SITE INSPECTION REPORT FOR PER- AND POLYFLUOROALKYL SUBSTANCES AT LONE STAR ARMY AMMUNITION PLANT, TEXAS

Prepared for:

U.S. ARMY
ODCS, G-9, ISE BRAC

Final
December 2023

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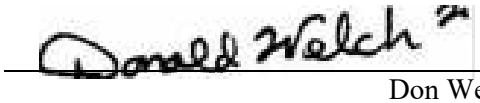

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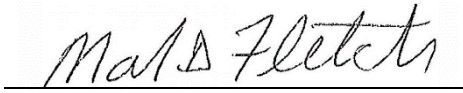

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ACRONYMS AND ABBREVIATIONS

%	percent
%R	Percent Recovery
°C	degrees Celsius
ºF	degrees Fahrenheit
AAR	ARS Aleut Remediation, LLC
AFFF	aqueous film-forming foam
amsl	above mean sea level
AOPI	Area of Potential Interest
Army	U.S. Army
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/sec	centimeters per second
CoC	chain-of-custody
CSM	conceptual site model
DERP	Defense Environmental Restoration Program
DL	detection limit
DoD	U.S. Department of Defense
DPT	direct push technology
DQO	data quality objective
DUA	Data Usability Assessment
DZI	Day & Zimmermann, Inc.
DZLS	Day & Zimmermann Lone Star, LLC
EIS	extracted internal standard
ELAP	Environmental Laboratory Accreditation Program
GO/CO	government-owned/contractor operated
GPS	global positioning system
HDPE	high density polyethylene
HEBG	High Explosives Burning Ground
HFPO-DA	hexafluoropropylene oxide dimer acid (GenX)
HQ	hazard quotient
HQDA	Headquarters, Department of the Army
ID	identification
IDW	investigation-derived waste
LAP	load, assembly, and pack
LC/MS/MS	Liquid Chromatography with Tandem Mass Spectrometry
LCS	laboratory control sample
LOD	limit of detection
LOQ	limit of quantitation
LSAAP	Lone Star Army Ammunition Plant
LUC	land use control
MIL-SPEC	military specification
MS	matrix spike
MSD	matrix spike duplicate

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	non-detect
ng/L	nanograms per liter
NPL	National Priorities List
NS	not sampled
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutane sulfonate
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexane sulfonate
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PPE	personal protective equipment
ppm	parts per million
ppt	parts per trillion
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RRAD	Red River Army Depot
RRRA	Red River Redevelopment Authority
RSL	regional screening level
SDG	sample delivery group
SGS	SGS North America, Inc. – Orlando
SI	Site Inspection
SL	screening level
SOP	Standard Operating Procedure
SWMU	Solid Waste Management Unit
TAC	TexAmericas Center
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity Characteristic Leaching Procedure
TDLR	Texas Department of Licensing and Regulation
TGI	Technical Guidance Instructions
TWU	Texarkana Water Utilities
U.S.	United States
U.S.C.	United States Code
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WISL	Western Inactive Sanitary Landfill

EXECUTIVE SUMMARY

The United States (U.S.) Army (Army) is conducting Preliminary Assessments (PAs) and Site Inspections (SIs) to determine the use, storage, disposal, or release of per- and polyfluoroalkyl substances (PFAS) at multiple Base Realignment and Closure (BRAC) installations, nationwide. This report documents SI activities conducted for 11 areas of potential interest (AOPIs) at Lone Star Army Ammunition Plant (LSAAP) in Bowie County, Texas. AOPIs were identified during the PA phase for investigation through multimedia sampling in an SI phase to determine whether a PFAS release occurred. Activities were completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601, et. seq.), the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2700, et. seq.) the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations [CFR] Part 300), and Army and U.S. Department of Defense (DoD) policy and guidance, and U.S. Environmental Protection Agency (USEPA) guidance.

The PA identified areas where PFAS-containing materials were used, stored, and/or disposed of, or areas where known or suspected releases to the environment occurred. Based on recommendations from the PA, soil and/or groundwater samples were collected from 11 AOPIs. The field investigation at LSAAP was conducted in accordance with the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (ARS Aleut Remediation, LLC [AAR] 2023a). Samples collected during this SI were analyzed for PFAS using procedures compliant with the DoD Quality Systems Manual (QSM) Version 5.3, Table B-15 (DoD 2019) and the laboratory standard operating procedure (SOP).

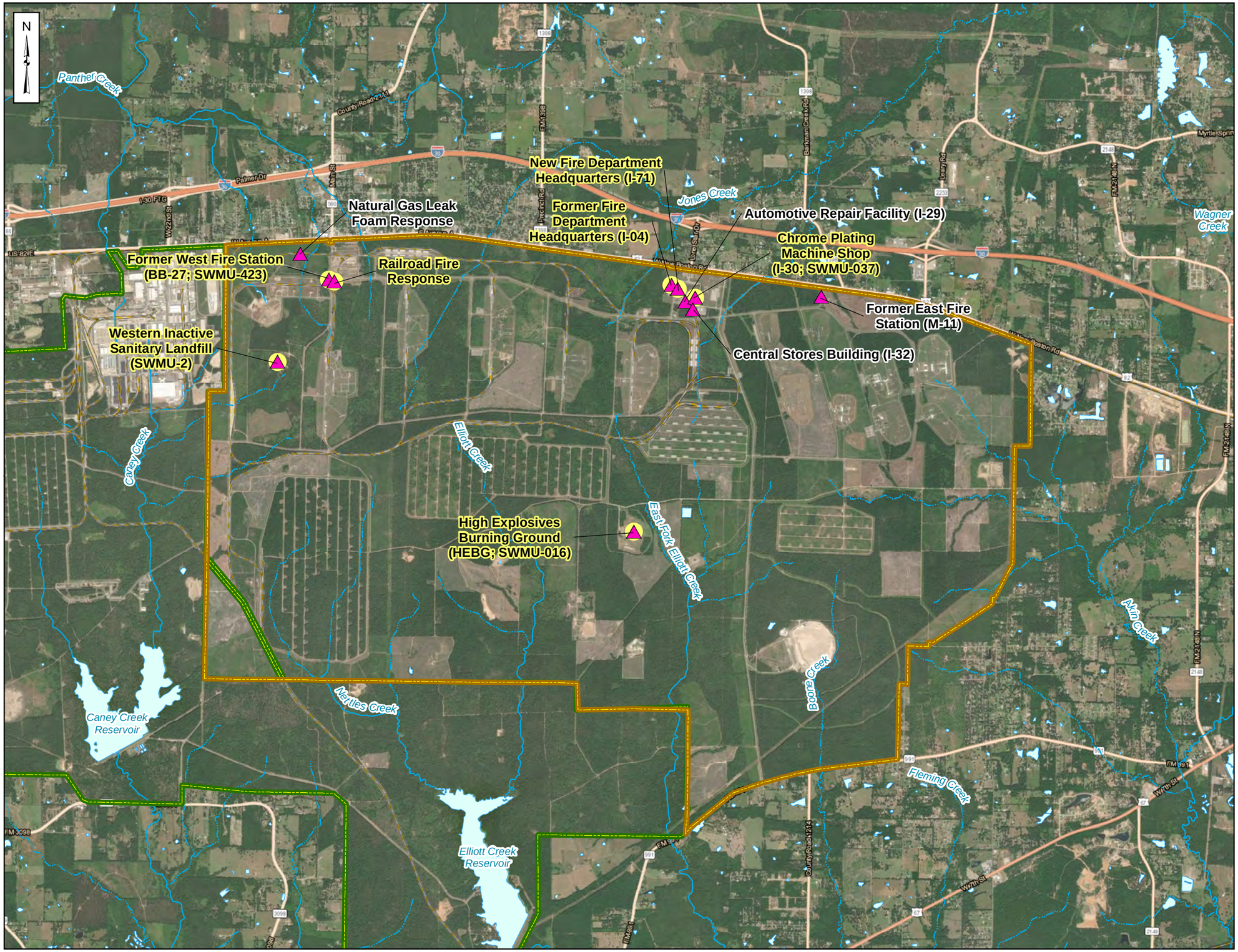
To determine if further investigation is warranted at each AOPI, this SI followed established USEPA guidance as well as DoD policy and guidance for investigating perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), perfluorohexanoic acid (PFHxA), perfluorobutanoic acid (PFBA), and hexafluoropropylene oxide dimer acid (HFPO-DA) (also known as GenX) (DoD 2023). Analytical results for samples collected during this SI were compared to residential scenario screening levels (SLs) calculated using the USEPA Regional Screening Level calculator for soil and the tap water criteria for groundwater, as published in the 2023 Office of the Secretary of Defense (OSD) Memorandum (DoD 2023). Of the six PFAS compounds presented in the 24 August 2023 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte in the Final UFP-QAPP for this SI (AAR 2023a). Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at LSAAP because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF). Also, based on GenX's history, including distribution limitations that restricted its use, GenX is generally not a component of other products the military used. Since PFAS is a large grouping consisting of thousands of individual chemicals, PFOA, PFOS, PFBS, PFNA, PFHxS, PFHxA, and PFBA altogether will be referred to in this report as "Target PFAS."

CSMs were developed during the PA, and then updated for each AOPI where Target PFAS were detected (at concentrations above the level of detection [LOD]). The updated CSMs detail site geological conditions; determine primary and secondary release mechanisms; identify potential human receptors; and detail complete, potentially complete, and incomplete exposure pathways for current and reasonably anticipated future exposure scenarios. Target PFAS were detected in at least one medium at eight AOPIs. PFOS, PFOA, and PFNA concentrations exceeded SLs for groundwater at seven of the AOPIs. Target PFAS concentrations did not exceed SLs for soil at any AOPIs. Figure ES-1 depicts the facility-wide map of AOPIs and the distribution of SLs exceedances and proximity to facility boundaries.

Table ES-1 summarizes the AOPIs investigated during the SI and recommendations for further investigation.

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure ES-1
Summary of Target PFAS



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- AOPI with OSD Risk Screening Level Exceedance
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body

AOPI = area of potential interest
OSD = Office of the Secretary of Defense

Note:
1. Analytical results were compared to residential scenario screening levels (SLs) calculated using the USEPA Regional Screening Level calculator for soil and the tap water criteria for groundwater, as published in the 2022 Office of the Secretary of Defense (OSD) Memorandum.

0 0.5 1
Miles

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

Table ES-1. Summary of AOPIs and Recommendations for Further Investigation

AOPI Name	Exceedance of SLs[1]		Recommendation
	Groundwater	Soil	
Former Fire Department Headquarters	Yes	No	Further investigation recommended
New Fire Department Headquarters	Yes	No	Further investigation recommended
Automotive Repair Facility	ND	ND	Further investigation not recommended
Chrome Plating Machine Shop	Yes	No	Further investigation recommended
Central Stores Building	NS[2]	ND	Further investigation recommended as part of a future phase of work due to the Chrome Plating Machine Shop
Former West Fire Station	Yes	ND	Further investigation recommended
Railroad Fire Response Area	Yes	ND	Further investigation recommended
Former East Fire Station	No	ND	Further investigation not recommended
Natural Gas Leak Foam Response Area	NS	ND	Further investigation not recommended
High Explosives Burning Ground (HEBG)	Yes	NS	Further investigation recommended
Western Inactive Sanitary Landfill (WISL)	Yes	NS	Further investigation recommended

Notes:

[1]Analytical results were compared to residential scenario SLs calculated using the USEPA Regional Screening Level calculator for soil and the tap water criteria for groundwater, as published in the 2023 Office of the Secretary of Defense (OSD) Memorandum

[2]Due to the presence of utilities and infrastructure, groundwater samples were not collected at this AOPI. However, Target PFAS were detected in groundwater at the Chrome Plating Machine Shop, located approximately 450 feet north and regionally downgradient of the AOPI. PFAS impacts between these two AOPIs have not been delineated. Therefore, it is recommended that these impacts be delineated in a future phase of work at the Chrome Plating Machine Shop.

Highlighted values indicate AOPIs with a recommendation for further investigation.

-- = not applicable

AOPI – area of potential interest

ND – non-detect, analytes for the specified media were not detected above laboratory reporting limits at this AOPI location

No – PFOS, PFOA, PFBS, PFNA, PFHxS, PFHxA, and/or PFBA detected at a concentration below the SL

NS – not sampled

SL – screening level

Yes – PFOS, PFOA, PFBS, PFNA, PFHxS, PFHxA, and/or PFBA detected at a concentration above the SL

1. INTRODUCTION

The United States (U.S.) Army (Army) is conducting Preliminary Assessments (PAs, 40 Code of Federal Regulations [CFR] 300.420(b)) and Site Inspections (SIs, 40 CFR 300.420(c)) to investigate the presence or release of Per-and Polyfluoroalkyl Substances (PFAS), by investigating the use, storage, or disposal of PFAS at multiple Base Realignment and Closure (BRAC) installations, nationwide. This SI is focused on the 15,589 acres of Lone Star Army Ammunition Plant (LSAAP) which were part of the installation's footprint when the DoD recommended LSAAP for closure in the 2005 Defense Base Closure and Realignment Commission Report to the President (BRAC 2005). This SI was conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601 et seq.); the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2700 et seq.); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300); and guidance documents developed by the U.S. Environmental Protection Agency (USEPA), the Department of Defense (DoD) and the Army. The Old Demolition Area at LSAAP is on the National Priorities List (NPL), under USEPA identification number TX7213821831, and the rest of the facility is considered non-NPL. Additionally, LSAAP has two Resource Conservation and Recovery Act (RCRA) Permits through the Texas Commission and Environmental Quality (TCEQ, Permits No. 50419 and No. 50292), as a hazardous waste closure and compliance plan facility, and the permit requires compliance with RCRA regulations for the permitted units as well as for the solid waste management units (SWMUs) and areas of concern (AOCs) subject to corrective action per the Compliance Plan (TCEQ 2006, TCEQ 2021).

Based on results of the LSAAP PFAS PA (AAR 2023b), 11 areas of potential interest (AOPIs) were identified for investigation through multimedia sampling in an SI to determine whether a PFAS release occurred. LSAAP is located in Bowie County, Texas. The installation is approximately 12 miles west of Texarkana, Texas. The installation is adjacent to and south of Hooks, Texas and Leary, Texas and is immediately east and northeast of the Red River Army Depot (RRAD). The location of the installation is depicted on Figure 1-1. LSAAP was separated into 27 areas: 13 areas were used directly for or in support of load, assembly, and pack (LAP) munition operations and 14 areas were used for other activities, including inert material storage, munitions and raw material storage, administrative and support functions, landfills, and munition testing and destruction areas.

This SI covers the 15,589 acres which comprised the LSAAP installation footprint at the time of the DoD's 2005 BRAC recommendation for closure. Prior to its deactivation on September 30, 2009, LSAAP was a government owned/contractor operated facility, and Day & Zimmerman, Inc. (DZI) was the operator. Therefore, this SI reviews combined DoD/DZI operations of LSAAP prior to deactivation (Headquarters, Department of the Army [HQDA] 2020). Throughout this document, the LSAAP installation footprint at the time of the BRAC closure is referred to as the "site," and any areas outside the installation footprint are referred to as "off-site." Activities that occurred prior to the BRAC closure are referenced to as "Pre-BRAC" throughout this document.

1.1 SCOPE AND OBJECTIVES

The overall objective of the SI is to determine the presence or absence of PFAS at each AOPI. The SI Report will use the findings from the PA in conjunction with soil and groundwater sampling data to determine whether PFAS have been released to the environment and whether a release has affected or may affect specific human health targets. Furthermore, the SI will evaluate and summarize the need for additional investigation (40 CFR 300.420(c)(1)).

The SI scope included preparation of project planning documents; field investigation; validation and management of analytical data; comparison of analytical data to OSD SLs; and documentation of the

investigation results. This SI was conducted in accordance with the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (AAR 2023a). The field activities followed site-specific sampling and health and safety protocols, as identified in the Accident Prevention Plan and the Site Safety and Health Plan (Appendix E of the UFP-QAPP Addendum).

1.2 LSAAP DESCRIPTION

LSAAP is an Army facility located in east Texas, in Bowie County. In 2005, the BRAC Committee selected LSAAP for closure, and property conveyances were recommended. LSAAP was intermittently operated as a Government Owned/Contractor Operated (GO/CO) installation with DZI until all missions ceased and the plant closed as part of the BRAC process on 30 September 2009. The excessed property was transferred primarily to Day and Zimmermann Lone Star, LLC (DZLS), and the Red River Redevelopment Authority (RRRA), which would later become TexAmericas Center (TAC) in May 2011. One (1) acre of the excessed property was also transferred to the Southwestern Power Company. There are 1,297 acres of land that have not yet been transferred due to ongoing cleanup by the Army. TAC has agreed to take most of this land after closure. The property has been deed restricted for commercial and industrial purposes only (TAC 2021). During the development of the PA, historical records, interviews, site reconnaissance, available documentation, and physical evidence were reviewed to determine where PFAS-containing materials may have previously been stored, used, or disposed (40 CFR 300.420(b)(5)). The evaluated areas include fire stations, automotive repair facilities, chrome plating shops, chemical storage areas, AFFF response areas, munitions disposal sites, landfills, munitions LAP lines, spent chemical/wastewater storage ponds, chemical burial sites, gas station, paint storage facilities, and pesticide storage facilities. The LSAAP PFAS PA recommended 11 AOPIs for further investigation in an SI due to known or potential historical PFAS-containing material use, storage, or disposal. The AOPIs, as well as the dates of operation and sizes of each area, are presented in Table 1-1 and illustrated in Figure 1-2.

Table 1-1. List of AOPIs at LSAAP

AOPI Name	Dates of Operation/Incident	Approximate Size (acres)
Former Fire Department Headquarters	1942 to 1981	6
New Fire Department Headquarters	1980s to 2009	2
Automotive Repair Facility	1952 to 2009	3
Chrome Plating Machine Shop	1952 to 2009	4
Central Stores Building	1952 to 2009	2
Former West Fire Station	1942 to 1980s	0.5
Railroad Fire Response Area	1990s	4
Former East Fire Station	1942 to 2005	0.5
Natural Gas Leak Foam Response Area	2008/2009	3
High Explosives Burning Ground (HEBG)	1940s to 2009	92
Western Inactive Sanitary Landfill (WISL)	1940s to 1973; 2008/2009 (approximate date of AFFF release)	23

1.3 REPORT ORGANIZATION

The contents of the remaining sections of this SI Report are summarized below:

- ***Section 2. Environmental Setting***—This section discusses the environmental setting at LSAAP. Demographics, land use, geology, hydrogeology, hydrology, soil, and climate are described.

- ***Section 3. Field Investigation Activities***—This section provides field procedures followed during the implementation of the SI.
- ***Section 4. Data Analysis and Quality Assurance Summary***—This section describes the laboratory chemical analysis program for the investigation. Sample handling procedures, laboratory equipment calibration, laboratory analytical methods, data reporting and validation, and sample data quality assurance (QA)/quality control (QC) are discussed.
- ***Section 5. Screening Levels***—This section presents the PFAS with screening levels outlined in the 2023 Office of the Secretary of Defense (OSD) Memorandum (DoD 2023) and the SLs to which SI results are compared.
- ***Section 6. SI Results***—This section presents the data gathered during the SI activities and updated conceptual site models (CSMs).
- ***Section 7. Conclusions and Recommendations***—This section summarizes the SI conclusions and presents recommendations for the LSAAP AOPIs.
- ***Section 8. References***—This section lists the references that were used in the preparation of this report.
- ***Appendices***—Appendices A through G include data from field activities or related assessments:
  - Appendix A. Daily Quality Control Reports
  - Appendix B. Photograph Log
  - Appendix C. Boring Logs and Well Construction Logs
  - Appendix D. Sampling and Calibration Logs
  - Appendix E. Investigation-Derived Waste (IDW) Documents
  - Appendix F. Data Usability Assessment
  - Appendix G. Data Presentation Tables.

2. ENVIRONMENTAL SETTING

This section provides general information about LSAAP, including the site location, operational 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

LSAAP is located approximately 12 miles west of Texarkana, Texas in Bowie County. It is positioned south of Hooks, Texas and Leary, Texas and is immediately east and northeast of the RRAD. Land surrounding the installation is sparsely populated; primarily consisting of agricultural land and mixed soft and hardwood forest. There is no land use zoning within Bowie County (U.S. Army Corps of Engineers [USACE] Mobile District 2008). The majority of surface water drainage of LSAAP is to the south by way of the perennial Elliot Creek, its unnamed intermittent tributaries, unnamed intermittent tributaries of Wright Patman Lake, and an unnamed perennial stream. The remaining surface water drainage is to the north by Panther Creek and Jones Creek tributaries (which eventually terminates in the Red River) and to the east by tributaries of Aiken Creek (URS 2006). Figure 2-1 depicts the LSAAP site features, including the site boundary, roads, buildings, topography, surface water drainage divide, and surface water bodies.

2.2 SITE OPERATIONAL HISTORY

LSAAP was constructed in 1942 and designated as the Lone Star Ordnance Plant, a GO/CO utilized for shell loading during World War II. Lone Star Defense Corporation, a subsidiary of B.F Goodrich, operated this facility until it was deactivated in the 1940s. From 1943 to 1944, LSAAP was associated with RRAD as the Texarkana Ordnance Center. In 1945, the Texarkana Ordnance Center was abolished and LSAAP was then incorporated with Red River Ordnance Depot (and later named RRAD). These merged installations were referred to Red River Arsenal and primarily conducted munitions demilitarization and renovation work under the jurisdiction of the Red River Arsenal until 1951.

In 1951, LSAAP was reactivated as Lone Star Ordnance Plant and operated by DZI. Following a few years of production area rehabilitation and reactivation, LSAAP was returned to full production status. LSAAP was widely recognized for its melt pour operation for artillery shells and hand grenades, press loading operations for submunition grenades, detonators, booster pellets, primers, and tracers. Following the Korean War (between 1954 and 1960), production was periodically reduced and increased again from 1961 through 1968 to support Southeast Asia operations. In 1963, the installation was redesignated as LSAAP. Updates to the production lines occurred throughout the 1970s and 1980s, transitioning infrastructure to modernized systems with automated or semi-automated operation capacities. In the late 1990s, various production lines were shut down. However, LSAAP continued to be used for storage, demilitarization, research, and development of weapons items; maintaining a reduced LAP operation for various caliber munitions; and continuing upgrades to improve operation efficiency. In 2000, a major fire destroyed 47 buildings in Area Q, effectively ceasing operations there. In 2005, the BRAC Commission recommended LSAAP for closure. All active missions ceased, and the plant closed on 30 September 2009.

Due to the nature of their operations, proximity to RRAD, and history of merged use, several LSAAP features were utilized or operated by RRAD. It was common for landfills to receive waste from both installations. For example, RRAD utilized the WISL (LSAAP-002) for the disposal of non-hazardous wastes from the mid-1940s until 1973. RRAD also utilized the Western Active Sanitary Landfill (also known as CC Landfill; RRAD-61), to dispose of construction debris. RRAD assumed responsibility for the Western Active Sanitary Landfill and has closed the site. The sanitary sewer system was also formerly operated by RRAD, until 2002, when TAC began managing it (URS 2006).

2.3 DEMOGRAPHICS, PROPERTY TRANSFER, AND LAND USE

The installation is primarily surrounded by parks/preserves to the south, agricultural cropland, woodlands, and pastures to the north, the Texarkana metropolitan area to the east, and agricultural cropland, pastures, and RRAD and the city of New Boston to the west (RRAD 2021). In the city of New Boston is the New Boston Industrial Park. There are no zoning regulations in effect for the area surrounding LSAAP, in the non-incorporated area of Bowie County. Land use in Bowie County is heavily agricultural, with approximately 300,000 acres or approximately 52 percent (%) of the total land area of the county in farm production (United States Department of Agriculture 2017). The population of Bowie County in 2020 was 92,983 according to U.S. Census survey data (U.S. Census Bureau 2020).

2.3.1 BRAC Events

In 2005, the BRAC Commission recommended closure of LSAAP. The installation closed on 30 September 2009. In September 2010, the LSAAP property was divided into four portions based on BRAC transfer agreements:

- 8,867 acres were transferred to the RRRA, later renamed TAC,
- One acre was transferred to the Southwestern Power Company,
- 5,424-acres were transferred to DZLS, and
- 1,297 acres were retained by the Government for environmental cleanup, disposal, and subsequent transfer.

The extent of the areas transferred thus far, as well as the remaining area to be transferred are shown on Figure 1-2. As of 2021, 14,292 acres of the total 15,589 acres have been conveyed to non-governmental organizations (HQDA 2020).

2.3.1.1 TAC

RRRA (now TAC) acquired 8,867 acres that include Areas A, B, BB, C, D, E, F, G, and XX, as well as portions of Areas I and U, under an early transfer agreement that requires environmental remediation to be completed after transfer but allows for the redevelopment/reuse activities occurring. Portions of land have since transferred ownership under this agreement. For example, Area G has since been transferred to a company called Expansion Ammunition. All TAC-transferred property has been restricted to commercial and industrial uses via recorded deed covenants.

2.3.1.2 DZLS

DZI was the primary contractor operating LSAAP between 1951 and its closure in 2009. They provided design and consulting services, training of operational personnel, and conducted operation of LAP facilities, which utilized essentially the entirety of the installation. DZI created a limited liability corporation (DZLS) which acquired 5,242 acres as part of the BRAC transfer process that include portions of Areas I and U, as well as Areas H, J, K, M, O, P, Q, R, S, T, and W. DZI operations were consolidated to these areas, which are utilized for purposes similar to their historic operations.

2.3.1.3 Not Yet Transferred

The Army remains the owner of 1,297 acres which require cleanup/closure activities associated with municipal solid waste program requirements (e.g., Area A Landfill and the Old Boston Road Landfill), RCRA requirements for permitted units (e.g., the High Explosives Demolition Ground, the High Explosives Burning Ground [HEBG]) and for SWMUs/AOCs subject to corrective action, and CERCLA requirements (e.g., the Old Demolition Area, a Superfund Site). This acreage is planned to be transferred in the future

once remediation efforts are completed. Additionally, some minimum acreage was retained for utility easements.

2.4 TOPOGRAPHY

Topography of LSAAP is generally characterized as flat to gently rolling hills. Elevations vary from a maximum elevation of approximately 450 feet above mean sea level (amsl) in the western half of this site to just under 300 feet amsl where the East Fork of Elliot Creek crosses the southern LSAAP property boundary (URS 2006).

The major topographic feature within the installation is a drainage divide, separating LSAAP into four distinct drainage areas as shown on Figure 2-1. Some of the creeks and drainage ditches have eroded valleys which may act as barriers to groundwater flow. Groundwater is encountered at elevations higher than surface water elevations at these sites (URS 2006).

2.5 GEOLOGY

The three most shallow geologic units present at LSAAP are the Tertiary age Wilcox Group, Tertiary age Midway Group, and the Quaternary age alluvial deposits. The Wilcox Group and the Midway Group are described as "clay-shale" and form east-west outcrop bands.

The Wilcox Group is coarser grained and consists of reddish tan to brown irregularly bedded sands that are interbedded with clay, silty clay, lignitic clay, and lignite. The Wilcox Group can be as thick as 700 feet, but the maximum thickness observed at LSAAP is approximately 100 feet. The Midway Group locally contains glauconitic sand and consists of calcareous clay and clay-shale, grey to bluish grey in color with reddish-brown iron-stained lenses of sands and silts. The Midway Group represents the oldest and most laterally extensive unit to crop out at LSAAP. The Midway Group extends across the northern two-thirds of LSAAP. The thickness of the Midway Group is believed to be approximately 600 feet. The Midway Group has weathered to a depth of about 42 feet. The weathered section of the formation is yellow brown jointed clay shale that is soft and moist and has iron oxide staining along joint planes (URS 2006).

Alluvial deposits are present along the Red River and the Sulphur River and their tributaries. The alluvial deposits vary from silty clays and clayey silts to sandy silts and silty sands and gravels. The alluvium ranges from light grey to reddish-brown, very fine to coarse sand interbedded with dark-colored clays and silts with a few gravels (URS 2006).

Two major surface soil units, the Swayer-Eylau-Woodtell and the Rushton-McKamie soils, and one minor soil, the Annona Alusa soil, unit are found at LSAAP. The Swayer-Eylau-Woodtell soil covers approximately 60% of LSAAP and are generally clayey to silty loams with low permeability. The Rushton-McKamie soils cover the remaining 40% of LSAAP and are generally sandy loams with some clay and moderate to low permeability. The low permeability loam of the Annona Alusa soils is only present near the HEBG (URS 2006).

2.6 HYDROGEOLOGY

Groundwater flow generally follows the topographic divides shown on Figure 2-1. Groundwater north of the divide flows north and groundwater south of the divide flows south, with potential for local variations in flow direction. Groundwater in the area can be found at generally shallow depths. Groundwater depth levels range from near the surface along creek bottoms to depths of approximately 25 feet below ground surface (bgs) along the ridge lines. This allows for groundwater to surface water transition zones throughout LSAAP. Groundwater may discharge into nearby creeks or drainage ditches, especially during wet seasons when groundwater levels are near the surface. Seasonal fluctuations in the water table during precipitation are relatively small due to impermeable soils and well-developed drainage systems (URS 2006).

