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

Anniston Army Depot, Alabama

Prepared For:
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EXECUTIVE SUMMARY

The United States (U.S.) 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 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 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. The PA/SI for Anniston Army Depot (ANAD) was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense policy and guidance.

ANAD is located in Calhoun County in northeastern Alabama, approximately 110 miles west of Atlanta, Georgia and 50 miles east of Birmingham, Alabama. The City of Anniston is located 10 miles east of ANAD. The depot is surrounded by a series of small communities clustered primarily along the southern and eastern boundaries and is bordered to the north by the Pelham Range portion of the former Fort McClellan Military Reservation. ANAD encompasses 15,357 acres. The central and northern portion of ANAD includes over 13,000 acres containing ammunition storage bunkers in an area identified as the ammunition storage area. Industrial facilities are located in the area identified as the Southeast Industrial Area. A cantonment area, located on the south-central border in the Western Industrial Area, contains the administrative areas, warehouses, and small shops.

The ANAD PA identified nine AOPIs for investigation during the SI phase. SI sampling results from the nine 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 soil and/or groundwater at eight AOPIs; five of the eight AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the OSD risk-based screening levels. The ANAD 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 for each AOPI.

Table ES-1. Summary of AOPIs Identified During the PA, PFOS, PFOA, and PFBS Sampling at Anniston Army Depot, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)		Recommendation
	GW	SO	
Fire Station #1	Yes	No	Further study in a remedial investigation
Old Wastewater Treatment Plant / Fire Training Area	Yes	No	Further study in a remedial investigation

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)		Recommendation
	GW	SO	
Fire Department Burn Pit	Yes	No	Further study in a remedial investigation
Fire Training Ditch	Yes	No	Further study in a remedial investigation
Building 114 Fire	No	NS[1]	No action at this time
Fire Station #2	No	No	No action at this time
Old Industrial Wastewater Treatment Plants	No	ND	No action at this time
Old Sewage Treatment Plants	Yes	No	Further study in a remedial investigation
Building 632	NS[2]	ND	No action at this time

Notes:

1. No soil samples were proposed for the Building 114 Fire AOPI because the fluids used to extinguish the fire were confined to the building basement.
2. No groundwater samples were proposed for the Building 632 AOPI because it was used only for short-term, temporary storage of approximately 15 to 20 5-gallon AFFF pails and no spills were reported.

Light gray shading – detection greater than the OSD risk screening level
GW – groundwater
ND – non-detect
NS – not sampled
SO – soil

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 PAs/SIs 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 Anniston Army Depot (ANAD) PFAS PA/SI included two distinct efforts. The PA identified locations that are areas of potential interest (AOPIs) at ANAD 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 a release has occurred, and comparison of the PFOS, PFOA, and PFBS results 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 summarizes the PA/SI for ANAD 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 and Regulatory Council 2020a). 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 2016a). 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 memorandum, on April 8, 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 (OSD 2021). 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 and SI were 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 a site reconnaissance. The ANAD PA was conducted to 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 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 ANAD, 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 ANAD. 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), ANAD, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 13 December 2018, approximately 6 weeks before the site visit, 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 ANAD.

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 operation order
- The Army PA Operations Security requirements package, which includes the antiterrorism/operations security review cover sheet
- The PFAS PA kickoff call minutes
- An information paper on the PA portion of the Army's PFAS PA/SI program
- Contact information for key program 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 from 28 to 29 January 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 of ANAD. The interviews focused on confirming information discussed in historical documents, collecting information that may not have been included in historical documents, and corroborating other interviewees' information.

The 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 distance to the installation boundary. Access to existing groundwater monitoring wells, if present, was 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 29 January 2019 with the installation and USAEC 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 the 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 served as the basis for developing the SI scope of work presented in an installation-specific Quality Assurance Project Plan (QAPP) Addendum (Arcadis 2020a).

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 to determine whether further investigation is warranted. First, an SI kickoff teleconference was held between the Army PA team and ANAD personnel.

The objectives of the SI kickoff teleconference were to:

- discuss the AOPIs selected for sampling and the proposed sampling plan for each AOPI
- gauge regulatory involvement requirements or preferences
- identify specific installation access requirements and potential schedule conflicts
- 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 to obtain concurrence on the SI sampling plan from USAEC, USACE, and the installation. Additional discussion topics included:

- confirm regulatory involvement requirements or preferences
- identify overlapping unexploded ordnance or cultural resource areas
- confirm the plan for investigation-derived waste (IDW) handling and disposal
- confirm 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 program (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 of the program 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 (Arcadis 2020a). 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 (Arcadis 2020b). 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 SI field work was completed in accordance with the PQAPP (Arcadis 2019) and the approved installation-specific QAPP Addendum.

The DQOs, sampling design and rationale, and field methods employed for the SI are summarized from the QAPP Addendum developed for ANAD (Arcadis 2020a) 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 that 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) 5.3 (DoD and Department of Energy 2019). 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 ANAD, including the location and layout, the installation mission 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

ANAD is located in Calhoun County in northeastern Alabama, approximately 110 miles west of Atlanta, Georgia and 50 miles east of Birmingham, Alabama. The City of Anniston is located 10 miles east of ANAD (**Figure 2-1**). The depot is surrounded by a series of small communities clustered primarily along the southern and eastern boundaries and is bordered to the north by the Pelham Range portion of the former Fort McClellan Military Reservation. ANAD encompasses 15,357 acres. The central and northern portion of ANAD includes over 13,000 acres containing ammunition storage bunkers in an area identified as the ammunition storage area. Industrial facilities are located in the area identified as the Southeast Industrial Area (SIA). A cantonment area, located on the south-central border in the Western Industrial Area (WIA), contains the administrative areas, warehouses, and small shops (**Figure 2-2**).

2.2 Mission and Brief Site History

ANAD was constructed and designated as the Anniston Ordnance Depot (AOD) in October 1941 and included ammunition storage igloos, warehouses, and administrative buildings. In 1942, the AOD expanded from its initial 10,040 acres to approximately 15,000 acres. The AOD was assigned a maintenance mission in 1952 for overhauling and repairing combat vehicles. This mission was subsequently expanded to cover the repair, overhaul, and modification of anti-aircraft and mobile artillery and various aspects of tank repair. In August 1962, the installation was renamed ANAD under the jurisdiction of the Army Materiel Command (AECOM 2018). The maintenance and storage of chemical munitions began in 1963. In August 1992, ANAD assumed the General Supply Mission by the Defense Distribution Depot, Anniston under the command of the Defense Logistics Agency (DLA). In 2003, the safe and secure destruction of the ANAD's obsolete stockpile of chemical munitions began at the Anniston Chemical Disposal Facility. This mission was completed in 2013.

ANAD is the designated Center of Industrial and Technical Excellence for combat vehicles, artillery, bridging systems, and small caliber weapons. ANAD is the only Army depot capable of performing maintenance and overhaul on both heavy and light-tracked combat vehicles and their components. Key tenants on the ANAD include the DLA and the Anniston Defense Munitions Center. The DLA receives, stores, and ships military equipment and materials and is also responsible for demilitarization and disposal of excess government equipment and materials. The Anniston Defense Munitions Center stores, maintains, and demilitarizes munitions (USAEC 2016).

2.3 Current and Projected Land Use

ANAD is divided into three main areas:

- Ammunition Storage Area (ASA): The ASA occupies more than 13,000 acres covering the entire central and northern portions of the depot. The ASA contains approximately 1,300 ammunition storage magazines with an ammunition maintenance workshop complex located in the center of the ASA.
- SIA: The SIA occupies approximately 600 acres in the southeastern portion of ANAD and contains general purpose warehouses, depot maintenance, materiel rebuild and support shops, general supply processing facilities, major items in-loading and out-loading facilities, and vehicle test facilities.
- WIA: The WIA occupies approximately 816 acres in the south-central portion of ANAD and contains the ANAD's administrative buildings and utility areas.

Additional areas, primarily along the depot's southern boundary, are allocated for warehouse storage, fuel storage, administrative services, and recreation. Southern Railroad supports ANAD with an extensive network of spur lines, primarily within the SIA and ASA. Future use of ANAD is anticipated to be similar to current use.

Land use surrounding ANAD is primarily rural, residential, cropland/pasture, mixed forest, as well as some industrial use around the southern boundary. There are a series of small communities clustered primarily along the southern and eastern boundaries of the depot. The largest populated community near ANAD is Anniston City, with a population of approximately 23,000. A former catfish farm (now ANAD property) is located approximately 300 feet southeast of ANAD's boundary. ANAD is bordered on the north by the former Fort McClellan Military Reservation. The depot is completely surrounded by a chain-link fence, which prevents casual access to the depot (Science Applications International Corporation [SAIC] 2001a).

2.4 Climate

Northeastern Alabama has a temperate climate with warm, humid summers and mild, dry winters. During the summer, the climate borders on the subtropical as maritime tropical air prevails along a high-pressure system. Convectional thunderstorms are localized and frequent in the summer months. The first frost usually occurs in October and frost conditions can last into mid-April. Typically, rainfall is greatest in the months of January through April and lowest from August through November. Prevailing winds are from the south to southwest from March to August, changing direction to the north-northwest in the fall and winter months, averaging approximately 8 miles per hour annually (SAIC 2001). The average annual temperature for the Anniston area is 62 degrees Fahrenheit (°F) with annual average high temperatures about 73°F and annual average low temperatures about 51°F. The average annual precipitation is 52 inches (AECOM 2018).

2.5 Topography

Calhoun County is located within the Valley and Ridge physiographic province of the Appalachian Highlands Region, specifically within the Coosa Valley of the Valley and Ridge physiographic section. The Appalachian Highlands are characterized by sharply folded consolidated strata that form northeast trending sub-parallel valleys and ridges. The Calhoun County topography ranges from flat to gently rolling hills in the western portion and is mountainous in the eastern portion with elevations reaching 2,100 feet National Geodetic Vertical Datum (NGVD) at Choccolocco Mountain (Osborne and Szabo 1984). Coldwater Mountain, the most predominant topographic feature adjacent to ANAD has a peak elevation of 1,709 feet NGVD. ANAD is located near the western edge of the Weisner Ridge district of the Valley and Ridge physiographic province. The ground elevation ranges from approximately 600 to 1,000 feet NGVD (**Figure 2-3**).

2.6 Geology

ANAD lies within the fold-and-thrust belt of the Appalachian Valley and Ridge Province where major geomorphic and geologic structures, including fold axes, fault traces, and lithologic boundaries are commonly oriented northeastward. Geologic contacts in the region are generally oriented parallel to mapped faults, and repetition of rock units is common in vertical sequences. The Jacksonville thrust fault complex, which roughly parallels the southeastern edge of ANAD, is a northeast-trending, low-angle thrust fault interpreted as a major splay (SAIC 2004).

ANAD is underlain by rocks of the Knox Group. The Knox Group consists of microcrystalline to finely crystalline dolostone and microcrystalline limestone, both of which are soluble. The bedrock weathers to a clay-dominated residuum that is typically tens to hundreds of feet thick with local variability. In brief, the stratigraphic profile of interest consists of:

- Unconsolidated material, predominantly consisting of a clay residuum derived from the weathering of the underlying bedrock. Chert blocks are common and interspersed within the residuum.
- The epikarst, which consists of the highly-weathered “rind” of the bedrock. The epikarst contains a system of solution porosity (e.g., cavities) that is complexly interconnected and may be filled with water, sediment, or some combination of the two. The thickness of the epikarst varies widely due to differential weathering of the bedrock.
- Carbonate (limestone and dolostone) bedrock. Predominantly unweathered bedrock ranging from dense to highly fractured with low matrix porosity. Contains interconnected networks of solution porosity that occupy a small volume of the rock. The frequency of solution porosity and fracturing decrease with depth.

The residuum and underlying weathered bedrock are likely in full or partial hydraulic communication. Groundwater flow in the weathered bedrock transition zone is controlled by available pathways between rock blocks, clay-infilling, and fractures or relict conduits within the rock matrix. The gradational transition with depth to the more competent unweathered bedrock interval results in more discrete pathways for groundwater migration and groundwater movement to become more restricted.

Hydrophysical testing of the unweathered bedrock in the SIA and off-post areas in deep bedrock wells indicates a high degree of variability in the location and yield of transmissive zones Lateral and vertical changes in flow properties were recognized within and between adjacent boreholes, demonstrating a high degree of aquifer heterogeneity (SAIC 2008b).

2.7 Hydrogeology

Groundwater beneath the SIA and WIA is derived chiefly from infiltration of precipitation. Precipitation percolates downward through the residuum to the water table, which occurs in the residuum. While dominated by clay, movement of water through the residuum is enhanced due to macropores (e.g., root channels, desiccation cracks, and relict rock structures such as bedding-plane fractures). Macropores increase the bulk hydraulic conductivity of the residuum; therefore, the residuum is more transmissive than would be expected for a deposit comprised chiefly of clay (Quinlan and Aley 1987) but is less transmissive than the underlying epikarst and bedrock.

While some groundwater in the residuum moves laterally towards the nearest groundwater discharge boundary (i.e., Dry Creek and its tributaries in the SIA and Eastaboga Creek and its tributaries in the WIA), there is also a significant downward component of flow into the epikarst. Most groundwater enters the epikarst at discrete points, such as solution-widened openings along the rock surface, rather than uniformly across a broad area.

In the epikarst and underlying bedrock, most groundwater movement occurs through interconnected networks of solution porosity (e.g., solution-widened fractures, cavities, and conduits). These networks typically occupy a small volume of the rock and can support high groundwater velocities (Worthington 1999). The geometry of the networks is influenced by the orientation and interplay of fractures and faults and is typically extremely complex and unpredictable. Outside these networks, the bedrock is generally poorly permeable, and groundwater moves relatively slowly. The aperture of fractures and the frequency of solution porosity are inferred to generally decrease with depth; therefore, the transmissivity of the rock also decreases with depth. Groundwater transported through the solution-porosity networks in aquifers of this type typically discharges at springs (Worthington and Ford 2009). Collectively, the residuum, epikarst, and bedrock comprise a single, unconfined aquifer. Springs are numerous within the Coosa Valley, with many inferred to be related to faults. One such spring, Coldwater Spring, is the major spring in the ANAD area, producing 32 million gallons of water per day. Given its high yield, the catchment of the spring (i.e., the three-dimensional region from which its water is derived) must also be large and it may be enhanced by a large, nearby fault. The catchment has not been defined (Kidd 2001).

Specific groundwater divides or units cannot be defined clearly for all of ANAD because of the karst geology. Site-specific data indicate that in the WIA the predominant groundwater flow directions are toward the southeast and the southwest (AECOM 2018). In the SIA, the predominant flow direction is to the southwest (Leidos 2017). Within the ASA, groundwater generally flows to the northwest in the western portions and to the east and northeast in the eastern portions (EMR Environmental, LLC 2017).

2.8 Surface Water Hydrology

ANAD lies within the Coosa River watershed. The Coosa River is one of the major drainages in northeastern Alabama and is located approximately 5 miles west of ANAD, where it flows toward the southwest. Surface water bodies that traverse ANAD flow into three major streams outside of the installation boundary: Cane Creek to the north, Blue Eye Creek to the west, and Choccolocco Creek (via Eastaboga Creek) to the south. All of the streams that drain Anniston eventually flow into the Coosa River. A pronounced drainage divide (i.e., watershed boundary) bisects the ANAD from the eastern-central boundary to the southwest boundary. To the north of the divide, the drainage flows into Cane

Creek and south of the divide, the drainage flows into Eastaboga Creek. The streams in the westernmost portion of ANAD drain to Blue Eye Creek (**Figure 2-3**).

The SIA is drained by Dry Creek, which flows southward along the eastern boundary of the SIA and eventually flows into Choccolocco Creek, approximately 2.5 miles south of ANAD. Within the Dry Creek drainage basin, a number of small, intermittent and perennial streams, and gullies contribute to the flow of Dry Creek. A portion of Dry Creek was diverted from its natural channel during construction of the SIA and now follows a channel constructed along the eastern boundary of the site. The former natural channel was backfilled and is covered by structures and roadways (SAIC 2004). The WIA is situated at the headwaters of Eastaboga Creek, which also flows southwestward, joining Choccolocco Creek approximately 7 miles downstream of ANAD.

Lakes and ponds near the WIA occur south of the Eastaboga Creek divide. Two artificial lakes, Cone Lake and ANAD Fish Pond, lie within the ANAD boundary. There are 24 smaller ponds located throughout ANAD, which are used for fire protection (SAIC 2018).

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 ANAD.

2.9.1 Stormwater Management System Description

ANAD discharges water under a National Pollutant Discharge Elimination System (NPDES) Permit No. AL0002658 that was originally granted in 1986 and last modified 01 September 2016. The NPDES permit includes discharges from the SIA, WIA, and ASA. There are 53 outfalls at ANAD; 14 are designated sampling points. Each outfall is labeled with a Discharge Serial Number or Stormwater Outfall number (Alabama Department of Environmental Management [ADEM] 2018).

The SIA has 45 outfalls of which 38 discharge runoff directly into Dry Creek. Four other SIA outfalls discharge runoff into tributaries along the northern and southern portions of the SIA, which eventually drain to Dry Creek. The three remaining SIA outfalls discharge effluent from the treatment facilities within the SIA to Choccolocco Creek (see discussion in **Section 2.9.2**). The ASA has five sampled stormwater outfalls regulated in the NPDES permit. The ASA outfalls receive runoff from the open burn / open detonation unit and the demilitarization facility. The WIA has three outfalls. Stormwater runoff at these outfalls comes from paved and unpaved areas of the ASA and WIA. Runoff from these areas forms a tributary that meanders through the WIA, drains to on-site ponds, and then eventually flows to Eastaboga Creek (ADEM 2018).

2.9.2 Sewer System Description

There are three wastewater treatment plants at ANAD: 1) the new Industrial Wastewater Treatment Plant (IWTP); 2) the Sanitary Treatment Plant; and 3) the Groundwater Treatment Plant (GWTP). Industrial process wastes such as chrome plating waste, cooling water, and acid rinses drain to the IWTP. Sewage system wastewater is treated at the Sanitary Treatment Plan located near the Old Sewage Treatment Plants (STPs). The GWTP receives water from groundwater extraction wells associated with a groundwater remediation system in the SIA, as well as from the Building 114 French drain extraction system. The effluents from all three treatment plants are combined and then are discharged via piping from the SIA approximately six miles to Choccolocco Creek in accordance with ANAD's NPDES permit.

2.10 Potable Water Supply and Drinking Water Receptors

The City of Anniston Water Works and Sewer Board (AWWSB) draws the majority of its water for public water supply from Coldwater Spring, approximately 1.6 miles south of the SIA. The spring and approximately 240 surrounding acres are the property of the City of Anniston, which includes the Paul B. Krebs Water Treatment Plant adjacent to the spring pool. The Krebs facility withdraws, treats, and distributes water to customers at an average of 13 million gallons per day (ADEM 2018). The spring is the primary source of drinking water for the city of Anniston, ANAD, and several smaller cities. Potable water is supplied to ANAD via pipelines from the AWWSB and the use of on-site groundwater is restricted, eliminating the potential for exposure to contaminated groundwater (USACE, Buffalo District 2015). The ADEM classifies Coldwater Spring as “groundwater under the influence of surface water” because stormwater runoff can enter the spring pool from which the treatment plant draws its water (AWWSB 2018). The secondary source of drinking water used by AWWSB is the Hillabee Creek Reservoir located 7 miles southeast of the City of Anniston near the town of Oxford.

Private residences to the south, east, and west of ANAD utilize groundwater as a source of drinking water or for watering gardens. In 2000, an off-post well and spring inventory was conducted in two phases in the areas surrounding ANAD (ANAD 2004). The well survey identified a total of 123 wells and springs used by residents, with 70 of these identified as a sole source of drinking water. The remaining 53 wells and springs were identified as being used for agricultural and recreational purposes (SAIC 2008a). Wells and springs identified as sole source drinking water supplies have been sampled annually since 2000 for volatile organic compounds (VOCs). The results indicate that there are no VOCs detected at concentrations greater than the maximum contaminant levels (MCLs) (ANAD 2016).

Up to 31 private wells are currently included in an annual monitoring program associated with operable unit 1 (OU-1), which addresses groundwater at the SIA (Leidos 2019). The off-post locations are monitored in accordance with the requirements of ANAD's Federal Facility Agreement with USEPA Region 4 and ADEM. Groundwater samples are analyzed for VOCs, bis(2-ethylhexyl)phthalate, and the metals arsenic, chromium lead, and manganese (Leidos 2017). The private well results show sporadic VOC detections at concentrations significantly below their respective MCLs (Leidos 2017). The AWWSB and ANAD also analyze water samples from Coldwater Spring on a monthly basis (ANAD 2016). Sample are analyzed for VOCs, bis(2-ethylhexyl)phthalate, and the metals arsenic, chromium lead, and manganese (Leidos 2017). In 2016, trichloroethylene was the only constituent detected at concentrations above its MCL of 5 micrograms per liter in samples collected from the spring pool, which represents conditions prior to treatment by the Paul B. Krebs Water Treatment Plant (Leidos 2017).

An Environmental Data Resources, Inc. (EDR) report includes search results from a variety of environmental, state, city, and other publicly available databases for a referenced property. An EDR report was generated for ANAD, which identified multiple state-permitted wells within 5 miles of the installation boundary (**Figure 2-4**). The EDR report providing well search results is included as **Appendix E**.

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.

ANAD is filled with suitable habitats and forage grounds for small, ground-dwelling mammals and for granivorous and insectivorous birds. Large predatory birds and mammals, such as hawks and foxes, are likely to hunt, nest or den in the ASA of ANAD. ANAD also has habitats such as managed timber production land; abandoned home site and cropland/pasture; artificially created ponds; wetlands; and upland depression forest (Malcolm Pirnie, Inc. 2006). Eight species that are federally listed (either endangered [E] or threatened [T]) have the potential to occur in the vicinity of ANAD in Calhoun County (USFWS 2021): gray bat (*Myotis grisescens*) (E); Indiana bat (*Myotis sodalis*) (E); Northern Long- Eared Bat (*Myotis septentrionalis*) (T); Pygmy Sculpin (*Cottus paulus (=pygmaeus)*) (T); Southern clubshell (*Pleurobema decisum*) (E); Mohr's Barbara's buttons (*Marshallia mohrii*) (T), White fringeless orchid (*Platanthera integrilabia*) (T); and Tennessee yellow-eyed grass (*Xyris tennesseensis*) (E). The only federally-listed species known to occur on ANAD is the Tennessee yellow-eyed grass, which is a wetland plant (AECOM 2018).

2.12 Previous PFAS Investigations

The USEPA conducted the third Unregulated Contaminant Monitoring Rule (UCMR3) monitoring between 2013 to 2015. UCMR3 is a national program that collects data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the Safe Drinking Water Act (USEPA 2016b). The UCMR3 included the analysis of PFOS, PFOA, and PFBS in public water systems serving more than 10,000 people between 2013 to 2015. Samples were collected from the Coldwater Spring public water supply during four monitoring events in February, May, August, and November 2014. Results indicated that PFOS, PFOA, and PFBS were not detected in any of the samples collected from Coldwater Spring. The limit of detection (LOD) at the time of UCMR3 sampling was 40 ng/L for PFOS, 20 ng/L for PFOA, and 90 ng/L for PFBS. The laboratory that analyzed the 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 ANAD, 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 F**), installation personnel interviews (**Appendix G**), site reconnaissance photos (**Appendix H**) and site reconnaissance logs (**Appendix I**) during the PA process for ANAD 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, ANAD fire department documents, ANAD directorate of public works documents, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. Additionally, an EDR report generated for ANAD was reviewed to obtain off-post water supply well information. A list of the specific documents reviewed for ANAD is provided in **Appendix F**.

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 ANAD is presented below (affiliation is with ANAD unless otherwise noted):

- Environmental Restoration Manager, Directorate of Risk Management
- Fire Department Fire Chief
- Environmental Compliance Manager
- Health Physicist, Directorate of Risk Management
- X-Ray Technician

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

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at ANAD during the records review process, the installation in-brief meeting, and the installation personnel interviews. A photo log from the site reconnaissance is provided in **Appendix H**. The site reconnaissance logs are provided in **Appendix I**.

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

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

ANAD 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 aqueous film-forming foams (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 percent (%) hydrocarbon surfactants, and 1 to 3% PFAS (Interstate Technology and Regulatory Council 2020b). 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.

The volume of AFFF stored at all Army installations was compiled as part of a data call in 2016 to 2017. In total, 20 gallons of AFFF concentrate were identified as in storage at ANAD during this data call. As confirmed by the Fire Chief at ANAD, AFFF was historically stored at Fire Station #1 (Building 2) and Fire Station #2 (Building 107). The AFFF was held in 5-gallon buckets placed on pallets and 5-gallon buckets placed on the fire trucks. AFFF was not stored in fire truck tanks and no usage of AFFF or nozzle testing is known to have occurred at the fire stations. Approximately 15 to 20 5-gallon buckets containing AFFF were transported to Building 632 in late 2017 / early 2018 for temporary storage prior to off-site disposal in 2018. Approximately 10 5-gallon buckets of Solberg Arctic™ alcohol type concentrate (ATC) alcohol-resistant aqueous film-forming foam (AR-AFFF) 3% or 6% (non-PFOA/PFOS containing AFFF) stored on pallets were observed at both fire stations during the PA site visit. The Fire Chief confirmed that fire suppression systems at three buildings (Buildings 410, 474, and 475) do not use AFFF.

There are no current firefighting training areas at ANAD; however, the Fire Chief identified three areas where AFFF may have been historically used for firefighting training: 1) Fire Department Burn Pit; 2) Old Wastewater Treatment Plant / Fire Training Area (WTP/FTA); and 3) Fire Training Ditch. The Fire Chief confirmed that no nozzle testing is performed regularly onsite. The site histories for each of the firefighting training areas are described in **Section 5.2**.

The Fire Chief identified one fire response where AFFF was used to extinguish a fire that occurred at Building 114 in March 1990. Approximately 2 gallons of AFFF concentrate were used inside the building with approximately 10,000 gallons of water. The materials used to extinguish the fire were contained to the building basement and were then pumped out by a contractor and disposed off-site. Additional details regarding Building 114 are described in **Section 5.2**.

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

Following document research, personnel interviews, and site reconnaissance at ANAD, areas related to metal plating operations and wastewater treatment 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**.

