FINAL

PRELIMINARY ASSESSMENT REPORT OF PFAS LONE STAR ARMY AMMUNITION PLANT, TEXAS

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AAR	ARS Aleut Remediation
AFFF	aqueous film-forming foam
amsl	above mean sea level
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	U.S. Army
bls	below land surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act of 1980
cm/sec	centimeters per second
DoD	U.S. Department of Defense
DZI	Day & Zimmermann, Inc. (DZI)
DZLS	Day & Zimmermann Lone Star, LLC
EDR	Environmental Data Resources, Inc.
F	Fahrenheit
FASCAM	Family of Scatterable Mines
GIS	geographic information system
GO/CO	government-owned/contractor operated
HEDG	High Explosives Demolition Ground
HFPO-DA	hexafluoropropylene oxide dimer acid
HQDA	Headquarters, Department of the Army
ICM	improved conventional munition
installation	U.S. Army or Reserve installation
IWTP	industrial wastewater treatment plants
LAP	load, assemble, and pack
LSAAP	Lone Star Army Ammunition Plant
NAICS	North American Industry Classification System
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/L	nanograms per liter (parts per trillion)
OB/OD	open burn/open detonation
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PBX	plastic-bonded explosives
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexane sulfonate
PFNA	perfluorononanoic acid

Acronym	Definition
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
PTFE	polytetrafluoroethylene
RRAD	Red River Army Depot
RRRA	Red River Redevelopment Authority
RSL	Regional Screening Level
SI	Site Inspection
SIC	Standard Industrial Classification
SWMU	Solid Waste Management Unit
TAC	TexAmericas Center Inc.
TFE	tetrafluoroethylene
TWU	Texarkana Water Utilities
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WASL	Western Active Sanitary Landfill
WISL	Western Inactive Sanitary Landfill
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

The objective of a Preliminary Assessment (PA) is to identify areas of potential interest (AOPIs) based on whether use, storage, disposal, or release of potential PFAS-containing materials, including AFFF, occurred in accordance with the 2018 Army *Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). A PA for PFAS-containing materials with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt ("GenX" chemicals) was completed at the Former Lone Star Army Ammunition Plant (LSAAP), to assess potential PFAS release areas and exposure pathways. The Lone Star Army Ammunition Plant (LSAAP) PA was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, The National Oil and Hazardous Substance Pollution Contingency Plan, (NCP), the Department of Defense Environmental Remediation Program (DERP). Army/U.S. Department of Defense (DoD) policy and guidance, Guidance for Performing Preliminary Assessments Under CERCLA (U.S. Environmental Protection Agency [USEPA] 1991), and the Federal Facilities Remedial Preliminary Assessment Summary Guide (USEPA 2005).

LSAAP is located approximately 12 miles west of Texarkana, Texas in Bowie County. LSAAP operated as an ammunition production facility. In the late 1990s, various production lines were shut down. In 2005, the BRAC Committee selected LSAAP for closure. At this time, LSAAP consisted of approximately 15,589 acres. In September 2009, all active missions at LSAAP ceased and in September 2010, the former LSAAP property was divided into four portions based on BRAC transfer agreements:

- 8,867 acres were transferred to the Red River Redevelopment Authority (RRRA) (later TexAmericas Center Inc. [TAC]),
- 1 acre was transferred to the Southwestern Power Company,
- 5,424-acres were transferred to Day & Zimmermann Lone Star, LLC (DZLS), and
- 1,297 acres were retained (has not been transferred) by the Government for environmental cleanup, disposal, and subsequent transfer.

This PA covers the 15,589 acres which comprised the former LSAAP and reviews DoD/DZLS operations of LSAAP prior to transfer (Headquarters, Department of the Army 2020).

operations of LSAAP prior to transfer (Headquarters, Department of the Army 2020).

In conducting the PA of the BRAC property at LSAAP, 11 AOPIs were identified where a potential for release of PFAS exists resulting from site operational history. AOPIs were identified at potential PFAS-release locations on LSAAP.

Based on the potential PFAS releases at the AOPIs, the potential for exposure to PFAS contamination in soil exists. In addition, the potential for off-post exposure in groundwater exists, as on-post groundwater could influence downgradient drinking water sources. Given the findings of this PA, the AOPIs presented warrant further evaluation in a Site Inspection (SI).

1.0 INTRODUCTION

The Army conducted this Preliminary Assessment (PA) to investigate the potential presence of Per-and Polyfluoroalkyl Substances (PFAS) at LSAAP in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 U.S.C. §9601 et. seq.), the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2701 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) and the Department of the Army. LSAAP is on the National Priorities List and the U.S. Army (Army) is responsible for compliance with CERCLA in accordance with Executive Order 12580, as amended.

The purpose of this PFAS PA is to identify locations that are areas of potential interest (AOPIs) on the former LSAAP based on the use, storage and/or disposal of potential PFAS-containing materials, in accordance with the 2018 Army *Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances* (Army 2018). The PA was conducted in general accordance with 40 CFR §300.420(b) and the U.S. Environmental Protection Agency (USEPA) *Guidance for Performing Preliminary Assessments Under CERCLA* (USEPA 1991) and the U.S. Army (Army) *Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018). This report presents findings from research conducted to assess past use of materials containing PFAS and identify areas where these materials were stored, handled, used, or disposed at LSAAP.

The entirety of LSAAP property was evaluated for this PFAS PA, including Army-owned property as well as property that has been previously transferred. References to LSAAP on- and off-post within this PA refer to the original LSAAP property boundary prior to closure. 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 Red River Army Depot.

1.1 Project Background

PFAS are a group of synthetic compounds that have been manufactured and used extensively worldwide since the 1950s for a variety of purposes. PFAS are stable, man-made fluorinated organic chemicals that repel oil, grease, and water. Common industrial uses of PFAS include paints, varnishes, sealants, hydraulic fluid, surfactants, and firefighting foams. PFAS include both per- and polyfluorinated compounds. Perfluorinated compounds, such as perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA or Gen X) are a subset of PFAS with completely fluorinated carbon chains, while polyfluorinated compounds have at least one carbon chain atom that is not fully fluorinated. These six PFAS compounds together, and for the purposes of this PA, are referred to in this report as “target PFAS.”

LSAAP was evaluated for all potential use, storage, and/or disposal of PFAS-containing materials. There are a variety of PFAS-containing materials used in relation to current and historical Army operations. However, the use, storage, and/or disposal of aqueous film-forming foam (AFFF) is the most common potential source of PFAS chemicals at DoD facilities. As such, this section is organized to summarize the AFFF-related sources first, and all remaining potential PFAS-containing materials in the subsequent paragraph. AFFF is used as a firefighting agent to suppress petroleum hydrocarbon fires and vapors. Firefighting foams like AFFF were developed in the 1960s (ITRC 2020a), but AFFF did not see widespread DoD use until the early 1970s. Older fire training facilities often were unlined and not constructed to prevent infiltration of firefighting foams and combustion products leaching into the subsurface. Large quantities of AFFF may have been released into the environment as a result of fire training exercises, fire responses, fire suppression system activations, and tank and pipeline leaks/spills.

Other potential PFAS sources considered include installation storage warehouses, metal plating activities, some pesticide use, automobile maintenance shops, photo processing facilities, laundry/water-proofing facilities, car washes, stormwater, or sanitary sewer components, and biosolid application areas.

Many PFAS compounds are highly soluble in water and have low volatility due to their ionic nature. The specific gravity/relative density for PFOS and PFOA is 1.8 (ITRC 2020c). Long-chain perfluorinated compounds have low vapor pressure and are expected to persist in aquatic environments. These compounds do not readily degrade by most natural processes. They are thermally, chemically, and biologically stable, and are resistant to biodegradation, atmospheric photooxidation, direct photolysis, and hydrolysis. The structure of these compounds increases their resistance to degradation; the carbon-fluorine bond is one of the strongest in nature, and the fluorine atoms shield the carbon backbone.

When PFAS are released to the environment, they can readily migrate into soil, groundwater, surface water, and sediment. Once in the environment, the compounds are persistent and may continue to migrate through airborne transport, surface water, groundwater, and/or biologic uptake. The amount of PFAS entering the environment depends on the type and amount of the PFAS material that may have been released, where and when it was used, the type of soil, and other factors. If private or public wells are located nearby, they potentially could be affected by PFAS. Similarly, surface water features may be impacted and may convey PFAS to downgradient receptors.

Of the thousands of PFAS chemicals, some are considered precursor compounds (typically polyfluoroalkyl substances). Precursor compounds can abiotically or biotically transform into PFOS and PFOA. PFOS and PFOA are referred to as terminal PFAS, meaning no further degradation products will form from them (ITRC 2020b).

1.2 PA Objectives

The purpose of a PA under the NCP is to 1) eliminate from further consideration those sites that pose no threat to public health or the environment; 2) determine if there is any potential need for removal action; 3) set priorities for Site Inspections (SIs); and 4) gather existing data to facilitate evaluation for the release pursuant to the Hazard Ranking System, if warranted (40 CFR §300.420(b)(1)).

The primary objective of the PA is to identify and evaluate locations at LSAAP where there was use, storage, or disposal of PFAS-containing materials resulting in a potential release of PFAS to the environment and conduct an initial assessment of possible migration pathways of potential contamination. This PA also includes development of a preliminary conceptual site model (CSM) for areas of potential interest (AOPIs) related to PFAS.

Please note that the focus of this PA is on the active Army use of LSAAP prior to September 2009, when all active missions at LSAAP ceased. The use of potential PFAS-containing materials after the 2005 BRAC event is not the focus of this PA.

1.2.1 PFAS REGULATORY OVERVIEW AND SCREENING CRITERIA

In May 2016, USEPA issued lifetime health advisories (LHAs) for PFOA and PFOS under the Safe Drinking Water Act (SDWA). To provide Americans, including the most sensitive populations, with a margin of protection from a lifetime of exposure to PFOS and PFOA in drinking water, USEPA established an HA level for PFOS and PFOA (individually or combined) of 70 ng/L (parts per trillion) (USEPA 2016).

In October 2019, the Office of the Assistant Secretary of Defense (OSD) issued guidance on investigation PFOS, PFOA, and PFBS at Department of Defense (DoD) restoration sites. The OSD guidance provided risk screening levels for PFOS, PFOA, and PFBS in (groundwater) tap water and soil, based on the EPA Regional Screening Level (RSL) calculator for residential and industrial reuse and using the oral reference dose of 2E-05 mg/kg-day. These screening levels are used during a Site Inspection (SI) to determine if further investigation in a Remedial Investigation (RI) is warranted.

In April 2021, USEPA issued an updated toxicity assessment for PFBS. USEPA developed chronic (0.0003 mg/kg-day) and subchronic (0.001 mg/kg-day) oral reference doses (RfDs) for PFBS as part of USEPA's toxicity assessment. The regional screening level (RSL) for PFBS was previously calculated using the RfD of 0.02 mg/kg day. New toxicity values resulted in revisions to the RSLs for PFBS in May 2021 (USEPA 2021).

In September 2021, OSD issued a revision to Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (DoD 2021). The revised memorandum accounts for the updated PFBS screening levels attributable to USEPA's reassessment of PFBS toxicity in 2021. Based on USEPA research, the RSLs for PFOS and PFOA are calculated using an RfD of 2E-05 mg/kg-day. The RSL for PFBS is calculated using an RfD of 3E-04 mg/kg-day. When multiple PFAS are encountered at a site, a 0.1 factor is applied to the screening level when it is based on noncarcinogenic endpoints.

In May 2022, based on continued evaluation of target PFAS compounds by the Agency for Toxic Substances and Disease Registry (ATSDR) and the EPA Office of Water, EPA provided new screening levels for PFOA, PFOS, PFNA, PFHxS, and HFPO-DA.

In July 2022, OSD issued a policy memorandum adopting these new screening levels to be used during the SI-phase to determine whether further investigation in a RI is warranted. Therefore, the screening level for target PFAS compounds are: This revised guidance is in effect as of July 2022 and is applicable to investigating PFOS, PFOA, PFBS, PFNA, PFHxS, and HFPO-DA at DOD restoration sites, including BRAC (DoD 2022). Currently, no legally enforceable Federal standards exist for PFAS in groundwater, surface water, soil, or sediment.

Table 1-1. Screening Levels from the 2022 OSD Memorandum

Chemical	Residential Tap Water HQ = 0.1 (ng/L or ppt)	Residential Soil HQ = 0.1 (μg/kg or ppb)
HFPO-DA (GenX)	6	23
PFBS	601	1,900
PFHxS	39	130
PFNA	6	19
PFOA	6	19
PFOS	4	13

Note:

The Residential Tap Water Screening Levels are used to evaluate groundwater and surface water data. The Residential Soil Screening Levels are used to evaluate soil and sediment data.
HFPO-DA Hexafluoropropylene oxide dimer acid
HQ Hazard Quotient
OSD Office of the Secretary of Defense
PFBS Perfluorobutane Sulfonate
PFHxS Perfluorohexane Sulfonate
PFNA Perfluorononanoic Acid
PFOA Perfluorooctanoic Acid
PFOS Perfluorooctane Sulfonate

The Army's strategy is to continue to assess and investigate potential releases and implement necessary response actions in accordance with CERCLA to ensure that no human health-based exposures are above the CERCLA risk-based values in drinking water. Therefore, sites where human exposure to contaminated drinking water exists will be addressed first and as quickly as possible to eliminate the exposure, and then will be subsequently prioritized and sequenced to conduct the investigations and response actions necessary to characterize and, if necessary, remediate the source of PFAS contamination (U.S. Army 2018).