The major aquifer serving LSAAP area is the Carrizo-Wilcox aquifer. The hydraulic conductivity varies throughout LSAAP property. The hydraulic conductivity within the Wilcox Group is estimated to be 5.0 x 10-5 centimeters per second (cm/sec) at the HEBG. Groundwater flow in Quaternary deposits, such as stream beds and terrace deposits, is reported to be from 4 x 10-4 to 6 x 10-6 cm/sec. The hydraulic conductivity of the Midway Group is relatively low compared to the Wilcox Group and water may not be present when drilling for monitoring wells (URS 2006) in the Midway. Shallow groundwater at LSAAP is categorized under Texas regulations generally as either Class II (if in the Wilcox Formation) or Class III (if in the Midway Group). Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

The minor aquifer, the Nacatoch aquifer, lies below the Carrizo-Wilcox Aquifer and covers an estimated 10% of the northern portion of LSAAP. The rate of flow through the aquifer is unknown, but water flows southeast. Wells drilled into the Nacatoch sands located north of LSAAP range from 276 to 455 feet bgs (URS 2006).

2.7 SURFACE WATER HYDROLOGY

As described above, the site generally consists of relatively impermeable soils with a well-developed surface water drainage system. A topographic ridge running east-west influences the surface water flow as shown on Figure 2-1. Water flow is part of the Arkansas-White-Red region. Water flowing on the northern half of the ridge flows towards the Red River Watershed and water flowing on the southern half of the ridge flows toward the Sulphur River Watershed. Although there are two main watersheds, there are five main drainage areas throughout the site. Drainage areas exit at the northern, western, eastern, south-central, and southwestern boundaries. Precipitation is captured by several tributaries that feed into six main creeks and three reservoirs. Three reservoirs are located within the western and southern vicinity of LSAAP and not within the site (URS 2006).

The Red River Watershed is fed by four intermittent tributaries of Panther Creek and three tributaries of Jones Creek. Water flow within the installation drains into intermittent streams. Once the water leaves the site at the northern boundary, they enter perennial streams that eventually empty into Barkman Creek. Canney Creek is located past the western boundary of the site footprint and is fed by two intermittent streams. Canney Creek drains into Caney Creek Reservoir (URS 2006).

Aiken Creek is fed by four intermittent tributaries within the site. When drainage exits the site at the eastern boundary, it enters a perennial stream approximately 2.5 miles downstream of the site's eastern border. Aiken Creek then empties into Elliot Creek. On the south-central side of the site, multiple tributaries flow into Elliot Creek. Elliot Creek then empties into Wright Patman Lake. Elliot Creek serves as the only perennial stream within the site (URS 2006).

At the southwestern corner, water exits the site and flows into Wright Patman Lake. The southwestern portion also consists of two intermittent tributaries that flow into a perennial stream that then eventually empties into the Elliot Creek Reservoir. Elliot Creek Reservoir is also fed by Nettles Creek. Nettles Creek is an intermittent stream that flows south along the southwestern boundary of the site footprint and is fed by two intermittent tributaries. When Nettles Creek exits the site, it becomes perennial (URS 2006).

Other methods of drainage were implemented throughout the site. Drainage ditches at the site may retain runoff water, but typically remain dry throughout the year. The water in drainage ditches flows into the creeks and streams in their respective watersheds, and ultimately drain into the Red River or Sulphur River.

2.8 WATER USAGE

Currently, there are no potable wells located at LSAAP. Drinking water is provided to LSAAP by an offsite water utility. From 1993 until closure, LSAAP purchased potable water from Texarkana Water Utilities (TWU). The TWU treats surface water from the Wright Patman Lake Reservoir and the Millwood Reservoir. In Area Z, a concrete-lined, ground level tank with a storage capacity of 15,000,000 gallons was designated to be used for fire protection. It was taken out of service in 1968 (URS 2006). Caney Creek Reservoir was also used as an alternative source of water. DZI maintained LSAAP water lines during the installation's active life (URS 2006).

2.9 ECOLOGICAL PROFILE

Mammals found to be common to abundant at LSAAP include white-tailed deer, gray squirrel, fox squirrel, raccoon, bobcat, skunk, and armadillo. More than 400 species of birds potentially use the natural habitat at LSAAP. This includes, but is not limited to, migratory waterfowl, mourning dove, wild turkey, bobwhite quail, American kestrel, red-tailed hawk, red-shouldered hawk, eastern bluebird, and green heron. Common reptiles located at the installation include cottonmouth snake, copperhead snake, timber or canebrake rattlesnake, diamondback rattlesnake, kingsnake, northern fence lizard, green anole, box turtle, common snapping turtle, and red-eared slider. Common amphibians include central newt, smallmouth salamander, marbled salamander, spadefoot, narrow-mouth toad, green treefrog, south leopard frog, and bullfrog (USACE, Mobile District 2008).

The alligator snapping turtle, a state-listed threatened species, has been observed at LSAAP. It occupies perennial water bodies; deep water of rivers, canals, lakes, and oxbows; and swamps, bayous, and ponds near deep running water. Additionally, the American alligator has also been observed at LSAAP in the past. It is listed as threatened by similarity of appearance with the endangered American crocodile (USACE, Mobile District 2008).

The only other federally listed species that may occupy the area are the threatened bald eagle, endangered interior least tern, red-cockaded woodpecker, and threatened Louisiana black bear. Other state-listed bird species that may migrate through the area include the endangered American peregrine falcon and the threated article peregrine falcon (ELM Consulting, LLC 2008).

2.10 CLIMATE

The climate in the vicinity of LSAAP is characterized by mild winters and hot summers. The spring and fall months are mild with warm days and cool nights. The high humidity in this area is typically caused by warm moist air from the Gulf of Mexico (URS 2006).

Temperatures average 81 degrees Fahrenheit (°F) during the summer and 46°F during the winter, with an average temperature of 64°F. Precipitation averages about 48 inches per year with peak rainfall in May and December, and the driest months in July and August (National Weather Service 2021).

Snowfall in the area is rare and usually very light, averaging 1 to 2 inches per year. Prevailing winds are northeasterly during the fall and winter months and south-southwesterly during the spring and summer. Average wind speed is 7.6 miles per hour (URS 2006).

3. FIELD INVESTIGATION ACTIVITIES

This section provides field procedures followed during the implementation of the SI (40 CFR 300.420(c)(4)(i)). The principal guidance document for the field investigation activities and procedures used for the LSAAP SI were consistent with the requirements presented in the Army Guidance for Addressing Releases of PFAS (U.S. Army 2018).

3.1 SITE INSPECTION DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) were developed to define the problem at the AOPIs, identify the necessary decisions, specify decision-making rules and the level of confidence necessary to resolve the problem, identify the number of samples necessary to support the decision, and obtain agreement from the decision makers before the sampling program was initiated. The LSAAP sample locations were determined based on current site conditions (i.e., groundwater flow direction), historical data (e.g., suspected location of PFAS release), and historical activities (e.g., remedial activities, disposal of potentially contaminated materials). The project stakeholders concurred that selected sampling schemes would be representative of site conditions prior to initiation of field investigation activities. The field investigation at LSAAP was conducted in accordance with the UFP-QAPP (AAR 2023a). The field activities employed to execute the UFP-QAPP are described below and include any variances or deviations.

3.2 SAMPLE DESIGN AND RATIONALE

Eleven AOPIs were investigated during the LSAAP SI to determine the presence or absence of PFAS in the environment. Information inputs from the preliminary CSMs presented on Worksheet #10 of the UFP-QAPP (AAR 2023a) were the basis for sample design at each AOPI. All samples were analyzed for the Target PFAS list of PFOA, PFOS, PFBS, PFNA, PFHxS, PFHxA, and PFBA.

The general approach for determining the presence or absence of PFAS at an AOPI consisted of collecting groundwater samples within and/or downgradient from the AOPI and at least two soil samples. Groundwater samples were not proposed at the Natural Gas Leak Foam Response Area because the AOPI abuts a railroad and a drill rig would not be able to access the area. Soil samples were not proposed within the HEBG because the potential AFFF-release area within the HEBG could not be determined during the PA.

All sample identifications were assigned in the following format:

- Parent soil samples: LSAAP-[AOPI]-SO-[Boring No.]-[MMDDYY];
- Parent grab groundwater samples: LSAAP-[AOPI]-GW-[Boring No.]-[MMDDYY];
- Parent groundwater samples from existing monitoring wells: LSAAP-[existing mw nomenclature]-GW-[Sample No.]-[MMDDYY];
- FD: LSAAP-FD-[Duplicate No.]-[Medium Type]-[MMDDYY];
- Blank QC samples: LSAAP-[QC sample type]-[QC sample type number]-[MMDDYY].
    - Note: [MMDDYY] = Month Day Year
    - Example Sample Nomenclature: LSAAP-AMRF-GW-01-062923

3.3 FIELD INVESTIGATION ACTIVITIES

SI field activities were conducted from 15 June to 02 July 2023. The locations and methods of sample collection under the SI are described in the following sections. Sampling procedures adhered to the UFP-QAPP (AAR 2023a), with relevant information summarized below.

Sampling activities at LSAAP included collecting surface soil samples from soil borings, sampling existing monitoring wells, as well as installing temporary groundwater monitoring wells and direct push technology (DPT) screen point samplers for collection of groundwater samples. One round of groundwater sampling was conducted. Samples were analyzed for 26 PFAS to determine the presence or absence of PFAS. A total of 67 samples were collected among the 11 AOPIs, including ten existing monitoring well groundwater samples, seven DPT screen point groundwater samples, four temporary monitoring well groundwater samples, and 46 surface soil samples. A breakdown of samples collected at each AOPI is provided in Table 3-1. Prior to beginning sampling, site reconnaissance and utility clearance were performed. Sampling was completed at one AOPI before moving to the next AOPI when feasible. Any variances in sampling procedure, such as moving a location or sample point elimination, were discussed with the project team, and communicated in the Daily Quality Control Reports submitted via email (Appendix A). Field procedures and any variances are discussed in the following sections. Photographs of SI field activities are provided in Appendix B.

Table 3-1. LSAAP AOPI SI Sample Collection

AOPI Name	Soil Samples	Groundwater Samples
Former Fire Department Headquarters	8	3
New Fire Department Headquarters	6	2
Automotive Repair Facility	3	1
Chrome Plating Machine Shop	3	1
Central Stores Building	4	0
Former West Fire Station	2	2
Railroad Fire Response Area	11	1
Former East Fire Station	3	1
Natural Gas Leak Foam Response Area	6	0
HEBG	0	5
WISL	0	5
Total	**46**	**21**

3.4 FIELD PROCEDURES

The following sections describe utilities clearance, temporary well installation and development procedures, field procedures for sampling each medium, borehole abandonment, and location survey.

Because many materials routinely used during environmental investigation can potentially contain PFAS, the field crew conducted SI activities in accordance with the PFAS sampling SOPs/ Technical Guidance Instructions (TGIs) presented in Appendix B of the UFP-QAPP (AAR 2023a). Procedures include requirements for equipment, containers, handling, and sampling, including PFAS-specific requirements, to ensure that sample contamination does not occur during collection and transport.

3.4.1 Utility Clearance

Prior to initiating intrusive activities, the field manager coordinated underground utility clearances for the 11 AOPIs through LSAAP, and Texas811 "Call Before You Dig." LSAAP utility clearance was included as part of the Texas811 dig permit process and utility clearance. As part of the utility clearance process, individual utility companies were consulted (as needed), each area was visually inspected to verify that utilities had been marked, and the field manager looked for signs of unidentified utilities (including overhead utilities) prior to initiating drilling operations. In addition to the field manager, the rig geologist and drillers would also check for marked utilities and signs of unidentified utilities prior to initiating drilling operations. As part of field activities hand clearance was conducted at each boring location prior to

conducting powered drilling within of known or suspected subsurface utilities, the boreholes were excavated using a low-impact technique (hand auger) to a minimum of 5 feet bgs. If power drilling operations were required within the first 5 feet bgs it was first discussed between the rig geologist, field manager, driller, and any utility company (if needed).

3.4.2 Bulk Source Water Sampling

Prior to beginning work, a bulk source water sample was collected on 22 June 2023 (LSAAP-SB-01). The sample was collected from the point of exit from the water tanks used by the drilling subcontractors (Cascade Environmental). It underwent PFAS analysis as a QA/QC measure. Source water was used for decontamination of equipment, including drill tooling, and for abandonment of boreholes. Source water was purged for a minimum of 1 minute prior to filling the high-density polyethylene (HDPE) bottle. Concentrations of PFAS were not detected above laboratory reporting limits in the source blank water sample, LSAAP-SB-01-062223.

3.4.3 Soil Sampling

All soil samples were collected in accordance with the procedures outlined in the UFP-QAPP (AAR 2023a). QC samples, including duplicates, equipment rinsate blanks, and matrix spike/matrix spike duplicates (MS/MSDs), were also collected.

Soil samples were collected using a stainless-steel hand auger bucket. Each soil core was logged for lithology in accordance with USACE guidance and recorded on a drilling log (drilling logs are provided in Appendix C). Sample bottles were labeled and sealed in Ziploc® bags and placed on wet ice for cooling to ≤6 degrees Celsius (°C). Additional details on protocols for obtaining soil samples are outlined on Worksheet #18 and the Arcadis P-08 TGI PFAS Field Sampling Guide provided in the UFP-QAPP (AAR 2023a). Surface soil samples were collected from the 0- to 2-foot bgs interval.

Soil borings were abandoned following sample collection by backfilling the borehole with bentonite chips. Bentonite chips were hydrated using the bulk source water. Surface restoration matched the surrounding surface (e.g., concrete, asphalt, grass).

3.4.4 Groundwater Sampling

All groundwater samples were collected in accordance with the procedures outlined in the UFP-QAPP (AAR 2023a). QC samples, including equipment blanks, duplicates, and MS/MSDs were also collected.

Groundwater was sampled from permanent monitoring wells, temporary monitoring wells, and from DPT groundwater sampling assemblies (e.g., Geoprobe® SP16 screen point samplers or similar tooling). Groundwater was collected using the low-flow purge method via peristaltic pump whenever conditions allowed. Otherwise, groundwater would be collected using grab methods via installed DPT groundwater sampling assemblies, peristaltic pump, or bailers.

Prior to sampling, static water level measurements were collected to the nearest 0.01 foot. Following completion of monitoring well purging and stabilization, samples were collected in laboratory-supplied HDPE plastic containers. All samples were collected and handled while wearing clean non-powdered, disposable nitrile gloves. Sample bottles were labeled and sealed in Ziploc® bags and placed on wet ice for cooling to ≤6°C. New, clean nitrile gloves were donned prior to each new sample collection. Sampling containers were labeled with the following information: site name, sample identification, date and time of sample collection, and type of analysis.

3.4.4.1 Temporary Monitoring Well Sampling

Temporary monitoring wells were installed at the Former Fire Department Headquarters (LSAAP-FFDHQ-GW-02 and LSAAP-FFDHQ-GW-03), New Fire Department Headquarters (LSAAP-NFDHQ-GW-01), Chrome Plating Machine Shop (LSAAP-CPMS-GW-01), and Automotive Repair Facility (LSAAP-AMRF-GW-01) AOPIs using a Geoprobe® DPT drill rig and constructed using new 5-foot prepacked 0.010-inch slot schedule 40 polyvinyl chloride (PVC) 65mesh stainless steel wire wrapped screen and 5-foot schedule 40 PVC risers. All temporary wells were developed or dried multiple times and considered developed after all criteria were achieved excluding stability parameters. Well development forms are provided in Appendix D.

Four temporary wells (LSAAP-FFDHQ-GW-02, LSAAP-FFDHQ-GW-01, LSAAP-NFDHQ-GW-01, and LSAAP-AMRF-GW-01) were not capable of sustaining adequate purging and experienced continuous drawdown at the lowest pump settings. These wells were purged dry and allowed to recharge. The field team returned to the wells when a sufficient volume of water had entered the wells and grab samples were collected using a peristaltic pump and new HDPE tubing.

Once groundwater sampling was complete, all temporary monitoring wells were abandoned in accordance with the Texas Department of Licensing and Regulation (TDLR) *Rules for the Plugging and Abandonment of Drilled Wells* in Chapter 76.104 (TDLR 2018) and as outlined in the LSAAP Well Installation Plan (AAR 2023c). Temporary monitoring wells were abandoned by removing all PVC casing and screen and backfilling the borehole from the bottom to the surface with bentonite chips. The chips were then hydrated with bulk source water. Surface completion matched the surrounding surface (i.e., concrete, asphalt, grass).

3.4.4.2 DPT Screen Point Sampling

Groundwater samples were collected from seven DPT groundwater sample locations (LSAAP-FFDHQ-GW-01, LSAAP-NFDHQ-GW-02, LSAAP-FWFS-GW-01, LSAAP-FWFS-GW-02, LSAAP-RFRA-GW-01, and LSAAP-FEFS-GW-01). Collection methods for DPT groundwater samples are outlined in the LSAAP Well Installation Plan (AAR 2023c) and the Arcadis P-08 TGI PFAS Field Sampling Guide provided in the UFP-QAPP (AAR 2023a). Following completion of drilling each borehole for soil lithology and sample collection, the inner drill rods were removed and a decontaminated SP16 DPT groundwater sampling assembly, which included a 3-foot slotted stainless screen attached to the inner drill rods, was installed in the borehole. The outer drilling rods were then retracted, allowing formation water to enter the screened interval. Select locations used clean, new 3/4-inch PVC 65mesh stainless steel wire wrapped screen and 3/4-inch riser in the open borehole instead of the SP16 stainless steel sampler. Groundwater samples were collected as grab samples using a peristaltic pump with new HDPE tubing inserted through the drilling rods or a HDPE bailer.

If groundwater volume allowed for the collection of water quality measurements, they were recorded after the collection of the groundwater sample. Once sampling was complete, all tooling and materials were removed and the borehole abandoned. The borehole was sealed with bentonite chips to approximately 1-foot bgs and the chips were hydrated bulk source water obtained onsite. Surface restoration matched the surrounding surface (e.g., concrete, asphalt, grass).

3.4.4.3 Monitoring Well Sampling

Existing permanent monitoring wells were sampled at HEBG and WISL AOPIs by low flow sampling techniques using a peristaltic pump. Groundwater parameters (i.e., pH, temperature, etc..) stabilized in each monitoring well prior to sampling.

3.4.5 Equipment Calibration

Equipment including a handheld gas monitor (RKI GX-6000) and a water quality instrument (YSI Professional Plus and In-Situ Aquatroll 600) were calibrated daily per Worksheet #24 of the UFP-QAPP (AAR 2023a) against known standards in accordance with the manufacturer's instructions and documented on the calibration forms provided in Appendix D.

3.4.6 Location Survey

Environmental sample locations and notable site features were located and mapped using a portable Trimble global positioning system (GPS) unit capable of achieving ± 3 feet accurate results. GPS data were transferred for use in ArcGIS mapping applications during data evaluation and reporting.

3.4.7 Deviations and Field Change Requests

One instance of field modification impacting project scope and/or data usability/quality were encountered during the SI fieldwork. Activities were completed per the UFP-QAPP (AAR 2023a) and UFP-QAPP Addendum (AAR 2023a). The following minor deviations from the UFP-QAPP and UFP-QAPP Addendum were observed during field activities and summarized for USACE in daily field notes:

- The quantities of samples varied from Table 5 (Worksheet #18) of the UFP-QAPP (AAR 2023a). The deviation in sample quantities is a result of actual field conditions, as detailed below:
    - One planned groundwater sample (LSAAP-CSB-GW-01) was not collected due to the presence of railroad ties encountered during hand clearance and unable to offset due to marked underground utilities and overhead electrical utilities. Refusal was hit at approximately 0.3 feet bgs. Due to the location of the utilities and the continuation of buried and visible train tracks and railroad ties, this boring could not be offset and therefore soil sample (LSAAP-CSB-01) was collected 0 – 0.3' bgs but was unable to complete groundwater boring for groundwater sample. Therefore, groundwater data from the nearby Chrome Plating Machine Shop is used to support the recommendations for the Central Stores Building.
    - One planned soil sample (LSAAP-CSB-SO-02) was offset from the initial location being in concrete to a low point (culvert) on the Northwest side of the Central Stores Building (I-32).
    - One planned surface soil sample (LSAAP-RFRA-SO-07) was collected at depth of 0 to 0.5' bgs. Anomaly detections were obtained while advancing the borehole after the initial 0-0.5' hand clearance of the original boring location. An offset of the boring was done after anomaly detection at 0.5' bgs. Another anomaly detection was at 0.5' in the offset boring. With USACE field oversite present, the decision was made to sample from surface 0 to 0.5' bgs collected from the offset boring, due to anomaly detections around boring and offset boring location.
    - One thing to note for safety in the Railroad Fire Response Area that UXO was discovered while conducting work by UXO Tech, a 37mm, location was marked, and appropriate parties were notified.

3.5 DECONTAMINATION PROCEDURES

To ensure that chemical analysis results reflect the actual concentrations at sample locations, the non-dedicated, reusable equipment used in sampling activities was rigorously cleaned and decontaminated between sample locations in accordance with the UFP-QAPP (AAR 2023a). The non-disposable sampling equipment used to conduct sampling activities (e.g., drilling rods, screen point samplers, water level meters) was decontaminated before sampling activities began, between locations, between sampling events, and after sampling activities were completed. Decontamination guidelines followed the direction provided in

the Arcadis P-07 TGI for Groundwater and Soil Sampling Equipment Decontamination provided in the UFP-QAPP (AAR 2023a). Wastewater generated from decontamination activities was handled as IDW. Decontamination water was combined with well development and sampling purge water and managed as one medium.

The decontamination process included an initial scrub with a laboratory-grade, phosphate-free, biodegradable detergent (e.g., Liquinox® or Alconox®) to remove particulate matter and surface film. Following this scrub, the equipment was then rinsed twice in separate bins containing bulk source water and laboratory-certified PFAS-free water. Decontaminated sampling equipment was wrapped in thin sheets of HDPE to prevent subsequent contamination if being stored and not used immediately.

Decontamination of downhole drill rig equipment was completed prior to use, between locations, and after final use before departing the site. Tooling such as hollow stem augers, DPT rods, and hand augers were decontaminated in a mobile decontamination trailer by using a steam cleaner/power washer followed by a PFAS Free Water rinse. Non-dedicated tools, such as hand augers, water level meters, and taglines were bucket washed in an HPDE bucket with bulk source water/biodegradable detergent (e.g., Liquinox® or Alconox®) and rinsed with bulk source, followed by a final rinse of PFAS-Free water at the drilling site. Equipment was scrubbed using polyethylene or PVC brushes to remove particulates if required.

3.6 DISPOSITION OF FIELD INVESTIGATION-DERIVED WASTE

The IDW generated during the SI at LSAAP included solids (e.g., soil, well construction materials, acetate liners) and liquids (e.g., development and purge water, decontamination rinse water). These materials were managed in accordance with the Arcadis P-12 TGI Investigation-Derived Waste Handling and Storage provided in the UFP-QAPP (AAR 2023a).

All IDW generated at LSAAP was placed in U.S. Department of Transportation (USDOT)-approved, 55-gallon drums for storage, transport, and disposal. Permanent labels for the drums included a unique container number, a description of the contents (i.e., soil or wastewater), the fill date, the source location, the generator's name (i.e., LSAAP), and a telephone number for the generator's point of contact (e.g., AAR Project Manager or Field Manager). Each bucket or carboy used to temporarily store liquid IDW before it was transferred to a 55-gallon drum was marked "Nonpotable Water" or "Decontamination Waste" to comply with requirements of the P-12 TGI provided in the UFP-QAPP (AAR 2023a).

The contents of the IDW drums were sampled for characterization and profiling. A solid waste sample was composited by collecting aliquots from the solid waste drums using a decontaminated stainless-steel spoon. The solids were homogenized in a stainless-steel bowl and then placed into laboratory-supplied sample containers. For drums containing liquid IDW (i.e., wastewater), a composite sample was collected using a peristaltic pump and new HDPE tubing and pumping directly into sample bottles. Both solid and liquid IDW were analyzed for PFAS, Toxicity Characteristic Leaching Procedure (TCLP) pesticides, TCLP herbicides, TCLP volatile organic compounds (VOCs), TCLP semivolatile organic compounds, and TCLP metals. In addition, the certified waste hauler required the analysis of polychlorinated biphenyls, pH, and flashpoint.

IDW from LSAAP was characterized as Class II nonhazardous waste. The signed waste manifests and certificates of disposal will be provided in Appendix E prior to the finalization of this report, if available. Containerized waste will be disposed of in accordance with applicable state and Federal RCRA regulations. Upon the completion of waste disposal, the SI report will be updated, or a letter report will be drafted, describing the licensed and certified waste hauler, the date that IDW drums were picked up by the hauler, and the disposal location for these drums. Soiled personal protective equipment (PPE) that came into contact with sample media was contained in USDOT-approved 55-gallon drums.

4. DATA ANALYSIS AND QUALITY ASSURANCE SUMMARY

This section summarizes the QA/QC program and laboratory chemical analysis program implemented as part of the LSAAP SI field activities (40 CFR 300.420(c)(4)). Additional information on these procedures is presented in the UFP-QAPP (AAR 2023a).

SGS North America, Inc. (SGS), located in Orlando, Florida, was selected as the DoD Environmental Laboratory Accreditation Program (ELAP)-accredited analytical laboratory for the analysis of PFAS during the LSAAP SI field activities. Sections 4.1 through 4.4 summarize sample handling procedures, laboratory analytical methods, data QA/QC, data reporting and validation, and sample QA/QC. A QA summary of the analytical data is presented in Section 4.5. Appendix F provides the laboratory analytical reports generated for the site and a data usability assessment that details the quality and usability of the SI analytical data and the process performed to evaluate the data for compliance with established QC criteria.

4.1 SAMPLE HANDLING PROCEDURES

A critical aspect of sample collection and analysis protocols is the maintenance of strict chain-of-custody (CoC) procedures, which include tracking and documentation during sample collection, shipment, and laboratory processing. The Sample Manager was responsible for sample custody until the samples were properly packaged, documented, and released to FedEx. The laboratory was responsible for sample custody thereafter in accordance with approved procedures.

4.1.1 Chain-of-Custody Record

CoC forms were used to document the traceability and integrity of all samples from the point of collection to the laboratory by maintaining a record of sample collection, shipment, and receipt by the laboratory. A CoC form was filled out and was signed and dated by each sample custodian.

Shipping containers were sealed with custody tape. Sealed coolers were transported to FedEx for overnight delivery to the laboratory. The FedEx tracking number associated with each cooler acted as the custody documentation while the sealed coolers were in the possession of FedEx. The CoC form was placed in a resealable plastic bag and taped to the inside lid of the cooler.

When the possession of samples was transferred, the individual relinquishing the samples and the individual receiving the samples signed, dated, and noted the time of transferal on the CoC. This record represents the official documentation for all transferal of sample custody until the samples arrived at the laboratory.

4.1.2 Laboratory Sample Receipt

All samples received by the Laboratory Sample Custodian or designee were checked for proper preservation (e.g., pH, temperature of coolant blank above 2 degrees Celsius [°C] or below 6°C); integrity (e.g., leaking, broken bottles); and proper, complete, and accurate documentation and identification (ID) of the samples. The temperature of the coolant blank was noted. No insufficiencies and/or discrepancies were noted.

Samples received at the laboratory were logged into the laboratory computer database. Initial entries included field sample number, date of receipt, and analyses required. As samples were received, they were assigned a laboratory sample ID number. The sample custodian labeled each container with its sample ID number, and the samples then were transferred to their designated storage areas.

Samples received by the laboratory were considered to be physical evidence and were handled according to USEPA procedural safeguards. In addition, all data generated from the sample analyses, including all associated calibrations, method blanks, and other supporting QC analyses, were identified with the project

name, project number, and sample delivery group (SDG) designation. All data were maintained under the proper custody. The laboratory provided complete security for samples, analyses, and data.

4.2 LABORATORY ANALYTICAL METHODS

The chemical analysis program for the LSAAP SI conforms to the analytical requirements presented in the UFP-QAPP (AAR 2023a) for the chemical analysis of field investigation samples. All samples were analyzed for PFAS using liquid chromatography with tandem mass spectrometry (LC/MS/MS) procedures compliant with U.S. DoD QSM Version 5.3, Table B-15 (DoD 2019) and the laboratory SOP.

4.3 DATA QUALITY ASSURANCE/QUALITY CONTROL

This section presents the QA/QC procedures applied during sampling and laboratory analysis. This discussion includes laboratory QA/QC (Section 4.3.1) and field QA/QC (Section 4.3.2) procedures. Details on the results of the QC samples (field and laboratory) are presented in the Data Usability Assessment (DUA) included in Appendix F.

4.3.1 Laboratory Quality Assurance/Quality Control

Samples were analyzed for PFAS using LC/MS/MS in compliance with DoD QSM Version 5.3, Table B-15 (DoD 2019). QC checks included holding times, method blanks, calibration standards, extracted internal standards (EISs), laboratory control samples (LCSs), MS/MSDs, and detection limits (DLs). The acceptance criteria and laboratory SOP are provided in the UFP-QAPP (AAR 2023a).

