng/L, respectively). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-17-PDO-3 (79 ng/L).

7.3.2 Soil

Soil samples were collected via hand auger from two locations where AFFF was suspected to flow off the concrete pad at the Former Concrete Lined Fire Training Area (LEAD-063) [LEAD-Concrete-FTA-1-SO-(0-2) and LEAD-Concrete-FTA-2-SO-(0-2); **Figure 7-4**]. The soil locations were collected from the native soil directly outside the boundaries of the excavated FTA. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS was detected below the residential OSD risk screening level of 0.13 mg/kg at LEAD-Concrete-FTA-1-SO-(0-2) and LEAD-Concrete-FTA-2-SO-(0-2) (0.052 mg/kg and 0.0020 mg/kg, respectively). PFOA was detected below the residential OSD risk screening level of 0.13 mg/kg at LEAD-Concrete-FTA-1-SO-(0-2) (0.00068 M mg/kg). PFBS was not detected in any of the soil samples.

7.4 IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with IWWS Lines (LEAD-005 AFFF Release) (LEAD-074).

7.4.1 Groundwater

Two groundwater samples were collected from existing monitoring wells 94-320-2 and 94-350-2, which are east and west of the suspected LEAD-005 sewer line breaks at IWWS Lines (LEAD-005 AFFF Release) (LEAD-074) (LEAD-94-320-2 and LEAD-94-350-2; **Figure 7-5**). The groundwater samples were collected from the middle of the open hole of each well at approximately 60 feet bgs and 45 feet bgs, respectively. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected below the OSD risk screening level of 40 ng/L at LEAD-94-320-2 and LEAD-94-350-2 (9.8 ng/L and 13 ng/L, respectively). PFOA was detected below the OSD risk screening level of 40 ng/L at LEAD-94-320-2 and LEAD-94-350-2 (2.7 M ng/L and 7.1 M ng/L, respectively). PFBS was not detected at LEAD-94-320-2 and was detected at a concentration below the OSD risk screening level of 600 ng/L at LEAD-94-350-2 (6.5 ng/L).

7.4.2 Soil

Soil samples were collected using DPT drilling methods from three locations along the transect of and below the historical IWWS line breaks at IWWS Lines (LEAD-005 AFFF Release) (LEAD-074) [LEAD-IWWS-1-SO-(11.5-13.5), LEAD-IWWS-2-SO-(11.5-13.5), and LEAD-IWWS-3-SO-(11.5-13.5); **Figure 7-5**]. Each boring included one subsurface soil sample from 11.5 to 13.5 feet bgs. Surficial soil samples were not collected due to the suspected PFOS, PFOA, and/or PFBS leak occurring at or below the buried IWWS Lines. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in the three subsurface soil samples.

7.5 Current Fire Department Station

The subsections below summarize the soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with the Current Fire Department Station.

7.5.1 Groundwater

Two groundwater samples were collected from temporary wells via sonic drilling (**Figure 7-6**). LEAD-B521-GW-01 was installed on the downgradient (eastern) side of the Current Fire Department Station, associated with a release of PFAS-containing materials (AFFF) to the ground surface at the station. LEAD-B521-GW-02 was installed at the Current Fire Department Station's stormwater outlet pond downgradient of the station (south-southeast). The temporary well samples were collected mid-screen, which was approximately 23 feet bgs and 18 feet bgs, respectively. One existing monitoring well was sampled, which was cross-gradient to the inferred groundwater flow direction (LEAD-93-SE-04; **Figure 7-6**). The groundwater sample was collected from the middle of the inferred screen interval, which was

approximately 77 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-2**.

PFOS was not detected at LEAD-B521-GW-01 and was detected below the OSD risk screening level of 40 ng/L at LEAD-B521-GW-02 and LEAD-93-SE-04 (5.1 ng/L and 26 J [The analyte was positively identified; however, the associated numerical value is an estimated concentration only.] ng/L, respectively). PFOA was not detected at LEAD-B521-GW-01 and was detected below the OSD risk screening level of 40 ng/L at LEAD-93-SE-04 (1.5 J ng/L). PFOA was detected above the OSD risk screening level at LEAD-B521-GW-02 (110 ng/L). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-B521-GW-01, LEAD-B521-GW-02, and LEAD-93-SE-04 (0.97 J ng/L, 3.6 ng/L, and 1.4 J, respectively).

7.5.2 Soil

Soil samples were collected via hand auger from four locations along the fire station driveway and stormwater inlet locations along the driveway, due to surface gradient and flow direction, at the Current Fire Department Station [LEAD-B521-1-SO-(0-2), LEAD-B521-2-SO-(0-2), LEAD-B521-3-SO-(0-2), and LEAD-B521-4-SO-(0-2); **Figure 7-6**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS was detected below the residential OSD risk screening level of 0.13 mg/kg at LEAD-B521-1-SO-(0-2), LEAD-B521-2-SO-(0-2), LEAD-B521-3-SO-(0-2), and LEAD-B521-4-SO-(0-2) (0.015 mg/kg, 0.039 mg/kg, 0.038 mg/kg, and 0.030 mg/kg, respectively). PFOA and PFBS were not detected in any of the soil samples.

7.5.3 Surface Water

One surface water sample, co-located with a sediment sample, was collected at the stormwater outfall southeast of the Current Fire Department Station, where AFFF was suspected to drain (LEAD-B521-1-SW; **Figure 7-6**). This sample was collected from the storm water outfall southeast of the building. A summary of PFOS, PFOA, and PFBS surface water analytical results is provided in **Table 7-3**.

PFOS, PFOA, and PFBS were not detected in the surface water sample.

7.5.4 Sediment

One sediment sample, co-located with a surface water sample, was collected at the stormwater outfall southeast of the Current Fire Department Station, where AFFF was suspected to drain (LEAD-B521-1-SE; **Figure 7-6**). This sample was collected from the storm water outfall southeast of the building. A summary of PFOS, PFOA, and PFBS sediment analytical results is provided in **Table 7-4**.

PFOS was detected at LEAD-B521-1-SE (0.0043 mg/kg). PFOA and PFBS were not detected. As stated in **Section 6.5**, comparison of sediment results to the OSD risk screening levels are not applicable.

7.6 BRAC Area Building 2291 – Former Hazardous Materials Building

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with BRAC Area Building 2291 – Former Hazardous Materials Building.

7.6.1 Groundwater

One groundwater sample was collected from existing monitoring well 00-PDO-02 to determine presence or absence of PFOS, PFOA, and PFBS within the area of the BRAC Area Building 2291 – Former Hazardous Materials Building that was not impacted by AOPIs north of it (LEAD-00-PDO-02; **Figure 7-7**). The groundwater sample was collected mid-screen at approximately 60 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected above the OSD risk screening level of 40 ng/L at LEAD-00-PDO-02 (220 D ng/L). PFOA was detected below the OSD risk screening level of 40 ng/L at LEAD-00-PDO-02 (23 ng/L). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-00-PDO-02 (7.5 ng/L).

7.6.2 Soil

Soil samples were collected via hand auger from four locations along the northwest and northeast sides of the BRAC Area Building 2291 – Former Hazardous Materials Building, where AFFF was suspected to flow out [LEAD-B2291-1-SO-(0-2), LEAD-B2291-2-SO-(0-2), LEAD-B2291-3-SO-(0-2), and LEAD-B2291-4-SO-(0-2); **Figure 7-7**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in any of the soil samples.

7.7 Former Chrome Plating (LEAD-003)

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Former Chrome Plating (LEAD-003). The available history of this area and absence of any potential or suspected points of PFAS release outside of the building provided an insufficient basis for selecting meaningful soil sample locations; therefore, soil sampling was not performed.

7.7.1 Groundwater

Two groundwater samples were collected from existing monitoring wells 88-03 and 88-04 at Former Chrome Plating (LEAD-003) due to previous detections of chromium and hexavalent chromium in these wells (LEAD-88-03 and LEAD-88-04; **Figure 7-8**). The groundwater samples were collected mid-screen at approximately 60 feet bgs and 70 feet bgs, respectively. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was below the OSD risk screening level of 40 ng/L at LEAD-88-03 (15 ng/L), and above the OSD risk screening level of 40 ng/L at LEAD-88-04 (44 ng/L). PFOA was detected below the OSD risk screening level of 40 ng/L at LEAD-88-03 and LEAD-88-04 (8.0 M ng/L and 17 M ng/L, respectively). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-88-03 and LEAD-88-04 (1.1 J ng/L and 4.1 ng/L, respectively).

7.8 Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)

The subsections below summarize the groundwater, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013). The soil in lagoons had been previously excavated, treated (for VOCs), reinterred, and then capped. Soil samples were not collected here due to land use restrictions preventing work that would penetrate the cap.

7.8.1 Groundwater

Four groundwater samples were collected from existing monitoring wells at Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) (**Figure 7-9**). Three groundwater samples were collected from TW-2, TW-3, and TW-4 due to their previous use as lagoon monitoring wells and existing trichloroethene and dichloroethane concentrations in all three wells (LEAD-TW-2, LEAD-TW-3, and LEAD-TW-4). TW-2 and TW-3 are downgradient of the lagoon area and TW-4 is within the area of the Lagoon Liner outfall. The groundwater samples were collected mid-screen at approximately 50 feet bgs, 40 feet bgs, and 40 feet bgs, respectively. One groundwater sample was collected from existing monitoring well 96-NSIA-2 (LEAD-96-NSIA-2) to assess groundwater conditions near the previously collected surface water sample location (LEAD-GWTS-OUTFALL-SW) (**Figure 7-9**). This groundwater sample was collected using a HydraSleeve™. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected below the OSD risk screening level of 40 ng/L at LEAD-TW-2, LEAD-TW-3, LEAD-TW-4, and LEAD-96-NSIA-2 (15 ng/L, 15 ng/L, 14 ng/L, and 8.3 J, respectively). PFOA was detected below the OSD risk screening level of 40 ng/L at LEAD-TW-2, LEAD-TW-3, LEAD-TW-4, and LEAD-96-NSIA-2 (19 M ng/L, 23 ng/L, 17 ng/L, and 1.5 J, respectively). PFBS was not detected at LEAD-96-NSIA-2 and was detected below the OSD risk screening level of 600 ng/L at LEAD-TW-2, LEAD-TW-3, and LEAD-TW-4 (1.3 J ng/L, 1.1 JM ng/L, and 1.2 JM ng/L, respectively).

7.8.2 Surface Water

One surface water sample, co-located with a sediment sample, was collected downstream and north-northeast of the IWTP outfall at Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013), (LEAD-GWTS-Outfall-1-SW; **Figure 7-9**). This sample was collected from the Lagoon groundwater treatment plant (GWTP) outfall. A summary of PFOS, PFOA, and PFBS surface water analytical results is provided in **Table 7-3**.

PFOS and PFOA were detected at LEAD-GWTS-Outfall-1-SW (54 J- [result is an estimated quantity; the result may be biased low] ng/L and 88 M ng/L, respectively. PFBS was detected at LEAD-GWTS-Outfall-1-SW (3.2 J ng/L). As stated in **Section 6.5**, comparison of the surface water results to the OSD risk screening levels are not applicable.

7.8.3 Sediment

Two sediment samples, one of which was co-located with the surface water sample, were collected at Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) (LEAD-GWTS-Outfall-1-SE and LEAD-IWTP-Outfall-1-SE; **Figure 7-9**). One sample was collected from the Lagoon GWTP outfall, and one sample was collected downstream and north-northeast of the IWTP outfall. A summary of PFOS, PFOA, and PFBS sediment analytical results is provided in **Table 7-4**.

PFOS was detected at LEAD-GWTS-Outfall-1-SE and LEAD-IWTP-Outfall-1-SE (0.022 mg/kg and 0.00049 J mg/kg, respectively). PFOA was detected at LEAD-GWTS-Outfall-1-SE (0.0019 mg/kg). PFBS was not detected. As stated in **Section 6.5**, comparison of sediment results to the OSD risk screening levels are not applicable.

7.9 Sludge Application Area –VTT Southern Lobe (LEAD-016)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Sludge Application Area – VTT Southern Lobe (LEAD-016).

7.9.1 Groundwater

One groundwater sample was collected from existing monitoring well EW-10 at Sludge Application Area – VTT Southern Lobe (LEAD-016) due to previous detections of VOCs in this well (LEAD-EW-10; **Figure 7-10**). The groundwater sample was collected mid-screen at approximately 50 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected below the OSD risk screening level of 40 ng/L at LEAD-EW-10 (14 ng/L). PFOA was detected below the OSD risk screening level of 40 ng/L at LEAD-EW-10 (2.1 M ng/L). PFBS was not detected.

7.9.2 Soil

Soil samples were collected via hand auger from three locations at Sludge Application Area – VTT Southern Lobe (LEAD-016) in locations where sludge potentially containing PFOS, PFOA, and/or PFBS was applied [LEAD-CVTT-1-SO-(0-2), LEAD-CVTT-2-SO-(0-2), and LEAD-CVTT-3-SO-(0-2); **Figure 7-10**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS was detected below the residential OSD risk screening level of 0.13 mg/kg at LEAD-CVTT-1-SO-(0-2), LEAD-CVTT-2-SO-(0-2), and LEAD-CVTT-3-SO-(0-2) (0.0015 mg/kg, 0.0072 mg/kg, and 0.0074 mg/kg, respectively). PFOA and PFBS were not detected in any of the soil samples.

7.10 BRAC Area – Government Vehicle Storage Area

The subsections below summarize the groundwater, soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with BRAC Area – Government Vehicle Storage Area.

7.10.1 Groundwater

One groundwater sample was collected from existing monitoring well 84-4 at the BRAC Area – Government Vehicle Storage Area due to dye tracer tests indicating the well is downgradient of the parking area where AFFF was suspected to flow from, and upgradient of wells previously sampled that reported presence of PFAS-related compounds (LEAD-84-4; **Figure 7-11**). The groundwater sample was collected mid-screen at approximately 40 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS and PFOA were detected below the OSD risk screening level of 40 ng/L at LEAD-84-4 (26 ng/L and 3.8 ng/L, respectively). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-84-4 (1.9 ng/L).

7.10.2 Soil

Soil samples were collected via hand auger from two locations within the parking area, where AFFF was suspected to collect, at the BRAC Area – Government Vehicle Storage Area [LEAD-B34-1-SO-(0-2) and LEAD-B34-2-SO-(0-2); **Figure 7-11**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in any of the soil samples.

7.10.3 Surface Water

One surface water sample, co-located with a sediment sample, was collected at the BRAC Area – Government Vehicle Storage Area (LEAD-B34-1-SW; **Figure 7-11**). This sample was collected from the storm sewer outfall, which drains the area suspected to have presence of PFOS, PFOA, and/or PFBS. A summary of PFOS, PFOA, and PFBS surface water analytical results is provided in **Table 7-3**.

PFOS, PFOA, and PFBS were not detected in the surface water sample.

7.10.4 Sediment

One sediment sample, co-located with a surface water sample, was collected at the BRAC Area – Government Vehicle Storage Area (LEAD-B34-1-SE; **Figure 7-11**). This sample was collected from the storm sewer outfall, which drains the area suspected to have presence of PFOS, PFOA, and/or PFBS. A summary of PFOS, PFOA, and PFBS sediment analytical results is provided in **Table 7-4**.

PFOS, PFOA, and PFBS were not detected in the sediment sample.

7.11 Past AFFF Storage Area

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Past AFFF Storage Area.

7.11.1 Groundwater

One groundwater sample was collected from existing monitoring well 96-NSIA-5 at the Past AFFF Storage Area due to the well location proximal to the storm sewer that is downgradient of the storage building in respect to surface gradient and groundwater flow direction (LEAD-96-NSIA-5; **Figure 7-12**). This sample was originally proposed at well 82-2 (see **Section 6.3.4** and **Appendix L** for details regarding FCRs). The groundwater sample was collected from the middle of where the screen was assumed to be located, at approximately 160 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS and PFOA were detected below the OSD risk screening level of 40 ng/L at LEAD-96-NSIA-5 (8.6 ng/L and 7.6 ng/L, respectively). PFBS was not detected.

7.11.2 Soil

Soil samples were collected via hand auger from three locations, located on three sides of the Past AFFF Storage Area building that were closest to where AFFF was stored [LEAD-B357-1-SO-(0-2)-110420, LEAD-B357-2-SO-(0-2), and LEAD-B357-3-SO-(0-2); **Figure 7-12**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in any of the soil samples.

7.12 Low Temperature Thermal Volatilization (LTTV) Site

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Low Temperature Thermal Volatilization (LTTV) Site.

7.12.1 Groundwater

One groundwater sample was collected from existing monitoring well 01-DA-04 at the Low Temperature Thermal Volatilization (LTTV) Site, due to the eastern groundwater flow direction and the well's location directly east of the former exclusion/hot zone, where the contaminated soil was stored (LEAD-01-DA-04; **Figure 7-13**). The groundwater sample was collected from the middle of the open hole at approximately 55 feet bgs. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**.

PFOS was detected above the OSD risk screening level of 40 ng/L at LEAD-01-DA-04 (160 D ng/L). PFOA was detected at a concentration equivalent to the OSD risk screening level of 40 ng/L at LEAD-01-DA-04 (40 ng/L). PFBS was detected below the OSD risk screening level of 600 ng/L at LEAD-01-DA-04 (2.4 M ng/L).

7.12.2 Soil

Soil samples were collected via hand auger from four locations within the former exclusion/hot zone, the adjacent clean stockpile area, and within the former additional storage area at the Low Temperature Thermal Volatilization (LTTV) Site because they are areas where contaminated soil was located or may

have been located. Another soil sample was collected at the eastern edge of the AOPI due to the eastern prevailing wind direction of the area [LEAD-LTTV-1-SO-(1.5-2.5), LEAD-LTTV-2-SO-(0-2), LEAD-LTTV-3-SO-(0-2), and LEAD-LTTV-4-SO-(0-2); **Figure 7-13**]. Each boring included one surface soil sample from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**.

PFOS, PFOA, and PFBS were not detected in any of the soil samples.

7.13 Dedicated Equipment Background Samples

A total of two DEBs were collected during the SI sampling event. One DEB (LEAD-DEB-1) was collected from the well LEAD-00-PDO-02 at the BRAC Area Building 2291 – Former Hazardous Materials Building due to an old, stained bailer found in the well. The second DEB (LEAD-DEB-2) was collected from the well LEAD-01-DA-04 at the Low Temperature Thermal Volatilization (LTTV) Site AOPI due to a transducer found in the well. PFOS was detected in LEAD-DEB-1 collected on 04 November 2020. PFOA and PFBS were not detected, and PFOS was detected at 41 ng/L. While this may have affected PFOS concentrations detected in the normal groundwater sample collected at LEAD-00-PDO-02, the reported PFOS concentration of 160 D ng/L in the normal sample showed an exceedance of the OSD risk screening level for PFOS four times higher than concentrations observed in the DEB, indicating that PFOS concentrations in groundwater would still exceed the OSD risk screening levels despite the observed concentrations in the DEB. PFOS, PFOA, and PFBS were not detected in LEAD-DEB-2. The full analytical results (i.e., for all constituents analyzed) for DEB samples collected during the SI are included in **Appendix N**.

7.14 Investigation Derived Waste

A composite sample was collected from the granular activated carbon unit used to treat wastewater produced from the SI events. PFOS was detected at 0.035 mg/kg, PFOA was detected at 0.0036 M mg/kg, and PFBS was not detected. The full analytical results (i.e., for all constituents analyzed) for the IDW sample collected during the SI are included in **Appendix N**.

7.15 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI was analyzed for TOC, pH, moisture content, and grain size data as they may be useful in future fate and transport studies. The TOC in the soil samples ranged from 2,930 to 142,000 mg/kg. The TOC at this installation was mostly within range of what is typically observed in topsoil: 5,000 to 30,000 mg/kg. The combined percentage of fines (i.e., silt and clay) in soils at LEAD ranged from 8.7 to 87.3% with an average of 34.8%. In general, PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The average percent moisture of the soil (14.0%) was typical for clay (0 to 20%). The pH of the soil was slightly alkaline (7 to 9 standard units). While PFAS constituents are relatively more mobile in soils with low percentages of fines, elevated TOC may retard transport of the constituents from soil to groundwater.

7.16 Blank Samples

PFOS, PFOA, and/or PFBS were not detected in any of the QA/QC samples collected during the SI work. The full analytical results for blank samples collected during the SI are included in **Appendix N**.

7.17 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-14** through **7-23** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

Many of the PFAS constituents found in AFFF and metal plating operations are surfactants (which do not volatilize) and are found in a charged or ionic state at environmentally-relevant pH (i.e., pH 5 to 9 standard units). PFOS, PFOA, and PFBS are each negatively charged at environmentally-relevant pH. The media potentially affected by PFOS, PFOA, PFBS releases at Army installations are soil, groundwater, surface water, and sediment. Once released to the environment, a primary factor that inhibits the movement of PFAS constituents is the presence of organic matter and organic co-constituents in soils and sediments. Generally, PFAS constituents are mobile in the potentially affected media, and they are not known to be fully broken down by natural processes.

Based on the use, storage, and/or disposal of PFAS-containing materials at the AOPIs, affected media are likely to consist of soil, groundwater, surface water, and sediment. Release and transport mechanisms include dissolution/desorption from soil to groundwater, transport via sediment carried in and dissolution to stormwater and surface water, discharge/recharge between groundwater and surface water and adsorption/desorption between surface water and sediment. Generic categories of potential human receptors and their associated exposure scenarios that are typically evaluated in a CERCLA human health risk assessment were considered and include on-installation site workers (e.g., industrial/commercial workers, utility workers, or future construction workers who could be exposed to chemicals in soil at an AOPI or to chemicals in tap water in an industrial/commercial building), on-installation residents (e.g., adults and children who could be exposed to chemicals in tap water in a residence), and on-installation recreational users (e.g., hikers or hunters who could be exposed to chemicals in waterways at an installation). Off-installation receptor types could include drinking water receptors (i.e., commercial/industrial workers or residents) and recreational users.

Human exposure pathways are shown as “complete”, “potentially complete”, or “incomplete” on the CSM figures. A complete exposure pathway consists of a constituent source and release mechanism, a transport or retention medium, an exposure point where human contact with the contaminated medium could occur, and an exposure route at the exposure point. If any of these elements is missing, the exposure pathway is incomplete. Pathways are “potentially complete” where data are insufficient to conclude the pathway is either “complete” or “incomplete”. Additionally, the CSMs do not include ecological receptors and exposure pathways. The potential for ecological exposures to PFOS, PFOA, and PFBS may be evaluated at a future date if those pathways warrant further consideration.

CSMs were developed for each individual AOPI and were combined where source media, potential migration pathways and exposure media, and human exposure pathway determinations are congruent. The following exposure pathway determinations apply to all CSMs:

- There are no permanent residents at LEAD, therefore all exposure pathways for on-installation residents are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at or downgradient of all AOPIs. As described in **Section 2.10**, LEAD obtains drinking water from FCGA, which sources raw water from the Letterkenny Reservoir, located approximately 8 miles north of the closest identified AOPI. There are no on-post drinking water wells, and the LEAD Master Plan prohibits use of groundwater for any purpose on-post at LEAD (Weston Solutions, Inc. 2017a). However, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers is potentially complete to account for potential future potable use of groundwater downgradient of the AOPIs.
- Recreational users are not likely to contact groundwater during outdoor recreational activities. Therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the on-installation and BRAC Property AOPIs flows radially off-post or off-property. Due to the absence of land use controls preventing potable use of the off-post or off-property groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for off-installation or off-property receptors are potentially complete.

Additional exposure pathway descriptions for each CSM are provided below by figure.

Figure 7-14 shows the CSM for the Former Area B Fire Training Area (LEAD-009) AOPI. Former Area B Fire Training Area was the first FTA at LEAD and where AFFF was used briefly prior to its closure.

- PFOS was detected in soil at the Former Area B Fire Training Area (LEAD-009), and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- The AOPI is not likely to be regularly accessed by on-installation recreational users or off-installation receptors. Therefore, the soil exposure pathways for these receptors are incomplete.
- There are no nearby on-post surface water bodies to which surface runoff could flow or shallow groundwater could discharge. Therefore, the surface water and sediment exposure pathways for on-installation receptors are incomplete.
- Groundwater originating at this AOPI could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-15 shows the CSM for the Past AFFF Storage Area and Low Temperature Thermal Volatilization (LTTV) Site AOPIs. The Past AFFF Storage Area is currently in operation at LEAD and is where empty AFFF drums are transported for disposal. The LTTV Site stored and treated excavated soil containing PFOS, PFOA, and/or PFBS from Former Lagoons 361 and 362.

- PFOS, PFOA, and PFBS were not detected in soil at these AOPIs, therefore the soil exposure pathways are incomplete.
- There are no nearby on-post surface water bodies to which surface runoff could flow or shallow groundwater could discharge. Therefore, the surface water and sediment exposure pathways for on-installation receptors are incomplete.
- Groundwater originating at this AOPI could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through

incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-16 shows the CSM for the PDO Area – Oil Burn Pit (LEAD-010) and Former Concrete Lined Fire Training Area (LEAD-063) AOPIs. The PDO Area was the second FTA operated by the LEAD Fire Department. AFFF was regularly used at this location, which later underwent an in-situ chemical oxidation treatment. The Former Concrete Lined FTA was the third and final FTA and has a similar usage history to PDO Area – Oil Burn Pit (LEAD-010). The area was excavated, and lime stabilized sludge from the FTA was disposed off-post.

- Soil samples were not collected at the PDO Area – Oil Burn Pit (LEAD-010) AOPI. However, previous PFAS investigations at the AOPI were completed in 2013, 2017, and 2019, and soil sample results were greater than the OSD risk screening level. PFOS, PFOA, and/or PFBS were detected in soil at the Former Concrete Lined Fire Training Area (LEAD-063) AOPI. Site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- The AOPIs are not likely to be regularly accessed by on-installation recreational users or off-installation receptors. Therefore, the soil exposure pathways for these receptors are incomplete.
- Groundwater originating at these AOPIs may discharge to MMR and Muddy Run at the PDO Area, and either MMR and Muddy Run or Rocky Spring Branch System at the Former Concrete Lined FTA. On-installation site workers are not expected to contact surface water and sediment, therefore these exposure pathways are incomplete. While unlikely, recreational users could contact constituents in the on-post portion of MMR through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete.
- Groundwater originating at these AOPIs could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-17 shows the CSM for the Industrial Wastewater Sewer (IWWS) Lines (LEAD-005 AFFF Release) (LEAD-074) AOPI. AFFF discharged to the sewer lines in the subsurface at this AOPI, which were evaluated and repaired due to suspected leaks.

- PFOS, PFOA, and PFBS were not detected in soil at this AOPI, therefore the soil exposure pathways are incomplete.
- Groundwater originating at this AOPI may discharge to nearby Rowe Run. On-installation site workers are not expected to contact surface water and sediment, and on-installation recreational use of Rowe Run in this area is highly unlikely. Therefore, these exposure pathways are incomplete.
- Groundwater originating at this AOPI could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-18 shows the CSM for Former Chrome Plating (LEAD-003) AOPI. Chromium plating wastes were discharged to the sewer lines, which were evaluated and repaired due to suspected leaks.