1.3 PA Process Description

The PA for LSAAP included a site visit, aerial photographic analysis, records review, and interviews that were conducted in accordance with the methods detailed in PA Quality Control Checklist (Appendix B). The Checklist outlines the approach and methodology for conducting the PFAS PA. As detailed in the Checklist, the PA activities focused on ascertaining and documenting the following information regarding PFAS history and use, storage or disposal at LSAAP.

- On-post fire training activities.
- Use of PFAS-based AFFF in fire suppression systems or other systems.
- AFFF stored, used, and/or disposed of at buildings and crash sites.
- Activities or use of materials that are likely to contain PFAS constituents, such as chrome plating operations.
- Wastewater treatment plants (WWTPs) and landfills that may have received PFAS-containing materials.

- Studies conducted to assess environmental impacts at the facility.
- Potential PFAS use at parcels post transfer.
- Potential off-post sources that may impact LSAAP.

The data gathered during PA activities are summarized in Sections 1.3.1 through 1.3.3 below. Section 3 provides a summary of the PA activities completed at LSAAP.

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact (POC) from the USACE, the Army BRAC organization, ARS Aleut Remediation, LLC (AAR), and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 29 May 2022, before the site visit, to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

Records research was conducted before the site visit to obtain electronically available documents from the installation and external sources for review. The purpose of the records research was to identify any area on the installation that may have been a location where PFAS-containing materials were used, stored, and/or disposed, as well as to gather information on the physical setting and site history at LSAAP (40 C.F.R. 300.420(b)(2)).

1.3.2 Preliminary Assessment Site Visit

The site visit was conducted on 24 May through 26 May 2022. An in-briefing was held to provide the on-site staff at LSAAP with the objectives of the site visit and team introductions.

Personnel interviews were conducted with military and civilian individuals having significant historical knowledge at LSAAP. The interviews focused on confirming information discussed in historical documents, collecting information that may have not been in historical documents, and corroborating other interviewees' information. **Section 3** includes information regarding personnel interviewed.

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

The findings identified during the PA were communicated during a conference call held on 27 June 2022.

1.3.3 Post-Site Visit

Information collected before, during, and after the site visit was reviewed and corroborated by cross-referencing records and reviewing interview details and observations noted during site visit reconnaissance. A site visit trip report was completed and provided to POCs from the installation, the USACE, and the Army BRAC organization following the site visit. Map document files and associated geographic information system (GIS) data are provided as ***Appendix C***. GIS data layers created for the project are included in a Spatial Data Standards for Facilities, Infrastructure, and Environment-compliant geodatabase.

2.0 INSTALLATION OVERVIEW

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

2.1 Site Terminology

LSAAP, and its other iterations (e.g., Lone Star Ordnance Plant; Texarkana Ordnance Center; Red River Arsenal), was created in 1941 as a government-owned/contractor operated (GO/CO) shell-loading installation. From 1950 until closure, the operating engineer was Day & Zimmermann, Inc. (DZI). The installation was temporarily merged with the neighboring Red River Army Depot (RRAD and also known under its previous iterations of Red River Ordnance Depot and Red River Arsenal).

LSAAP was separated into 27 areas: 13 areas were used directly for or in support of load, assemble, and pack (LAP) operations (Areas B, C, E, F, G, J, K, M, O, P, Q, R, and S) and 15 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 (Areas A, D, H, I, T, U, V, W, X, Y, Z, AA, BB, CC, and XX). LSAAP property encompassed 15,589 acres and included approximately 946 permanent and semi-permanent buildings, 38 magazines, and 200 earthen storage bunkers (igloos).

LSAAP was operated as a GO/CO installation on and off until all missions ceased, and the plant closed as part of the BRAC process on 30 September 2009. This PA covers the 15,589 acres which comprised the former LSAAP and reviews DoD/Day & Zimmermann Lone Star, LLC (DZLS) operations of LSAAP prior to transfer (Headquarters, Department of the Army [HQDA] 2020). Activities that occurred prior to the BRAC closure are referenced to as "PRE-BRAC" throughout this document. The extent of LSAAP at the time of closure is shown on ***Figure 2-1***.

2.2 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 as shown on ***Figure 2-1***. State Highway 82 and State Highway 30 are located north of the former LSAAP boundary and run west and east. A railroad system runs through the former installation footprint. At the time of closure, the Union Pacific Railroad owned the tracks north and south of LSAAP and leased the north track to the Texas Northeastern Railroad Service, who serviced LSAAP from the north.

2.3 Pre-BRAC Mission and Brief Site 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 soon in 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 in order 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 selected LSAAP for closure. All active missions ceased and the plant closed on 30 September 2009.

2.3.1 Pre-BRAC Tenants and Operations

Prior to BRAC while operating as a GO/CO, LSAAP tenants included TEC Linens, Inc. (Building K-21: laundry facility operation), American Dehydrated Foods (Area E: Pet Food Production), RRAD (Area BB: rubber denuding operations), Lone Star Rail Car Storage Company (Area CC: storing rail cars), De-manufacturing of Electronic Equipment for Reuse and Recycling (Area C: de-manufacturing of electronic equipment), Defense Reutilization and Marketing Service (Area H: administrative), and Defense Logistics Agency (Area D: inert storage). Prior to the BRAC event, Area Z was also utilized as a recreational fishing area (URS 2006a).

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 Western Inactive Sanitary Landfill (WISL; LSAAP-002) for the disposal of non-hazardous wastes from the mid-1940s until 1973. RRAD also utilized the Western Active Sanitary Landfill ([WASL], also known as CC Landfill; RRAD-61), to dispose of construction debris. RRAD assumed responsibility for WASL and has closed the site. The sanitary sewer system was also formerly operated by RRAD, until 2002, when TAC began managing it (URS 2006b).

2.4 BRAC Process at LSAAP

In 2005, the BRAC Commission recommended closure of LSAAP, with relocation LSAAP missions, including:

- Munition storage and demilitarization to McAlester Army Ammunition Plant in Oklahoma,
- 105mm and 155mm improved conventional munition (ICM) artillery, multiple launch rocket system artillery, hand grenades, 60mm, and 81mm mortar production to the Milan Army Ammunition Plant in Tennessee,
- Mines and detonators/relays/delay production to Iowa Army Ammunition Plant in Iowa, and
- Demolition charges to Crane Army Ammunition Activity in Indiana.

In September 2010, the former LSAAP property was divided into four portions based on BRAC transfer agreements:

- 8,867 acres were transferred to the RRRA, later TAC,
- one acre was transferred to the Southwestern Power Company,
- 5,424-acres were transferred to DZLS, and
- 1,297 acres were not transferred 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 2-2***. As of 2021, 14,292 acres of the total 15,589 acres have been conveyed to non-governmental organizations (HQDA 2020).

2.4.1 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 prior to redevelopment/reuse activities occurring. The reuse plan calls for multiple-use redevelopment of the area, including industrial, light industrial, warehouse, office, commercial, and forest management uses (USACE Mobile District 2007).

Portions of land have since transferred ownership under this agreement. For example, Area G has since been transferred to Expansion Ammunition.

2.4.2 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 5,424 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. Day & Zimmermann operations were consolidated to these areas, which are utilized for purposes similar to their historic operations.

2.4.3 Remaining Army-Owned

The Army remains the owner of 1,297 acres of the installation which required cleanup/closure activities associated with municipal solid waste program requirements (e.g., Area A Landfill and the Old Boston Road Landfill), Resource Conservation and Recovery Act (RCRA) permitted units [e.g., the High Explosives Demolition Ground (HEDG), the High Explosives Burning Ground (HEBG), and a Superfund Site (the Old Demolition Area). Additionally, some acreage was retained for easements.

2.5 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 (NWS 2021).

Snowfall in the area is rare and usually very light, averaging one to two 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).

2.6 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 percent of LSAAP and are generally clayey to silty loams with low permeability. The Rushton-McKamie soils cover the remaining 40 percent 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).

2.7 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 five distinct drainage areas. 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). The topography for this site is shown on ***Figure 2-3.***

2.8 Hydrogeology

Groundwater flow follows the topographic divide. 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 land surface (bls) 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 5.0×10^{-5} centimeters per second (cm/sec) at the HEBG and 2×10^{-6} cm/sec at the HEDG. Groundwater flow in Quaternary deposits, such as stream beds and terrace deposits, is reported to be from 4×10^{-4} to 6×10^{-6} cm/sec. The hydraulic conductivity of the Midway Group is relatively lower compared to the Wilcox Group and water may not be present when drilling for monitoring wells (URS 2006).

The minor aquifer, the Nacatoch aquifer, lies below the Carrizo-Wilcox Aquifer and covers an estimated 10 percent 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 bls (URS 2006).

2.9 Surface Water Hydrology

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. 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 former LSAAP footprint. Drainage areas exit mainly at the northern, western, eastern, south-central, and southwestern boundaries. Drainage runs into many 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 former property (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 former installation footprint at the northern boundary, they enter perennial streams that eventually empty into Barkman Creek. Canney Creek is located past the western boundary of former LSAAP 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 former LSAAP property. When drainage exits the former property at the eastern boundary, it enters a perennial stream approximately 2.5 miles downstream of former LSAAP footprint eastern border. Aiken Creek then empties into Elliot Creek. On the south-central side of the former installation footprint, multiple tributaries flow into Elliot Creek. Elliot Creek then empties into Wright Pitman Lake. Elliot Creek serves as the only perennial stream within the former installation property (URS 2006).

At the southwestern corner, water exits the former installation footprint and flows into Wright Pitman 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 former LSAAP footprint and is fed by two intermittent tributaries. When Nettles Creek exits the former installation boundary, it becomes perennial (URS 2006).

Other methods of drainage were implemented throughout the former LSAAP installation. Drainage ditches 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. Additionally, the HEDG area is surrounded by a dike system that controls erosion and runoff. Runoff flows through a site retention basin in the southwest corner of the bermed area before being discharged into an adjacent stream (URS 2006).

The surface water hydrology for the site is shown on ***Figure 2-4.***

2.10 Relevant Utility Infrastructure

The following subsections provide general information regarding the former installation's stormwater and wastewater management systems, as well as information on how the utility infrastructures may influence the fate and transport of PFAS from former activities at LSAAP. LSAAP had a sanitary sewer system and an industrial sanitary sewer system, with five wastewater discharge outfalls active at the time of closure. Outfall 01 discharged into Sulphur River, Outfall 02 and 03 discharged into the sanitary sewer that then fed Area X, Outfall 04 discharged into the Lower Red River, and Outfall 05 discharged into Wright Patman Lake (URS 2006).

2.10.1 Stormwater Management System Description

LSAAP was authorized under the Texas Pollutant Discharge Elimination System (TPDES) Multi-Sector General Permit to discharge stormwater associated with industrial activities into surface waters of the state. At the time of closure, there were 31 non-point source discharge locations throughout LSAAP that required annual monitoring and quarterly inspection during sampling intervals and during site compliance evaluations (URS 2006).

LSAAP was largely dependent on drainage ditches and natural features for stormwater control. Stormwater sewer systems only existed in Areas H, I, and D. The stormwater in Area I was collected in catch basins, traveled through stormwater pipes and emptied into drainage ditches. Stormwater in Area D and H followed a similar path, but stormwater was discharged on the eastern edge of Area D and the northeast side of Area H (URS 2006).

Stormwater runoff from Areas A, B, BB, C, D, E, F, G, H, I, J, M and R flowed north off the former installation footprint. Stormwater runoff from Areas K, O, P, Q, S, T, U, V, W, and XX flowed south off the former installation footprint (URS 2006).

2.10.2 Sewer System Description

The sanitary sewer system at LSAAP consists of sewer main lines and a wastewater treatment plant (WWTP), located at Building X-01. No septic tanks have been identified within the former installation boundary. All water systems were privatized in 2002. At the time of closure, Riverbend Water Resources District managed the sanitary WWTP. At the time of closure, the WWTP was composed of two clarifiers and a chlorination treatment step. Sludge from these clarifiers would be pumped into two anaerobic digesters, which was put into eight sludge drying beds (conveyed via piping) prior to disposal. Historically, sludge was disposed of in WISL, WASL, and off-site (URS 2006).

The oil/water separators present across the installation during its active life discharged to the sanitary WWTP via gravity. Of the 20 oil/water separators at the former installation, 13 were equipped with a 250-gallon waste oil holding tank. These tanks were pumped into a tank truck on a daily basis. Water contents of the truck were pumped into a septic-like tank at Building G-62, which lead to the sanitary WWTP. Emulsified oil from the truck would be placed in drums at Building P-82 and shipped off-site for disposal (URS 2006).

2.10.3 Industrial Wastewater System Description

During the active life of the installation, some areas in the production process which handled explosive powders were washed down at the end of every shift or whenever a batch completed processing. This washdown occurred at pelletizing, screening and blending, and melt/pour operations. The wastewater contained explosive residues, called pinkwater. Pinkwater was also known to contain traces of solvents used to clean equipment (A.T. Kearney, Inc. 1988). Melt/pour operations specifically generated high volumes of pinkwater. Explosive powders would also be washed out of off-specification products in specified wash racks. Manufacturing wastes included primarily explosive wastes, explosives-contaminated wastes, paints, coatings, and solvents (URS 2006).