Method Blanks—Method blanks were used to monitor the possibility of laboratory-induced contamination by running a volume of approved reagent water through the entire analytical scheme (i.e., extraction, concentration, analysis). Blank requirements are specified in the DoD QSM Version 5.3, Table B-15 (DoD 2019) and the laboratory SOP. It should be noted that PFOS or PFHxA were detected in the method blanks for batches OP97845, OP98074, and OP98101 associated with the project at an estimated concentration greater than the detection limit (DL) and less than the limit of quantitation (LOQ). Therefore, the environmental samples associated with this blank with estimated concentrations greater than or equal to the DL and less than or equal to the LOD (i.e., J qualified samples) were additionally qualified as not detected (U qualified) at the LOD. Additionally, the estimated concentrations greater than the LOD and less than or equal to the LOQ were qualified as not being detected (U qualified) at the LOQ. This is described in additional detail in the DUA included as Appendix F.

Matrix Spike/Matrix Spike Duplicates—Additional sample volume was collected from select field sample locations to evaluate accuracy and precision using MS/MSD analyses. MS/MSDs are aliquots of environmental samples to which known concentrations of certain target analytes have been added before sample preparation, cleanup, and determinative procedures have been implemented (SW846 Chapter One). Accuracy was expressed as the percent recovery (%R) of each added compound. Precision was expressed as the relative percent difference (RPD) between the MS and the MSD results. MS/MSD samples were collected and analyzed at a frequency of one for every 20 samples of similar matrix received at the laboratory.

Laboratory Control Samples—LCSs were analyzed to evaluate the accuracy of the analysis in the absence of sample matrix impacts. A known concentration of select compounds were added to the LCS. The spiked samples were analyzed in the same manner as the environmental samples. Accuracy was expressed as the %R of each added compound. An LCS was analyzed with each SDG.

4.3.2 Field Quality Assurance/Quality Control

Table 4-1 summarizes the frequency of field QC samples that were collected during the LSAAP field investigation. The requirements for field QC were established on Worksheet #20 of the UFP-QAPP (AAR 2023a).

Table 4-1. Frequency of Field QC Samples for LSAAP Field Investigation

QC Sample	Frequency
Field Blank	1 for every 20 or fewer investigative groundwater samples
Source Water Blank	1 per bulk rinse water source that is not laboratory certified PFAS free water
Matrix Spike	1 for every 20 or fewer investigative samples, per media
Matrix Spike Duplicate	1 for every 20 or fewer investigative samples, per media
Equipment Blank	1 for every 20 or fewer investigative samples
Field Duplicate	1 for every 10 or fewer investigative samples, per media

4.4 DATA REPORTING AND VALIDATION

The AAR QA Manager or designee (Geosyntec) initiated a validation of the analytical data packages. One hundred percent of the data were validated using objective criteria taken from the requirements of the UFP-QAPP (AAR 2023a) and DoD QSM Version 5.3 (DoD 2019) and qualified in accordance with DoD Data Validation Guidelines Module 3 (DoD 2020) and the revised table for sample qualification in the presence of blank contamination (DoD 2023).

Reported laboratory data were reviewed in accordance with DoD QSM Stage 2B validation guidelines to ensure that the QC results fell within appropriate QC limits for holding times, blank contamination, EISs, calibrations, MS/MSDs, LCSs, and ion ratios. Any data validation qualifiers resulting from outlier QC results were applied and a data validation report, as previously described, was prepared. In addition, 10% of the data were validated in accordance with DoD QSM Stage 3 guidelines, and analytical results were checked and recalculated from raw data.

Equipment blanks and field blanks were associated with the corresponding environmental samples. These blanks were evaluated following the same criteria as method blanks, and the associated environmental samples were appropriately qualified as needed. After the data validation for the project was completed, a project DUA (Appendix F) was prepared.

Results from the data validation process that potentially impact the SI findings includes the following:

- In the groundwater sample collected from the Railroad Fire Response Area (LSAAP-RFRA-GW-01), PFOS was originally detected at an estimated concentration of 27.5 J ng/L. However, due to the method blank contamination, the data was qualified as non-detect at the LOQ with a U validation qualifier. Therefore, the final result for PFOS is 40.0 UJ ng/L, with the LOQ above the PFOS SL of 4 ng/L (described in Section 5).
- In the groundwater sample collected from the New Fire Department Headquarters AOPI (LSAAP-NFDHQ-GW-02-061823), PFOS was originally detected at an estimated concentration of 8.5 ng/L, which is above the PFOS SL of 4 ng/L (described in Section 5). However, due to the method blank contamination, the data was qualified as non-detect at the LOQ with a U validation qualifier. Therefore, the final result for PFOS is 5.0 UJ ng/L, which is above the PFOS SL of 4 ng/L. However, concentrations of PFOS, PFOA, and PFNA in groundwater samples and an associated groundwater duplicate from the same AOPI were above their respective SLs, which causes the AOPI to be recommended for additional investigation.

- The UFP-QAPP for the project indicated that holding time between sample collection and sample preparation was 14 days for aqueous samples. However, the quality manual for laboratory used for the project indicates a holding time between sample collection and sample preparation of 28 days for aqueous samples. Due to this discrepancy, the data validation flagged 32 aqueous samples as being out of hold time for sample preparation. The affected samples were subsequently qualified as follows:
    - Non-detect samples were UJ qualified as estimated less than the LOD.
    - Samples with detections were qualified as estimated (J).

4.5 QUALITY ASSURANCE SUMMARY

A comprehensive QA/QC program was implemented during the sampling event in June and July 2023 at LSAAP. Samples and associated QC samples (e.g., field duplicates, field blanks, equipment blanks, source water blanks, MSs, MSDs) were collected and analyzed for PFAS using methods specified in the UFP-QAPP (AAR 2023a). Consistent with the data quality requirements established in the UFP-QAPP (AAR 2023a) and DQOs, all sample data and associated QC data were evaluated during the review and validation process. Individual sample results were qualified, as necessary, to designate usability of the data toward meeting project objectives. Data qualifiers were applied based on deviations from the measurement performance criteria in the UFP-QAPP (AAR 2023a). Results of the validation are found in the DUA (Appendix F). The analyses associated with each data quality indicator are summarized below, with details of the results of the QC checks provided in the DUA.

4.5.1 Precision

Precision was evaluated by the analysis of MS/MSDs and field duplicate samples and the RPD between the duplicate spike results.

4.5.2 Accuracy

Bias introduced due to blank contamination (in method, instrument, or field blanks) and any impact on accuracy were evaluated during validation. Analytical accuracy was measured through the use of LCSs, MS/MSDs, isotope dilution standards, initial and continuing calibration, and target compound quantitation requirements.

4.5.3 Sensitivity

Sensitivity requirements were evaluated against minimum required limits of quantitation (LOQs) and LODs in the UFP-QAPP (AAR 2023a).

4.5.4 Representativeness

Representativeness was satisfied by ensuring that the UFP-QAPP (AAR 2023a) protocols were followed, appropriate sampling techniques were used, established analytical procedures were implemented, and analytical holding times of the samples were not exceeded.

4.5.5 Comparability

Comparability was achieved by using consistent, documented and UFP-QAPP-approved methods , and meeting project accuracy and precision objectives.

4.5.6 Completeness

Completeness measures the amount of valid data obtained from the sampling and analysis effort. For analytical data to be usable, each data point must be validated and meet criteria without significant non-conformance.

4.5.7 Data Usability

Data that have been qualified as estimated (i.e., J and UJ) during validation indicate accuracy, precision, or sensitivity QC measurements may have exceeded criteria, but the results are considered valid. Results that have been qualified as estimated by the laboratory or during the data validation process are done relative to the LOD. J-flagged results were detected above the DL but are less than the LOD and UJ-flagged results are qualified as being less than the LOD.

Data that were recommended for exclusion during validation (qualified X) and subsequently rejected (qualified R) by the project decision team were not used during the evaluation of project objectives.

5. SI SCREENING LEVELS

Detected concentrations of the Target PFAS in samples collected during this SI are compared to residential scenario SLs calculated using the USEPA regional screening level calculator for soil and the tap water criteria for groundwater, as published in the 2023 OSD Memorandum (DoD 2023). This SI uses the SLs and a target hazard quotient (HQ) of 0.1 to evaluate the Target PFAS concentrations. These SLs (***Table 5-1***) are used to evaluate the data and determine if further investigation is warranted at each AOPI.

Table 5-1. Screening Levels from the 2023 OSD Memorandum

Chemical	Residential Tap Water HQ = 0.1 (ng/L or ppt)	Residential Soil HQ = 0.1 (mg/kg or ppm)
PFOS	4	0.013
PFOA	6	0.019
PFBS	600	1.9
PFNA	5.9	0.019
PFHxS	39	0.13
PFHxA	990	3.2
PFBA	1,800	7.8

mg/kg = milligram per kilogram
ng/L = nanogram per liter
ppm = parts per million
ppt = parts per trillion
Note: The residential tap water SLs are used to evaluate groundwater data. The residential soil SLs are used to evaluate soil data.

6. SI RESULTS

This section presents the site background, summary of analytical results, and the CSM for each AOPI at LSAAP. Sampled media and QA/QC samples were analyzed for the list of 25 PFAS specified in the Performance Work Statement (AAR 2022). The sample results discussed below focus on five Target PFAS outlined in the 2023 OSD Memorandum and sampled as part of this SI (DoD 2023): PFOS, PFOA, PFBS, PFNA, PFHxS, PFHxA, and PFBA. Analytical data tables for all PFAS analyzed are provided in Appendix G.

6.1 CONCEPTUAL SITE MODELS

The preliminary CSMs developed for each AOPI during the PA were further refined where Target PFAS were detected above the DL in soil or groundwater. Based on the SI sample results, CSMs presented for each AOPI represent the current understanding of site conditions with respect to known or suspected sources of PFAS-containing materials, potential transport mechanisms and migration pathways, and potentially exposed human receptors.

The CSMs were prepared in accordance with the Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) (USEPA 1989) and the *USACE Engineer Manual on Conceptual Site Models*, EM 200-1-12 (USACE 2023). The CSMs evaluated ingestion, dermal contact, and inhalation exposure routes for human receptors. The exposure pathways are evaluated as complete, potentially complete, or incomplete in the CSMs presented in figures in each AOPI-specific CSM section. 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 (USEPA 1989). If any of these elements is missing, the exposure pathway is incomplete. For example, if PFAS are not detected in soil, then there is no source at the AOPI, and the soil exposure pathway is incomplete. Pathways are "potentially complete" where data or information are insufficient to conclude the pathway is either "complete" or "incomplete." Exposure pathways are also potentially complete for media where Target PFAS are detected but existing LUCs are in place for non-PFAS constituents, because the LUCs are not Target PFAS specific. Where PFAS are detected in groundwater, however the hydrogeologic connection between groundwater at the AOPI and a drinking water well is not documented, the groundwater exposure pathway is potentially complete.

The deed, and all subsequent deeds, for the installation includes land use controls (LUCs) prohibiting the residential use of all AOPIs as well as the accessing or use of groundwater without prior written approval from the United States Department of the Army and TCEQ (Texas Commission on Environmental Quality; Bowie County Texas Deed Book 2010a, Bowie County Texas Deed Book 2010b). These LUCs are not Target PFAS specific. Ground-disturbing and intrusive activities are also disallowed in the HEBG. There are landfill restrictions in place for WISL preventing excavation, digging, drilling, or other ground disturbing activities that may damage caps or disturb buried waste. Finally, the deed without warranty also prescribes that United States Army maintain the site through the maintenance of the existing fencing and funding for security guards, contingent on the completion of remediation activities and TCEQ approvals (LSAAP 2010).

Shallow subsurface geology in the northern portion of LSAAP is generally composed of clays and silty clay shales of the Midway Group. The Midway Group is a marine clay-shale with millimeter-scale clay and silty clay horizontal stratification. Vertical migration is limited to occasional small vertical fractures and joints in the weathered portions of the unit. The unit is classified as an aquiclude and has a thickness of approximately 600 feet.

There are no potable water wells located at LSAAP, and groundwater is not used for drinking water. The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at LSAAP is categorized as either Class II or Class III. Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

6.2 FORMER FIRE DEPARTMENT HEADQUARTERS (BUILDING I-04) AOPI

6.2.1 AOPI Background

The Former Fire Department Headquarters is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the area having been used for AFFF storage and possible AFFF firefighter training activities. The Former Fire Department Headquarters, Building I-04, was the original headquarters location and housed fire protection equipment and personnel. The building was originally constructed in a horseshoe pattern surrounding the communications building. The Former Fire Department Headquarters was utilized from 1942 to 1981 and was demolished sometime between 1981 and 1984. Shipments of AFFF were brought to the Former Fire Department Headquarters before being distributed to other fire stations. Therefore, there is the potential for AFFF to have been spilled, or for residual AFFF to have been washed off during washing and maintenance practices. This AFFF may have accumulated in vegetated areas or entered stormwater and/or sanitary sewers.

This AOPI is no longer owned by the Army.

6.2.2 SI Sampling and Results

Eight soil samples and one QC duplicate were collected from eight soil borings (LSAAP-FFDHQ-SO-01, LSAAP-FFDHQ-SO-02, LSAAP-FFDHQ-SO-03, LSAAP-FFDHQ-SO-04, LSAAP-FFDHQ-SO-05, LSAAP-FFDHQ-SO-06, LSAAP-FFDHQ-SO-07, and LSAAP-FFDHQ-SO-08). Soil samples were collected from locations adjacent to the original building footprint and areas where runoff from vehicle washing or other maintenance activities may have accumulated. Three groundwater samples and one QC duplicate were collected at the AOPI. One was co-located with LSAAP-FFDHQ-SO-01 (LSAAP-FFDHQ-GW-01) and the other was co-located with LSAAP-FFDHQ-SO-02 (LSAAP-FFDHQ-GW-02). The third groundwater sample was collected north of the former building footprint. Figure 6-1 depicts sampling locations at the Former Fire Department Headquarters AOPI in conjunction with the New Fire Department Headquarters AOPI. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-1 and Figure 6-2 and summarized below.

6.2.2.1 Soil

PFOA was detected at concentrations below the SL in three soil samples: LSAAP-FFDHQ-SO-01, LSAAP-FFDHQ-SO-02, and LSAAP-FFDHQ-SO-04.

PFBA and PFHxA were detected at estimated concentrations (J flagged) below the SL in one soil sample: LSAAP-FFDHQ-SO-01 and LSAAP-FFDHW-SO-02, respectively.

PFOS, PFBS, PFNA, and PFHxS were not detected above the LODs in any of the soil samples collected at the AOPI.

6.2.2.2 Groundwater

PFOA, PFBA, PFHxA, and PFHxS were detected in groundwater samples at the AOPI:

1. PFOA was detected at estimated concentrations (J flagged) above the SL (4 ng/L) in LSAAP-FFDHQ-GW-01 (2,720 J ng/L) and LSAAP-FFDHQ-GW-02 (390 J ng/L). PFOA was detected at an estimated concentration below the SL in LSAAP-FFDHQ-GW-03.
2. PFBA and PFHxA were detected at estimated concentrations below the SL in LSAAP-FFDHQ-GW-01 and LSAAP-FFDHQ-GW-02
3. PFHxS was detected at an estimated concentration below the SL in LSAAP-FFDHQ-GW-02.

PFOS, PFBS, and PFNA were not detected above the LODs in any of the groundwater samples collected at the AOPI.

6.2.3 CSM

The Former Fire Department Headquarters AOPI is approximately 6 acres in size. The area was declared excess under BRAC 2005 and has been transferred to TAC. The building has been demolished. The ground surface elevation of the Former Fire Department Headquarters is approximately 375 feet amsl. Stormwater runoff from the area likely flows east towards a swale that runs parallel to the street and continues to flow east. The closest surface water body to the Former Fire Department Headquarters is the unnamed tributary to Jones Creek, located approximately 0.25 miles to the west.

The AOPI is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the Former Fire Department Headquarters. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. There are no current residents at LSAAP. However, all exposure pathways for future onsite residents are potentially complete because there are no PFAS-specific land use restrictions precluding residential development. The soil exposure pathway is complete for site workers because they may access the AOPI and Target PFAS that were detected in soil samples at the Former Fire Department Headquarters.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the Former Fire Department Headquarters is potentially complete for future site workers and residents because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-3 presents the CSM for the Former Fire Department Headquarters.

6.2.4 Recommendation

Human exposure pathways are complete or potentially complete and concentrations of Target PFAS in groundwater at the Former Fire Department Headquarters AOPI exceeded the SLs; therefore, further investigation is recommended.

Table 6-1. Target PFAS Analytical Results at the Former Fire Department Headquarters

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Screening Levels	0.013	0.019	1.9	0.019	0.13
LSAAP-FFDHQ-SO-01	LSAAP-FFDHQ-SO-01-062223	HA	0-2	06/22/2023	0.00067 U	**0.0034**	0.00067 U	0.00067 U	0.00067 U
	LSAAP-FD-05-SO-062223	HA	0-2	06/22/2023	0.00064 U	**0.0046**	0.00064 U	0.00064 U	0.00064 U
LSAAP-FFDHQ-SO-02	LSAAP-FFDHQ-SO-02-062123	HA	0-2	06/21/2023	0.00061 U	**0.0021**	0.00061 U	0.00061 U	0.00061 U
LSAAP-FFDHQ-SO-03	LSAAP-FFDHQ-SO-03-062123	HA	0-2	06/21/2023	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
LSAAP-FFDHQ-SO-04	LSAAP-FFDHQ-SO-04-061723	HA	0-2	06/17/2023	0.00063 U	**0.00098 J**	0.00063 U	0.00063 U	0.00063 U
LSAAP-FFDHQ-SO-05	LSAAP-FFDHQ-SO-05-061723	HA	0-2	06/17/2023	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
LSAAP-FFDHQ-SO-06	LSAAP-FFDHQ-SO-06-061723	HA	0-2	06/17/2023	0.0006 U	0.0006 U	0.0006 U	0.0006 U	0.0006 U
LSAAP-FFDHQ-SO-07	LSAAP-FFDHQ-SO-07-061723	HA	0-2	06/17/2023	0.00058 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
LSAAP-FFDHQ-SO-08	LSAAP-FFDHQ-SO-08-061723	HA	0-2	06/17/2023	0.0006 U	0.0006 U	0.0006 U	0.0006 U	0.0006 U
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	4	6	601	6	39
LSAAP-FFDHQ-GW-01	LSAAP-FFDHQ-GW-01-062223	TMW	30	06/22/2023	4.5 UJ	**2720.0 J**	4.5 UJ	4.5 UJ	4.5 UJ
	LSAAP-FD-04-GW-062223	TMW	30	06/22/2023	4.5 UJ	**2870.0 J**	4.5 UJ	4.5 UJ	4.5 UJ
LSAAP-FFDHQ-GW-02	LSAAP-FFDHQ-GW-02-062923	TMW	35	06/29/2023	4.0 UJ	**390.0 J**	4.0 UJ	4.0 UJ	**2.9 J**
LSAAP-FFDHQ-GW-03	LSAAP-FFDHQ-GW-03-062923	DPT SP	38.6	06/29/2023	4.8 UJ	**4.4 J**	4.8 UJ	4.8 UJ	4.8 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate depth of the soil sample or the total depth of the DPT SP screen or temporary monitoring well below ground surface.
DPT SP = direct push technology screen point
HA = hand auger
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
mg/kg = milligram per kilogram
ng/L = nanogram per liter
TMW = temporary monitoring well
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD. However, the associated numerical value is approximate.

6.3 NEW FIRE DEPARTMENT HEADQUARTERS (BUILDING I-71) AOPI

6.3.1 AOPI Background

The New Fire Department Headquarters is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the area having been used for AFFF storage and AFFF firefighter training activities. It is currently owned by DZLS. The New Fire Department Headquarters, Building I-71, housed fire protection equipment, including AFFF. In May 1995, a firefighter training exercise was conducted over a series of three days here. A total of three gallons of diesel fuel were burned on the concrete pad west of the building based on interview statements (LSAAP 1995). It is assumed that AFFF was utilized as the extinguishing media for this exercise. Therefore, there is the potential for AFFF to have been released during training exercises, or for residual AFFF to have been washed off during washing and maintenance practices. This AFFF may have accumulated in vegetated areas or enter stormwater and/or sanitary sewers.

This AOPI is no longer owned by the Army.

6.3.2 SI Sampling and Results

Six soil samples and one QC duplicate were collected from six soil borings (LSAAP-NFDHQ-SO-01 through LSAAP-NFDHQ-SO-06). Soil samples were collected from locations adjacent to the building footprint. Two groundwater samples and one QC duplicate were collected. Both groundwater samples were co-located with one of which was from a temporary monitoring well co-located with LSAAP-NFDHQ-SO-02 (LSAAP-NFDHQ-GW-02). Figure 6-1 depicts sampling locations at the New Fire Department Headquarters AOPI in conjunction with the Former Fire Department Headquarters AOPI. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-2 and Figure 6-2 and summarized below.

6.3.2.1 Soil

PFOS, PFOA, PFBA, PFNA, PFHxA, and/or PFHxS were detected in soil samples at concentrations below the SL at all soil sample locations at the New Fire Department Headquarters AOPI. PFBS was not detected above the LOD in the soil samples collected at the AOPI.

6.3.2.2 Groundwater

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were detected in groundwater samples at the AOPI.

PFOS, PFOA, and/or PFNA were detected at estimated concentrations (J flagged) above the SL (4, 6, and 6 ng/L, respectively) at the two sample locations south and east of the fire station bay as follows:

1. LSAAP-NFDHQ-GW-01 – PFOA was detected at an estimated concentration of 32.5 J ng/L and PFNA was detected at an estimated concentration 29.0 J ng/L
2. LSAAP-NFDHQ-GW-02 – PFOS was detected at an estimated concentration of 16.5 J ng/L and PFOA was detected at a concentration 6.9 J ng/L).

PFOS was detected at estimated quantities below the SL at LSAAP-NFDHQ-GW-01. PFBS, PFNA, and PFHxS were detected at estimated quantities below the SL at LSAAP-NFDHQ-GW-02. PFBA and PFHxA were detected at estimated quantities below the SL at LSAAP-NFDHQ-GW-01 and LSAAP-NFDHQ-GW-02.

6.3.3 CSM

The New Fire Department Headquarters AOPI is approximately 2 acres in size. The area was declared excess under BRAC 2005 and has been transferred to DZLS. The ground surface elevation of the New Fire

Department Headquarters is approximately 375 feet amsl. Stormwater runoff from the area likely flows south towards storm drains. Drains are also located inside the New Fire Department Headquarters bay. The closest surface water body to the AOPI is the unnamed tributary to Jones Creek, located approximately 0.3 miles to the west.

The AOPI is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the New Fire Department Headquarters. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. There are no current residents at LSAAP. However, all exposure pathways for future onsite residents are potentially complete because there are no PFAS-specific land use restrictions precluding residential development. The soil exposure pathway is complete for site workers because they may access the AOPI and Target PFAS were detected in soil samples at the New Fire Department Headquarters.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the New Fire Department Headquarters is potentially complete for future site workers and residents because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-3 presents the CSM for the New Fire Department Headquarters.

6.3.4 Recommendation

Human exposure pathways are complete or potentially complete and concentrations of Target PFAS in groundwater at the New Fire Department Headquarters AOPI exceeded the SLs; therefore, further investigation is recommended.

Table 6-2. Target PFAS Analytical Results at the New Fire Department Headquarters

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Screening Levels	0.013	0.019	1.9	0.019	0.13
LSAAP-NFDHQ-SO-01	LSAAP-NFDHQ-SO-01-061923	HA	0-2	06/19/2023	0.00065 U	**0.003**	0.00065 U	**0.0062**	0.00065 U
LSAAP-NFDHQ-SO-02	LSAAP-NFDHQ-SO-02-061823	HA	0-2	06/18/2023	**0.0016**	**0.0021**	0.00058 U	**0.00041 J**	**0.00054 J**
LSAAP-NFDHQ-SO-03	LSAAP-NFDHQ-SO-03-061723	HA	0-2	06/17/2023	**0.0004 J**	**0.0013 J**	0.00076 U	**0.0011 J**	0.00076 U
LSAAP-NFDHQ-SO-04	LSAAP-NFDHQ-SO-04-061723	HA	0-2	06/17/2023	0.00066 UJ	**0.00083 J**	0.00066 UJ	0.00066 UJ	0.00066 UJ
LSAAP-NFDHQ-SO-05	LSAAP-NFDHQ-SO-05-061723	HA	0-2	06/17/2023	**0.00046 J**	0.0006 U	0.0006 U	**0.00078 J**	0.0006 U
	LSAAP-FD-03-SO-061723	HA	0-2	06/17/2023	**0.0017**	**0.00063 J**	0.00068 U	**0.00039 J**	0.00068 U
LSAAP-NFDHQ-SO-06	LSAAP-NFDHQ-SO-06-061723	HA	0-2	06/17/2023	0.0006 U	**0.00097 J**	0.0006 U	**0.00069 J**	0.0006 U
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	4	6	601	6	39
LSAAP-NFDHQ-GW-01	LSAAP-NFDHQ-GW-01-062223	TMW	35	06/22/2023	**2.7 J**	**32.5 J**	4.5 UJ	**29.0 J**	4.5 UJ
LSAAP-NFDHQ-GW-02	LSAAP-NFDHQ-GW-02-061823	TMW	35	06/18/2023	9.1 UJ	**4.8 J**	**24.1 J**	4.5 UJ	**15.7 J**
	LSAAP-FD-02-GW-061823	TMW	35	06/18/2023	**16.5 J**	**6.9 J**	**26.9 J**	**2.4 J**	**19.9 J**

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate depth of the soil sample or the total depth of the temporary monitoring well below ground surface.
DPT SP = direct push technology screen point
HA = hand auger
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
mg/kg = milligram per kilogram
ng/L = nanogram per liter
TMW = temporary monitoring well
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or LOQ. However, the associated numerical value is approximate.

6.4 AUTOMOTIVE REPAIR FACILITY (BUILDING I-29) AOPI

6.4.1 AOPI Background

The Automotive Repair Facility is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the servicing, storage, and cleaning of fire trucks that contained AFFF. The Automotive Repair Facility, Building I-29, serviced and stored emergency vehicles such as fire trucks from 1952 until installation closure. Exact locations for vehicle servicing and staging are not known. Washdown is described as having occurred here and would have flowed into a nearby sump. Washdown of firefighting equipment may have resulted in the release of AFFF to the area.

Historical constituents of concern at this AOPI are hydrocarbons in soil from an oil leak from a hydraulic lift. The amount of soil removed during the remedial action jeopardized the structural integrity of the building. Therefore, the remaining oil contamination was capped.

This AOPI is no longer owned by the Army.

6.4.2 SI Sampling and Results

Three surface soil samples were collected from three soil borings (LSAAP-AMRF-SO-01, LSAAP-AMRF-SO-02, and LSAAP-AMRF-SO-03). Soil samples were collected from areas where runoff from vehicle washing or other maintenance activities may have accumulated. In addition, one grab groundwater sample and one QC duplicate were collected from a temporary monitoring well co-located with LSAAP-AMRF-SO-01 (LSAAP-AMRF-GW-01). Figure 6-4 depicts sampling locations at the Automotive Repair Facility AOPI in conjunction with the Chrome Plating Machine Shope and Central Stores Building AOPIs. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-3 and Figure 6-5 and summarized below.

6.4.2.1 Soil

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected at concentrations above the LODs in the soil samples collected at the Automotive Repair Facility AOPI.

6.4.2.2 Groundwater

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected at concentrations above the LODs in the groundwater samples collected at the Automotive Repair Facility AOPI.

PFOS was not detected above the DL or LOD in sample LSAAP-AMRF-GW-01-062923 (4.3 ng/L). The LOD is above the SL of 4 ng/L. Because the LOD for all other Target PFAS in soil and groundwater were below their respective SLs and none were detected above the LOD, it is unlikely that PFOS is present at concentrations above the SL at this AOPI.

6.4.3 CSM

The Automotive Repair Facility AOPI is approximately 3 acres in size. The area was declared excess under BRAC 2005 and has been transferred to DZLS. The ground surface elevation of the Automotive Repair Facility is approximately 370 feet amsl. Stormwater runoff from the area likely flows east of the building into swales, and then continues to flow south towards the road. Surface water and sediment do not exist at this AOPI. The closest surface water body to the Automotive Repair Facility is the unnamed tributary to Jones Creek, located approximately 0.4 miles to the west.

The AOPI Is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at LSAAP is categorized as either Class II or Class III. Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the Automotive Repair Facility. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. The soil exposure pathway is incomplete for site workers as no Target PFAS were detected in soil samples at the Automotive Repair Facility.

Target PFAS were not detected in groundwater samples at the AOPI. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) is therefore incomplete. Groundwater originating from the AOPI could flow offsite, and there is the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. However, the offsite groundwater exposure pathway (via drinking water ingestion and dermal contact) and the onsite and offsite surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are incomplete because target PFAS were not detected in soil or groundwater at the AOPI.

Figure 6-6 presents the CSM for the Automotive Repair Facility.

6.4.4 Recommendation

Target PFAS were not detected in soil or groundwater at the Automotive Repair Facility; therefore, further investigation is not recommended.