- At Former Chrome Plating (LEAD-003), potentially impacted soil is in the subsurface (greater than 2 feet bgs). Soil samples were not collected at this AOPI. If PFOS, PFOA, and/or PFBS are present in subsurface soil, site workers (e.g., utility workers or contractors performing maintenance or repair work) could contact constituents in subsurface soil via incidental ingestion, dermal contact, and inhalation of dust during intrusive subsurface work. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.
- On-installation recreational users and off-installation receptors are not expected to contact constituents in subsurface soil. Therefore, the soil exposure pathways for these receptors are incomplete.
- There are no nearby on-post surface water bodies to which surface runoff could flow or shallow groundwater could discharge. Therefore, the surface water and sediment exposure pathways for on-installation receptors are incomplete.
- Groundwater originating at this AOPI could discharge to nearby Rowe Run north of the AOPI in the BRAC area (i.e., on-property) and other off-post surface water bodies or springs. Recreational users on-property or off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-19 shows the CSM for the Current Fire Department Station AOPI. AFFF has been discharged to the fire station floor drains, which eventually discharged to an off-post private pond proximal to the AOPI. Fire truck washing along the fire station driveway also introduced residual AFFF into the same storm water system and soil surrounding the driveway.

- PFOS was detected in soil at this AOPI, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- The AOPI is not likely to be regularly accessed by on-property recreational users or off-property receptors. Therefore, the soil exposure pathways for these receptors are incomplete.
- There are no on-property surface water bodies at this AOPI and no on-property, nearby surface water bodies within the immediate vicinity of the AOPI to which surface runoff could flow or groundwater could discharge. Additionally, surface water runs into the storm sewer system at this AOPI. Therefore, the surface water and sediment exposure pathways for on-property receptors are incomplete.
- Storm water components originating from the Current Fire Department Station AOPI reportedly discharge to an off-post pond south of the building. PFOS was detected in sediment collected near the associated outfall. PFOS, PFOA, and PFBS were not detected in a surface water sample that was co-located with the sediment sample. However, surface water could contain PFOS, PFOA, and/or PFBS through desorption from the sediment. Off-post receptors could contact constituents in the off-post pond through incidental ingestion and dermal contact. Therefore, the sediment exposure pathway is complete, and the surface water exposure pathway is potentially complete for off-property receptors.

Figure 7-20 shows the CSM for the BRAC Area Building 2291 – Former Hazardous Material Building AOPI. This BRAC Area reportedly contained a fire suppression system that utilized AFFF. An accidental discharge during testing occurred and it could not be confirmed if AFFF was pushed out into the surrounding environment or confined to secondary containment.

- PFOS, PFOA, and PFBS were not detected in soil at this AOPI; therefore, the soil exposure pathways are incomplete.
- There are no nearby on-property surface water bodies to which surface runoff could flow or groundwater could discharge. Therefore, the surface water and sediment exposure pathways for on-property receptors are incomplete.
- Groundwater originating at this BRAC Area could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-21 shows the CSM for Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) AOPI. LEAD-013 regularly received AFFF and chromium plating wastes containing PFOS, PFOA, and/or PFBS. Generated wastewater was discharged to the Industrial Waste Outfall Ditch on-post at the IWTP outfall located directly north of the plant. The Sludge Holding Lagoons historically received processed IWTP sludge. Lagoon soils were excavated to bedrock, treated via LTTV to remove the residual VOC source, and backfilled into the excavation. Treated soils were then covered with a synthetic geotextile layer and a vegetative cap. A groundwater pump and treat system was constructed to treat groundwater impacted by the lagoons. GWTP operation is currently suspended while a groundwater chemical oxidation remedy is ongoing. The GWTP effluent suspected to contain AFFF was discharged directly to the Industrial Waste Outfall Ditch on-post.

- The IWTP effluent suspected to contain AFFF was discharged directly to surface water. The lagoon was excavated, and the excavated material was treated via LTTV and reapplied as fill. The lagoon cap was installed using presumably non-impacted, off-post material. While PFOS, PFOA, and/or PFBS may remain as a constituent of LTTV treated backfill, due to the presence of a cap which effectively prevents human exposure to subsurface soil, the soil exposure pathways are incomplete.
- The Industrial Waste Outfall Ditch flows northward and ultimately into Rowe Run. PFOS, PFOA, and/or PFBS were detected in surface water and sediment. On-installation site workers (e.g., maintenance workers) could contact constituents in the ditch through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation site workers are complete.
- Recreational users are not present in this area, therefore the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation recreational users are incomplete.
- PFOS, PFOA, and/or PFBS were detected in surface water and sediment, and groundwater originating at this AOPI could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-22 shows the CSM for the Sludge Application Area – VTT Southern Lobe (LEAD-016) AOPI. Areas within the boundaries of the test track received processed IWTP sludge and the sludge that was land-applied here is suspected to have been impacted by PFOS, PFOA, and/or PFBS.

- PFOS, PFOA, and/or PFBS were detected in soil at this AOPI, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- This AOPI is not likely to be regularly accessed by on-installation recreational users or off-installation receptors. Therefore, the soil exposure pathways for these receptors are incomplete.
- There are no nearby on-post surface water bodies to which surface runoff could flow or to which groundwater could discharge. Therefore, the surface water and sediment exposure pathways for on-installation receptors are incomplete.
- Groundwater originating at this AOPI could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-23 shows the CSM for BRAC Area – Government Vehicle Storage Area AOPI, which was identified by current fire chief as a fire station support building. Three government vehicles are stored here, including a government vehicle stocked with AFFF.

- PFOS, PFOA, and PFBS were not detected in soil at BRAC Area – Government Vehicle Storage Area, therefore the soil exposure pathways are incomplete.
- There are no surface water bodies at this BRAC Area and no nearby surface water bodies to which surface runoff could flow or shallow groundwater could discharge. Therefore, the surface water and sediment exposure pathways for on-property receptors are incomplete.
- Groundwater originating at this BRAC Area could discharge to nearby off-post surface water bodies or springs. Recreational users off-post could contact constituents in these waterbodies through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Following the SI sampling, all 12 AOPIs were considered to have complete or potentially complete exposure pathways. Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**).

8 OFF-POST PRIVATE WELL INVESTIGATION

Based on SI sampling results, off-post private potable wells were identified for potential sampling as part of the PA/SI investigation at LEAD to determine whether there are off-post impacts to drinking water due to Army operations. These wells are downgradient of groundwater wells at AOPIs near the installation boundaries where PFOS and/or PFOA concentrations were detected at concentrations greater than the USEPA Lifetime Health Advisory. To identify potential potable wells that were downgradient of the eastern and southeastern installation boundary to include in this sampling effort, an off-post well survey was completed using readily available information from the online Pennsylvania Department of Conservation and Natural Resources Pennsylvania Groundwater Information System (PAGWIS 2020). County records were reviewed to identify wells that may not be included in PAGWIS; however, no county records pertaining to unidentified wells exist. County records were also reviewed to identify relevant parcels were reviewed to compile a list of property owners. Finally, available groundwater modeling reports (i.e., United States Geological Survey or Pennsylvania Department of Conservation and Natural Resources reports) were reviewed for the area.

After reviewing the available information in groundwater modeling reports (i.e., United States Geological Survey reports or other) for the area, numerous off-post private potable wells were identified for possible sampling as part of this investigation based on the understanding of the relationship between on- and off-post hydrogeological conditions. Community outreach and notification will be coordinated between the Army PA/SI team, LEAD, Headquarters of the Department of the Army, and USAEC Divisions to sample the wells located immediately downgradient of the installation boundary. A letter report presenting a summary of the off-post private well investigation results and the associated laboratory reports will be included in a subsequent addendum (when available).

9 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA/SI included two distinct efforts. The PA identified AOPIs at LEAD based on the use, storage, and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release of PFOS, PFOA, and PFBS to the environment occurred.

OSD provided residential risk screening levels based on the USEPA oral reference dose for PFOS, PFOA, and PFBS in soil and groundwater (tap water) and industrial/commercial risk screening levels for PFOS, PFOA, and PFBS in soil (**Appendix A**). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit were used to identify specific areas of suspected PFOS, PFOA, and PFBS use, storage, and/or disposal at LEAD. Following the evaluation, 12 AOPIs were identified.

There are no on-post supply wells used to provide LEAD with potable water and no potential on-post drinking water sources. LEAD is supplied by the Letterkenny Reservoir, which is located off-post of LEAD. The installation obtains its drinking water from the FCGA, which utilizes the reservoir for water supply. Water supplied by the FCGA was sampled for PFOS and PFOA in 2016 by the AMC. No PFOS or PFOA was detected in any of the collected water samples. Information detailing the type of water sample collected (e.g., pre-treated or treated water) was not reported. Rocky Spring is classified as an Institutional Water Supply Source by the PAGWIS. It is not currently used as a potable water source but could be used as such in the future. Rocky Spring is one of the major discharge points for groundwater originating in the vicinity of AOPIs at LEAD with OSD risk screening level exceedances from samples collected in November 2020 (PDO Area – Oil Burn Pit [LEAD-010], Former Concrete Lined Fire Training Area [LEAD-063]).

In October 2011, a historical investigation and process review was conducted by LEAD personnel to evaluate the use of AFFF at LEAD. As a result of the investigation, seven operational areas connected to AFFF usage were identified at LEAD; three of the seven were identified as areas of potential concern (**Section 2.12**). In 2013, groundwater sampling was performed at the three previously identified areas of potential concern. Following the detection of PFOS and PFOA in groundwater at the Former Oil Burn Pit in 2013, a sampling program to complete the delineation of the nature and extent of PFAS contamination was ordered in 2017 for OU 4, the OU associated with the Former Oil Burn Pit. Further PFAS sampling was performed in 2019 to continue the investigation into the nature and extent of PFAS contamination at OU 4. Previous investigation results for PFOS, PFOA, and PFBS are shown in **Tables 2-1** to **2-3**.

Potable water from the FCGA Public Water System, which provides LEAD with its potable drinking water, was sampled in August 2016 and indicated that PFOS and PFOA were not detected above the laboratory LOD.

All AOPIs were sampled during the SI at LEAD to identify presence or absence of PFOS, PFOA, and PFBS at each AOPI. The SI scope of work was completed in accordance with the Final PQAPP (Arcadis 2019) and the LEAD QAPP Addendum (Arcadis 2020).

Twelve AOPIs had detections of PFOS, PFOA, and PFBS in groundwater. Six AOPIs exceeded OSD tap water risk screening levels. The highest PFOS, PFOA, and PFBS concentrations in groundwater were

observed at the Former Concrete Lined Fire Training Area (LEAD-063) AOPI at 1,000 D ng/L, 74 M ng/L, and 79 ng/L, respectively.

Four AOPIs had detections of PFOS, PFOA, and PFBS in soil and no AOPIs exceeded OSD soil risk screening levels. The highest PFOS and PFOA concentrations in soil were observed at the Former Concrete Lined Fire Training Area (LEAD-063) AOPI at 0.052 mg/kg and 0.00068 M mg/kg, respectively.

One AOPI had detections of PFOS, PFOA, and PFBS in surface water. The highest PFOS, PFOA, and PFBS concentrations in surface water were observed at the Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) AOPI at 53 J- ng/L, 88 M ng/L, and 1.2 JM ng/L, respectively.

Two AOPIs had detections of PFOS, PFOA, and PFBS in sediment. The highest PFOS and PFOA concentrations in sediment were observed at the Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) AOPI at 0.022 mg/kg and 0.0019 mg/kg, respectively.

Following the SI sampling, all 12 AOPIs were considered to have complete or potentially complete exposure pathways. The following exposure pathways are complete or potentially complete.

- The soil exposure pathways for on-installation site workers are complete at five AOPIs, where PFOS, PFOA, and/or PFBS were detected.
- The soil exposure pathways for on-installation site workers are potentially complete at one AOPI where soil was not sampled.
- The groundwater exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for on-installation and off-installation receptors at all 12 AOPIs.
- The surface water exposure pathways (via incidental ingestion and dermal contact) are complete for on-installation site workers at one AOPI.
- The surface water exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for on-installation recreational users at two AOPIs.
- The surface water exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for off-installation receptors at all 12 AOPIs.
- The sediment exposure pathways (via incidental ingestion and dermal contact) are complete for on-installation site workers at one AOPI.
- The sediment exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for on-installation recreational users at two AOPIs.
- The sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for off-installation receptors at 11 AOPIs.
- The sediment exposure pathways (via incidental ingestion and dermal contact) are complete for off-installation receptors at one AOPI.

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for future study in a remedial investigation or no action at this time is based on the

comparison of the SI analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 9-1** below summarizes the AOPIs identified at LEAD, PFOS, PFOA, and PFBS sampling and recommendations for each AOPI; further investigation is warranted at LEAD. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 9-1. Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at LEAD, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Former Area B Fire Training Area (LEAD-009)	No	No	NS	NS	No action at this time
Property Disposal Office Area - Oil Burn Pit (LEAD-010)	Yes	NS	NS	NS	Further study in a remedial investigation
Former Concrete Lined Fire Training Area (LEAD-063)	Yes	No	NS	NS	Further study in a remedial investigation
Industrial Wastewater Sewer Lines (LEAD-005 Aqueous Film-Forming Foam Release) (LEAD-074)	No	ND	NS	NS	No action at this time
Current Fire Department Station	Yes	No	ND	NA	Further study in a remedial investigation
Base Realignment and Closure Area Building 2291 – Former Hazardous Materials Building	Yes	ND	NS	NS	No action at this time; will be addressed under the Property Disposal Office Area - Oil Burn Pit (LEAD-010) AOPI
Former Chrome Plating (LEAD-003)	Yes	NS	NS	NS	Further study in a remedial investigation
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	No	NS	NA	NA	No action at this time
Sludge Application Area – Vehicle Test Track Southern Lobe (LEAD-016)	No	No	NS	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Base Realignment and Closure Area – Government Vehicle Storage Area	No	ND	ND	ND	No action at this time
Past Aqueous Film-Forming Foam Storage Area	No	ND	NS	NS	No action at this time
Low Temperature Thermal Volatilization Site	Yes	ND	NS	NS	Further study in a remedial investigation

Notes:
Light gray shading – detection greater than the OSD risk screening level
GW - groundwater
NA – not applicable (PFOS, PFOA, or PFBS detected, but comparison to OSD Risk Screening Levels is not applicable for surface water and sediment)
ND – non-detect
NS – not sampled
SE – sediment
SO – soil
SW – surface water

Data collected during the PA (**Sections 3** through **5**) and SI (**Section 6** and **Section 7**) were sufficient to draw conclusions and recommendations summarized above. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at LEAD are discussed below.

Former Area B Fire Training Area (LEAD-009): Interviewed personnel indicated that LEAD Fire Department personnel began using AFFF at this FTA in 1980. The exact year that LEAD Fire Department personnel ceased using the pit is unavailable, and therefore; the exact years of AFFF use at this location is unavailable.

PDO Area - Oil Burn Pit (LEAD-010): Information regarding the neighboring fire departments that engaged in joint-fire training exercises with LEAD Fire Department personnel is unavailable.

Former Concrete Lined Fire Training Area (LEAD-063): Information regarding the neighboring fire departments that engaged in joint-fire training exercises with LEAD Fire Department personnel is unavailable.

Industrial Wastewater Sewer (IWWS) Lines (LEAD-005 AFFF Release) (LEAD-074): The LEAD Fire Department reportedly disposed of AFFF into the LEAD-005 IWWS inlet in the late 1980s. According to a retired DPW Division Chief interviewed following the site visit, the IWWS lines connecting LEAD-005 to the IWTP were repaired due to suspected line leaks sometime between 1987 and 1988. It could not be

confirmed whether the IWWS lines connecting LEAD-005 to the IWTP were repaired prior to the discharge of AFFF into the sewer system.

BRAC Area Building 2291 – Former Hazardous Materials Building: Personnel interviewed during the PA could not recall whether AFFF accidentally discharged in the Flammable Liquids Storage Room at Building 2291 was pushed out into the surrounding environment via doorways or confined to secondary containment. Groundwater exceedances are believed to be a result of the PDO Area – Oil Burn Pit (LEAD-010).

Former Chrome Plating (LEAD-003): The exact dates of use, chemical composition, and name of the chemical mist-suppressant tested at this location in the early 1980s could not be confirmed during the PA.

Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013): Additional groundwater samples from existing well locations to determine presence or absence of PFOS, PFOA and PFBS are pending approval of an additional SI Phase. The results will be included in future iterations of this report.

Records gathered for the use, storage and/or disposal of PFAS-containing materials were reviewed during the PA process. Documentation specific to AFFF may have been limited (e.g., each AFFF use; procurement records, documentation of AFFF used during crash responses or fire training activities) due to lack of recordkeeping requirements for the full timeline of common AFFF practices. Anecdotal accounts of AFFF use (and therefore likely PFOS, PFOA, and PFBS use) were limited to available installation personnel, whose knowledge of AFFF use may have been restricted by their time spent at the installation or previous roles held that limited their relevant knowledge of potential AFFF (or other PFAS-containing material) use.

A comprehensive well survey was not completed as part of this PA; therefore, the information reviewed regarding off-post wells is limited to what is contained in the off post well search results (**Appendix D**).

The searches for ecological receptors and off-post PFOS, PFOA, and PFBS sources were not exhaustive and were limited to easily identifiable and readily available information evaluated during the relevant documents research, installation personnel interviews, and site reconnaissance.

Finally, the available PFOS, PFOA, and PFBS analytical data is limited to groundwater, soil, sediment, and surface water samples. Additionally, the available PFOS, PFOA, and PFBS analytical data is limited to a select list of PFAS (**Table 6-2**), which were analyzed per the selected analytical method. The sampling scope of the SI focused on identifying presence or absence of PFOS, PFOA, and PFBS at the AOPIs. SI sampling at locations at or in close proximity of the AOPIs did not delineate the extent of PFOS, PFOA, and PFBS impacts or identify the primary migration pathways for the chemicals. Available data, including PFOS, PFOA, and PFBS are listed in **Appendix N**, which were analyzed per the selected analytical method.

Results from this PA/SI indicate further study in a remedial investigation is warranted at LEAD in accordance with the guidance provided by the OSD.

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ACRONYMS

°F	degrees Fahrenheit
%	percent
AFFF	aqueous film-forming foam
AMC	Army Materiel Command
amsl	above mean sea level
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
D	The analyte was analyzed at dilution.
DEB	dedicated equipment background
DoD	Department of Defense
DPT	direct-push technology
DPW	directorate of public works
DQO	data quality objective
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FCGA	Franklin County General Authority
FCR	field change report
FTA	fire training area
GIS	geographic information system
GW	groundwater
GWTP	groundwater treatment plant
HQAES	Headquarters Army Environmental System

IDW	investigation-derived waste
installation	United States Army or Reserve installation
IRFNA	inhibited red fuming nitric acid
IRP	Installation Restoration Program
IWTP	industrial waste treatment plant
IWWS	industrial wastewater sewer
J	The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
J-	The result is an estimated quantity; the result may be biased low.
JM	The limit of quantitation (LOQ) is approximate and may be inaccurate or imprecise.
LEAD	Letterkenny Army Depot
LKOD	Letterkenny Ordnance Depot
LOD	limit of detection
LOQ	limit of quantitation
LTTV	low temperature thermal volatilization
M	manually integrated compound
mg/kg	milligrams per kilogram (parts per million)
MMR	Meghan McKenzie Run
NA	not applicable
ND	non-detect
ng/L	nanograms per liter (parts per trillion)
NS	not sampled
OBP	oil burn pit
OSD	Office of the Secretary of Defense
OU	operable unit
PA	preliminary assessment
PADEP	Pennsylvania Department of Environmental Protection
PAGWIS	Pennsylvania Groundwater Information System
PDO	Property Disposal Office (Area)
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid

PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
ppm	parts per million
ppt	parts per trillion
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RSL	Regional Screening Level
SE	sediment
SI	site inspection
SO	soil
SOP	standard operating procedure
SR	State Route
SSHP	Site Safety and Health Plan
STP	sewage treatment plant
SW	surface water
TGI	technical guidance instruction
TOC	total organic carbon
U.S.	United States
US 11	U.S. Highway No. 11
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USAR	United States Army Reserve
UCMR3	Third Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
VTT	Vehicle Test Track

TABLES

Table 2-1. PFOS, PFOA, and PFBS Detections in Groundwater from Previous PFAS Investigations
USAEC PFAS Preliminary Assessment/Site Investigation
Letterkenny Army Depot, Pennsylvania

Location Type	Sample Location	Sample Date	Sample Type	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				Result	Qual	Result	Qual	Result	Qual
Monitoring Well	00-PDO-03	04/08/2019	N	**35**		**4.1**		**3.7**	
		08/06/2019	N	**51**		**5.5**		**3.7**	
Monitoring Well	02-SE-01	04/29/2013	N	**8.8**	**J**	**1.0**	**J**	NS	-
		10/16/2013	N	**11.2**	**J**	**1.29**	**J**	NS	-
Monitoring Well	03-PDO-5	05/01/2013	N	<2.0		<1.0		NS	-
		10/18/2013	N	<2.0		<1.0		NS	-
		05/10/2017	N	6.4	UJ	6.4	UJ	12	UJ
		10/18/2017	N	6.7	U	6.7	U	12	U
Monitoring Well	03-PZ-1	05/09/2017	N	**255**		**58.9**		**58**	
		10/17/2017	N	6.7	U	6.7	U	12	U
Monitoring Well	04-PDO-3	05/10/2017	N	**1134**		**116**		**29.7**	**J**
		10/18/2017	N	**906**		**63.7**		12	U
Monitoring Well	04-PDO-4	05/10/2017	N	**10.2**	**J**	**31.3**	**J**	**10.7**	**J**
		10/18/2017	N	**27.7**		**97.2**		**19.0**	
			FD	**27.0**		**101**		**17.8**	
		04/09/2019	N	**57**		**150**		**24**	
		08/07/2019	N	**37**		**140**		**17**	
Monitoring Well	04-PDO-11	04/30/2013	N	**77.8**		**83.5**		NS	-
		10/17/2013	N	**103**		**73.3**		NS	-
		05/09/2017	N	**87.2**	**J**	**44.3**	**J**	**22.7**	**J**
			FD	**93.8**		**53.1**		**24.3**	
		10/17/2017	N	**52.8**		**52.8**		**18.9**	
			FD	**47.9**		**50.1**		**17.6**	
		04/09/2019	N	**62**		**48**		**17**	
		08/07/2019	N	**48**		**58**		**16**	
Monitoring Well	05-PDO-2	05/09/2017	N	15	U	**6.07**	**J**	12	U
		10/17/2017	N	6.7	U	6.7	U	12	U
Monitoring Well	05-PDO-4	05/09/2017	N	**78.5**	**J**	**4.43**	**J**	**12.2**	**J**
		10/17/2017	N	**56**		6.2	U	**8.96**	**J**
		04/09/2019	N	**130**		**11**		**17**	
		08/07/2019	N	**53**		**4.3**		**7.6**	
Monitoring Well	05-PZ-01	05/09/2017	N	**26.2**		**4.03**	**J**	12	U
		10/17/2017	N	**76.3**		**17**		**11.8**	**J**
Monitoring Well	05-PZ-02	05/09/2017	N	**37.6**		**4.55**	**J**	12	U
		10/17/2017	N	**65.2**		**14**	**J**	**8.77**	**J**
Monitoring Well	06-PDO-2(S)	05/09/2017	N	15	U	**11.4**	**J**	12	U
		10/17/2017	N	6.7	U	6.7	U	12	U
Monitoring Well	06-PDO-2(D)	05/09/2017	N	6.2	UJ	6.2	UJ	12	UJ
		10/17/2017	N	6.7	U	6.7	U	12	U

Table 2-1. PFOS, PFOA, and PFBS Detections in Groundwater from Previous PFAS Investigations
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Location Type	Sample Location	Sample Date	Sample Type	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				Result	Qual	Result	Qual	Result	Qual
Monitoring Well	06-PDO-4	05/01/2013	N	**87.3**		**58.3**		NS	-
		10/17/2013	N	**79.7**		**41.6**		NS	-
		05/11/2017	N	**36.7**		**23.2**	**J**	**7.91**	**J**
		10/19/2017	N	**31.7**		**16.8**	**J**	12	U
		04/09/2019	N	**45**		**33**		**8.8**	
		08/07/2019	N	**39**		**24**		**5.4**	
			FD	**36**		**22**		**5.3**	
Monitoring Well	06-PDO-5	05/11/2017	N	**74.5**	**J**	**45.7**	**J**	**18.1**	**J**
		10/19/2017	N	**12.1**	**J**	**12.3**	**J**	12	U
Monitoring Well	1383 (09-MW-01)	04/08/2019	N	**37**		**3.2**		**3.1**	
		08/06/2019	N	**110**		**10**		**5.0**	
Monitoring Well	17-PDO-1	05/11/2017	N	6.4	U	6.4	U	12	U
		10/19/2017	N	**18.2**		7.3	U	14	U
Monitoring Well	17-PDO-2	05/10/2017	N	6.4	UJ	6.4	UJ	12	UJ
		10/18/2017	N	6.7	U	6.7	U	12	U
Monitoring Well	17-PDO-3	05/10/2017	N	28.2	J	6.2	UJ	12	UJ
		10/18/2017	N	**146**		**11.5**	**J**	**16.9**	
Monitoring Well	17-PDO-4	05/10/2017	N	6.7	UJ	6.7	UJ	12	UJ
		10/18/2017	N	6.2	U	6.2	U	12	U
Monitoring Well	17-PDO-5	05/10/2017	N	6.7	UJ	6.7	UJ	12	UJ
		10/18/2017	N	6.2	U	6.2	U	12	U
Monitoring Well	81-04	04/08/2019	N	**220**		**11**		**22**	
		08/06/2019	N	**200**		**12**		**8.2**	
Monitoring Well	83-19	04/08/2019	N	**120**		**8.1**		**7.8**	
			FD	**120**		**8.8**		**8.2**	
		08/07/2019	N	**48**		**6.6**		**2.9**	
Monitoring Well	84-02	04/09/2019	N	2.8	U	1.4	U	0.92	U
		08/07/2019	N	2.7	U	1.4	U	0.9	U
Monitoring Well	93-SE-04	04/29/2013	N	**39.2**		**2.3**	**J**	NS	-
		10/16/2013	N	**45.0**	**J**	**2.09**	**J**	NS	-
Monitoring Well	94-17-OB	04/30/2013	N	**7.4**	**J**	**3.8**	**J**	NS	-
		10/17/2013	N	**10.4**	**J**	**4.49**	**J**	NS	-
Monitoring Well	94-PDO-1	05/01/2013	N	**642**		**212**		NS	-
		10/18/2013	N	**887**		**200**		NS	-
		05/10/2017	N	**1840**		**229**		12	U
		10/18/2017	N	**890**		**119**		**68.2**	
Monitoring Well	94-PDO-3	05/09/2017	N	16	U	6.4	U	**18.2**	
		10/17/2017	N	6.7	UJ	6.7	UJ	**29.8**	**J**

Table 2-1. PFOS, PFOA, and PFBS Detections in Groundwater from Previous PFAS Investigations
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Location Type	Sample Location	Sample Date	Sample Type	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				Result	Qual	Result	Qual	Result	Qual
Monitoring Well	94-PDO-9	05/01/2013	N	**5.1**	**J**	1.0	**J**	NS	-
		10/18/2013	N	**10.8**	**J**	1.92	**J**	NS	-
		05/09/2017	N	16	U	6.4	U	12	U
		10/17/2017	N	6.7	U	6.7	U	12	U
Monitoring Well	96-DA-04	04/30/2013	N	**16.8**	**J**	**5.3**	**J**	NS	-
			FD	**18.0**	**J**	**5.5**	**J**	NS	-
		10/17/2013	N	**7.2**	**J**	**3.10**	**J**	NS	-
			FD	**7.58**	**J**	**3.23**	**J**	NS	-
Monitoring Well	96-DA-08	04/30/2013	N	**7.5**	**J**	**1.6**	**J**	NS	-
		10/17/2013	N	**4.33**	**J**	**1.57**	**J**	NS	-

Acronyms/Abbreviations:
D = deep
FD = field duplicate sample
N = primary sample
NS = no sample
ng/L = nanograms per liter (parts per trillion)
OB = Oil Burn Pit
PDO = Property Disposal (Area)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
PZ = peizometer
Qual = qualifier
S = shallow
SE = southeast

Qualifier
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for but the result was not detected above the LOQ.
UJ = The analyte was analyzed for but was not detected. The reported LOQ is approximate and may be inaccurate or imprecise.