Industrial sewer lines that serviced the productions areas were operated and maintained by DZI at the time of LSAAP closure. According to the 2006 Environmental Condition of Property (ECP) Report, the industrial sewer system was made up of a total of seven industrial wastewater treatment plants (IWTP); one of which was used for the treatment of chrome- and pyrotechnic-contaminated wastewater (Chrome Removal IWTP [G-130]), one of which was used for the treatment of lead-contaminated wastewater (Lead IWTP [P-78]); and five of which were used for the pre-treatment of pinkwater (wastewater containing TNT, RDX, tetryl, or HMX; URS 2006). The pinkwater IWTPs were located in buildings C-80, E-150, F-93, G-141, and O-47, and were operational beginning in 1975 (A.T. Kearney, Inc. 1988). Wastewater treated at these pinkwater IWTPs were either discharged to streams under NPDES permits or discharged to the on-site sanitary WWTP (Building X-01). The sludges generated through the industrial wastewater treatment process were disposed of off-site, at WISL, or were burned in the HEBG (A.T. Kearney, Inc. 1988).

The Chrome Removal IWTP was used beginning in 1972. It received waste via piping from sumps in Areas B, J, K, P, and Q. It also received waste from sumps via vacuum truck from Area R. The precipitator unit was treated with a daily acid bath to clean the plates, which was cycled from an acid bath solution holding tank. Sludge generated in this treatment process was consolidated and transported to the Lead IWTP for additional treatment prior to off-site disposal. Treated wastewater was discharged to the sanitary sewer.

The Lead IWTP began operation in the 1970s and received wastewater from the Chrome Removal IWTP, Areas K and Q via tank truck, and Area P via a pumped return system. Sludge was stored at P-82 prior to off-site disposal. Treated water was discharged into Aiken Creek.

2.11 Potable Water Supply and Drinking Water Receptors

DZI maintained LSAAP water lines during the installation's active life. Water lines range in size from 6- to 16- inch diameters. Water lines ran through the production areas and the administrative areas in a loop fashion. No water lines serviced the Igloo Areas E, T, V, and W (URS 2006). Water lines are now maintained by Riverbend Water Resources District.

From 1993 until closure, LSAAP purchased potable water from Texarkana Water Utilities (TWU). 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. Prior to 1993, RRAD provided water for LSAAP.

An Environmental Data Resources, Inc. (EDR) report includes search results from a variety of environmental, state, city, and other publicly available databases for a referenced property. An EDR report was generated for LSAAP, which along with state and county GIS provided by the installation identified several off-post public and private wells within two miles of the installation boundary (***Figure 2-4***). The EDR report with well search results is provided as ***Appendix D***.

2.12 Ecological Receptors

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

The habitat within the LSAAP footprint is located in an oak-pine, broadleaf, deciduous, and needle green-evergreen forest. Common vegetation found on the installation includes loblolly short-leafed pine, pine-hardwood, and mixed hardwood associates. The dominant tree species includes red maple, black hickory, southern hackberry, persimmon, sweet-gum, short-leafed pine, loblolly pine, southern red oak, and post oak. Common shrub species found as LSAAP include the American beautyberry, hawthorn, sumac, blackberry, and tree huckleberry. Common grass species include longleaf uniola, purple top, little bluestem, and broomsedge (URS 2006).

Typical resident species found within the former LSAAP footprint include white tail deer, gray squirrel, fox squirrel, raccoon, bobcat, skunk, and armadillo. Common reptiles found within former LSAAP footprint include snakes (cottonmouth, copperhead, and diamondback rattlesnake), box turtle, and snapping turtle. Amphibians include the Texas salamander, siren, great plain narrow-mouthed toad, and bullfrog (URS 2006).

Additionally, over 400 species of birds use the former LSAAP footprint as a stop on their migratory path, or as their home. Game birds found on site include the mourning dove, wild turkey, and nonwhite quail. Several raptor species forage on the property, including the American Kestrel, red tail hawk, and red-shouldered hawk. Migratory waterfowl passing over the Mississippi Valley migration route use the former LSAAP footprint as a temporary refuge. Other birds that have been recorded to use the former LSAAP footprint include the eastern bluebird and green heron (URS 2006).

2.13 Previous PFAS Investigations

Previous (i.e., pre-PA) PFAS investigations, including both those conducted and not conducted by the Army, are summarized to provide full context of available PFAS data for LSAAP. Although no previous (i.e., pre-PA) PFAS investigations relative to LSAAP were identified for review, PFAS sampling in drinking water systems near RRAD and in the public utility that supplies RRAD and LSAAP have been completed in recent years and are described below. However, only data collected by the Army are used to make recommendations for further investigation.

In response to the USEPA's third Unregulated Contaminant Monitoring Rule, PFOA and PFOS were sampled at public water supply systems (serving less than or equal to 10,000 people) throughout the U.S. No water systems in zip codes bordering RRAD were sampled as part of the third Unregulated Contaminant Monitoring Rule. One water system located approximately 5 miles east of the installation was tested but had no detections of PFOA or PFOS (USEPA 2016a).

Water from the public utility which supplies RRAD and LSAAP with drinking water was tested for PFOS and PFOA in 2016 by Texarkana Water Utility; concentrations were reportedly not detected above laboratory reporting limits (below 40 and 20 ng/L, respectively; Tetrahedron, Inc. 2017).

2.14 Exposure/Migration Pathways and Targets

The evaluation of potential exposure and migration pathways and the resulting targets (i.e., receptors) for PFAS in soil, surface water, groundwater, and/or air for the potential AOPIs at the site is presented below.

2.14.1 Soil Exposure Pathways and Targets

Releases of PFAS containing material to soil are known to have occurred at one or more AOPIs at the site. The primary source of known PFAS impacts for the site is AFFF and it is reported to have been released to the ground surface at fire response areas (e.g., Railroad Fire Response, Natural Gas Leak Foam Response, and WISL landfill) and is likely to have been used in fire training at fire stations and the HEBG. The PFAS impacts to soil may remain present near the AOPIs (described further in **Section 5.1**) and may present exposure pathways for direct contact.

Potentially affected targets at LSAAP for direct contact to potentially impacted soil includes commercial and construction workers. The potential for workers to be in direct contact with potentially impacted soils is generally low as the potential release areas are in locations not commonly accessed (e.g., railroad siding, roadsides, and landfills). Access to the Army-owned sites as a whole are generally restricted by fencing and security, and many of the potential AOPIs have additional access controls through gates and security (e.g., open burn/open detonation [OB/OD]areas) and the potential for residential and recreational target exposure (in those areas) is relatively low.

2.14.2 Surface Water Migration Pathways and Targets

A well-developed intermittent surface water drainage system is present at the site. A topographic ridge running east-west influences the surface water flow. 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 in the Sulphur River Watershed. Although there are two main watersheds, there are five main drainage areas throughout the former LSAAP footprint. Drainage areas exit mainly at the northern, western, eastern, south-central, and southwestern boundaries. Drainage runs into many tributaries that feed into six main creeks, the Red River to the north, and three reservoirs (Caney Creek Reservoir and the Elliot Creek Reservoir located on RRAD and Wright Patman Lake located south of RRAD).

Surface water at the site has potential to be an exposure and migration pathway as precipitation drains over and through potential surface soil impacts and enters the intermittent drainages. Additionally, groundwater potentially impacted by PFAS may enter the surface water drainages. Potential surface water exposures are possible on-site and off-site as surface water originating on the site exits the LSAAP and ultimately enters the Red River to the north or Wright Patman Lake to the south of the site.

Targets for potential surface water impacts on-site include site workers who may rarely access intermittent surface water bodies for maintenance activities. Off-site targets include workers, residents, and recreational users that may enter the intermittent surface water drainages or surface water bodies (e.g., Red River or Wright Patman Lake) as off-site access is uncontrolled. Wright Patman Lake also serves as a drinking water source for TWU.

2.14.3 Groundwater Migration Pathways and Targets

Groundwater is present at the site and is potentially impacted by releases of PFAS containing materials from soil at the AOPIs. As described in **Section 2.6**, shallow soils at the site generally exhibit low permeability with precipitation being more likely to enter the local surface water system than entering the underlying aquifers. Shallow groundwater flow at the site is reported to flow north and south based on the topographic divide, which also controls surface water flow directions. Deeper groundwater in the underlying Wilcox and Midway Groups are part of a larger aquifer system with minimally expected recharge from the site. Alluvium is present within the larger surface water conveyances that are downgradient of the site and may provide potable water supplies for residential use.

On-site exposure to groundwater is not anticipated to be an exposure pathway as water wells for purposes other than groundwater monitoring are not present at the LSAAP. LSAAP has deed restrictions in place on sites closed as Remedy Standard B to prevent exposure to any waste left in-place or sites still in the process of being remediated. Properties that have been transferred have the commercial/industrial institutional control**.** Drinking water is provided to LSAAP by an offsite water utility.

Off-site exposure to groundwater is a potential pathway for commercial and residential targets based on the presence of domestic, public supply, and irrigation wells as shown on ***Figure 2-4***. Water supply wells installed within the Wilcox and Midway Groups are potentially but unlikely to be impacted by surficial releases from the site as shallow precipitation and shallow groundwater in soil most likely is migrating into the surface water system. Potential exists for shallow wells screened within the alluvial aquifer of creeks and rivers downgradient of the site to access PFAS impacted surface water entering the alluvial aquifer and being withdrawn as groundwater. The potentially affected targets would include residents and/or commercial workers utilizing the groundwater for a drinking water supply (i.e., ingestion).

2.14.4 Air Migration Pathways and Targets

PFAS impacts in soil or surface water present from pre-BRAC event releases are unlikely to volatize and/or migrate through air under normal atmospheric pressure, pH, and temperatures. A potential may exist for surficial soil with PFAS impacts to dry and become airborne as dust at the release point (e.g., a fire training area exposed to AFFF). Such potential exposure pathways would be limited to the site and the potential targets would include commercial workers and construction workers that may be working near the source area.