Table 6-3. Target PFAS Analytical Results at the Automotive Repair Facility

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				**Units**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
				Screening Levels	**0.013**	**0.019**	**1.9**	**0.019**	**0.13**
LSAAP-AMRF-SO-01	LSAAP-AMRF-SO-01-062023	HA	0-2	06/20/2023	0.00062 U	0.00062 U	0.00062 U	0.00062 U	0.00062 U
LSAAP-AMRF-SO-02	LSAAP-AMRF-SO-02-062023	HA	0-2	06/20/2023	0.00059 U	0.00059 U	0.00059 U	0.00059 U	0.00059 U
LSAAP-AMRF-SO-03	LSAAP-AMRF-SO-03-062023	HA	0-2	06/20/2023	0.00059 U	0.00059 U	0.00059 U	0.00059 U	0.00059 U
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**4**	**6**	**601**	**6**	**39**
LSAAP-AMRF-GW-01	LSAAP-AMRF-GW-01-062923	TMW	43	06/29/2023	4.3 UJ	4.3 UJ	4.3 UJ	4.3 UJ	4.3 UJ
	LSAAP-FD-03-GW-062923	TMW	43	06/29/2023	4.2 UJ	4.2 UJ	4.2 UJ	4.2 UJ	4.2 UJ

Notes:
Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
Depths indicate depth of the soil sample or the total depth of the temporary monitoring well below ground surface.
HA = hand auger
mg/kg = milligram per kilogram
ng/L = nanogram per liter
TMW = temporary monitoring well
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD. However, the associated numerical value is approximate.

6.5 CHROME PLATING MACHINE SHOP (BUILDING I-30/ SWMU-037) AOPI

6.5.1 AOPI Background

The Chrome Plating Machine Shop is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the use of PFAS-containing materials. The Chrome Plating Machine Shop, Building I-30, was utilized from 1952 until 2009. Metal plating operations are known to potentially utilize PFAS-containing materials in their operations. However, a list of chemicals utilized in chrome plating operations was not available for review and it can therefore not be confirmed whether these metal plating operations utilized PFAS-containing materials. Records do state that PFAS-containing materials were spray-applied to component parts as a dry film lubricant, although it is unclear when this spray application began (URS 2006, DZI 2005).

Historical constituents of concern at this AOPI include chromium in soil and groundwater. Prior to 1968, chromium plating waste was discharged to the unlined drainage ditch located west of the building. In 1979, an 8,000-gallon underground storage tank was installed to store wastewater from the operations. In 1987, a leak was discovered in the tank and/or piping. There were monitoring wells installed. Groundwater did not appear to have been impacted by the releases (Dames & Moore 1990). In 1992, the Texas Natural Resource Conservation Commission (now TCEQ) approved a No Further Action designation and the SWMU-037 site was closed. PFAS-containing wastes may have also been released to site media (soil and groundwater) during the historical operation of this facility.

This AOPI is no longer owned by the Army.

6.5.2 SI Sampling and Results

Three soil samples were collected from three soil borings (LSAAP-CPMS-SO-01, LSAAP-CPMS-SO-02, and LSAAP-CPMS-SO-03). Soil samples were collected from areas where runoff from metal plating activities may have accumulated. Additionally, one groundwater sample was collected. Figure 6-4 depicts sampling locations at the Chrome Plating Machine Shop AOPI in conjunction with the Automotive Repair Facility and Central Stores Building AOPIs. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-4 and Figure 6-5 and summarized below.

6.5.2.1 Soil

PFOS was the only Target PFAS detected in soil samples at the Chrome Plating Machine Shop AOPI. PFOS was detected at an estimated concentration (J flagged) below the SL at LSAAP-CPMS-SO-01.

PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected above the LOD in the soil samples collected at the AOPI.

6.5.2.2 Groundwater

PFOS, PFOA, PFBA, and PFBS were detected in the groundwater sample (LSAAP-CMPS-GW-01) collected at this AOPI. PFOA was detected at an estimated concentration (J flagged) of 14.4 J ng/L which is above the SL (6 ng/L). PFOS, PFBA, and PFBS were detected at estimated concentrations below their respective SLs.

PFNA, PFHxA, and PFHxS were not detected in groundwater samples collected at the AOPI.

6.5.3 CSM

The Chrome Plating Machine Shop AOPI is approximately 4 acres in size. The area was declared excess under BRAC 2005 and has been transferred to DZLS. The ground surface elevation of the Chrome Plating

Machine Shop is approximately 370 feet amsl. Stormwater runoff from the area likely flows west of the building via a drainage ditch, and then continues to flow south towards the road. The closest surface water body to the Chrome Plating Machine Shop is the unnamed tributary to Jones Creek, located approximately 0.3 miles to the east.

The AOPI is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at LSAAP is categorized as either Class II or Class III. Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the Chrome Plating Machine Shop. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. There are no current residents at LSAAP. However, all exposure pathways for future onsite residents are potentially complete because there are no Target PFAS-specific land use restrictions precluding residential development. The soil exposure pathway is complete for site workers because they may access the AOPI and Target PFAS that were detected in soil samples at the Former Fire Department Headquarters.

Target PFAS were detected in the groundwater sample collected at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the Chrome Plating Machine Shop is potentially complete for future site workers and residents because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-7 presents the CSM for the Chrome Plating Machine Shop.

6.5.4 Recommendation

Human exposure pathways are complete or potentially complete and concentrations of Target PFAS in groundwater at the Chrome Plating Machine Shop exceeded the SLs; therefore, further investigation is recommended.

Table 6-4. Target PFAS Analytical Results at the Chrome Plating Machine Shop

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				**Units**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
				Screening Levels	**0.013**	**0.019**	**1.9**	**0.019**	**0.13**
LSAAP-CPMS-SO-01	LSAAP-CMPS-SO-01-062823	HA	0-2	06/28/2023	**0.0005 J**	0.00064 U	0.00064 U	0.00064 U	0.00064 U
LSAAP-CPMS-SO-02	LSAAP-CPMS-SO-02-062023	HA	0-2	06/20/2023	0.00066 U	0.00066 U	0.00066 U	0.00066 U	0.00066 U
LSAAP-CPMS-SO-03	LSAAP-CPMS-SO-03-062023	HA	0-2	06/20/2023	0.00074 U	0.00074 U	0.00074 U	0.00074 U	0.00074 U
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**4**	**6**	**601**	**6**	**39**
LSAAP-CPMS-GW-01	LSAAP-CMPS-GW-01-062823	DPT SP	35	06/28/2023	**3.1 J**	**14.4 J**	**5.6 J**	5.3 UJ	5.3 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate the total depth of the DPT SP sample screen point or the depth of the soil sample below ground surface.
DPT SP = direct push technology screen point
HA = hand auger
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
mg/kg = milligram per kilogram
ng/L = nanogram per liter
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD. However, the associated numerical value is approximate.

6.6 CENTRAL STORES BUILDING (BUILDING I-32) AOPI

6.6.1 AOPI Background

The Central Stores Building is identified as an AOPI following records research and personnel interviews because the area had been used for AFFF storage prior to distribution to other buildings. The Central Stores Building is identified as Building I-32. It was utilized from 1952 until installation closure. The area is highly developed. The surrounding area mainly consists of paved roads, cemented driveways, and gravel. Runoff most likely flows south of the building via drainage ditch.

6.6.2 SI Sampling and Results

Four soil samples and one QC duplicate were collected from four soil borings (LSAAP-CSB-SO-01, LSAAP-CSB-SO-02, LSAAP-CSB-SO-03, and LSAAP-CSB-SO-04). Soil samples were collected from areas where runoff from potential AFFF spills may have accumulated. Due to the presence of utilities and infrastructure, groundwater samples were not collected at this AOPI as described in Section 3.4.7. However, a groundwater sample was collected from the Chrome Plating Shop, which is located immediately north of the road separating the two locations, and those groundwater sample results are used to make a recommendation for the Central Stores Building. Figure 6-4 depicts sampling locations at the Central Stores Building AOPI in conjunction with the Automotive Repair Facility and Chrome Plating Machine Shop AOPIs. The Target PFAS analytical results for soil samples collected at the Central Stores Building AOPI are provided in Table 6-5 and Figure 6-5 and summarized below.

This AOPI is no longer owned by the Army.

6.6.2.1 Soil

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected above the LOD in the soil samples collected at the Central Stores Building AOPI.

6.6.3 CSM

The Central Stores Building AOPI is approximately 2 acres in size. The area was declared excess under BRAC 2005 and has been transferred to DZLS. The ground surface elevation of the Central Stores Building is approximately 370 feet amsl. Stormwater runoff from the area likely flows south of the building via a drainage ditch. The closest surface water body to the Central Stores Building is the unnamed tributary to Jones Creek, located approximately 0.3 miles to the east.

The AOPI is located in the northern portion of LSAAP and is likely to be positioned on the clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at LSAAP is categorized as either Class II or Class III. Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the Central Stores Building. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. There are no current residents at LSAAP, and future residential development is not a reasonably anticipated future land use; therefore, all

exposure pathways for onsite residents are incomplete. The soil exposure pathway is incomplete for site workers as no Target PFAS were detected in four soil samples collected at the Central Stores Building.

Due to the presence of utilities and infrastructure, groundwater samples were not collected at this AOPI. However, Target PFAS were detected in groundwater at the Chrome Plating Machine Shop, located approximately 450 feet north and regionally downgradient of the AOPI. PFAS impacts between these two AOPIs have not been delineated. There are no potable water wells located at LSAAP and groundwater is not used for drinking water. However, the onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) is potentially complete for future site workers and residents because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite, and there is the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. Target PFAS were detected in groundwater at the Chrome Plating Machine Shop, located approximately 450 feet north and regionally downgradient of the Central Stores Building. PFAS impacts between these two AOPIs have not been delineated. Therefore, the offsite groundwater exposure pathway (via drinking water ingestion and dermal contact) is potentially complete at this AOPI. However, the onsite and offsite surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are incomplete because target PFAS were not detected in soil at the AOPI.

Figure 6-8 presents the CSM for the Central Stores Building.

6.6.4 Recommendation

Human exposure pathways are potentially complete, and concentrations of Target PFAS in groundwater at the downgradient Chrome Plating Machine Shop exceeded the SLs; therefore, further investigation is recommended.

Table 6-5. Target PFAS Analytical Results at the Central Stores Building

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Screening Levels	0.013	0.019	1.9	0.019	0.13
LSAAP-CSB-SO-01	LSAAP-CSB-SO-01-062923	HA	0-0.3	06/29/2023	0.00058 U	0.00058 U	0.00058 U	0.00058 U	0.00058 U
LSAAP-CSB-SO-02	LSAAP-CSB-SO-02-062223	HA	0-2	06/22/2023	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U
	LSAAP-FD-06-SO-062223	HA	0-2	06/22/2023	0.00064 U	0.00064 U	0.00064 U	0.00064 U	0.00064 U
LSAAP-CSB-SO-03	LSAAP-CSB-SO-03-062223	HA	0-2	06/22/2023	0.00065 U	0.00065 U	0.00065 U	0.00065 U	0.00065 U
LSAAP-CSB-SO-04	LSAAP-CSB-SO-04-062223	HA	0-2	06/22/2023	0.00057 U	0.00057 U	0.00057 U	0.00057 U	0.00057 U

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Depths indicate the depth of the soil sample below ground surface.

HA = hand auger
mg/kg = milligram per kilogram
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.

6.7 FORMER WEST FIRE STATION (BUILDING BB-27) AOPI

6.7.1 AOPI Background

The Former West Fire Station is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the possibility of AFFF storage and AFFF firefighting activities. The Former West Fire Station was located in Building BB-27. Area BB was used to support the Fire Department and Security Force. It was constructed in 1942 and utilized as a fire station until 1980s when it was converted into an entomology service building and utilized for pesticide mixing. The Former West Fire Station housed fire protection equipment and personnel. AFFF was confirmed to have been stored and utilized on the installation according to records. The Former West Fire Station was converted into a pesticide mixing and storage area in the late 1980s. Sometime between 2015 and 2019, the northern part of the building was demolished. The northern foundation and southern garage remain. The Former West Fire Station is located in Area BB with grassy areas to the north, west, and south. Runoff would likely flow east toward a swale running parallel to the street. The street runs from north to south.

Historical constituents of concern at this AOPI are related to the historical storage, mixing, and preparation of pesticides at this building after the building was no longer used for fire department support. In 2011, TCEQ approved the No Further Action designation (Science Applications International Corporation 2013).

This AOPI is no longer owned by the Army.

6.7.2 SI Sampling and Results

Two surface soil samples were collected from two soil borings LSAAP-FWFS-SO-01 and LSAAP-FWFS-SO-02). Soil samples were collected to the north and south of the AOPI, from in the direction where runoff from potential AFFF or pesticide spills may have flowed/accumulated. Additionally, two groundwater samples (LSAAP-FWFS-GW-01 and LSAAP-FWFS-GW-02) were co-located with the soil samples. Figure 6-9 depicts the sampling locations at the Former West Fire Station AOPI in conjunction with the Railroad Fire Response Area AOPI. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-6 and Figure 6-10 and summarized below.

6.7.2.1 Soil

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected at concentrations above the LODs in either of the soil samples collected.

6.7.2.2 Groundwater

PFOS, PFOA, PFBA, PFBS, PFNA, and/or PFHxA were detected in the groundwater samples collected at the Former West Fire Station AOPI as follows:

- LSAAP-FWFS-GW-01 - PFOA was detected at an estimated (J flagged) concentration of 11.6 J ng/L, above the SL (6 ng/L). PFBS was detected at an estimated concentration below the SL.
- LSAAP-FWFS-GW-02 - PFOS was detected at an estimated concentration of 25.0 J ng/L, above the SL (4 ng/L). PFOA was detected at an estimated concentration 44.0 J ng/L above the SL (6 ng/L).

PFBA, PFBS, PFBA, and PFHxA were detected at estimated concentrations below their respective SLs.

PFHxS was not detected above the LOD in the groundwater samples collected at the AOPI.

6.7.3 CSM

The Former West Fire Station AOPI is approximately 0.5 acres in size. The area was declared excess under BRAC 2005 and has been transferred to TAC. The ground surface elevation of the Former West Fire Station is approximately 395 feet amsl. Stormwater runoff from the area likely flows east toward a swale running parallel to the street and then continues flow north. The closest surface water body to the Former West Fire Station is the unnamed tributary to Panther Creek, located approximately 0.25 miles to the west.

The AOPI is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of unconsolidated deposits overlying the clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

Surface water and sediment are not present at the AOPI. The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater in Area BB is classified as Class III and is generally not suitable for consumption (Science Applications International Corporation 2013).

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the Former West Fire Station. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. There are no current residents at LSAAP, and future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete. The soil exposure pathway is incomplete for site workers as no Target PFAS were detected in soil samples at the Former West Fire Station.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the Former West Fire Station is potentially complete because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-11 presents the CSM for the Former West Fire Station.

6.7.4 Recommendation

Human exposure pathways are potentially complete, and concentrations of Target PFAS in groundwater at the Former West Fire Station exceeded the SLs; therefore, further investigation is recommended.

Table 6-6. Target PFAS Analytical Results at the Former West Fire Station

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				**Units**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
				Screening Levels	**0.013**	**0.019**	**1.9**	**0.019**	**0.13**
LSAAP-FWFS-SO-01	LSAAP-FWFS-SO-01-061723	HA	0-2	06/17/2023	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U
LSAAP-FWFS-SO-02	LSAAP-FWFS-SO-02-061623	HA	0-2	06/16/2023	0.00061 U	0.00061 U	0.00061 U	0.00061 U	0.00061 U
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**4**	**6**	**601**	**6**	**39**
LSAAP-FWFS-GW-01	LSAAP-FWFS-GW-01-061723	DPT SP	5.5	06/17/2023	4.5 UJ	**11.6** J	**2.9 J**	4.5 UJ	4.5 UJ
LSAAP-FWFS-GW-02	LSAAP-FWFS-GW-02-061723	DPT SP	5	06/17/2023	**25.0** J	**44.0** J	**6.7 J**	**4.1 J**	6.9 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate the total depth of the DPT SP sample screen point or the depth of the soil sample below ground surface.
DPT SP = direct push technology screen point
HA = hand auger
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
mg/kg = milligram per kilogram
ng/L = nanogram per liter
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD. However, the associated numerical value is approximate.

6.8 RAILROAD FIRE RESPONSE AREA AOPI

6.8.1 AOPI Background

The Railroad Fire Response Area is identified as an AOPI based on interviews describing a diesel engine fire having been responded to with AFFF in the 1990s. The Railroad Fire occurred in the southwest corner of the BB Area between two railroad tracks. It was reported that a train engine fire occurred approximately 300 feet east of the Former West Fire Station. This fire was reportedly responded to with AFFF. However, the volume of AFFF utilized is not known. The area is vegetated and has gravel dispersed through the area. Runoff would flow north towards a swale that is parallel to the street, running west and east.

Historical constituents of concern include munitions spilled from rail shipments. Surface clearance activities were performed in 2017. All hazards identified were removed or destroyed. Munitions debris included one 100lb sand filled bomb (inert) and two fuzes (inert). Approximately 2,430 cubic yards of soils were excavated and screened prior to inspection for munitions. These soils were then backfilled for site restoration.

This AOPI is no longer owned by the Army.

6.8.2 SI Sampling and Results

Eleven surface soil samples and one QC duplicate were collected from eleven soil borings (LSAAP-RFRA-SO-01 through LSAAP-RFRA-SO11). Soil samples were collected from areas where AFFF was historically sprayed and where runoff may have accumulated. Additionally, one groundwater sample was collected and co-located with LSAAP-RFRA-SO-01. Figure 6-9 depicts sampling locations at the Railroad Fire Response Area AOPI in conjunction with the Former West Fire Station AOPI. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-7 and Figure 6-10 and summarized below.

6.8.2.1 Soil

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected at concentrations above the LODs in any of the soil samples collected.

6.8.2.2 Groundwater

PFOA was detected in the groundwater sample collected at the AOPI (LSAAP-RFRA-GW-01). PFOA was detected at an estimated (J flagged) concentration of 15.1 J ng/L, above the SL (6 ng/L).

PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected above the LOD at the AOPI.

Due to the method blank contamination, the PFOS data was qualified as non-detect at the LOQ with a U validation qualifier. Therefore, the final result for PFOS is 40.0 UJ ng/L.

6.8.3 CSM

The Railroad Fire Response Area AOPI is approximately 4 acres in size. The area was declared excess under BRAC 2005 and has been transferred to TAC. The ground surface elevation of the Railroad Fire Response Area is approximately 395 feet amsl. Stormwater runoff from the area likely flows north toward a swale running parallel to the street and then continues flow north. The closest surface water body to the Railroad Fire Response Area is the unnamed tributary to Panther Creek, located approximately 0.3 miles to the west.

The AOPI is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of unconsolidated deposits overlying the clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater in Area BB is classified as Class III and is generally not suitable for consumption (Science Applications International Corporation 2013).

The primary release mechanism is the potential release of AFFF to surface soils related to historical operations at the Railroad Fire Response Area. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. There are no current residents at LSAAP. However, all exposure pathways for future onsite residents are potentially complete because there are no PFAS-specific land use restrictions precluding residential development. The soil exposure pathway is incomplete for site workers as no Target PFAS were detected in soil samples at the Railroad Fire Response Area.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the Railroad Fire Response Area is potentially complete because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for stormwater runoff and shallow groundwater discharge to nearby surface water drainage features. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-11 presents the CSM for the Railroad Fire Response Area.

6.8.4 Recommendation

Human exposure pathways are potentially complete, and concentrations of Target PFAS in groundwater at the Railroad Fire Response Area exceeded the SLs; therefore, further investigation is recommended.

Table 6-7. Target PFAS Analytical Results at the Railroad Fire Response Area

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Screening Levels	0.013	0.019	1.9	0.019	0.13
LSAAP-RFRA-SO-01	LSAAP-RFRA-SO-01-061623	HA	0-2	06/16/2023	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U
LSAAP-RFRA-SO-02	LSAAP-RFRA-SO-02-061523	HA	0-2	06/15/2023	0.00054 U	0.00054 U	0.00054 U	0.00054 U	0.00054 U
LSAAP-RFRA-SO-03	LSAAP-RFRA-SO-03-061523	HA	0-2	06/15/2023	0.00058 U	0.00058 U	0.00058 U	0.00058 U	0.00058 U
LSAAP-RFRA-SO-04	LSAAP-RFRA-SO-04-061523	HA	0-2	06/15/2023	0.00059 U	0.00059 U	0.00059 U	0.00059 U	0.00059 U
LSAAP-RFRA-SO-05	LSAAP-RFRA-SO-05-061523	HA	0-2	06/15/2023	0.00058 U	0.00058 U	0.00058 U	0.00058 U	0.00058 U
	LSAAP-FD-01-SO-061523	HA	0-2	06/15/2023	0.00057 U	0.00057 U	0.00057 U	0.00057 U	0.00057 U
LSAAP-RFRA-SO-06	LSAAP-RFRA-SO-06-061523	HA	0-2	06/15/2023	0.00058 U	0.00058 U	0.00058 U	0.00058 U	0.00058 U
LSAAP-RFRA-SO-07	LSAAP-RFRA-SO-07-061523	HA	0-0.5	06/15/2023	0.00058 U	0.00058 U	0.00058 U	0.00058 U	0.00058 U
LSAAP-RFRA-SO-08	LSAAP-RFRA-SO-08-061523	HA	0-2	06/15/2023	0.00056 U	0.00056 U	0.00056 U	0.00056 U	0.00056 U
LSAAP-RFRA-SO-09	LSAAP-RFRA-SO-09-061523	HA	0-2	06/15/2023	0.00055 U	0.00055 U	0.00055 U	0.00055 U	0.00055 U
LSAAP-RFRA-SO-10	LSAAP-RFRA-SO-10-061523	HA	0-2	06/15/2023	0.00053 U	0.00053 U	0.00053 U	0.00053 U	0.00053 U
LSAAP-RFRA-SO-11	LSAAP-RFRA-SO-11-061523	HA	0-2	06/15/2023	0.00054 U	0.00054 U	0.00054 U	0.00054 U	0.00054 U
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	4	6	601	6	39
LSAAP-RFRA-GW-01	LSAAP-RFRA-GW-01-061623	DPT SP	30	06/16/2023	40.0 UJ	**15.1 J**	20.0 UJ	20.0 UJ	20.0 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate the total depth of the DPT SP sample screen point or the depth of the soil sample below ground surface.
DPT SP = direct push technology screen point
HA = hand auger
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
mg/kg = milligram per kilogram
ng/L = nanogram per liter
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or LOQ. However, the associated numerical value is approximate.

6.9 FORMER EAST FIRE STATION (BUILDING M-11) AOPI

6.9.1 AOPI Background

The Former East Fire Station is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the possibility of AFFF storage and AFFF firefighting activities. The Former East Fire Station was located in Building M-11, in the M Area, and was constructed in 1942. The fire station housed fire protection equipment and personnel, and potentially stored AFFF, which has been confirmed to have been stored and utilized on the installation according to records. In 1971, the building transitioned to be used for general purposes in which it served as storage for the fire department. The building was demolished sometime between 1995 and 2005. The former building location is within a fenced area surrounded by grassy area to the north, west, and south. Runoff would flow south, southwest, where there was no apparent stormwater drain nearby.

This AOPI is no longer owned by the Army.

6.9.2 SI Sampling and Results

Three surface soil samples were collected from three soil borings (LSAAP-FEFS-01, LSAAP-FEFS-02, and LSAAP-FEFS-03). Soil samples were collected on opposing sides of the former fire station driveway, as well as from within the drainage ditch leading from the fire station to a nearby unnamed intermittent tributary, where runoff from potential AFFF spills may have accumulated. Additionally, one groundwater sample was collected downgradient of the fire station where AFFF may have accumulated. Sample locations are shown on Figure 6-12. The Target PFAS analytical results for soil and groundwater samples collected are provided in Table 6-8 and Figure 6-13 and summarized below.

6.9.2.1 Soil

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected at concentrations above the LODs in any of the soil samples collected.

6.9.2.2 Groundwater

PFOA and PFBA were detected in the groundwater sample collected at the Former East Fire Station AOPI (LSAAP-FEFS-GW-01) at estimated concentrations (J flagged) below their respective SLs. PFOA and PFBA were detected at estimated concentrations were of 5.4 J ng/L and 6.7 J ng/L, respectively.

PFOS was not detected above the DL or LOD in sample LSAAP-FEFS-GW-01-062923 (5.0 ng/L). The LOD is above the SL of 4 ng/L. Because the LOD for all other Target PFAS in soil and groundwater were below their respective SLs and none were detected above the LOD, it is unlikely that PFOS is present at concentrations above the SL at this AOPI.

PFOS, PFBS, PFNA, and PFHxS were not detected above the LOD at the AOPI.

6.9.3 CSM

The Former East Fire Station AOPI is approximately 0.5 acres in size. The area was declared excess under BRAC 2005 and has been transferred to DZLS. The ground surface elevation of the Former East Fire Station is approximately 370 feet amsl. Stormwater runoff from the area likely flows south, southwest. The closest surface water body to the Former East Fire Station is an unnamed tributary to Jones Creek, located approximately 0.6 miles to the west.

The AOPI is located in the northern portion of LSAAP and the shallow subsurface geology encountered during drilling was composed of clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at LSAAP is categorized as either Class II or Class III. Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the Former East Fire Station. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. The soil exposure pathway is incomplete for site workers as no Target PFAS were detected in soil samples at the Former East Fire Station.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the Former East Fire Station is potentially complete because there are no PFAS-specific land use restrictions precluding groundwater use. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for shallow groundwater discharge to nearby surface water drainage features. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-14 presents the CSM for the Former East Fire Station.

6.9.4 Recommendation

Although human exposure pathways are complete or potentially complete, detected concentrations of Target PFAS in groundwater and soil at the Former East Fire Station were below the SLs. Therefore, further investigation is not recommended.

Table 6-8. Target PFAS Analytical Results at the Former East Fire Station

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				**Units**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
				Screening Levels	**0.013**	**0.019**	**1.9**	**0.019**	**0.13**
LSAAP-FEFS-SO-01	LSAAP-FEFS-SO-01-061923	HA	0-2	06/19/2023	0.0006 U	0.0006 U	0.0006 U	0.0006 U	0.0006 U
LSAAP-FEFS-SO-02	LSAAP-FEFS-SO-02-061923	HA	0-2	06/19/2023	0.00061 U	0.00061 U	0.00061 U	0.00061 U	0.00061 U
LSAAP-FEFS-SO-03	LSAAP-FEFS-SO-03-061923	HA	0-2	06/19/2023	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**4**	**6**	**601**	**6**	**39**
LSAAP-FEFS-GW-01	LSAAP-FEFS-GW-01-062923	DPT SP	36	06/29/2023	5.0 UJ	**5.4 J**	5.0 UJ	5.0 UJ	5.0 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Depths indicate the total depth of the DPT SP sample screen point or the depth of the soil sample below ground surface.
DPT SP = direct push technology screen point
HA = hand auger
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
mg/kg = milligram per kilogram
ng/L = nanogram per liter
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or LOQ. However, the associated numerical value is approximate.

6.10 NATURAL GAS LEAK FOAM RESPONSE AREA AOPI

6.10.1 AOPI Background

The Natural Gas Leak Foam Response Area (located north of Area A) is identified as an AOPI following interviews because it was reported that AFFF was used here in response to a natural gas leak within the 2008/2009 timeframe. The exact location of this response and the volume of AFFF deployed was not known, but it is believed to have been near the roadway, where the utilities lines are located. The area is vegetated and has gravel dispersed through the area. Runoff would flow north towards a swale that is parallel to the street, running west and east.

This AOPI is no longer owned by the Army.

6.10.2 SI Sampling and Results

Six surface soil samples and one QC duplicate were collected from six soil borings distributed within the AOPI (LSAAP-NGLFRA-SO-01 through LSAAP-NGLFRA-SO-06). Soil samples were collected from areas where AFFF was historically sprayed and runoff may have accumulated. Groundwater samples were not proposed at the Natural Gas Leak Foam Response Area because the AOPI abuts a railroad and a drill rig would not be able to access the area. Soil sample locations are shown on Figure 6-15. The Target PFAS analytical results for soil samples collected are provided in Table 6-9 and Figure 6-16 and summarized below.

6.10.2.1 Soil

PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected at concentrations above the LODs in any of the soil samples collected.

6.10.3 CSM

The Natural Gas Leak Foam Response Area is approximately 3 acres in size. The area was declared excess under BRAC 2005 and has been transferred to TAC. The ground surface elevation of the Natural Gas Leak Foam Response Area is approximately 390 feet amsl. Stormwater runoff from the area likely flows north towards a swale that is parallel to the street, running west and east. The closest surface water body to the Natural Gas Leak Foam Response Area is an unnamed intermittent tributary to Jones Creek, located approximately 0.1 miles to the east.

The AOPI is located in the northern portion of LSAAP and is likely to be positioned on clays and silty clay shales of the Midway Group. Regional groundwater flow is to the north. Surface water and sediment are not present at the AOPI.

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at LSAAP is categorized as either Class II or Class III. Class III groundwater is generally not considered suitable for consumption by humans, but Class II is considered a potential potable water source (USACE, Mobile District 2008).

The primary release mechanism is the potential release of AFFF to surface soils related to historical operations at the Natural Gas Leak Foam Response Area. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation.

The soil exposure pathway is incomplete for site workers as no Target PFAS were detected in six soil samples collected at the Natural Gas Leak Foam Response Area. Since Target PFAS were not detected in

soil, there is no potential source of Target PFAS in soil, or transport mechanism between soil and groundwater. Therefore, all exposure pathways are incomplete.

Figure 6-17 presents the CSM for the Natural Gas Leak Foam Response Area.