Table 2-2. PFOS, PFOA, and PFBS Detections in Soil from Previous PFAS Investigations
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Location Type	Sample Location	Boring	Sample Depth (feet bgs)	Sample Date	Sample Type	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
						Result	Qual	Result	Qual	Result	Qual
Subsurface Soil Boring	SB-1	01SB01B001	4.5 - 4.9	05/04/2017	N	**0.00326**	**J**	0.0012	UJ	0.0012	UJ
Subsurface Soil Boring		01SB01B002	8.5 - 9.0		N	**0.0201**	**J**	**0.00727**	**J**	0.0012	UJ
Subsurface Soil Boring		01SB01B003	14.0 - 14.5		N	**0.0204**	**J**	0.0012	UJ	0.0012	UJ
Subsurface Soil Boring	SB-2	01SB02B001	4.5 - 5.0		N	**0.00317**		0.0012	U	0.0012	U
Subsurface Soil Boring		01SB02B002	8.0 - 9.0		N	**0.00201**	**J**	0.0012	UJ	0.0012	UJ
Subsurface Soil Boring					FD	**0.00273**	**J**	0.0012	UJ	0.0012	UJ
Subsurface Soil Boring		01SB02B003	10.5 - 11.5		N	**0.00185**	**J**	0.0012	UJ	0.0012	UJ
Subsurface Soil Boring	SB-3	01SB03B001	4.5 - 5.0		N	**0.00534**		0.0011	U	0.0011	U
Subsurface Soil Boring		01SB03B002	6.0 - 7.0		N	**0.00325**	**J**	0.0011	UJ	0.0011	UJ

Acronyms/Abbreviations:
FD = field duplicate sample
mg/kg = milligrams per kilograms
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SB = soil boring

Qualifier
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for but the result was not detected above the LOQ.
UJ = The analyte was analyzed for but was not detected. The reported LOQ is approximate and may be inaccurate or imprecise.

Table 2-3. PFOS, PFOA, and PFBS Detections in Surface Water from Previous PFAS Investigations
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Location Type	Sample Location	Sample Date	Sample Type	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				Result	Qual	Result	Qual	Result	Qual
Surface Water Grab Sample	HS-SW-01	04/29/2013	N	**34.7**		**1.6**	**J**	NS	-
		10/17/2013	N	**38.3**		**1.64**	**J**	NS	-
Surface Water Grab Sample	MM-SW-03	04/09/2019	N	**42**		**6.3**		**4.7**	
		08/07/2019	N	**59**		**8.9**		**6.1**	
Surface Water Grab Sample	MM-SW-04	04/09/2019	N	**43**		**6.5**		**4.4**	
		08/07/2019	N	**66**		**8.0**		**5.6**	
Surface Water Grab Sample	RS-SW-01	04/09/2019	N	**38**		**2.7**		**2.9**	
		08/06/2019	N	**67**		**8.5**		**3.4**	
Surface Water Grab Sample	08-SW-01	04/09/2019	N	**23**		**2.0**		**2.0**	
			FD	**21**		**2.3**		**1.8**	
		08/06/2019	N	**35**		**4.3**		**2.3**	
			FD	**37**		**4.6**		**2.5**	

Acronyms/Abbreviations:
FD = field duplicate sample
HS = Hawbaker
MM = Meghan Mackenzie
N = primary sample
NS = no sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
RS = Rocky Spring
SW = surface water

Qualifier
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Area of Potential Interest or BRAC Area	Sampling Location ID	Total Well Depth (ft bgs)	Measuring Point Elevation (ft amsl)	Measuring Point	Depth to Groundwater from MP (ft)	Groundwater Elevation (ft amsl)	Screened Interval (ft bgs)	Casing Diameter (inches)	Dedicated Equipment (Y/N)
Former Area B Fire Training Area (LEAD-009)	LEAD-94-17-OBP	80	NA	TOC	30.4	NA	60 (pump setting)	NA	N
PDO Area - Oil Burn Bit (LEAD-010)	LEAD-04-PDO-3	43	NA	TOC	26.1	NA	20 - 40	NA	N
Former Concrete Lined Fire Training Area (LEAD-063)	LEAD-17-PDO-3	60	NA	GS	NA	NA	Open hole from 26 - 60	NA	N
Industrial Wastewater Sewer Lines (Building 351 AFFF Release) (LEAD-074)	LEAD-94-320-2	75	NA	GS	33.2	NA	Open hole from 40 - 75	NA	N
	LEAD-94-350-2	75	NA	GS	32.9	NA	Open hole from 17.5 - 75	NA	N
Current Fire Department Station	LEAD-93-SE-04	NA	NA	NA	NA	NA	NA	NA	N
BRAC Area Building 2291 - Former Hazardous Materials Building	LEAD-00-PDO-02	80	NA	TOC	33.2	NA	4-inch liner from 40 - 80	NA	Y
Former Chrome Plating (LEAD-003)	LEAD-88-03	72	NA	TOC	37.8	NA	55 - 65	NA	N
	LEAD-88-04	77	NA	TOC	35.9	NA	63 - 73	NA	N
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	LEAD-TW-2	74	NA	TOC	34.2	NA	30 - 74	NA	N
	LEAD-TW-3	50	NA	TOC	31.8	NA	30 - 50	NA	N
	LEAD-TW-4	50	NA	TOC	28.8	NA	30 - 50	NA	N
	LEAD-96-NSIA-2	45.5	NA	TOC	>150	NA	NA	NA	N
Sludge Application Area - Vehicle Test Track Southern Lobe (LEAD-016)	LEAD-EW-10	58	NA	TOC	41.8	NA	Uncertain (14.5 ft screen length)	NA	N
BRAC Area – Government Vehicle Storage Area	LEAD-84-4	49	NA	TOC	39.9	NA	27 - 47	NA	N
Past AFFF Storage Area	LEAD-96-NSIA-5	171	NA	TOC	37.7	NA	NA	NA	N
Low Temperature Thermal Volatilization Site	LEAD-01-DA-04	88	NA	GS	9.0	NA	Open hole from 25 - 88	NA	Y
Monitoring Well Sampling (PDO Operational Unit 2)	LEAD-1383	23.5	NA	TOC	17.9	NA	NA	NA	N

Acronyms/Abbreviations:
amsl - above mean sea level
bgs - below ground surface
BRAC - Base Realignment and Closure
ft - feet
GS - ground surface
ID - identification
IWWS - industrial wastewater sewer
MP - measuring point
N - no
NA - not available
PDO - Property Disposal Office (Area)
TOC - top of casing
Y - yes

Sources:
1. USACE, Letterkenny Army Depot
2. Letterkenny Army Depot November 2020 SI event

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Associated AOPI	Location Type	Location	Sample ID / Parent Sample ID		Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				OSD Risk Screening Level for Tap Water		40		40		600	
				Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Former Area B Fire Training Area (LEAD-009)	Monitoring Well	LEAD-94-17-OBP	LEAD-94-17-OBP-110920	11/09/2020	N	**6.1**		**2.5**	M	**1.2**	JM
Former Area B Fire Training Area (LEAD-009)			LEAD-FD-1-GW-110920 / LEAD-94-17-OBP-110920	11/09/2020	FD	**5.7**		**2.0**	M	**1.2**	JM
PDO Area - Oil Burn Pit (LEAD-010)	Monitoring Well	LEAD-04-PDO-3	LEAD-04-PDO-3-110320	11/03/2020	N	**400**	D	**33**	M	**9.3**	M
Former Concrete Lined Fire Training Area (LEAD-063)	Monitoring Well	LEAD-17-PDO-3	LEAD-17-PDO-3-110520	11/05/2020	N	**1,000**	D	**74**	M	**79**	
IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)	Monitoring Well	LEAD-94-320-2	LEAD-94-320-2-110320	11/03/2020	N	**9.8**		**2.7**	M	1.8	U
IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)	Monitoring Well	LEAD-94-350-2	LEAD-94-350-2-110320	11/03/2020	N	**13**		**7.1**	M	**6.5**	
Current Fire Department Station	Monitoring Well	LEAD-93-04	LEAD-93-04-012522	01/25/2022	N	**26**	J	**1.5**	J	**1.4**	J
Current Fire Department Station	Monitoring Well	LEAD-B521-GW-01	LEAD-B521-GW-01-032322	03/23/2022	N	1.7	U	1.7	U	**0.97**	J
			LEAD-FD-2-032322 / LEAD-B521-GW-01-032322	03/23/2022	FD	1.7	U	1.7	U	**1.0**	J
Current Fire Department Station	Monitoring Well	LEAD-B521-GW-02	LEAD-B521-GW-02-032122	03/21/2022	N	**110**		**5.1**		**3.6**	
BRAC Area Building 2291 – Former Hazardous Materials Building	Monitoring Well	LEAD-00-PDO-02	LEAD-00-PDO-02-110420	11/04/2020	N	**220**	D	**23**		**7.5**	
Former Chrome Plating (LEAD-003)	Monitoring Well	LEAD-88-03	LEAD-88-03-110520	11/05/2020	N	**15**		**8.0**	M	**1.1**	J
Former Chrome Plating (LEAD-003)	Monitoring Well	LEAD-88-04	LEAD-88-04-110520	11/05/2020	N	**44**		**17**	M	**4.1**	
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Monitoring Well	LEAD-TW-2	LEAD-TW-2-110520	11/05/2020	N	**15**		**19**	M	**1.3**	J
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Monitoring Well	LEAD-TW-3	LEAD-TW-3-110420	11/04/2020	N	**15**		**23**		**1.1**	JM
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Monitoring Well	LEAD-TW-4	LEAD-TW-4-110920	11/09/2020	N	**14**		**17**		**1.2**	JM
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Monitoring Well	LEAD-96-NSIA-2	LEAD-96-NSIA-2-012522	01/26/2022	N	**8.3**	J	**1.5**	J	1.7	UJ
			LEAD-FD-1-GW-012622 / LEAD-96-NSIA-2-012522	01/26/2022	FD	**11**	J	**1.7**	J	**0.95**	J
Sludge Application Area – Vehicle Test Track Southern Lobe (LEAD-016)	Monitoring Well	LEAD-EW-10	LEAD-EW-10-110620	11/06/2020	N	**14**		**2.1**	M	1.8	U
BRAC Area – Government Vehicle Storage Area	Monitoring Well	LEAD-84-4	LEAD-84-4-110420	11/04/2020	N	**26**		**3.8**		**1.9**	
Past aqueous film-forming foam (AFFF) Storage Area	Monitoring Well	LEAD-96-NSIA-5	LEAD-96-NSIA-5-110920	11/09/2020	N	**8.6**		**7.6**		1.9	U
Low Temperature Thermal Volatilization (LTTV) Site	Monitoring Well	LEAD-01-DA-04	LEAD-01-DA-04-110620	11/06/2020	N	**160**	D	**40**	M	**2.4**	M

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection

2. Gray shaded values indicate the result was detected greater than the 2021 Office of the Secretary of Defense (OSD) risk screening levels for tap water (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).

Acronyms/Abbreviations:
AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
FD = field duplicate sample
ID = identification
IWWS = industrial wastewater sewer
LEAD = Letterkenny Army Depot
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PDO = Property Disposal Office (Area)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier

Qualifier

D = The analyte was analyzed at dilution.
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only
M = Manually intergrated compound
JM = The limit of quantitation (LOQ) is approximate and may be inaccurate or imprecise.
U = The analyte was analyzed for but the result was not detected above the LOQ.

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

ARCADIS

Associated AOPI	Location Type	Location	Sample ID / Parent Sample ID	Analyte		PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				OSD Risk Screening Level for Industrial/Commercial Scenario		1.6		1.6		25	
				OSD Risk Screening Level for Residential Scenario		0.13		0.13		1.9	
				Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
BRAC Area Building 2291 – Former Hazardous Materials Building	Soil	LEAD-B2291-1	LEAD-B2291-1-SO-(0-2)-110320	11/03/2020	N	0.00063	U	0.00063	U	0.0021	U
BRAC Area Building 2291 – Former Hazardous Materials Building	Soil	LEAD-B2291-2	LEAD-B2291-2-SO-(0-2)-110320	11/03/2020	N	0.00063	U	0.00063	U	0.0021	U
BRAC Area Building 2291 – Former Hazardous Materials Building	Soil	LEAD-B2291-3	LEAD-B2291-3-SO-(0-2)-110220	11/02/2020	N	0.00067	U	0.00067	U	0.0022	U
BRAC Area Building 2291 – Former Hazardous Materials Building	Soil	LEAD-B2291-4	LEAD-B2291-4-SO-(0-2)-110220	11/02/2020	N	0.00060	U	0.00060	U	0.0020	U
BRAC Area – Government Vehicle Storage Area	Soil	LEAD-B34-1	LEAD-B34-1-SO-(0-2)-110420	11/04/2020	N	0.00068	U	0.00068	U	0.0023	U
BRAC Area – Government Vehicle Storage Area	Soil	LEAD-B34-2	LEAD-B34-2-SO-(0-2)-110420	11/04/2020	N	0.00080	U	0.00080	U	0.0027	U
Past AFFF Storage Area	Soil	LEAD-B357-1	LEAD-B357-1-SO-(0-2)-110420	11/04/2020	N	0.00062	U	0.00062	U	0.0021	U
Past AFFF Storage Area	Soil	LEAD-B357-2	LEAD-B357-2-SO-(0-2)-110420	11/04/2020	N	0.00068	U	0.00068	U	0.0023	U
Past AFFF Storage Area	Soil	LEAD-B357-3	LEAD-B357-3-SO-(0-2)-110420	11/04/2020	N	0.00069	U	0.00069	U	0.0023	U
Current Fire Department Station	Soil	LEAD-B521-1	LEAD-B521-1-SO-(0-2)-110420	11/04/2020	N	**0.015**		0.00068	U	0.0023	U
Current Fire Department Station	Soil	LEAD-B521-2	LEAD-B521-2-SO-(0-2)-110420	11/04/2020	N	**0.039**		0.00067	U	0.0022	U
Current Fire Department Station	Soil	LEAD-B521-3	LEAD-B521-3-SO-(0-2)-110420	11/04/2020	N	**0.038**		0.00067	U	0.0022	U
Current Fire Department Station	Soil	LEAD-B521-4	LEAD-B521-4-SO-(0-2)-110420	11/04/2020	N	**0.030**		0.00062	U	0.0021	U
Former Area B Fire Training Area (LEAD-009)	Soil	LEAD-AREA-B-FTA-1	LEAD-AREA-B-FTA-1-SO-(0-2)-110920	11/09/2020	N	0.00070	U	0.00070	U	0.0023	U
Former Area B Fire Training Area (LEAD-009)	Soil	LEAD-AREA-B-FTA-2	LEAD-FD-2-SO-110920 / LEAD-AREA-B-FTA-2-SO-(0-2)-110920	11/09/2020	FD	**0.00050**	J	0.00065	U	0.0022	U
			LEAD-AREA-B-FTA-2-SO-(0-2)-110920	11/09/2020	N	**0.00071**		0.00067	U	0.0022	U
Sludge Application Area – VTT Southern Lobe (LEAD-016)	Soil	LEAD-CVTT-1	LEAD-CVTT-1-SO-(0-2)-110620	11/06/2020	N	**0.0015**		0.00063	U	0.0021	U
Sludge Application Area – VTT Southern Lobe (LEAD-016)	Soil	LEAD-CVTT-2	LEAD-CVTT-2-SO-(0-2)-110620	11/06/2020	N	**0.0072**		0.00068	U	0.0023	U
Sludge Application Area – VTT Southern Lobe (LEAD-016)	Soil	LEAD-CVTT-3	LEAD-CVTT-3-SO-(0-2)-110620	11/06/2020	N	**0.0074**		0.00073	U	0.0024	U
Former Concrete Lined Fire Training Area (LEAD-063)	Soil	LEAD-CRTE-FTA-1	LEAD-FD-1-SO-(0-2)-110520 / LEAD-CONCRETE-FTA-1-SO-(0-2)-10520	11/05/2020	FD	**0.0011**		0.00062	U	0.0021	U
			LEAD-CONCRETE-FTA-1-SO-(0-2)-10520	11/05/2020	N	**0.052**		**0.00068**	M	0.0021	U
Former Concrete Lined Fire Training Area (LEAD-063)	Soil	LEAD-CRTE-FTA-2	LEAD-CONCRETE-FTA-2-SO-(0-2)-10520	11/05/2020	N	**0.0020**		0.00064	U	0.0021	U
IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)	Soil	LEAD-IWWS-1	LEAD-IWWS-1-SO-(11.5-13.5)-110320	11/03/2020	N	0.00079	U	0.00079	U	0.0026	U
IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)	Soil	LEAD-IWWS-2	LEAD-IWWS-2-SO-(11.5-13.5)-110320	11/03/2020	N	0.00077	U	0.00077	U	0.0026	U
IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)	Soil	LEAD-IWWS-3	LEAD-IWWS-3-SO-(11.5-13.5)-110320	11/03/2020	N	0.00070	U	0.00070	U	0.0023	U
Low Temperature Thermal Volatilization (LTTV) Site	Soil	LEAD-LTTV-1	LEAD-LTTV-1-SO-(1.5-2.5)-110520	11/05/2020	N	0.00079	U	0.00079	U	0.0026	U
Low Temperature Thermal Volatilization (LTTV) Site	Soil	LEAD-LTTV-2	LEAD-LTTV-2-SO-(0-2)-110520	11/05/2020	N	0.00062	U	0.00062	U	0.0021	U
Low Temperature Thermal Volatilization (LTTV) Site	Soil	LEAD-LTTV-3	LEAD-LTTV-3-SO-(0-2)-110520	11/05/2020	N	0.00063	U	0.00063	U	0.0021	U
Low Temperature Thermal Volatilization (LTTV) Site	Soil	LEAD-LTTV-4	LEAD-LTTV-4-SO-(0-2)-110520	11/05/2020	N	0.00064	U	0.00064	U	0.0021	U

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection
2. Data are compared to the 2021 Office of the Secretary of Defense (OSD) risk screening levels for both the residential as well as the industrial/commercial scenarios (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).

Acronyms/Abbreviations:
AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
FD = field duplicate sample
ID = identification
IWWS = industrial wastewater sewer
LEAD = Letterkenny Army Depot
LTTV = low temperature thermal volatilization
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SO = soil
VTT = Vehicle Test Track

Qualifier

J = The analyte was positively identified; however the associated numerical value is an estimated concentration only

M = Manually intergrated compound

U = The analyte was analyzed for but the result was not detected above thelimit of quantitation (LOQ).

Table 7-3 - Surface Water PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Associated AOPI	Location Type	Location	Sample ID / Parent Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
BRAC Area – Government Vehicle Storage Area	Surface Water/Seep	LEAD-B34-1	LEAD-B34-1-SW-110420	11/04/2020	N	1.6	U	1.6	U	1.6	U
Current Fire Department Station	Surface Water/Seep	LEAD-B521-1	LEAD-B521-1-SW-110420	11/04/2020	N	1.6	U	1.6	U	1.6	U
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Surface Water/Seep	LEAD-GWTS-OUTFALL	LEAD-FD-1-SW-110620 / LEAD-GWTS-OUTFALL-1-SW-	11/06/2020	FD	**54**	J-	**87**	M	**3.2**	J
			LEAD-GWTS-OUTFALL-1-SW-110620	11/06/2020	N	**53**	J-	**88**	M	**1.2**	JM

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection.

Acronyms/Abbreviations:
AOPI = Area of Potential Interest
BRAC = Base Realignment and Closure
FD = field duplicate sample
ID = identification
LEAD = Letterkenny Army Depot
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier

Qualifier
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only
J- = The result is an estimated quantity; the result may be biased low.
M = Manually intergrated compound
U = The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).

Table 7-4 - Sediment PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, Pennsylvania

Associated AOPI	Location Type	Location	Sample ID / Parent Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
BRAC Area – Government Vehicle Storage Area	Sediment	LEAD-B34-1	LEAD-B34-1-SE-110420	11/04/2020	N	0.00068	U	0.00068	U	0.0023	U
Current Fire Department Station	Sediment	LEAD-B521-1	LEAD-FD-1-SE-110420 / LEAD-B521-1-SE-110420	11/04/2020	FD	**0.0043**		0.00078	U	0.0026	U
			LEAD-B521-1-SE-110420	11/04/2020	N	**0.0033**		0.00077	U	0.0026	U
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Sediment	LEAD-GWTS-OUTFALL	LEAD-GWTS-OUTFALL-1-SE-110620	11/06/2020	N	**0.022**		**0.0019**		0.0024	U
Former Industrial Waste Treatment Plant Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)	Sediment	LEAD-IWTP-OUTFALL	LEAD-IWTP-OUTFALL-1-SE-110620	11/06/2020	N	**0.00049**	J	0.00065	U	0.0022	U

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection

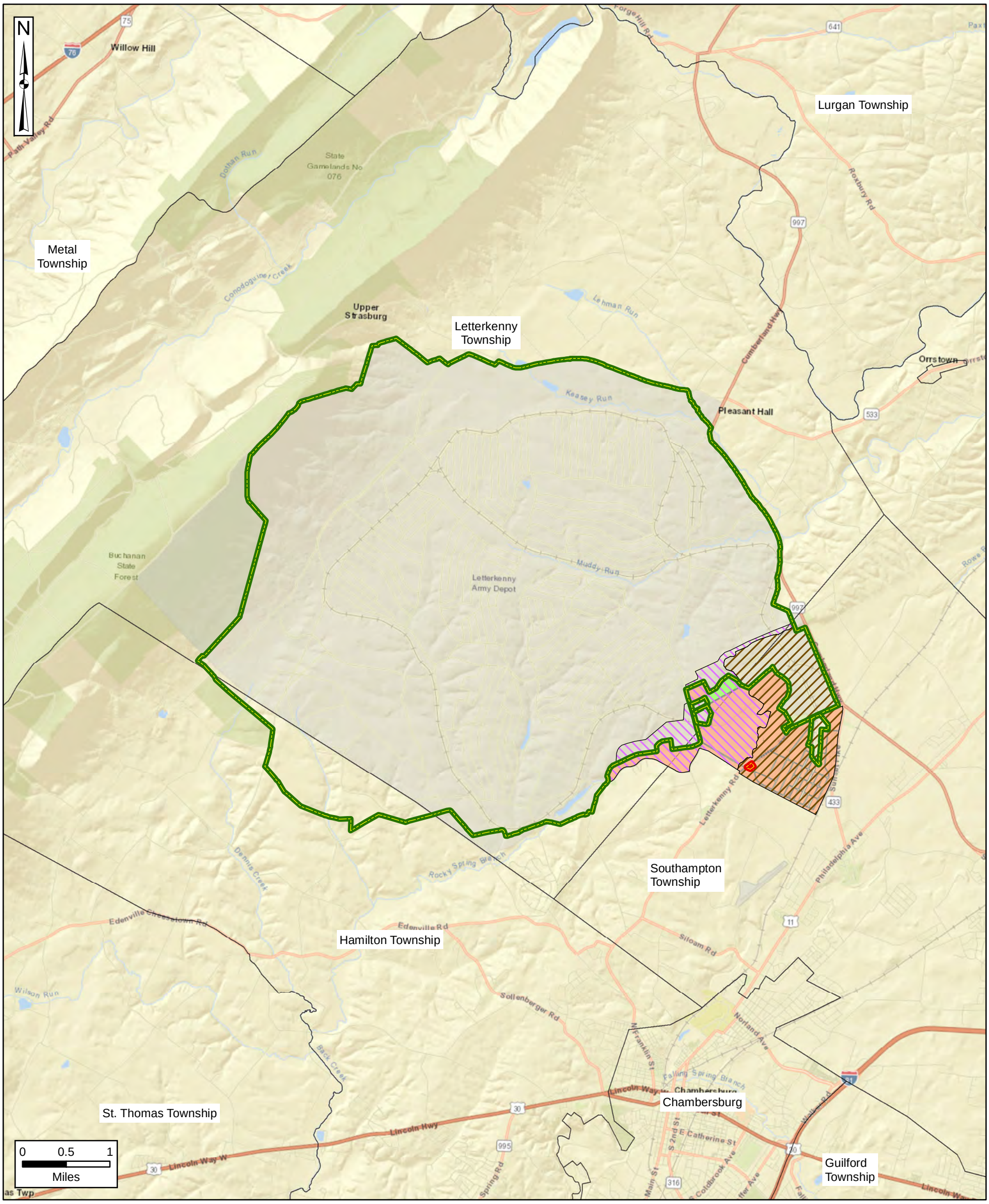
Acronyms/Abbreviations:
AOPI = area of potential interest
BRAC = Base Realignment and Closure
FD = field duplicate sample
ID = identification
LEAD = Letterkenny Army Depot
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier

Qualifier
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only
U = The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).