The September 2018 Army Guidance for Addressing Release of Per- and Polyfluoroalkyl Substances indicates the mechanisms for potential use, storage, and/or disposal of PFAS-containing materials including metal plating operations (Army 2018). During metal plating operations, a metal surface may be treated with a layer of electrochemically deposited metals in an acid bath. PFAS, specifically PFOS, have been used in metal plating operations as surface tension-reducing wetting agents to mitigate the release of aerosolized chemicals into a working environment. Hard chromium plating is one type of metal plating operation where PFAS-containing mist suppressants were commonly used. Historically, it was common for spent plating baths from metal plating operations to be disposed of in a lined or unlined pit or into a sanitary or storm sewer. Therefore, PFAS present in mist suppressants during the metal plating process could be released to the environment. Building 114 is used as a metal plating and finishing shop. According to ANAD personnel, there is no current or historical use of PFAS-containing mist suppressants at Building 114. Industrial wastewater from Building 114 operations is discharged to the ANAD IWTP.

Several inactive WTPs were identified as facilities that were likely to have received PFAS-contaminated wastewaters from various identified AOPIs at ANAD. These include the Old IWTPs, which are known as solid waste management unit (SWMU)-03 and SWMU-04 under ANAD’s IRP, as well as the Old STPs, known as SWMUs-19 and -20. SWMU-03 and SWMU-04 are co-located in the SIA of ANAD. SWMU-03 (active from 1976 to 1981) and SWMU-04 (active from 1981 to 2011) received industrial wastewater from various operations including several AOPIs. The contents of the oil / water separator (OWS) used at the Fire Department Burn Pit until approximately 2004 were disposed at the Old IWTPs and a water / AFFF mixture from the fire at Building 114 was pumped to SWMU-04 for treatment in 1990. SWMU 19 (active from 1948 to 1982) and SWMU-020 (active from 1982 to 2016) are co-located and received sanitary sewer wastewater as well as material that drained from the fire stations at ANAD. The Old IWTPs and Old STPs are discussed in detail in **Section 5.2**.

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 ANAD) 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.

The City of Anniston is served by a municipal fire department and ANAD’s Fire Chief did not note any off-post fire responses by ANAD’s firefighting personnel. As shown in the EDR Key Map (**Appendix E**), industrial activities in the areas surrounding ANAD are concentrated to the east of the installation with the highest concentration in a north-south corridor approximately 4 miles east of ANAD and to the southwest of the installation. Industrial activities include metals works such as foundries and metal plating industries, pest control firms, and lumber and construction contractors. No known off-post PFAS sources have been readily identified.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage, and/or disposal of PFAS-containing materials at ANAD 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, nine areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

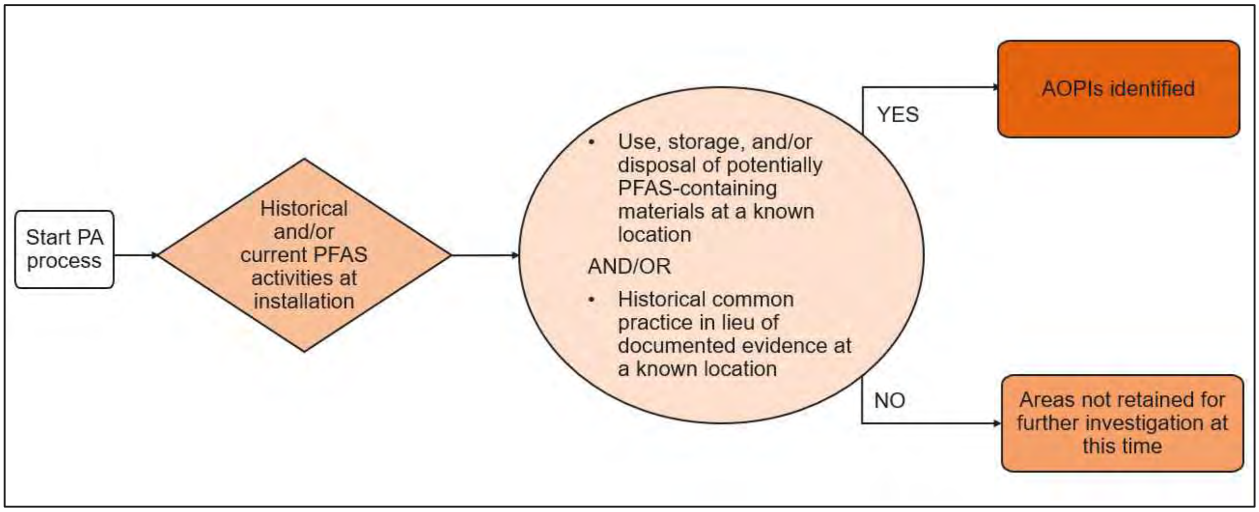

Figure 5-1. AOPI Decision Flowchart

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 the PA/SI at ANAD are presented in **Section 8**.

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
Facility 414 Old Lagoons (SWMU-012 / 01012.1012)	1960 to 1978	Three unlined waste lagoons used for the disposal of metal plating and other residue from the IWTP. The lagoons were emptied in 1978, and the liquid was pumped to the A-Block Lagoon (SWMU-022).	No current or historical use of PFAS-containing mist suppressants for chrome plating; therefore, no evidence of PFAS-containing materials disposed at this location.
A Block Lagoon (SWMU-022 / 01012.1022)	1978 to 1982	Synthetically lined lagoon constructed in 1978 to contain liquid waste (including metal plating waste) previously held at the Facility 414 Old Lagoons.	No current or historical use of PFAS-containing mist suppressants for chrome plating; therefore, no evidence of PFAS-containing materials disposed at this location.
Chrome Plating Operations at Building 114 (SWMU-031 / 01012.1031)[1]	1978 to present	In 1978, the chrome plating facility did not use PFAS-containing mist suppressant (Installation Assessment of Anniston Army Depot Report No. 119; USATHAMA 1978). No known use of PFAS-containing mist suppressant between 1978 and current. Currently, the chrome plating facility at Building 114 does not use PFAS-containing mist suppressant. Instead, plastic balls are used in conjunction with the ventilation system as a mist suppressant.	No current or historical use of PFAS-containing mist suppressants for chrome plating; therefore, no evidence of PFAS-containing materials use, storage, or disposal at this location.
Industrial Wastewater Treatment Plant	2007 to present	Industrial process waste such as chrome plating waste, cooling water, and acid rinses drain to the IWTP. Chrome plating operations at ANAD do not use PFAS-containing mist suppressants. No other known uses of PFAS-containing materials for industrial processes at ANAD.	No record of PFAS-containing materials use, storage, or disposal.
Sanitary Treatment Plant	2016 to present	Unreported spills or leaks of AR-AFFF from fire stations would be directed to the sanitary treatment plant.	No record of PFAS-containing materials use or disposal post-2016.
Groundwater Treatment Plant	1990 to present	Receives water from groundwater extraction wells associated with a groundwater remediation system in the SIA, as well as from the Building 114 French drain extraction system.	No record of PFAS-containing materials use, storage, or disposal. Building 114 is included as a separate AOPI due to AFFF use during a fire response; the AFFF used at that time was disposed at the Old IWTP.

Note:

1. Although Building 114 was not retained for further investigation as a result of chrome plating operations, Building 114 is an AOPI due to AFFF used to extinguish a fire in 1990 (see Section 5.2.5).

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Four of the nine AOPIs overlap fully or partially with ANAD IRP sites and/or Headquarters Army Environmental System sites. The AOPI, overlapping IRP site identifier, Headquarters Army Environmental System number, and current site status are discussed within each AOPI subsection presented below. At the time of this PA, none of the ANAD 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**. Aerial photographs of each AOPI are presented on **Figures 5-3** through **5-11** and include active monitoring wells in the vicinity of each AOPI.

5.2.1 Fire Station #1

Fire Station #1 (Building 2) is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical storage of AFFF. The current Fire Chief, who started at ANAD in 1989, stated that Fire Station #1 historically stored AFFF in 5-gallon buckets placed on pallets and 5-gallon buckets placed on the fire trucks. AFFF was not stored in fire truck tanks and no usage or spills of AFFF or nozzle testing is known to have occurred at Fire Station #1. Approximately 15 to 20 5-gallon buckets containing AFFF from both Fire Station #1 and Fire Station #2 were transported to Building 632 in late 2017 / early 2018 for storage prior to off-site disposal in April 2018. Approximately 10 5-gallon buckets of Solberg Arctic™ ATC AR-AFFF 3% or 6% (non-PFOA/PFOS containing AFFF) stored on pallets were observed at Fire Station #1's garage bay during the site visit. Fire trucks are washed inside the garage bays. Floor drains observed in the bays drain to the STP.

Fire Station #1 is located in the administrative area of the WIA and has been in service as a fire station since the 1940s. The fire station is a metal building with slab on grade. There are both front and rear paved surfaces for fire truck and vehicle parking (**Figure 5-3**). Fire Station #1 is surrounded by administrative buildings to the immediate north, south and west, as well as grassy areas to the east and west. Fire Station #1 is situated on a hill, with the ground sloping downward to the southeast and southwest from the station. Surface water runoff from the vicinity of Fire Station #1 drains to Eastaboga Creek, which passes approximately 600 feet south of the fire station building. Eastaboga Creek drains to Choccolocco Creek approximately 7 miles southwest of ANAD's southern boundary.

5.2.2 Old Wastewater Treatment Plant / Fire Training Area (SWMU 18 / 01012.1018)

The Old WTP/FTA is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical usage of AFFF. The Old WTP was used from 1942 to 1982 to treat domestic sewage from the western area of ANAD. After closure of the Old WTP, the former trickling filter was used as a fire training pit until approximately 1992. For this use, the filter sludge discharge pipeline was plugged and the filter was lined with firebrick. During firefighting exercises, the filter was filled with water and diesel fuel was poured on top of the water, ignited, and extinguished (SAIC 2001). An OWS was added approximately 70 feet south of the training pit as an emergency response/release prevention measure to guard against accidental overflow of diesel fuel from the filter. The trickling filter was filled in with concrete in April 1995 (SAIC 2001). The Fire Chief noted that animal protein foam was primarily used for training; however, it was possible that AFFF had also been used. It was noted that purging of fire truck hoses to the ground surface occurred following burning/training.

The Old WTP/FTA is located in the administrative area of the WIA, at the southwest corner of the intersection of Roosevelt Drive and Old U.S. Highway 78. The AOPI consists of a grassy area that includes a small round cement pit that can be distinguished by its lack of vegetation (**Figure 5-4**). The Old WTP/FTA is surrounded by grassy and forested areas to the west, south and east, and by administrative buildings (including Fire Station #1) to the north. The fire training pit was investigated as SWMU-18 during the ASA remedial investigation (RI) completed in 2001 (SAIC 2001). Based on the results of surface and subsurface soil samples analyzed for VOCs, semi-volatile organic compounds, metals, pesticides, and polychlorinated biphenyls, the RI report recommended no further action. ADEM accepted the no further action recommendation in a letter dated June 2002 (ANAD 2016). Surface water runoff from the vicinity of the Old WTP/FTA drains to Eastaboga Creek, approximately 450 feet south of the AOPI. Eastaboga Creek drains to Choccolocco Creek approximately 7 miles southwest of ANAD’s southern boundary.

5.2.3 Fire Department Burn Pit

The Fire Department Burn Pit is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical usage of AFFF. The Fire Department Burn Pit is the most recently used fire training area at ANAD, and reportedly has not been used since approximately 2004. The Fire Chief noted that approximately 25 gallons of 3% to 6% AFFF concentrate were released to the pit by the ANAD Fire Department training operations. It was noted that purging of lines following burning/training occurred in the pit. An OWS inlet is located near the bottom of the pit, and the OWS is thought to have been located northeast of the pit. The OWS was periodically pumped out via vacuum truck, with the contents taken to the IWTP.

The Fire Department Burn Pit is located in the utility area of the WIA directly south of 6th Avenue West. The burn pit consists of a circular concrete-lined area approximately 90 feet in diameter, surrounded by a wall of stacked bricks approximately 12 inches high. The burn pit is surrounded by grassy areas and paved storage areas (**Figure 5-5**). Surface water runoff from the vicinity of the Fire Department Burn Pit drains to the southwest to an intermittent creek that drains south then west to an eventual confluence with Eastaboga Creek. Eastaboga Creek drains to Choccolocco Creek approximately 7 miles southwest of ANAD’s southern boundary.

5.2.4 Fire Training Ditch

The Fire Training Ditch is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical usage of AFFF. The Fire Training Ditch was reportedly used as a fire training area from the 1980s to the 1990s. The Fire Chief noted that animal protein foam was primarily used for training; however, it was possible that AFFF had also been used. It was noted that fire truck hoses were purged into the ditch following burning/training activities. The Fire Training Ditch was covered in the mid-1990s following the installation of storm water drainage pipes. Some native soil was also removed during this construction activity.

The Fire Training Ditch is located in the utility area of the WIA, directly east of Gadsden Avenue and west of Building 21 (Material Handling Equipment / Maintenance Facility). During its period of use, the Fire

Training Ditch was an unlined ditch, oriented west to east, approximately 8 feet wide by 2 to 4 feet deep. The Fire Training Ditch is surrounded by paved areas to the north, west, and south, and by a grassy area to the east (**Figure 5-6**). Surface water runoff from the vicinity of the Fire Training Ditch drains to the west, to an intermittent creek that drains south then west to an eventual confluence with Eastaboga Creek. Eastaboga Creek drains to Choccolocco Creek approximately 7 miles southwest of ANAD's southern boundary.

5.2.5 Building 114 Fire (SWMU-031 / 01012.1031)

The Building 114 Fire is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical usage of AFFF. The Fire Chief noted that a fire occurred at Building 114 on 31 March 1990 at approximately 10 p.m. Approximately 2 gallons of AFFF concentrate and 10,000 gallons of water were used to extinguish the fire. The fluids used to extinguish the fire drained to the basement and were subsequently pumped out by a contractor and disposed at the Old IWTP (SWMU-04).

Building 114 is located in the SIA of ANAD near the eastern ANAD installation boundary. Operations at Building 114 including metal cleaning, treating, and plating. Building 114 is designated as SWMU-031 due to chromium and VOC contamination in soil and groundwater. A French drain system constructed around the foundation of the building to prevent infiltration into the basement surrounds the building and drains into an adjacent collection sump. The water is collected and pumped to the GWTP for VOCs and metals treatment (USACE, Buffalo District 2015). Building 114 is surrounded by pavement and buildings on all four sides, with Fire Station #2 located directly to the southeast (**Figure 5-7**). Surface water runoff from the vicinity of Building 114 drains to Dry Creek (also known as Coldwater Spring Branch), which flows southward in a channel constructed along the eastern boundary of ANAD. Dry Creek discharges to Choccolocco Creek approximately 2.5 miles south of ANAD.

5.2.6 Fire Station #2

Fire Station #2 (Building 107) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to historical storage of AFFF. The current Fire Chief, who started at ANAD in 1989, stated that Fire Station #2 historically stored AFFF in 5-gallon buckets placed on pallets and 5-gallon buckets placed on the fire trucks. AFFF was not stored in fire truck tanks and no usage or spills of AFFF or nozzle testing is known to have occurred at Fire Station #1. Approximately 15 to 20 5-gallon buckets containing AFFF from both Fire Station #1 and Fire Station #2 were transported to Building 632 in late 2017 / early 2018 for storage prior to off-site disposal in April 2018. Approximately 10 to 16 5-gallon buckets of Solberg Arctic™ ATC AR-AFFF 3% or 6% (non-PFOA/PFOS containing AFFF) stored on pallets were observed at Fire Station #2's garage bay during the PA site visit. Fire trucks are washed inside the garage bays. Floor drains observed in the bays drain to the STP.

Fire Station #2 is located in the SIA and has been in service as a fire station since the early 1940s. The fire station is a metal building with slab on grade. The building is surrounded by paved surfaces and other buildings, with Building 114 directly to the northwest (**Figure 5-8**). The Fire Station #2 parking lot overlooks the western bank of Dry Creek, which flows southward in a channel constructed along the eastern boundary of ANAD. Stormwater outfalls direct surface runoff from the vicinity of Fire Station #2 into Dry Creek, which discharges to Choccolocco Creek approximately 2.5 miles south of ANAD.

5.2.7 Old Industrial Wastewater Treatment Plants (SWMU-03 and -04 / 01012.1003 / 1004)

The Old IWTPs (SWMUs 03 and 04) are co-located and are identified as an AOPI following records review, personnel interviews, and site reconnaissance due to potential discharge of AFFF-containing materials to the IWTPs from OWS's at the Old WTP/FTA and the Fire Department Burn Pit, as well as from the Building 114 fire. The SWMU-03 IWTP operated from 1976 to 1981 and received industrial wastewater from various operations in the SIA including steam cleaning, electroplating, corrosion removal, paint stripping, and other activities related to cleaning and refurbishing combat and transportation vehicles. Treated wastewater was discharged either directly to Dry Creek or to the sanitary sewer for final treatment (ADEM 2018). A newer IWTP (SWMU-04) was constructed in 1980 and was located in the area of the SWMU-03 IWTP. Wastes treated were similar to those listed for the older IWTP. The SWMU-04 IWTP ceased operation in 2011. Demolition was conducted from June 2012 to May 2013 (ADEM 2018). The sludge drying beds associated SWMUs 03 and 04 are still present at the site; it is assumed the sludge drying beds were unlined. SWMU-03 and SWMU-04 were assessed during the RI for OU-2 (SIA Soils) at ANAD. The 2008 Record of Decision indicated no further action was required for both SWMUs (ANAD 2016).

The Old IWTPs AOPI is located in the northeastern section of the SIA southeast of the intersection of Eulaton Gate Road and Roosevelt Drive. The majority of the former plant area has been covered with concrete and is being used for parking. The AOPI is surrounded by paved surfaces and buildings (**Figure 5-9**). Surface water runoff from the vicinity of the Old IWTPs drains to Dry Creek (also known as Coldwater Spring Branch), which flows southward in a channel constructed along the eastern boundary of ANAD. Dry Creek discharges to Choccolocco Creek approximately 2.5 miles south of ANAD.

5.2.8 Old Sewage Treatment Plants (SWMU-19 and -20 / 01012.1019 / 1020)

The Old STPs (SWMUs 19 and 20) are co-located and are identified as an AOPI following records review, personnel interviews, and site reconnaissance due to potential unreported spills or leaks of AFFF-containing materials to the STPs from drains located at the fire stations. The SWMU-19 STP operated from 1948 to 1982, when it was replaced by the New STP (SWMU-20), which was constructed at the same location and incorporated some of the older facility's equipment. Approximately 435,000 gallons per day of domestic sewage and pre-treated industrial wastewaters were processed at the SWMU-19 facility. Effluent was discharged to Dry Creek (ANAD 2016). The SWMU-20 STP was constructed in 1982 using an activated bio-filter design. It had 10 sludge drying beds including four native clay-lined beds from the old plant, two new concrete-lined beds, and four pie-shaped beds from the converted trickling filter (ADEM 2018). SWMUs 19 and 20 were evaluated as a single unit during the Phase II RI for OU-1. Land use controls are in place at this site to maintain industrial land use, and groundwater monitoring is on-going (ANAD 2016).

The Old STPs AOPI is located in the southern section of the SIA southeast of the intersection of Eulaton Gate Road and Roosevelt Drive. The majority of the former plant area has been covered with concrete and is being used for parking. The AOPI is surrounded by paved surfaces and buildings (**Figure 5-10**). Surface water runoff from the vicinity of the Old STPs drains to Dry Creek (also known as Coldwater Spring Branch), which flows southward in a channel constructed along the eastern boundary of ANAD. Dry Creek discharges to Choccolocco Creek approximately 2.5 miles south of ANAD.

5.2.9 Building 632

Building 632 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the storage of AFFF. Building 632 is a small warehouse that was used for short-term storage of AFFF in 5-gallon buckets placed on pallets. Approximately 15 to 20 5-gallon buckets containing AFFF were transported to Building 632 in late 2017 / early 2018 for temporary storage prior to off-site disposal in 2018. No spills were reported during the storage period. Currently no AFFF is stored in Building 632.

The Building 632 AOPI is located in the south-central portion of ANAD, immediately to the northeast of the WIA. A rail spur runs adjacent to the southwest side of the building. Surface water runoff drains to the southwest towards a small tributary to Eastaboga Creek (**Figure 5-11**).

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at ANAD, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at ANAD at all nine AOPIs 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 2020a) was developed to supplement the general programmatic 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 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 through the collection of field data and analytical samples over several mobilizations as follows: 04 to 08 May 2020; 20 October to 21 October 2020; and 29 July 2021.

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 2020a) 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 ANAD. 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 2020a), 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 and/or soil for PFOS, PFOA, or 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.

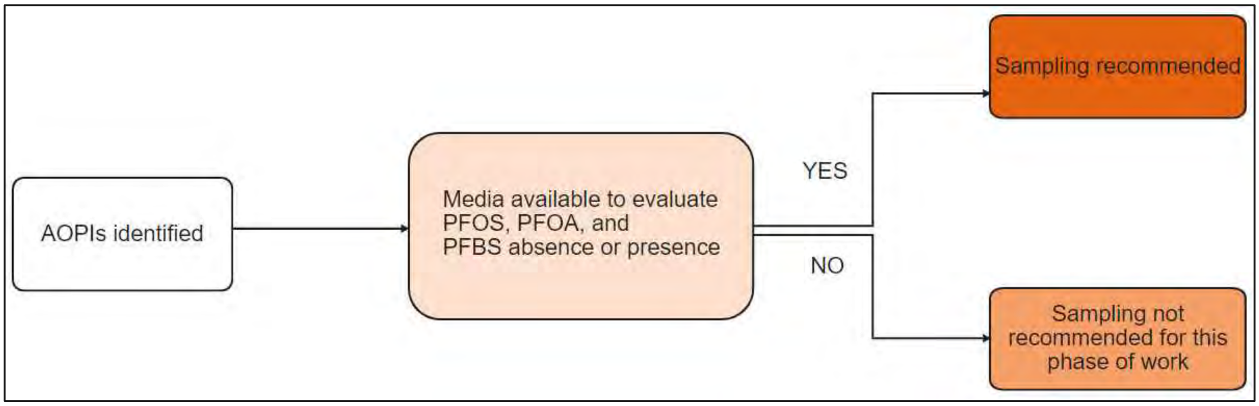

Figure 6-1. AOPI Sampling Decision Tree

The sampling design for SI sampling activities at ANAD is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020a). For each of the nine AOPIs, samples were collected at locations of known or suspected use, storage, and/or disposal of PFAS-containing materials, locations of surface runoff collection, and downgradient locations if exact use, storage, or disposal locations are unknown. Sample locations were selected based on site-specific historical evidence, suspected groundwater flow conditions, and surface runoff/surface conditions observed in the field at each sampled AOPI. Sample media types (i.e., surface soil and groundwater) collected for each sampled AOPI were based on media most likely to confirm the presence of absence of PFOS, PFOA, and PFBS directly related to the AOPI.

The focus of the soil sampling was the upper 2 feet of native soil, as determined by the field geologist. The first encountered groundwater was the focus of groundwater sampling. Where available, groundwater samples were collected from existing downgradient on-installation monitoring wells. Temporary wells were installed to collect groundwater samples at AOPIs where no existing monitoring wells were present. **Table 6-1** presents the construction details for the existing monitoring wells and temporary wells sampled during the SI.

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 2020a), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHP (Arcadis 2020b). 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 2020a). The subsections below provide a summary of the field methods and procedures used to complete the SI scope of work. 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 **Appendix J**. Photographs of the sampling activities, for locations where photographs were permitted, are included in **Appendix K**.

6.3.1 Field Methods

Grab groundwater samples were collected from temporary well screens installed using direct-push technology (DPT) at four locations and from existing monitoring wells (12 locations). At Building 114, groundwater samples were collected from the influent and effluent taps associated with the groundwater collection and treatment system. For the temporary wells, first-encountered groundwater was sampled as determined by the field geologist. For existing monitoring wells, groundwater samples were collected from the center of the saturated screened interval. Groundwater samples were collected via low-flow purging methods using either a peristaltic pump or a bladder pump with PFAS-free disposable high-density polyethylene tubing. Field parameters (temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured during purging and allowed to stabilize in accordance with the TGI for PFAS Sampling Procedures and Low-Flow Groundwater Purging for Monitoring Wells (P-11 in Appendix A to the PQAPP, Arcadis 2019), or purged for a maximum of 20 minutes, whichever occurred first, before groundwater sampling to ensure a representative sample was collected and, potentially, to inform the interpretation of analytical data. Temporary monitoring wells were abandoned by a licensed Alabama driller by removing the well casing and adding bentonite chips or similar to fill the boring within 1 foot of ground surface. The remainder of the borehole was completed with material consistent with the surrounding ground surface (e.g., topsoil, gravel). Coordinates for each temporary well location were recorded using a handheld global positioning system device.

Surface soil samples were collected at 21 discrete locations using a clean stainless steel hand auger. Surface soil samples were collected from within the top 2 feet of native soil. Most of the soil samples were homogenized over the entirety of the top 2-feet interval. However, in some instances, samples were collected from a shallower soil interval (i.e., 0 to 0.5, 0 to 1, or 0 to 1.5 feet below ground surface [bgs]) due to encountering refusal or difficult augur conditions. A subsurface soil sample (4 to 6 feet bgs) was collected from the former Fire Training Ditch using a DPT rig. The 4 to 6 feet bgs soil interval was selected because it approximates the surface soil horizon at the time when training activities occurred, before the ditch was filled during installation of drainage pipes in the mid-1990s. Coordinates for each soil sampling location were recorded using a handheld global positioning system device.

One surface water sample was collected from the easternmost ANAD fish pond, where a spring daylights into the pond. The grab sample was collected using a dedicated stainless scoop positioned near the throat of the spring.

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

6.3.2 Quality Assurance/Quality Control

Worksheet #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 initial decontamination step for drill tooling, 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 2020a), 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 2020a). The decontaminated reusable equipment from which EBs were collected include tubing, screen-point samplers, drill casing and cutting shoes, hand augers, water-level meters, acetate liners, and bailers as applicable to the sampled media. Source blanks were collected from the water used to pressure-wash drill tooling. Analytical results for blank samples are discussed in **Section 7.14**.