6.10.4 Recommendation

All human exposure pathways are incomplete; therefore, further investigation is not recommended.

Table 6-9. Target PFAS Analytical Results at the Natural Gas Leak Foam Response Area

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Soil				Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Screening Levels	0.013	0.019	1.9	0.019	0.13
LSAAP-NGLFRA-SO-01	LSAAP-NGLFRA-SO-01-061523	HA	0-2	06/15/2023	0.00064 U	0.00064 U	0.00064 U	0.00064 U	0.00064 U
LSAAP-NGLFRA-SO-02	LSAAP-NGLFRA-SO-02-061523	HA	0-2	06/15/2023	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
LSAAP-NGLFRA-SO-03	LSAAP-NGLFRA-SO-03-061523	HA	0-2	06/15/2023	0.00059 U	0.00059 U	0.00059 U	0.00059 U	0.00059 U
	LSAAP-FD-02-SO-061523	HA	0-2	06/15/2023	0.00062 U	0.00062 U	0.00062 U	0.00062 U	0.00062 U
LSAAP-NGLFRA-SO-04	LSAAP-NGLFRA-SO-04-061523	HA	0-2	06/15/2023	0.00059 U	0.00059 U	0.00059 U	0.00059 U	0.00059 U
LSAAP-NGLFRA-SO-05	LSAAP-NGLFRA-SO-05-061523	HA	0-2	06/15/2023	0.00063 U	0.00063 U	0.00063 U	0.00063 U	0.00063 U
LSAAP-NGLFRA-SO-06	LSAAP-NGLFRA-SO-06-061523	HA	0-2	06/15/2023	0.00061 U	0.00061 U	0.00061 U	0.00061 U	0.00061 U

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. 4. Depths indicate the depth of the soil sample below ground surface.

HA = hand auger
mg/kg = milligram per kilogram
U = The analyte was not detected and is reported as less than the LOD. The LOD has been adjusted for dilution.

6.11 HIGH EXPLOSIVES BURNING GROUND (HEBG/SWMU-16) AOPI

6.11.1 AOPI Background

The HEBG is identified as an AOPI following records research due to the use of the area for firefighter training. The HEBG is located on the southeast portion of the installation. The HEBG is a RCRA permitted unit, which had four burn pans (miscellaneous units) and two hazardous waste container storage areas (one of which is divided into three locations) associated with it on the RCRA permit (Permit No. 50292). The explosives were initially burned in four earthen, unlined pits. Concrete pads with three metal pans each were added in the 1970s to burn the explosives. Later configurations of the site contained more pans. The pans were updated to refractory-lined burning pans in 1985 to contain explosive-contaminated liquids and burn residue. Other special burn pads were used to dispose of dry materials contaminated with explosives. The HEBG was updated again in the early 2000s to include a propane-fueled burn pit with a concrete pad under it. At the time of LSAAP closure, there were four burning pads, which contained burning pans. The burning pans were located over soil, which was surfaced with native white clay, used to provide a contrasting surface to enhance the identification of contaminants from the burn pans and serve as a buffer against grass fires. Adjacent to the burning pads are three hazardous waste storage areas. These areas were used for temporary storage for ash/residual from burn operations. A storage shed was also positioned within the area to temporarily store material prior to thermal treatment. Live fire training exercises for firefighting training occurred here as recently as 1986. Boxes were placed inside metal containers and ignited with diesel fuel. Records do not indicate what type of extinguishing material was utilized, although it was potentially AFFF. The specific location where these exercises occurred within the HEBG was not identified in historical records.

Historical constituents of concern include antimony, cadmium, lead, and mercury. An APAR was submitted in November 2001. In 2004, 999.9 cubic yards of soil were removed from the pits and in 2005, an additional 1,052 cubic yards of soil were removed from the site. Groundwater monitoring has been conducted since 2004 (Matrix Environmental Services 2019) as part of Compliance Plan requirements. The constituents of concern monitored in groundwater include: 1,3,5-trinitroperhydro-1,3,5-triazine, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine, 1,3-dinitrobenzene, tetryl, 1,3,5-trinitrobenzene, nitrobenzene, 4-amino-2,6-dinitrotolunene, 2-amino-4,6-dinitrotolunene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 3-nitrotoluene (m-nitrotoluene), antimony, arsenic, barium, copper, lead, mercury, and zinc.

This AOPI is currently owned by the Army and will be transferred in the future.

6.11.2 SI Sampling and Results

Due to land redevelopment and historical remedial activities, soil samples were not collected. Five groundwater samples and one QC duplicate were collected from five existing monitoring wells (LSAAP-BG-22-GW-01, LSAAP-BG-23-GW-01, LSAAP-BG-25-GW-01, LSAAP-BG-9-GW-01, and LSAAP-EPS-2-GW-01). Groundwater samples were collected from existing monitoring wells located downgradient of the historical burn pits and hazardous waste storage areas. Sample locations are shown on Figure 6-18. The Target PFAS analytical results for groundwater samples collected are provided in Table 6-10 and Figure 6-19 and summarized below.

6.11.2.1 Groundwater

PFOS and PFOA were detected in groundwater samples collected at the HEBG AOPI as follows:

- PFOS was detected at an estimated (J flagged) concentration above the SL (4 ng/L) at LSAAP-EPS-2-GW-01 (36.9 J ng/L).
- PFOA was detected at an estimated concentration below the SL at LSAAP-EPS-2-GW-01.

PFBA, PFBS, PFNA, PFHxA, and PFHxS were not detected above the LOD at the AOPI.

6.11.3 CSM

The HEBG is approximately 92 acres in size. The area is owned by the Army. The ground surface elevation of the HEBG is approximately 340 feet amsl. Stormwater runoff from the area likely flows east, southeast. Storm water from the drainage swales of the burning pits eventually discharges into the intermittent tributary of the East Fork of Elliot Creek located approximately 1,000 feet from the burning pits.

The Wilcox Formation contains the shallow aquifer and the uppermost bearing unit at this AOPI. The clays and silty clay shales of the Midway Group underlie the Wilcox Formation. The Midway Group ranges between 15 and 40 feet bgs and is the primary aquitard beneath the HEBG and LSAAP in general. Shallow groundwater is encountered generally within 15 feet of the ground surface, and four of the monitoring wells sampled during the SI had water levels within 2.5 feet of the ground surface. The groundwater flow direction is to the south. Surface water and sediment are not present at the AOPI (Matrix Environmental Services 2019).

The installation obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary. Shallow groundwater at the HEBG is categorized as Class III. Class III groundwater is generally not considered suitable for consumption by humans (LSAAP 2010).

The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the HEBG. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. Soil samples were not collected at the HEBG due to land redevelopment and historical remedial activities. There are no current residents at LSAAP. Future residential development is not a reasonably anticipated future land use for a high explosives burning ground. However, all exposure pathways for future onsite residents are potentially complete because there are no PFAS-specific land use restrictions precluding groundwater use. If PFAS are present in soil, site workers may contact PFAS through incidental ingestion and dermal contact; therefore, the soil exposure pathway for site workers is potentially complete. As part of the Hazardous Waste Permit for the HEBG, 24-hour surveillance of the active portion of the site and 48-inch high, four-strand barbed wire fence control access to the site.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the HEBG is potentially complete for future site workers and residents. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for shallow groundwater discharge to nearby surface water drainage features upstream of Elliott Creek and Wright Patman Lake. Wright Patman Lake Reservoir is a source of potable water for LSAAP and surrounding communities. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for onsite workers and offsite drinking water users. Additionally, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-20 presents the CSM for the HEBG.

6.11.4 Recommendation

Human exposure pathways are potentially complete, and concentrations of Target PFAS in groundwater at the HEBG exceeded the SLs; therefore, further investigation is recommended.

Table 6-10. Target PFAS Analytical Results at the High Explosives Burning Ground

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	4	6	601	6	39
LSAAP-BG-22-GW-01	LSAAP-BG-22-GW-01-061623	PMW	3.4	06/16/2023	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
LSAAP-BG-23-GW-01	LSAAP-BG-23-GW-01-061623	PMW	17.65	06/16/2023	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
	LSAAP-FD-01-GW-061623	PMW	17.65	06/16/2023	3.9 UJ	3.9 UJ	3.9 UJ	3.9 UJ	3.9 UJ
LSAAP-BG-25-GW-01	LSAAP-BG-25-GW-01-061623	PMW	3.48	06/16/2023	4.2 UJ	4.2 UJ	4.2 UJ	4.2 UJ	4.2 UJ
LSAAP-BG-9-GW-01	LSAAP-BG-9-GW-01-061623	PMW	4.91	06/16/2023	3.9 UJ	3.9 UJ	3.9 UJ	3.9 UJ	3.9 UJ
LSAAP-EPS-2-GW-01	LSAAP-EPS-2-GW-01-061623	PMW	5.76	06/16/2023	**36.9 J**	**2.9 J**	3.9 UJ	3.9 UJ	3.9 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate the depth to water below the top of casing for the monitoring wells.
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
ng/L = nanogram per liter
PMW = permanent monitoring well
UJ = The analyte was not detected and is reported as less than the LOD. However, the associated numerical value is approximate.

6.12 WESTERN INACTIVE SANITARY LANDFILL (WISL) AOPI

6.12.1 AOPI Background

The WISL is identified as an AOPI following interviews and site reconnaissance due to a fire response that likely utilized AFFF. The WISL occupies approximately 26.96 acres in the northwestern portion of the former installation's boundary. The landfill was active from the mid-1940s until 1973 and was used for RRAD and LSAAP to dispose of nonhazardous waste such as paint filters, paint cans, thinners, oil absorbent, contaminated rags, and floor sweepings. The WISL was closed in accordance with a Corrective Measures Implementation Work Plan prepared in 1994 which provided for establishment of a 3-foot clay cap with 6 inches of topsoil mulched and seeded with grass. The cap and soil cover were graded to facilitate rain fall drainage and sustain vegetation. Currently the WISL has 100% vegetative cover consisting of mature pine trees (12-inch diameter), grasses and bushes. The WISL area is characterized by a topographic high area to the east of the landfill, with gentle slopes to the north, west, and south of this topographic high. An intermittent creek with small perennial pools is located less than 50 feet from the southern boundary of the landfill. The WISL is listed as SWMU-002 on the RCRA Permit. During the PA site visit interviews, the fire department reported a tire fire occurred sometime between 2008 and 2009. According to fire department personnel, it was likely AFFF was used in the fire response.

Historical constituents of concern at this AOPI are VOCs and metals in groundwater. The RFI was completed in 1998. The Phase II RFI was completed in 2001. A Compliance Plan application for LSAAP was submitted to TCEQ in 1997 and the Compliance Plan was first issued in 2001. In 2002, a Response Action Plan was submitted to TCEQ in which, monitored natural attenuation (MNA) was the selected remedy for groundwater under Remedy Standard B, and in 2003, a MNA Demonstration Report was submitted to demonstrate MNA's applicability for the WISL. Institutional controls and physical controls also exist for the site since waste has been left in place. The Compliance Plan was reissued in 2006 and 2021, and groundwater monitoring has been performed at the WISL in accordance with Compliance Plan requirements since the Compliance Plan was first issued. The constituents of concern monitored in groundwater include cis-1,2-dichloroethylene, trichloroethylene, vinyl chloride, and arsenic. In June 2023, the U.S. Army submitted a Class III permit modification application to TCEQ which updates the Compliance Plan to select a plume management zone as the new final corrective measure for the WISL.

This AOPI is no longer owned by the Army.

6.12.2 SI Sampling and Results

Soil samples were not collected due to the presence of a 3-foot clay cap with six inches of topsoil mulched and seeded with grass. Five groundwater samples were collected from five existing monitoring wells (LSAAP-10-R-GW-01, LSAAP-CC-17-GW-01, LSAAP-CC-20-GW-01, LSAAP-CC-26-GW-01, and LSAAP-CC-30-GW-01). Groundwater samples were collected from existing monitoring wells located downgradient and adjacent to the perimeter of the original landfill footprint. Sample locations are shown on Figure 6-21. The Target PFAS analytical results for groundwater samples collected are provided in Table 6-11 and Figure 6-22 and summarized below.

6.12.2.1 Groundwater

PFOS, PFOA, PFHxA, and PFHxS were detected only in the groundwater sample collected from LSAAP-CC-26-GW-01, which is the monitoring well at the downgradient landfill boundary. PFOS was detected at an estimated (J flagged) concentration of 13.3 J ng/L, above the SL (4 ng/L), and PFOA was detected at an estimated concentration of 51.3 J ng/L, above the SL (6 ng/L). PFHxA and PFHxS were detected at estimated concentrations below their respective SL.

PFBA, PFBS, and PFNA were not detected above the LOD at the AOPI.

6.12.3 CSM

The WISL is approximately 23 acres in size. The area was declared excess under BRAC 2005 and has been transferred to TAC. The ground surface elevation of the WISL is approximately 450 feet amsl. Stormwater runoff from the area likely flows radially outward from the topographic high area to the east of the landfill. The closest surface water body to the WISL an unnamed tributary to Caney Creek, which flows through the AOPI to the southwest.

Soil beneath the landfill consists of approximately 40 feet of sand, silty sand, and clayey sand, which form the base of the Wilcox Group, and the groundwater bearing unit beneath the WISL is Class II, which is considered a potential potable source. The Midway Group underlies the Wilcox Formation and serves as an aquitard. Monitoring well CC-18 is located on a topographic high near the east gate of WISL and is the monitoring well with the highest potentiometric surface elevation. Therefore, CC-18 is the background well for the unit. Groundwater flow radiates out from well CC-18 to the west, southwest and northwest. Shallow groundwater is approximately between 6-25 feet bgs at this AOPI, and generally flows to the northwest at the northern end of the landfill and to the south/southwest at the southern end of the landfill.

The primary release mechanism is the potential release of AFFF to soils related to historical operations at the WISL. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through infiltration, leaching, and percolation. Soil samples were not collected due to the presence of a 3-foot clay cap with six inches of topsoil mulched and seeded with grass. There are no current residents at LSAAP, and future residential development is not a reasonably anticipated future land use. However, all exposure pathways for future onsite residents are potentially complete because there are no PFAS-specific land use restrictions precluding groundwater use. The soil exposure pathway for onsite workers is incomplete, as direct contact with subsurface soil beneath the landfill cap is not expected. Physical controls for the WISL include a gated access road and landfill cover.

Target PFAS were detected in groundwater samples at the AOPI, however there are no potable water wells located at LSAAP and groundwater is not used for drinking water. The onsite groundwater exposure pathway (via drinking water ingestion and dermal contact) at the WISL is potentially complete for future site workers and residents. Groundwater originating from the AOPI could flow offsite and in the absence of Target PFAS specific LUCs preventing potable use of groundwater offsite, a potentially complete groundwater exposure pathway exists for offsite drinking water users.

There is also the potential for shallow groundwater discharge to nearby surface water drainage features, with an intermittent stream being present immediately south of the landfill footprint. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for onsite workers and offsite recreational users of downgradient/downstream surface water features.

Figure 6-23 presents the CSM for the WISL.

6.12.4 Recommendation

Human exposure pathways are potentially complete, and concentrations of Target PFAS in groundwater at the WISL exceeded the SLs; therefore, further investigation is recommended.

Table 6-11. Target PFAS Analytical Results at the Western Inactive Sanitary Landfill

Location ID	Sample ID / Duplicate ID	Sample Type	Depth (feet)	Sample Date	PFOS	PFOA	PFBS	PFNA	PFHxS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	4	6	601	6	39
LSAAP-10-R-GW-01	LSAAP-10-R-GW-01-062123	PMW	28.61	06/21/2023	4.5 UJ	4.5 UJ	4.5 UJ	4.5 UJ	4.5 UJ
LSAAP-CC-17-GW-01	LSAAP-CC-17-GW-01-062123	PMW	17.51	06/21/2023	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
LSAAP-CC-20-GW-01	LSAAP-CC-20-GW-01-062123	PMW	11.84	06/21/2023	4.3 UJ	4.3 UJ	4.3 UJ	4.3 UJ	4.3 UJ
LSAAP-CC-26-GW-01	LSAAP-CC-26-GW-01-062123	PMW	6.35	06/21/2023	**13.3 J**	**51.3 J**	20.0 UJ	4.0 UJ	**13.4 J**
LSAAP-CC-30-GW-01	LSAAP-CC-30-GW-01-062123	PMW	23.58	06/21/2023	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ

Notes:
1. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for residential scenarios (OSD. 2023. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. August).
2. Bolded values indicate the result was detected greater than the limit of detection
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2023).
4. Depths indicate the depth to water below the top of casing for the monitoring wells.
J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
ng/L = nanogram per liter
PMW = permanent monitoring well
UJ = The analyte was not detected and is reported as less than the LOD. However, the associated numerical value is approximate.

7. CONCLUSIONS AND RECOMMENDATIONS

A PFAS 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 (40 CFR 300.420(5)). The SI Report used the findings from the PA in conjunction with soil and groundwater sampling data for each AOPI to determine whether Target PFAS have been released to the environment and whether a release has affected or may affect specific human health targets.

Before the SI sampling, a preliminary CSM was developed in the PA for each AOPI based on an evaluation of existing records, personnel interviews, and site reconnaissance. The preliminary CSMs identified potential human receptors and exposure pathways for groundwater and surface water that is known to be used, or could realistically be used in the future, as a source of drinking water and identified potential soil and sediment exposure pathways. All AOPIs were sampled during the SI at LSAAP to further evaluate PFAS-related releases and identify the presence or absence of Target PFAS.

Target PFAS were detected at eight AOPIs. PFOS, PFOA, and/or PFNA concentrations exceeded SLs at seven of the AOPIs.

The CSMs were updated for each AOPI where Target PFAS were detected. The updated CSMs detailed site geological conditions; determined primary and secondary release mechanisms; identified potential human receptors; and detailed complete, potentially complete, and incomplete exposure pathways for current and reasonably anticipated future exposure scenarios. Table 7-1 summarizes the conclusions and recommendations for each AOPI.

The following table summarizes the results of the SI project and presents recommendations for further investigation at eight of the AOPIs and no further investigation at three AOPIs.

Groundwater could not be collected at the Central Storage Building, one of the AOPIs recommended for further investigation, due to the presence of utilities and infrastructure. However, Target PFAS were detected in groundwater at the Chrome Plating Machine Shop, located regionally downgradient. The AOPI has been recommended for further investigation so that PFAS impacts between these two AOPIs may be delineated.

Table 7-1. Summary of Target PFAS Detected and Recommendations

AOPI	Detection of Target PFAS?		Recommendation and Rationale
	Groundwater	Soil	
Former Fire Department Headquarters	Exceeds SL	Detected	SLs exceeded in groundwater; further investigation recommended
New Fire Department Headquarters	Exceeds SL	Detected	SLs exceeded in groundwater; further investigation recommended
Automotive Repair Facility	ND[1]	ND	SLs not exceeded; further investigation not recommended at this time
Chrome Plating Machine Shop	Exceeds SL	Detected	SLs exceeded in groundwater; further investigation recommended
Central Stores Building	NS[2]	ND	SLs not exceeded; further investigation recommended as a future phase of work at the Chrome Plating Machine Shop
Former West Fire Station	Exceeds SL	ND	SLs exceeded in groundwater; further investigation recommended
Railroad Fire Response Area	Exceeds SL	ND	SLs exceeded in groundwater; further investigation recommended
Former East Fire Station	Detected[1]	ND	SLs not exceeded; further investigation not recommended at this time
Natural Gas Leak Foam Response Area	NS	ND	SLs not exceeded; further investigation not recommended at this time
HEBG	Exceeds SL	NS	SLs exceeded in groundwater; further investigation recommended
WISL	Exceeds SL	NS	SLs exceeded in groundwater; further investigation recommended

Notes:
Highlighted cells are recommended for further investigation
ND = Non-Detect
NS = not sampled
PFAS = per- and polyfluoroalkyl substances
SL = Screening Level
Target PFAS = PFOA, PFOS, PFBS, PFNA, and/or PFHxS

[1] PFOS was not detected above the DL or LOD. The LOD is above the SL. Because the LOD for all other Target PFAS in soil and groundwater were below their respective SLs and none were detected above the LOD, it is unlikely that PFOS is present at concentrations above the SL at this AOPI.

[2] Groundwater could not be collected at this AOPI, but Target PFAS were detected above SLs at an AOPI located approximately 450 feet downgradient.

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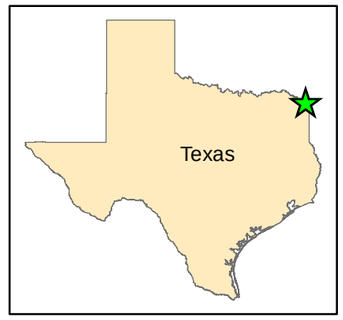
FIGURES

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 1-1
Installation Location

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary



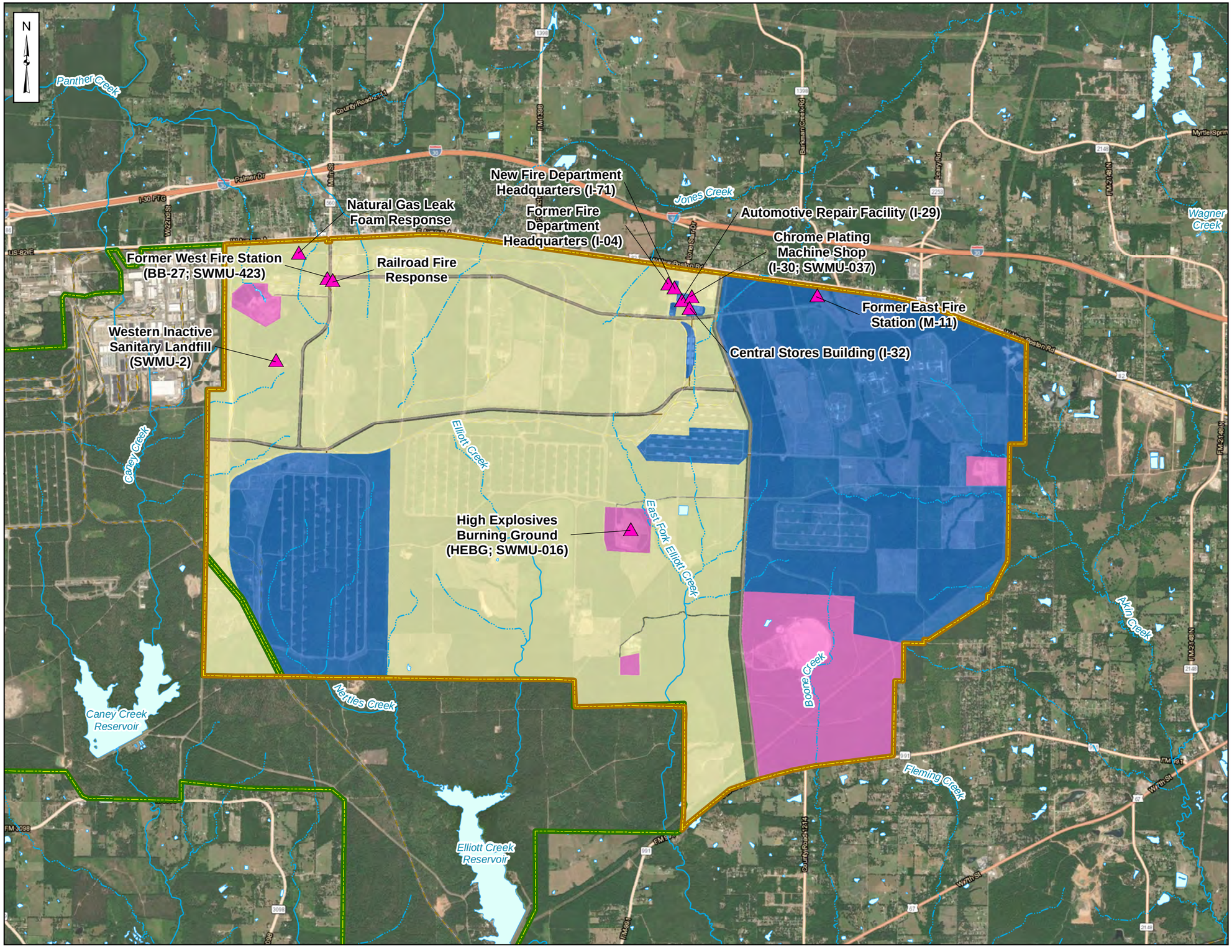
0 1 2
Miles

Data Sources: ESRI, ArcGIS Online, StreetMap Data

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 1-2
AOPI Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Access Easement
- Army-Retained
- Utility Easement
- Day & Zimmerman Lone Star LLC (DZLS)
- TexAmericas Center (TAC) Property
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body

AOPI = area of potential interest

0 0.5 1
Miles

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 2-1
Site Features

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Surface Water Drainage Divide (approximate)
- Elevation Contour (10 feet)

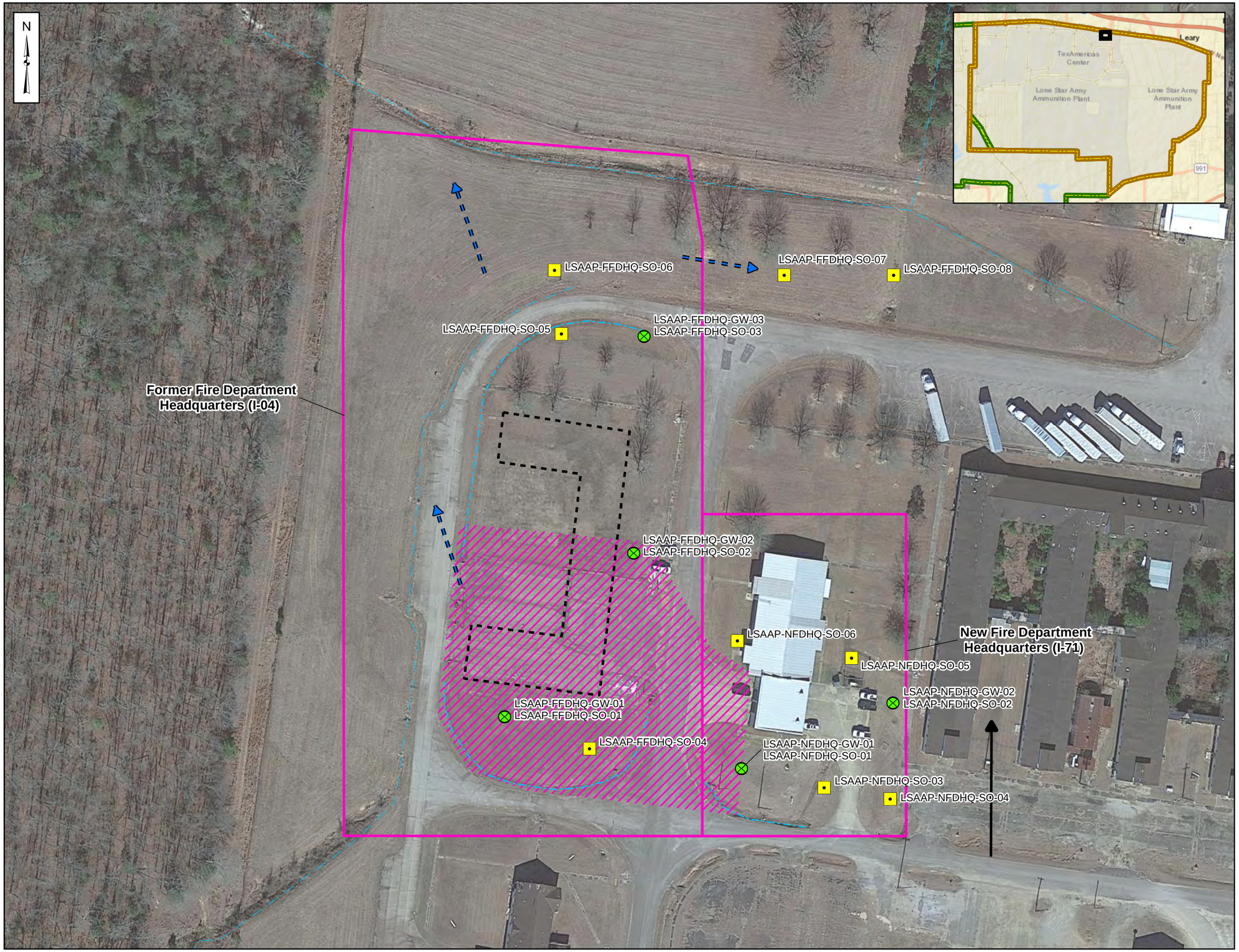
0 0.5 1
Miles

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-1
Former Fire Department Headquarters and New Fire Department Headquarters Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Estimated AFFF Use Area
- Former Building Footprint
- Swale/Ditch
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)

Sampling Locations

- Surface Soil (Hand Auger)
- Groundwater / Surface Soil (DPT)

AFFF = aqueous film-forming form
AOPI = area of potential interest
DPT = direct-push technhology

0 100 200
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-2
Former Fire Department Headquarters and New Fire Department Headquarters Sample Results

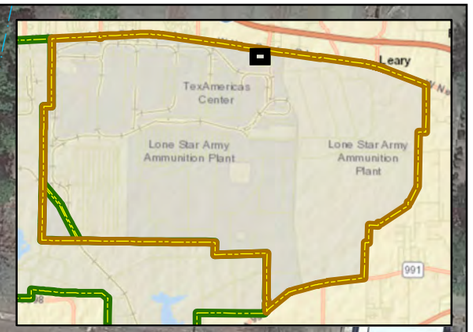
Chemical	Residential Scenario Risk Screening Level	
	Tap Water (ng/L)	Soil (mg/kg)
PFOS	4	0.013
PFOA	6	0.019
PFBS	600	1.9
PFNA	5.9	0.019
PFHxS	39	0.13
PFBA	1800	7.8
PFHxA	990	3.2