FIGURES

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-1
Site Location



Installation Boundary
Area Operated By Army Under Lease
Municipality
Property Disposal Office (PDO) Area
Southeast (SE) Area

BRAC Parcels
Phase VIII (Transfer Planned)
Other BRAC Parcel

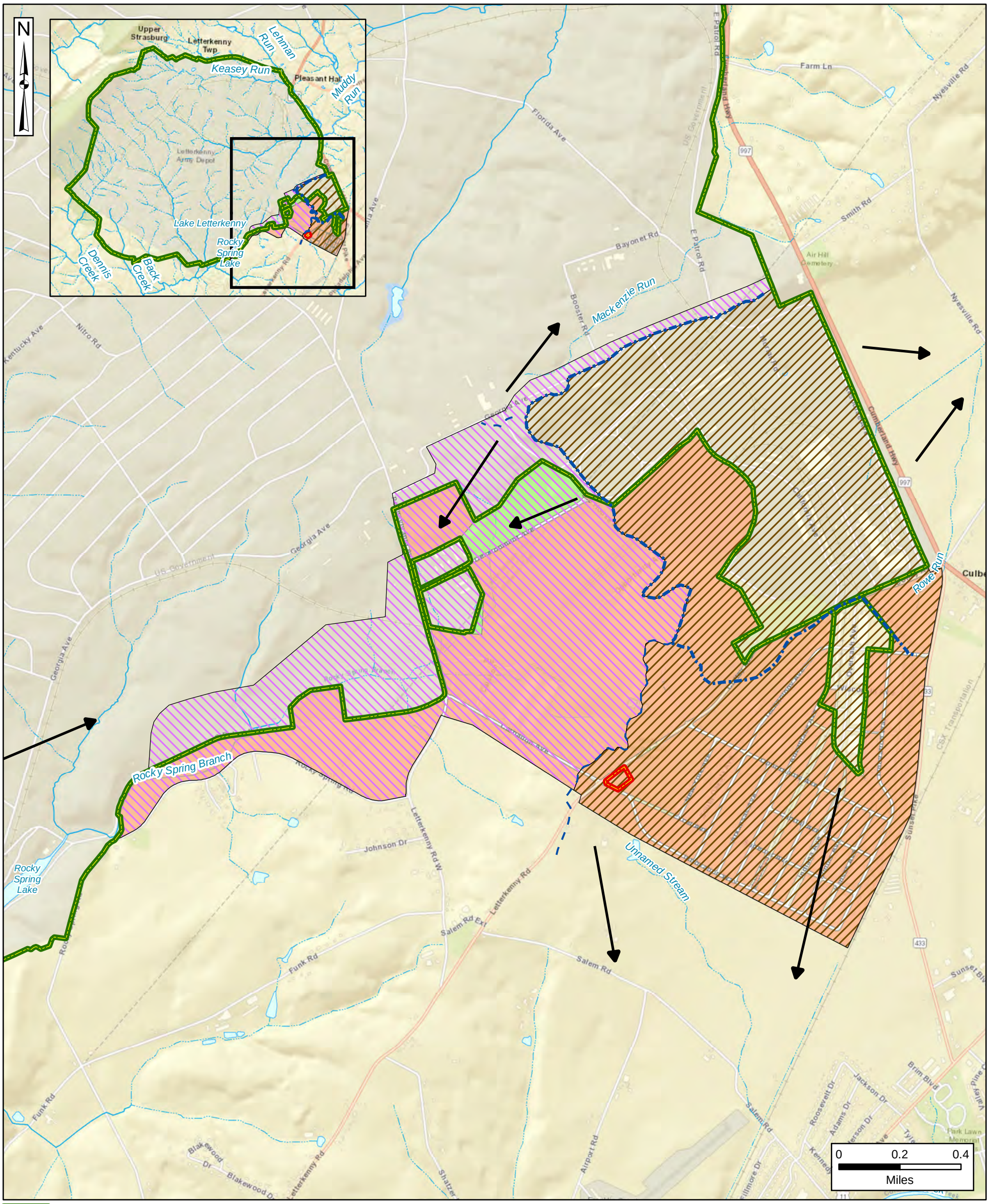
BRAC = Base Realignment and Closure

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-2
Site Layout



Installation Boundary
Area Operated By Army Under Lease
River/Stream (Perennial)
Stream (Intermittent)
Water Body
Groundwater Flow Direction

Major Groundwater/Surface Water Divide
Minor Groundwater/Surface Water Divide
Property Disposal Office (PDO) Area
Southeast (SE) Area

BRAC Parcels
Phase VIII (Transfer Planned)
Other BRAC Parcel

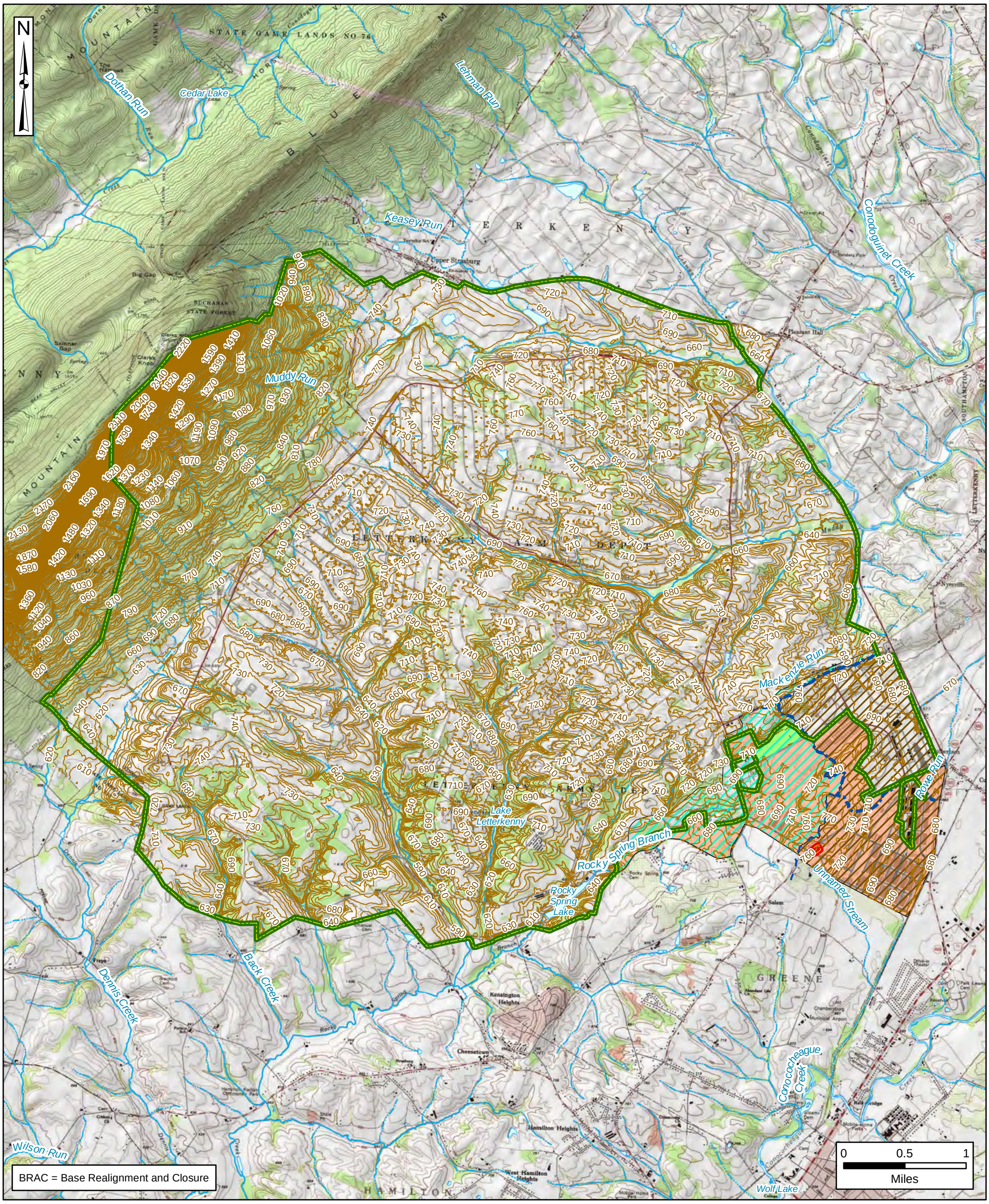
BRAC = Base Realignment and Closure

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-3
Topographic Map



- Installation Boundary
- Area Operated By Army Under Lease
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Major Groundwater/Surface Water Divide
- Minor Groundwater/Surface Water Divide
- Elevation Contour (feet)
- Property Disposal Office (PDO) Area
- Southeast (SE) Area

BRAC Parcels

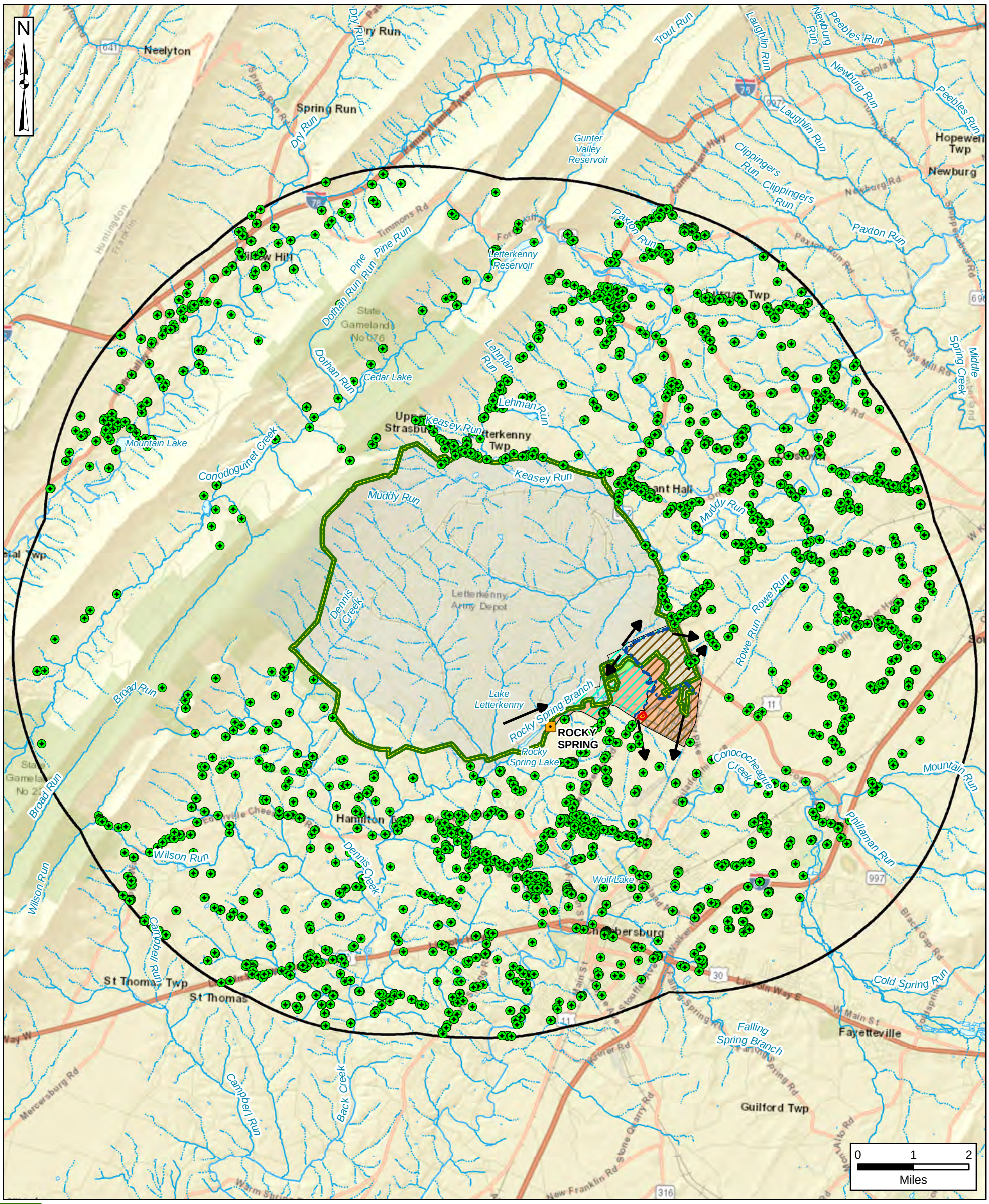
- Phase VIII (Transfer Planned)
- Other BRAC Parcel

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, Topo Map

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-4
Off-Post Potable Wells



Installation Boundary
Area Operated By Army Under Lease
5-Mile Radius
River/Stream (Perennial)
Stream (Intermittent)
Water Body

Groundwater Flow Direction
Major Groundwater/Surface Water Divide
Minor Groundwater/Surface Water Divide
Potable Supply Well
Property Disposal Office (PDO) Area
Southeast (SE) Area

BRAC Parcels
Phase VIII (Transfer Planned)
Other BRAC Parcel

Water Supply Sources
Institutional Water Supply Source

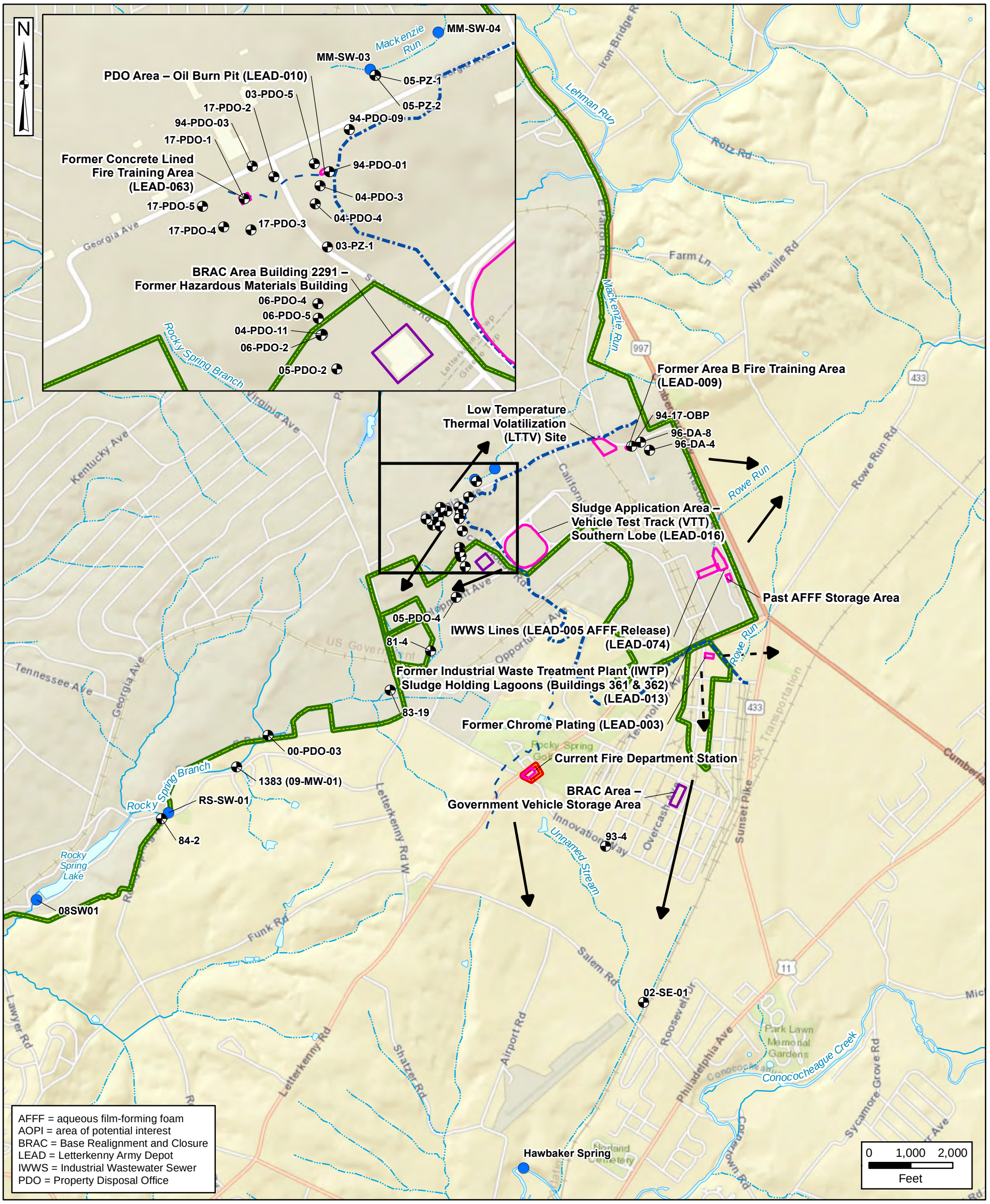
BRAC = Base Realignment and Closure

Data Sources:
Pennsylvania Groundwater Information System (PaGWIS), 2019;
Letterkenny Army Depot, GIS Data, 2019
EDR, Well Data, 2018
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-5
Historical Groundwater and Surface Water Sample Locations



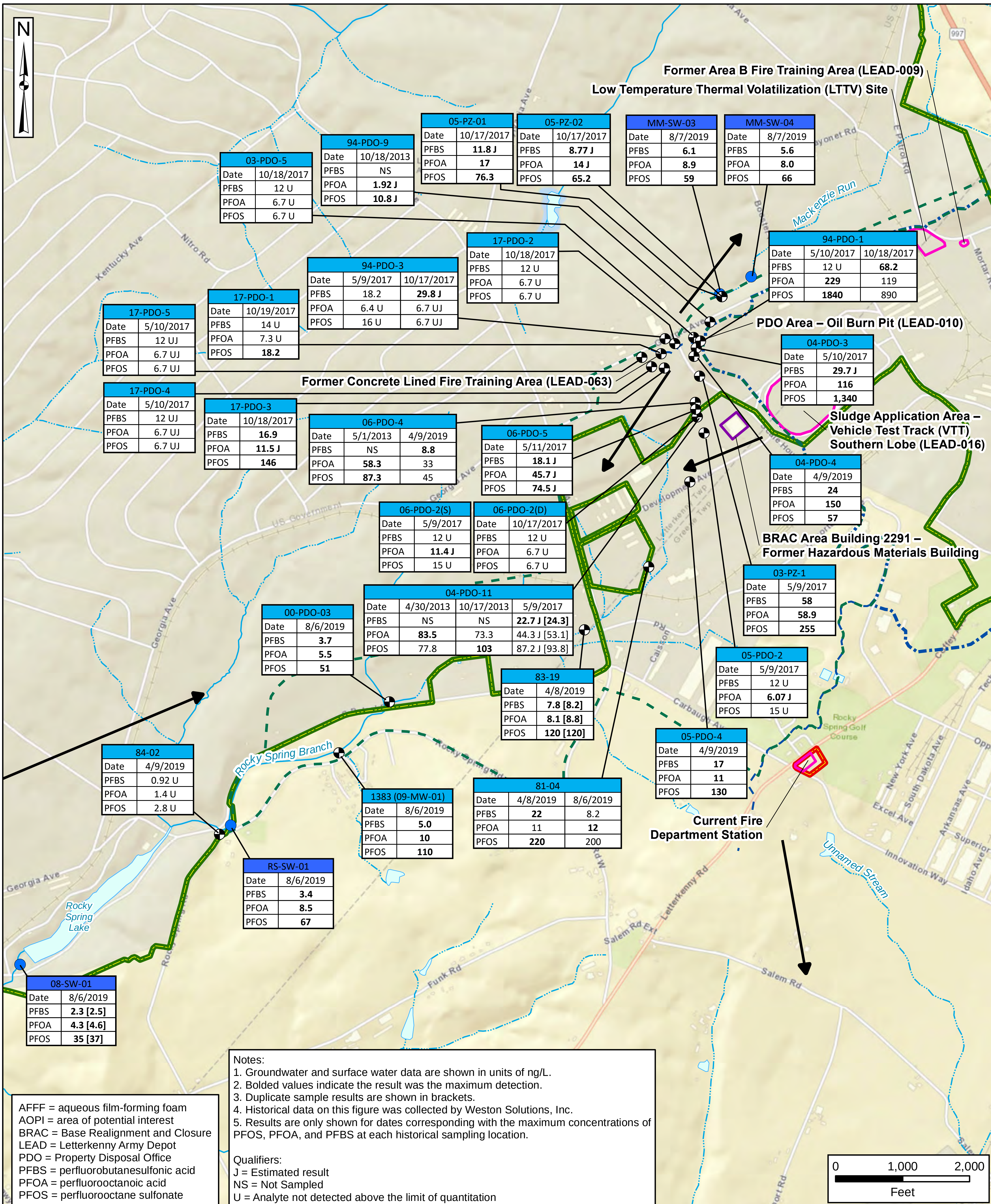
Installation Boundary
Area Operated By Army Under Lease
AOPI
River/Stream (Perennial)
Stream (Intermittent)
Water Body
Groundwater Flow Direction
Approximated Direction of Groundwater Flow
Major Groundwater/ Surface Water Divide
Minor Groundwater/ Surface Water Divide
BRAC Area
Historical Groundwater Sampling Location
Historical Surface Water Sampling Location

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
USGS, NHD Data, 2019;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-6
Historical PDO Area
Maximum PFOS, PFOA, and PFBS Results



05-PZ-01	
Date	10/17/2017
PFBS	**11.8 J**
PFOA	**17**
PFOS	**76.3**

05-PZ-02	
Date	10/17/2017
PFBS	**8.77 J**
PFOA	**14 J**
PFOS	**65.2**

MM-SW-03	
Date	8/7/2019
PFBS	**6.1**
PFOA	**8.9**
PFOS	**59**

MM-SW-04	
Date	8/7/2019
PFBS	**5.6**
PFOA	**8.0**
PFOS	**66**

94-PDO-9	
Date	10/18/2013
PFBS	NS
PFOA	**1.92 J**
PFOS	**10.8 J**

03-PDO-5	
Date	10/18/2017
PFBS	12 U
PFOA	6.7 U
PFOS	6.7 U

17-PDO-2	
Date	10/18/2017
PFBS	12 U
PFOA	6.7 U
PFOS	6.7 U

94-PDO-1		
Date	5/10/2017	10/18/2017
PFBS	12 U	**68.2**
PFOA	**229**	119
PFOS	**1840**	890

94-PDO-3		
Date	5/9/2017	10/17/2017
PFBS	18.2	**29.8 J**
PFOA	6.4 U	6.7 UJ
PFOS	16 U	6.7 UJ

17-PDO-1	
Date	10/19/2017
PFBS	14 U
PFOA	7.3 U
PFOS	**18.2**

17-PDO-5	
Date	5/10/2017
PFBS	12 UJ
PFOA	6.7 UJ
PFOS	6.7 UJ

04-PDO-3	
Date	5/10/2017
PFBS	**29.7 J**
PFOA	**116**
PFOS	**1,340**

17-PDO-4	
Date	5/10/2017
PFBS	12 UJ
PFOA	6.7 UJ
PFOS	6.7 UJ

17-PDO-3	
Date	10/18/2017
PFBS	**16.9**
PFOA	**11.5 J**
PFOS	**146**

06-PDO-4		
Date	5/1/2013	4/9/2019
PFBS	NS	**8.8**
PFOA	**58.3**	33
PFOS	**87.3**	45

06-PDO-5	
Date	5/11/2017
PFBS	**18.1 J**
PFOA	**45.7 J**
PFOS	**74.5 J**

04-PDO-4	
Date	4/9/2019
PFBS	**24**
PFOA	**150**
PFOS	**57**

06-PDO-2(S)	
Date	5/9/2017
PFBS	12 U
PFOA	**11.4 J**
PFOS	15 U

06-PDO-2(D)	
Date	10/17/2017
PFBS	12 U
PFOA	6.7 U
PFOS	6.7 U

03-PZ-1	
Date	5/9/2017
PFBS	**58**
PFOA	**58.9**
PFOS	**255**

04-PDO-11			
Date	4/30/2013	10/17/2013	5/9/2017
PFBS	NS	NS	**22.7 J [24.3]**
PFOA	**83.5**	73.3	44.3 J [53.1]
PFOS	77.8	**103**	87.2 J [93.8]

00-PDO-03	
Date	8/6/2019
PFBS	**3.7**
PFOA	**5.5**
PFOS	**51**

05-PDO-2	
Date	5/9/2017
PFBS	12 U
PFOA	**6.07 J**
PFOS	15 U

83-19	
Date	4/8/2019
PFBS	**7.8 [8.2]**
PFOA	**8.1 [8.8]**
PFOS	**120 [120]**

05-PDO-4	
Date	4/9/2019
PFBS	**17**
PFOA	**11**
PFOS	**130**

84-02	
Date	4/9/2019
PFBS	0.92 U
PFOA	1.4 U
PFOS	2.8 U

1383 (09-MW-01)	
Date	8/6/2019
PFBS	**5.0**
PFOA	**10**
PFOS	**110**

81-04		
Date	4/8/2019	8/6/2019
PFBS	**22**	8.2
PFOA	11	**12**
PFOS	**220**	200

RS-SW-01	
Date	8/6/2019
PFBS	**3.4**
PFOA	**8.5**
PFOS	**67**

08-SW-01	
Date	8/6/2019
PFBS	**2.3 [2.5]**
PFOA	**4.3 [4.6]**
PFOS	**35 [37]**

Notes:
1. Groundwater and surface water data are shown in units of ng/L.
2. Bolded values indicate the result was the maximum detection.
3. Duplicate sample results are shown in brackets.
4. Historical data on this figure was collected by Weston Solutions, Inc.
5. Results are only shown for dates corresponding with the maximum concentrations of PFOS, PFOA, and PFBS at each historical sampling location.

Qualifiers:
J = Estimated result
NS = Not Sampled
U = Analyte not detected above the limit of quantitation

AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot
PDO = Property Disposal Office
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 1,000 2,000
Feet

Installation Boundary
Area Operated By Army Under Lease
AOPI
River/Stream (Perennial)
Stream (Intermittent)
Water Body
Groundwater Flow Direction
Approximated Direction of Groundwater Flow
Major Groundwater/ Surface Water Divide
Minor Groundwater/ Surface Water Divide
BRAC Area
Historical Groundwater Sampling Location
Historical Surface Water Sampling Location
Property Disposal (PDO) Area

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
USGS, NHD Data, 2019;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 2-7
Historical Southeast Area
Maximum PFOS, PFOA, and PFBS Results

Former Area B Fire Training Area (LEAD-009)

Low Temperature Thermal Volatilization (LTTV) Site

94-17-OBP	
Date	10/17/2013
PFBS	NS
PFOA	**4.49 J**
PFOS	**10.4 J**

96-DA-04	
Date	4/30/2013
PFBS	NS
PFOA	**5.3 J [5.5 J]**
PFOS	**16.8 J [18.0 J]**

96-DA-08	
Date	4/30/2013
PFBS	NS
PFOA	**1.6 J**
PFOS	**7.5 J**

PDO Area – Oil Burn Pit (LEAD-010)

Former Concrete Lined Fire Training Area (LEAD-063)

BRAC Area Building 2291 – Former Hazardous Materials Building

Sludge Application Area – Vehicle Test Track (VTT) Southern Lobe (LEAD-016)

IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)

Former Industrial Waste Treatment Plant (IWTP) Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)

Past AFFF Storage Area

Former Chrome Plating (LEAD-003)

Current Fire Department Station

BRAC Area – Government Vehicle Storage Area

93-SE-04		
Date	4/29/2013	10/16/2013
PFBS	NS	NS
PFOA	**2.3 J**	2.09 J
PFOS	39.2	**45.0 J**

02-SE-01	
Date	10/16/2013
PFBS	NS
PFOA	**1.29 J**
PFOS	**11.2 J**

HS-SW-01	
Date	10/17/2013
PFBS	NS
PFOA	**1.64 J**
PFOS	**38.3**

AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
IWWS = Industrial Wastewater Sewer
LEAD = Letterkenny Army Depot
PDO = Property Disposal Office
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Notes:
1. Groundwater and surface water data are shown in units of ng/L.
2. Bolded values indicate the result was the maximum detection.
3. Duplicate sample results are shown in brackets.
4. Historical data on this figure was collected by Weston Solutions, Inc.
5. Results are only shown for dates corresponding with the maximum concentrations of PFOS, PFOA, and PFBS at each historical sampling location.