6.3.3 Dedicated Equipment Background

Dedicated equipment background (DEB) samples were collected from two monitoring wells that contained dedicated, down-hole equipment to evaluate whether the dedicated equipment may be impacting PFOS, PFOA, and/or PFBS results, as it is unknown if the dedicated equipment was comprised of PFAS-containing components. Existing Teflon™ tubing was encountered at monitoring well X04-B09S, and a passive diffusion bag was encountered at MW-1-23. At X04-B095, the tubing was removed temporarily to collect the DEB. At MW-1-23, after consultation with ANAD personnel, the passive diffusion bag was removed temporarily and stored in a clean bucket while the DEB was collected. Each DEB sample was collected from the first water produced through the pump and tubing; therefore, the DEB sample results reflect concentrations of stagnant groundwater and may be biased high by contributions from equipment that contains PFOS, PFOA, and/or PFBS. The parent samples were collected at each well following purging and parameter stabilization. The DEB is not collected like an EB and therefore is not used to qualify data during the data validation process. However, DEB results (discussed in **Section 7.11**) may be used in a weight-of-evidence discussion regarding data conclusions.

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 ANAD SI work. In some cases, clarifications and additions to the established scope of work were needed but did not necessarily constitute a non-conformance from the sampling plans described in the QAPP Addendum. The additional sampling work was documented in Field Change Reports (FCRs) dated 06 October 2020 (FCR-ANAD-01) and 15 July 2021 (FCR-ANAD-02) included as **Appendix L** and summarized below:

- FCR-ANAD-01 was prepared because a groundwater sample was unable to be obtained from the Fire Department Burn Pit AOPI during the May 2020 field event due to DPT refusal at 34 feet bgs. The FCR describes plans to re-attempt the boring using a heavier DPT rig equipped with augers and an air hammer. FCR-ANAD-01 also included collection of groundwater samples from three additional monitoring wells at the Old STPs AOPI as requested by the installation. The planned groundwater sample was collected from the Fire Department Burn Pit AOPI on 20 October 2020. Two of the planned three monitoring wells at the Old STPs AOPI (88EWLF-4 and 95-GOU-U01) were sampled on 21 October 2020. During sampling at the third well (83B17), the tubing broke and the pump slid to the bottom of the well; therefore, this well was not sampled.

- FCR-ANAD-02 includes groundwater and spring sample collection to assess potential off-post migration of groundwater containing PFOS, PFOA, and/or PFBS in the WIA. Six existing monitoring wells downgradient from AOPIs with PFOS, PFOA, and/or PFBS detections in groundwater were sampled on 29 July 2021. Additionally, a spring sample was collected from the easternmost ANAD Fish Pond, located near the installation boundary.

Several other field modifications from the originally proposed sampling approach did not impact DQOs or significantly modify the scope and therefore were not included in FCRs. Explanations of these minor changes are provided below:

- Fire Station #1 – Two groundwater samples were planned for this AOPI. DPT rig refusal was encountered at a depth of 28 feet bgs at location ANAD-FS1-2-GW. During a conference call with the Army on 24 June 2021, it was decided that the data from location ANAD-FS1-1-GW were sufficient to characterize the Fire Station #1 AOPI.
- Fire Station #2 – DPT rig refusal was encountered at a depth of 30 feet bgs during an attempt to collect a groundwater sample from this AOPI. In lieu of the DPT groundwater sample, a groundwater sample was collected from nearby monitoring well 82B-12 (total depth of 85 feet bgs). During a conference call with the Army on 24 June 2021, it was decided that the data from the monitoring well, together with data from Building 114 (located near Fire Station #2) were sufficient to characterize the Fire Station #2 AOPI. The Building 114 data are comprised of influent and effluent samples from a groundwater extraction system that has been operating since approximately 1985, and that would presumably be extracting groundwater from the vicinity of Fire Station #2.
- Old IWTPs AOPI – Two shallow soil samples were originally proposed to be collected from within the footprints of the former sludge drying beds. However, the sludge drying beds were found to be concrete-lined. Therefore, the borings were moved to the west just outside the drying bed concrete aprons.
- Fire Department Burn Pit – Groundwater sample ANAD-FDBP-1-GW was collected without purging the temporary well location due to slow water recharge. During drill rod advancement with a DPT rig, first water was observed at approximately 25 feet bgs but was followed by dry gravelly sand. A screen was set at 20 to 35 feet bgs; however, after waiting for approximately an hour, water did not accumulate in the screen. The screen and riser were pulled out of the hole and the drill rods were advanced to 45 feet bgs. The screen was reset from 30 to 45 feet bgs. After nearly two hours, approximately 3 feet of water accumulated in the one-inch temporary well. This volume of water was sufficient for sample collection; however, given the slow recharge rate, no purging was performed prior to sample collection.

6.3.5 Decontamination

Non-dedicated reusable sampling equipment (e.g., hand augers, drill cutting shoes and casing, screen-point samplers, water-level meters) 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

IDW, consisting of soil cuttings, groundwater, and decontamination fluids, was collected and placed in Department of Transportation-approved 55-gallon drums, labeled as non-hazardous, and segregated by medium (water and soil). During the first mobilization (May 2020), IDW liquid was processed through the onsite treatment plant for Building 114 and two soil drums were staged near the Old STPs AOPI for installation personnel to collect. During the second mobilization (October 2020), one soil drum and one liquid IDW drum were staged near Building 528 as requested by ANAD personnel. During the third mobilization (July 2021), one liquid IDW drum was left near the last collected sample as requested by ANAD personnel. IDW characterization and disposition was managed by ANAD personnel.

Other IDW, including personal protective equipment and other disposable materials (e.g., plastic sheeting, Lexan tubes, and high-density polyethylene and silicon tubing) that may have contacted sampling media, was collected in bags and disposed of in municipal waste receptacles.

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 Pace South Carolina (formerly Shealy Environmental Services, Inc.), 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, surface water, and soil samples using a PFAS analytical method that is ELAP-accredited and compliant with QSM 5.3 (DoD and Department of Energy 2019), Table B15.

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

- TOC by Solid Waste Test Method 846 9060A
- Grain size analysis by ASTM International 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 Reports (DUSRs; **Appendix M**).

6.4.2 Data Validation

All analytical data generated during the SI, except soil grain size, 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 5.3 (DoD and Department of Energy 2019). 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 DUSRs 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 ANAD. Documentation generated during the data usability assessments, which were compiled into DUSRs (**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 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 DUSRs.

During the validation process, the perfluorotetradecanoic acid result for sample location ANAD-FS1-1-GW was qualified as “X” due to extracted internal standards exhibiting recoveries less than 20%, which is indicative of matrix interference. This result was rejected as explained in the DUSR. Based on the final data usability assessment, the remaining environmental data collected at ANAD 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 ANAD QAPP Addendum (Arcadis 2020a). Data qualifiers applied to laboratory analytical results for samples collected during the SI at ANAD are provided in the data tables, data validation reports, and the Data Usability Summary Table located at the end of the 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, 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 was used to compare all groundwater and surface water data (if the surface water is an expression of groundwater [i.e., springs]) for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at ANAD are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS were used to evaluate detected soil concentrations. 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 8**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

This section summarizes the analytical results obtained from samples collected during the SI at ANAD (field duplicate results are provided in the associated tables and also shown in brackets in the text below). Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the QAPP Addendum (Arcadis 2020a). 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 the concentrations of these constituents relative to the OSD risk screening criteria.

Tables 7-1, **7-2,** and **7-3** provide a summary of the groundwater, soil, and surface water analytical results for PFOS, PFOA, and PFBS, respectively. **Table 7-4** 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 ANAD with OSD risk screening level exceedances is depicted on **Figure 7-1. Figures 7-2** through **7-10** show the PFOS, PFOA, and PFBS analytical results for groundwater and soil for each AOPI. **Figure 7-11** shows the PFOS, PFOA, and PFBS analytical results for groundwater and surface samples collected downgradient of the AOPIs located in the WIA. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and 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 data are reported in mg/kg, or parts per million.

Field parameters measured for groundwater during low-flow purging and sample collection and for surface water during sample collection are provided on the field forms in **Appendix J**. Soil 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. Groundwater was first encountered at an average depth of approximately 15 feet bgs. Depth to groundwater varied across the installation with the deepest groundwater encountered at Fire Station #1 (26.1 feet bgs), located on a local topographic high point. The shallowest groundwater was encountered at the Old STPs AOPI (6.2 feet bgs).

Table 7-4. AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Fire Station #1	Yes
Old Wastewater Treatment Plant/Fire Training Area	Yes
Fire Department Burn Pit	Yes
Fire Training Ditch	Yes
Building 114 Fire	No
Fire Station #2	No

AOPI Name	OSD Exceedances (Yes/No)
Old Industrial Wastewater Treatment Plants	No
Old Sewage Treatment Plants	Yes
Building 632	No

7.1 Fire Station #1

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Fire Station #1.

7.1.1 Groundwater

A grab groundwater sample (ANAD-FS1-1-GW) was collected from one boring advanced via DPT at Fire Station #1. The groundwater sample was collected at first-encountered groundwater obtained from a temporary well screen installed at a depth interval of 24 to 28 feet bgs. The boring was located in the grassy area to the west of the building where AFFF may have drained during AFFF equipment testing or spills (**Figure 7-2**). Groundwater sampling was completed on 08 May 2020.

PFOS (59 ng/L) and PFOA (180 ng/L) were detected at concentrations exceeding the OSD risk screening level of 40 ng/L. PFBS (3.6 J ng/L)[1] was detected at a concentration below the OSD risk screening level of 600 ng/L. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.1.2 Soil

Four surface soil samples were collected via hand auger in the vicinity of Fire Station #1 on 05 May 2020 (**Figure 7-2**). Soil samples ANAD-FS1-1-SO (0 to 2 feet bgs), ANAD-FS1-2-SO (0 to 2 feet bgs), ANAD-FS1-3-SO (0 to 1 foot bgs), and ANAD-FS1-4-SO (0 to 2 feet bgs) were positioned at the edges of paved areas where AFFF may have drained during AFFF equipment testing or spills.

PFOS was detected in all four of the surface soil samples: ANAD-FS1-1-SO (0.0015 mg/kg), ANAD-FS1-2-SO (0.003 mg/kg), ANAD-FS1-3-SO (0.0019 mg/kg), and ANAD-FS1-4-SO (0.00089 J mg/kg). All of the detected PFOS concentrations are lower than the residential OSD risk screening level of 0.13 mg/kg. PFOA and PFBS were not detected in any of the soil samples. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.2 Old Wastewater Treatment Plant / Fire Training Area

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Old WTP/FTA AOPI.

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[1] The “J” qualifier indicates that the analytes were positively identified, but the associated numerical values are estimated concentrations only.

7.2.1 Groundwater

A grab groundwater sample (ANAD-FTA-GW(9-13)) was collected from one boring advanced via DPT at the Old WTP/FTA. The groundwater sample was collected at first-encountered groundwater obtained from a temporary well screen installed at a depth interval of 9 to 13 feet bgs. The boring was located in the grassy area downgradient and proximate to the former FTA (**Figure 7-3**). Groundwater sampling was completed on 07 May 2020.

PFOS (200 ng/L) and PFOA (55 ng/L) were detected at concentrations exceeding the OSD risk screening level of 40 ng/L. PFBS (2.7 J ng/L) was detected at a concentration below the OSD risk screening level of 600 ng/L. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.2.2 Soil

Four surface soil samples were collected via hand auger from the Old WTP/FTA AOPI on 05 May 2020. Soil samples ANAD-FTA-1-SO (0 to 0.5 foot bgs), ANAD-FTA-2-SO (0 to 1 foot bgs), ANAD-FTA-3-SO (0 to 2 feet bgs), and ANAD-FTA-4-SO (0 to 2 feet bgs) were located on the north, west, east, and south edges of the former FTA, respectively (**Figure 7-3**).

PFOS was detected in three of the four surface soil samples, ANAD-FTA-1-SO (0.0037 mg/kg), ANAD-FTA-2-SO (0.0024 mg/kg), and ANAD-FTA-4-SO (0.016 mg/kg), at concentrations lower than the residential OSD risk screening level of 0.13 mg/kg. PFOA and PFBS were not detected in any of the four surface soil samples. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.3 Fire Department Burn Pit

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Department Burn Pit AOPI.

7.3.1 Groundwater

A grab groundwater sample (ANAD-FDBP-1-GW) was collected from one boring advanced via DPT at the Fire Department Burn Pit AOPI. The groundwater sample was collected at first-encountered groundwater obtained from a temporary well screen installed at a depth interval of 30 to 45 feet bgs. The boring was located in the grassy area downgradient and proximate to the Fire Department Burn Pit AOPI (**Figure 7-4**). Groundwater sampling was completed on 20 October 2020.

PFOS (3,600 J ng/L) and PFOA (160 ng/L) were detected at concentrations exceeding the OSD risk screening level of 40 ng/L. PFBS (380 ng/L) was detected at a concentration below the OSD risk screening level of 600 ng/L. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.3.2 Soil

Four surface soil samples were collected via hand auger from the Fire Department Burn Pit AOPI on 05 May 2020. Soil samples ANAD-FDBP-1-SO (0 to 2 feet bgs), ANAD- FDBP-2-SO (0 to 1.5 feet bgs), ANAD-FDBP-3-SO (0 to 2 feet bgs), and ANAD-FDBP-4-SO (0 to 2 feet bgs) were located on the northwest, northeast, southwest, and southeast edges of the former burn pit, respectively (**Figure 7-4**).

PFOS was detected in two of the four surface soil samples, ANAD-FDBP-1-SO (0.00055 J mg/kg) and ANAD-FDBP-2-SO (0.001 mg/kg), at concentrations lower than the residential OSD risk screening level of 0.13 mg/kg. PFOA and PFBS were not detected in any of the four surface soil samples. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.4 Fire Training Ditch

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Training Ditch AOPI.

7.4.1 Groundwater

One groundwater sample (ANAD-OU5-MW-55) was collected from existing monitoring well OU5-MW-55 located in a parking lot adjacent to the Fire Training Ditch AOPI (**Figure 7-5**). The groundwater sample was collected from approximately the center of the saturated screened interval for OU5-MW-55 (screened 65 to 75 feet bgs). Groundwater sampling was completed on 07 May 2020.

PFOS (390 ng/L) and PFOA (180 ng/L) were detected at concentrations exceeding the OSD risk screening level of 40 ng/L. PFBS (22 ng/L) was detected at a concentration below the OSD risk screening level of 600 ng/L. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.4.2 Soil

One subsurface soil sample was collected using a DPT rig on 07 May 2020. Subsurface soil sample ANAD-FTD-1-SO (4 to 6 feet bgs) was located adjacent to the former Fire Training Ditch (**Figure 7-5**).

PFOS (0.0022 mg/kg) was detected in sample ANAD-FTD-1-SO at a concentration lower than the residential OSD risk screening level of 0.13 mg/kg. PFOA and PFBS were not detected in this sample. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.5 Building 114 Fire

The subsection below summarizes the groundwater PFOS, PFOA, and PFBS analytical results associated with the Building 114 Fire AOPI. No soil samples were collected because the AFFF and water used to extinguish the fire were contained in the basement and were later pumped out and discharged to the Old IWTP (SWMU-04).

7.5.1 Groundwater

Two groundwater samples, ANAD-B114-INF-GW and ANAD-B114-EFF-GW were collected from the influent and effluent taps for the groundwater extraction and treatment system at Building 114 (**Figure 7-6**). The samples were collected on 06 May 2020.

PFOS (6.8 ng/L), PFOA (4.5 ng/L) and PFBS (5.5 ng/L) were detected in the influent sample and PFOS (5.8 ng/L), PFOA (3.7 J ng/L) and PFBS (5.4 ng/L) were detected in the effluent sample. Detected concentrations were below the OSD risk screening levels of 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.6 Fire Station #2

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Station #2 AOPI.

7.6.1 Groundwater

One groundwater sample (ANAD-82B12) was collected from existing monitoring well 82B12 (associated with OU-1) located in a parking lot adjacent to Fire Station #2 (**Figure 7-7**). The groundwater sample was collected from approximately the center of the saturated screened interval for well 82B12 (screened 62 to 87 feet bgs). Groundwater sampling was completed on 08 May 2020.

PFOS (12 ng/L) and PFOA (3.9 J ng/L) were detected at concentrations lower than the OSD risk screening level of 40 ng/L; PFBS was not detected. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.6.2 Soil

Four surface soil samples were collected via hand auger in the vicinity of Fire Station #2 on 06 May 2020 (**Figure 7-7**). Soil samples ANAD-FS2-1-SO (0 to 2 feet bgs), ANAD-FS2-2-SO (0 to 2 feet bgs), ANAD-FS2-3-SO (0 to 2 feet bgs), and ANAD-FS2-4-SO (0 to 2 feet bgs) were positioned at the edges of the paved area where AFFF may have drained during AFFF equipment testing or spills.

PFOS was detected in three of the four surface soil samples, ANAD-FS2-1-SO (0.0017 mg/kg), ANAD-FS2-2-SO (0.0021 mg/kg), and ANAD-FS2-4-SO (0.0021 mg/kg) at concentrations lower than the residential OSD risk screening level of 0.13 mg/kg. PFOA and PFBS were not detected in any of the four surface soil samples. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.7 Old Industrial Wastewater Treatment Plants

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Old IWTPs AOPI.

7.7.1 Groundwater

Two groundwater samples (ANAD-W3 and ANAD-82B09) were collected from existing monitoring wells W3 and 82B09 (both associated with OU-1). Monitoring well W3 is located adjacent to the former sludge dry beds and monitoring well 82B09 is located downgradient of the IWTPs (**Figure 7-8**). A groundwater sample was collected from approximately the center of the saturated screened interval for 82B09 (screened 10 to 25 feet bgs). The screened interval for well W3 (total depth of 19 feet bgs) is unknown; therefore, the intake tube was placed at approximately 15 feet bgs. Groundwater sampling was completed on 06 May 2020 at W3 and on 07 May 2020 at 82B09.

At monitoring well W3, PFOS (4.9 ng/L), PFOA (2.3 J ng/L), and PFBS (16 ng/L) concentrations were lower than the OSD risk screening levels of 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. At monitoring well 82B09 PFOS (3.6 J ng/L) and PFBS (15 ng/L) concentrations were lower than the OSD risk screening levels of 40 ng/L for PFOS and 600 ng/L for PFBS. PFOA was not detected in the sample collected from monitoring well 82B09. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.7.2 Soil

Two surface soil samples were collected via hand auger from the Old IWTPs AOPI on 06 and 07 May 2020. Surface soil samples ANAD-IWTP-1-SO (0 to 1.5 feet bgs) and ANAD-IWTP-2-SO (0 to 1 foot bgs) were collected near the aprons draining from each of two former sludge drying beds (**Figure 7-8**).

PFOS, PFOA, and PFBS were not detected in either of the soil samples. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.8 Old Sewage Treatment Plants

The subsection below summarizes the soil PFOS, PFOA, and PFBS analytical results associated with the Old STPs AOPI.

7.8.1 Groundwater

One groundwater sample (ANAD-STP-1-GW) was collected from a boring advanced via DPT and two groundwater samples (ANAD-88EWLF-4 and ANAD-95-GOU-U01) were collected from existing monitoring wells 88EWLF-4 and 95-GOU-U01. Sample ANAD-STP-1-GW was collected at first-encountered groundwater obtained from a temporary well screen installed at a depth interval of 7 to 11 feet bgs. The boring at location ANAD-STP-1 was advanced on 08 May 2020 and was located in a grassy area inferred to be downgradient of the Old STPs (**Figure 7-9**). Monitoring well 88EWLF-4 is located side-gradient of the Old STPs and monitoring well 95-GOU-U01 is located downgradient of the Old STPs. The screened intervals for well 88EWLF-4 (total depth of 88 feet bgs) and GOU-U01 (total depth of 23 feet bgs) are unknown. The intake tubes were placed at approximately 68 feet bgs for 88EWLF-4 and 19 feet bgs for GOU-U01. Groundwater sampling was completed at both monitoring wells on 21 October 2020.

PFOS (46 [40] ng/L) was detected in the parent sample at a concentration higher than the OSD risk screening level and in the duplicate sample (shown in brackets) at a concentration equal to the screening level of 40 ng/L in sample ANAD-STP-1-GW. PFOA (16 [17] ng/L) was detected in both the parent and the duplicate samples at concentrations lower than the OSD risk screening level of 40 ng/L in sample ANAD-STP-1-GW. PFBS was not detected in sample ANAD-STP-1-GW. PFOS (13 [12] ng/L), PFOA (17 [17] ng/L) and PFBS (2 J [1.9 J] ng/L) were detected in both the parent sample and the duplicate samples from 88EWLF-4 at concentrations lower than the OSD risk screening level of 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. PFOS (9.3 ng/L), PFOA (11 ng/L) and PFBS (2.2 J) were detected in the sample from 95-GOU-U01 at concentrations lower than the OSD risk screening level of 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.8.2 Soil

Two surface soil samples were collected via hand auger from the Old STPs AOPI on 06 and 07 May 2020. Surface soil sample ANAD-STP-1-SO (0 to 2 feet bgs) was co-located with groundwater sample ANAD-STP-1-GW. Surface soil sample ANAD-STP-2-SO (0 to 1.5 feet bgs) was collected in the direction of surface runoff flow from the sludge drying beds (**Figure 7-9**).

PFOS, PFOA, and PFBS were not detected in soil sample ANAD-STP-1-SO. PFOS (0.0021 [0.0027] mg/kg) was detected at a concentration lower than the residential OSD risk screening level of 0.13 mg/kg in sample ANAD-STP-2-SO. PFOA and PFBS were not detected in sample ANAD-STP-2-SO. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.9 Building 632

The subsection below summarizes the soil PFOS, PFOA, and PFBS analytical results associated with the Building 632 AOPI. No groundwater samples were proposed for this AOPI because it was used only for short-term, temporary storage of 5-gallon AFFF pails and no spills were reported.

7.9.1 Soil

Four surface soil samples were collected via hand auger from the Building 632 AOPI on 04 and 05 May 2020. Surface soil samples ANAD-B632-1-SO (0 to 2 feet bgs), ANAD-B632-2-SO (0 to 1 foot bgs), ANAD-B632-3-SO (0 to 2 feet bgs), and ANAD-B632-4-SO (0 to 1 foot bgs) were collected from around the concrete pad in front of the building in the direction of surface runoff (**Figure 7-10**).

PFOS, PFOA, and PFBS were not detected in any of the four soil samples. PFOS, PFOA, and PFBS soil analytical results are summarized in **Table 7-2**.

7.10 WIA Downgradient Areas

The subsections below summarize the groundwater and surface water PFOS, PFOA, and PFBS analytical results for samples collected downgradient of AOPIs located in the WIA (i.e., the Fire Department Burn Pit, Fire Training Ditch, Fire Station #1, and Old WTP/FTA AOPIs).

7.10.1 Groundwater

Six groundwater samples were collected from the following existing monitoring wells located downgradient of AOPIs in the WIA: OU5-PZ-03S (total depth of 19.2 feet bgs), OU5-PZ-03I (total depth of 33.2 feet bgs), OU5-MW-60 (screened 17 to 32 feet bgs), MW-1-23 (screened 49 to 59 feet bgs), OU5-PZ-04S (total depth of 18 feet bgs), and X04-B09S (screened 88 to 109 feet bgs) (**Figure 7-11**). Groundwater sampling was completed on 29 July 2021.

PFOS, PFOA, and/or PFBS were detected at all six locations at concentrations lower than the OSD risk screening levels of 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. PFOS (5.5 ng/L) and PFOA (3.8 J) were detected at OU5-PZ-03S; PFBS was not detected at this location. PFOS (14 ng/L) and PFOA 11 ng/L) were detected OU5-PZ-03I; PFBS was not detected at this location. PFOA (3.3 J ng/L) and PFBS (2.4 J ng/L) were detected at OU5-MW-60; PFOS was not detected at this location. PFOS (3.8 [3.6 J] ng/L) and PFOA (3.2 J [3 J] ng/L) were detected in both the parent and duplicate samples from MW-1-23; PFBS was not detected in the parent and duplicate samples from this location. PFOS (29 ng/L), PFOA (8.8 ng/L), and PFBS (3.1 J) were detected in the sample from OU5-PZ-04S. PFOS (29 ng/L) and PFOA (9.1 ng/L) were detected in the sample from X04-B09S; PFBS was not detected at this location. PFOS, PFOA, and PFBS groundwater analytical results are summarized in **Table 7-1**.

7.10.2 Surface Water

Surface water sample ANAD-EFP-1 was collected from the easternmost ANAD Fish Pond, where a spring daylights and the resulting spring pool creates the ANAD Fish Ponds. Springs are points at which groundwater discharges at the surface and the results, therefore, are indicative of the quality of groundwater drained by the springs. PFOS (17 J- ng/L)[2], and PFOA (14 ng/L) were detected at concentrations lower than the OSD risk screening level of 40 ng/L; PFBS was not detected. PFOS, PFOA, and PFBS surface water analytical results are summarized in **Table 7-3**.

7.11 Dedicated Equipment Background Samples

Two DEB samples were collected, one from monitoring well X04-B09S and the other from monitoring well MW-1-23 (see **Section 6.3.3**). No equipment influences on PFOS, PFOA, or PFBS concentrations were observable in either of the DEB samples, as the reported concentrations of these analytes were similar in both parent and companion DEB samples (**Appendix N**). At MW-1-23, the parent sample PFOS (3.8 ng/L) and PFOA (3.2 J ng/L) concentrations were similar to the DEB sample PFOS (4.1 ng/L) and PFOA (3.6 J ng/L) concentrations. PFBS was not detected in the parent and DEB samples collected from MW-1-23. At X04-B09S, the parent sample PFOS (29 ng/L) and PFOA (9.1 ng/L) concentrations were similar to the DEB sample PFOS (28 ng/L) and PFOA (10 ng/L) concentrations. PFBS was not detected in the parent and DEB samples collected from X04-B09S.

7.12 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. TOC concentrations in the soil samples ranged from 876 to 16,800 mg/kg. TOC concentrations reported at all of the AOPIs other than Fire Station #2, the Fire Training Ditch and the Old IWTPs were within the lower range of what is typically observed in topsoil (5,000 to 30,000 mg/kg). TOC concentrations reported at Fire Station #2, the Fire Training Ditch and the Old IWTPs are more aligned with desert-type soils (i.e., less than 5,000 mg/kg). The combined percentage of fines (i.e., silt and clay) in soils at ANAD ranged from 36% to 78.5% with an average of 49%. In general, PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The percent moisture of the soil averaged approximately 12.5%, which is typical for clay (0 to 20%). The pH of the soil was generally neutral (approximately 7). Based on these geochemical and physical soil characteristics (i.e., generally low TOC

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[2] The “J-“ qualifier indicates that the analyte was positively identified; however, the associated numerical value is an estimated concentration and may be biased low.

and high percentage of fines), PFAS constituents are expected to exhibit enhanced mobility. While PFAS constituents are relatively less mobile in soils with a high percentage of fines, depleted TOC may allow for enhanced mobility of the constituents in soil.