LSAAP-FFDHQ-SO-05	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00063 U
PFOA	0.00063 U
PFBS	0.00063 U
PFNA	0.00063 U
PFHxS	0.00063 U
PFBA	0.00063 U
PFHxA	0.00063 U

LSAAP-FFDHQ-SO-06	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00060 U
PFOA	0.00060 U
PFBS	0.00060 U
PFNA	0.00060 U
PFHxS	0.00060 U
PFBA	0.00060 U
PFHxA	0.00060 U

LSAAP-FFDHQ-SO-07	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00058 U
PFOA	0.00058 U
PFBS	0.00058 U
PFNA	0.00058 U
PFHxS	0.00058 U
PFBA	0.00058 U
PFHxA	0.00058 U

LSAAP-FFDHQ-SO-08	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00060 U
PFOA	0.00060 U
PFBS	0.00060 U
PFNA	0.00060 U
PFHxS	0.00060 U
PFBA	0.00060 U
PFHxA	0.00060 U



LSAAP-FFDHQ-GW-03	
Date	6/29/2023
PFOS	4.8 UJ
PFOA	**4.4 J**
PFBS	4.8 UJ
PFNA	4.8 UJ
PFHxS	4.8 UJ
PFBA	9.5 UJ
PFHxA	4.8 UJ

LSAAP-FFDHQ-SO-03	
Date	6/21/2023
Depth	0-2 ft bgs
PFOS	0.00063 U
PFOA	0.00063 U
PFBS	0.00063 U
PFNA	0.00063 U
PFHxS	0.00063 U
PFBA	0.00063 U
PFHxA	0.00063 U

LSAAP-FFDHQ-GW-01	
Date	6/22/2023
PFOS	4.5 UJ [4.5 UJ]
PFOA	**2720 J [2870 J]**
PFBS	4.5 UJ [4.5 UJ]
PFNA	4.5 UJ [4.5 UJ]
PFHxS	4.5 UJ [4.5 UJ]
PFBA	**73.5 J [76.8 J]**
PFHxA	**395 J [421 J]**

LSAAP-FFDHQ-SO-01	
Date	6/22/2023
Depth	0-2 ft bgs
PFOS	0.00067 U [0.00064 U]
PFOA	**0.0034 [0.0046]**
PFBS	0.00067 U [0.00064 U]
PFNA	0.00067 U [0.00064 U]
PFHxS	0.00067 U [0.00064 U]
PFBA	0.00067 U [0.00064 U]
PFHxA	**0.00043 J [0.00048 J]**

LSAAP-FFDHQ-GW-02	
Date	6/29/2023
PFOS	4.0 UJ
PFOA	**390 J**
PFBS	4.0 UJ
PFNA	4.0 UJ
PFHxS	**2.9 J**
PFBA	**11.3 J**
PFHxA	**29.8 J**

LSAAP-FFDHQ-SO-02	
Date	6/21/2023
Depth	0-2 ft bgs
PFOS	0.00061 U
PFOA	**0.0021**
PFBS	0.00061 U
PFNA	0.00061 U
PFHxS	0.00061 U
PFBA	**0.00055 J**
PFHxA	0.00061 U

Former Fire Department Headquarters (I-04)

LSAAP-NFDHQ-SO-06	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00060 U
PFOA	**0.00097 J**
PFBS	0.00060 U
PFNA	**0.00069 J**
PFHxS	0.00060 U
PFBA	**0.00063 J**
PFHxA	**0.00036 J**

LSAAP-NFDHQ-SO-05	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	**0.00046 J [0.0017 J]**
PFOA	**0.00060 U [0.00063 J]**
PFBS	0.00060 U [0.00068 U]
PFNA	**0.00078 J [0.00039 J]**
PFHxS	0.00060 U [0.00068 U]
PFBA	**0.00060 U [0.00070 J]**
PFHxA	**0.00060 U [0.00059 J]**

LSAAP-NFDHQ-GW-02	
Date	6/18/2023
PFOS	**9.1 [16.5 J]**
PFOA	**4.8 J [6.9 J]**
PFBS	**24.1 J [26.9 J]**
PFNA	4.5 UJ **[2.4 J]**
PFHxS	**15.7 J [19.9 J]**
PFBA	**16.1 J [21.5 J]**
PFHxA	**79.5 J [90.3 J]**

LSAAP-NFDHQ-SO-02	
Date	6/18/2023
Depth	0-2 ft bgs
PFOS	**0.0016**
PFOA	**0.0021**
PFBS	0.00058 U
PFNA	**0.00041 J**
PFHxS	**0.00054 J**
PFBA	**0.00057 J**
PFHxA	**0.00081 J**

New Fire Department Headquarters (I-71)

LSAAP-NFDHQ-GW-01	
Date	6/22/2023
PFOS	**2.7 J**
PFOA	**32.5 J**
PFBS	4.5 UJ
PFNA	**29.0 J**
PFHxS	4.5 UJ
PFBA	**19.8 J**
PFHxA	**31.9 J**

LSAAP-NFDHQ-SO-01	
Date	6/19/2023
Depth	0-2 ft bgs
PFOS	0.00065 U
PFOA	**0.0030**
PFBS	0.00065 U
PFNA	**0.0062**
PFHxS	0.00065 U
PFBA	**0.00089 J**
PFHxA	**0.0011 J**

LSAAP-FFDHQ-SO-04	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00063 U
PFOA	**0.00098 J**
PFBS	0.00063 U
PFNA	0.00063 U
PFHxS	0.00063 U
PFBA	0.00063 U
PFHxA	0.00063 U

LSAAP-NFDHQ-SO-03	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	**0.00040 J**
PFOA	**0.0013 J**
PFBS	0.00076 U
PFNA	**0.0011 J**
PFHxS	0.00076 U
PFBA	0.00076 U
PFHxA	**0.00067 J**

LSAAP-NFDHQ-SO-04	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00066 UJ
PFOA	**0.00083 J**
PFBS	0.00066 U
PFNA	0.00066 UJ
PFHxS	0.00066 U
PFBA	**0.0025 J**
PFHxA	**0.0024 J**

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. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.
5. Results that meet or exceed Office of the Secretary of Defense (OSD) residential scenario risk screening levels (OSD 2023) are highlighted gray.

J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
U = The analyte was not detected and is reported as less than the limit of detection (LOD). The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or limit of quantitation (LOQ). However, the associated numerical value is approximate.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Estimated AFFF Use Area
- Former Building Footprint
- Swale/Ditch
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)

Sampling Locations

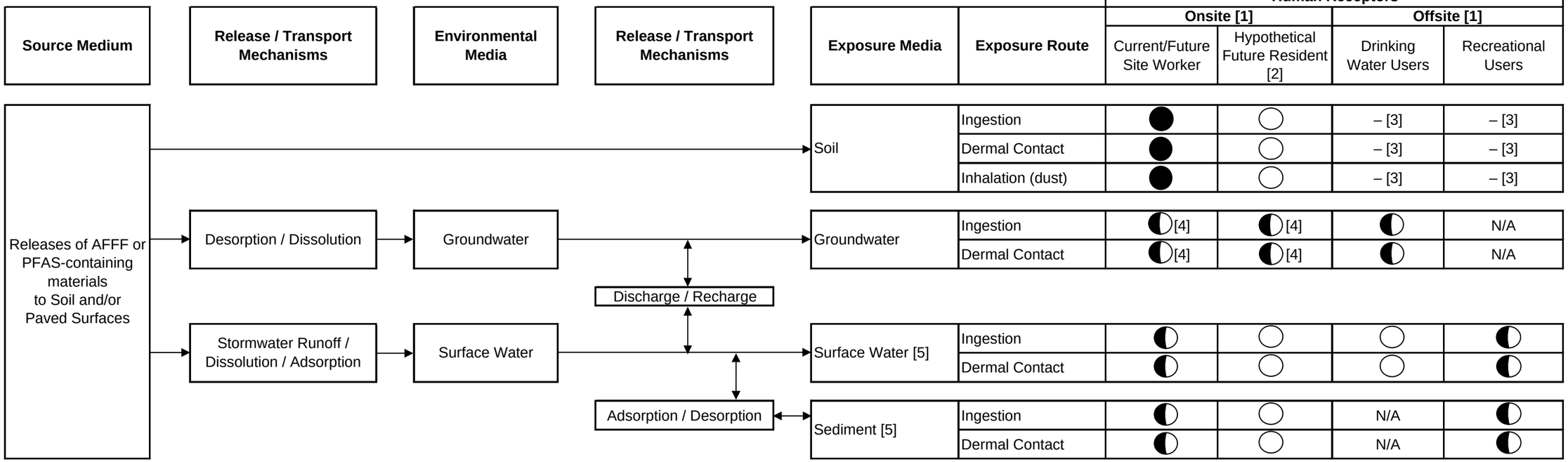
- Surface Soil (Hand Auger)
- Groundwater / Surface Soil (DPT)

AFFF = aqueous film-forming form
AOPI = area of potential interest
DPT = direct-push technhology
AOPI = area of potential interest
DPT = direct-push technhology
ft bgs = feet below ground surface
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 100 200
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Exposure Media	Exposure Route	Human Receptors: Onsite [1] – Current/Future Site Worker	Onsite [1] – Hypothetical Future Resident [2]	Offsite [1] – Drinking Water Users	Offsite [1] – Recreational Users
Soil	Ingestion	●	○	– [3]	– [3]
	Dermal Contact	●	○	– [3]	– [3]
	Inhalation (dust)	●	○	– [3]	– [3]
Groundwater	Ingestion	◐ [4]	◐ [4]	◐	N/A
	Dermal Contact	◐ [4]	◐ [4]	◐	N/A
Surface Water [5]	Ingestion	◐	○	○	◐
	Dermal Contact	◐	○	○	◐
Sediment [5]	Ingestion	◐	○	N/A	◐
	Dermal Contact	◐	○	N/A	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

PFAS = per- and polyfluoroalkyl substances

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

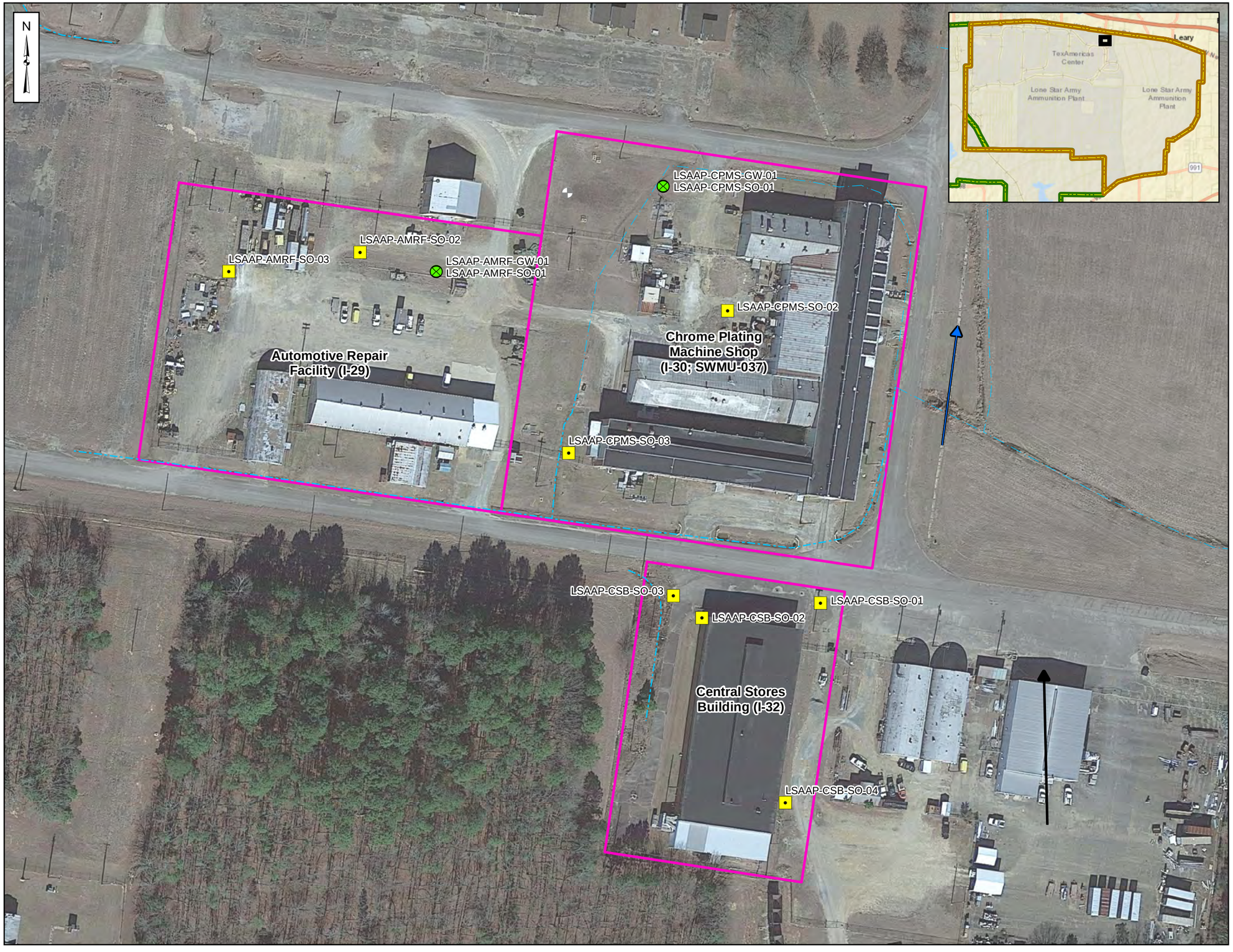
[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Former Fire Department Headquarters and New Fire Department Headquarters
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-3

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-4
Automotive Repair Facility, Chrome Plating Machine Shop, and Central Stores Building Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Swale/Ditch
- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)
- Inactive Monitoring Well

Sampling Locations

- Surface Soil (Hand Auger)
- Groundwater / Surface Soil (DPT)

AOPI = area of potential interest
DPT = direct-push technhology

0 50 100
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Investigation
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-5
Automotive Repair Facility, Chrome Plating Machine Shop, and Central Stores Building Sample Results

Chemical	Residential Scenario Risk Screening Level	
	Tap Water (ng/L)	Soil (mg/kg)
PFOS	4	0.013
PFOA	6	0.019
PFBS	600	1.9
PFNA	5.9	0.019
PFHxS	39	0.13
PFBA	1800	7.8
PFHxA	990	3.2

LSAAP-AMRF-SO-02	
Date	6/20/2023
Depth	0-2 ft bgs
PFOS	0.00059 U
PFOA	0.00059 U
PFBS	0.00059 U
PFNA	0.00059 U
PFHxS	0.00059 U
PFBA	0.00059 U
PFHxA	0.00059 U

LSAAP-AMRF-SO-03	
Date	6/20/2023
Depth	0-2 ft bgs
PFOS	0.00059 U
PFOA	0.00059 U
PFBS	0.00059 U
PFNA	0.00059 U
PFHxS	0.00059 U
PFBA	0.00059 U
PFHxA	0.00059 U

LSAAP-AMRF-GW-01	
Date	6/29/2023
PFOS	4.3 UJ [4.2 UJ]
PFOA	4.3 UJ [4.2 UJ]
PFBS	4.3 UJ [4.2 UJ]
PFNA	4.3 UJ [4.2 UJ]
PFHxS	4.3 UJ [4.2 UJ]
PFBA	8.7 UJ [8.3 UJ]
PFHxA	4.3 UJ [4.2 UJ]

LSAAP-AMRF-SO-01	
Date	6/20/2023
Depth	0-2 ft bgs
PFOS	0.00062 U
PFOA	0.00062 U
PFBS	0.00062 U
PFNA	0.00062 U
PFHxS	0.00062 U
PFBA	0.00062 U
PFHxA	0.00062 U

LSAAP-CPMS-GW-01	
Date	6/28/2023
PFOS	**3.1 J**
PFOA	**14.4 J**
PFBS	**5.6 J**
PFNA	5.3 UJ
PFHxS	5.3 UJ
PFBA	**18.5 J**
PFHxA	5.3 UJ

LSAAP-CPMS-SO-01	
Date	6/28/2023
Depth	0-2 ft bgs
PFOS	**0.00050 J**
PFOA	0.00064 U
PFBS	0.00064 U
PFNA	0.00064 U
PFHxS	0.00064 U
PFBA	0.00064 U
PFHxA	0.00064 U

LSAAP-CPMS-SO-02	
Date	6/20/2023
Depth	0-2 ft bgs
PFOS	0.00066 U
PFOA	0.00066 U
PFBS	0.00066 U
PFNA	0.00066 U
PFHxS	0.00066 U
PFBA	0.00066 U
PFHxA	0.00066 U

LSAAP-CPMS-SO-03	
Date	6/20/2023
Depth	0-2 ft bgs
PFOS	0.00074 U
PFOA	0.00074 U
PFBS	0.00074 U
PFNA	0.00074 U
PFHxS	0.00074 U
PFBA	0.00074 U
PFHxA	0.00074 U

LSAAP-CSB-SO-03	
Date	6/22/2023
Depth	0-2 ft bgs
PFOS	0.00065 U
PFOA	0.00065 U
PFBS	0.00065 U
PFNA	0.00065 U
PFHxS	0.00065 U
PFBA	0.00065 U
PFHxA	0.00065 U

LSAAP-CSB-SO-01	
Date	6/29/2023
Depth	0-2 ft bgs
PFOS	0.00058 U
PFOA	0.00058 U
PFBS	0.00058 U
PFNA	0.00058 U
PFHxS	0.00058 U
PFBA	0.00058 U
PFHxA	0.00058 U

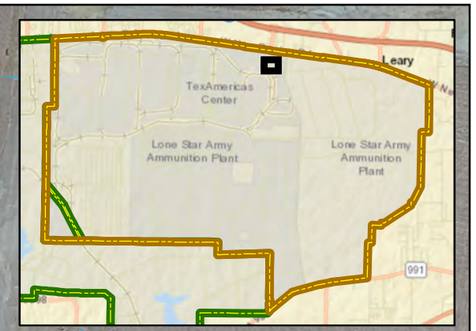
LSAAP-CSB-SO-02	
Date	6/22/2023
Depth	0-2 ft bgs
PFOS	0.00065 U [0.00064 U]
PFOA	0.00065 U [0.00064 U]
PFBS	0.00065 U [0.00064 U]
PFNA	0.00065 U [0.00064 U]
PFHxS	0.00065 U [0.00064 U]
PFBA	0.00065 U [0.00064 U]
PFHxA	0.00065 U [0.00064 U]

LSAAP-CSB-SO-04	
Date	6/22/2023
Depth	0-2 ft bgs
PFOS	0.00057 U
PFOA	0.00057 U
PFBS	0.00057 U
PFNA	0.00057 U
PFHxS	0.00057 U
PFBA	0.00057 U
PFHxA	0.00057 U

Automotive Repair Facility (I-29)

Chrome Plating Machine Shop (I-30; SWMU-037)

Central Stores Building (I-32)



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. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.
5. Results that meet or exceed Office of the Secretary of Defense (OSD) residential scenario risk screening levels (OSD 2023) are highlighted gray.

J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
U = The analyte was not detected and is reported as less than the limit of detection (LOD). The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or limit of quantitation (LOQ). However, the associated numerical value is approximate.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Swale/Ditch
- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)
- Inactive Monitoring Well

Sampling Locations

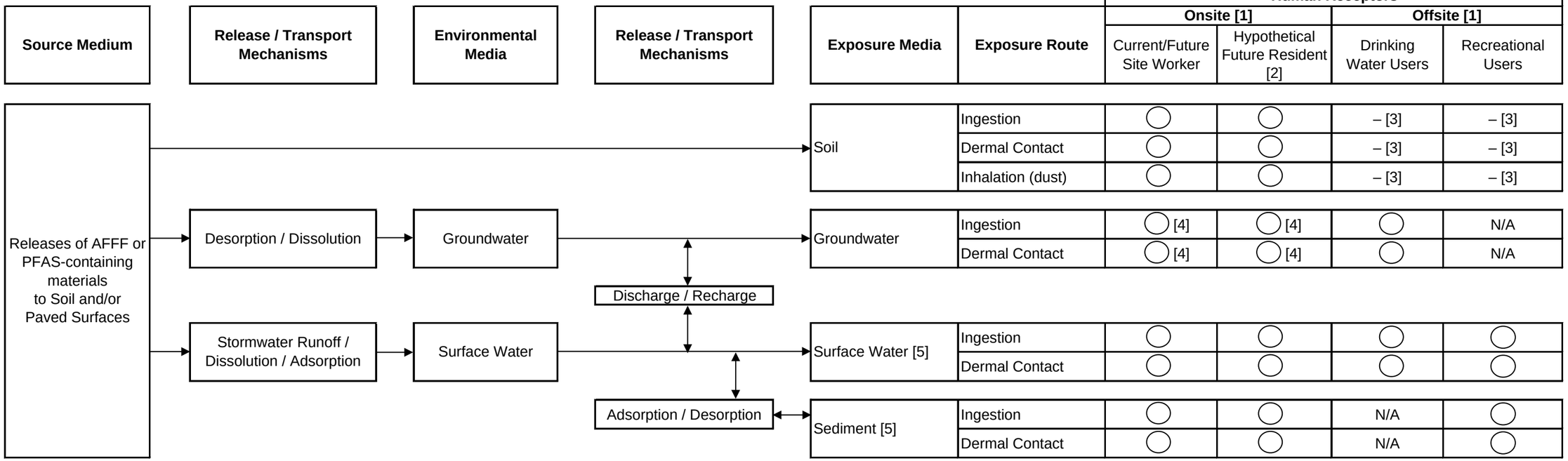
- Surface Soil (Hand Auger)
- Groundwater / Surface Soil (DPT)

AOPI = area of potential interest
DPT = direct-push technhology
ft bgs = feet below ground surface
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 50 100
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Exposure Media	Exposure Route	Human Receptors: Onsite [1] Current/Future Site Worker	Onsite [1] Hypothetical Future Resident [2]	Offsite [1] Drinking Water Users	Offsite [1] Recreational Users
Soil	Ingestion	◯	◯	– [3]	– [3]
	Dermal Contact	◯	◯	– [3]	– [3]
	Inhalation (dust)	◯	◯	– [3]	– [3]
Groundwater	Ingestion	◯ [4]	◯ [4]	◯	N/A
	Dermal Contact	◯ [4]	◯ [4]	◯	N/A
Surface Water [5]	Ingestion	◯	◯	◯	◯
	Dermal Contact	◯	◯	◯	◯
Sediment [5]	Ingestion	◯	◯	N/A	◯
	Dermal Contact	◯	◯	N/A	◯

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

PFAS = per- and polyfluoroalkyl substances

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

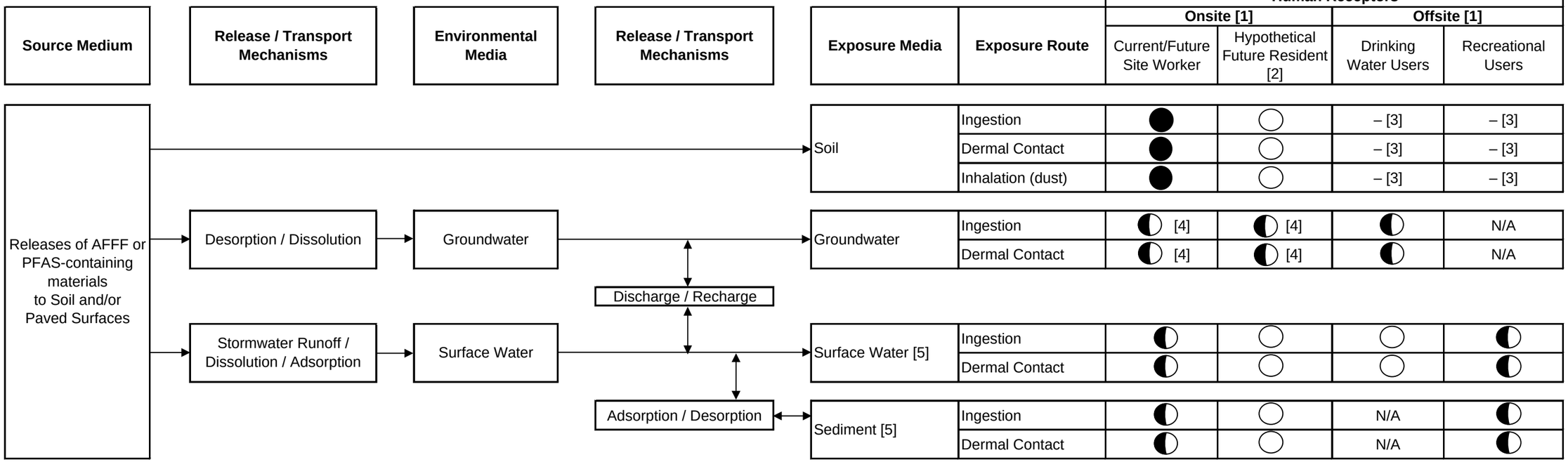
[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Automotive Repair Facility
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-6



Exposure Media	Exposure Route	Human Receptors: Onsite [1] – Current/Future Site Worker	Onsite [1] – Hypothetical Future Resident [2]	Offsite [1] – Drinking Water Users	Offsite [1] – Recreational Users
Soil	Ingestion	●	○	– [3]	– [3]
	Dermal Contact	●	○	– [3]	– [3]
	Inhalation (dust)	●	○	– [3]	– [3]
Groundwater	Ingestion	◐ [4]	◐ [4]	◐	N/A
	Dermal Contact	◐ [4]	◐ [4]	◐	N/A
Surface Water [5]	Ingestion	◐	○	○	◐
	Dermal Contact	◐	○	○	◐
Sediment [5]	Ingestion	◐	○	N/A	◐
	Dermal Contact	◐	○	N/A	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

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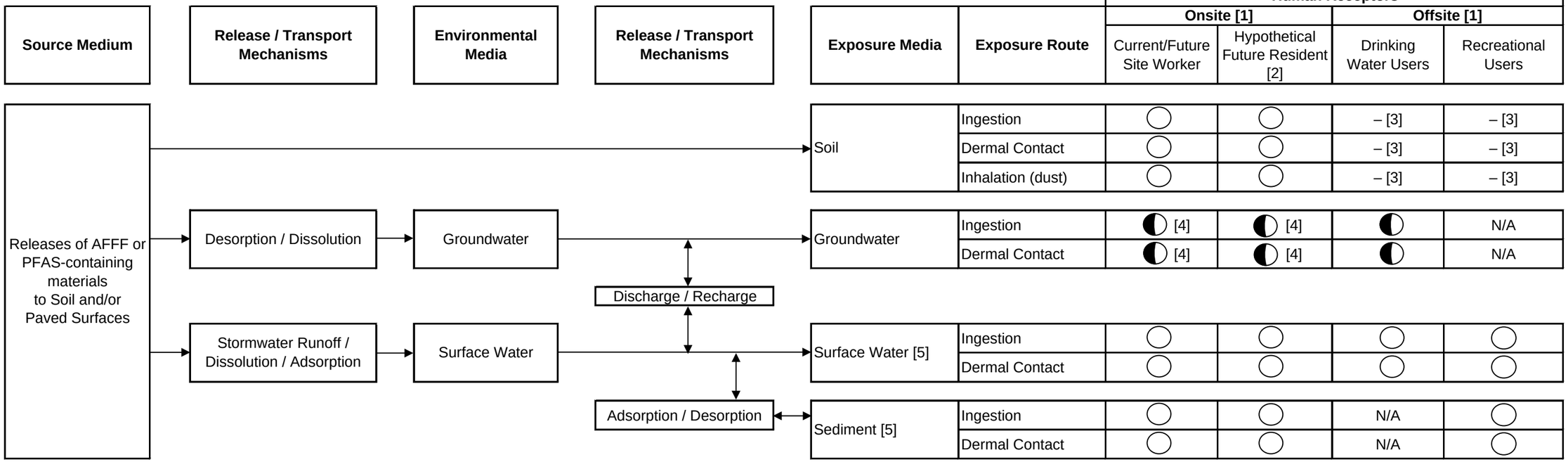
[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Chrome Plating Machine Shop
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-7



Exposure Media	Exposure Route	Human Receptors: Onsite [1] – Current/Future Site Worker	Onsite [1] – Hypothetical Future Resident [2]	Offsite [1] – Drinking Water Users	Offsite [1] – Recreational Users
Soil	Ingestion	○	○	– [3]	– [3]
	Dermal Contact	○	○	– [3]	– [3]
	Inhalation (dust)	○	○	– [3]	– [3]
Groundwater	Ingestion	◐ [4]	◐ [4]	◐	N/A
	Dermal Contact	◐ [4]	◐ [4]	◐	N/A
Surface Water [5]	Ingestion	○	○	○	○
	Dermal Contact	○	○	○	○
Sediment [5]	Ingestion	○	○	N/A	○
	Dermal Contact	○	○	N/A	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