Qualifiers:
J = Estimated result
NS = Not Sampled

0 1,000 2,000
Feet

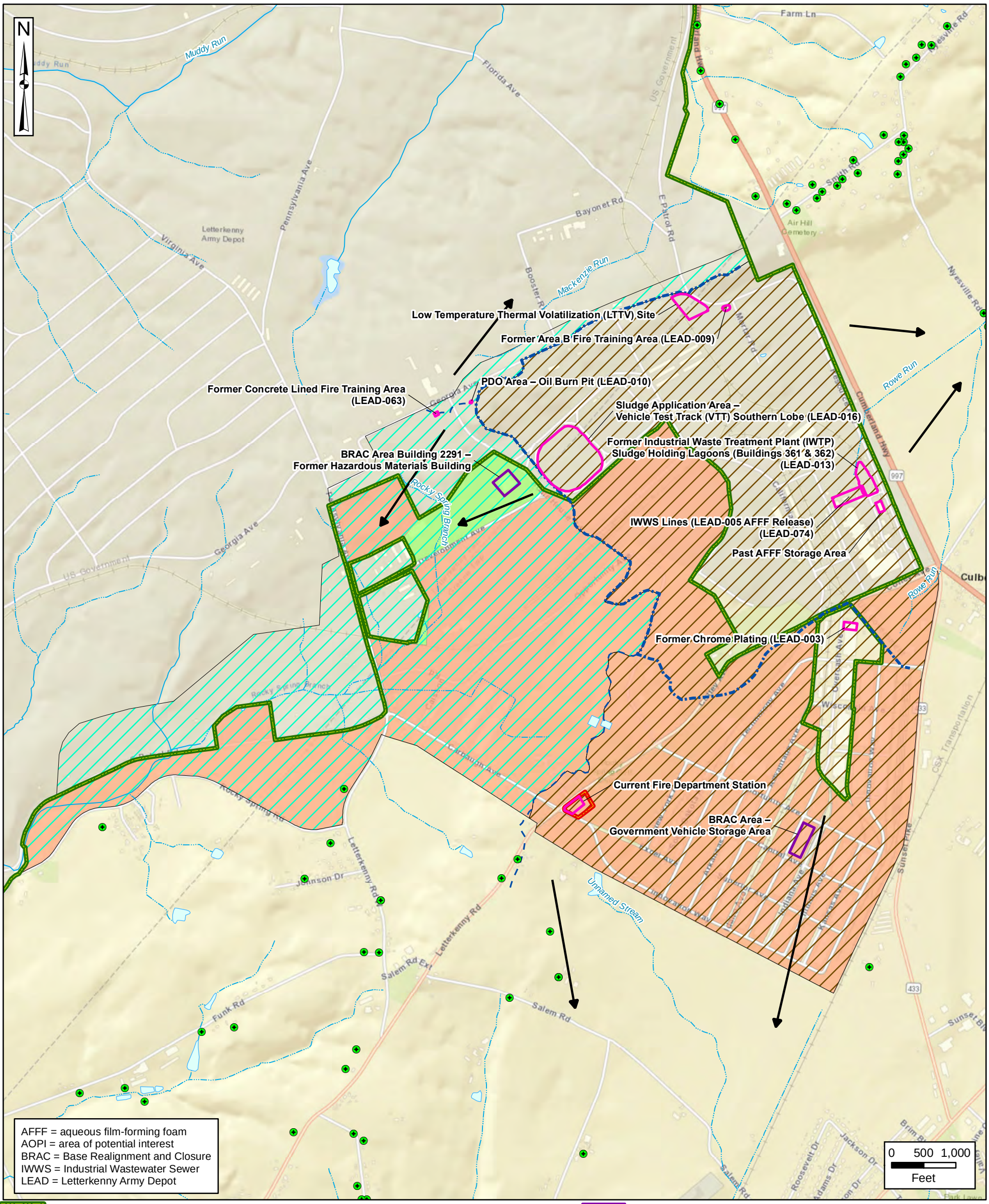
- Installation Boundary
- Area Operated By Army Under Lease
- AOPI
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Groundwater Flow Direction
- Approximated Direction of Groundwater Flow
- Major Groundwater/ Surface Water Divide
- Minor Groundwater/ Surface Water Divide
- BRAC Area
- Historical Groundwater Sampling Location
- Historical Surface Water Sampling Location

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
USGS, NHD Data, 2019;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-2
AOPI Locations



Installation Boundary
Area Operated By Army Under Lease
AOPI
River/Stream (Perennial)
Stream (Intermittent)
Water Body

Groundwater Flow Direction
Major Groundwater/ Surface Water Divide
Minor Groundwater/ Surface Water Divide
Property Disposal Office (PDO) Area
Southeast (SE) Area
Drinking Water Well

BRAC Area

BRAC Parcels

Phase VIII (Transfer Planned)
Other BRAC Parcel

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
PaGWIS, Well Data, 2019;
USGS, NHD Data, 2019;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-3
Former Area B Fire Training Area (LEAD-009) AOPI

94-17-OBP		
Date	04/30/2013	10/17/2013
PFBS	NS	NS
PFOA	3.8 J	4.49 J
PFOS	7.4 J	10.4 J

96-DA-08		
Date	04/30/2013	10/17/2013
PFBS	NS	NS
PFOA	1.6 J	1.57 J
PFOS	7.5 J	4.33 J

96-DA-04		
Date	04/30/2013	10/17/2013
PFBS	NS	NS
PFOA	5.3 J [5.5 J]	3.10 J [3.23 J]
PFOS	16.8 J [18.0 J]	7.2 J [7.58 J]

Area B Fire Training Area (LEAD-009)

Notes:
1. Groundwater results are in nanograms per liter (ng/L)
2. Duplicate sample results are shown in brackets.
3. Historical data on this figure was collected by Weston Solutions, Inc.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
NS = Not Sampled

0 50 100
Feet

Installation Boundary
AOPI
Suspected AFFF Release Area
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Previous Groundwater Sampling Location (Existing Well)

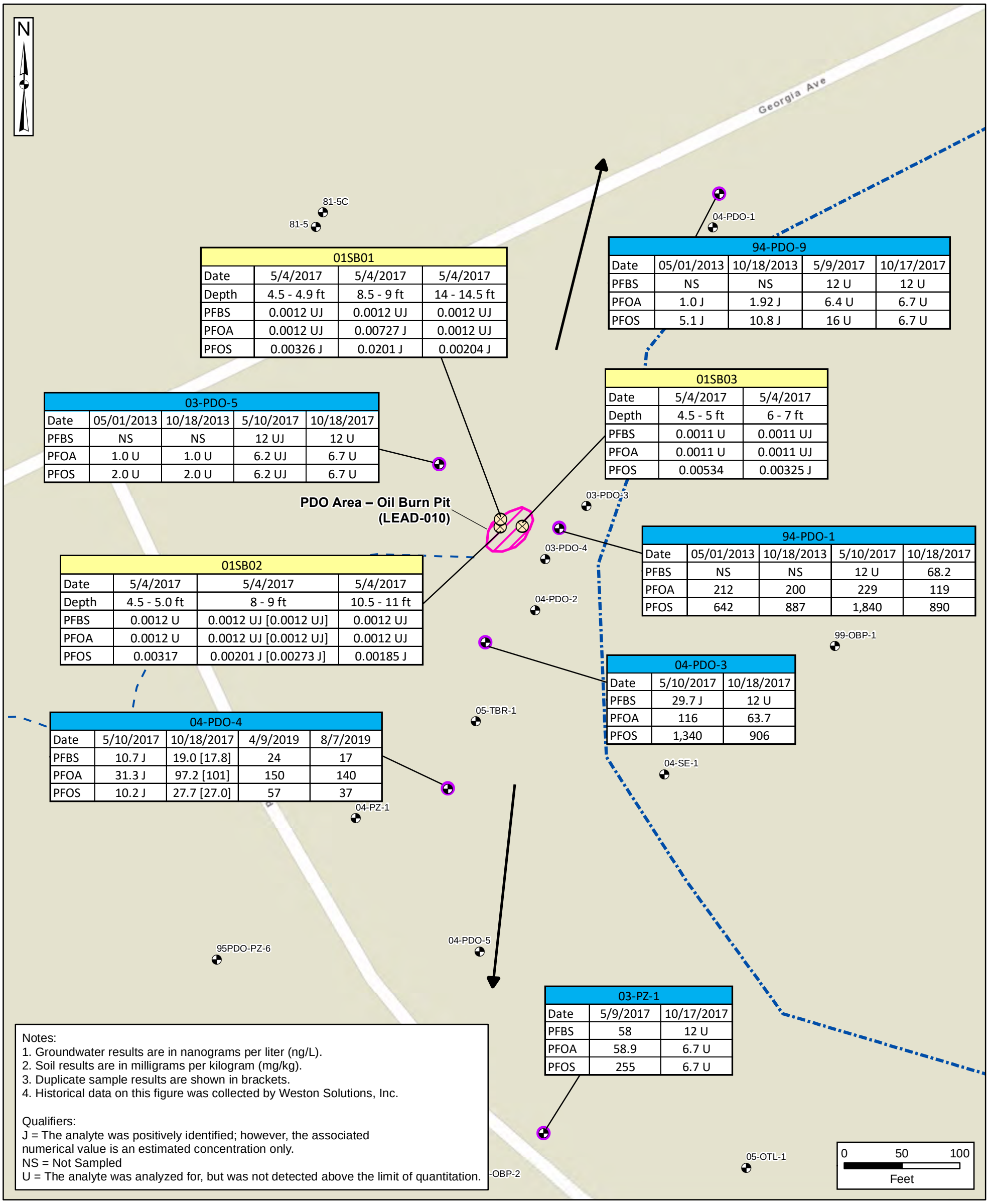
AFFF = aqueous film-forming foam
AOPI = area of potential interest
LEAD = Letterkenny Army Depot
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
PFBS = perfluorobutanesulfonic acid

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-4
PDO Area – Oil Burn Pit (LEAD-010) AOPI



Notes:
1. Groundwater results are in nanograms per liter (ng/L).
2. Soil results are in milligrams per kilogram (mg/kg).
3. Duplicate sample results are shown in brackets.
4. Historical data on this figure was collected by Weston Solutions, Inc.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
NS = Not Sampled
U = The analyte was analyzed for, but was not detected above the limit of quantitation.

- Installation Boundary
- AOPI
- Suspected AFFF Release Area
- Major Groundwater/Surface Water Divide
- Minor Groundwater/Surface Water Divide
- Groundwater Flow Direction
- Monitoring Well
- Previous Groundwater Sampling Location (Existing Well)
- Previous Soil Sampling Location (Boring)

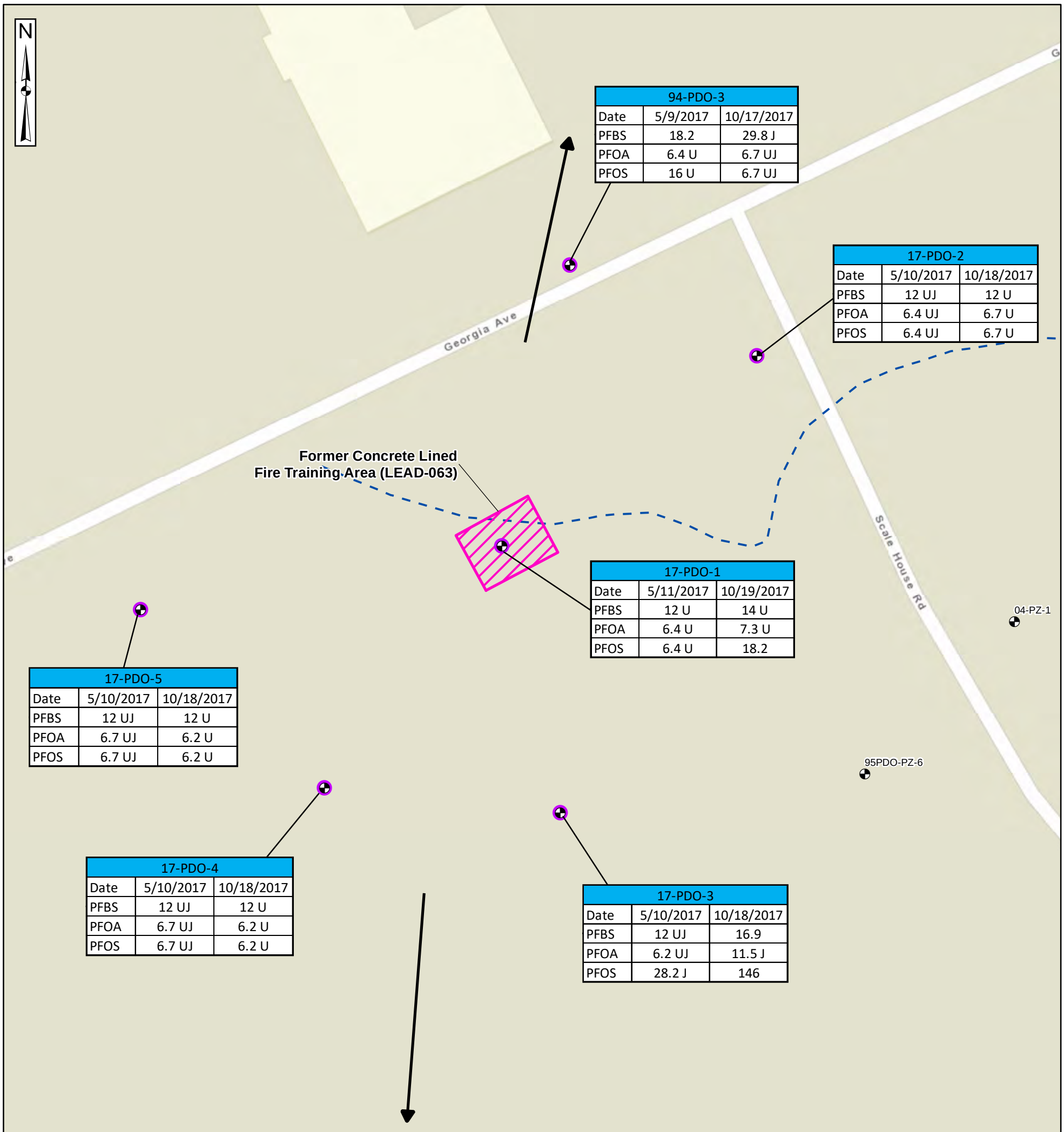
AFFF = aqueous film-forming foam
AOPI = area of potential interest
ft = feet
LEAD = Letterkenny Army Depot
PDO = Property Disposal Office
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
PFBS = perfluorobutanesulfonic acid

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
Weston, Soil Borings, 2017
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-5
Former Concrete Lined Fire Training Area (LEAD-063) AOPI



Notes:
1. Groundwater results are in nanograms per liter (ng/L)
2. Historical data on this figure was collected by Weston Solutions, Inc.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

0 50 100
Feet

Installation Boundary
AOPI
Suspected AFFF Release Area
Minor Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Previous Groundwater Sampling Location (Existing Well)

AFFF = aqueous film-forming foam
AOPI = area of potential interest
LEAD = Letterkenny Army Depot
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
Weston, Letter Report for 2017 Sampling Results for PFAS at PDO OU 4, 2018;
USGS, NHD Data, 2019;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-6
Industrial Wastewater Sewer (IWWS) Lines
(LEAD-005 AFFF Release) (LEAD-074) AOPI

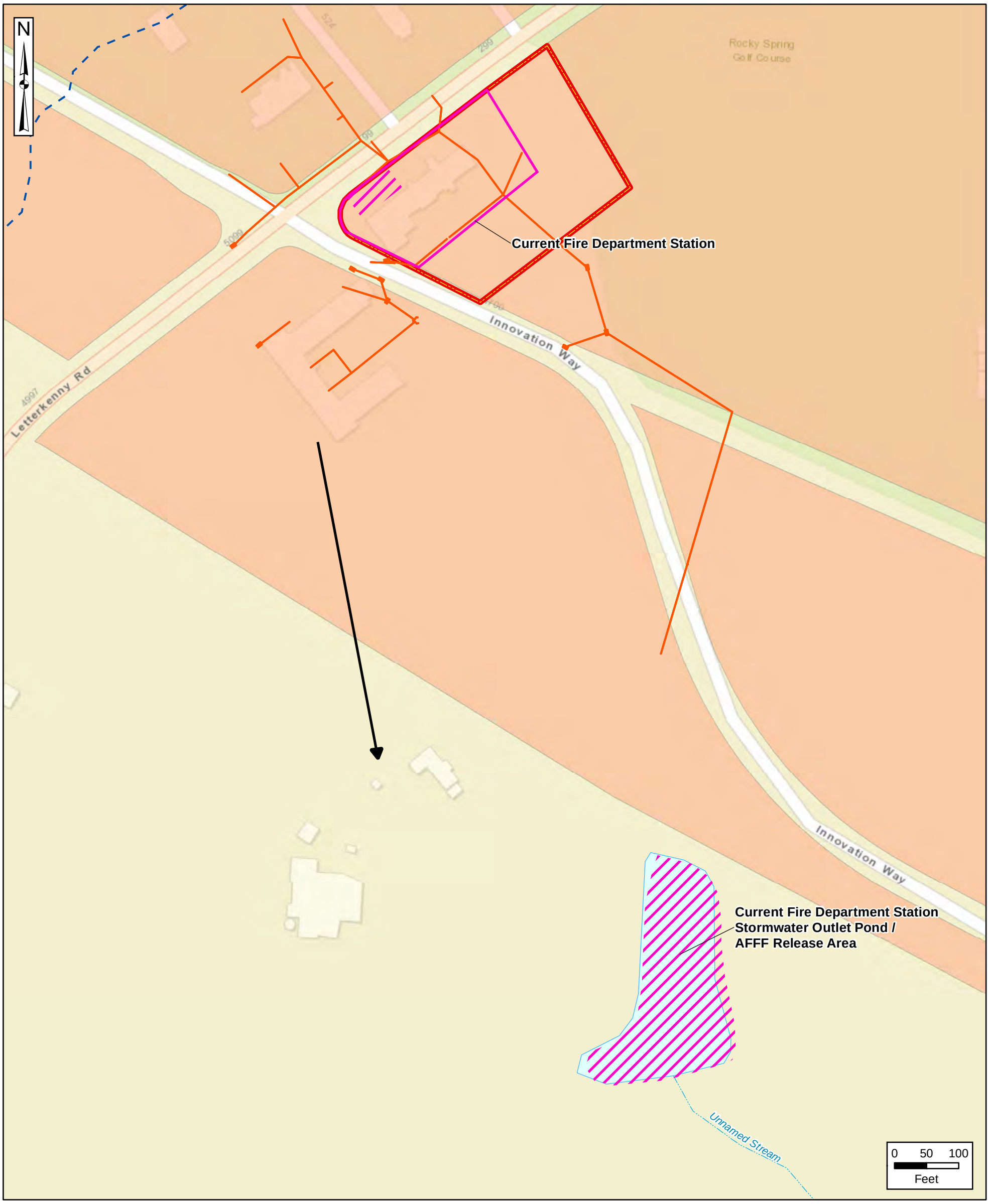
AFFF = aqueous film-forming foam
AOPI = area of potential interest
IWWS = Industrial Wastewater Sewer
IWTP = Industrial Waste Treatment Plant
LEAD = Letterkenny Army Depot

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-7
Current Fire Department Station AOPI



Installation Boundary
Area Operated By Army Under Lease
AOPI
Suspected AFFF Release Area
Stream (Intermittent)
Water Body
Minor Groundwater/Surface Water Divide
Groundwater Flow Direction
Storm Sewer
BRAC Parcel

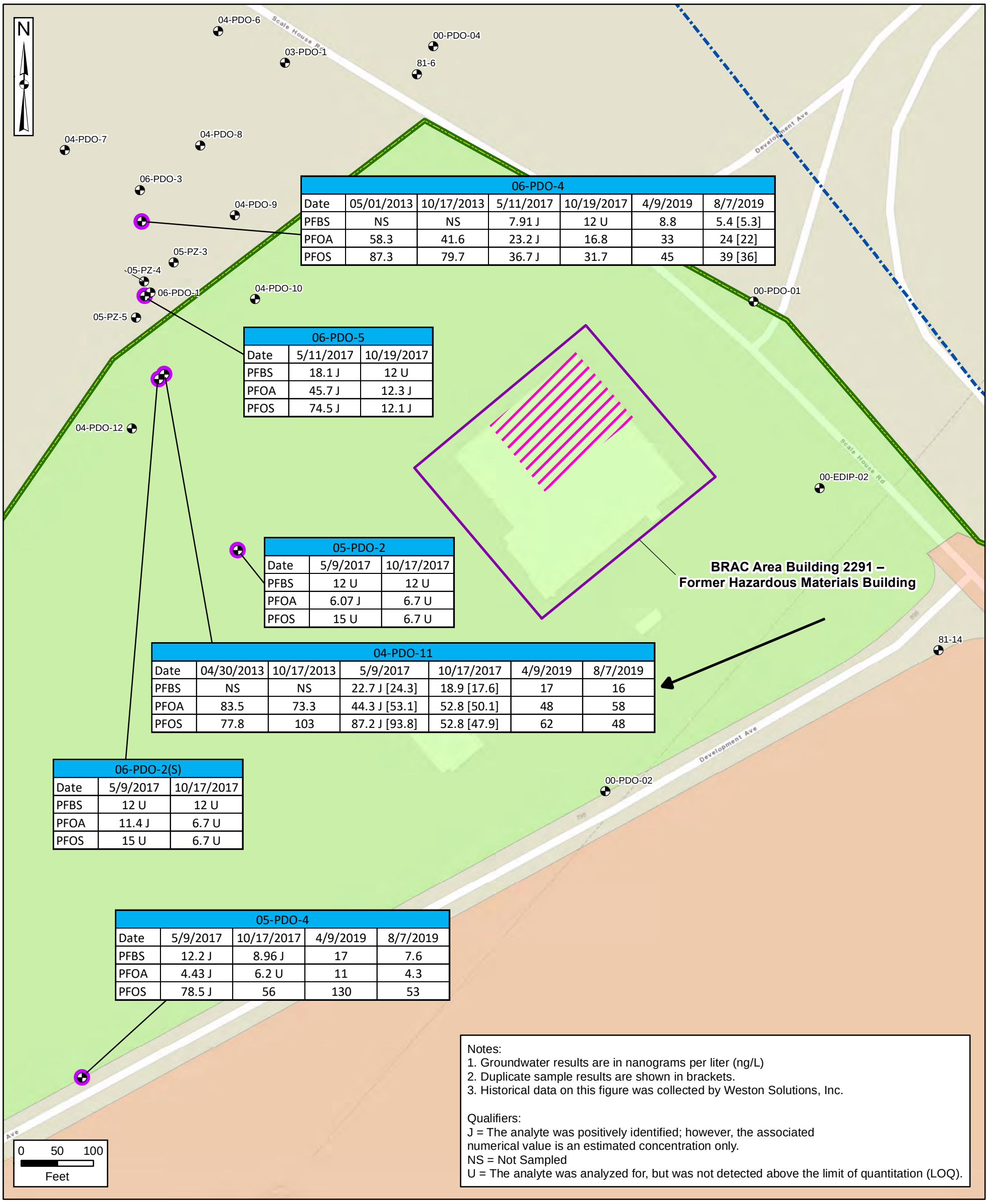
AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-8
BRAC Area Building 2291 – Former Hazardous Materials Building



06-PDO-4						
Date	05/01/2013	10/17/2013	5/11/2017	10/19/2017	4/9/2019	8/7/2019
PFBS	NS	NS	7.91 J	12 U	8.8	5.4 [5.3]
PFOA	58.3	41.6	23.2 J	16.8	33	24 [22]
PFOS	87.3	79.7	36.7 J	31.7	45	39 [36]

06-PDO-5		
Date	5/11/2017	10/19/2017
PFBS	18.1 J	12 U
PFOA	45.7 J	12.3 J
PFOS	74.5 J	12.1 J

05-PDO-2		
Date	5/9/2017	10/17/2017
PFBS	12 U	12 U
PFOA	6.07 J	6.7 U
PFOS	15 U	6.7 U

04-PDO-11						
Date	04/30/2013	10/17/2013	5/9/2017	10/17/2017	4/9/2019	8/7/2019
PFBS	NS	NS	22.7 J [24.3]	18.9 [17.6]	17	16
PFOA	83.5	73.3	44.3 J [53.1]	52.8 [50.1]	48	58
PFOS	77.8	103	87.2 J [93.8]	52.8 [47.9]	62	48

06-PDO-2(S)		
Date	5/9/2017	10/17/2017
PFBS	12 U	12 U
PFOA	11.4 J	6.7 U
PFOS	15 U	6.7 U

05-PDO-4				
Date	5/9/2017	10/17/2017	4/9/2019	8/7/2019
PFBS	12.2 J	8.96 J	17	7.6
PFOA	4.43 J	6.2 U	11	4.3
PFOS	78.5 J	56	130	53

Notes:
1. Groundwater results are in nanograms per liter (ng/L)
2. Duplicate sample results are shown in brackets.
3. Historical data on this figure was collected by Weston Solutions, Inc.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
NS = Not Sampled
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

Installation Boundary
BRAC Area
Suspected AFFF Release Area
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Previous Groundwater Sampling Location (Existing Well)

BRAC Parcels
Phase VIII (Transfer Planned)
Other BRAC Parcel

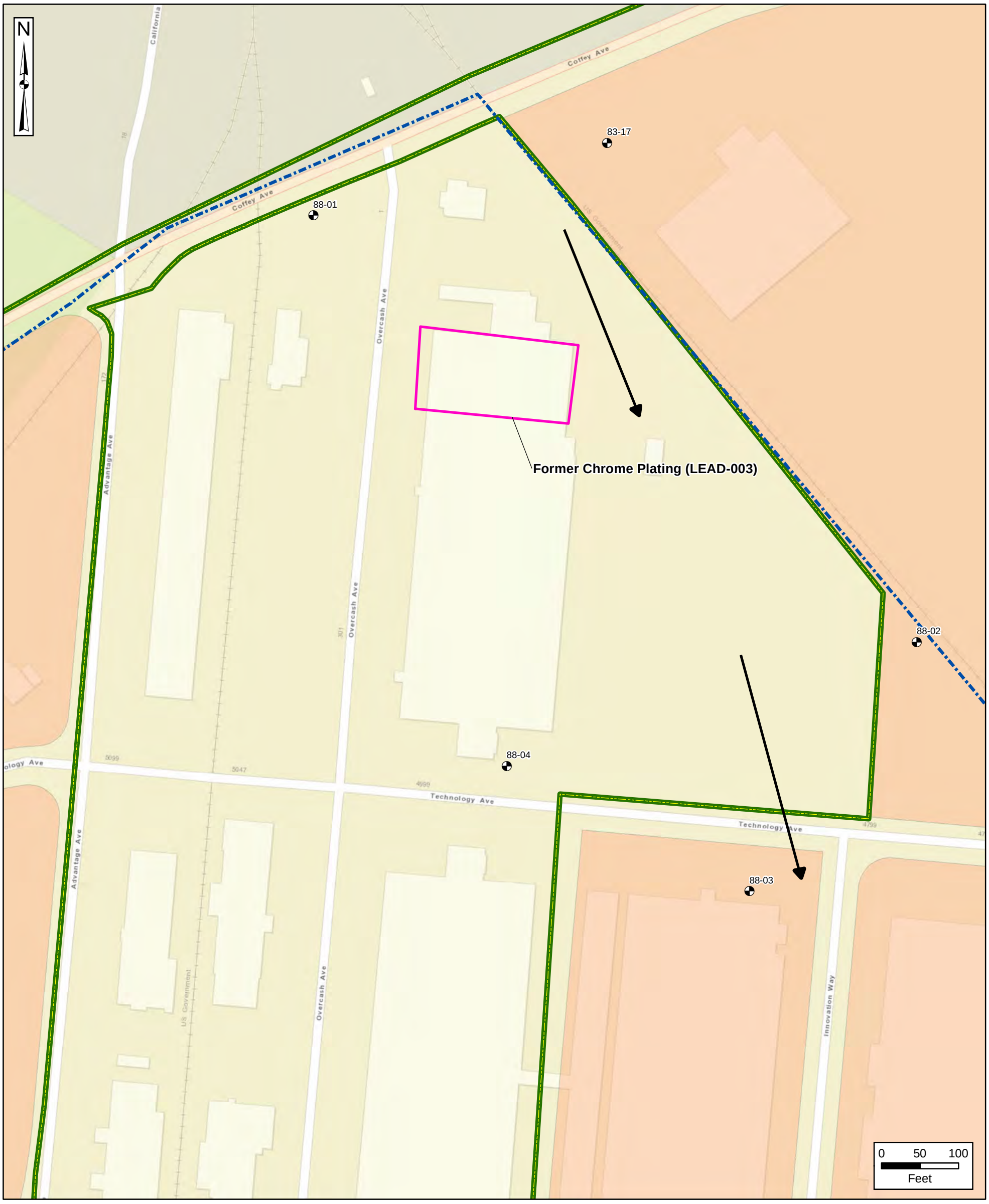
AFFF = aqueous film-forming foam
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-9
Former Chrome Plating (LEAD-003) AOPI