7.13 Blank Samples

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

7.14 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020a) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-12** through **7-17** 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 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:

- ANAD does not have any residential housing or permanent residents; therefore, the exposure pathways for on-installation residents are incomplete.
- The AOPIs are not likely to be accessed by on-installation recreational users, or by off-installation receptors; therefore, the soil exposure pathways for these receptors are incomplete.
- Recreational users are not likely to contact groundwater. Therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- On-post surface water bodies, and the off-post surface water bodies to which they flow, are not used as drinking water sources. Therefore, the surface water exposure pathways (via drinking water ingestion) for on-installation site workers and off-installation drinking water receptors are incomplete.
- On-installation site workers are not likely to contact the on-post surface water bodies. Therefore, the surface water and sediment exposure pathways for on-installation site workers are incomplete.

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

Figure 7-12 shows the CSM for the Fire Station #1, Old WTP/FTA, Fire Department Burn Pit, and Fire Station #2 AOPIs. AFFF releases occurred or potentially occurred at each of these AOPIs onto soil and paved surfaces during firefighter training exercises or other fire department activities. Each of these AOPIs is located near tributaries of Eastaboga Creek or Dry Creek; therefore, surface runoff is possible in conjunction with the releases to soil.

- PFOS was detected in soil at or adjacent to these AOPIs. 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.
- PFOS, PFOA, and/or PFBS were detected in groundwater at or adjacent to these AOPIs. Additionally, PFOS, PFOA, and/or PFBS were detected in groundwater samples collected from locations downgradient of the Fire Station #1, Old WTP/FTA, and Fire Department Burn Pit AOPIs. There are no on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at these AOPIs flows off-post through the installation’s southern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The Fire Station #1, Old WTP/FTA, and Fire Department Burn Pit AOPIs are in the WIA, where surface-water runoff drains to Eastaboga Creek. The Fire Station #2 AOPI is in the SIA, where surface-water runoff drains to Dry Creek. Recreational users could contact the surface water and sediment in Eastaboga Creek and Dry Creek. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation and off-installation recreational users are potentially complete.

Figure 7-13 shows the CSM for the Building 632 AOPI. Building 632 is a small warehouse and was used to store excess AFFF from the early 2000s to 2018. AFFF releases to soil and/or paved surfaces could have potentially occurred at this AOPI through incidental spills. Building 632 is located near tributaries of Eastaboga Creek; therefore, surface runoff is possible in conjunction with the releases to soil.

- PFOS, PFOA, and/or PFBS were not detected in soil at or adjacent to Building 632. Therefore, the soil exposure pathway (via incidental ingestion, dermal contact, and inhalation of dust) for on-installation site workers is incomplete.
- Groundwater samples were not collected at Building 632. However, PFOS, PFOA, and/or PFBS were not detected in soil, the source media, at Building 632. Therefore, the groundwater, surface water, and sediment exposure pathways are considered to be incomplete for all on-installation and off-installation receptors.

Figure 7-14 shows the CSM for the Building 114 AOPI. An AFFF release occurred at this AOPI during a fire response. Building 114 is located near tributaries of Dry Creek; therefore, groundwater discharge to surface water is possible in conjunction with the release. The release was contained to the basement of Building 114; therefore, surface runoff is not a viable transport mechanism for this AOPI.

- Soil was not sampled at Building 114. 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 potentially complete.
- PFOS, PFOA, and PFBS were detected in groundwater at this AOPI. There are no on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at this AOPI flows off-post through the installation’s southern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Building 114 is in the SIA, where surface-water runoff drains to Dry Creek and flows off post to Choccolocco Creek. Recreational users could contact the surface water and sediment in Dry Creek and Choccolocco Creek. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation and off-installation recreational users are potentially complete.

Figure 7-15 shows the CSM for the Fire Training Ditch AOPI. AFFF releases onto soil occurred at this AOPI during firefighter training exercises. After the release, surface soil was removed when a stormwater pipe was installed and backfill was added at the surface. The only remaining potential source of PFOS, PFOA, and/or PFBS is subsurface soil; therefore, surface runoff is not a viable transport mechanism for this AOPI.

- PFOS was detected in subsurface soil at this AOPI. Site workers could contact subsurface soil during intrusive work such as maintenance on the utility line that runs through the Fire Training Ditch area. Therefore, the soil exposure pathway (via incidental ingestion, dermal contact, and inhalation) for on-installation site workers is complete.

- PFOS, PFOA, and PFBS were detected in groundwater at this AOPI. Additionally, PFOS, PFOA, and/or PFBS were detected in groundwater samples collected from locations downgradient of the Fire Training Ditch AOPI. There are no on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at this AOPI flows off-post through the installation's southern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- The Fire Training Ditch is in the WIA. Shallow groundwater may discharge to tributaries leading to Eastaboga Creek. Recreational users could contact the surface water or sediment in Eastaboga Creek or its tributaries. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation and off-installation recreational users are potentially complete.

Figure 7-16 shows the CSM for the Old STPs AOPI. Wastewater potentially containing AFFF was historically processed at this AOPI. The treatment plants contained sludge drying beds; therefore, soil may have been impacted, as well as surface water and sediment at the outfall locations into Dry Creek.

- PFOS was detected in soil at this 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.
- PFOS, PFOA, and/or PFBS were detected in groundwater at or adjacent to this AOPI. There are no on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at this AOPI flows off-post through the installation's southern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Wastewater was released directly to Dry Creek. Dry Creek flows off post to Choccolocco Creek. Recreational users could contact the surface water and sediment in Dry Creek and Choccolocco Creek. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation and off-installation recreational users are potentially complete.

Figure 7-17 shows the CSM for the Old IWTPs AOPI. Wastewater potentially containing AFFF was historically processed at this AOPI. The treatment plants contained sludge drying beds; therefore, soil may have been impacted, as well as surface water and sediment at the outfall locations into Dry Creek.

- PFOS, PFOA, and/or PFBS were not detected in soil samples collected at this AOPI. Therefore, the soil exposure pathway (via incidental ingestion, dermal contact, and inhalation of dust) for on-installation site workers is considered to be incomplete.
- PFOS, PFOA, and PFBS were detected in groundwater at this AOPI. There are no on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion

and dermal contact) for site workers are potentially complete to account for potential future use of the downgradient on-post groundwater.

- Groundwater originating at this AOPI flows off-post through the installation’s southern boundary. Due to the absence of land use controls preventing potable use of groundwater in this area, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Wastewater was released directly to Dry Creek. Dry Creek flows off post to Choccolocco Creek. Recreational users could contact the surface water and sediment in Dry Creek and Choccolocco Creek. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation and off-installation recreational users are potentially complete.

8 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA/SI included two distinct efforts. The PA identified AOPIs at ANAD 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 ANAD. Following the evaluation, nine AOPIs were identified.

Coldwater Spring is a major public water supply located approximately 1.6 miles south of the SIA. The spring and approximately 240 surrounding acres are the property of the City of Anniston, which includes the Paul B. Krebs Water Treatment Plant adjacent to the spring pool. The Krebs facility withdraws, treats, and distributes water to customers at an average of 13 million gallons per day (ADEM 2018). The spring is the primary source of drinking water for the city of Anniston, ANAD, and several smaller cities. Potable water is supplied to ANAD via pipelines from the AWWSB and the use of on-site groundwater is restricted, eliminating the potential for exposure to contaminated groundwater (USACE, Buffalo District 2015). Samples were collected from the Coldwater Spring public water supply during four monitoring events in February, May, August, and November 2014 under the UCMR3. Results indicated that PFOS, PFOA, and PFBS were not detected in any of the samples collected from Coldwater Spring. The LOD at the time of UCMR3 sampling was 40 ng/L for PFOS, 20 ng/L for PFOA, and 90 ng/L for PFBS.

Private residences to the south, east, and west of ANAD utilize groundwater as a source of drinking water or for watering gardens. A total of 32 private wells are currently included in an annual monitoring program associated with OU-1, which addresses groundwater at the SIA (**Figure 2-4**). Groundwater samples are analyzed for VOCs, bis(2-ethylhexyl)phthalate, and select metals (arsenic, chromium lead, and manganese) (Leidos 2017).

All AOPIs were sampled during the SI at ANAD 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 ANAD QAPP Addendum (Arcadis 2020a). Furthermore, groundwater samples and a surface water sample were collected downgradient of the AOPIs in the WIA to assess the potential for off-post migration of PFOS, PFOA, and PFBS.

PFOS, PFOA, and/or PFBS were detected in soil and/or groundwater at eight of nine AOPIs. Five of the eight AOPIs had PFOS, PFOA, and/or PFBS present in groundwater at concentrations greater than the OSD risk-based screening levels. The maximum groundwater PFOS (3,600 ng/L) and PFBS (380 ng/L) concentrations were reported at the Fire Department Burn Pit. The maximum PFOA (180 ng/L) concentration was reported at both the Fire Station #1 and Fire Training Ditch AOPIs. In soil, the maximum PFOS (0.016 mg/kg) concentration was identified at the Old WTP/FTA AOPI. PFOA and PFBS were not detected in any soil samples.

Following the SI sampling, eight of the nine AOPIs are considered to have complete or potentially complete exposure pathways (the Building 632 AOPI does not have complete or potentially complete exposure pathways). Soil exposure pathways for on-installation workers are complete or potentially complete at seven AOPIs. Although there are no on-post drinking water wells, the groundwater exposure pathways for on-installation site workers are potentially complete at eight AOPIs to account for potential future use of the downgradient on-post groundwater. Due to a lack of land use controls off installation and downgradient of ANAD, the groundwater exposure pathways for off-installation drinking water receptors are also potentially complete for eight AOPIs. Groundwater PFOS, PFOA, and PFBS concentrations for on-post wells downgradient of the WIA AOPIs were lower than the OSD risk screening levels. The maximum detections of PFOS and PFOA in the sampled locations closest to the installation boundary, which are the ANAD Fish Pond spring sample and monitoring well X04-B09S, were 29 ng/L for PFOS and 14 ng/L for PFOA. Recreational users could contact constituents in surface water and sediment via incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways are potentially complete for eight AOPIs.

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for whether or not to conduct further study in the form of a remedial investigation 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 8-1** below summarizes the AOPIs identified at ANAD, identifies whether OSD risk screening levels were exceeded, and provides recommendations for each AOPI. As shown in the table, further investigation is warranted at five of the AOPIs investigated at ANAD. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 8-1. Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at Anniston Army Depot, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)		Recommendation
	GW	SO	
Fire Station #1	Yes	No	Further study in a remedial investigation
Old Wastewater Treatment Plant / Fire Training Area	Yes	No	Further study in a remedial investigation
Fire Department Burn Pit	Yes	No	Further study in a remedial investigation
Fire Training Ditch	Yes	No	Further study in a remedial investigation
Building 114 Fire	No	NS[1]	No action at this time
Fire Station #2	No	No	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)		Recommendation
	GW	SO	
Old Industrial Wastewater Treatment Plants	No	ND	No action at this time
Old Sewage Treatment Plants	Yes	No	Further study in a remedial investigation
Building 632	NS[2]	ND	No action at this time

Notes:

1. No soil samples were proposed for the Building 114 Fire AOPI because the fluids used to extinguish the fire were confined to the building basement.
2. No groundwater samples were proposed for the Building 632 AOPI because it was used only for short-term, temporary storage of approximately 15 to 20 5-gallon AFFF pails and no spills were reported.

Light gray shading – detection greater than the OSD risk screening level
GW – groundwater
ND – non-detect
NS – not sampled
SO – soil

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

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 fire 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 E**) and previous off-post well surveys performed as part of IRP activities.

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 document research, installation personnel interviews, and site reconnaissance.

Finally, the available PFOS, PFOA, and PFBS analytical data are limited to groundwater collected at eight of nine AOPIs (no groundwater samples were planned from the Building 632 AOPI) and soil samples collected from eight of nine AOPIs. The groundwater sample used to characterize Fire Station #2 was obtained from an inferred side-gradient location. However, given the longevity of operation for the

Building 114 groundwater extraction system (i.e., in operation since approximately 1985), which is located in close proximity to Fire Station #2, if significant PFOS, PFOA, or PFBS concentrations were present in groundwater at Fire Station #2, they would likely be reflected in the Building 114 results. No direct PFOS, PFOA, or PFBS impacts to surface water features were identified at the AOPIs; therefore, no surface water or sediment sampling was conducted at the AOPIs as part of this SI. The lack of recognized surface water impacts does not preclude the possibility of surface water impacts at ANAD. Available data, including PFOS, PFOA, and PFBS results, are included in **Appendix N**. All samples were analyzed per the selected analytical methods.

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

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
%	percent
ADEM	Alabama Department of Environmental Management
AFFF	aqueous film-forming foam
ANAD	Anniston Army Depot
AOD	Anniston Ordnance Depot
AOPI	area of potential interest
AR-AFFF	alcohol-resistant aqueous film-forming foam
Arcadis	Arcadis U.S., Inc.
Army	United States Army
ASA	Ammunition Storage Area
ATC	alcohol type concentrate
AWWSB	City of Anniston Water Works and Sewer Board
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DEB	dedicated equipment background
DLA	Defense Logistics Agency
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objective
DUSR	Data Usability Summary Report
E	endangered
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FCR	Field Change Report
FTA	fire training area
GIS	geographic information system

GW	groundwater
GWTP	groundwater treatment plant
IDW	investigation-derived waste
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
IWTP	Industrial Wastewater Treatment Plant
LOD	limit of detection
LOQ	limit of quantitation
MCL	maximum contaminant level
mg/kg	milligrams per kilogram (parts per million)
ng/L	nanograms per liter (parts per trillion)
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
NS	not sampled
OSD	Office of the Secretary of Defense
OU	operable unit
OWS	oil / water separator
PA	preliminary assessment
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
RI	remedial investigation

RSL	regional screening level
SAIC	Science Applications International Corporation
SI	site inspection
SIA	Southeast Industrial Area
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
STP	sewage treatment plant
SWMU	solid waste management unit
T	threatened
TGI	technical guidance instruction
TOC	total organic carbon
UCMR3	Third Unregulated Contaminant Monitoring Rule
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WIA	Western Industrial Area
WTP	wastewater treatment plant

TABLES

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

Area of Potential Interest	Sampling Location ID	Total Well Depth (ft bgs)	Measuring Point[1]	Measuring Point Elevation[2] (ft amsl)	Depth to Groundwater from MP (ft)	Groundwater Elevation (ft amsl)	Screened Interval (ft bgs)	Casing Diameter (inches)
Building 114 Fire	ANAD-B114-EFF	N/A	Effluent Tap	N/A	N/A	N/A	N/A	N/A
Building 114 Fire	ANAD-B114-INF	N/A	Influent Tap	N/A	N/A	N/A	N/A	N/A
Fire Department Burn Pit	ANAD-FDBP-1	45	GS	Unknown	25	N/A	30-45	1
Fire Station #1	ANAD-FS1-1	28	GS	Unknown	26.10	N/A	24-28	1
Fire Station #2	ANAD-82B-12	85	TOC	620.52	14.31	606.21	62-87	6
Old Wastewater Treatment Plant/Fire Training Area	ANAD-FTA-1	13	GS	Unknown	8.90	N/A	9-13	1
Fire Training Ditch	ANAD-OU5-MW-55	75	TOC	642.04	15.73	626.31	65-75	2
Old Industrial Wastewater Treatment Plants	ANAD-82B09	25	TOC	624.07	10.75	613.32	10-25	2
	ANAD-W3	19	TOC	626.5	13.85	612.65	Unknown	2
Old Sewage Treatment Plants	ANAD-88EWLF-4	88	TOC	619.4	22.18	597.22	Unknown	6
	ANAD-95-GOU-U01	26	TOC	619.01	9.20	609.81	Unknown	4
	ANAD-STP-1	11	GS	Unknown	6.20	N/A	7-11	1
Western Industrial Area Downgradient Sampling Locations	ANAD-MW-1-23	59	TOC	638.04	17.82	620.22	49-59	2
	ANAD-OU5-MW-60	32	TOC	638.45	16.03	622.42	17-32	2
	ANAD-OU5-PZ-03I	33.2	TOC	630.79	11.53	619.26	Unknown	1
	ANAD-OU5-PZ-03S	19.2	TOC	630.84	10.18	620.66	Unknown	1
	ANAD-OU5-PZ-04S	18	TOC	Unknown	12.12	N/A	Unknown	1
	ANAD-X04-B09S	109	TOC	621	27.59	593.41	88-109	2

Note:

1. The depth to water measuring point for temporary wells installed via direct-push technology was the ground surface. The total depth listed for temporary wells indicates the final depth of the temporary borehole. The screened interval listed for temporary sampling points indicates the interval at which a temporary screen was installed to allow for groundwater sample collection.

2. Existing well elevations are surveyed measurements provided in previous ANAD reports. Ground surface elevations are not available for temporary groundwater monitoring locations.

Acronyms/Abbreviations:

amsl = above mean sea leve	ID = identification
bgs = below ground surface	N/A = not applicable
ft = feet	MP = measuring point
GS = ground surface	TOC = top of casing

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

			Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Tapwater RiskScreening Level	40		40		600	
Associated AOPI	Sample ID / Parent Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Building 114 Fire	ANAD-B114-EFF-2-GW-050620	05/06/2020	N	**5.8**		**3.7**	J	**5.4**	
	ANAD-B114-INF-1-GW-050620	05/06/2020	N	**6.8**		**4.5**		**5.5**	
Fire Department Burn Pit	ANAD-FDBP-1-GW-102020	10/20/2020	N	**3600**	DJ	**160**		**380**	
Fire Station #1	ANAD-FS1-1GW-(24-28)-050820	05/08/2020	N	**59**		**180**		**3.6**	J
Fire Station #2	ANAD- 82B-12-050820	05/08/2020	N	**12**		**3.9**	J	4.0	U
Old Wastewater Treatment Plant/Fire Training Area	ANAD-FTA-GW(9-13)-050720	05/07/2020	N	**200**		**55**		**2.7**	J
Fire Training Ditch	ANAD-OU5-MW-55-050720	05/07/2020	N	**390**		**180**		**22**	
Old Industrial Wastewater Treatment Plants	ANAD-82B09-050720	05/07/2020	N	**3.6**	J	3.9	U	**15**	
	ANAD-W3-050620	05/06/2020	N	**4.9**		**2.3**	J	**16**	
Old Sewage Treatment Plants	ANAD-FD-102120	10/21/2020	FD	**12**		**17**		**1.9**	J
	ANAD-88EWLF-4-102120	10/21/2020	N	**13**		**17**		**2.0**	J
	ANAD-95-GOU-U01-102120	10/21/2020	N	**9.3**		**11**		**2.2**	J
	ANAD-FD1-GW-050820	05/08/2020	FD	**40**		**17**		4.1	U
	ANAD-STP-1-GW-(7-11)-050820	05/08/2020	N	**46**		**16**		4.0	U
Western Industrial Area Downgradient Sampling Locations	ANAD-FD-1-072921	07/29/2021	FD	**3.6**	J	**3.0**	J	3.7	U
	ANAD-MW-1-23-072921	07/29/2021	N	**3.8**		**3.2**	J	3.8	U
	ANAD-OU5-MW-60-072921	07/29/2021	N	3.7	U	**3.3**	J	**2.4**	J
	ANAD-OU5-PZ-03I-072921	07/29/2021	N	**14**		**11**		3.8	U
	ANAD-OU5-PZ03S-072921	07/29/2021	N	**5.5**		**3.8**	J	4.0	U
	ANAD-OU5-PZ-04S-072921	07/29/2021	N	**29**		**8.8**		**3.1**	J
	ANAD-X04-B09S-072921	07/29/2021	N	**29**		**9.1**		3.8	U

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, (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program.September 15).

Acronyms/Abbreviations:
-- = not applicable
AOPI = area of potential interest
FD = field duplicate sample
ID = identification
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
Qualifiers
DJ = The analyte was analyzed at dilution and the result is an estimated quantity
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).

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

			Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
			OSD Industrial/Commercial Risk Screening Levels	1.6		1.6		25	
			OSD Residential Risk Screening Levels	0.13		0.13		1.9	
Associated AOPI	Sample ID / Parent Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Fire Department Burn Pit	ANAD-FDBP-1-S0-(0-2)-050520	05/05/2020	N	**0.00055**	J	0.0011	U	0.0011	U
	ANAD-FDBP-2-S0-(0-1.5)-050520	05/05/2020	N	**0.001**		0.001	U	0.001	U
	ANAD-FDBP-3-S0-(0-2)-050520	05/05/2020	N	0.001	U	0.001	U	0.001	U
	ANAD-FDBP-4-S0-(0-2)-050520	05/05/2020	N	0.0011	U	0.0011	U	0.0011	U
Fire Station #1	ANAD-FS1-1-S0-(0-2)-050520	05/06/2020	N	**0.0015**		0.0012	U	0.0012	U
	ANAD-FS1-2-S0-(0-2)-050520	05/05/2020	N	**0.003**		0.0012	U	0.0012	U
	ANAD-FS1-3-S0-(0-1)-050520	05/05/2020	N	**0.0019**		0.0011	U	0.0011	U
	ANAD-FS1-4-S0-(0-2)-050520	05/05/2020	N	**0.00089**	J	0.0011	U	0.0011	U
Fire Station #2	ANAD-FS2-1-SO-(0-2)-050820	05/07/2020	N	**0.0017**		0.0012	U	0.0012	U
	ANAD-FS2-2-S0-(0-2)-050620	05/06/2020	N	**0.0021**		0.0012	U	0.0012	U
	ANAD-FS2-3-S0-(0-2)-050620	05/06/2020	N	0.0011	U	0.0011	U	0.0011	U
	ANAD-FS2-4-S0-(0-2)-050620	05/06/2020	N	**0.0021**		0.0011	U	0.0011	U
Old Wastewater Treatment Plant/Fire Training Area	ANAD-FTA-1-S0-(0-0.5)-050520	05/05/2020	N	**0.0037**		0.0011	U	0.0011	U
	ANAD-FTA-2-S0-(0-1)-050520	05/05/2020	N	**0.0024**		0.0012	U	0.0012	U
	ANAD-FTA-3-S0-(0-2)-050520	05/05/2020	N	0.0011	U	0.0011	U	0.0011	U
	ANAD-FTA-4-S0-(0-2)-050520	05/05/2020	N	**0.016**		0.0011	U	0.0011	U
Fire Training Ditch	ANAD-FTD-1-SO-(4-6)-050720	05/07/2020	N	**0.0022**		0.0013	U	0.0013	U
Old Industrial Wastewater Treatment Plants	ANAD-IWTP-1-S0-(0-1.5)-050620	05/06/2020	N	0.0011	U	0.0011	U	0.0011	U
	ANAD-IWTP-2-S0-(0-1)-050620	05/06/2020	N	0.001	U	0.001	U	0.001	U
Old Sewage Treatment Plants	ANAD-STP-1-SO-(0-2)-050820	05/07/2020	N	0.0012	U	0.0012	U	0.0012	U
	ANAD-FD-1-S0-050620 / ANAD-STP-2-SO-(0-1.5)-050620	05/06/2020	FD	**0.0027**		0.0011	U	0.0011	U
	ANAD-STP-2-S0-(0-1.5)-050620	05/06/2020	N	**0.0021**		0.0011	U	0.0011	U
Building 632	ANAD-B632-1-S0-(0-2)-050420	05/04/2020	N	0.0012	U	0.0012	U	0.0012	U
	ANAD-B632-2-S0-(0-1)-050520	05/05/2020	N	0.0011	U	0.0011	U	0.0011	U
	ANAD-B632-3-S0-(0-2)-050520	05/05/2020	N	0.0013	U	0.0013	U	0.0013	U
	ANAD-B632-4-S0-(0-1)-050520	05/05/2020	N	0.0012	U	0.0012	U	0.0012	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 the residential and commerical/industrial scenario (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).
3. Gray shaded values indicate the result was detected greater than or equal to the OSD risk screening level for the residential scenario. Italicized values indicate the result was detected greater than the OSD risk screening level for the industrial/commercial and residential scenario.

Acronyms/Abbreviations:
AOPI = area of potential interest
DPT = Direct-Push Technology
FD = field duplicate sample
ID = identification
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

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

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

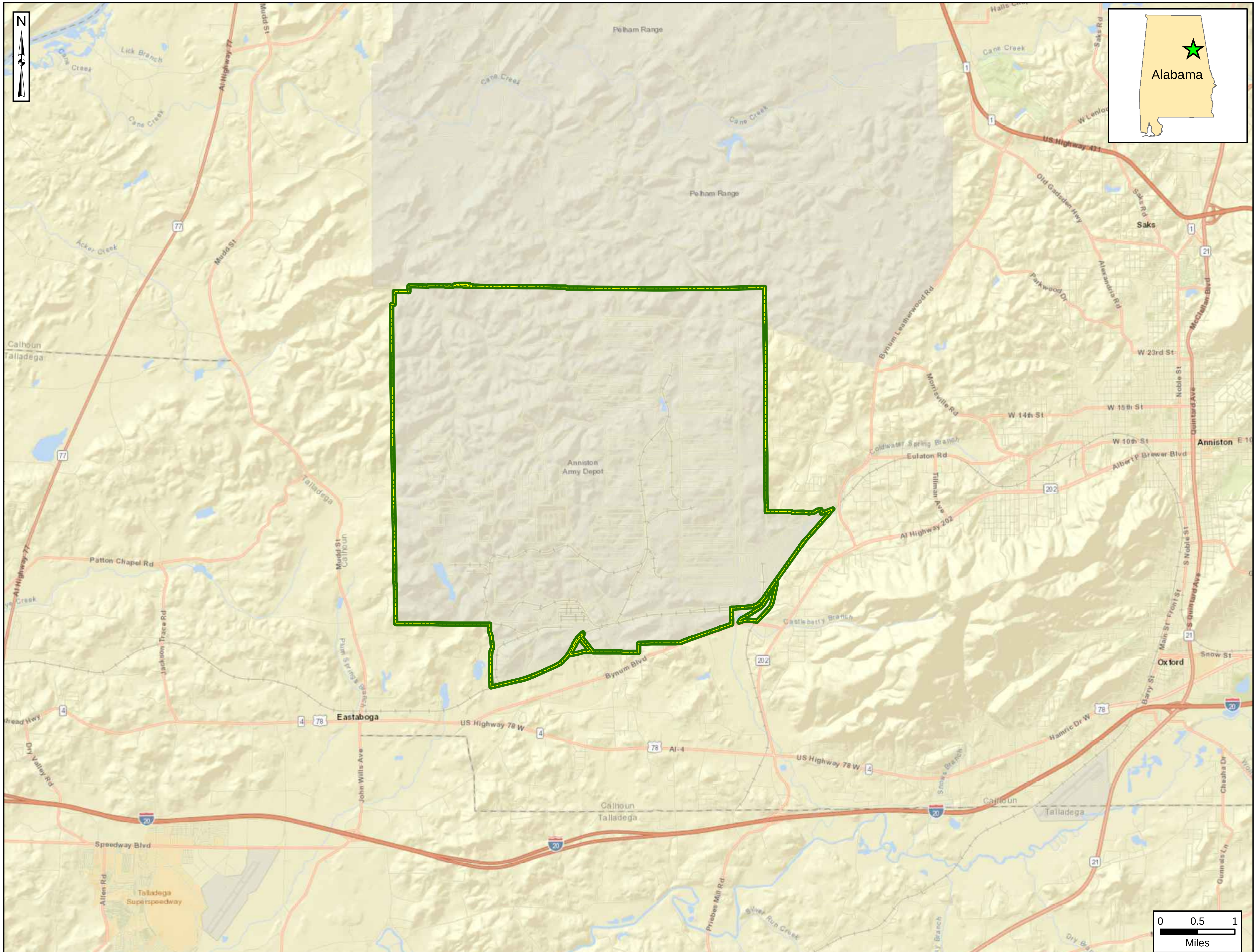
				Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				OSD Tapwater RiskScreening Level	40		40		600	
Associated AOPI	Location Type	Sample ID / Parent Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Western Industrial Area Downgradient Sampling Locations	Surface Water / Spring	ANAD-EFP-1-072921	07/29/2021	N	**17**	J-	**14**		3.4	U

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, (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15).