Figure 2-1: Site Location

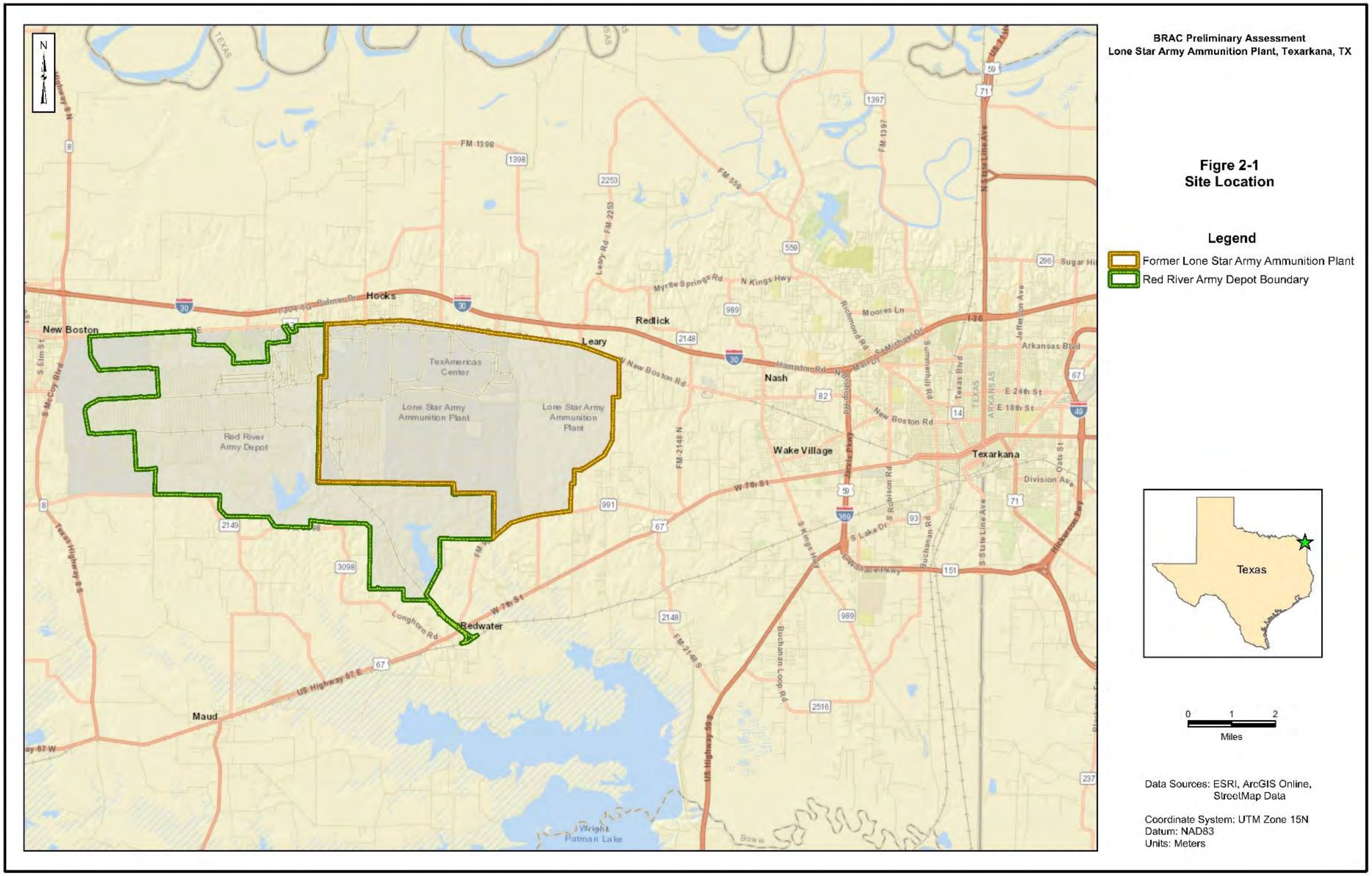


Figure 2-2: Site Layout

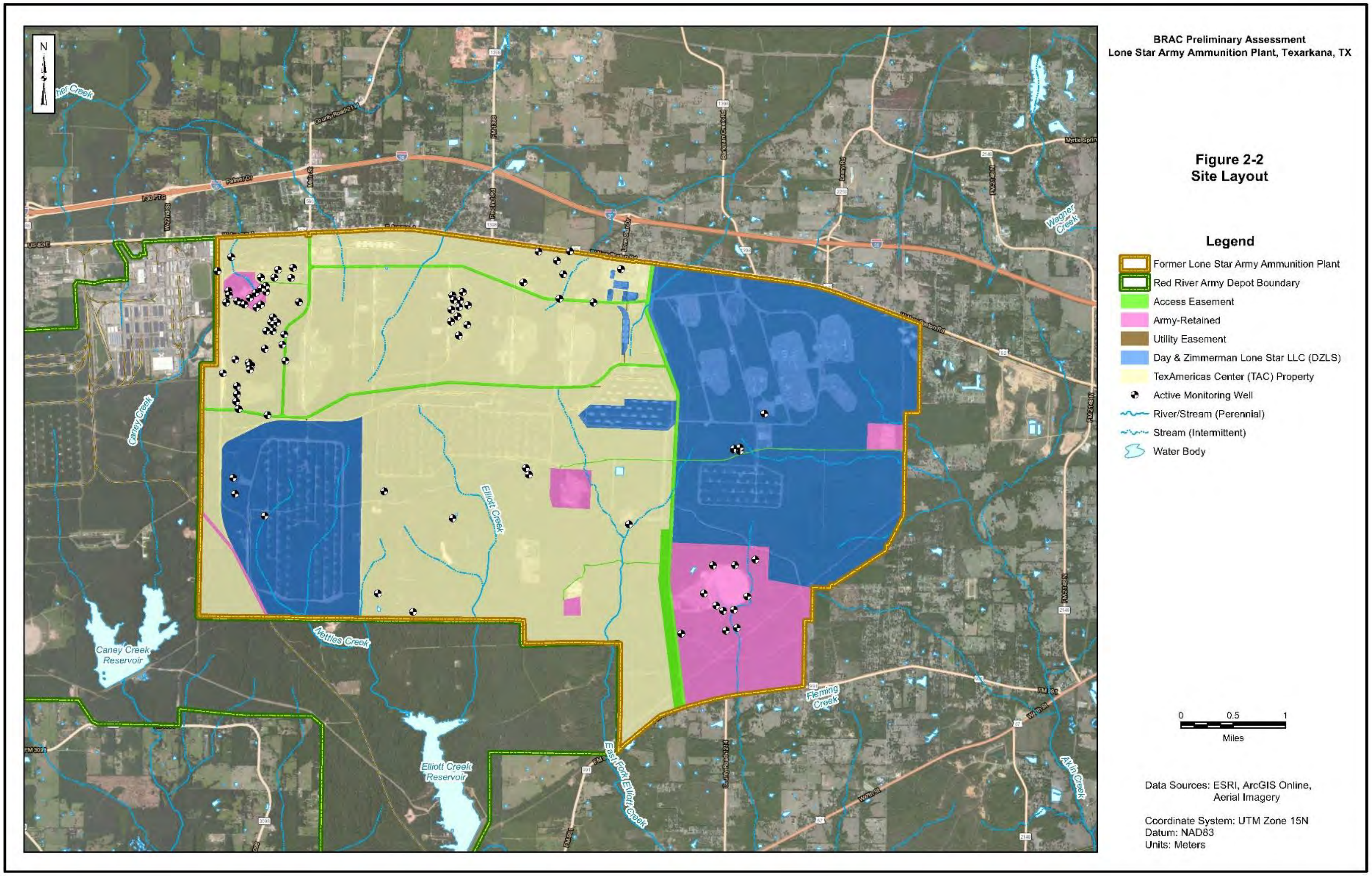


Figure 2-3: Topographic Map

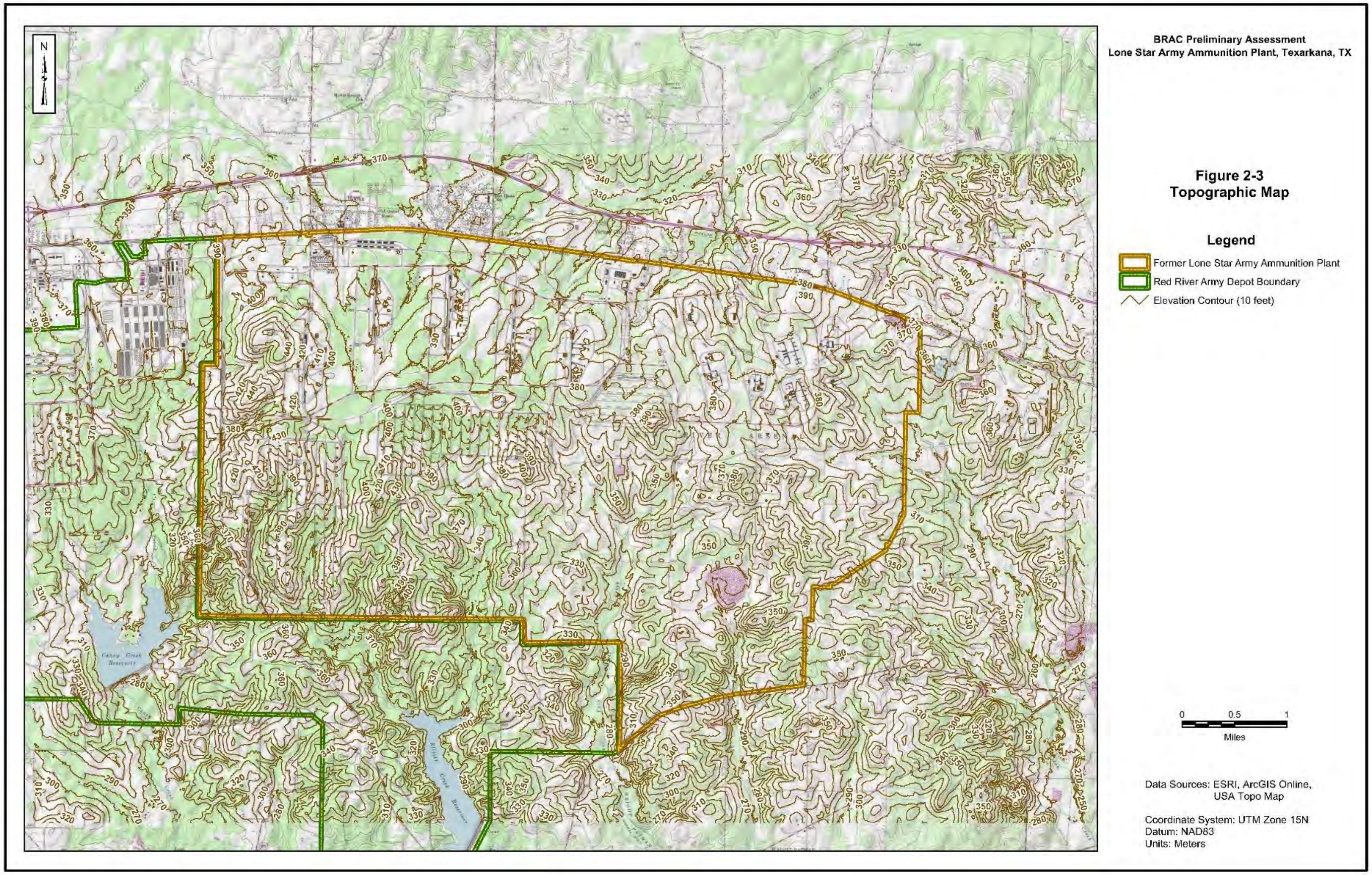
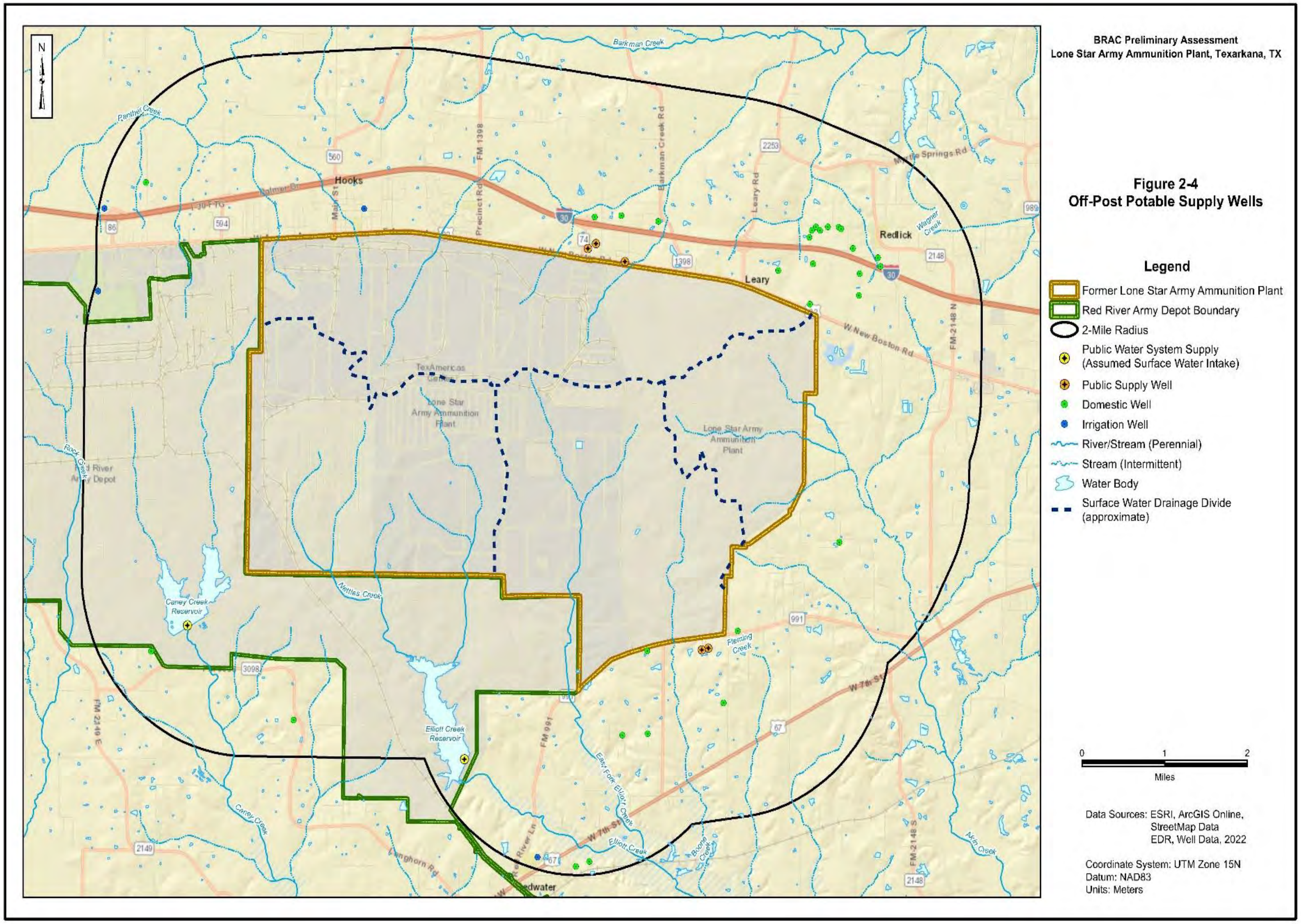


Figure 2-4: Off-Post Potable Supply Wells



3.0 SUMMARY OF PA ACTIVITIES

To document areas where any potential current and/or historical PFAS-containing materials were used, stored, and/or disposed at LSAAP, data were collected from three principal sources of information:

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

These sources of data, along with their relative application to this PA, are discussed below. The specific findings of records review, personnel interviews, and site reconnaissance relevant to PFAS-containing materials at LSAAP are described in **Section 4**.

3.1 Records Review

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

3.2 Personnel Interviews

Interviews were conducted during the PA site visit. However, in the years since active missions at LSAAP ceased in 2009, most DoD personnel associated with the active Army presence and DZI personnel responsible for operations at LSAAP have transferred to alternate assignments, retired, or passed away. Therefore, interviewees with recollections of historical site activities were typically unavailable. The list of roles for the personnel interviewed during the PA process for LSAAP is presented below.

- DZI Director of Maintenance, Environmental and Plant Protection
- DZI Environmental Supervisor
- BRAC Environmental Coordinator
- Riverbend Water District Authority Contractor
- LSAAP Project Manager/General Engineer
- LSAAP Former Fire Chief, Chief of Operations, and Chief of Prevention

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

3.3 Site Reconnaissance

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

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

Preliminary locations of potential use, storage, and/or disposal of PFAS-containing materials were then evaluated in the PA (during records review, personnel interviews, and/or site reconnaissance) and were categorized as AOPIs or as areas not retained for further investigation at this time based on a combination of information collected (e.g., records reviewed, personnel interviews, internet searches). A summary of the observations made, and data collected through records reviews (***Appendix E***), installation personnel interviews (***Appendix F)***, and site reconnaissance (***Appendix G***) during the PA process for LSAAP is presented in **Section 3**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.2**.

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

LSAAP was evaluated for all potential historical use, storage, and/or disposal of PFAS-containing materials during Army ownership. This section is organized to summarize the AFFF-related uses first, and all remaining potential PFAS-containing materials in the subsequent subsection.