Installation Boundary
AOPI*
BRAC Parcel
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
*Approximate Location of Chromium Plating Activities

Monitoring Well

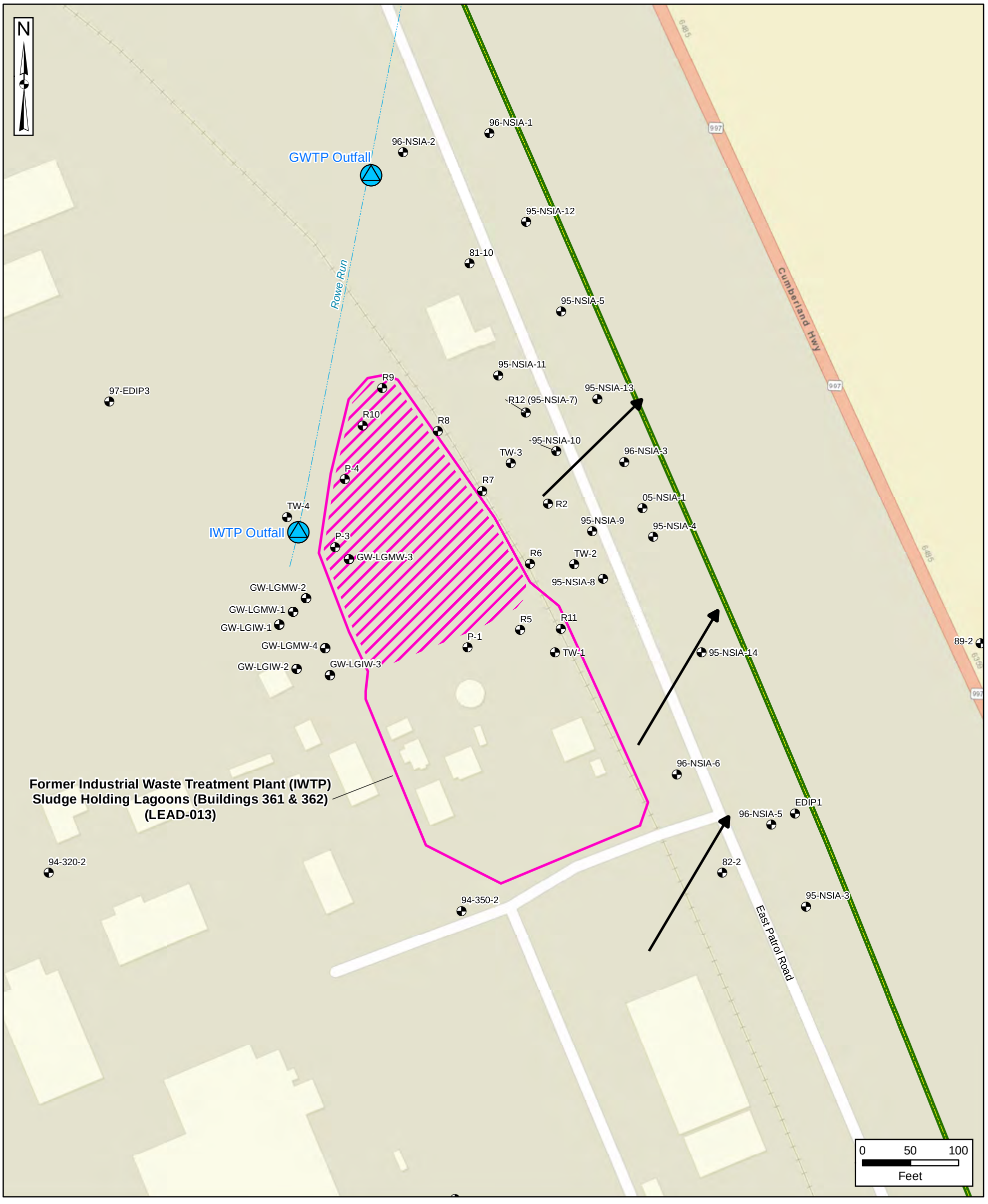
AOPI = area of potential interest
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-10
Former Industrial Waste Treatment Plant
Sludge Holding Lagoons (Buildings 361 & 362)
(LEAD-013) AOPI



Installation Boundary
AOPI
AFFF Release Area
Stream (Intermittent)
Outfall
Groundwater Flow Direction
Monitoring Well

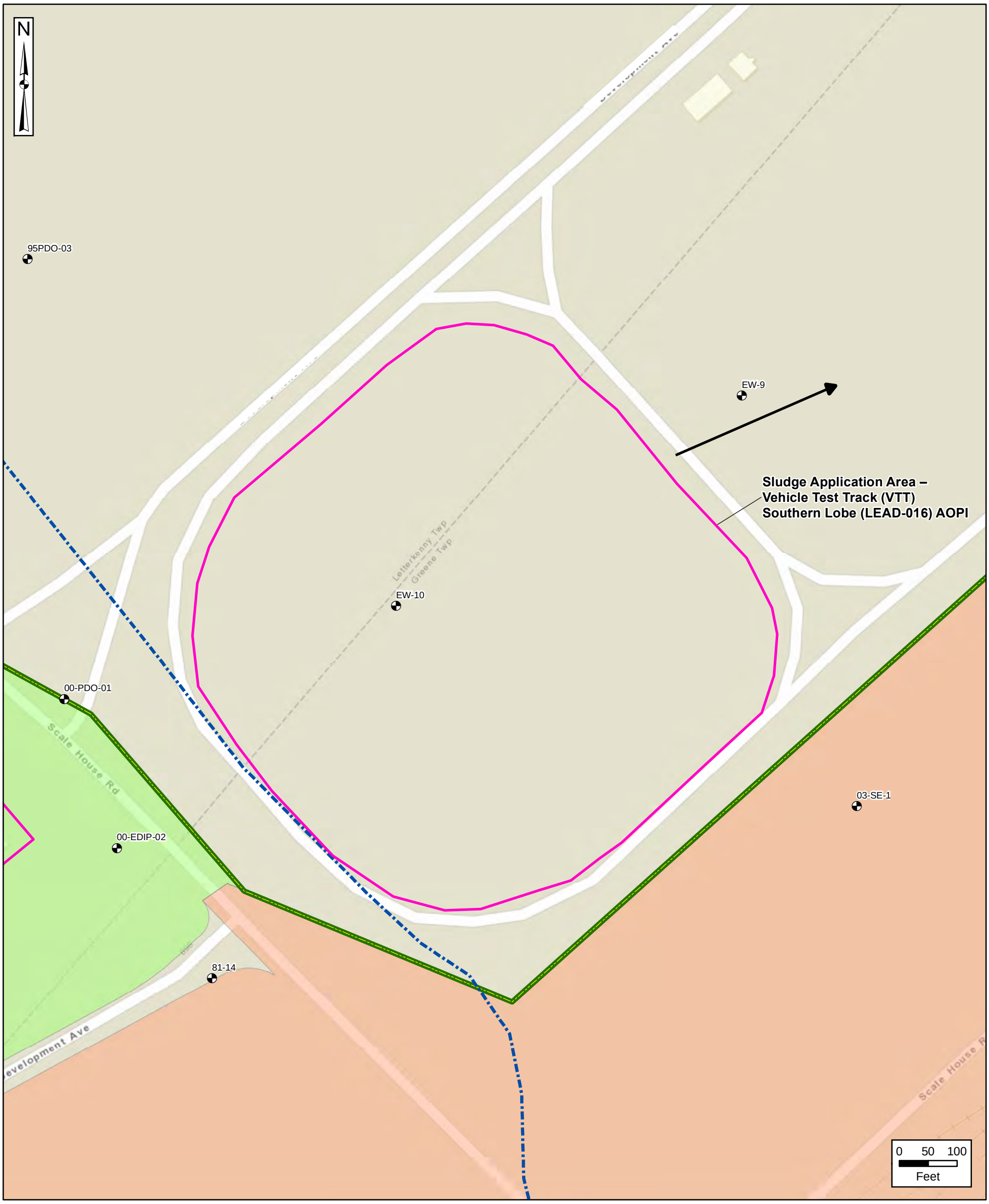
AFFF = aqueous film-forming foam
AOPI = area of potential interest
GWTP = Groundwater Treatment Plant
IWTP = Industrial Waste Treatment Plant
LEAD = Letterkenny Army Depot

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-11
Sludge Application Area – Vehicle Test Track (VTT)
Southern Lobe (LEAD-016) AOPI



Installation Boundary
AOPI*
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well

BRAC Parcels
Phase VIII (Transfer Planned)
Other BRAC Parcel

AOPI = area of potential interest
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot
WWTP = Wastewater Treatment Plant

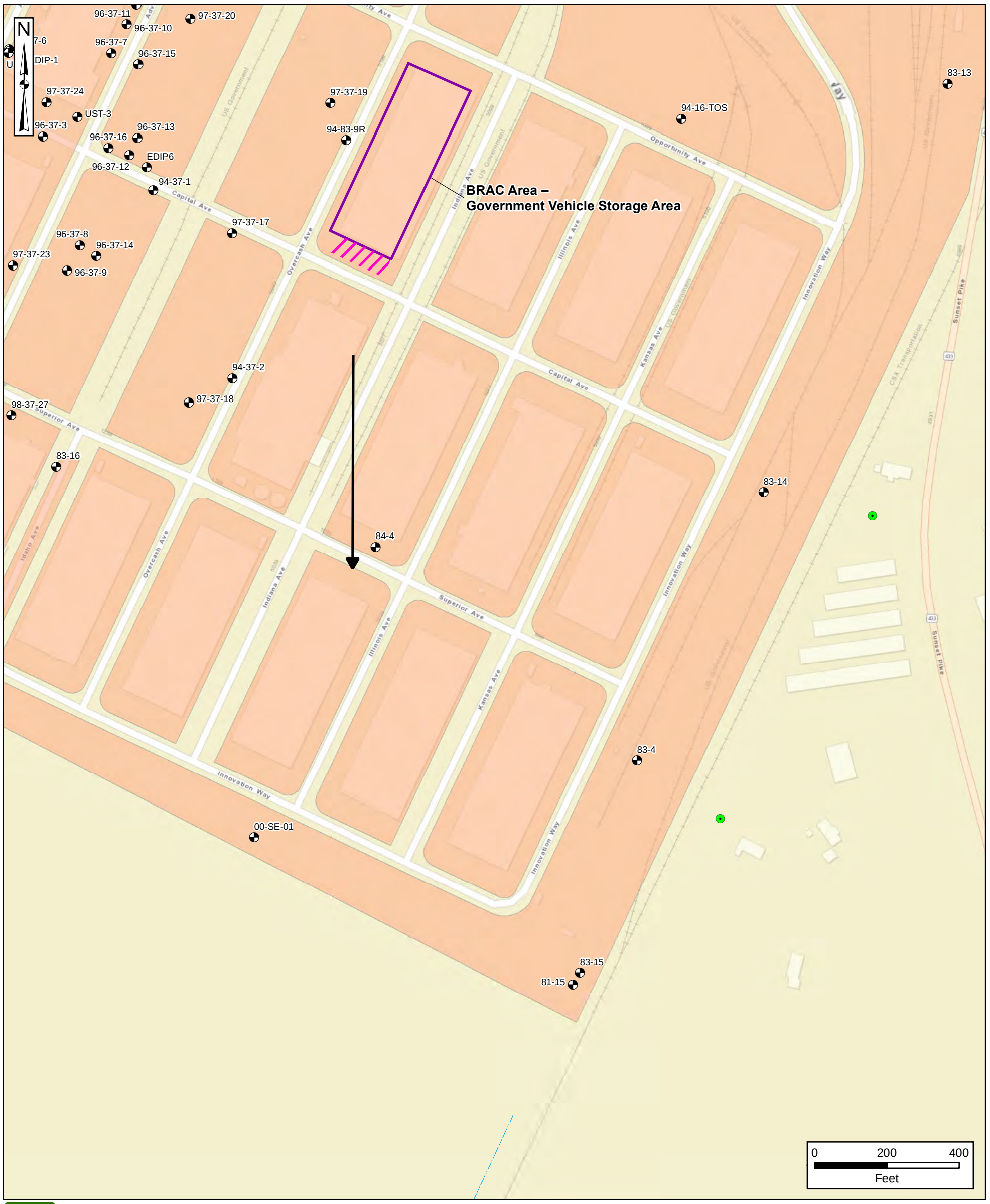
Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

*Approximate Area of WWTP Sludge Application

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-12
BRAC Area –
Government Vehicle Storage Area



Installation Boundary
BRAC Area
BRAC Parcel
AFFF Release Area
Stream (Intermittent)
Groundwater Flow Direction
Monitoring Well
Residential Well

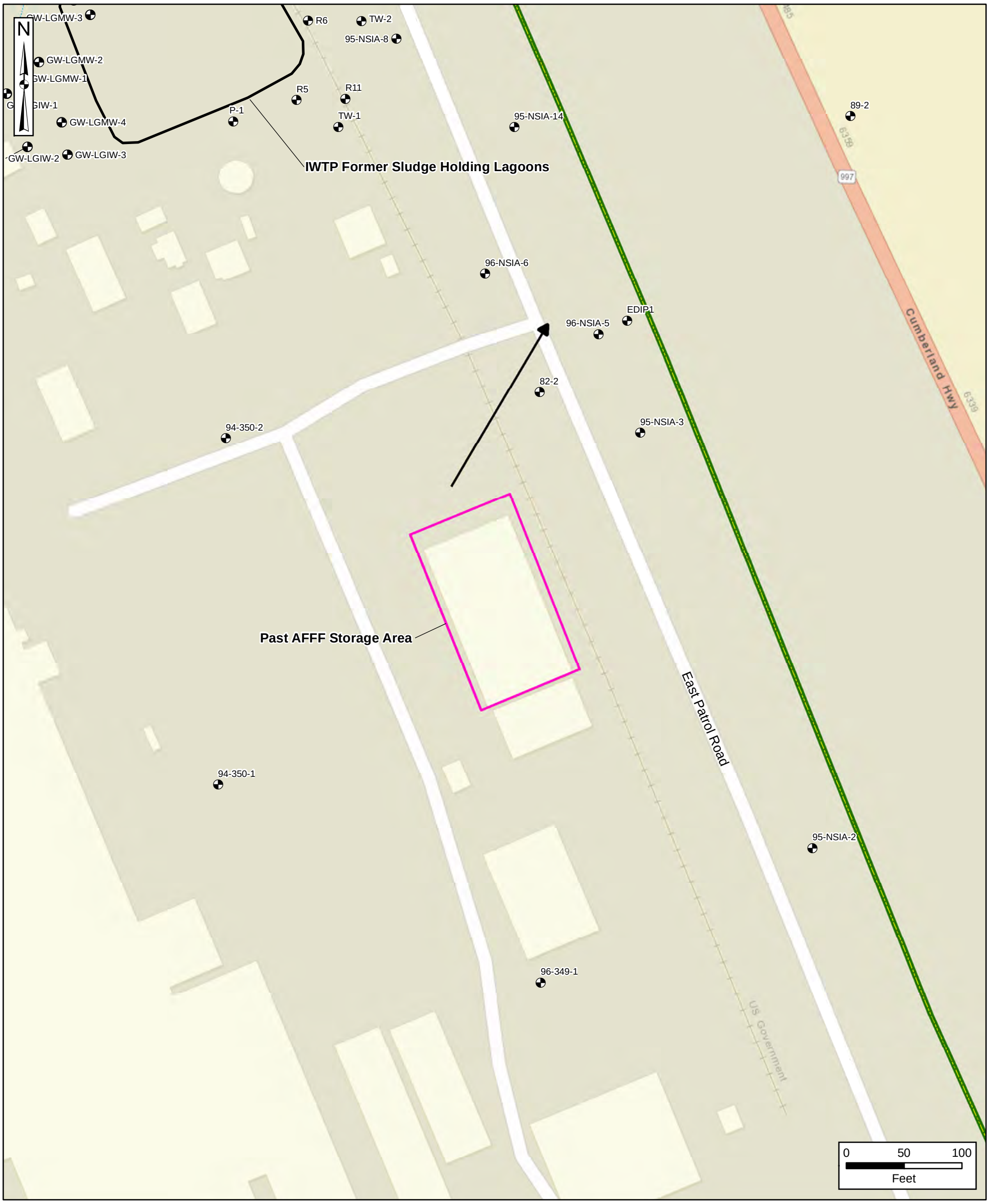
AFFF = aqueous film-forming foam
BRAC = Base Realignment and Closure

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-13
Past AFFF Storage Area AOPI



Installation Boundary
AOPI
Stream (Intermittent)
Groundwater Flow Direction
Monitoring Well

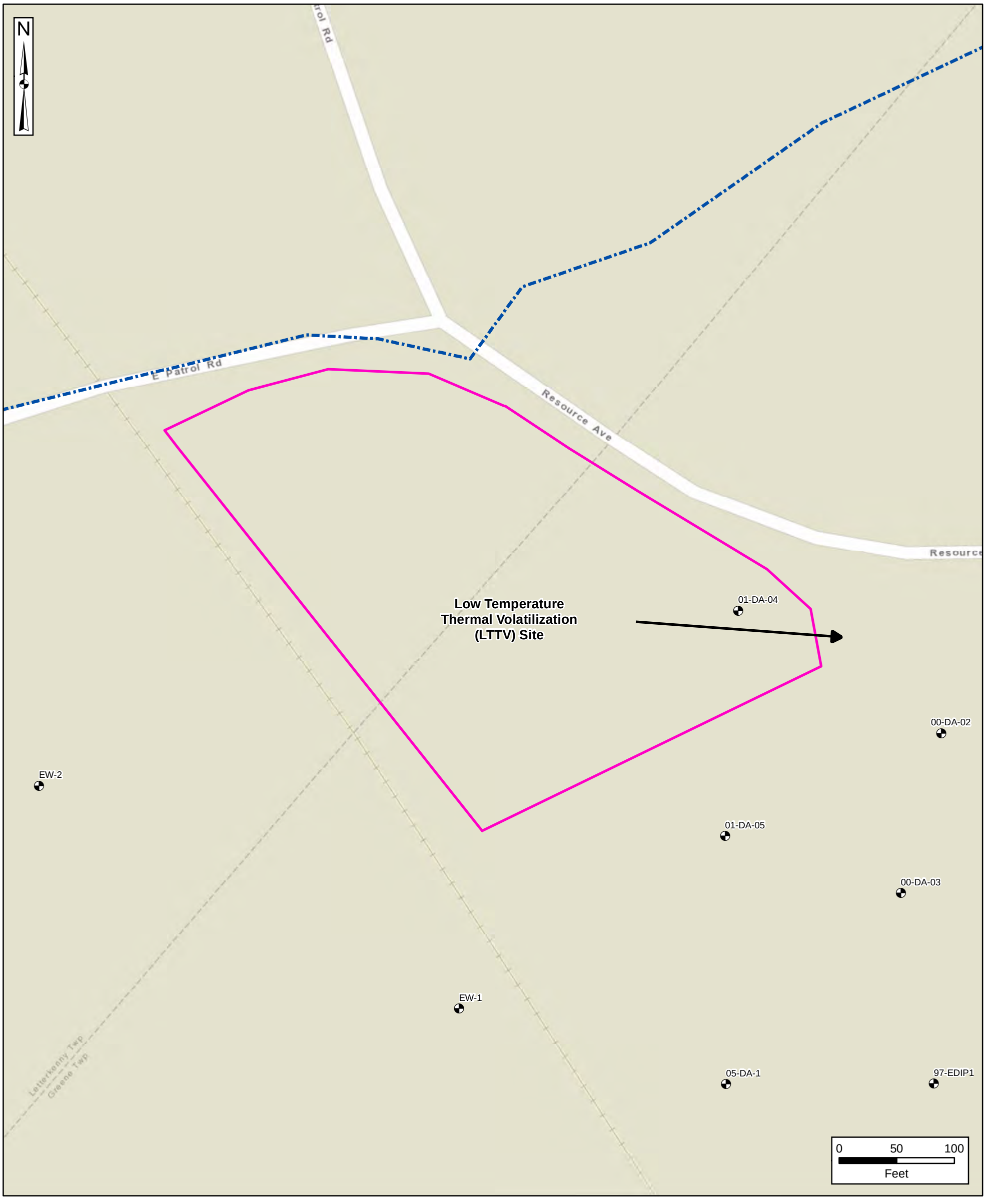
AOPI = area of potential interest
AFFF = aqueous film-forming foam
IWTP = Industrial Waste Treatment Plant

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 5-14
Low Temperature Thermal Volatilization (LTTV) Site AOPI



Installation Boundary
AOPI
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well

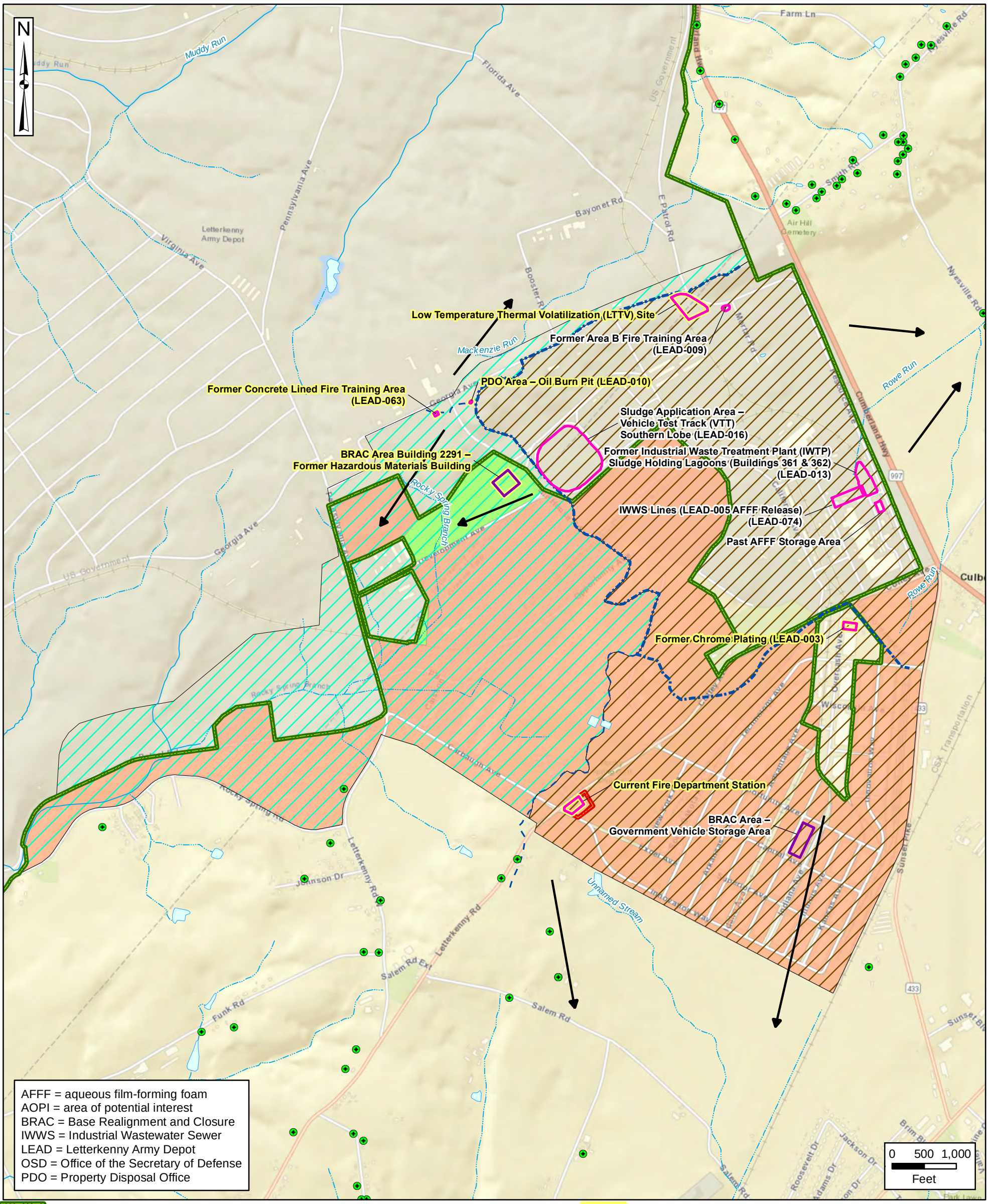
AOPI = area of potential interest
LEAD = Letterkenny Army Depot

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-1
AOPIs with OSD
Risk Screening Level Exceedances



- Installation Boundary
- Area Operated By Army Under Lease
- AOPI
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Groundwater Flow Direction
- Major Groundwater/ Surface Water Divide
- Minor Groundwater/ Surface Water Divide
- Property Disposal Office (PDO) Area
- Southeast (SE) Area
- Drinking Water Well
- AOPI with OSD Risk Screening Level Exceedance
- BRAC Area

BRAC Parcels

- Phase VIII (Transfer Planned)
- Other BRAC Parcel

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
PaGWIS, Well Data, 2019;
USGS, NHD Data, 2019;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-2
Former Area B Fire Training Area (LEAD-009) AOPI
PFOS, PFOA, and PFBS Analytical Results

N

LEAD-AREA-B-FTA-1-SO	
Date	11/09/2020
Depth	0-2 ft
PFBS	0.0023 U
PFOA	0.00070 U
PFOS	0.00070 U

LEAD-AREA-B-FTA-2-SO	
Date	11/09/2020
Depth	0-2 ft
PFBS	0.0022 U [0.0022 U]
PFOA	0.00067 U [0.00065 U]
PFOS	**0.00071 [0.00050 J]**

LEAD-94-17-OBP	
Date	11/09/2020
PFBS	**1.2 JM [1.2 JM]**
PFOA	**2.5 M [2.0 M]**
PFOS	**6.1 [5.7]**

00-AH-1
01-AH-3
00-DA-01
96-DA-14
00-DA-02
00-DA-03
96-DA-15
97-EDIP1
95-DA-5
96-DA-3
96-DA-11
96-DA-9
82-4
05-DA-3
OW-7-2
EDIP4
95-DA-7
OW-7-1
96-DA-16
96-DA-12
OW-10-3
OW-10-1
OW-10-6
96-DA-10
OW-10-4
OW-10-5
OW-10-2
OW-8-2
95-DA-8
OW-8-1
96-DA-5
PW-6
98-DAIP-3
95-DA-1
98-DAIP-1
99-DAIP-4
96-DA-13
PW-2
OW-6-1
95-DA-6
OW-6-2
98-EDIP-3

Resource Ave
Mortar Rd
Letterkenny Army Depot

Former Area B Fire Training Area (LEAD-009)

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
JM = The limit of quantitation (LOQ) is approximate and may be inaccurate or imprecise.
M = Manually integrated compound.
U = The analyte was analyzed for, but was not detected above the LOQ.