Acronyms/Abbreviations:
-- = not applicable
AOPI = area of potential interest
ID = identification
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

Qualifiers:
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).

FIGURES



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Anniston Army Depot, AL

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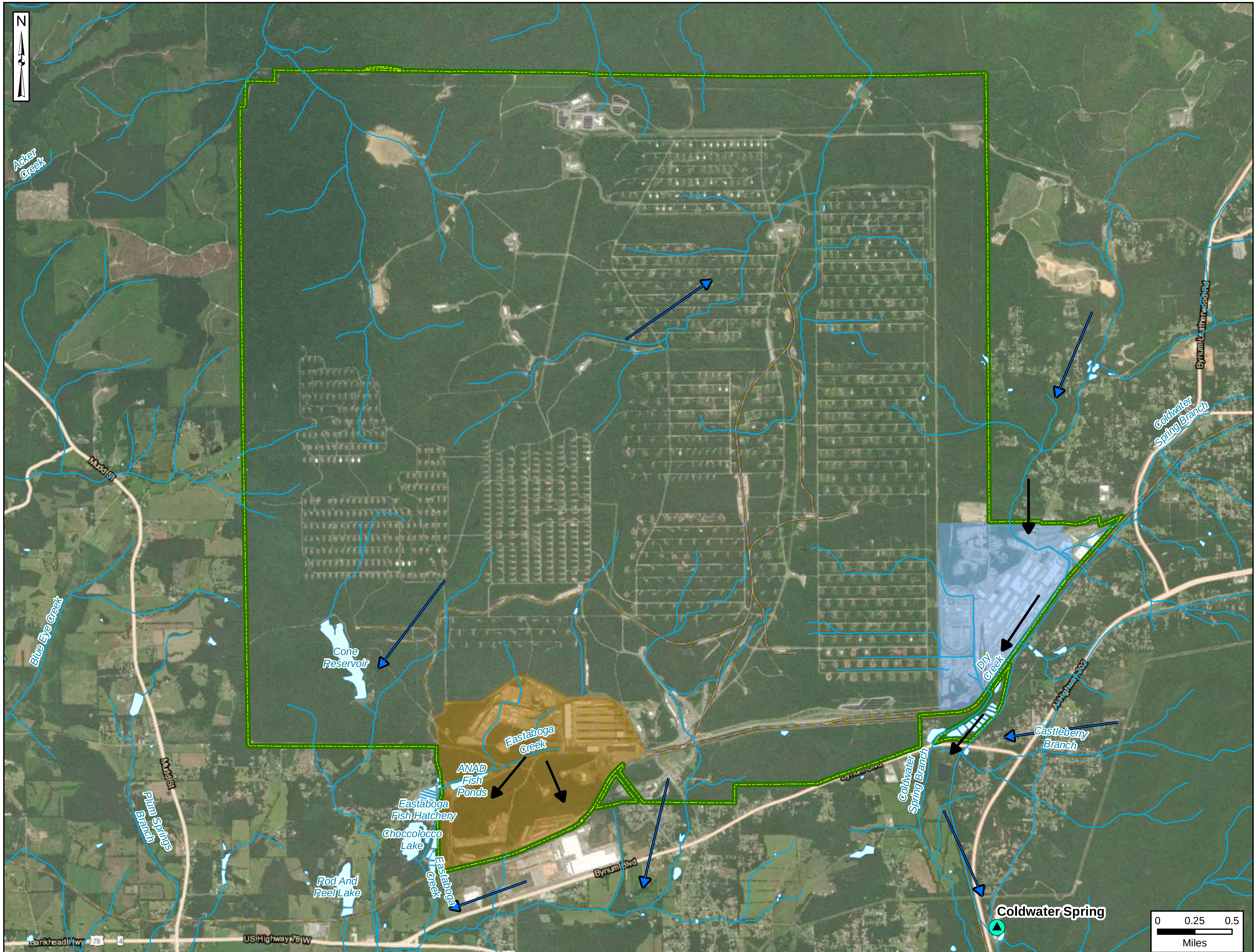
Figure 2-1
Site Location

Legend

Installation Boundary

Data Sources:
ANAD, GIS Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 16 North



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Preliminary Assessment /
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Anniston Army Depot, AL

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Figure 2-2
Site Layout

Legend

- Installation Boundary
- Southeast Industrial Area
- Western Industrial Area
- River/Stream
- Water Body
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Anniston Waterworks Supply

Data Sources:
ANAD, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

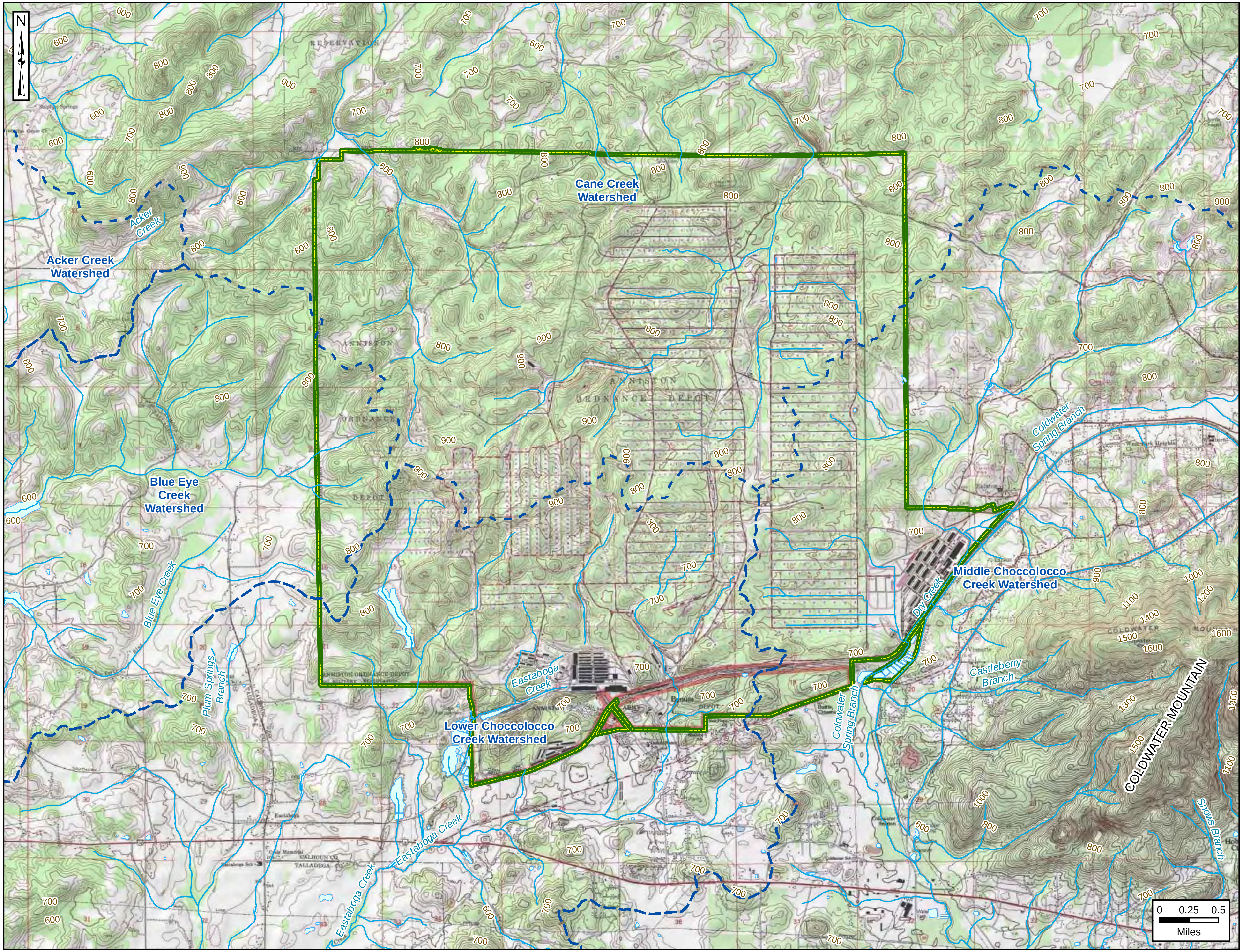

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Figure 2-3
Topographic Map

Legend

- Installation Boundary
- River/Stream
- Water Body
- Watershed Boundary

Note: Contour labels are in feet.

Data Sources:
ANAD, GIS Data, 2019
NHD, Hydrology Data, 2019
ESRI ArcGIS Online, USGS Topo Map

Coordinate System:
WGS 1984, UTM Zone 16 North

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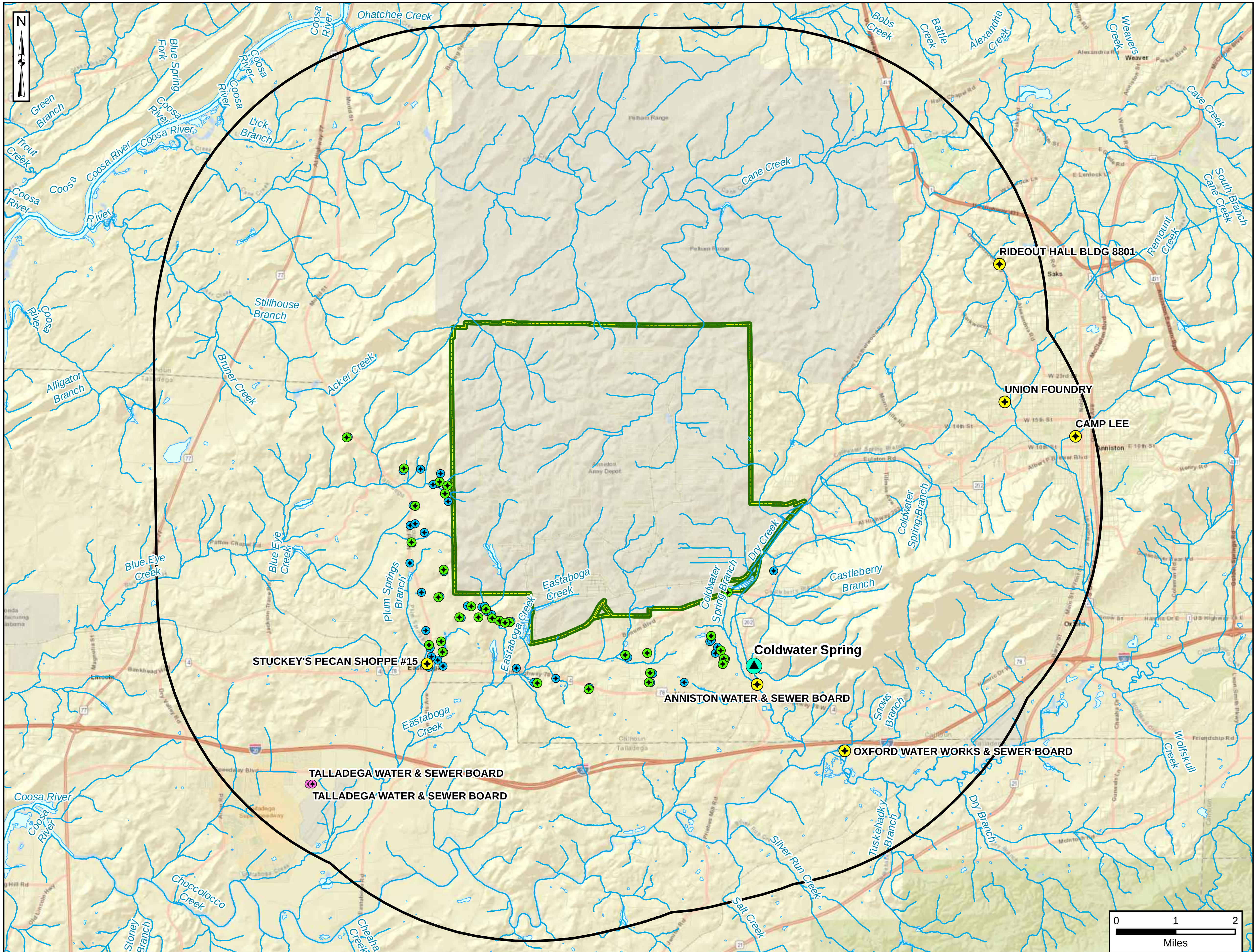

Figure 2-4
Off-Post Potable Supply Wells

Legend

- Installation Boundary
- 5-Mile Radius
- River/Stream
- Water Body
- Anniston Waterworks Supply
- Public Water Supply System Well
- Other Public Supply Well
- Private Well in Current OU1 Monitoring Program
- Private Well Identified in 2000 Survey (Leidos 2017)

Data Sources:
ANAD, GIS Data, 2019
EDR, Public Supply Wells, 2018
Leidos, Private Wells, 2017
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 16 North

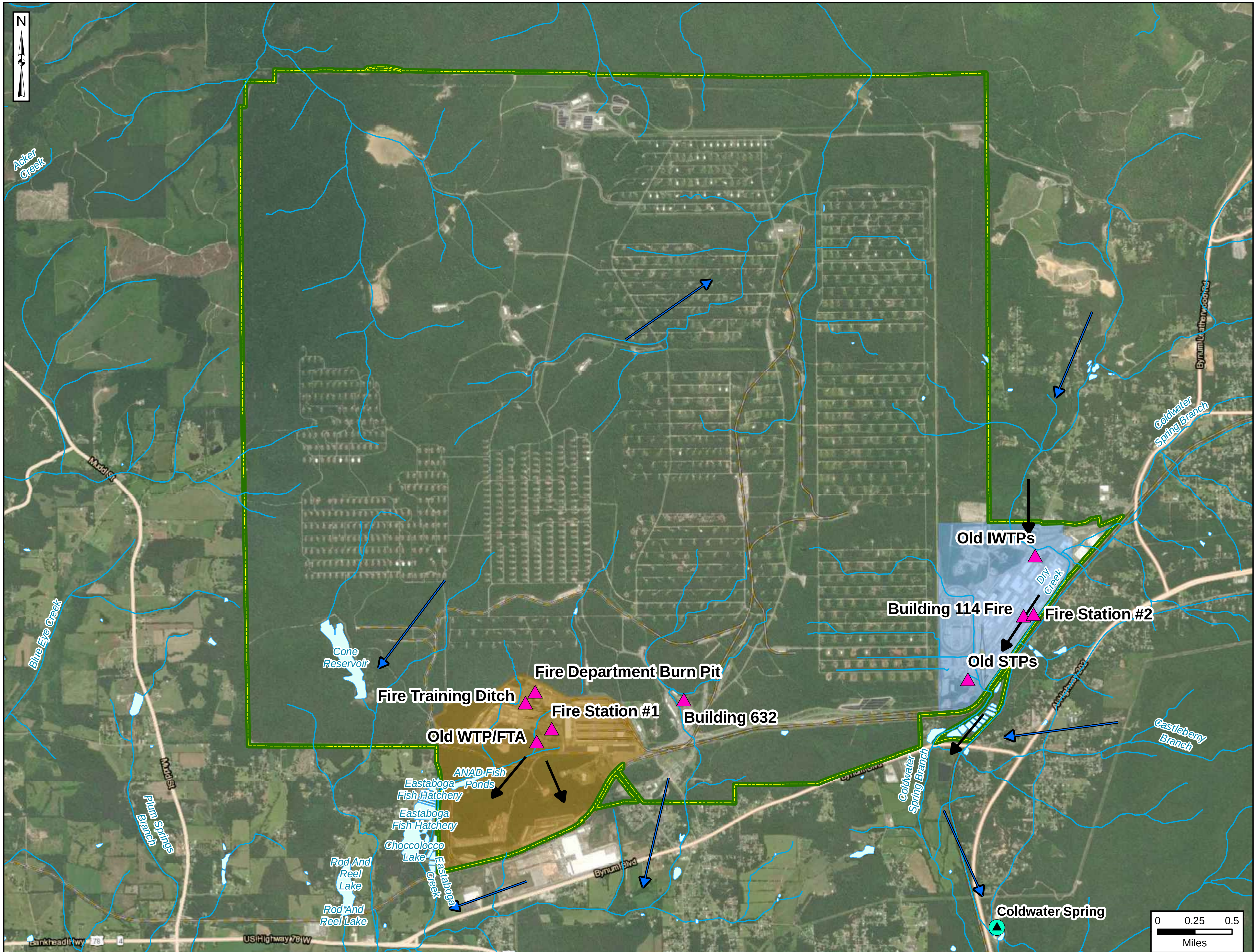

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Figure 5-2 AOPI Locations

Legend

- Installation Boundary
- AOPI Location
- Southeast Industrial Area
- Western Industrial Area
- River/Stream
- Water Body
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Anniston Waterworks Supply

AOPI = area of potential interest
FTA = fire training area
IWTP = industrial wastewater treatment plant
STP = sanitary treatment plant
WTP = wastewater treatment plant

Data Sources:
ANAD, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

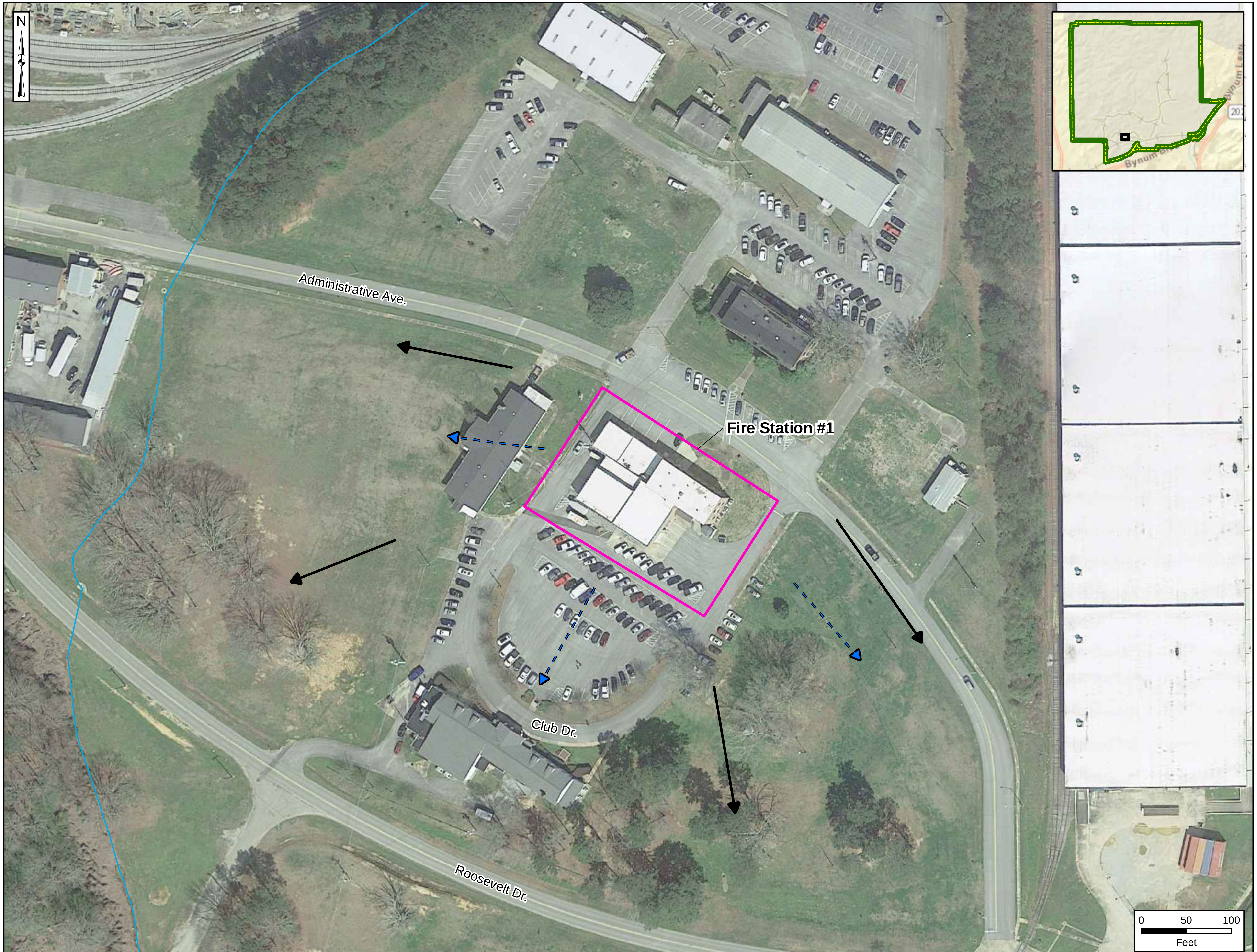

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Figure 5-3
Aerial Photo of
Fire Station #1 AOPI

Legend

AOPI
River/Stream
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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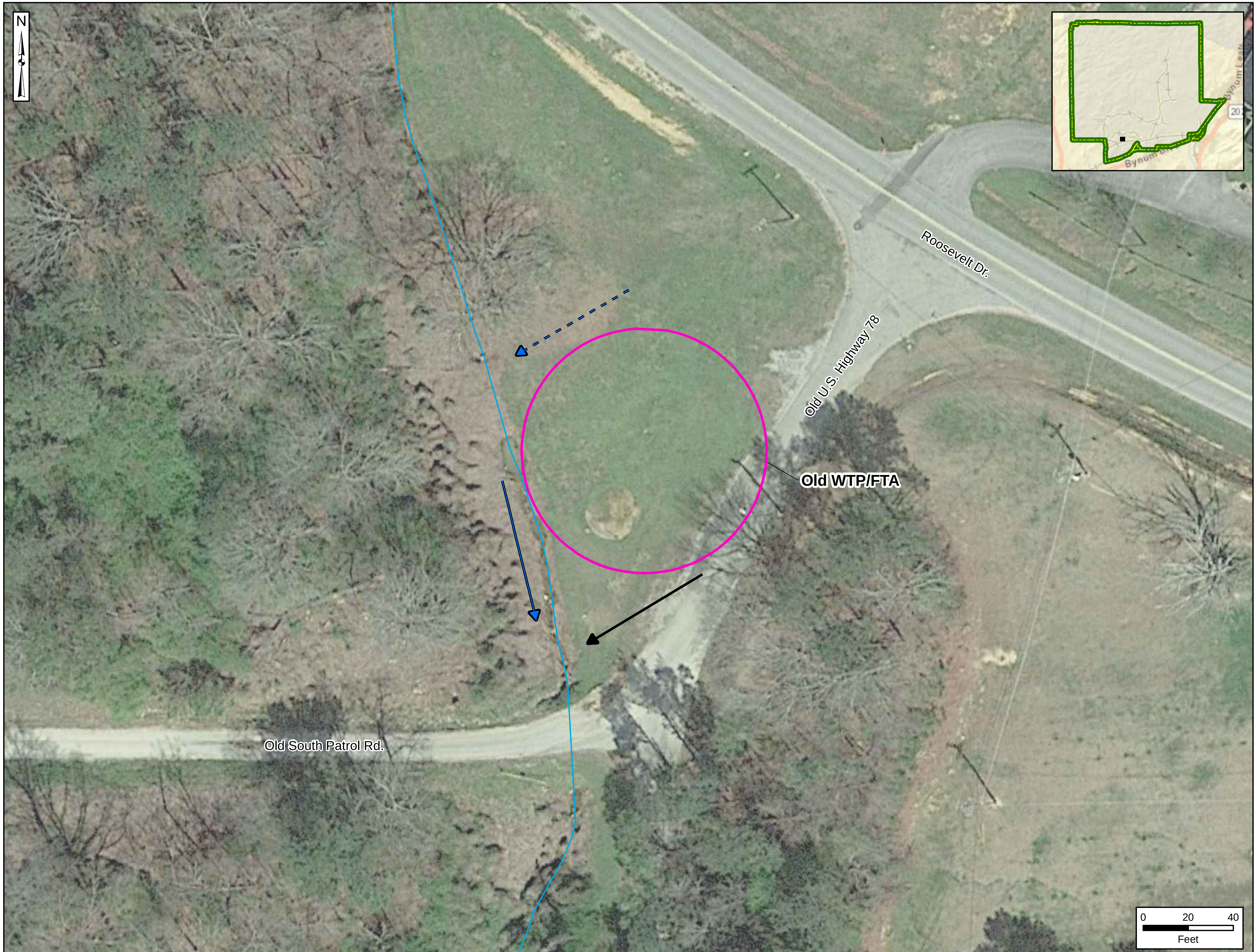
Figure 5-4
Aerial Photo of
Old WTP/FTA AOPI



Legend

- AOPI
- River/Stream
- Stream
- Inferred Groundwater Flow Direction
- Surface Water Flow Direction
- Surface Runoff Flow Direction

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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Figure 5-5
Aerial Photo of
Fire Department Burn Pit AOPI

Legend

- AOPI
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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Figure 5-6
Aerial Photo of
Fire Training Ditch AOPI

Legend

AOPI
River/Stream
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction
Monitoring Well

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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Figure 5-7
Aerial Photo of
Building 114 Fire AOPI