PFAS = per- and polyfluoroalkyl substances

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

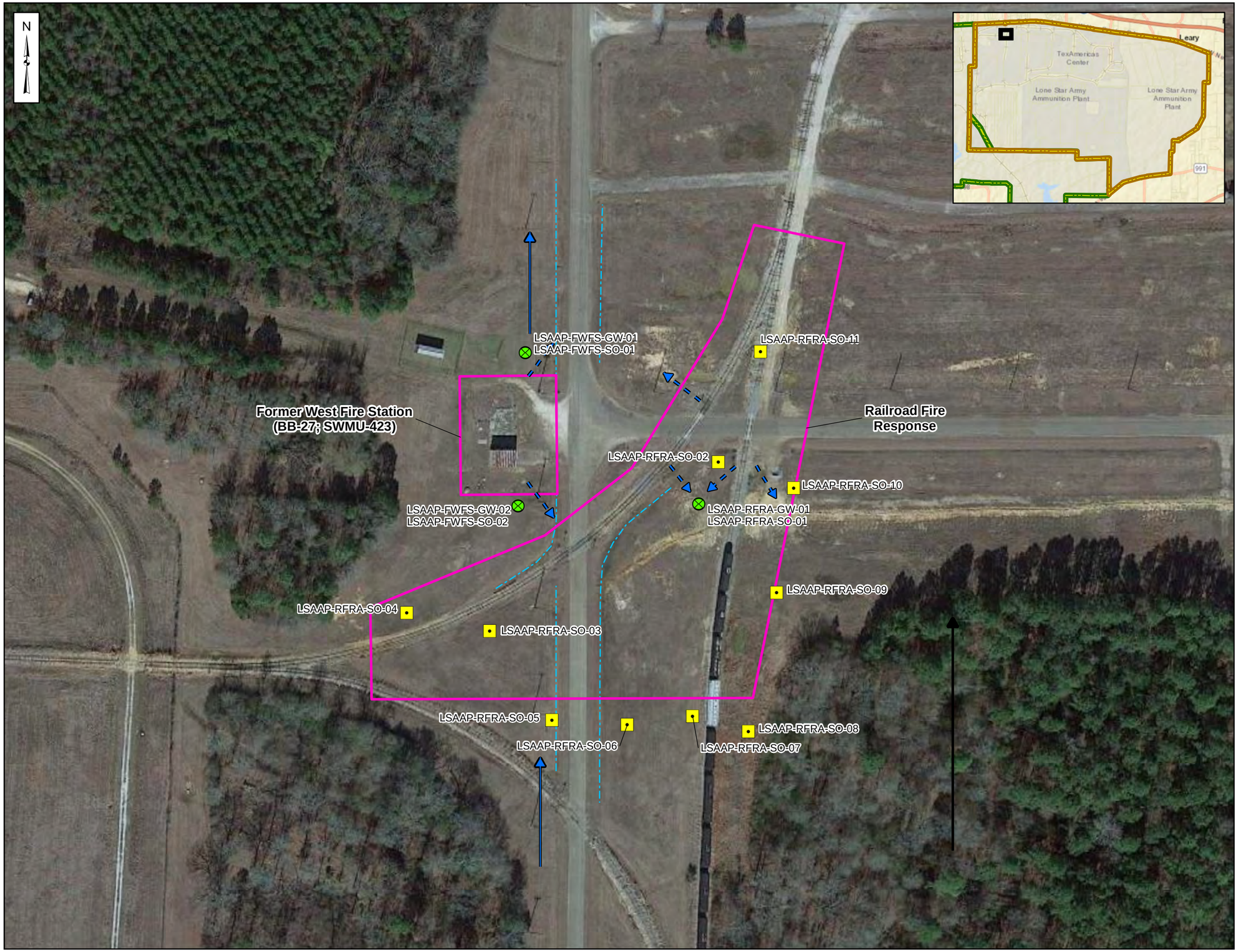
[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Central Stores Building
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-8

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-9
Former West Fire Station and Railroad Fire Response Area Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Swale/Ditch
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)

Sampling Locations

- Surface Soil (Hand Auger)
- Groundwater / Surface Soil (DPT)

AOPI = area of potential interest
DPT = direct-push technhology

0 100 200
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-10
Former West Fire Station and Railroad Fire Response Area Sample Results

Chemical	Residential Scenario Risk Screening Level	
	Tap Water (ng/L)	Soil (mg/kg)
PFOS	4	0.013
PFOA	6	0.019
PFBS	600	1.9
PFNA	5.9	0.019
PFHxS	39	0.13
PFBA	1800	7.8
PFHxA	990	3.2

LSAAP-FWFS-GW-01	
Date	6/17/2023
PFOS	4.5 UJ
PFOA	**11.6 J**
PFBS	**2.9 J**
PFNA	4.5 UJ
PFHxS	4.5 UJ
PFBA	**5.0 J**
PFHxA	**9.1 J**

LSAAP-FWFS-SO-01	
Date	6/17/2023
Depth	0-2 ft bgs
PFOS	0.00055 U
PFOA	0.00055 U
PFBS	0.00055 U
PFNA	0.00055 U
PFHxS	0.00055 U
PFBA	0.00055 U
PFHxA	0.00055 U

LSAAP-FWFS-GW-02	
Date	6/17/2023
PFOS	**25.0 J**
PFOA	**44.0 J**
PFBS	**6.7 J**
PFNA	**4.1 J**
PFHxS	6.9 UJ
PFBA	**64.1 J**
PFHxA	**17.7 J**

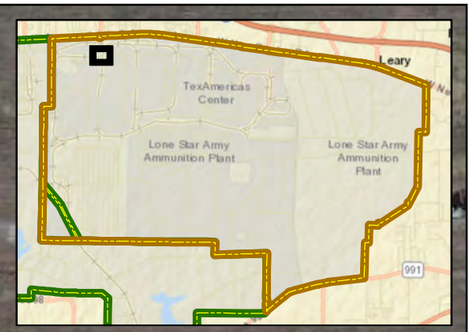
LSAAP-FWFS-SO-02	
Date	6/16/2023
Depth	0-2 ft bgs
PFOS	0.00061 U
PFOA	0.00061 U
PFBS	0.00061 U
PFNA	0.00061 U
PFHxS	0.00061 U
PFBA	0.00061 U
PFHxA	0.00061 U

LSAAP-RFRA-SO-04	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00056 U
PFOA	0.00056 U
PFBS	0.00056 U
PFNA	0.00056 U
PFHxS	0.00056 U
PFBA	0.00056 U
PFHxA	0.00056 U

LSAAP-RFRA-SO-03	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00058 U
PFOA	0.00058 U
PFBS	0.00058 U
PFNA	0.00058 U
PFHxS	0.00058 U
PFBA	0.00058 U
PFHxA	0.00058 U

LSAAP-RFRA-SO-02	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00054 U
PFOA	0.00054 U
PFBS	0.00054 U
PFNA	0.00054 U
PFHxS	0.00054 U
PFBA	0.00054 U
PFHxA	0.00054 U

LSAAP-RFRA-SO-11	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00054 U
PFOA	0.00054 U
PFBS	0.00054 U
PFNA	0.00054 U
PFHxS	0.00054 U
PFBA	0.00054 U
PFHxA	0.00054 U



Railroad Fire Response

LSAAP-RFRA-SO-10	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00053 U
PFOA	0.00053 U
PFBS	0.00053 U
PFNA	0.00053 U
PFHxS	0.00053 U
PFBA	0.00053 U
PFHxA	0.00053 U

LSAAP-RFRA-GW-01	
Date	6/16/2023
PFOS	20 UJ
PFOA	**15.1 J**
PFBS	20 UJ
PFNA	20 UJ
PFHxS	20 UJ
PFBA	40 UJ
PFHxA	20 UJ

LSAAP-RFRA-SO-01	
Date	6/16/2023
Depth	0-2 ft bgs
PFOS	0.00055 U
PFOA	0.00055 U
PFBS	0.00055 U
PFNA	0.00055 U
PFHxS	0.00055 U
PFBA	0.00055 U
PFHxA	0.00055 U

LSAAP-RFRA-SO-09	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00055 U
PFOA	0.00055 U
PFBS	0.00055 U
PFNA	0.00055 U
PFHxS	0.00055 U
PFBA	0.00055 U
PFHxA	0.00055 U

LSAAP-RFRA-SO-08	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00056 U
PFOA	0.00056 U
PFBS	0.00056 U
PFNA	0.00056 U
PFHxS	0.00056 U
PFBA	0.00056 U
PFHxA	0.00056 U

LSAAP-RFRA-SO-07	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00058 U
PFOA	0.00058 U
PFBS	0.00058 U
PFNA	0.00058 U
PFHxS	0.00058 U
PFBA	0.00058 U
PFHxA	0.00058 U

LSAAP-RFRA-SO-05	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00058 U [0.00057 U]
PFOA	0.00058 U [0.00057 U]
PFBS	0.00058 U [0.00057 U]
PFNA	0.00058 U [0.00057 U]
PFHxS	0.00058 U [0.00057 U]
PFBA	0.00058 U [0.00057 U]
PFHxA	0.00058 U [0.00057 U]

LSAAP-RFRA-SO-06	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00058 U
PFOA	0.00058 U
PFBS	0.00058 U
PFNA	0.00058 U
PFHxS	0.00058 U
PFBA	0.00058 U
PFHxA	0.00058 U

Former West Fire Station (BB-27; SWMU-423)

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. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.
5. Results that meet or exceed Office of the Secretary of Defense (OSD) residential scenario risk screening levels (OSD 2023) are highlighted gray.

J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
U = The analyte was not detected and is reported as less than the limit of detection (LOD). The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or limit of quantitation (LOQ). However, the associated numerical value is approximate.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Swale/Ditch
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)

Sampling Locations

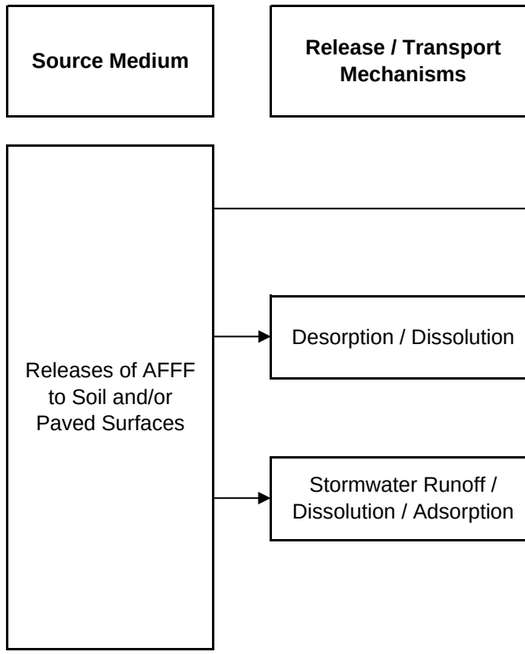
- Surface Soil (Hand Auger)
- Groundwater / Surface Soil (DPT)

AOPI = area of potential interest
DPT = direct-push technhology
ft bgs = feet below ground surface
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 100 200
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: Onsite [1] Current/Future Site Worker	Onsite [1] Hypothetical Future Resident [2]	Offsite [1] Drinking Water Users	Offsite [1] Recreational Users
Releases of AFFF to Soil and/or Paved Surfaces				Soil	Ingestion	○	○	– [3]	– [3]
					Dermal Contact	○	○	– [3]	– [3]
					Inhalation (dust)	○	○	– [3]	– [3]
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐ [4]	◐ [4]	◐	N/A
					Dermal Contact	◐ [4]	◐ [4]	◐	N/A
	Stormwater Runoff / Dissolution / Adsorption	Surface Water		Surface Water [5]	Ingestion	◐	○	○	◐
					Dermal Contact	◐	○	○	◐
				Sediment [5]	Ingestion	◐	○	N/A	◐
					Dermal Contact	◐	○	N/A	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

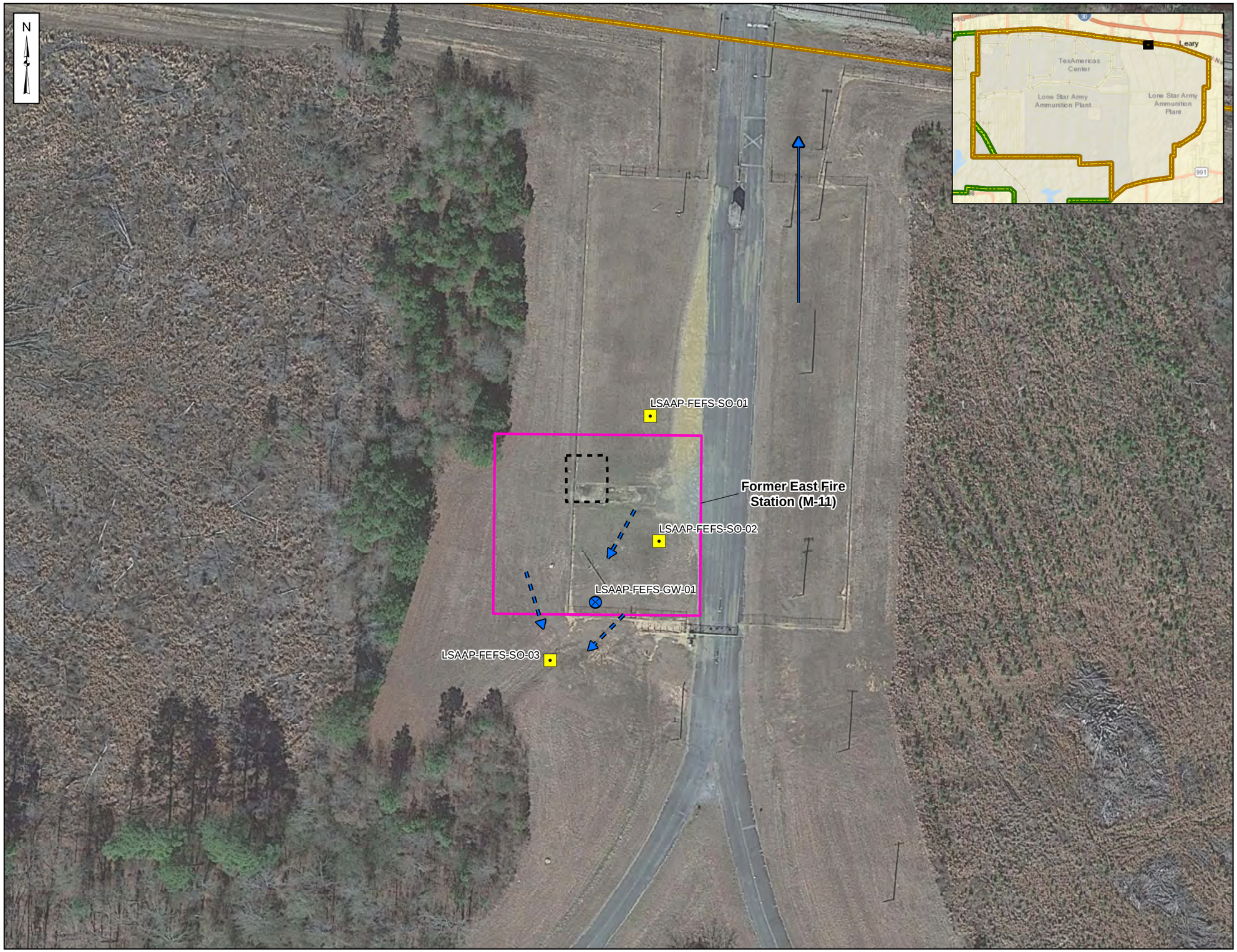
[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Former West Fire Station and Railroad Fire Response Area
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-11

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-12
Former East Fire Station
Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Former Building Footprint
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction

Sampling Locations

- Surface Soil (Hand Auger)
- Groundwater (DPT)

AOPI = area of potential interest
DPT = direct-push technhology

0 50 100
Feet

Data Sources: Google Earth, Aerial Imagery

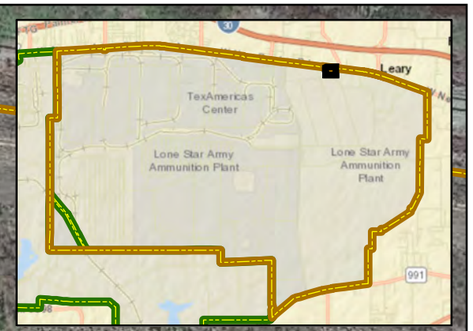
Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-13
Former East Fire Station
Sample Results

N

Chemical	Residential Scenario Risk Screening Level	
	Tap Water (ng/L)	Soil (mg/kg)
PFOS	4	0.013
PFOA	6	0.019
PFBS	600	1.9
PFNA	5.9	0.019
PFHxS	39	0.13
PFBA	1800	7.8
PFHxA	990	3.2



LSAAP-FEFS-SO-01	
Date	6/19/2023
Depth	0-2 ft bgs
PFOS	0.00060 U
PFOA	0.00060 U
PFBS	0.00060 U
PFNA	0.00060 U
PFHxS	0.00060 U
PFBA	0.00060 U
PFHxA	0.00060 U

Former East Fire Station (M-11)

LSAAP-FEFS-SO-02	
Date	6/19/2023
Depth	0-2 ft bgs
PFOS	0.00061 U
PFOA	0.00061 U
PFBS	0.00061 U
PFNA	0.00061 U
PFHxS	0.00061 U
PFBA	0.00061 U
PFHxA	0.00061 U

LSAAP-FEFS-SO-03	
Date	6/19/2023
Depth	0-2 ft bgs
PFOS	0.00063 U
PFOA	0.00063 U
PFBS	0.00063 U
PFNA	0.00063 U
PFHxS	0.00063 U
PFBA	0.00063 U
PFHxA	0.00063 U

LSAAP-FEFS-GW-01	
Date	6/29/2023
PFOS	5.0 UJ
PFOA	**5.4 J**
PFBS	5.0 UJ
PFNA	5.0 UJ
PFHxS	5.0 UJ
PFBA	**6.7 J**
PFHxA	5.0 UJ

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.

J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
U = The analyte was not detected and is reported as less than the limit of detection (LOD). The LOD has been adjusted for dilution.
UJ = The analyte was not detected and is reported as less than the LOD or limit of quantitation (LOQ). However, the associated numerical value is approximate.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Former Building Footprint
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction

Sampling Locations

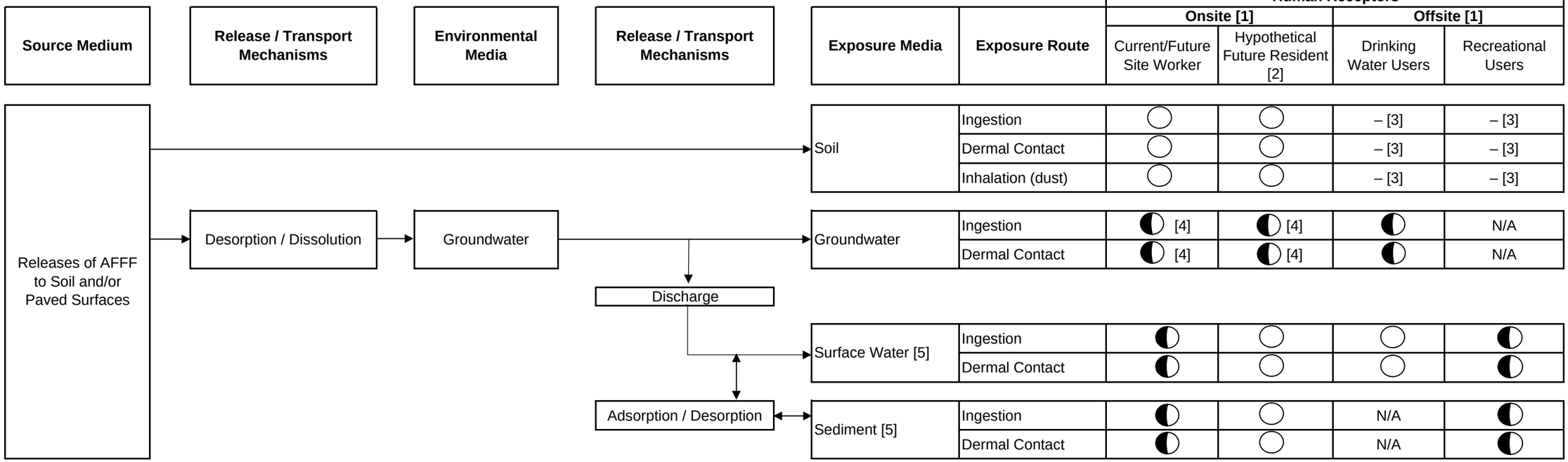
- Surface Soil (Hand Auger)
- Groundwater (DPT)

AOPI = area of potential interest
DPT = direct-push technhology
ft bgs = feet below ground surface
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 50 100
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Exposure Media	Exposure Route	Human Receptors: Onsite [1] – Current/Future Site Worker	Onsite [1] – Hypothetical Future Resident [2]	Offsite [1] – Drinking Water Users	Offsite [1] – Recreational Users
Soil	Ingestion	○	○	– [3]	– [3]
	Dermal Contact	○	○	– [3]	– [3]
	Inhalation (dust)	○	○	– [3]	– [3]
Groundwater	Ingestion	◐ [4]	◐ [4]	◐	N/A
	Dermal Contact	◐ [4]	◐ [4]	◐	N/A
Surface Water [5]	Ingestion	◐	○	○	◐
	Dermal Contact	◐	○	○	◐
Sediment [5]	Ingestion	◐	○	N/A	◐
	Dermal Contact	◐	○	N/A	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

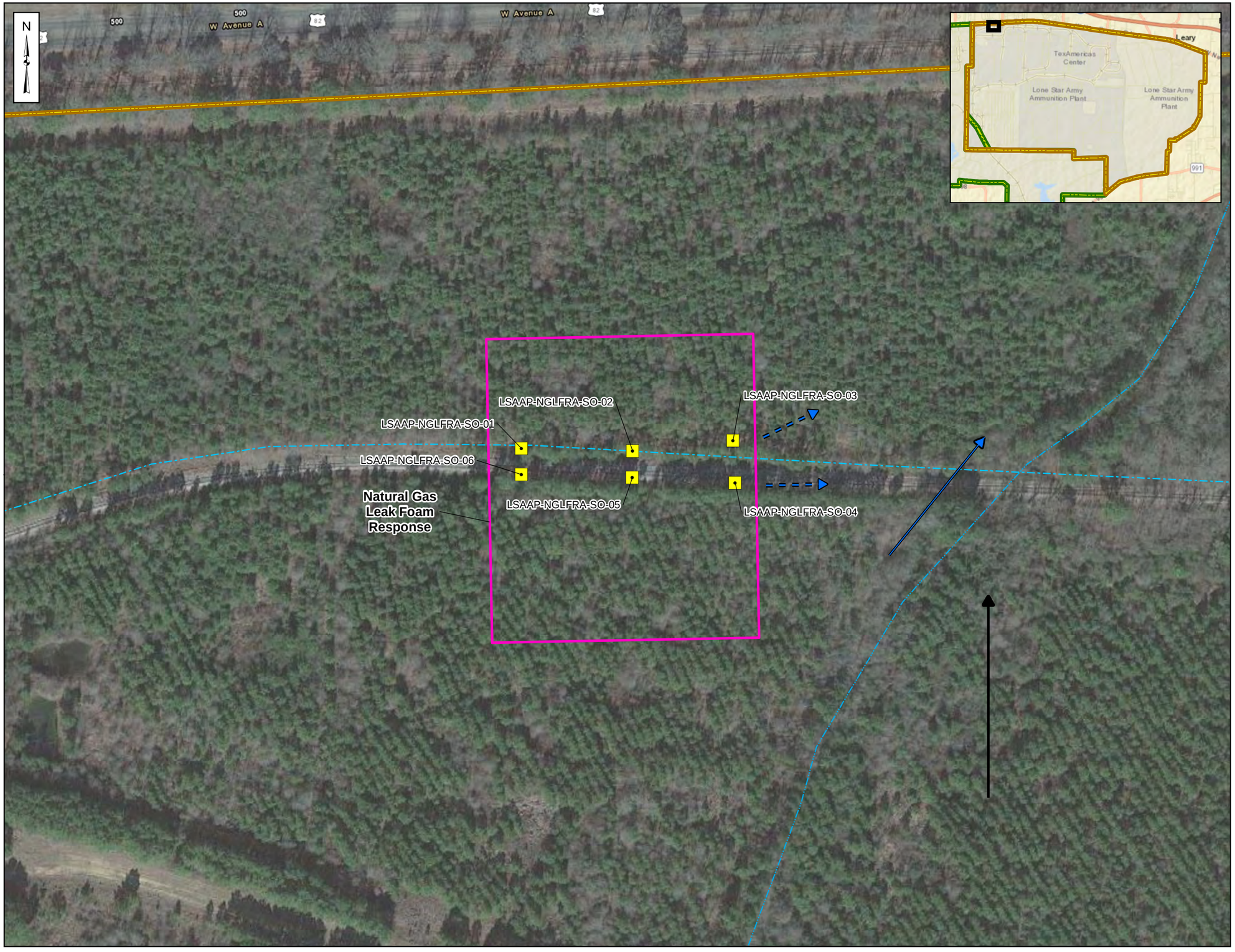
[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Former East Fire Station
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-14

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-15
Natural Gas Leak
Foam Response
Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Stream (Intermittent)
- Swale/Ditch
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)

Sampling Locations

- Surface Soil (Hand Auger)

AOPI = area of potential interest

0 100 200
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-15
Natural Gas Leak Foam Response Sample Results

Chemical	Residential Scenario Risk Screening Level Soil (mg/kg)
PFOS	0.013
PFOA	0.019
PFBS	1.9
PFNA	0.019
PFHxS	0.13
PFBA	7.8
PFHxA	3.2

LSAAP-NGLFRA-SO-01	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00064 U
PFOA	0.00064 U
PFBS	0.00064 U
PFNA	0.00064 U
PFHxS	0.00064 U
PFBA	0.00064 U
PFHxA	0.00064 U

LSAAP-NGLFRA-SO-02	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00063 U
PFOA	0.00063 U
PFBS	0.00063 U
PFNA	0.00063 U
PFHxS	0.00063 U
PFBA	0.00063 U
PFHxA	0.00063 U

LSAAP-NGLFRA-SO-03	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00059 U [0.00062 U]
PFOA	0.00059 U [0.00062 U]
PFBS	0.00059 U [0.00062 U]
PFNA	0.00059 U [0.00062 U]
PFHxS	0.00059 U [0.00062 U]
PFBA	0.00059 U [0.00062 U]
PFHxA	0.00059 U [0.00062 U]

LSAAP-NGLFRA-SO-04	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00059 U
PFOA	0.00059 U
PFBS	0.00059 U
PFNA	0.00059 U
PFHxS	0.00059 U
PFBA	0.00059 U
PFHxA	0.00059 U

LSAAP-NGLFRA-SO-05	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00063 U
PFOA	0.00063 U
PFBS	0.00063 U
PFNA	0.00063 U
PFHxS	0.00063 U
PFBA	0.00063 U
PFHxA	0.00063 U

LSAAP-NGLFRA-SO-06	
Date	6/15/2023
Depth	0-2 ft bgs
PFOS	0.00061 U
PFOA	0.00061 U
PFBS	0.00061 U
PFNA	0.00061 U
PFHxS	0.00061 U
PFBA	0.00061 U
PFHxA	0.00061 U

Natural Gas Leak Foam Response

Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
2. Results in brackets are field duplicate sample results.