0 50 100
Feet

Installation Boundary
AOPI
Suspected AFFF Release Area
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
ft = feet
LEAD = Letterkenny Army Depot
OBP = Oil Burn Pit
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-3
PDO Area – Oil Burn Pit (LEAD-010) AOPI
PFOS, PFOA, and PFBS Analytical Results

N

Georgia Ave

81-5C
81-5
94PDO-09
04-PDO-1
03-PDO-5
PDO Area – Oil Burn Pit
(LEAD-010)
03-PDO-3
03-PDO-4
04-PDO-2
99-OBP-1

LEAD-04-PDO-3	
Date	11/03/2020
PFBS	**9.3 M**
PFOA	**33 M**
PFOS	**400 D**

05-TBR-1
04-SE-1
Scale House Rd
04-PDO-4
04-PZ-1
04-PDO-5
95PDO-PZ-6
03-PZ-1
05-OTL-1

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.
3. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
D = The reported value is from a dilution.
M = Manually integrated compound.

0 50 100
Feet

Installation Boundary
AOPI
Suspected AFFF Release Area
Major Groundwater/Surface Water Divide
Minor Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Groundwater Sampling Location

AFFF = aqueous film forming foam
AOPI = area of potential interest
LEAD = Letterkenny Army Depot
PDO = Property Disposal Office
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-4
Former Concrete Lined Fire Training Area (LEAD-063) AOPI
PFOS, PFOA, and PFBS Analytical Results

N

81-5

94-PDO-03

Georgia Ave

17-PDO-2

Former Concrete Lined
Fire Training Area (LEAD-063)

17-PDO-1

Scale House Rd

17-PDO-5

04-PZ-1

LEAD-CRTE-FTA-1-SO	
Date	11/05/2020
Depth	0-2 ft
PFBS	0.0021 U [0.0021 U]
PFOA	**0.00068 M** [0.00062 U]
PFOS	**0.052 [0.0011]**

LEAD-CRTE-FTA-2-SO	
Date	11/05/2020
Depth	0-2 ft
PFBS	0.0021 U
PFOA	0.00064 U
PFOS	**0.0020**

17-PDO-4

95PDO-PZ-6

LEAD-17-PDO-3	
Date	11/05/2020
PFBS	**79**
PFOA	**74 M**
PFOS	**1,000 D**

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
D = The reported value is from a dilution.
M = Manually integrated compound.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

0 50 100
Feet

Installation Boundary
AOPI
Suspected AFFF Release Area
Minor Groundwater/Surface Water Divide
Groundwater Flow Direction

Monitoring Well
Soil Sampling Location
Groundwater Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019;
Weston, Letter Report for 2017 Sampling Results for PFAS at PDO OU 4, Well Locations, 2018;
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-5
IWWS Lines (LEAD-005 AFFF Release)
(LEAD-074) AOPI
PFOS, PFOA, and PFBS Analytical Results

LEAD-IWWS-2-SO	
Date	11/03/2020
Depth	11.5-13.5 ft
PFBS	0.0026 U
PFOA	0.00077 U
PFOS	0.00077 U

LEAD-IWWS-3-SO	
Date	11/03/2020
Depth	11.5-13.5 ft
PFBS	0.0023 U
PFOA	0.00070 U
PFOS	0.00070 U

LEAD-94-320-2	
Date	11/03/2020
PFBS	1.8 U
PFOA	**2.7 M**
PFOS	**9.8**

LEAD-IWWS-1-SO	
Date	11/03/2020
Depth	11.5-13.5 ft
PFBS	0.0026 U
PFOA	0.00079 U
PFOS	0.00079 U

LEAD-94-350-2	
Date	11/03/2020
PFBS	**6.5**
PFOA	**7.1 M**
PFOS	**13**

IWTP Former Sludge Holding Lagoons

IWWS Lines (LEAD-005 AFFF Release) (LEAD-074)

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.

Qualifiers:
M = Manually integrated compound.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

0 50 100
Feet

Installation Boundary
AOPI
Suspected AFFF Release Area
Historical Building Footprint
Stream (Intermittent)
Groundwater Flow Direction
IWTP Outfall
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
ft = feet
IWWS = Industrial Wastewater Sewer
IWTP = Industrial Waste Treatment Plant
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-6
Current Fire Department Station AOPI
PFOS, PFOA, and PFBS Analytical Results

LEAD-B521-3-SO	
Date	11/04/2020
Depth	0-2 ft
PFBS	0.0022 U
PFOA	0.00067 U
PFOS	**0.038**

LEAD-B521-1-SO	
Date	11/04/2020
Depth	0-2 ft
PFBS	0.0023 U
PFOA	0.00068 U
PFOS	**0.015**

LEAD-B521-4-SO	
Date	11/04/2020
Depth	0-2 ft
PFBS	0.0021 U
PFOA	0.00062 U
PFOS	**0.030**

Current Fire Department Station

LEAD-B521-GW-01	
Date	3/22/2022
PFBS	**0.97 J [1.0 J]**
PFOA	1.7 U [1.7 U]
PFOS	1.7 U [1.7 U]

LEAD-B521-2-SO	
Date	11/04/2020
Depth	0-2 ft
PFBS	0.0022 U
PFOA	0.00067 U
PFOS	**0.039**

LEAD-B521-GW-02	
Date	3/21/2022
PFBS	**3.6**
PFOA	**110**
PFOS	**5.1**

LEAD-B521-1-SW	
Date	11/04/2020
PFBS	1.6 U
PFOA	1.6 U
PFOS	1.6 U

LEAD-B521-1-SE	
Date	11/04/2020
Depth	0-1 ft
PFBS	0.0026 U [0.0026 U]
PFOA	0.00077 U [0.00078 U]
PFOS	**0.0033 [0.0043]**

Current Fire Department Station
Stormwater Outlet Pond /
AFFF Release Area

LEAD-93-SE-04	
Date	01/25/2022
PFBS	**1.4 J**
PFOA	**1.5 J**
PFOS	**26 J**

Notes:
1. Surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil and sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
DPT = direct push technology
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 100 200
Feet

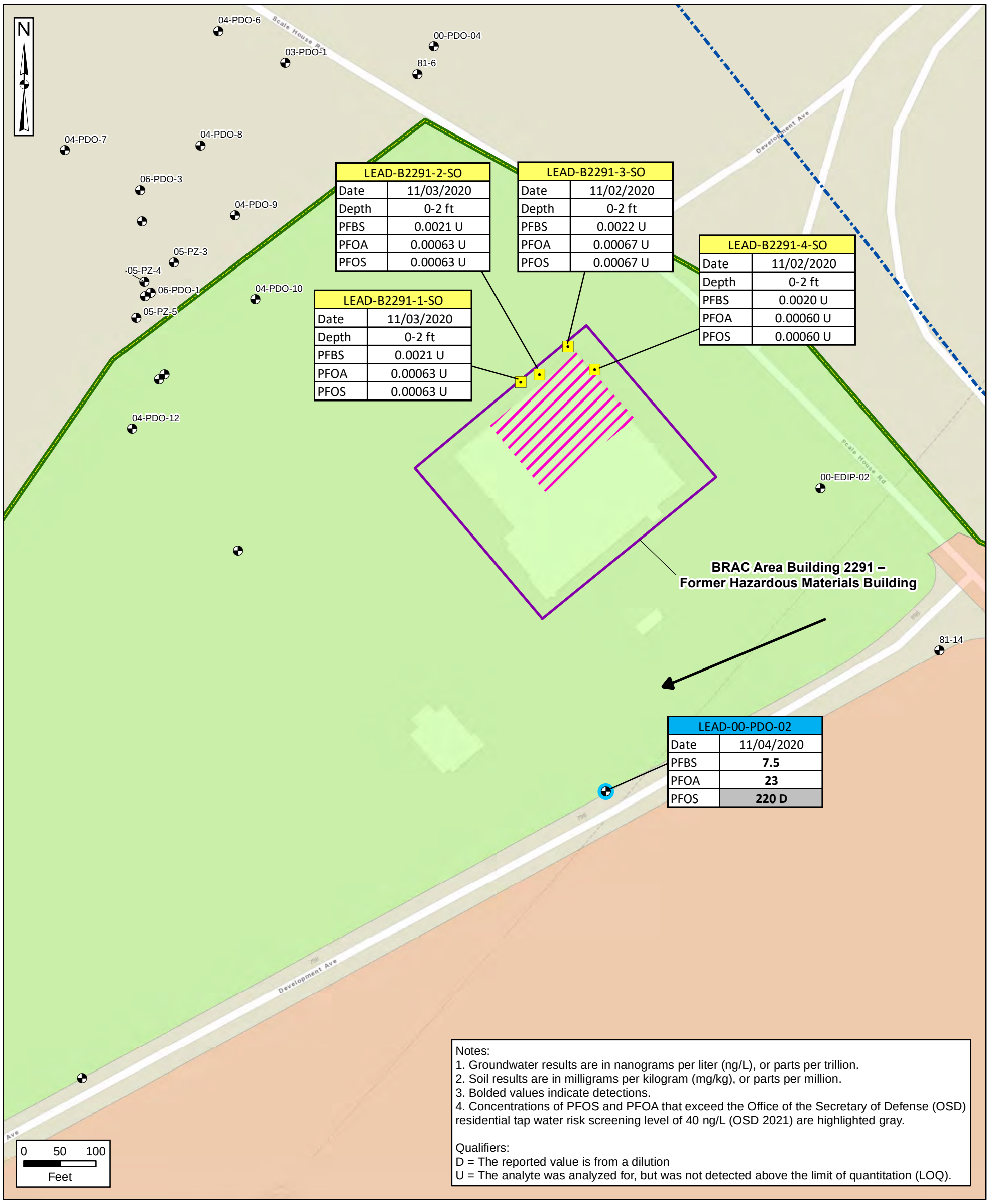
Installation Boundary
Area Operated By Army Under Lease
AOPI
Suspected AFFF Release Area
Stream (Intermittent)
Water Body
Minor Groundwater/Surface Water Divide
Groundwater Flow Direction
Storm Sewer
Soil Sampling Location
Surface Water/Sediment Sampling Location
Groundwater Sampling Location - DPT Boring
Low Flow Groundwater Sampling Location (Well)
BRAC Parcel

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-7
BRAC Area Building 2291 – Former Hazardous Materials Building PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
D = The reported value is from a dilution
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

- Installation Boundary
- BRAC Area
- Suspected AFFF Release Area
- Major Groundwater/Surface Water Divide
- Groundwater Flow Direction
- Monitoring Well
- Soil Sampling Location
- Groundwater Sampling Location

BRAC Parcels
- Phase VIII (Transfer Planned)
- Other BRAC Parcel

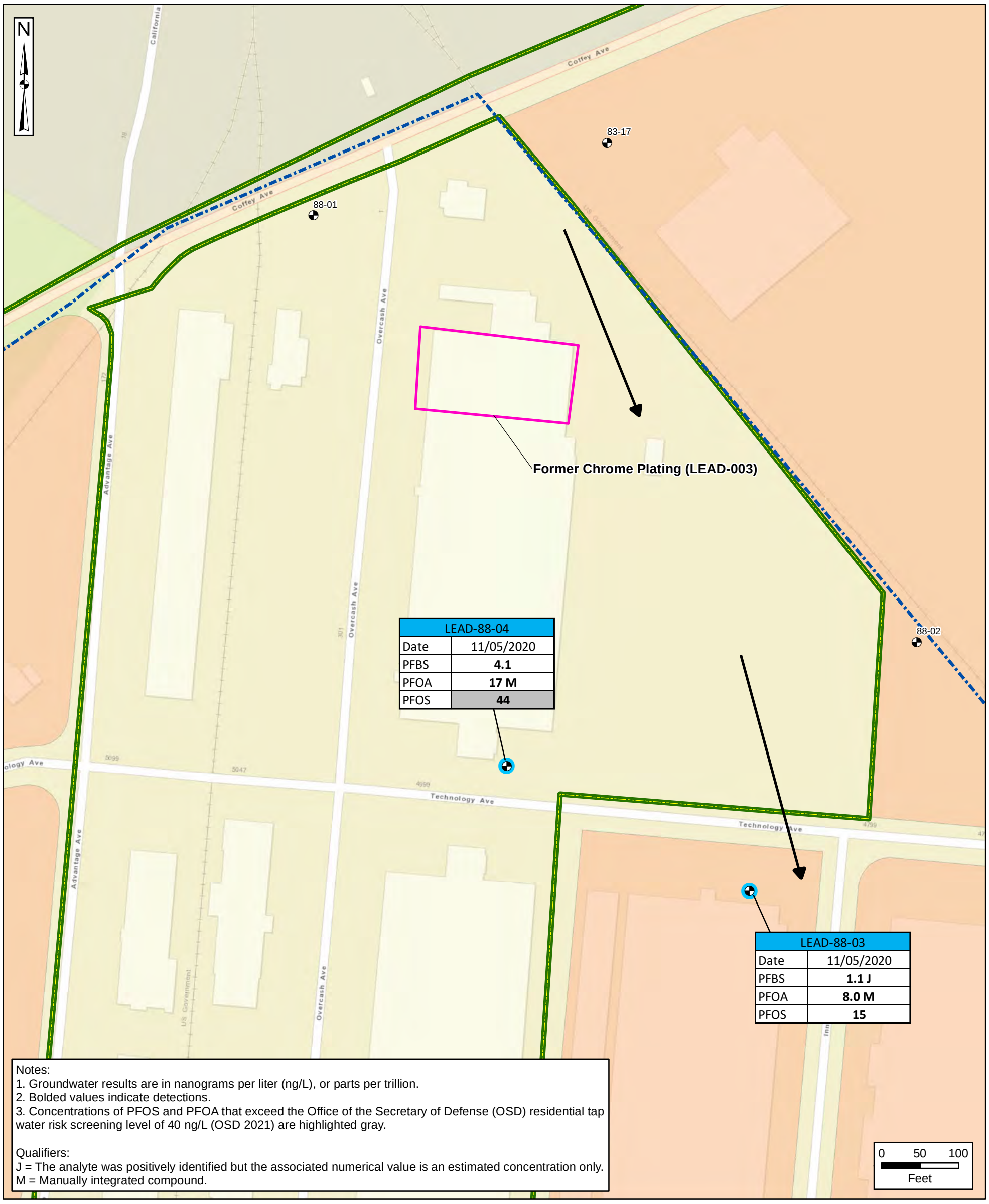
AFFF = aqueous film-forming foam
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-8
Former Chrome Plating (LEAD-003) AOPI
PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.
3. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified but the associated numerical value is an estimated concentration only.
M = Manually integrated compound.

Installation Boundary
AOPI*
BRAC Parcel
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Groundwater Sampling Location

*Approximate Location of Chromium Plating Activities

AOPI = area of potential interest
BRAC = Base Realignment and Closure
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-9
Former Industrial Waste Treatment Plant (IWTP) Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) AOPI
PFOS, PFOA, and PFBS Analytical Results

LEAD-GWTS-OUTFALL-SW	
Date	11/06/2020
PFBS	**1.2 JM [3.2 J]**
PFOA	**88 M [87 M]**
PFOS	**53 J- [54 J-]**

LEAD-96-NSIA-2	
Date	01/26/2022
PFBS	**1.7 UJ [0.95 J]**
PFOA	**1.5 J [1.7 J]**
PFOS	**8.3 J [11 J]**

LEAD-GWTS-OUTFALL-SE	
Date	11/06/2020
Depth	0-1 ft
PFBS	0.0024 U
PFOA	**0.0019**
PFOS	**0.022**

LEAD-TW-3	
Date	11/04/2020
PFBS	**1.1 JM**
PFOA	**23**
PFOS	**15**

LEAD-IWTP-OUTFALL-SE	
Date	11/06/2020
Depth	0-1 ft
PFBS	0.0022 U
PFOA	0.00065 U
PFOS	**0.00049 J**

LEAD-TW-2	
Date	11/05/2020
PFBS	**1.3 J**
PFOA	**19 M**
PFOS	**15**

LEAD-TW-4	
Date	11/09/2020
PFBS	**1.2 JM**
PFOA	**17**
PFOS	**14**

GWTP Outfall
IWTP Outfall
Rowe Run
Cumberland Hwy
East Patrol Road
Former Industrial Waste Treatment Plant (IWTP) Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013)

Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
J- = The result is an estimated quantity; the result may be biased low.
M = Manually integrated compound.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

0 50 100
Feet

Installation Boundary
AOPI
AFFF Release Area
Stream (Intermittent)
IWTP Outfall
Groundwater Flow Direction
Monitoring Well
Sediment Sampling Location
Surface Water/Sediment Sampling Location
Groundwater Sampling Location
Low Flow Groundwater Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
GWTS = Groundwater Treatment System
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-10
Sludge Application Area – Vehicle Test Track (VTT)
Southern Lobe AOPI (LEAD-016)
PFOS, PFOA, and PFBS Analytical Results

LEAD-CVTT-1-SO	
Date	11/06/2020
Depth	0-2 ft
PFBS	0.0021 U
PFOA	0.00063 U
PFOS	**0.0015**

LEAD-CVTT-2-SO	
Date	11/06/2020
Depth	0-2 ft
PFBS	0.0023 U
PFOA	0.00068 U
PFOS	**0.0072**

LEAD-EW-10	
Date	11/06/2020
PFBS	1.8 U
PFOA	**2.1 M**
PFOS	**14**

LEAD-CVTT-3-SO	
Date	11/06/2020
Depth	0-2 ft
PFBS	0.0024 U
PFOA	0.00073 U
PFOS	**0.0074**

95PDO-03
EW-9
00-PDO-01
00-EDIP-02
81-14
03-SE-1
Sludge Application Area –
Vehicle Test Track (VTT)
Southern Lobe (LEAD-016)
Scale House Rd
Development Ave
Letterkenny Twp
Guilford Twp
0 50 100
Feet

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.

Qualifiers:
M = Manually integrated compound.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

Installation Boundary
AOPI*
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location

BRAC Parcels
Phase VIII (Transfer Planned)
Other BRAC Parcel

*Approximate Area of WWTP Sludge Application

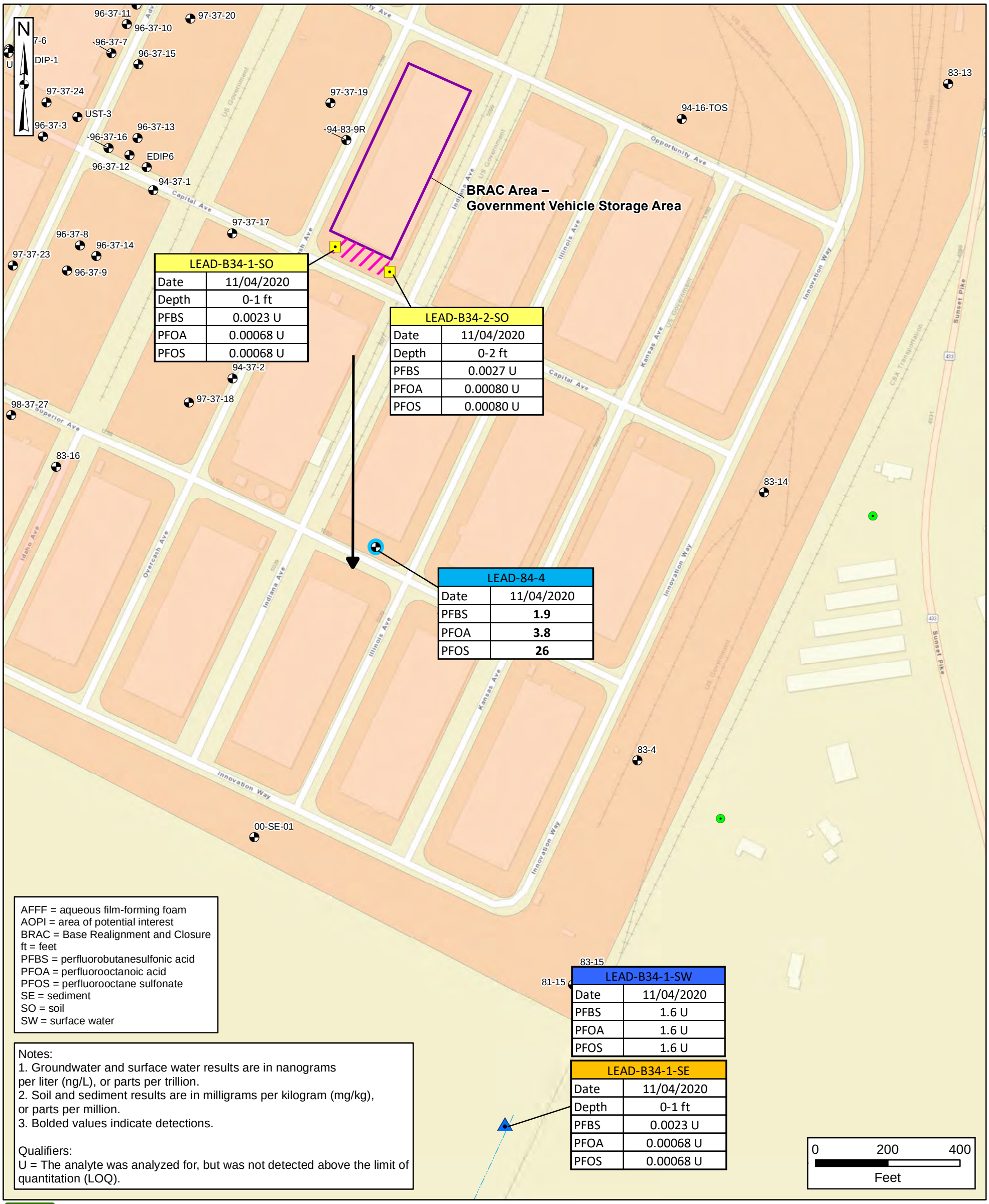
AOPI = area of potential interest
BRAC = Base Realignment and Closure
ft = feet
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
WWTP = Wastewater Treatment Plant
SO = soil

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-11
BRAC Area – Government Vehicle Storage Area
PFOS, PFOA, and PFBS Analytical Results



AFFF = aqueous film-forming foam
AOPI = area of potential interest
BRAC = Base Realignment and Closure
ft = feet
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SE = sediment
SO = soil
SW = surface water

Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil and sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.

Qualifiers:
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

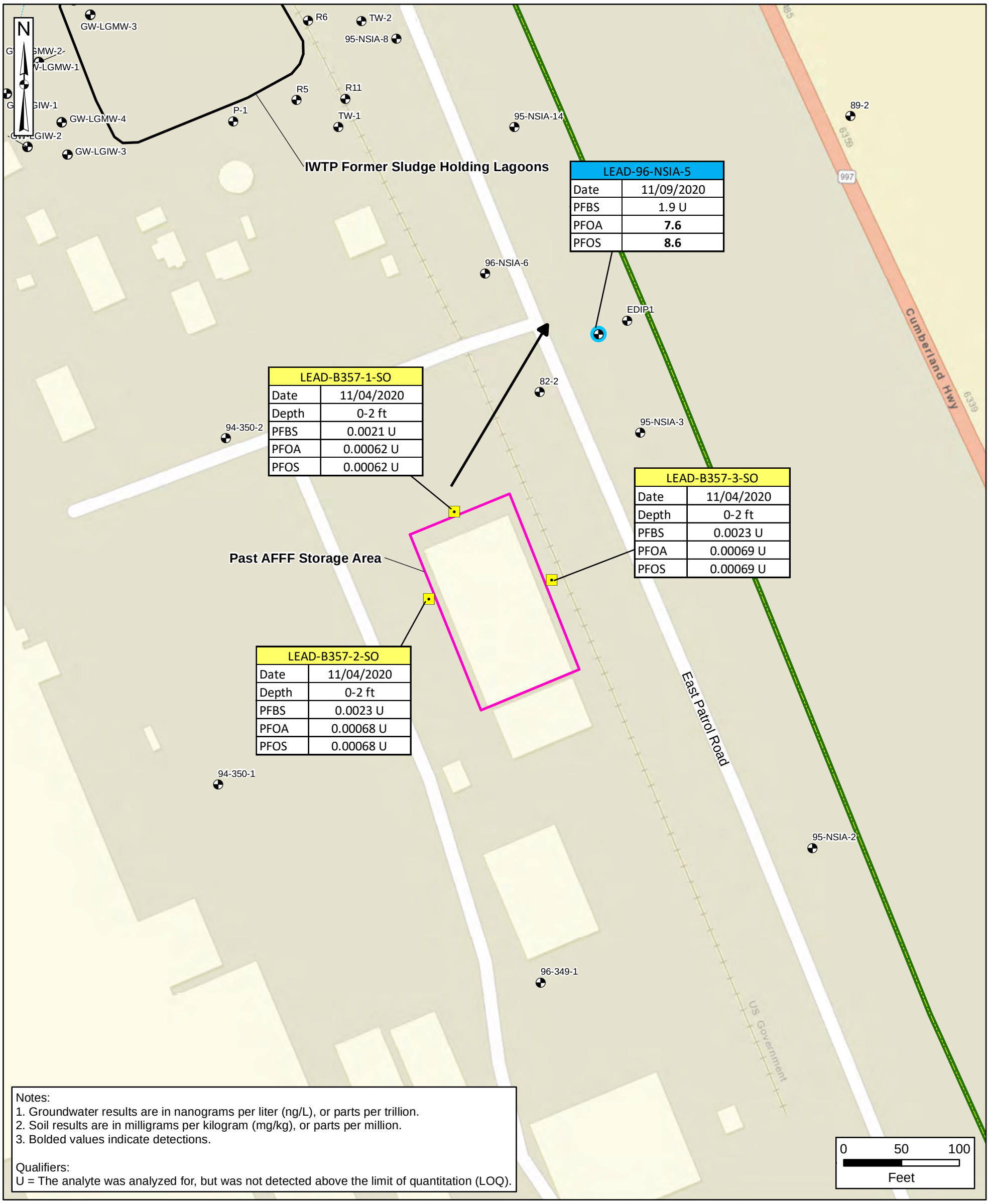
- Installation Boundary
- BRAC Area
- AFFF Release Area
- BRAC Parcel
- Stream (Intermittent)
- Groundwater Flow Direction
- Monitoring Well
- Residential Well
- Surface Water/Sediment Sampling Location
- Soil Sampling Location
- Groundwater Sampling Location

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-12
Past AFFF Storage Area AOPI
PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.