Legend

- Installation Boundary
- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Surface Water Flow Direction
- Monitoring Well

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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Figure 5-8
Aerial Photo of
Fire Station #2 AOPI

Legend

- Installation Boundary
- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Surface Water Flow Direction
- Monitoring Well

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

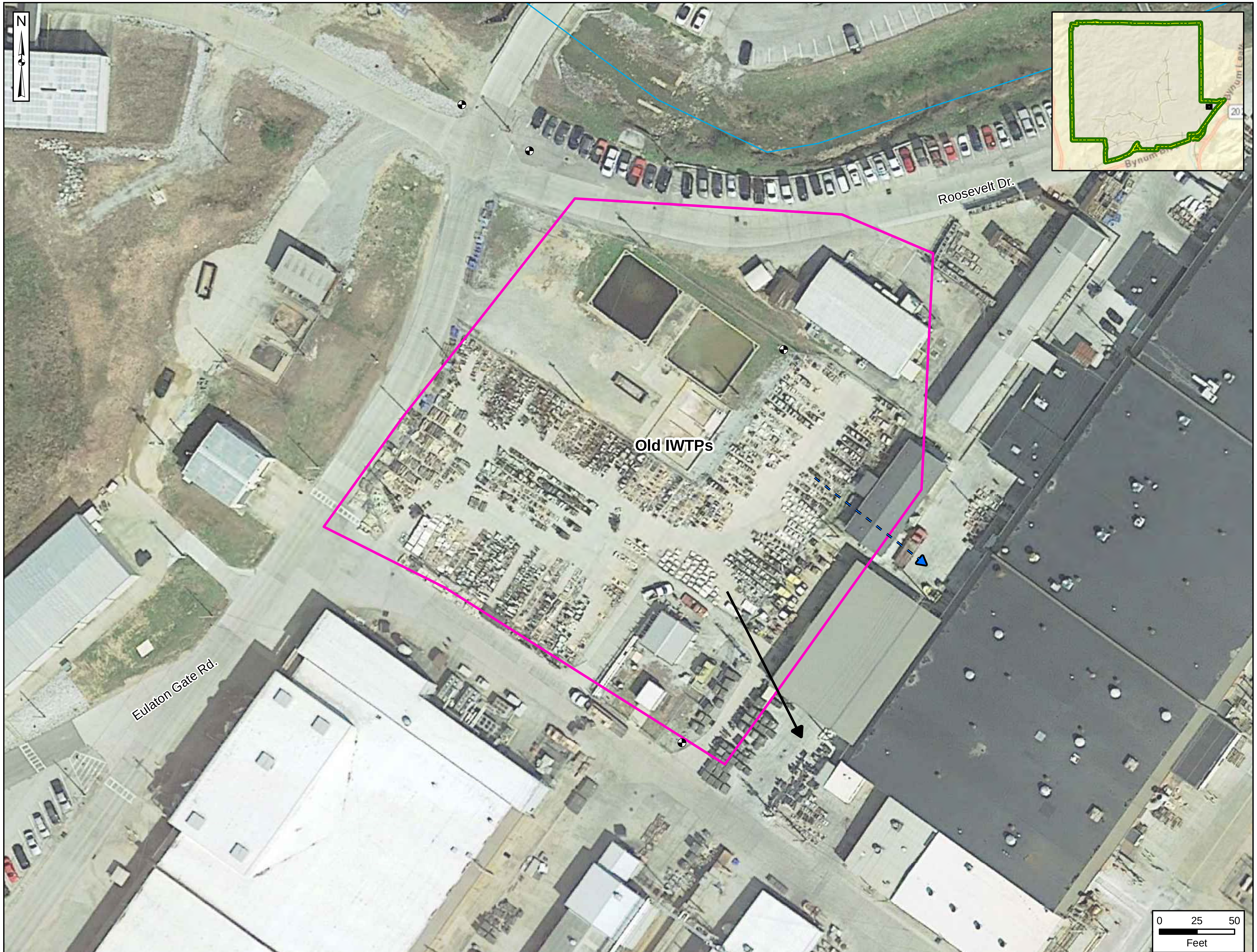

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Figure 5-9
Aerial Photo of Old IWTPs AOPI

Legend

- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Monitoring Well

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

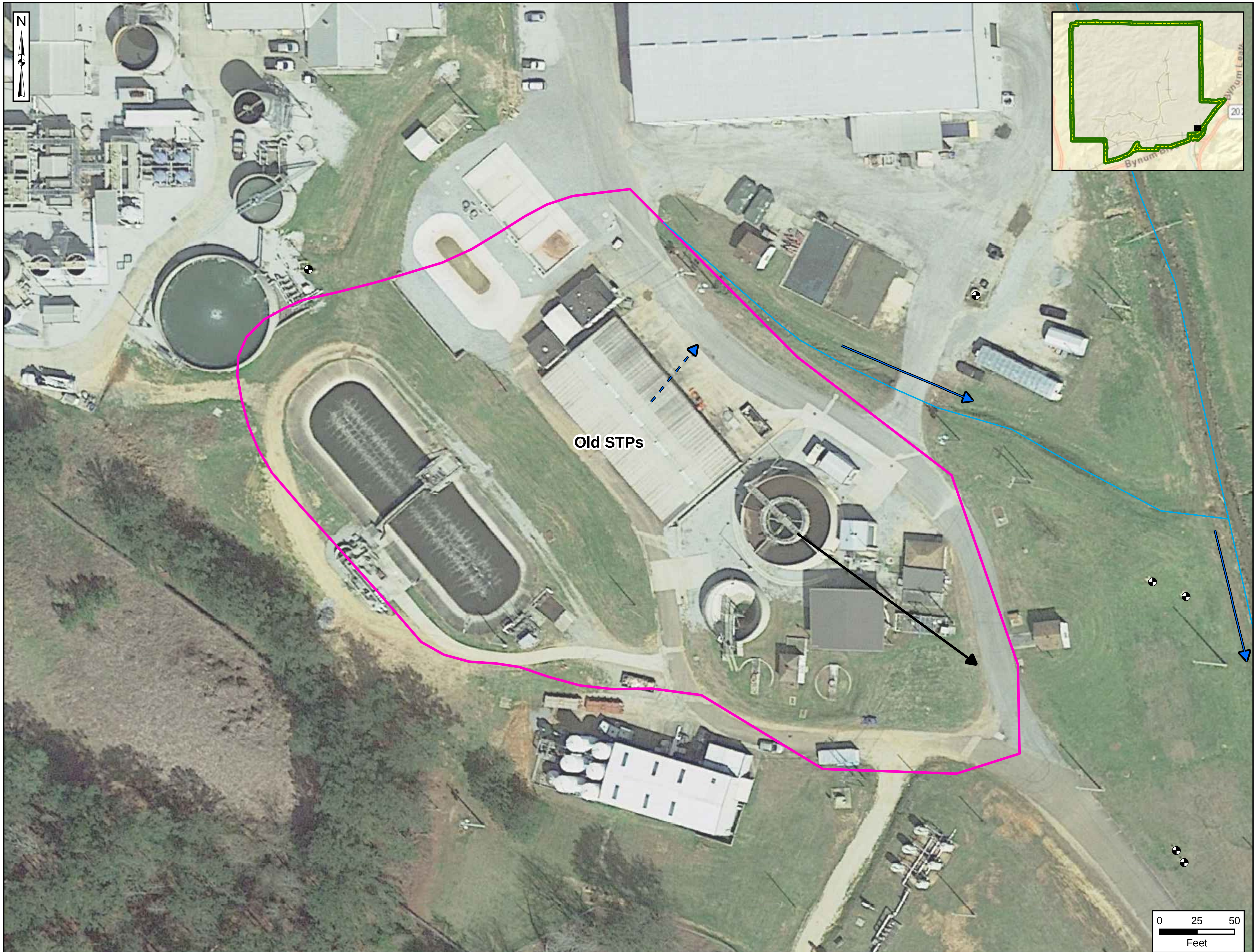

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Figure 5-10
Aerial Photo of Old STPs AOPI

Legend

- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Water Flow Direction
- Surface Runoff Flow Direction
- Monitoring Well

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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Figure 5-11
Aerial Photo of
Building 632 AOPI

Legend

- AOPI
- River/Stream
- Surface Runoff Flow Direction
- Surface Water Flow Direction

AOPI = area of potential interest

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery, 2019

Coordinate System:
WGS 1984, UTM Zone 16 North

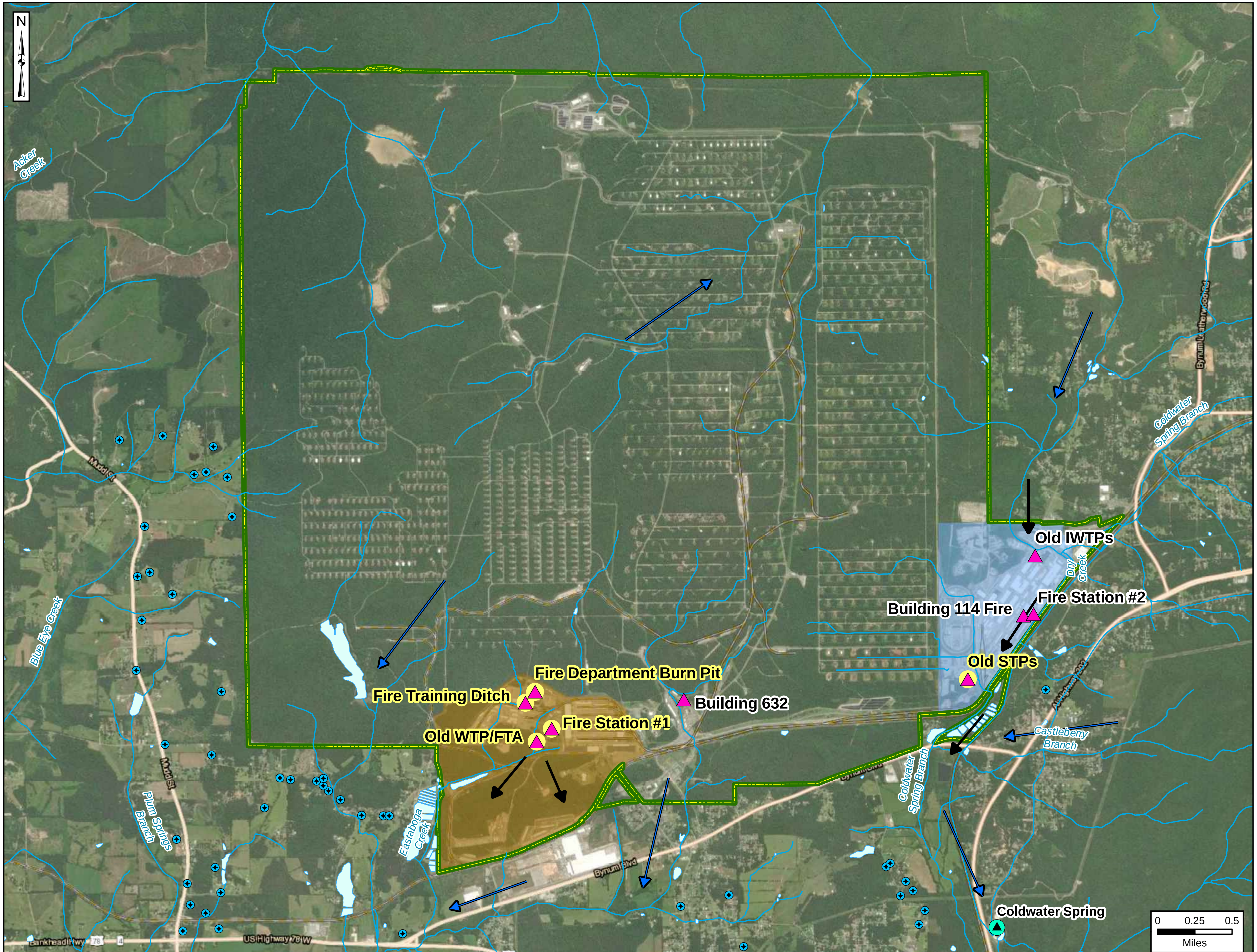

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Figure 7-1
AOPI Locations and OSD Risk Screening Level Exceedances

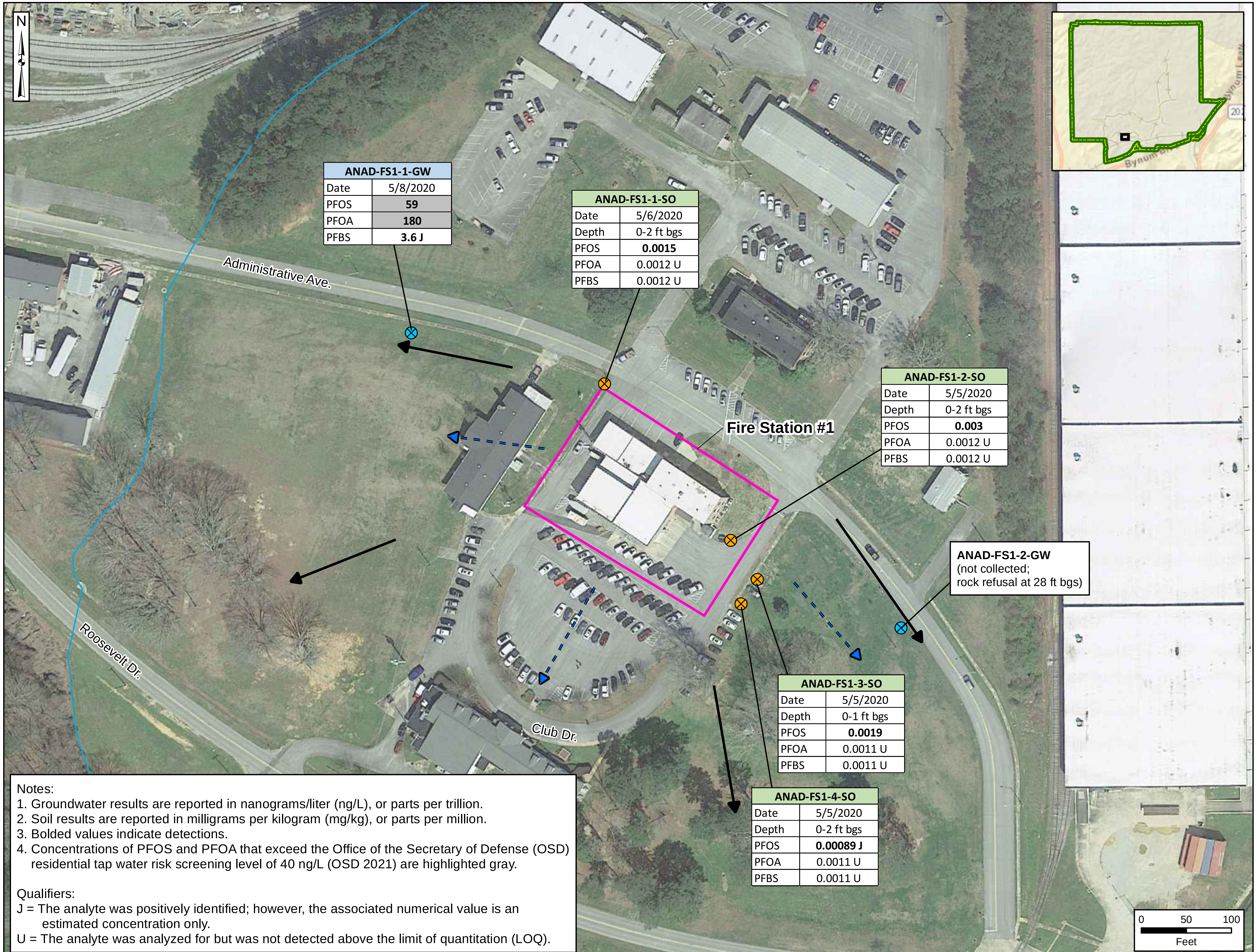
Legend

- Installation Boundary
- Southeast Industrial Area
- Western Industrial Area
- River/Stream
- Water Body
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Anniston Waterworks Supply
- AOPI Location
- ORAP Identified Groundwater Well
- AOPI Location with OSD Risk Screening Level Exceedance

AOPI = area of potential interest
FTA = fire training area
IWTP = industrial wastewater treatment plant
OSD = Office of the Secretary of Defense
STP = sanitary treatment plant
WTP = wastewater treatment plant

Data Sources:
ANAD, GIS Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North



ANAD-FS1-1-GW	
Date	5/8/2020
PFOS	**59**
PFOA	**180**
PFBS	**3.6 J**

ANAD-FS1-1-SO	
Date	5/6/2020
Depth	0-2 ft bgs
PFOS	**0.0015**
PFOA	0.0012 U
PFBS	0.0012 U

ANAD-FS1-2-SO	
Date	5/5/2020
Depth	0-2 ft bgs
PFOS	**0.003**
PFOA	0.0012 U
PFBS	0.0012 U

ANAD-FS1-2-GW
(not collected;
rock refusal at 28 ft bgs)

ANAD-FS1-3-SO	
Date	5/5/2020
Depth	0-1 ft bgs
PFOS	**0.0019**
PFOA	0.0011 U
PFBS	0.0011 U

ANAD-FS1-4-SO	
Date	5/5/2020
Depth	0-2 ft bgs
PFOS	**0.00089 J**
PFOA	0.0011 U
PFBS	0.0011 U

Notes:
1. Groundwater results are reported in nanograms/liter (ng/L), or parts per trillion.
2. Soil results are reported 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:
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).

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Figure 7-2
Fire Station #1 AOPI
PFOS, PFOA, and PFBS
Analytical Results

Legend

- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction

Sample Locations

- Groundwater Boring
- Soil Boring

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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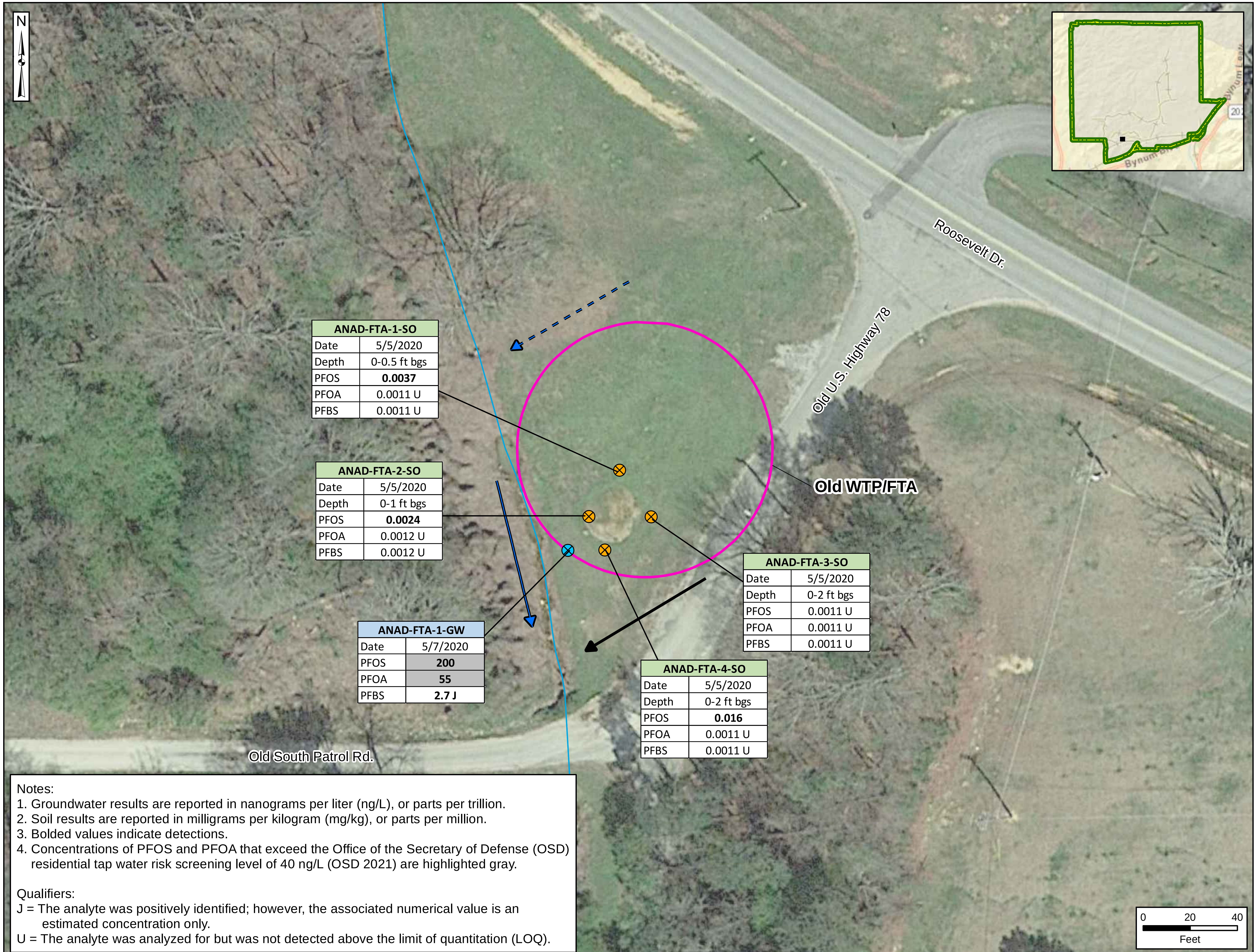
Figure 7-3 Old WTP/FTA AOPI PFOS, PFOA, and PFBS Analytical Results



ANAD-FTA-1-SO	
Date	5/5/2020
Depth	0-0.5 ft bgs
PFOS	**0.0037**
PFOA	0.0011 U
PFBS	0.0011 U

ANAD-FTA-2-SO	
Date	5/5/2020
Depth	0-1 ft bgs
PFOS	**0.0024**
PFOA	0.0012 U
PFBS	0.0012 U

ANAD-FTA-3-SO	
Date	5/5/2020
Depth	0-2 ft bgs
PFOS	0.0011 U
PFOA	0.0011 U
PFBS	0.0011 U

ANAD-FTA-4-SO	
Date	5/5/2020
Depth	0-2 ft bgs
PFOS	**0.016**
PFOA	0.0011 U
PFBS	0.0011 U

ANAD-FTA-1-GW	
Date	5/7/2020
PFOS	**200**
PFOA	**55**
PFBS	**2.7 J**

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported 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:
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).

Legend

AOPI
River/Stream
Stream
Inferred Groundwater Flow Direction
Surface Water Flow Direction
Surface Runoff Flow Direction

Sample Locations

Groundwater Boring
Soil Boring

AOPI = area of potential interest
FTA = fire training area
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
WTP = wastewater treatment plant

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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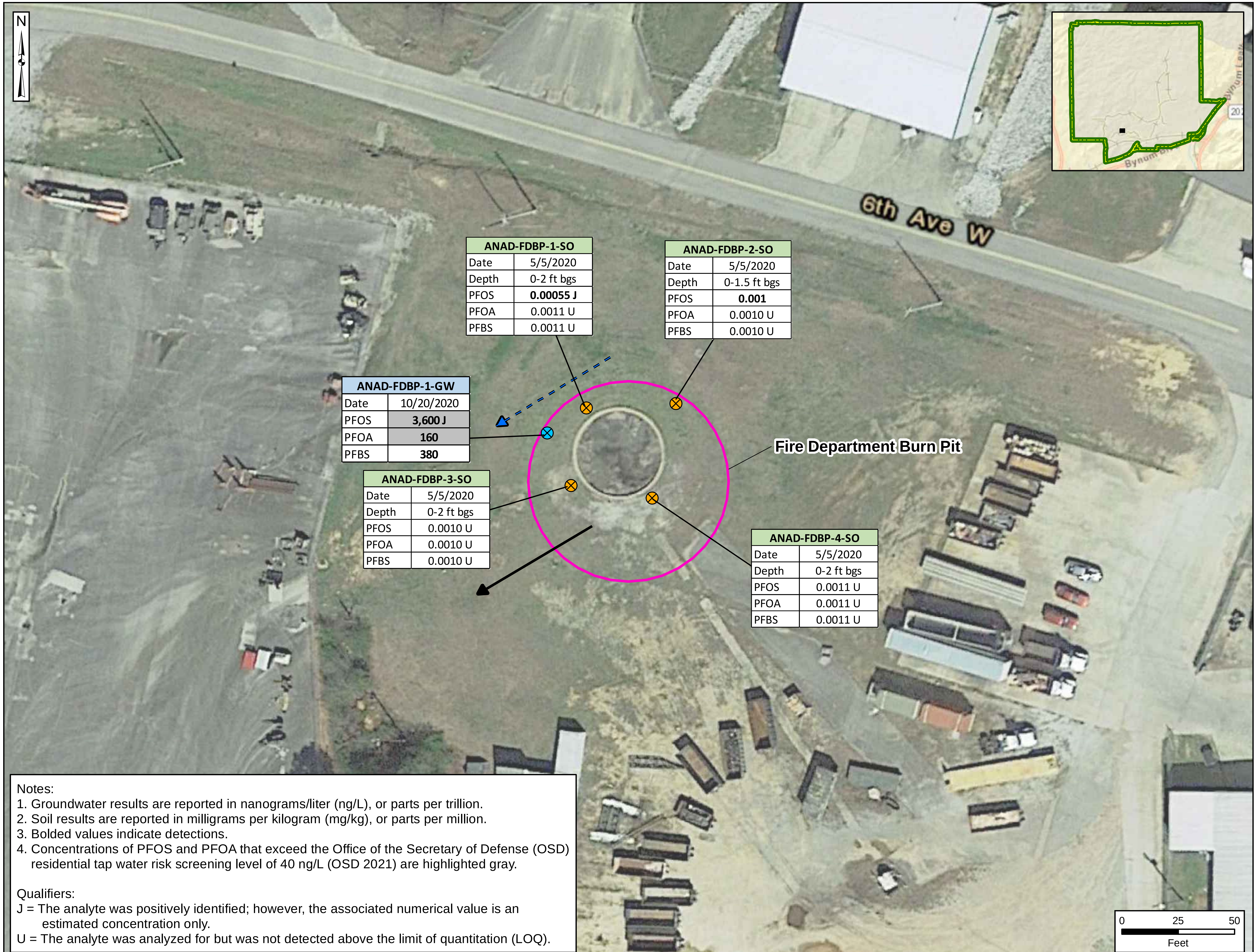
Figure 7-4
Fire Department Burn Pit AOPI PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater results are reported in nanograms/liter (ng/L), or parts per trillion.
2. Soil results are reported 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:
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).