4.1 Aqueous Film Forming Foam (AFFF) Use, Storage, and Disposal Areas

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

As described in **Section 3.2**, due to the time interval since 2009 when active missions at LSAAP ceased, interviewees with recollection of historical site information that is not typically well documented in environmental records, such as AFFF or general firefighting foam inventory data, were scarce. At LSAAP, one record shows that three types of AFFF were stored on site: Aero-water 6EM (produced by National Foam) and FC-500 Light Water ATC AR-AFFF 3% and FC-500 Light Water ATC AR-AFFF 6% (both produced by 3M) (URS 2006). A 5-gallon container of FC-500 Light Water ATC AR-AFFF 3% was observed in the storage area of the New Fire Department Headquarters during the PA site visit, with a manufacture date of 1989. Interviewees stated that this foam had been in storage prior to the BRAC transfer.

Emergency preparedness procedures practiced by the LSAAP Fire Department regarding nozzle testing (spraying AFFF through fire equipment to ensure proper consistency and flow of extinguishing material; avoiding blockages), wet lining (spraying diluted concentrations of AFFF or AFFF through a foam nozzle device to prevent the spread of fires) or arc training (training to maximize the arc, reach, and distance covered by AFFF) were not available through interviews or document review. Nozzle testing is anticipated to occur wherever firefighting equipment was stored and regularly utilized.

Firefighter Training:

The location(s) where firefighting training may have occurred historically is unclear. Records from 1953 state that firefighter training involved the familiarization of personnel with fire alarms and telephones. They were then familiarized with fire extinguishers, their locations, and the types of fires these extinguishers would be used on. After they learned how to use the house lines and related equipment, they would be taken “into the area” with a truck and crew and taught drills

(DZI 1953). The area they were taken into was not specified. During the week of 11 April 1954, an annual efficiency test started for the fire department wherein all members below the rank of assistant chief were required to demonstrate their ability to perform the minimum standard of performance that would be required of them on the Fire Grounds (DZI 1954). The location of the Fire Grounds was not indicated in any of the records reviewed. Considerable time was spent during the 1954 reporting period regarding the training of firemen; with records stating that some of the training was simulated under actual conditions constructed for this purpose. To do this, large piles of pallets and boxes were stacked on both sides of the burning pit with crankcase oil used to boost the fire. These drills were described as being as realistic as possible. However, the location of this training area, the dates of historic use, and the extinguishing material used for this training are not described in any documents available for review. One 1970 report commends the LSAAP for having won 10th place in the Military Division of the National Fire Protection Association's Fire Prevention Contest but does not describe the qualifications which resulted in the awarded merit. It also states that LSAAP participated and led off-plant fire prevention programs in Texarkana in the 1970s (DZI 1970). However, these records did not detail what these programs entailed, how frequently they convened, and where they took place. One record stated that aircraft crash and train derailment emergency response training was conducted as they may affect the mission of LSAAP, but that no designated training area existed on the installation (LSAAP 1978). Records detailing regular firefighter training after 1970, when AFFF would have been first available for use, were not available for review. Firefighter training areas that were active in the 1970s are likely to have utilized AFFF.

Records and interviews state that fire department personnel would often stand by while HEBG conducted burns, ready to respond to any potential out of control fires (DZI 1984, LSAAP 1986). Explosive waste would be stored in diesel oil to reduce sensitivity. Although AFFF is used on hydrocarbon-based fires, the risk posed by the explosive materials present would prevent firefighting personnel from approaching. Burn pans were maintained so that surrounding vegetation would be cleared to reduce the possibility of a brush fire. If a brush fire did occur, AFFF would not be the extinguishing material recommended for use. Firefighter presence may have been required during burning exercises so that they could respond to any brush-related fires, which is unlikely to have involved the use of AFFF. Records do show one interview which stated that "fire training exercises" were conducted at "XX Burn", which is understood to be the HEBG, but that exercises had not been conducted there since 1986 (URS 2006). These exercises reportedly consisted of burning boxes inside metal containers using diesel as an igniter. Records do not indicate whether fire training exercises utilized AFFF or other types of extinguishing materials. However, the period of use does coincide with the manufacture date of the FC-500 Light Water ATC AR-AFFF 3% identified on site during the PA and it is therefore likely that AFFF was used in these training exercises.

Records show that in 1994, a joint firefighting exercise was conducted at LSAAP, using scrap wood, boxes, and pallets (LSAAP 1994). A letter dated 15 May 1995 between the LSAAP Technical Division, and the Texas Natural Resources Conservation Commission confirms that the fire department previously conducted firefighter training annually but only using simulated fires. Local fire departments and RRAD took part in these training exercises. The May 1995 letter states that a firefighter training exercise would be conducted over a series of three days outside the New Fire Department Headquarters (Building I-71). A total of three gallons of diesel fuel would be burned on the concrete pad west of the building (LSAAP 1995). It is likely that AFFF was used as part of the 1995 training as it was the recommended extinguishing material at the time. It is unknown whether AFFF was utilized in earlier trainings.

Historic photos, estimated to have been taken some time between the 1960s and 1970s, were identified during the PA site visit and show firefighting training activities occurring on an aircraft hull and aboveground storage tank. However, interviewees and additional record review did not provide information that resulted in the identification of the site. These photos did not match the layout of the HEBG, and show several flags displayed in the background, including Brazil and Great Britain, as well as the state of Tennessee. It was determined that these photos were captured at a location that was not LSAAP.

The majority of records related to firefighter training were those from the 1950s to the early 1970s. Limited documentation was available for review pertaining to firefighter training activities in the 1990s and possibly the late 1980s, and interviewees had related installation experience back to the late 1980s. Thus, a significant data gap exists on the activities conducted by firefighters between the 1970s and late 1980s. Although AFFF was not available to the military until 1970, understanding the activities that were conducted before and after the present data gap (1970 through the late 1980s) can illustrate what may have occurred once AFFF was made available for use.

Fire Stations:

The Former Fire Department Headquarters, located in Building I-04, was utilized between 1942 and 1981, until it was demolished sometime between 1981 and 1984. Historical aerials from 1953-1980 show a large-heavily trafficked area bounding the Former Fire Department Headquarters to the north, west, and southwest. These aerials show the areas west and southwest of the station to have been used for parking in this time but not material storage (Environmental Research Inc. 2006). The area north of the station does not show parking or any other structures to have been present during this time despite the area having been well-trafficked. In this area, north of the station, historic utility figures show two fire hydrants, both approximately 100 feet north of the station and 200 feet from each other, positioned within this heavily trafficked area. A description of how this land was utilized was not identified in the reviewed documentation. Based on proximity to the former station and positioning within an empty, trafficked area, they may have been used for historic firefighter training. Nozzle testing was reported as being performed south and/or east of the building. Operations were moved to the New Fire Department Headquarters, identified as Building I-71. During the PA site visit, it was confirmed the New Fire Department Headquarters stored buckets of AFFF. It was confirmed during site visit interviews that AFFF was stored at the Fire Station Headquarters. The Central Stores Building, located in Building I-32, was the initial storage area for AFFF before it was distributed to other use areas across the installation. As described previously, at least one firefighting exercise was conducted at the New Fire Department Headquarters using diesel in 1995, which would have required AFFF as the extinguishing material. This record states that in the past, the fire department had simulated fires and that the training was performed annually. In 1994, the installation requested that a training exercise was conducted at the New Fire Department Headquarters with RRAD and other local fire departments but performing on wood-based fuels rather than diesel. Records do not state whether a fire was ignited for this exercise. A fire hydrant is located on the southwest corner of the I-04 block, which most likely utilized during these fire training exercises. Fire Department equipment was repaired and stored at the Automotive Repair Facility (Building I-29).

The Former East Fire Station (Building M-11) was constructed in 1942. In 1971, its use transitioned to a fire department storage building. Its period of operation as a fire department storage area coincides with the period of AFFF use on military installations. However, records describing AFFF were not available for review and interviewees did not know whether AFFF had ever been stored in this building. Interviews indicate that the building was rarely utilized. It was demolished sometime between 1995 and 2005.

During the PA interviews, the northern portion of Area V was identified as a region where another fire station may have existed. The portion of the area indicated consisted of Building V-29 and V-31. Building V-31 is not visible on any historical aerials, which included those from 1968, 1970, 1980, 1995, and 2004. It was therefore concluded that the building was planned but never constructed. Building V-29 was present, but there were no records to indicate that AFFF was stored here or that the building was utilized by the Fire Department.

The Former West Fire Station (Building BB-27) was used to support the Fire Department and the Security Force from 1942 until the late 1980s. Its period of operation coincides with the period of AFFF use on military installations. However, records describing AFFF were not available for review and interviewees did not know whether AFFF had ever been stored in this building.

Emergency Responses:

Emergency responses are not well documented in LSAAP records, and do not indicate the type of foam deployed in response to different types of fires and if it was utilized for spills. Interviews and knowledge on explosive safety procedures can help inform whether AFFF was utilized in response to an emergency. Records do indicate that LSAAP responded to on- and off-site fires (DZI 1956).

According to PA interviews, a diesel train engine ignited adjacent to Former West Fire Station, across the street, where multiple aboveground storage tanks were positioned. Interviews indicate that firefighters responded to this derailment with AFFF. The exact volume of AFFF deployed was not known.

A tire fire at WISL occurred in the 2008/2009 timeframe. It was reported that the fire was responded to with AFFF. The volume deployed is not known. AFFF had also been deployed north of Area A in response to a natural gas leak also 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 utilities run. The general location of the natural gas leak is shown in ***Figure 5-7***.

In 2000, an electrical fire in Area Q resulted in the loss of 47 buildings. However, firefighters were not deployed to control fires at Load, Assembly and Pack (LAP) lines due to the presence of an explosive hazard. Instead, the firefighters positioned themselves around the perimeter of the area so that fire would not spread outside of it. It is also understood that production area buildings were not outfitted with AFFF-based fire deluge systems (US Army Armament Research and Development Command 1980). Therefore, AFFF would not have been utilized in response to this fire.

Historic site photos additionally indicate that Building E-06 ignited in August 1975. The cause of fire and extinguishing material were not described; however, structural fires are unlikely to have been responded to with AFFF unless a Class B fire hazard was present, which is not indicated in records that were available for review. Therefore, it is unlikely that AFFF was utilized in this response.

Historically, LSAAP experienced explosions in Area C, Area I, Area T and Area V. However, these explosions occurred prior to the 1970s and therefore pre-date the period in which AFFF would have been used in the response. Due to the explosive hazards in production areas, firefighters, and therefore AFFF, were also unlikely to have been deployed.

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

Following document research, personnel interviews, and site reconnaissance, ordnance production areas, chrome plating operation areas, landfills, silver recovery areas, a sewage treatment plant, various munitions disposal pits, a pesticide storage building, and various munitions production disposal ponds were utilized after this date and therefore were also identified as possible locations for use, storage, and/or disposal of PFAS-containing materials. A summary of information gathered in the PA for each of these preliminary locations is described below. Specific discussion regarding areas retained as AOPIs is presented in **Section 5.1** and specific discussion regarding areas not retained for further investigation is presented in **Section 5.2**. PFAS-containing materials may be involved in the production and processing of ordnance. However, the availability of documentation regarding the use of PFAS containing materials as part of the ordnance manufacturing process at LSAAP prior to the BRAC event is limited as described below.

Pesticides:

Sulfuramid, flursulamid, novaluron, nifluiridide, and lithium PFOS are among several insecticides which are formulated with PFAS. The PA team reviewed available pesticide use inventory documentation provided by the installation and did not identify PFAS-containing pesticides use, storage, or disposal.

Lubricants:

Perfluorocarbons and hydrofluorocarbons are used to dissolve and deposit lubricants on a range of substrates and are used in lubricants themselves. Powder coatings are fluoropolymers in powder form (like PTFE) that can be applied by spraying or by dipping and then curing an object. PFOA has been historically used as a catalyst for this process.

PFAS serve in lubricants to prevent rusting, allow mechanisms to operate without forming a sludge that could cause mechanical failures, and secure seals. The U.S. military specified a lubricant for use with ammunition which had a 20% fluorocarbon telomer dispersion in 1,1,2-trichloro-1,2,2-trilfluoroethane. This specification existed from 1965-1998 (Army MU 1965). A multitude of buildings at the former installation were utilized for coating operations, but chemical lists for these operations were not available for review (URS 2006). PTFE is described in reviewed documents as having been utilized as a dry film lubricant at LSAAP and was specifically listed as having been sprayed in the Chrome Plating Machine Shop located in Building I-30 (URS 2006, DZI 2003).

Storage Igloo V-11-1 held materials containing PFAS components such as Viton A®, PTFE, and a lubricant likely similar to PTFE (fluorocarbon telomer; URS 2006). The fluorocarbon telomer was stored in an aqueous form and both PTFE and Viton A® were stored in their solid forms. However, there are no records indicating spills of these materials.

Metal Cleaning:

PFAS can be used in metal surface cleaning, as part of the molten-salt bath pickling process. PFAS are used in these baths to disperse scum, speed runoff of acid once the metal is removed, and increase bath life. There are government patents on using perfluoroalkane solvents to clean oily surfaces. On May 18, 1976, patent US3957672A of the U.S. Department of Navy was published. US3957672A patents compositions for displacing organic liquid films from solid surfaces using perfluoroalkane solvents (U.S. Department of Navy 1976). The Chrome Removal IWTP had a precipitator unit which had sludge cleaned off it daily using an acid bath, but the chemical contents of that acid bath were not available for review (Dames & Moore 1992). One record indicated the use of Kleen ATMS, an industrial metal cleaner which contains highly fluorinated substances, as having been used in Building B-46 (LSAAP 1999). Records did not indicate that this cleaner was utilized in any other buildings.