U = The analyte was not detected and is reported as less than the limit of detection (LOD). The LOD has been adjusted for dilution.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Stream (Intermittent)
- Swale/Ditch
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)

Sampling Locations

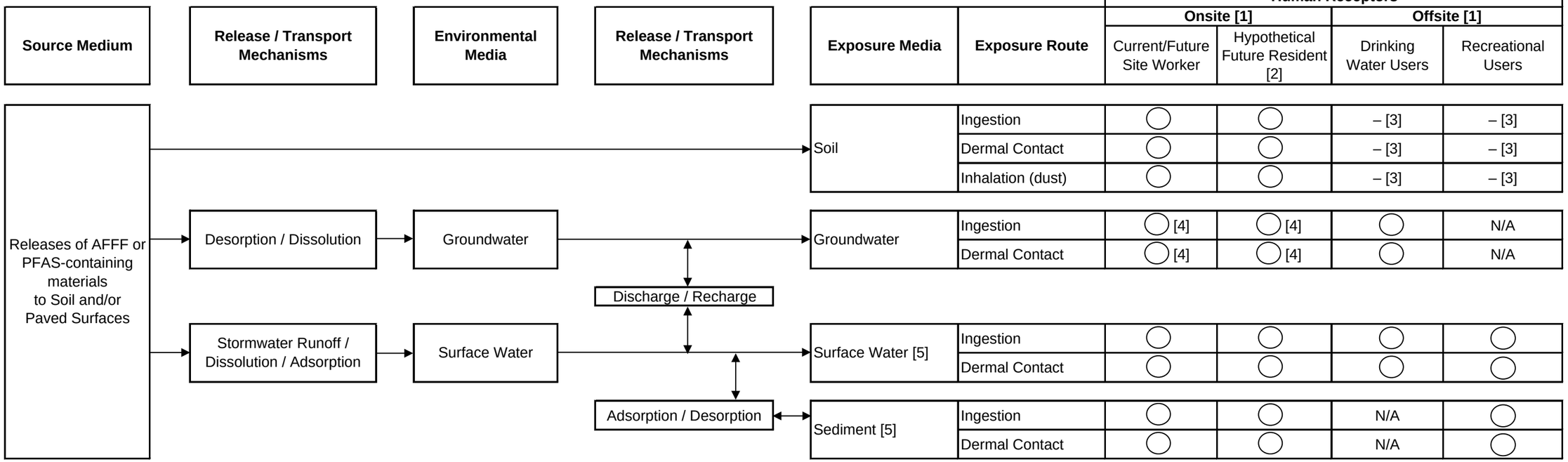
- Surface Soil (Hand Auger)

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 100 200
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Exposure Media	Exposure Route	Human Receptors: Onsite [1] Current/Future Site Worker	Onsite [1] Hypothetical Future Resident [2]	Offsite [1] Drinking Water Users	Offsite [1] Recreational Users
Soil	Ingestion	○	○	– [3]	– [3]
	Dermal Contact	○	○	– [3]	– [3]
	Inhalation (dust)	○	○	– [3]	– [3]
Groundwater	Ingestion	○ [4]	○ [4]	○	N/A
	Dermal Contact	○ [4]	○ [4]	○	N/A
Surface Water [5]	Ingestion	○	○	○	○
	Dermal Contact	○	○	○	○
Sediment [5]	Ingestion	○	○	N/A	○
	Dermal Contact	○	○	N/A	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

PFAS = per- and polyfluoroalkyl substances

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

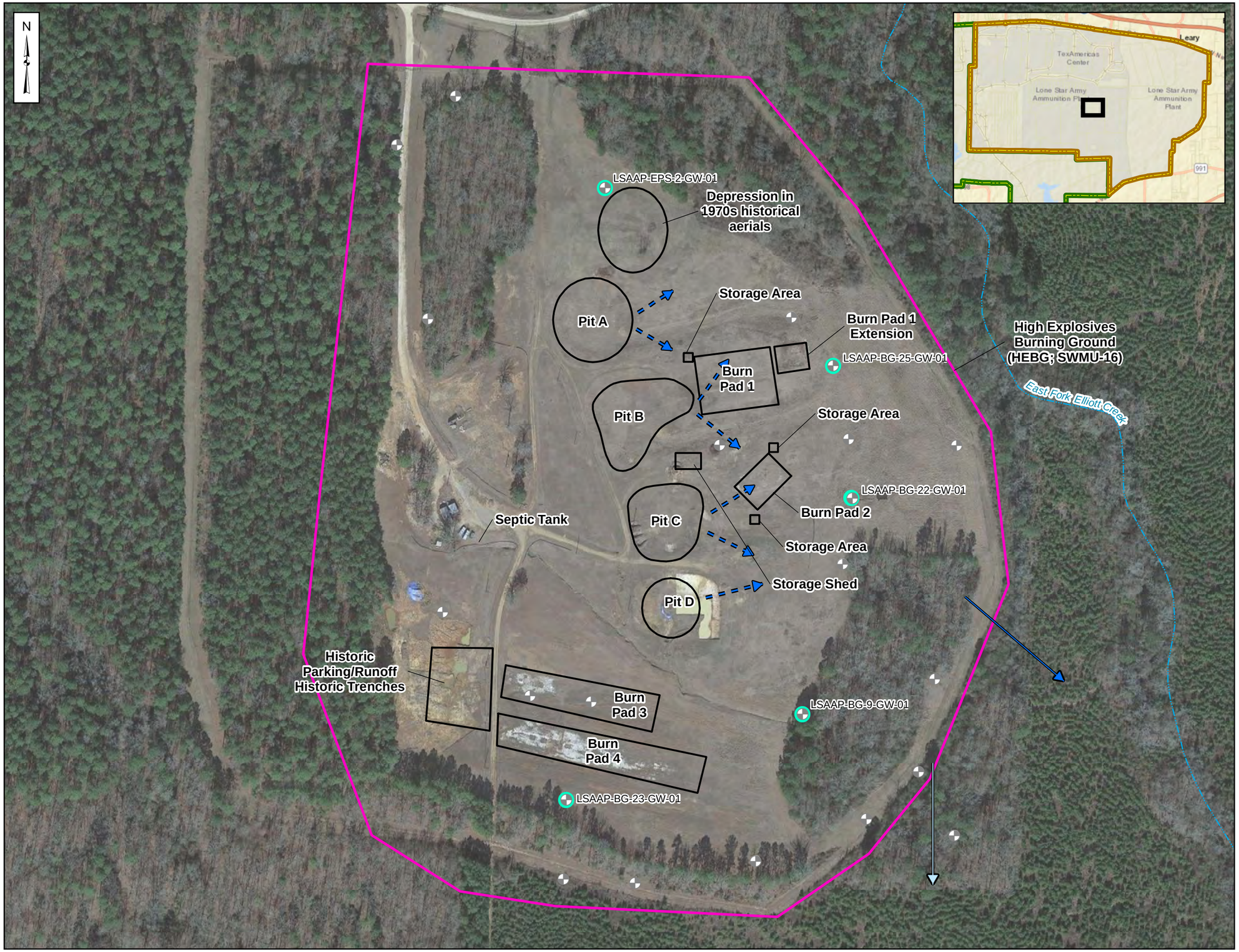
[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Natural Gas Leak Foam Response Area
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-17

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-18
High Explosives Burning Ground (HEBG; SWMU-16) Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Site Feature
- Stream (Intermittent)
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Local)
- Inactive Monitoring Well

Sampling Locations

- Groundwater (Existing Well)

AOPI = area of potential interest

0 250 500
Feet

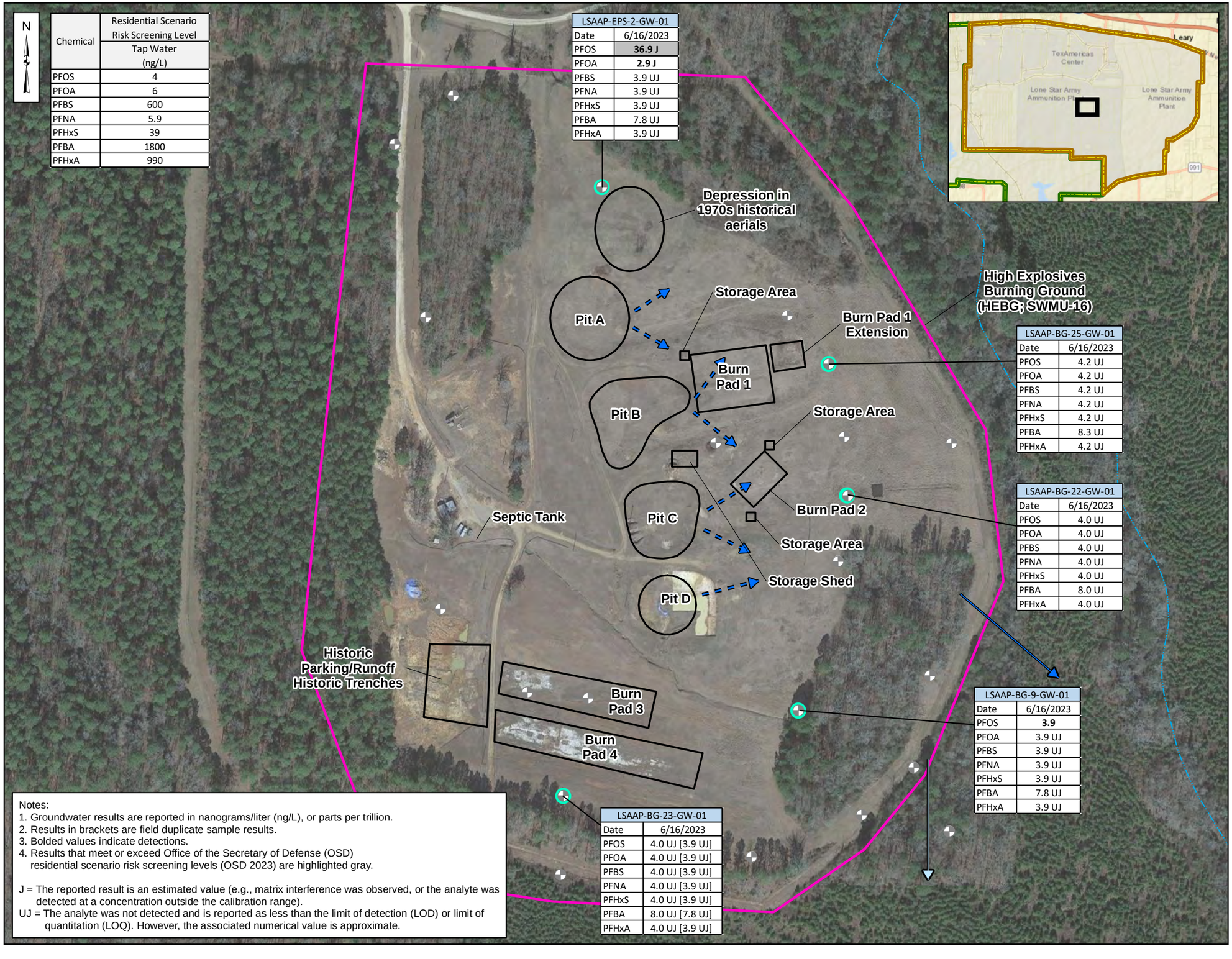
Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-19
High Explosives Burning Ground (HEBG; SWMU-16) Sample Results

Chemical	Residential Scenario Risk Screening Level
	Tap Water (ng/L)
PFOS	4
PFOA	6
PFBS	600
PFNA	5.9
PFHxS	39
PFBA	1800
PFHxA	990



LSAAP-EPS-2-GW-01	
Date	6/16/2023
PFOS	**36.9 J**
PFOA	**2.9 J**
PFBS	3.9 UJ
PFNA	3.9 UJ
PFHxS	3.9 UJ
PFBA	7.8 UJ
PFHxA	3.9 UJ

LSAAP-BG-25-GW-01	
Date	6/16/2023
PFOS	4.2 UJ
PFOA	4.2 UJ
PFBS	4.2 UJ
PFNA	4.2 UJ
PFHxS	4.2 UJ
PFBA	8.3 UJ
PFHxA	4.2 UJ

LSAAP-BG-22-GW-01	
Date	6/16/2023
PFOS	4.0 UJ
PFOA	4.0 UJ
PFBS	4.0 UJ
PFNA	4.0 UJ
PFHxS	4.0 UJ
PFBA	8.0 UJ
PFHxA	4.0 UJ

LSAAP-BG-9-GW-01	
Date	6/16/2023
PFOS	**3.9**
PFOA	3.9 UJ
PFBS	3.9 UJ
PFNA	3.9 UJ
PFHxS	3.9 UJ
PFBA	7.8 UJ
PFHxA	3.9 UJ

LSAAP-BG-23-GW-01	
Date	6/16/2023
PFOS	4.0 UJ [3.9 UJ]
PFOA	4.0 UJ [3.9 UJ]
PFBS	4.0 UJ [3.9 UJ]
PFNA	4.0 UJ [3.9 UJ]
PFHxS	4.0 UJ [3.9 UJ]
PFBA	8.0 UJ [7.8 UJ]
PFHxA	4.0 UJ [3.9 UJ]

Notes:
1. Groundwater results are reported in nanograms/liter (ng/L), or parts per trillion.
2. Results in brackets are field duplicate sample results.
3. Bolded values indicate detections.
4. Results that meet or exceed Office of the Secretary of Defense (OSD) residential scenario risk screening levels (OSD 2023) are highlighted gray.

J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
UJ = The analyte was not detected and is reported as less than the limit of detection (LOD) or limit of quantitation (LOQ). However, the associated numerical value is approximate.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Site Feature
- Stream (Intermittent)
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Local)
- Inactive Monitoring Well

Sampling Locations

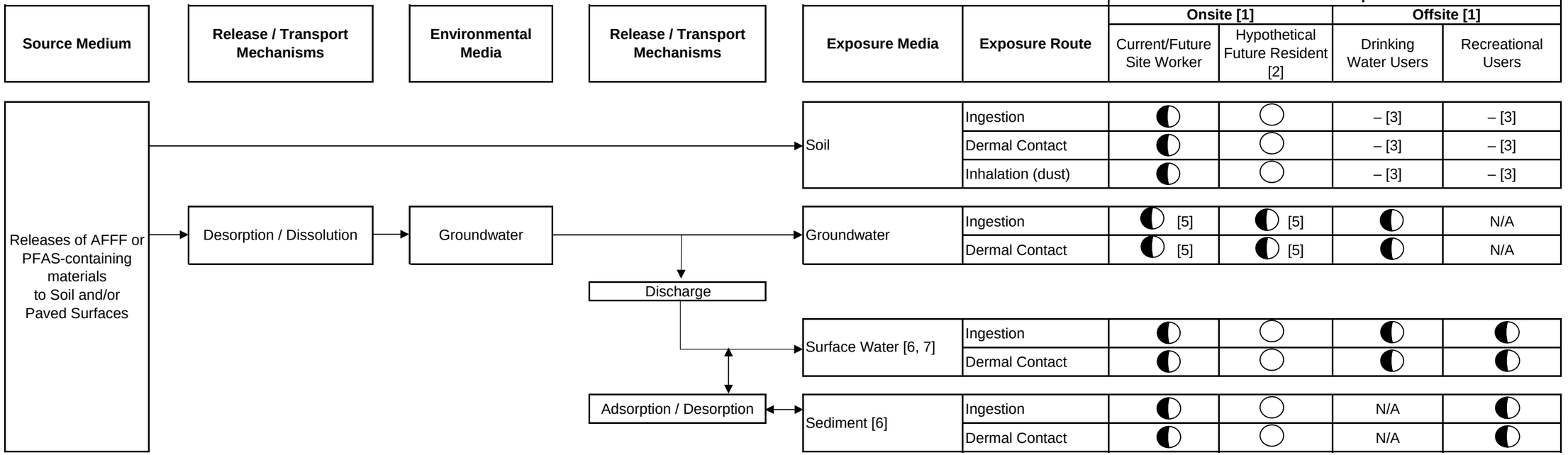
- Groundwater (Existing Well)

AOPI = area of potential interest
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 250 500
Feet

Data Sources: Google Earth, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Exposure Media	Exposure Route	Human Receptors: Onsite [1] – Current/Future Site Worker	Onsite [1] – Hypothetical Future Resident [2]	Offsite [1] – Drinking Water Users	Offsite [1] – Recreational Users
Soil	Ingestion	◐	○	– [3]	– [3]
	Dermal Contact	◐	○	– [3]	– [3]
	Inhalation (dust)	◐	○	– [3]	– [3]
Groundwater	Ingestion	◑ [5]	◑ [5]	◑	N/A
	Dermal Contact	◑ [5]	◑ [5]	◑	N/A
Surface Water [6, 7]	Ingestion	◐	○	◐	◐
	Dermal Contact	◐	○	◐	◐
Sediment [6]	Ingestion	◐	○	N/A	◐
	Dermal Contact	◐	○	N/A	◐

Legend:

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

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

PFAS = per- and polyfluoroalkyl substances

SWMU = solid waste management unit

Notes:

[1] Onsite refers to the area within the 15,589 acres of BRAC property, and offsite refers to the area outside the boundary of the BRAC property.

[2] There are no current residents at LSAAP and there is a land use control in place which prevents residential use of all AOPIs. Future residential development is not a reasonably anticipated future land use; therefore, all exposure pathways for onsite residents are incomplete.

[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[5] Currently, there are no potable wells located at LSAAP. A land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific.

[6] Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures.

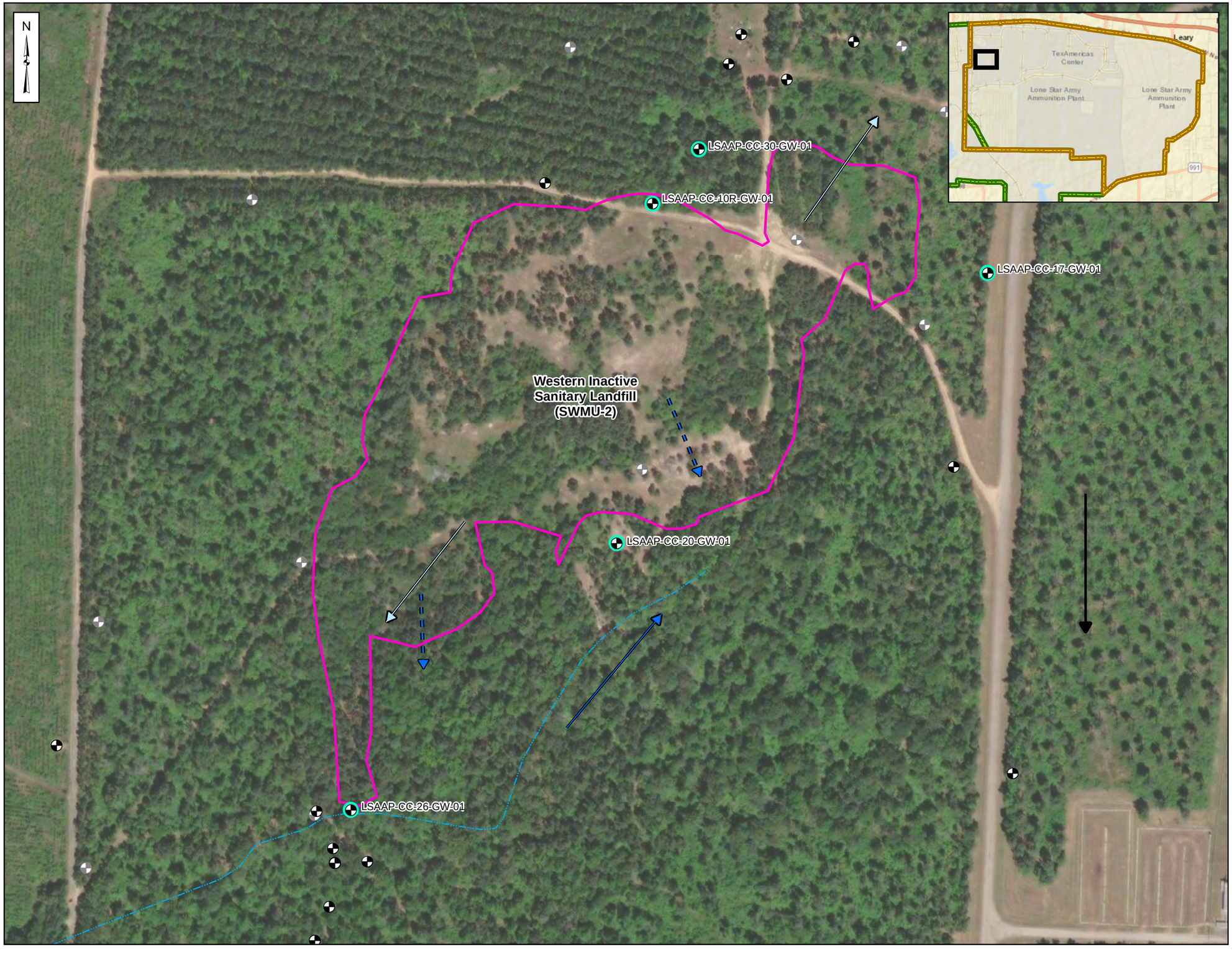
[7] LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, and the AOPI is within the watershed area for Wright Patman Lake.

Human Health Conceptual Site Model for High Explosives Burning Ground (HEBG)
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-20

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-21
Western Inactive Sanitary Landfill (SWMU-2) Sample Locations



Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Active Monitoring Well
- Inactive Monitoring Well
- Stream (Intermittent)
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)
- Groundwater Flow Direction (Local)

Sampling Locations

- Groundwater (Existing Well)

AOPI = area of potential interest

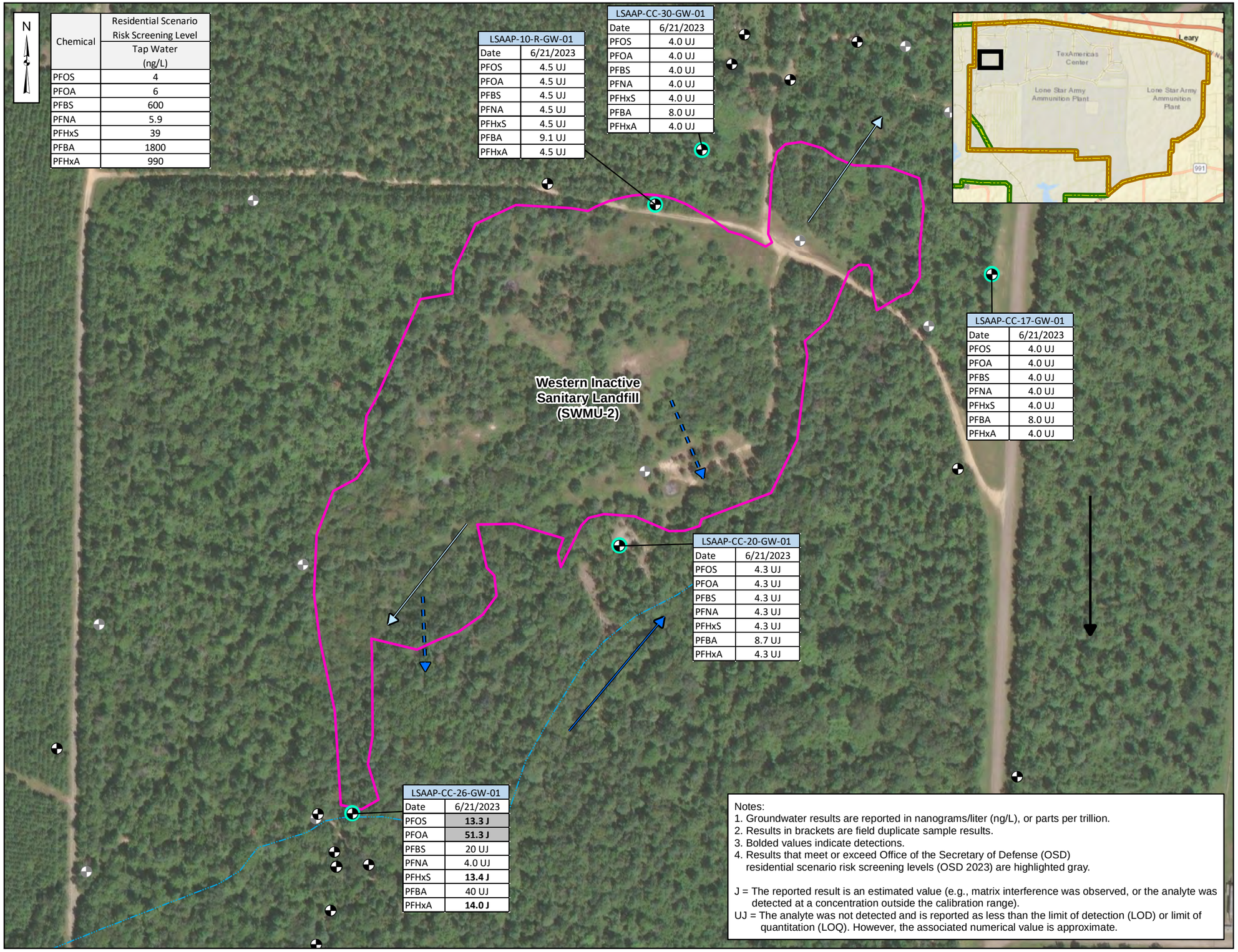
0 250 500
Feet

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters

BRAC Site Inspection
Lone Star Army Ammunition Plant, Texarkana, TX

Figure 6-22
Western Inactive Sanitary Landfill (SWMU-2) Sample Results



Chemical	Residential Scenario Risk Screening Level Tap Water (ng/L)
PFOS	4
PFOA	6
PFBS	600
PFNA	5.9
PFHxS	39
PFBA	1800
PFHxA	990

LSAAP-10-R-GW-01	
Date	6/21/2023
PFOS	4.5 UJ
PFOA	4.5 UJ
PFBS	4.5 UJ
PFNA	4.5 UJ
PFHxS	4.5 UJ
PFBA	9.1 UJ
PFHxA	4.5 UJ

LSAAP-CC-30-GW-01	
Date	6/21/2023
PFOS	4.0 UJ
PFOA	4.0 UJ
PFBS	4.0 UJ
PFNA	4.0 UJ
PFHxS	4.0 UJ
PFBA	8.0 UJ
PFHxA	4.0 UJ

LSAAP-CC-17-GW-01	
Date	6/21/2023
PFOS	4.0 UJ
PFOA	4.0 UJ
PFBS	4.0 UJ
PFNA	4.0 UJ
PFHxS	4.0 UJ
PFBA	8.0 UJ
PFHxA	4.0 UJ

LSAAP-CC-20-GW-01	
Date	6/21/2023
PFOS	4.3 UJ
PFOA	4.3 UJ
PFBS	4.3 UJ
PFNA	4.3 UJ
PFHxS	4.3 UJ
PFBA	8.7 UJ
PFHxA	4.3 UJ

LSAAP-CC-26-GW-01	
Date	6/21/2023
PFOS	**13.3 J**
PFOA	**51.3 J**
PFBS	20 UJ
PFNA	4.0 UJ
PFHxS	**13.4 J**
PFBA	40 UJ
PFHxA	**14.0 J**

Notes:
1. Groundwater results are reported in nanograms/liter (ng/L), or parts per trillion.
2. Results in brackets are field duplicate sample results.
3. Bolded values indicate detections.
4. Results that meet or exceed Office of the Secretary of Defense (OSD) residential scenario risk screening levels (OSD 2023) are highlighted gray.

J = The reported result is an estimated value (e.g., matrix interference was observed, or the analyte was detected at a concentration outside the calibration range).
UJ = The analyte was not detected and is reported as less than the limit of detection (LOD) or limit of quantitation (LOQ). However, the associated numerical value is approximate.

Legend

- Historical Lone Star Army Ammunition Plant Boundary
- Red River Army Depot Boundary
- AOPI
- Active Monitoring Well
- Inactive Monitoring Well
- Stream (Intermittent)
- Surface Water Flow Direction
- Surface Water Runoff Flow Direction
- Groundwater Flow Direction (Regional)
- Groundwater Flow Direction (Local)

Sampling Locations

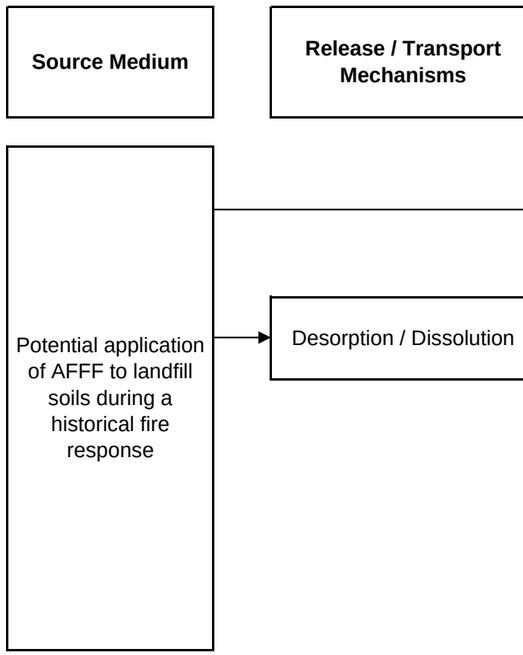
- Groundwater (Existing Well)

AOPI = area of potential interest
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

0 250 500
Feet

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 15N
Datum: NAD83
Units: Meters



Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: Onsite [1] – Current/Future Site Worker	Human Receptors: Onsite [1] – Hypothetical Future Resident [2]	Human Receptors: Offsite [1] – Drinking Water Users	Human Receptors: Offsite [1] – Recreational Users
Potential application of AFFF to landfill soils during a historical fire response				Subsurface Soil (beneath 3-foot landfill cap with vegetative cover)	Ingestion	○	○	– [3]	– [3]
					Dermal Contact	○	○	– [3]	– [3]
					Inhalation (dust)	○	○	– [3]	– [3]
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐ [4]	◐ [4]	◐	N/A
					Dermal Contact	◐ [4]	◐ [4]	◐	N/A
			Discharge	Surface Water [5]	Ingestion	◐	○	○	◐
					Dermal Contact	◐	○	○	◐
			Adsorption / Desorption	Sediment [5]	Ingestion	◐	○	N/A	◐
					Dermal Contact	◐	○	N/A	◐

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

AFFF = aqueous film-forming foam

AOPI = area of potential interest

BRAC - Base Realignment and Closure

N/A = not applicable

LSAAP = Lone Star Army Ammunition Plant

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[3] Offsite receptors are not expected to be exposed to soil at the AOPIs.

[4] Currently, there are no potable wells located at LSAAP, and a land use control restricts the installation of drinking water wells at the AOPI. However, this land use control is not Target PFAS specific. LSAAP obtains its drinking water via an off-site, public utility, supplied from Wright Patman Lake and Milwood Lake. Wright Patman Lake is within 5 miles downgradient of the southern installation boundary, however the AOPI is not within the watershed area for Wright Patman Lake.

[5] Surface water and sediment are not present at the AOPI. Surface water and sediment exposure pathways for onsite workers and offsite recreational users describe incidental ingestion and dermal contact exposures in downgradient/downstream surface water features.

Human Health Conceptual Site Model for Western Inactive Sanitary Landfill (WISL)
BRAC Site Inspection for Per- and Polyfluoroalkyl Substances
Lone Star Army Ammunition Plant, Texas

Figure 6-23