Qualifiers:
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

Installation Boundary
AOPI
Stream (Intermittent)
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location

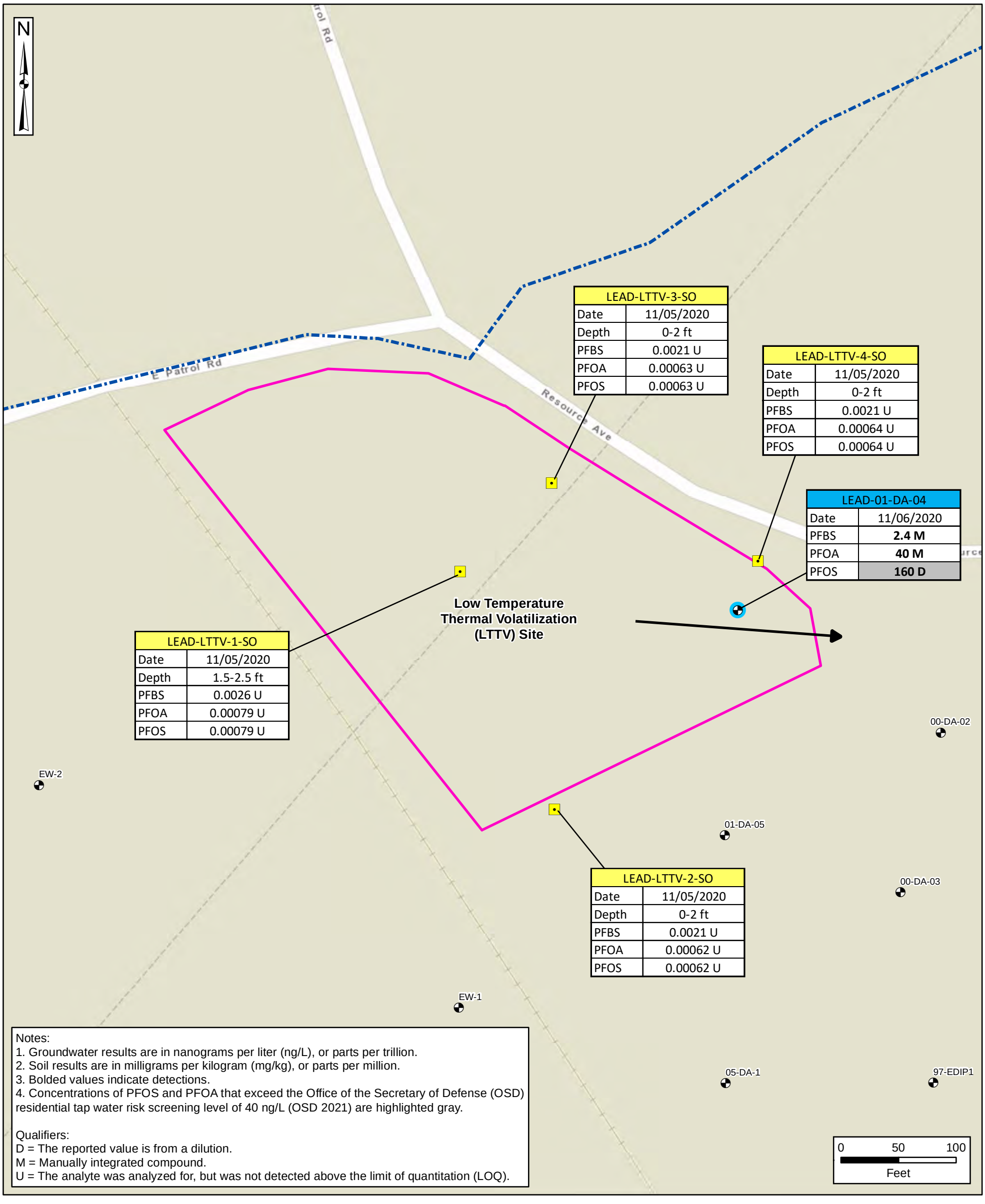
AFFF = aqueous film-forming foam
AOPI = area of potential interest
ft = feet
IWTP = Industrial Waste Treatment Plant
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment/Site Inspection
Letterkenny Army Depot, PA

Figure 7-13
Low Temperature Thermal Volatilization (LTTV) Site AOPI
PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

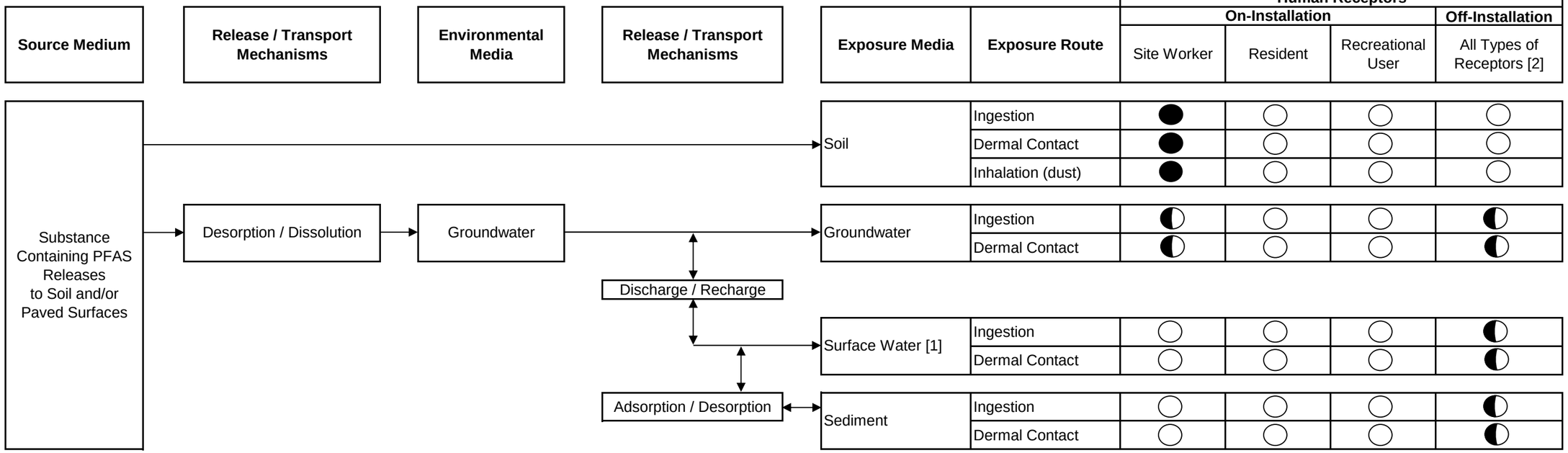
Qualifiers:
D = The reported value is from a dilution.
M = Manually integrated compound.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

Installation Boundary
AOPI
Major Groundwater/Surface Water Divide
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location

AOPI = area of potential interest
ft = feet
LEAD = Letterkenny Army Depot
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Letterkenny Army Depot, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North



Legend:

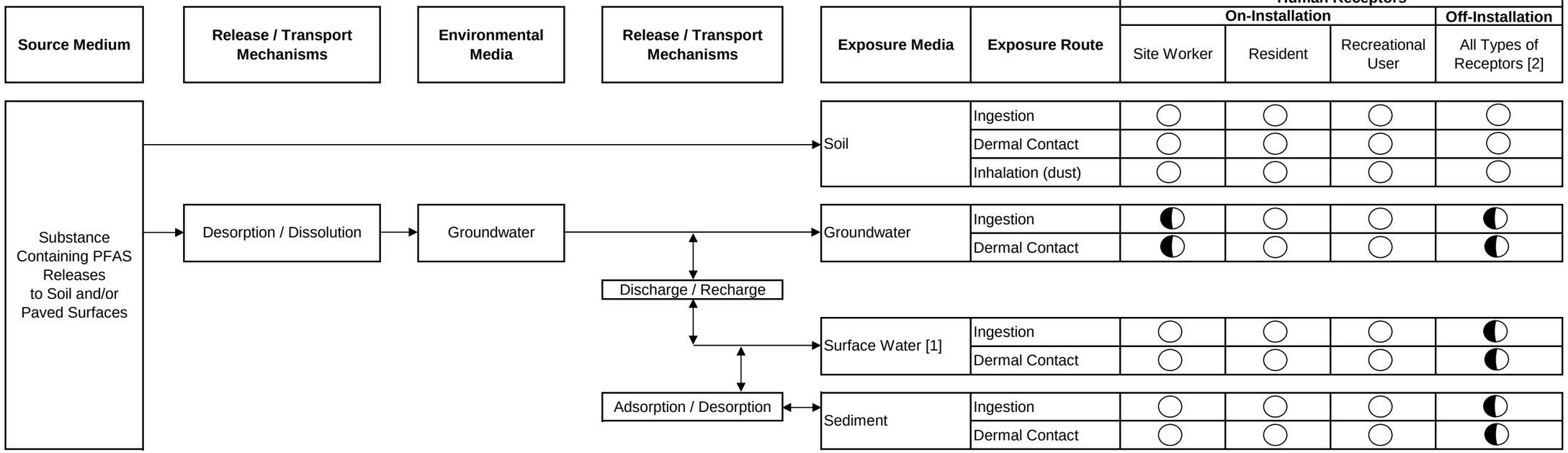
- = Complete Exposure Pathway
- = Potentially Complete Exposure Pathway
- = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest
PFAS= per- and polyfluoroalkyl substances

ARCADIS

Conceptual Site Model for Former Area B Fire Training Area (LEAD-009) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection

Figure 7-14



Legend:

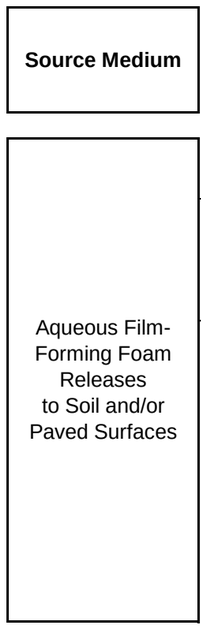
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

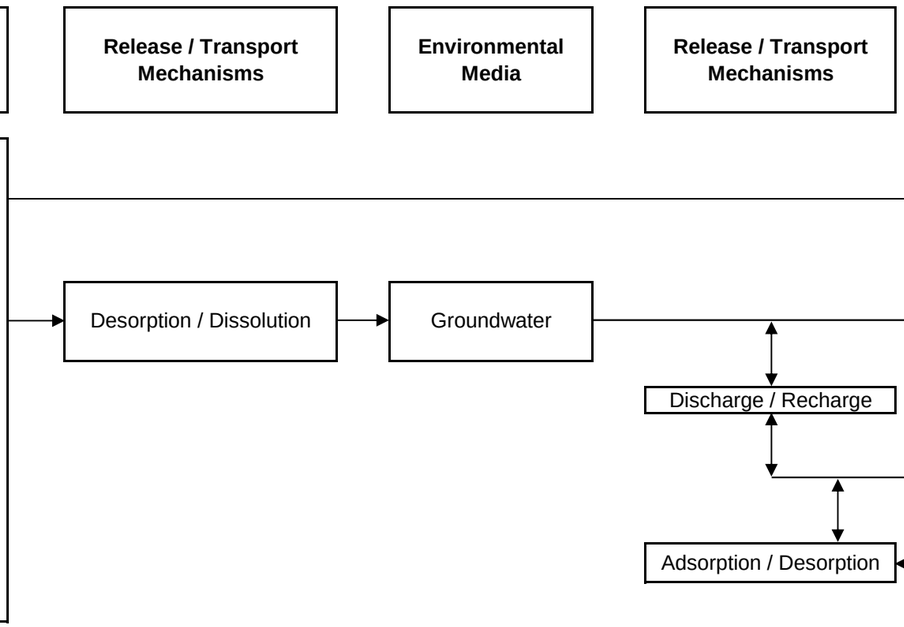
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF= aqueous film-forming foam
AOPI= area of potential interest
PFAS= per- and polyfluoroalkyl substances

ARCADIS

Conceptual Site Model for Past AFFF Storage Area and Low Temperature Thermal Volatilization (LTTV) Site AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection

Figure 7-15





Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	On-Installation: Resident	On-Installation: Recreational User	Off-Installation: All Types of Receptors [2]
Soil	Ingestion	●	○	○	○
	Dermal Contact	●	○	○	○
	Inhalation (dust)	●	○	○	○
Groundwater	Ingestion	◐	○	○	◐
	Dermal Contact	◐	○	○	◐
Surface Water [1]	Ingestion	○	○	◐	◐
	Dermal Contact	○	○	◐	◐
Sediment	Ingestion	○	○	◐	◐
	Dermal Contact	○	○	◐	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest
PDO = Property Disposal Area

ARCADIS

Conceptual Site Model for PDO Area - Oil Burn Pit (LEAD-010) and Former Concrete Lined Fire Training Area (LEAD-063) AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-16

Source Media	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	On-Installation: Resident	On-Installation: Recreational User	Off-Installation: All Types of Receptors [2]
Aqueous Film-Forming Foam or Chrome Plating Wastes Released to Industrial Sewer Line System with Known Fractures				Subsurface Soil	Ingestion	○	○	○	○
					Dermal Contact	○	○	○	○
					Inhalation (dust)	○	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	◐
					Dermal Contact	◐	○	○	◐
			Discharge / Recharge						
				Surface Water [1]	Ingestion	○	○	○	◐
					Dermal Contact	○	○	○	◐
			Adsorption / Desorption	Sediment	Ingestion	○	○	○	◐
					Dermal Contact	○	○	○	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

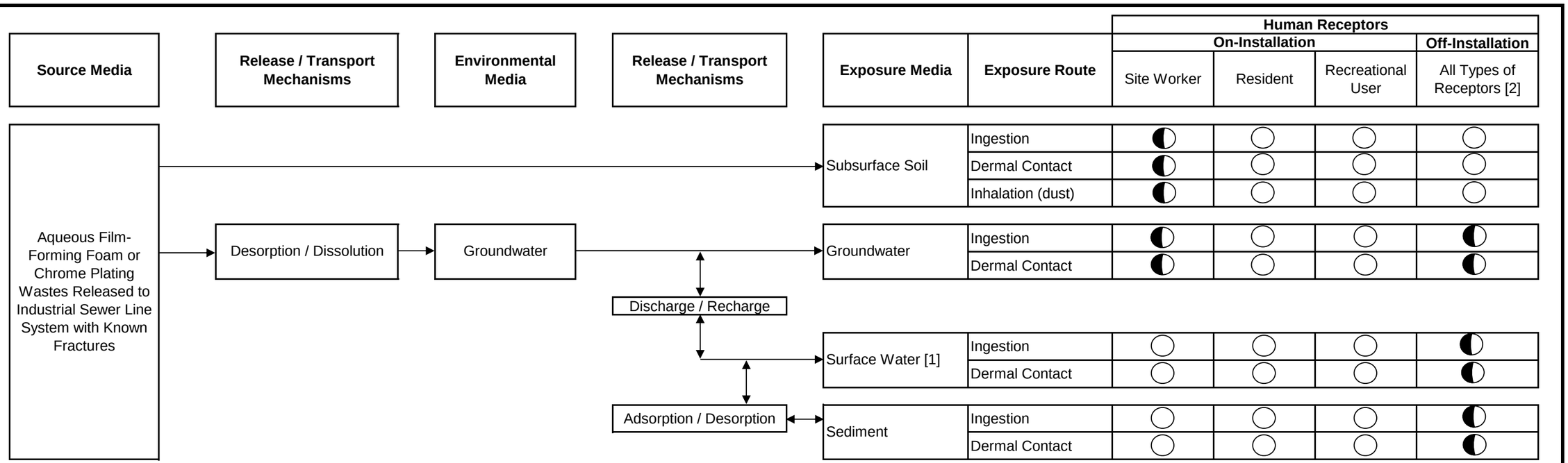
○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest

ARCADIS

Conceptual Site Model for Industrial Wastewater Sewer (IWWS) Lines (LEAD-005 AFFF Release) (LEAD-074) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-17



Legend:

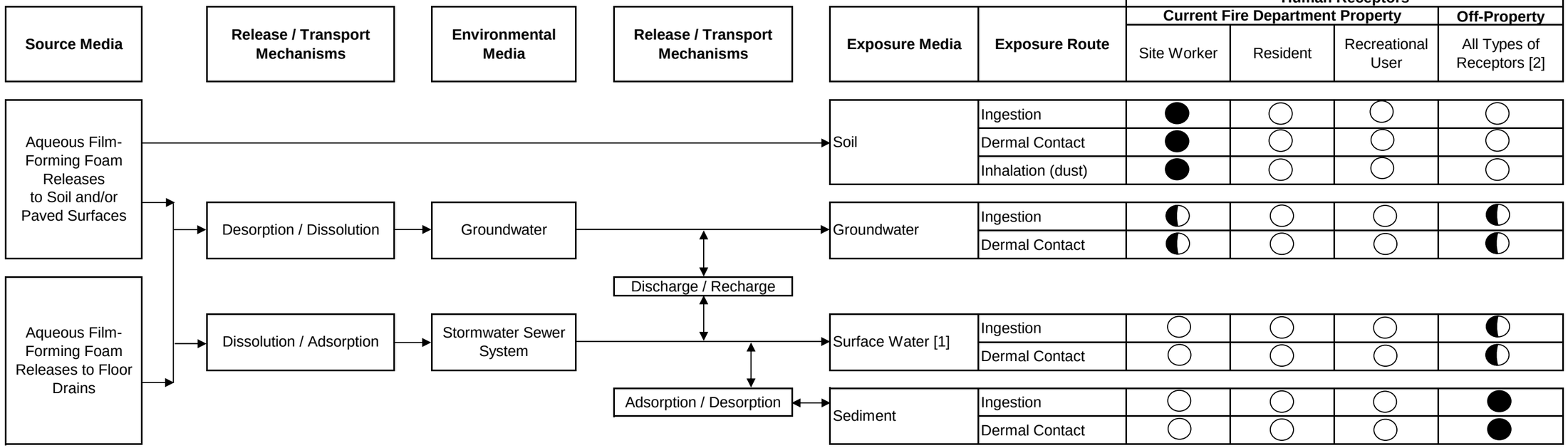
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest

ARCADIS

Conceptual Site Model for Former Chrome Plating (LEAD-003) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-18



Legend:

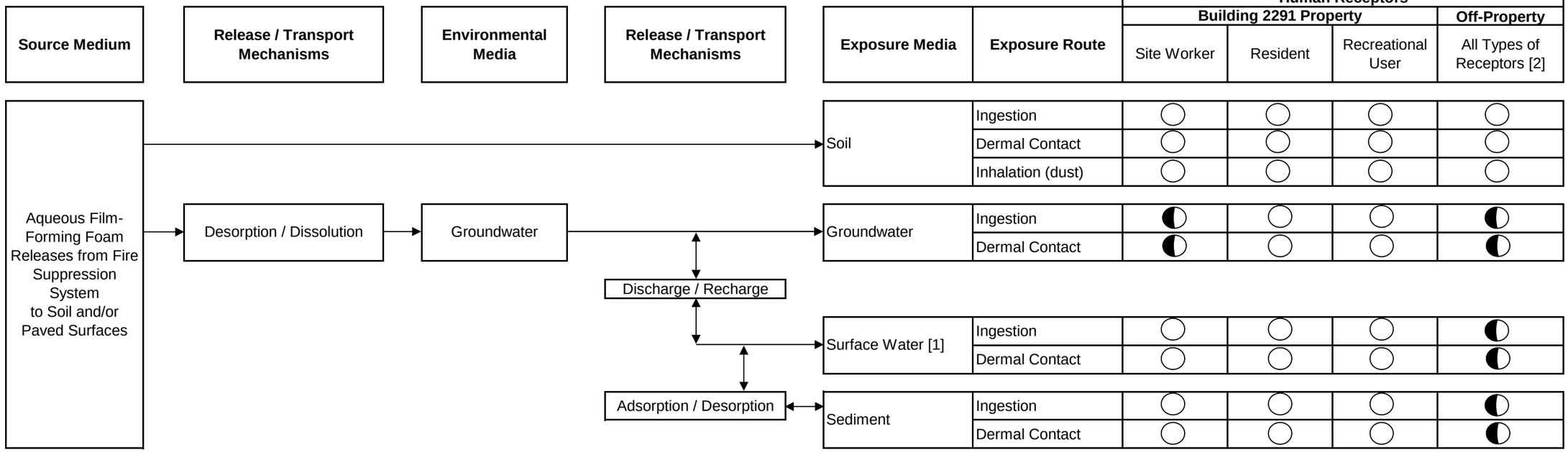
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI = area of potential interest

ARCADIS

Conceptual Site Model for Current Fire Department Station AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-19



Legend:

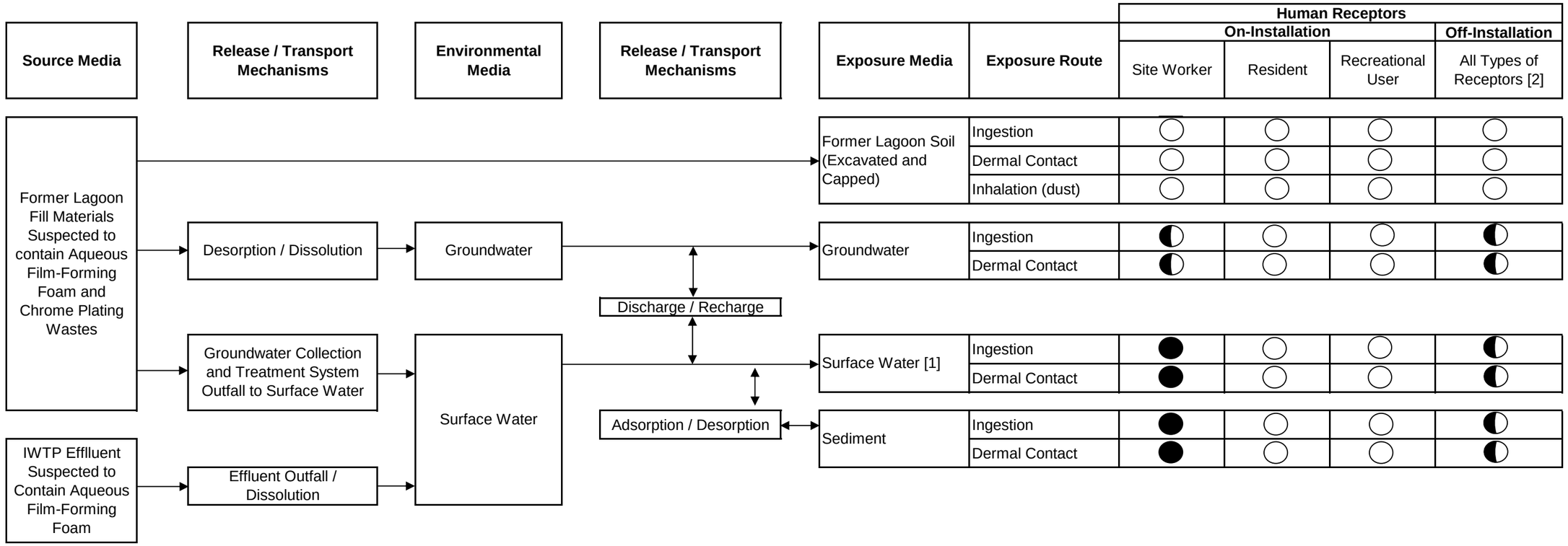
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

ARCADIS

Conceptual Site Model for Base Realignment and Closure (BRAC) Area Building 2291 - Former Hazardous Materials Building
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-20



Legend:

- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest

ARCADIS

Conceptual Site Model for Former Industrial Waste Treatment Plant (IWTP) Sludge Holding Lagoons (Buildings 361 & 362) (LEAD-013) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection

Figure 7-21

Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	On-Installation: Resident	On-Installation: Recreational User	Off-Installation: All Types of Receptors [2]
IWTP Sludge Suspected to be impacted with Aqueous Film-Forming Foam land-applied to this area.				Soil	Ingestion	●	○	○	○
					Dermal Contact	●	○	○	○
					Inhalation (dust)	●	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	◐
					Dermal Contact	◐	○	○	◐
			Discharge / Recharge	Surface Water [1]	Ingestion	○	○	○	◐
					Dermal Contact	○	○	○	◐
			Adsorption / Desorption	Sediment	Ingestion	○	○	○	◐
					Dermal Contact	○	○	○	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

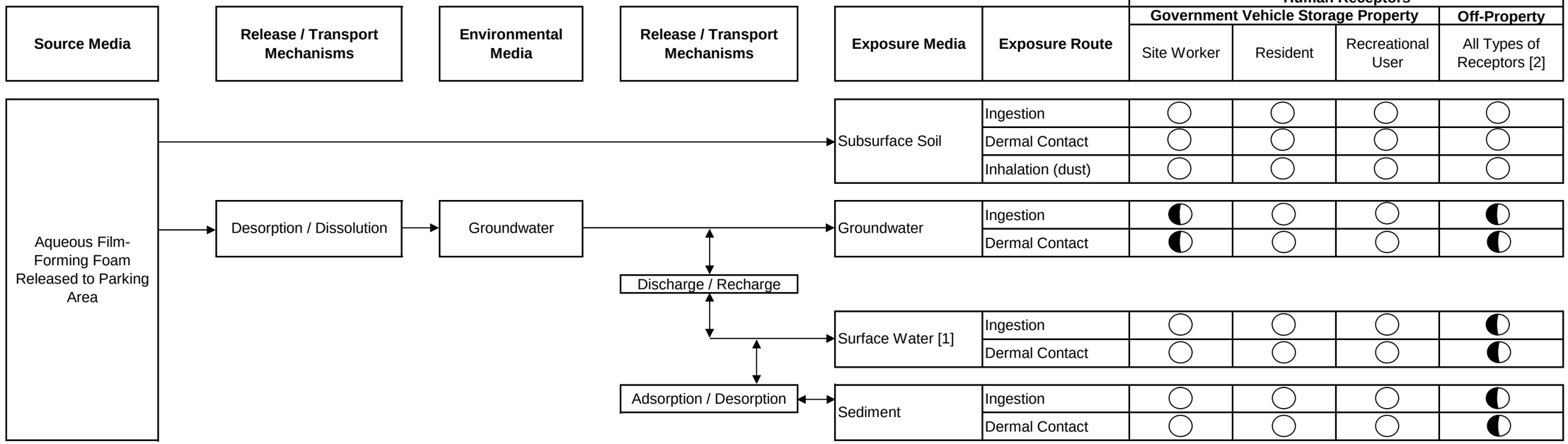
○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest
IWTP= industrial wastewater treatment plant

ARCADIS

Conceptual Site Model for Sludge Application Area - Vehicle Test Track (VTT) Southern Lobe (LEAD-016) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-22



Legend:

- = Complete Exposure Pathway
- = Potentially Complete Exposure Pathway
- = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI= area of potential interest

ARCADIS

Conceptual Site Model for Base Realignment and Closure (BRAC) Area - Government Vehicle Storage Area
USAEC PFAS Preliminary Assessment / Site Inspection
Letterkenny Army Depot (LEAD), Pennsylvania

Figure 7-23

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