X-Ray Development:

Fluorinated surfactants have been used as antifoaming agents in silver halide photographic processing solutions in order to eliminate air bubbles that can cause failure in image transfer (Gluege et al. 2020). X-rays were taken of munitions for evaluation in Areas B, E, and S. Silver recovery units were present in Area S and Area E in order to recover silver from x-ray films developed there. This wastewater was eventually discharged to the sanitary WWTP. No safety data sheets, or other records were available for review to confirm whether the silver being recovered may have been in a solution which contained PFAS.

Metal Plating:

Potential PFAS use associated with metal plating activities may also be relevant to Army installations and are not necessarily related to the production of ordnance. During metal plating operations, a metal surface may be treated with a layer of electrochemically deposited metals in an acid bath. PFAS, specifically PFOS, have been used in metal plating operations as surface tension-reducing wetting agents to mitigate the release of aerosolized chemicals into a working environment. Hard chromium plating is one type of metal plating operation where PFAS-containing mist suppressants were commonly used. Historically, it was common for spent plating baths from metal plating operations to be disposed of in a lined or unlined pit or into a sanitary or storm sewer. Therefore, PFAS present in mist suppressants during the metal plating process could be released to the environment. Metal plating occurred in Area I in the Chrome Plating Machine Shop and in Area G Buildings G-1 and G-2.

Chromium sludges from the Chrome Plating Machine Shop were discharged into a ditch (the ditch is listed as solid waste management unit (SWMU) 037 on LSAAP's RCRA Permit) that ran behind the building until 1968, when wastewater from these operations as well as the Area G plating operations was sent to the G Ponds for disposal. Chrome Plating Machine Shop waste disposal continued to be trucked to the G Ponds from 1968 until the early 1980s, when a treatment process was installed to remove chromium and wastewater was then either recycled or discharged to the sanitary sewer. Plating operations were moved off-site in 1987.

A Chemical Burial Site (SWMU-023) was reportedly used to dispose of 50, 55-gallon drums of sulfuric acid, chromic acid, and other industrial organics. Although records indicate that the drums were buried here, geophysical surveys did not identify the presence of buried drums, and TCEQ granted no further action in 1992. Available documentation does not identify PFAS-containing materials as being buried at this location.

The Area G Ponds consisted of three unlined closed surface impoundments which were used to hold spent sulfuric acid, chromic acids, nitric acids, sodium hydroxide, and rinse water generated from cartridge case cleaning and resizing operations in the Area G LAP Line as well as chromium waste from the Chrome Plating Machine Shop. From 1968 to the early 1980s, wastewater and sludge from the Chrome Plating Machine Shop was disposed of here. Records detailing whether waste produced at the Chrome Plating Machine Shop contained PFAS were not available for review. From 1942 to 1972, wastewater from the Area G LAP line was also discharged into the Area G Ponds. Chemical inventories reviewed do not detail PFAS-containing materials as having been processed through the Area G LAP line. After 1972, wastewater was sent to G-130, the Chrome Removal IWTP. The Area G Ponds were closed as a surface impoundment, with sludge in place, in 1983.

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, however, only positively confirm the use of PFAS-containing materials in the Chrome Plating Machine Shop (based on the surface coating of PTFE as a dry film lubricant).

4.3 Readily Identifiable Off-Post PFAS Sources

An exhaustive search to identify all potential off-post PFAS sources (i.e., not related to former operations at LSAAP) is not part of the PA. However, potential off-post PFAS sources within a 5-mile radius of the former installation footprint that were identified during the records search and site visit are described below. Post transfer activities are unknown for the sites transferred.

The Hooks Fire Department and two C5 Volunteer Fire Stations are present on the northern boundary of the former LSAAP footprint. Records indicate that firefighters at LSAAP would train with community fire departments. Records also indicate that AFFF was utilized on site. Therefore, it was possible that these fire departments could have responded to fires with AFFF.

PFAS is known to be used in specific industries. The USEPA has identified sectors under the North American Industry Classification System (NAICS) and Standard Industrial Classification (SIC) system which are associated with PFAS in their operations. Facilities within 5 miles of LSAAP that are categorized under these industrial classification sectors have been identified below. These facilities may be primary or secondary sources of PFAS based on their historical operations.

The Texana Class II Landfill is an inactive landfill (SIC code 4953: Refuse Systems) whose operational permits expired in 2007. It was located one and a half miles east of the former LSAAP boundary.

Red Lick Enterprises is an active metal coating facility (SIC codes: 3471: Plating and Polishing and 3479: Metal Coating and Allied Services). It is located one and a half miles northeast of the former LSAAP boundary.

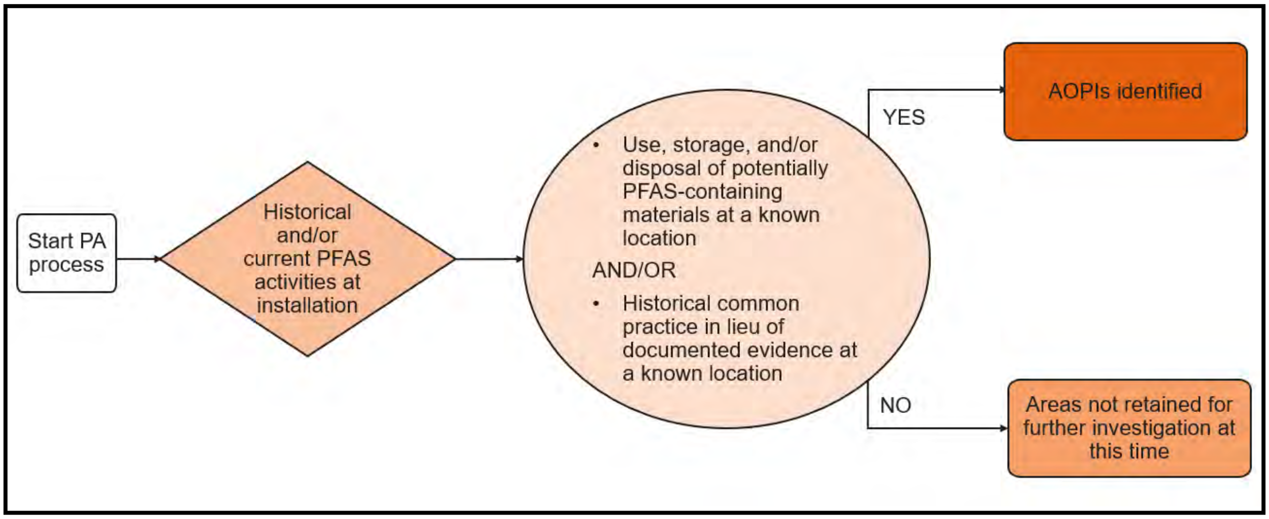
Mescalera Oil and Gas Company is an inactive chemical manufacturing plant (SIC codes 2869: Industrial Organic Chemicals and 4922: Natural Gas Transmission). It is located one mile south of the former LSAAP boundary.

The Martin Nash Facility is an active facility which manufactures chemicals (SIC code 2869: Industrial Organic Chemicals). It is located one and a half miles west of the former LSAAP boundary. The New Boston LLC Red River Biodiesel Plant is an active plant used for the manufacture of chemicals (SIC code 2869: Industrial Organic Chemicals and NAICS code 325199: All other Basic Organic Chemical Manufacturing). It is located one mile west of the former LSAAP boundary.

5.0 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage, and/or disposal of PFAS-containing materials at LSAAP were further refined during the PA process and identified either as an area not retained for further investigation or as an AOPI. In accordance with the established process for the PA, 11 areas have been identified as AOPIs and are discussed in **Section 5.1**. The process used for refining these areas is presented on ***Figure 5-1***, below.

Figure 5-1: AOPI Decision Flowchart



The areas not retained for further investigation are presented in **Section 5.2**. PFAS can be present in ordnance production processes (Ang et al 2012, De Barros 2016, James 1965, Olsavsky 2020, U.S. Patent Office 1964, Yeager et al 2010, Gluege et al 2020). However, it has not been established how commonly they have been utilized in the production processes conducted (e.g., preparing, blending, mixing, melt loading, pelleting, painting, spraying, coating, chrome plating, composing, etc.) during the operational history of LSAAP. Some records available for review do indicate that some materials containing PFAS (e.g., Viton A®, PTFE, and a fluorocarbon telomer likely similar to PTFE) were stored on site but do not go into detail on the utilization of those materials (URS 2006). Other records available for review show that PFAS-containing materials were applied in the Chrome Plating Machine Shop in lubricating, but do not indicate whether the materials were applied elsewhere (LSAAP 1999, DZI 2003). An all-encompassing resource describing the chemicals used in the ordnance production processes was not available for review for the purposes of this PA. Without an understanding of historical common practice at LSAAP, if the records review, site reconnaissance, and interviews did not document the presence of PFAS in these specific activities, the preliminary location was identified as an area not retained for further investigation instead of an AOPI. However, use of PFAS containing materials in many site areas is possible. As a result, this represents a data gap.

Data limitations for this PA at LSAAP are presented in **Section 6**.

5.1 AOPIs

Overviews for each of the 11 AOPIs identified during the PA process are presented in this section. The AOPI locations are shown on ***Figure 5-2***. Aerial photographs of each AOPI that also show the approximate extent of AFFF use (if applicable) are presented on ***Figures 5-3*** through ***Figures 5-10.*** Buildings are displayed on these figures; identified as "Production Area Features".

5.1.1 Former Fire Department Headquarters (Building I-04)

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 was located in Building I-04, which has been demolished as shown on ***Figure 5-3***. The Former Fire Department Headquarters was the original headquarters location and housed fire protection equipment and personnel. Shipments of AFFF were first brought to the Former Fire Department Headquarters before being distributed to other fire stations. The Former Fire Department Headquarters was utilized from 1942 to 1981. The building was originally constructed in a horseshow pattern surrounding the communications building. Operations were later moved to Building I-71. The Former Fire Department Headquarters was demolished sometime between 1981 and 1984.

An aerial photograph of the Former Fire Department Headquarters is provided on ***Figure 5-3*** The Former Fire Department Headquarters is located in the I Area. Runoff would likely flow to the east toward a swale that runs parallel to the street. The street runs from north to south.

This area was transferred to TAC. and no restrictions were applied. TAC has the commercial/industrial institutional control.

5.1.2 New Fire Department Headquarters (Building I-71)

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 and operated by DZLS. The Fire Station is located in Building I-71 and is shown on ***Figure 5-3***. The Fire Station housed fire protection equipment and personnel. It was confirmed during site visit interviews that AFFF was stored at the Fire Station Headquarters. 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.

An aerial photograph of the Fire Station Headquarters is provided on ***Figure 5-3***. The Fire Station Headquarters is located in the I area with drainage swales surrounding the building. Flow would likely flow south towards storm drains. Drains are also located inside the New Fire Station Headquarters Bay. No restrictions were applied.

5.1.3 Automotive Repair Facility (Building I-29)

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 is located in Building I-29 and is shown on ***Figure 5-4***. The Automotive Repair Facility serviced and stored emergency vehicles, including 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.

An aerial photograph of the Automotive Repair Facility is provided on ***Figure 5-4***. The Automotive Repair Facility is located in Area I. The area is highly developed. The surrounding area mainly consists of paved roads, cemented driveways, and gravel. Runoff most likely flows east of the building into swales, and then continues to flow south towards the road.

This area was transferred to DZLS. DZLS has the commercial/industrial institutional control.

5.1.4 Chrome Plating Machine Shop (Building I-30)

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 is located in Building I-30 and is shown on ***Figure 5-4***. It was utilized from 1952 until installation closure. 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 (URS 2006, DZI 2003).

An aerial photograph of the Chrome Plating Machine Shop is provided on ***Figure 5-4***. The area is highly developed. The surrounding area mainly consists of paved roads, cemented driveways, and gravel. Runoff most likely flows west of the building via drainage ditch (SWMU-037), and then continues to flow south towards the road.

This area was transferred to DZLS. DZLS has the commercial/industrial institutional control.

5.1.5 Central Stores Building (Building I-32)

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 and is shown on ***Figure 5-4***. It was utilized from 1952 until installation closure.

An aerial photograph of the Central Stores Building is provided on ***Figure 5-4***. 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.

This area was transferred to DZLS. DZLS has the commercial/industrial institutional control.

5.1.6 Former West Fire Station (Building BB-27) (SWMU-423)

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 and is shown on ***Figure 5-5***. Area BB was used to support the Fire Department and Security Force. The West Fire Station housed fire protection equipment and personnel. 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 potentially stored AFFF. AFFF was confirmed to have been stored and utilized on the installation according to records. Additionally, a train derailment that occurred approximately 300 feet to the east was reportedly responded to with AFFF (**Section 5.1.7)**. The Former West Fire Station most likely responded to the fire. 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.

An aerial photograph of the Former West Fire Station is provided on ***Figure 5-5.*** 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.

This area was transferred TAC. TAC has the commercial/industrial institutional control.

5.1.7 Railroad Fire Response Area

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 as shown on ***Figure 5-5***. It was reported that a train engine fire that 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.

An aerial photograph of the Railroad Fire Response is provided on ***Figure 5-5***. 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 area was transferred TAC. TAC has the commercial/industrial institutional control.

5.1.8 Former East Fire Station (Building M-11)

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 in Building M-11 and is shown on ***Figure 5-6***. The Former East Fire Station housed fire protection equipment and personnel. The Former East Fire Station potentially stored AFFF. AFFF was confirmed to have been stored and utilized on the installation according to records. The Former East Fire Station was constructed in 1942. In 1971, the building had been 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.