Legend

AOPI
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction

Sample Locations

Groundwater Boring
Soil Boring

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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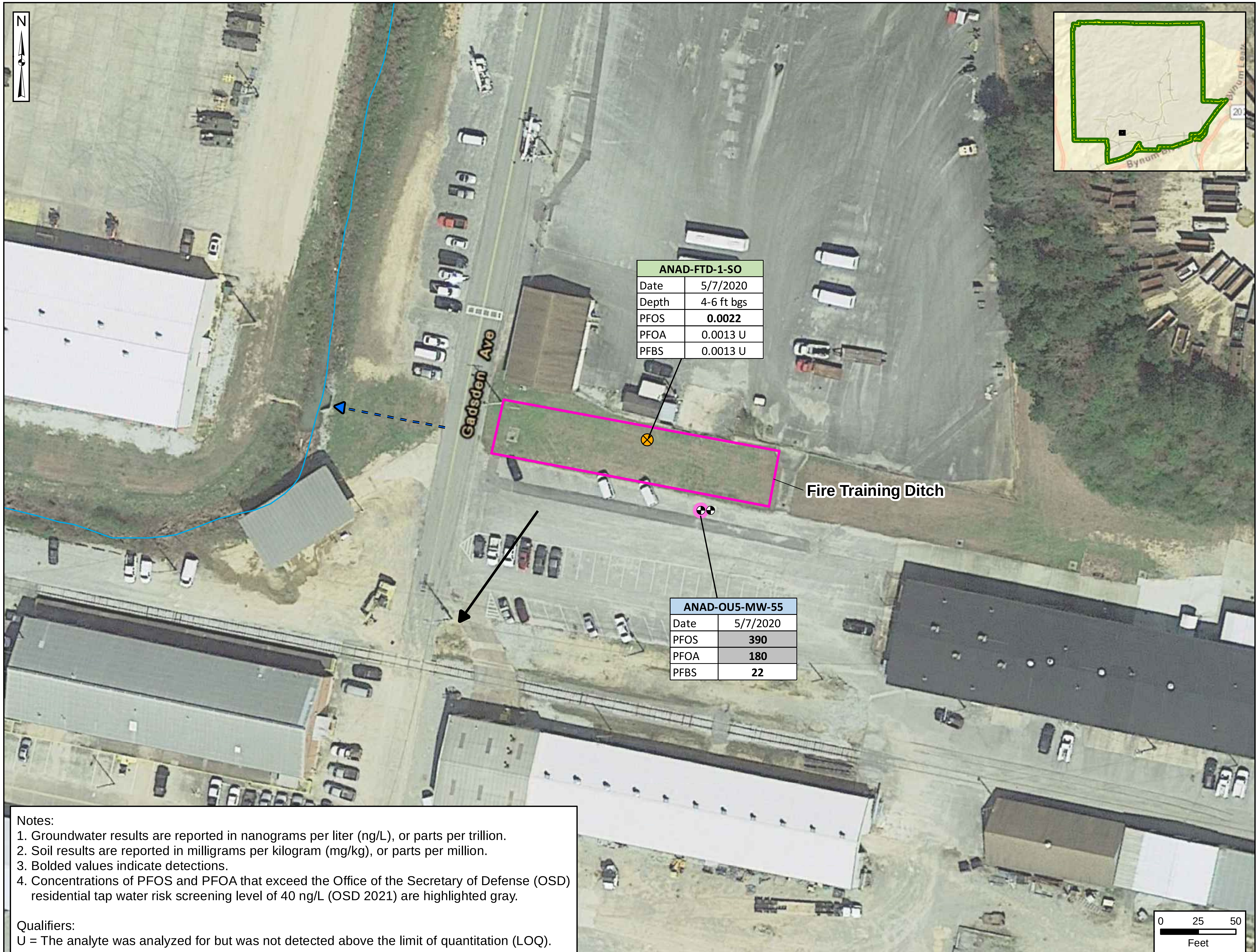
Figure 7-5
Fire Training Ditch AOPI PFOS, PFOA, and PFBS Analytical Results



ANAD-FTD-1-SO	
Date	5/7/2020
Depth	4-6 ft bgs
PFOS	**0.0022**
PFOA	0.0013 U
PFBS	0.0013 U

ANAD-OU5-MW-55	
Date	5/7/2020
PFOS	**390**
PFOA	**180**
PFBS	**22**

Legend

- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Monitoring Well

Sample Locations

- Soil Boring
- Groundwater Well

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported 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:
U = The analyte was analyzed for but was not detected above the limit of quantitation (LOQ).

0 25 50
Feet

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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Anniston Army Depot, AL

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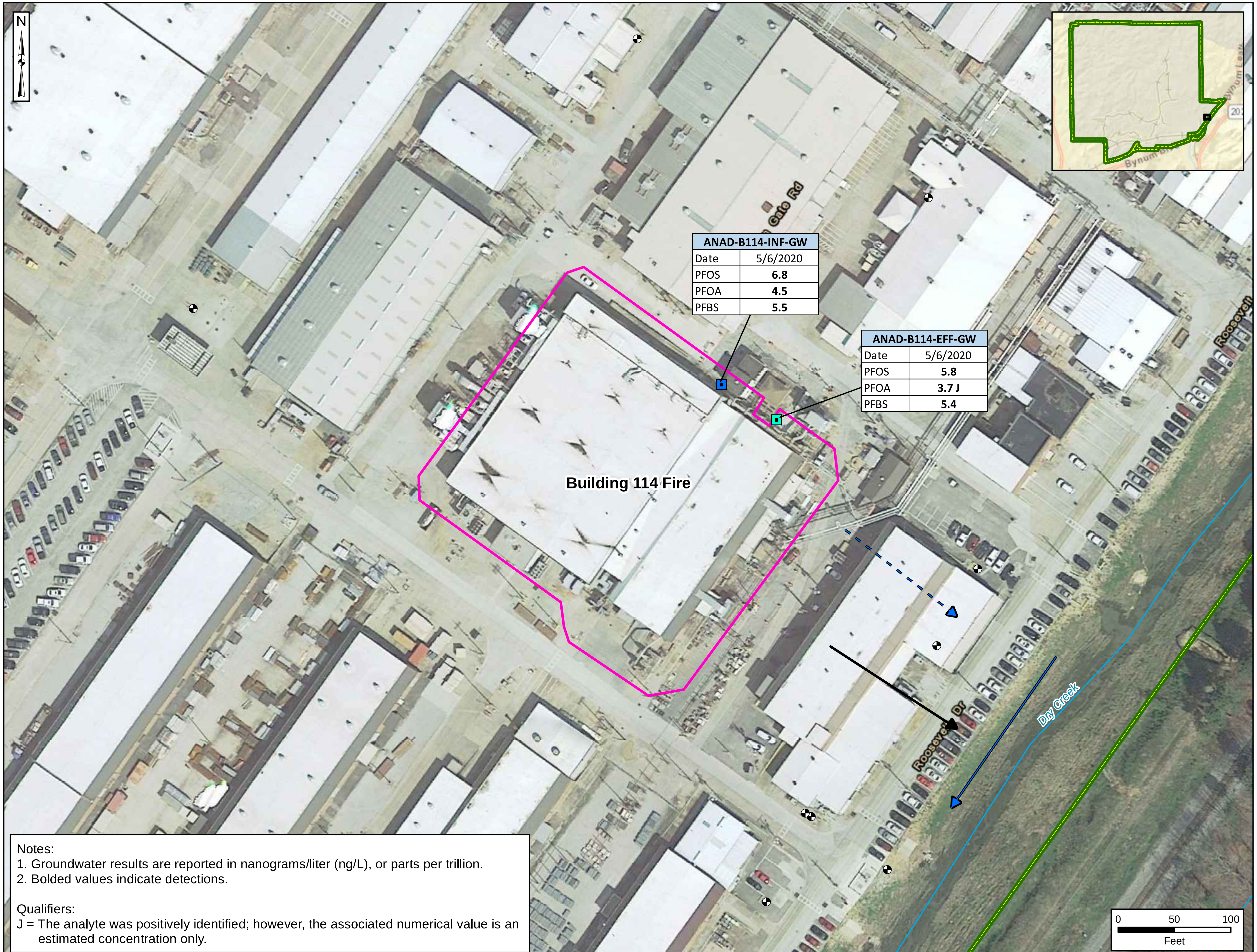
Figure 7-6
Building 114 Fire AOPI PFOS, PFOA, and PFBS Analytical Results



ANAD-B114-INF-GW	
Date	5/6/2020
PFOS	**6.8**
PFOA	**4.5**
PFBS	**5.5**

ANAD-B114-EFF-GW	
Date	5/6/2020
PFOS	**5.8**
PFOA	**3.7 J**
PFBS	**5.4**

Notes:
1. Groundwater results are reported in nanograms/liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.

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

Legend

- Installation Boundary
- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Surface Water Flow Direction
- Monitoring Well

Sample Locations

- Effluent Tap Sample
- Influent Tap Sample

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

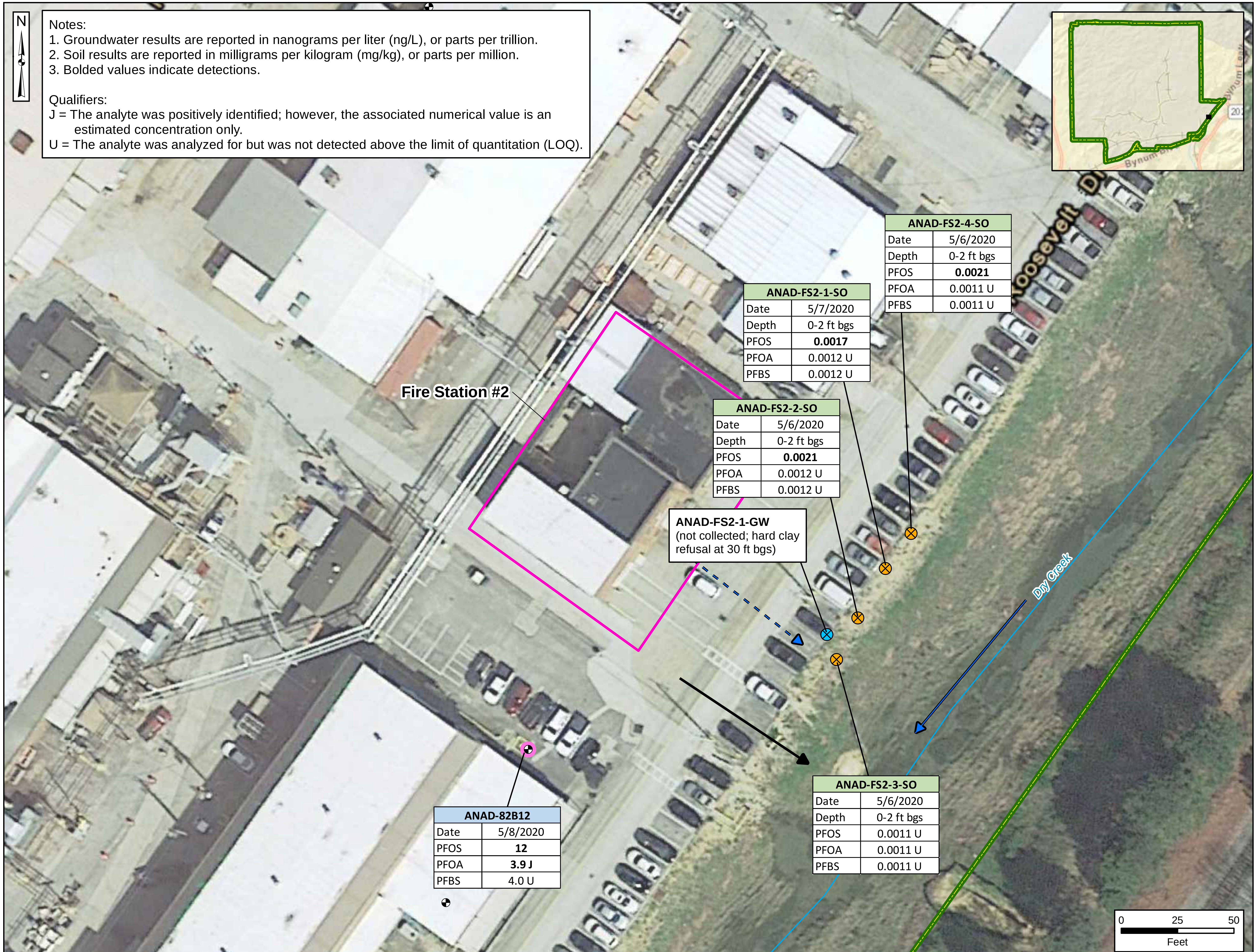


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Figure 7-7
Fire Station #2 AOPI PFOS, PFOA, and PFBS Analytical Results

Legend

- Installation Boundary
- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Surface Water Flow Direction
- Monitoring Well

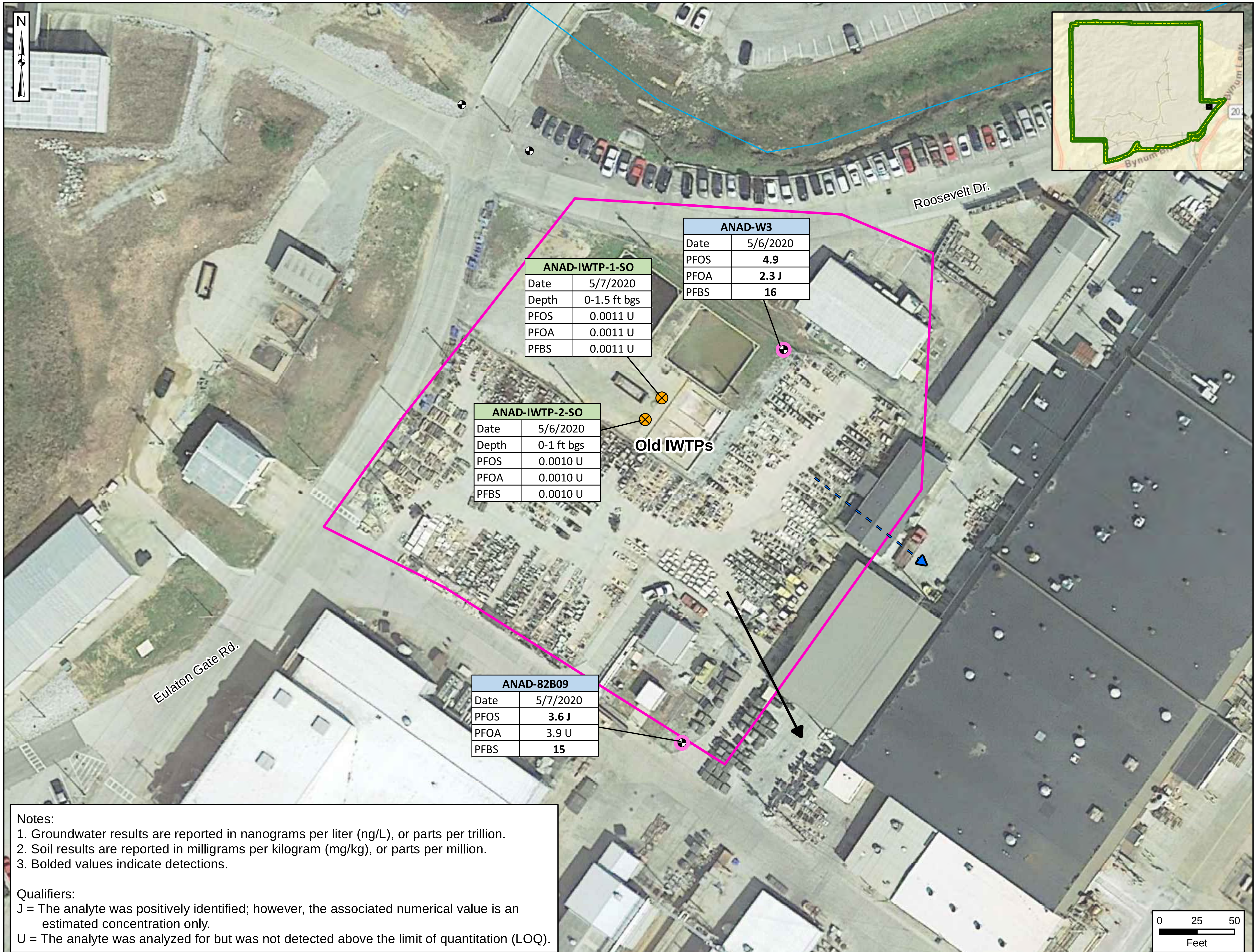
Sample Locations

- Groundwater Boring
- Soil Boring
- Groundwater Well

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North



ANAD-W3	
Date	5/6/2020
PFOS	**4.9**
PFOA	**2.3 J**
PFBS	**16**

ANAD-IWTP-1-SO	
Date	5/7/2020
Depth	0-1.5 ft bgs
PFOS	0.0011 U
PFOA	0.0011 U
PFBS	0.0011 U

ANAD-IWTP-2-SO	
Date	5/6/2020
Depth	0-1 ft bgs
PFOS	0.0010 U
PFOA	0.0010 U
PFBS	0.0010 U

ANAD-82B09	
Date	5/7/2020
PFOS	**3.6 J**
PFOA	3.9 U
PFBS	**15**

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

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).

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Figure 7-8
Old IWTPs AOPI
PFOS, PFOA, and PFBS Analytical Results

Legend

- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Runoff Flow Direction
- Monitoring Well

Sample Locations

- Groundwater Well
- Soil Boring

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
IWTP = industrial wastewater treatment plant

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North

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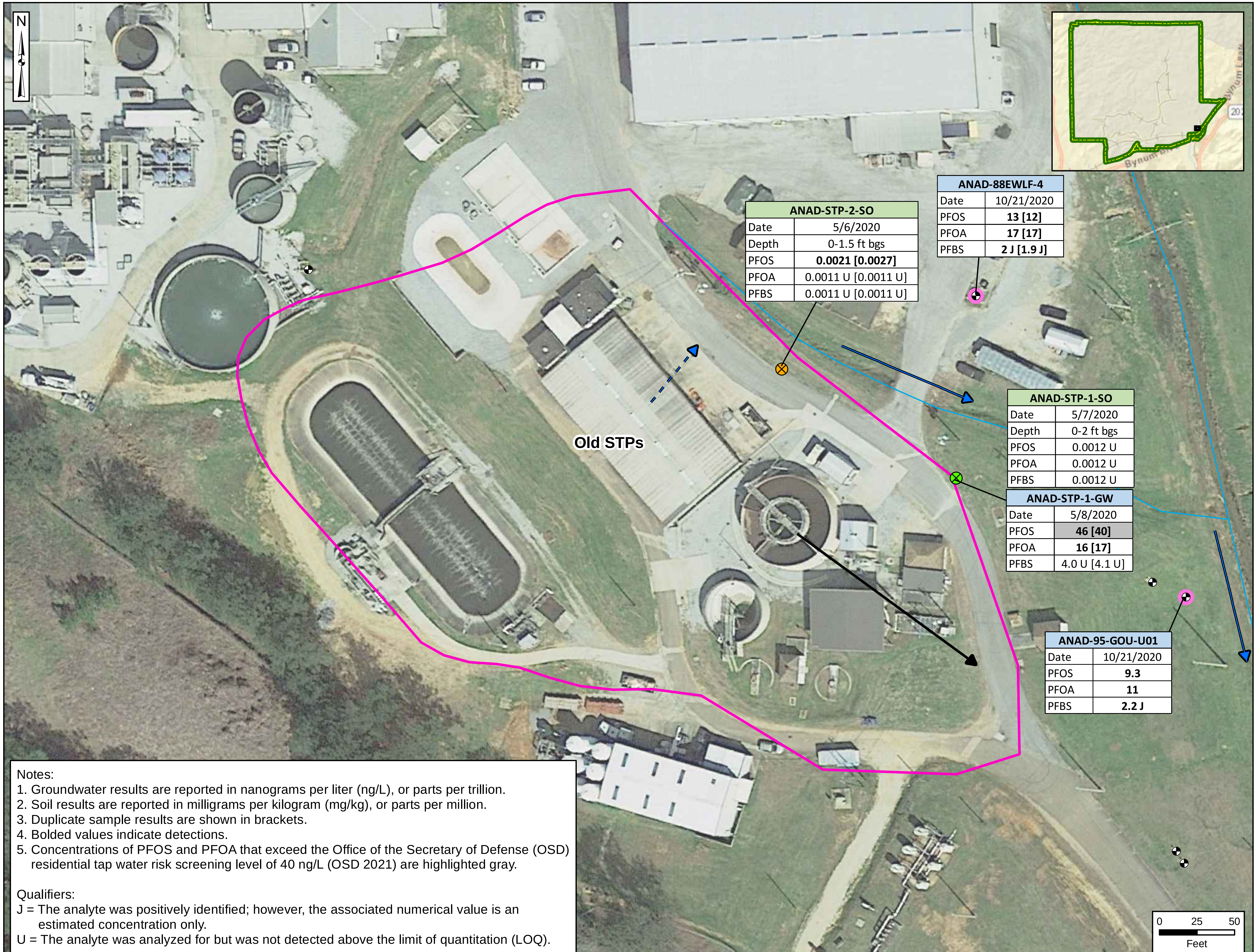
Figure 7-9
Old STPs AOPI
PFOS, PFOA, and PFBS
Analytical Results



ANAD-STP-2-SO	
Date	5/6/2020
Depth	0-1.5 ft bgs
PFOS	**0.0021 [0.0027]**
PFOA	0.0011 U [0.0011 U]
PFBS	0.0011 U [0.0011 U]

ANAD-88EWLF-4	
Date	10/21/2020
PFOS	**13 [12]**
PFOA	**17 [17]**
PFBS	**2 J [1.9 J]**

ANAD-STP-1-SO	
Date	5/7/2020
Depth	0-2 ft bgs
PFOS	0.0012 U
PFOA	0.0012 U
PFBS	0.0012 U

ANAD-STP-1-GW	
Date	5/8/2020
PFOS	**46 [40]**
PFOA	**16 [17]**
PFBS	4.0 U [4.1 U]

ANAD-95-GOU-U01	
Date	10/21/2020
PFOS	**9.3**
PFOA	**11**
PFBS	**2.2 J**

Legend

- AOPI
- River/Stream
- Inferred Groundwater Flow Direction
- Surface Water Flow Direction
- Surface Runoff Flow Direction
- Monitoring Well

Sample Locations

- Soil Boring
- Soil/Groundwater Boring
- Groundwater Well

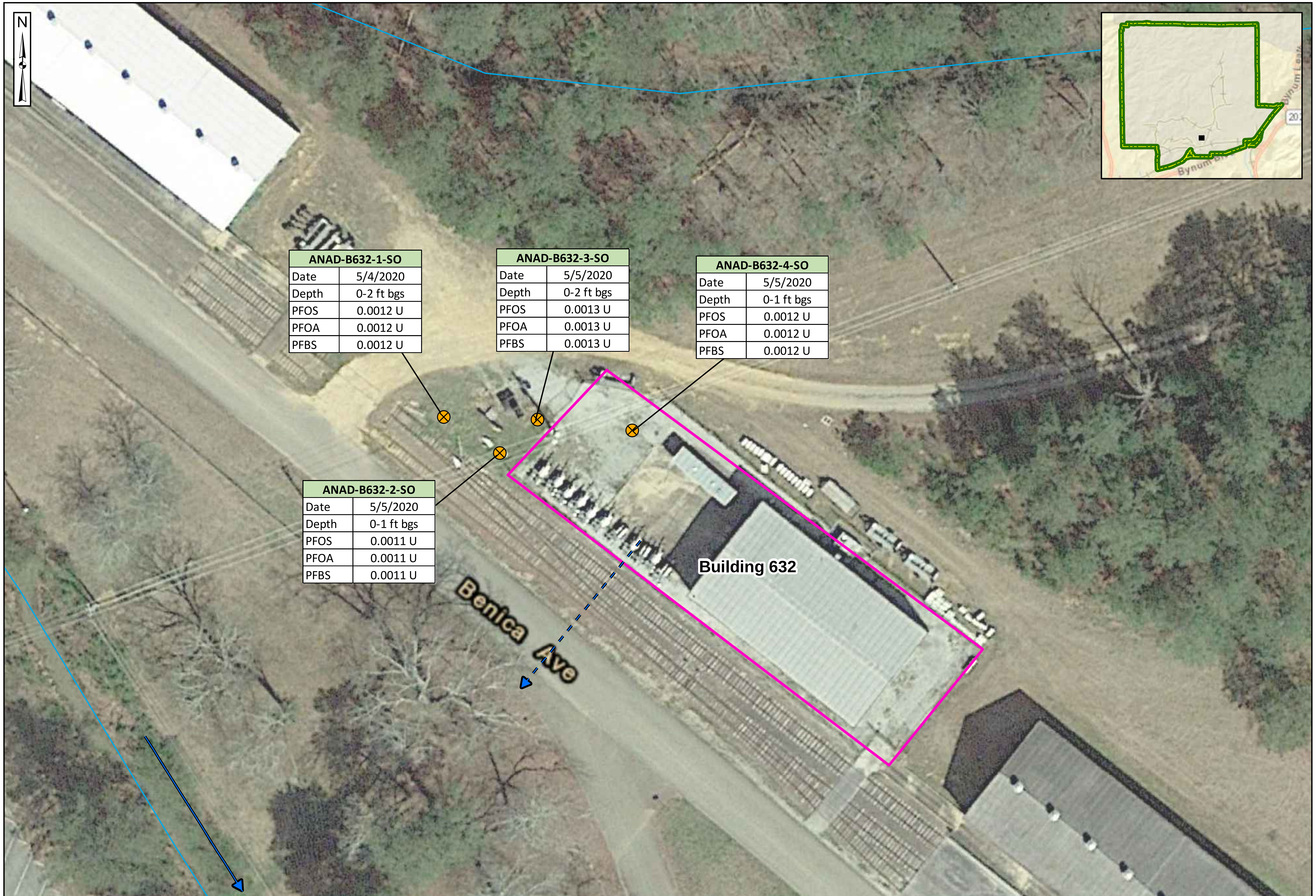
AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
STP = sanitary treatment plant

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported 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.
U = The analyte was analyzed for but was not detected above the limit of quantitation (LOQ).

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North



Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.