An aerial photograph of the Former East Fire Station is provided on ***Figure 5-6***. The Former East Fire Station is in the M Area. The former building was located within a fenced area surrounded by grassy area to the north, west, and south. Runoff would likely flow south, southwest, where there was no apparent stormwater drain nearby.

This area was transferred to DZLS. DZLS has the commercial/industrial institutional control.

5.1.9 Natural Gas Leak Foam Response Area

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 deployed 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.

An aerial photograph of the is provided on ***Figure 5-7.*** 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 area was transferred TAC. TAC has the commercial/industrial institutional control.

5.1.10 High Explosives Burning Ground (HEBG) (SWMU-016)

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 and is shown on ***Figure 5-8***. 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 a RCRA permit.

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 is likely to have been AFFF. The specific location where these exercises occurred within the HEBG was not identified in historic records. This area is still in Army's possession.

5.1.11 Western Inactive Sanitary Landfill

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 40 acres in the northwestern portion of the former installation's boundary and is shown on ***Figure 5-9***. 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.

An aerial photograph of the WISL is provided in ***Figure 5-9***.

This area was transferred TAC. TAC has the commercial/industrial institutional control.

5.2 Areas Not Retained for Further Investigation

Through the evaluation of information obtained during records review, personnel interviews, and/or site reconnaissance, the areas described below were categorized as areas not retained for further investigation at this time (i.e., non-AOPIs). The locations of the non-AOPIs are shown on ***Figure 5-10***.

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

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

Area Description	Dates of Operation	Relevant Site History	Rationale	Data Gap	Land Ownership
Area B Load, Assemble, and Pack (LAP) Line	1940s - 2009	Major caliber load line. Operations included melting and melt loading, servicing, painting, and demilitarization. One record indicated the use of Kleen ATMS, a highly fluorinated industrial cleaner.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	TAC[1]

Table 5-1: Installation Areas Not Retained for Further Investigation					
Area Description	**Dates of Operation**	**Relevant Site History**	**Rationale**	**Data Gap**	**Land Ownership**
Inactive Area C Load, Assemble, and Pack (LAP) Line	1940s - 2009	Major caliber load line. Operations included melting and melt loading, servicing, painting, and demilitarization. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	TAC[1]
Inactive Area E LAP Line	1940s - 2009	Major caliber load line. Operations included melting and melt loading, painting, demilitarization, and silver recovery of x-rays. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	TAC[1]
Area F LAP Line	1940s - 2009	Major caliber load line. Operations included preparation, composition, blending, melting and melt loading, loading, pelleting, servicing, painting, and cleaning/washout. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	TAC[1]
Area G LAP Line	1940s - 2009	Major caliber load line. Operations included composition, blending, mixing, melting and melt loading, loading, pelleting, servicing, painting, demilitarization, cleaning/washout, and chrome plating. A chrome removal plant treated chromic wastewaters from across the installation. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	Expansion Ammunition
G Ponds	1942 - 1972	Three unlined closed surface impoundments which were used to hold spent sulfuric acid, chromic acids, nitric acids, sodium hydroxide, and rinse water generated from cartridge case cleaning and resizing operations in the Area G LAP Line as well as chromium waste from the Chrome Plating Machine Shop. PFAS can be utilized in industrial processes, such as chrome plating. The ponds were closed as a	The dated record of PFAS use in the Chrome Plating Machine Shop takes place after its waste was no longer brought to the G Ponds	A complete list of chemicals utilized in the areas that contributed waste to these ponds, nor individuals with historic site knowledge during the years of operation were available. Therefore, it cannot be verified whether PFAS-	Expansion Ammunition

Table 5-1: Installation Areas Not Retained for Further Investigation					
Area Description	**Dates of Operation**	**Relevant Site History**	**Rationale**	**Data Gap**	**Land Ownership**
		landfill, sludge in place, in 1982.		containing materials were disposed of here.	
Inactive Area J LAP Line	1940s - 2009	Major caliber load line. Operations included blending, pelleting, and painting. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Area K LAP Line	1940s - 2009	Major caliber load line. Operations included blending, loading, pelleting, and demilitarization. A pinkwater industrial waste treatment plant treated pinkwater generated here. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Inactive Area M LAP Line	1940s - 2009	Major caliber load line. Operations included blending and pelleting. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Area O LAP Line	1940s - 2009	Major caliber load line. Operations included blending, melting and melt loading, painting, and spraying. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
O Ponds	1972 - 1978	Seven closed-surface impoundments and replaced the individual series of pits and sump systems used for wastewater disposal in each production area. PFAS can be utilized in industrial processes, such as ordnance manufacturing. The area served to settle pinkwater solids from washdown operations beginning in 1942. Wastewater was conveyed here via tanker truck or by piping until 1978. They were closed as a landfill, sludge in place, in 1982.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	A complete list of chemicals utilized in the areas that contributed waste to these ponds was not available for review. Therefore, it cannot be verified whether PFAS-containing materials were disposed of here	DZI

Table 5-1: Installation Areas Not Retained for Further Investigation					
Area Description	**Dates of Operation**	**Relevant Site History**	**Rationale**	**Data Gap**	**Land Ownership**
Area P LAP Line	1940s - 2009	Major caliber load line. Operations included preparation, mixing, loading, pelleting, and maintenance. PFAS can be utilized in industrial processes, such as ordnance manufacturing.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Former Area Q LAP Line	1940s - 2000	Major caliber load line. Operations included preparation, composition, blending, mixing, pelleting, and painting. PFAS can be utilized in industrial processes, such as ordnance manufacturing. A large fire took place here in 2000, burning down 40 buildings. AFFF can be used as an extinguishing material in hydrocarbon-based fires and to prevent fires from spreading using a technique called wet-lining.	Interviewees stated that firefighters would not respond to fires where MEC hazards were present. Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed.	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Area R LAP Line	1940s - 2009	Major caliber load line. Operations included preparation, blending, loading, painting, and cleaning / washout. PFAS can be utilized in industrial processes, such as ordnance manufacturing	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Area S LAP Line	1940s - 2009	Major caliber load line. Operations included preparation, blending, loading, and silver recovery of x-rays . PFAS can be utilized in industrial processes, such as ordnance manufacturing	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Use of PFAS-containing materials at the LAP line could not be verified through documentation or interviews.	DZI
Area T Igloo 3 Explosive Incident	1969	A fire occurred at Igloo T3, row 2 when 681,000 rejected detonators and relays from Areas P and Q exploded. AFFF can be used as an extinguishing material in hydrocarbon-based fires and to prevent fires from spreading using a technique called wet-lining	The fire predates possible utilization of AFFF	None identified.	DZI
Area V Igloo 2 Incident	2006	An igloo used for storage of paints, primers, thinners, and adhesives in support of ordnance production processes. Stressed vegetation was noted on the	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	Records do not indicate the specific materials stored in this igloo, whether these materials	DZI

Table 5-1: Installation Areas Not Retained for Further Investigation					
Area Description	**Dates of Operation**	**Relevant Site History**	**Rationale**	**Data Gap**	**Land Ownership**
		north side of the concrete loading area at Igloo V2, row 10. PFAS can be utilized in industrial processes, such as ordnance manufacturing.		contained PFAS, or whether a spill source was ever determined. An individual with historic site knowledge during the years of operation was not available to interview. Therefore, it cannot be verified whether PFAS-containing materials were utilized here	
Area V Igloo 7 Explosive Incident	1969	An explosion at Igloo V7, row 3 when a van with 531,000 detonators exploded in the area. AFFF can be used as an extinguishing material in hydrocarbon-based fires and to prevent fires from spreading using a technique called wet-lining.	The fire predates possible utilization of AFFF.	None identified.	DZI
Chemical Burial Site (LSAAP-023)	1950s – 1968	Reportedly used to dispose of 50, 55-gallon drums of sulfuric acid, chromic acid, and other industrial organics. Although records indicate that 50, 55-gallon drums of sulfuric acid, chromic acid, and industrial organics were buried here, geophysical surveys geophysical surveys did not identify the presence of buried drums. Review of aerial photographs indicate the disposal area appeared sometime between 1950 and 1960, and were overgrown with vegetation by 1968. PFAS can be utilized in industrial processes, such as ordnance manufacturing and chrome plating. Buildings G-1 and G-2, reportedly were used for chrome plating and produced sulfuric and chromic acid wastes.	Interviews and physical records did not identify PFAS-containing materials as having been used, stored, or disposed	A complete list of chemicals utilized in the areas that contributed waste to this location, nor individuals with historic site knowledge during the years of operation were available. Therefore, it cannot be verified whether PFAS-containing materials were disposed of here.	TAC[1]
Gas Station (I-72)	1980s – 2009	Gas station in Area I. AFFF can be used as a vapor suppression material in the event of a hydrocarbon spill	Records and interviews did not indicate the utilization of AFFF in response to	None identified.	DZI/TAC TAC[1]

Table 5-1: Installation Areas Not Retained for Further Investigation					
Area Description	**Dates of Operation**	**Relevant Site History**	**Rationale**	**Data Gap**	**Land Ownership**
			hydrocarbon spills. Furthermore, hydrocarbon spills were not reported here		
Paint House (BB-03)	1940s – 1980s	A paint house utilized until the 1980s. PFAS are known to be used as wetting agents, pigment dispersants, and binder emulsifiers in paints.	The paints listed in the 2006 Environmental Condition of Property Report are not known to contain PFAS in their formulations.	None identified.	TAC[1]
Potential Fire Station (V-29 and V-31)	N/A	Northern portion of Area V was identified as a region where another fire station may have existed and thus stored AFFF. The portion of the area indicated consisted of Building V-29 and V-31 according to records reviewed at the time.	Records do not support the possible utilization of V-29 as a fire station or fire department storage building; records also do not indicate that V-31 was ever constructed	None identified.	TAC[1]
Storage Igloo (V-11-1)	1940s – 2009	Storage Igloo V-11-1 held materials containing PFAS components such as Viton A, PTFE, and a lubricant coating likely similar to PTFE (fluorocarbon telomer).	Records did not indicate any releases of material to the environment	Spill records were not available for review and were not otherwise mentioned in the documents reviewed	TAC[1]
Railcar Fire (Area C)	1946	A railcar loaded with 37 mm high explosive rounds caught on fire. This fire resulted in multiple explosions in the C-Line at the T-shaped barricade of Building C-40.	The fire predates possible utilization of AFFF.	None identified.	TAC[1]
Building Fire (E-06)	1975	A fire occurred when Building E-06 caught fire. How the fire was ignited is unknown. The extinguishing media could not be confirmed.	AFFF not designed for use on a structural fire. Interviewees stated that firefighters would not respond to fires where MEC hazards were present.	The media used to extinguish the fire was not known	TAC[1]

[1] Land was transferred to TAC with the expectation that future redevelopment/reuse activities would occur. This land may have been subsequently transferred.

Figure 5-2: AOPI Locations

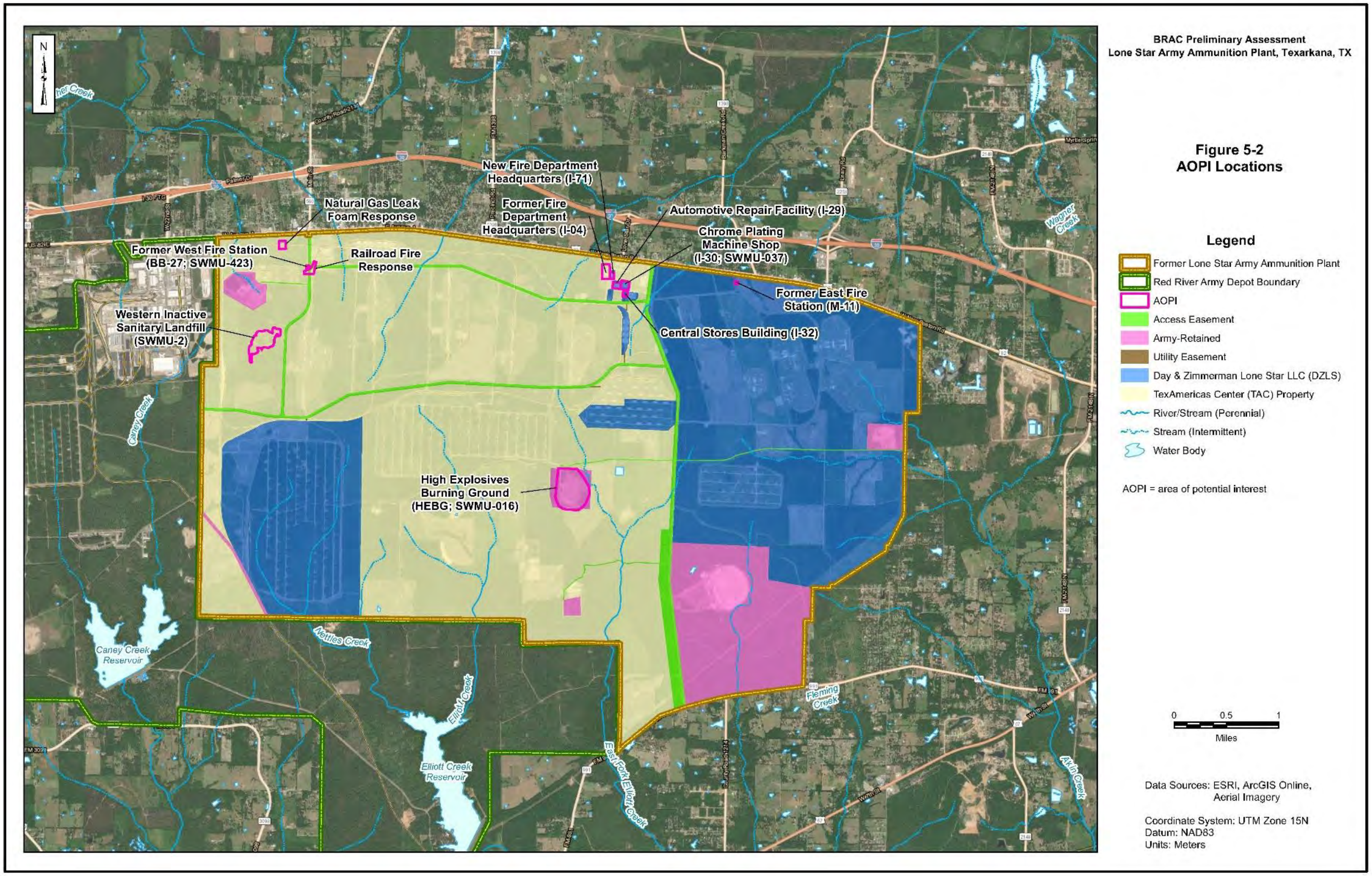


Figure 5-3: Aerial Photo of the Former Fire Department Headquarters (Building I-04) & New Fire Dept. Headquarters (Building I-71)