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

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Figure 7-10 Building 632 AOPI PFOS, PFOA, and PFBS Analytical Results

Legend

- AOPI
- River/Stream
- Surface Runoff Flow Direction
- Surface Water Flow Direction

Sample Locations

- Soil Boring

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery, 2019

Coordinate System:
WGS 1984, UTM Zone 16 North

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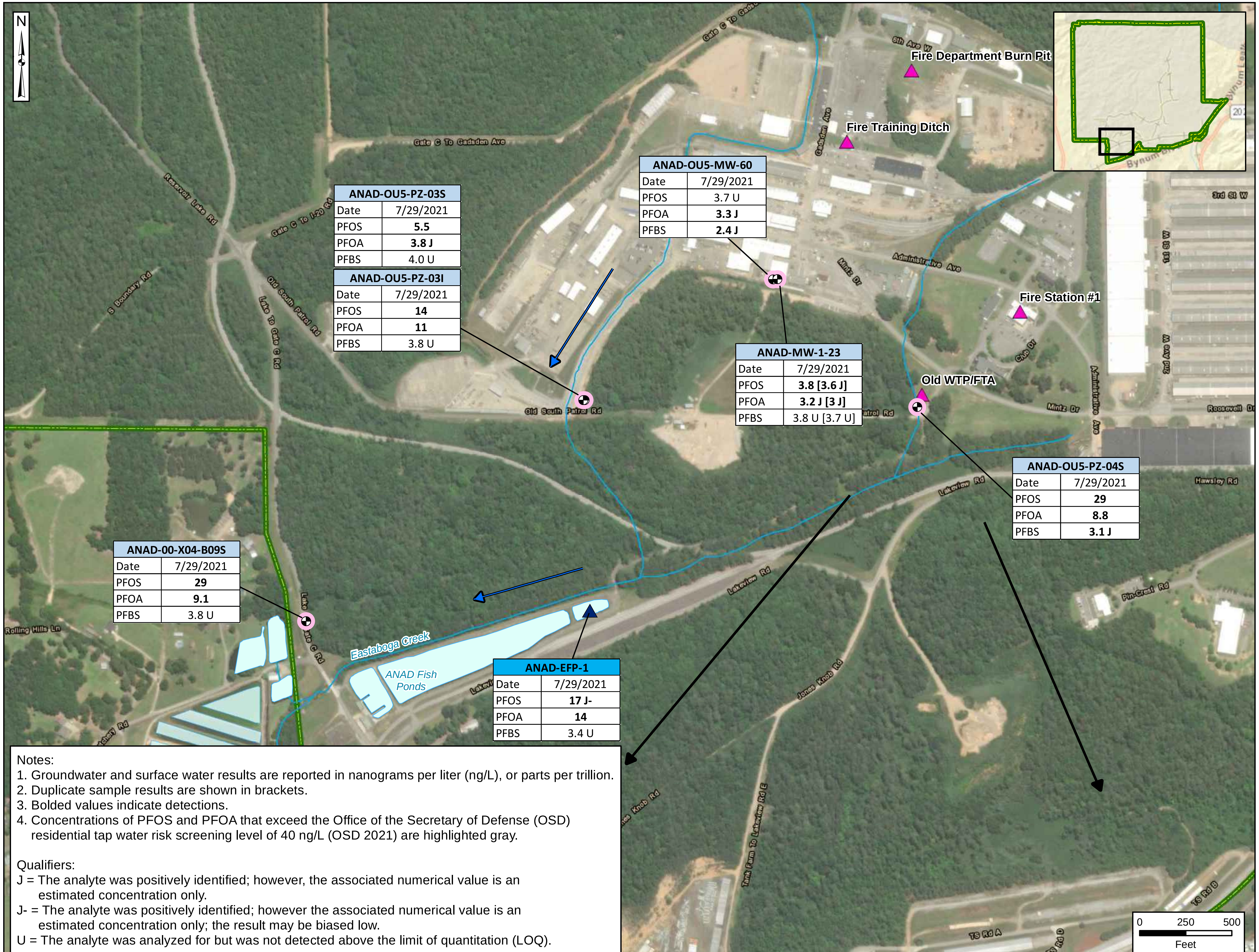
Figure 7-11
Western Industrial Area Downgradient Sampling PFOS, PFOA, and PFBS Analytical Results



ANAD-OU5-PZ-03S	
Date	7/29/2021
PFOS	**5.5**
PFOA	**3.8 J**
PFBS	4.0 U

ANAD-OU5-PZ-03I	
Date	7/29/2021
PFOS	**14**
PFOA	**11**
PFBS	3.8 U

ANAD-OU5-MW-60	
Date	7/29/2021
PFOS	3.7 U
PFOA	**3.3 J**
PFBS	**2.4 J**

ANAD-MW-1-23	
Date	7/29/2021
PFOS	**3.8 [3.6 J]**
PFOA	**3.2 J [3 J]**
PFBS	3.8 U [3.7 U]

ANAD-OU5-PZ-04S	
Date	7/29/2021
PFOS	**29**
PFOA	**8.8**
PFBS	**3.1 J**

ANAD-00-X04-B09S	
Date	7/29/2021
PFOS	**29**
PFOA	**9.1**
PFBS	3.8 U

ANAD-EFP-1	
Date	7/29/2021
PFOS	**17 J-**
PFOA	**14**
PFBS	3.4 U

Notes:
1. Groundwater and surface water results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Duplicate sample results are shown in brackets.
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:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
J- = The analyte was positively identified; however the associated numerical value is an estimated concentration only; the result may be biased low.
U = The analyte was analyzed for but was not detected above the limit of quantitation (LOQ).

Legend

- Installation Boundary
- AOPI
- River/Stream
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Monitoring Well

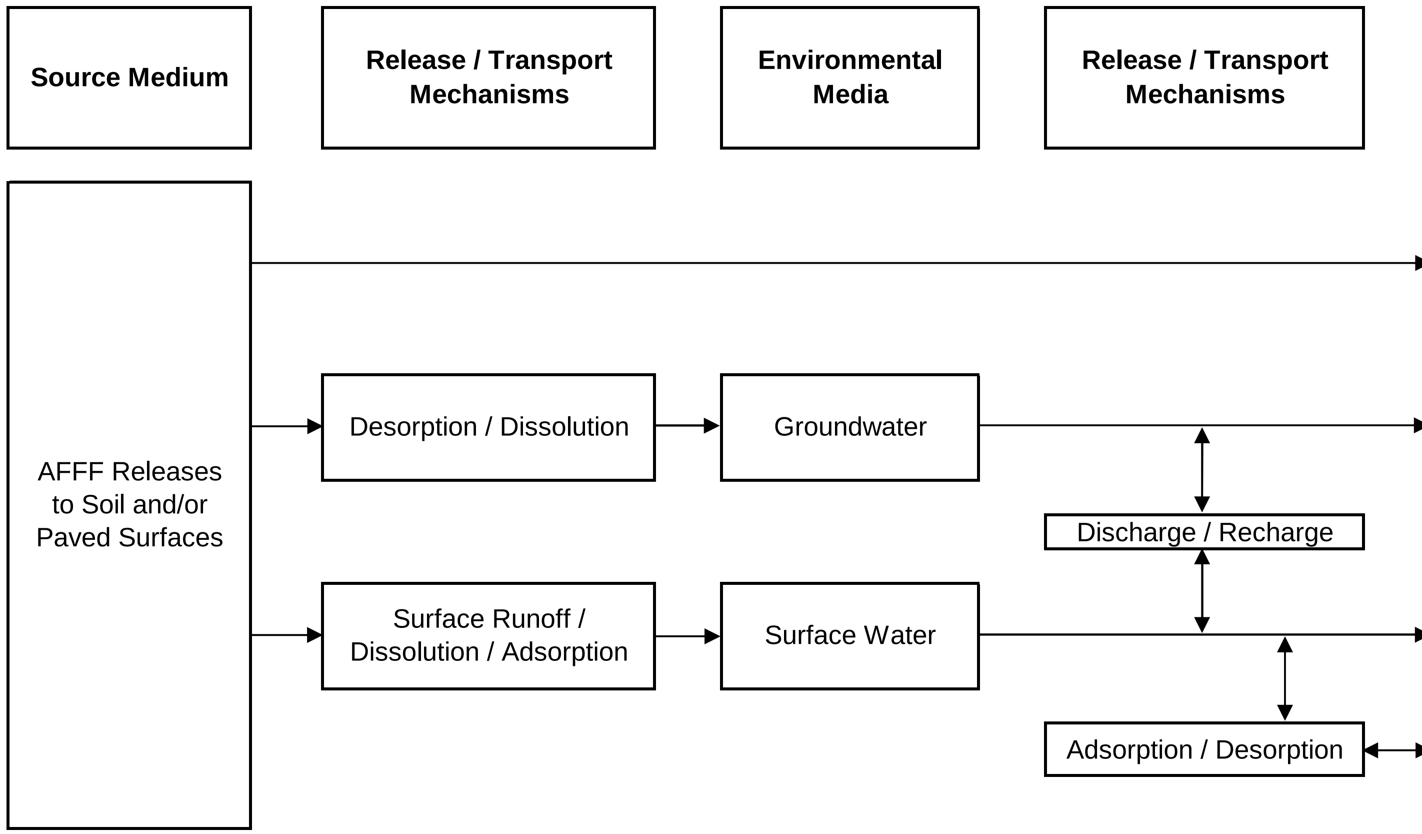
Sample Locations

- Groundwater Well
- Surface Water (Spring)

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
ANAD, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North



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.

Conceptual Site Model for Fire Station #1, Old WTP/FTA, Fire Department Burn Pit, and Fire Station #2 AOPIs
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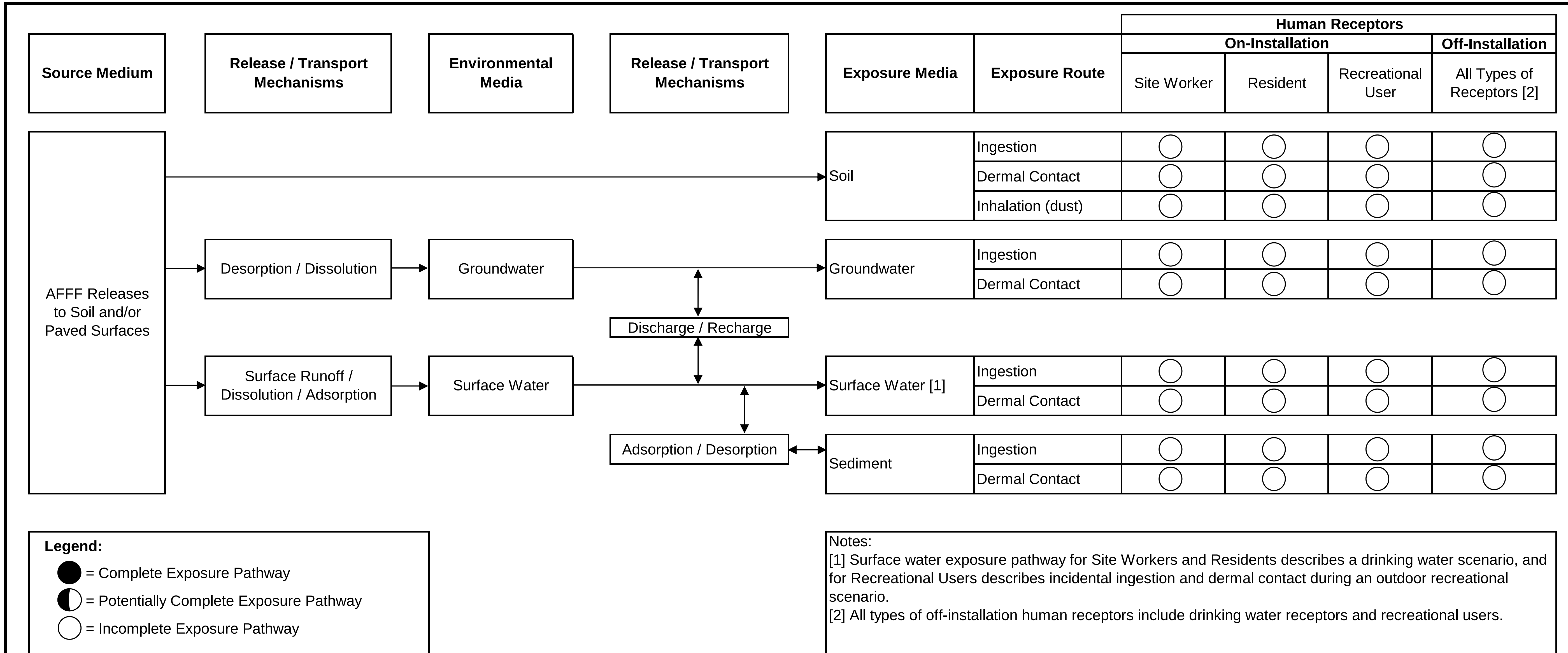
Figure 7-12

AFFF = aqueous film-forming foam
AOPI = area of potential interest
FTA = fire training area
WTP = wastewater treatment plant



Conceptual Site Model for Building 632 AOPI
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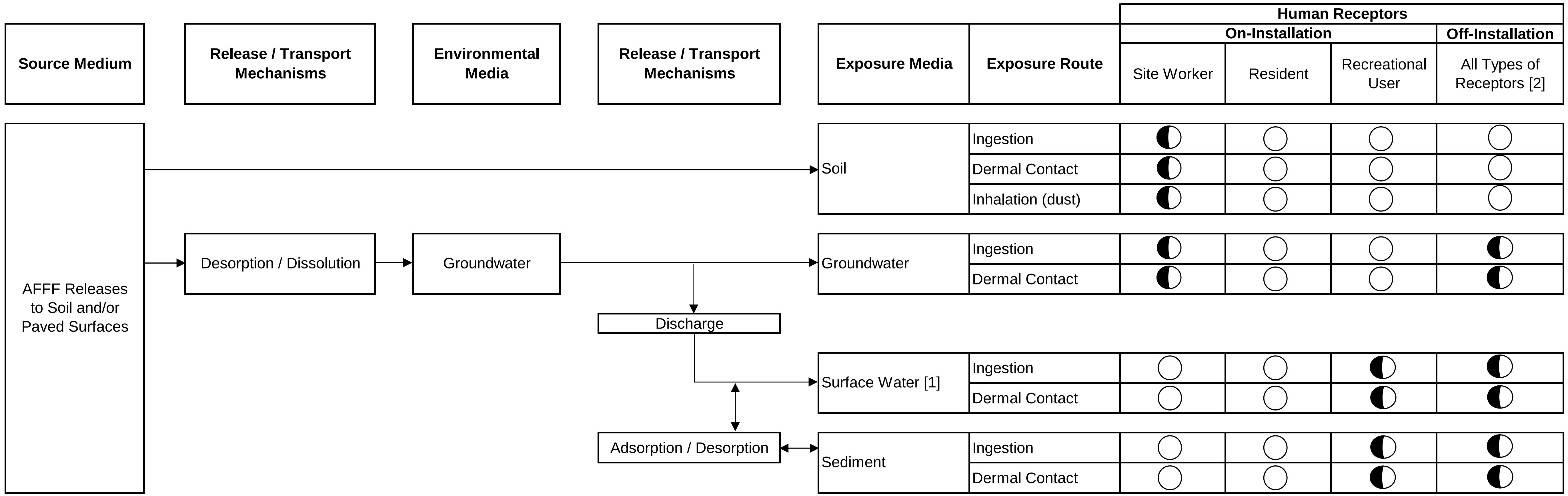
Figure 7-13

AFFF = aqueous film-forming foam
AOPI = area of potential interest



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.

Conceptual Site Model for Building 114 Fire AOPI

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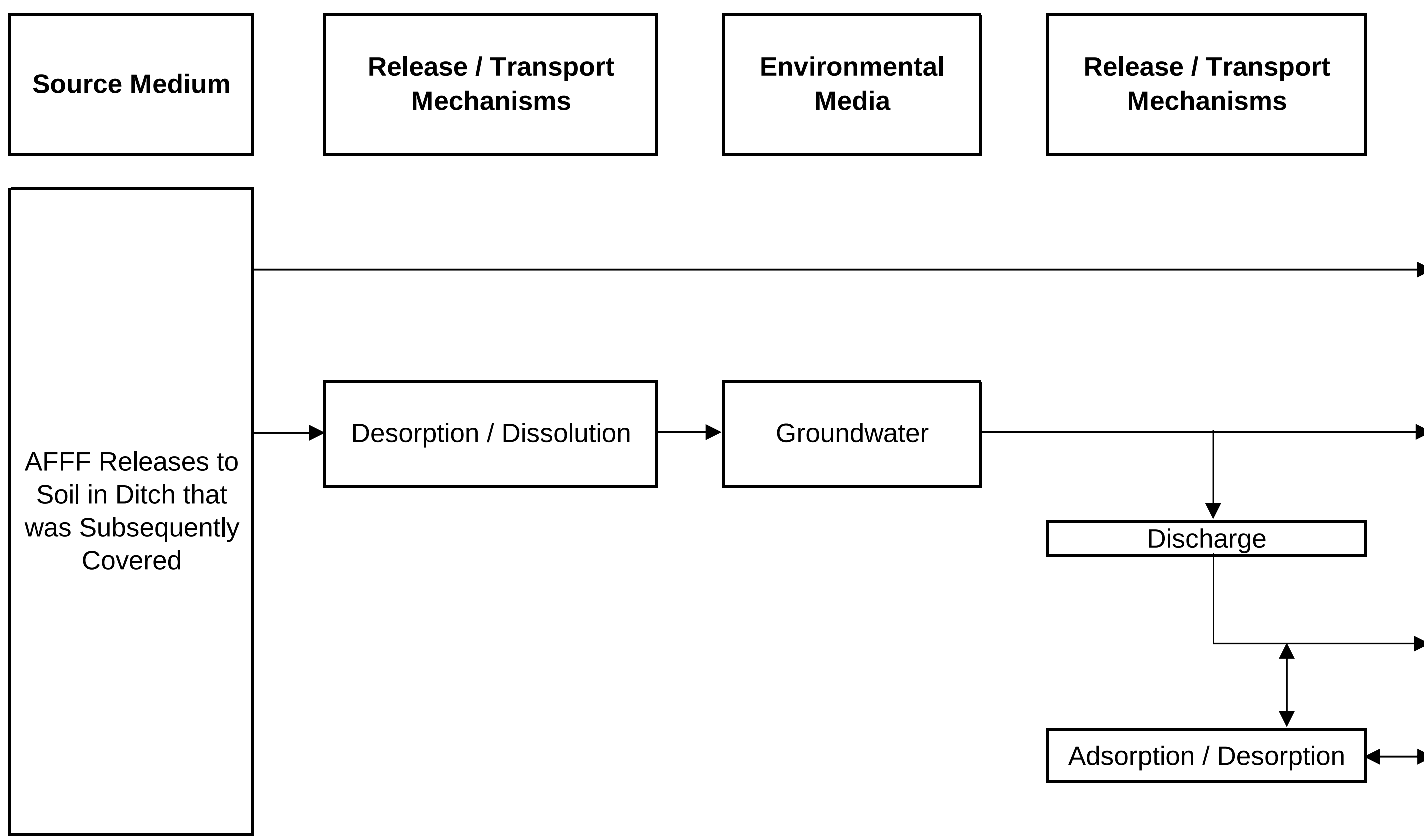
Figure 7-14

AFFF = aqueous film-forming foam

AOPI = area of potential interest



Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	Human Receptors: On-Installation: Resident	Human Receptors: On-Installation: Recreational User	Human Receptors: 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.

Conceptual Site Model for Fire Training Ditch AOPI
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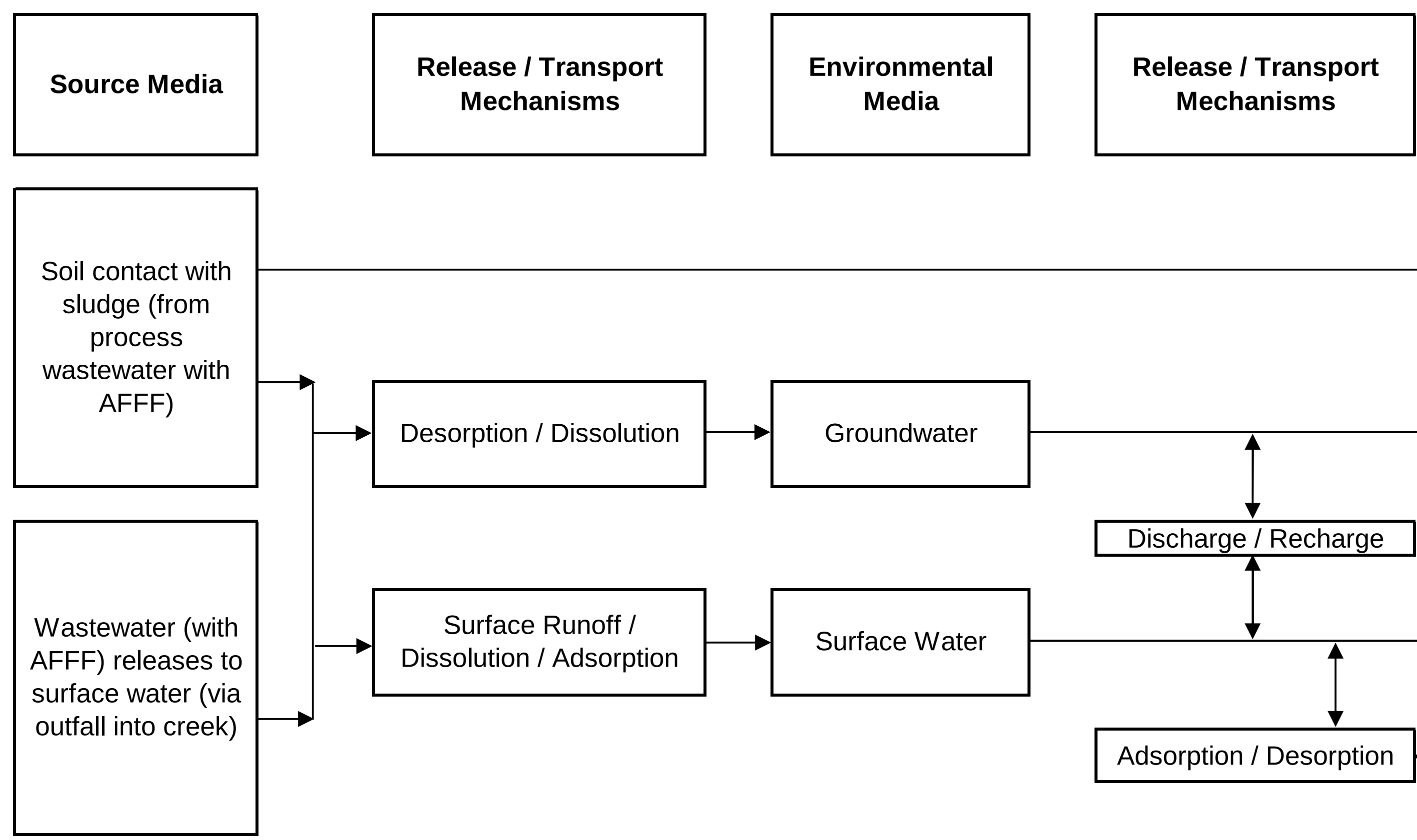
Figure 7-15

AFFF = aqueous film-forming foam
AOPI = area of potential interest



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.

Conceptual Site Model for Old Sewage Treatment Plants AOPI
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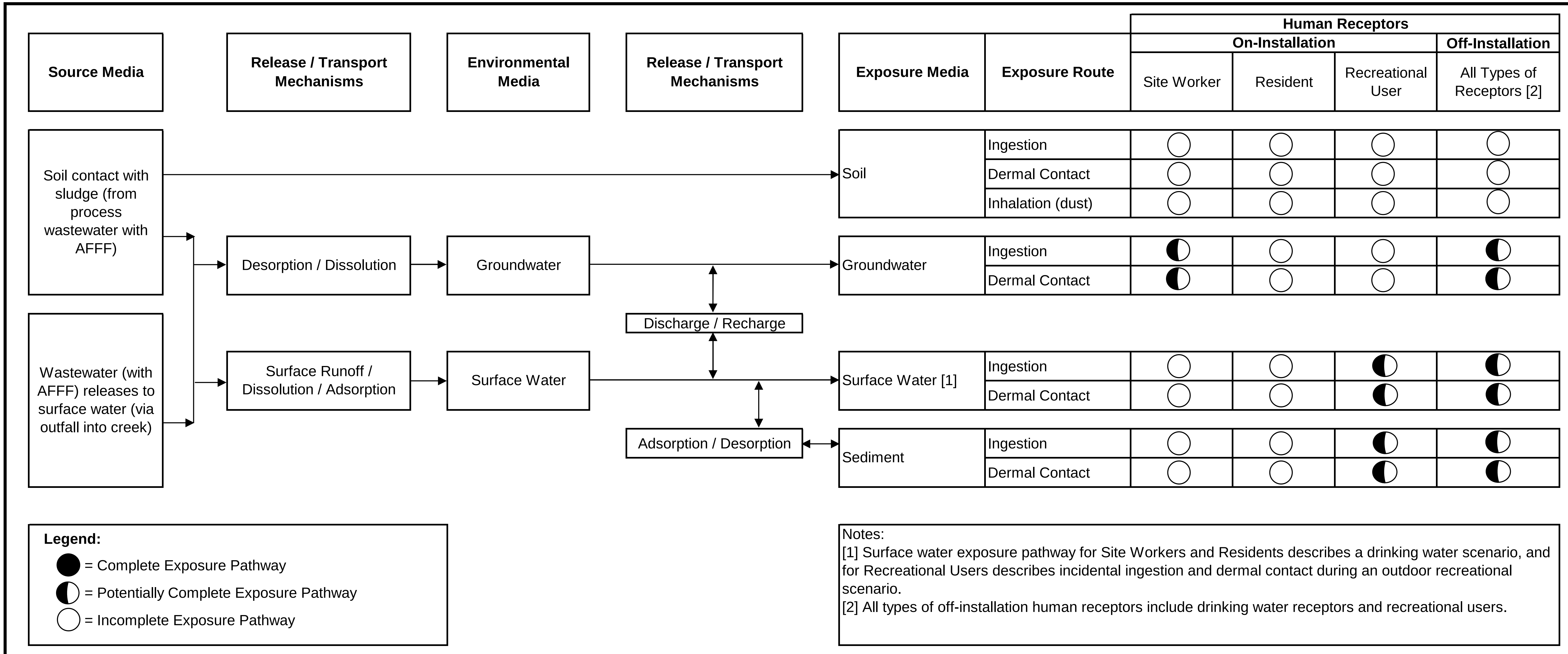
Figure 7-16

AFFF = aqueous film-forming foam
AOPI = area of potential interest



Conceptual Site Model for Old Industrial Wastewater Treatment Plants AOPI
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Figure 7-17

AFFF = aqueous film-forming foam
AOPI = area of potential interest

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