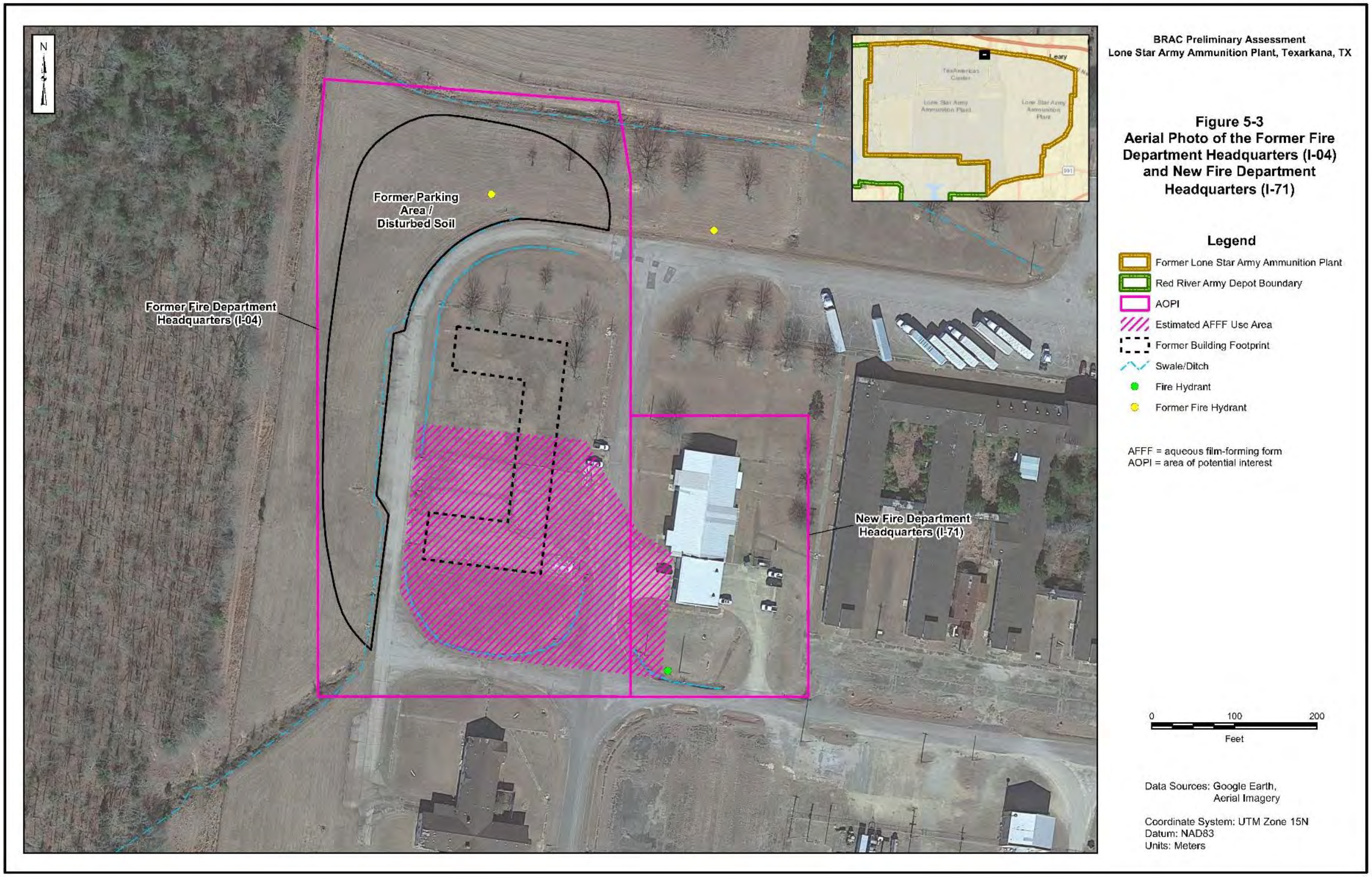


Figure 5-4: Aerial Photo of the Automotive Repair Facility (Building I-29) & Chrome Plating Machine Shop (Building I-30; SWMU-037)

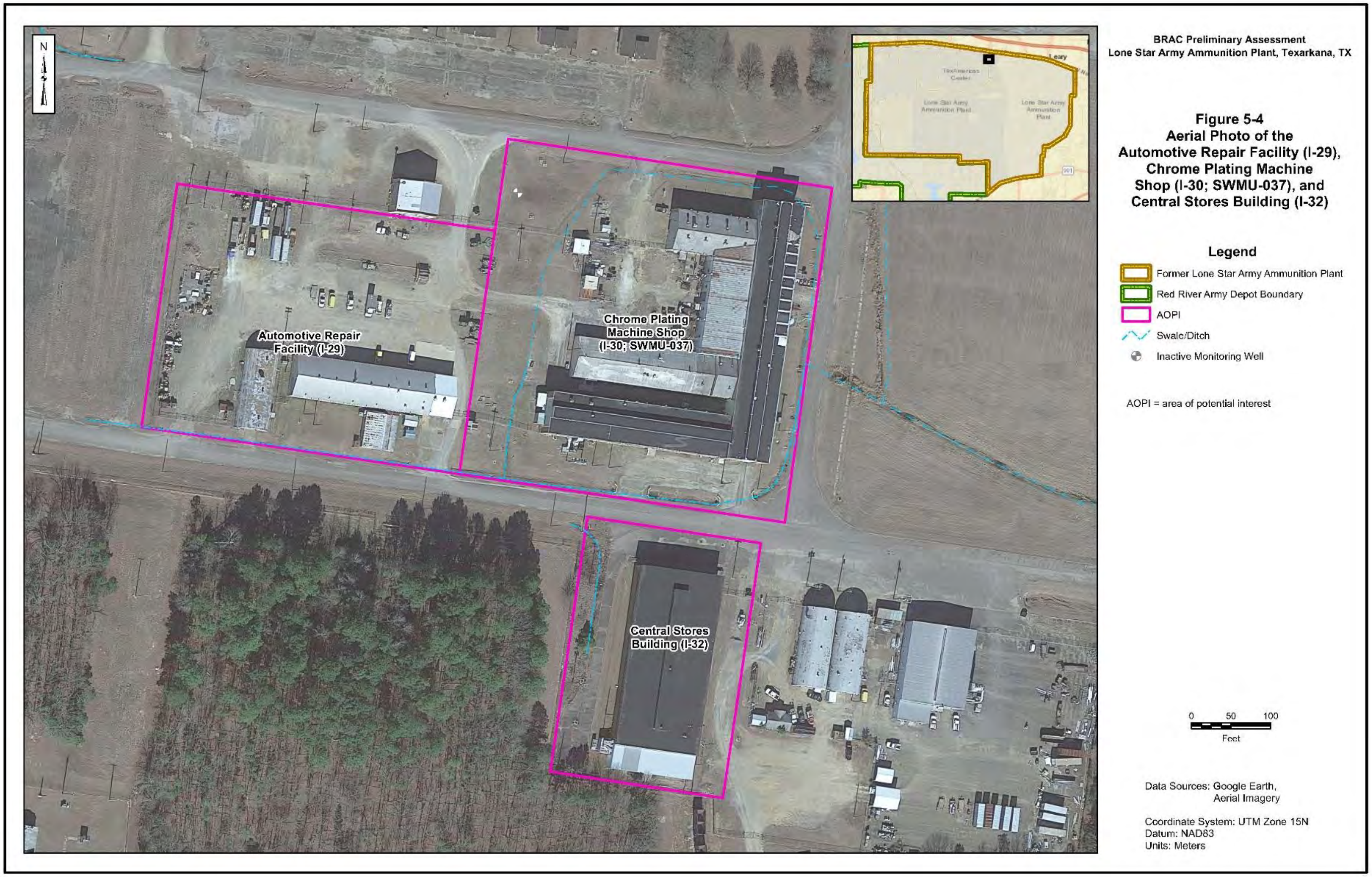


Figure 5-5: Aerial Photo of the Former West Fire Station (Building BB-27; SWMU-423) & Railroad Fire Response

Figure 5-6: Aerial Photo of the Former East Fire Station (Building M-11)

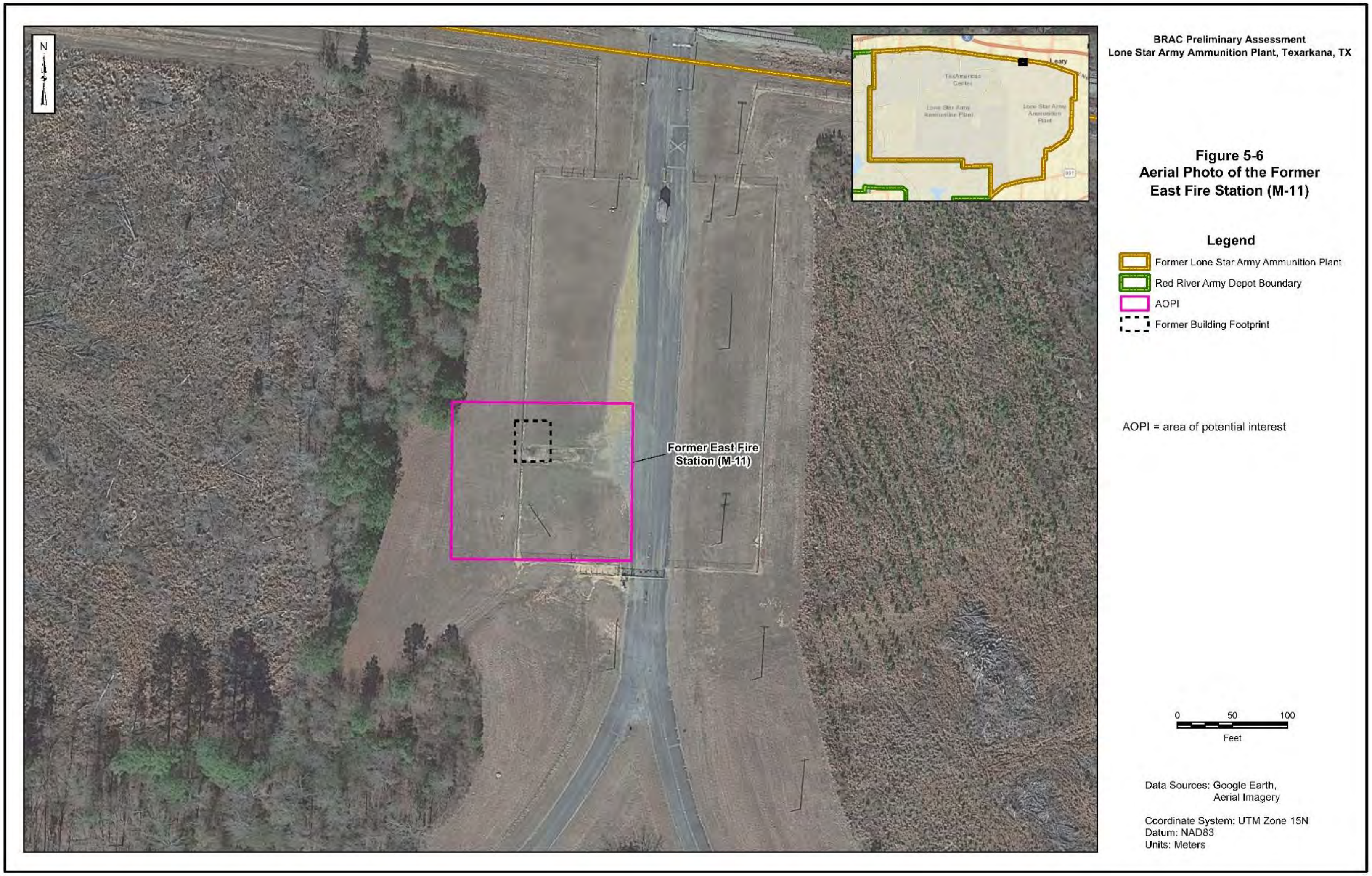


Figure 5-7: Aerial Photo of the Natural Gas Leak Foam Response

Figure 5-8: Aerial Photo of the HEBG (HEBG; SWMU-016)

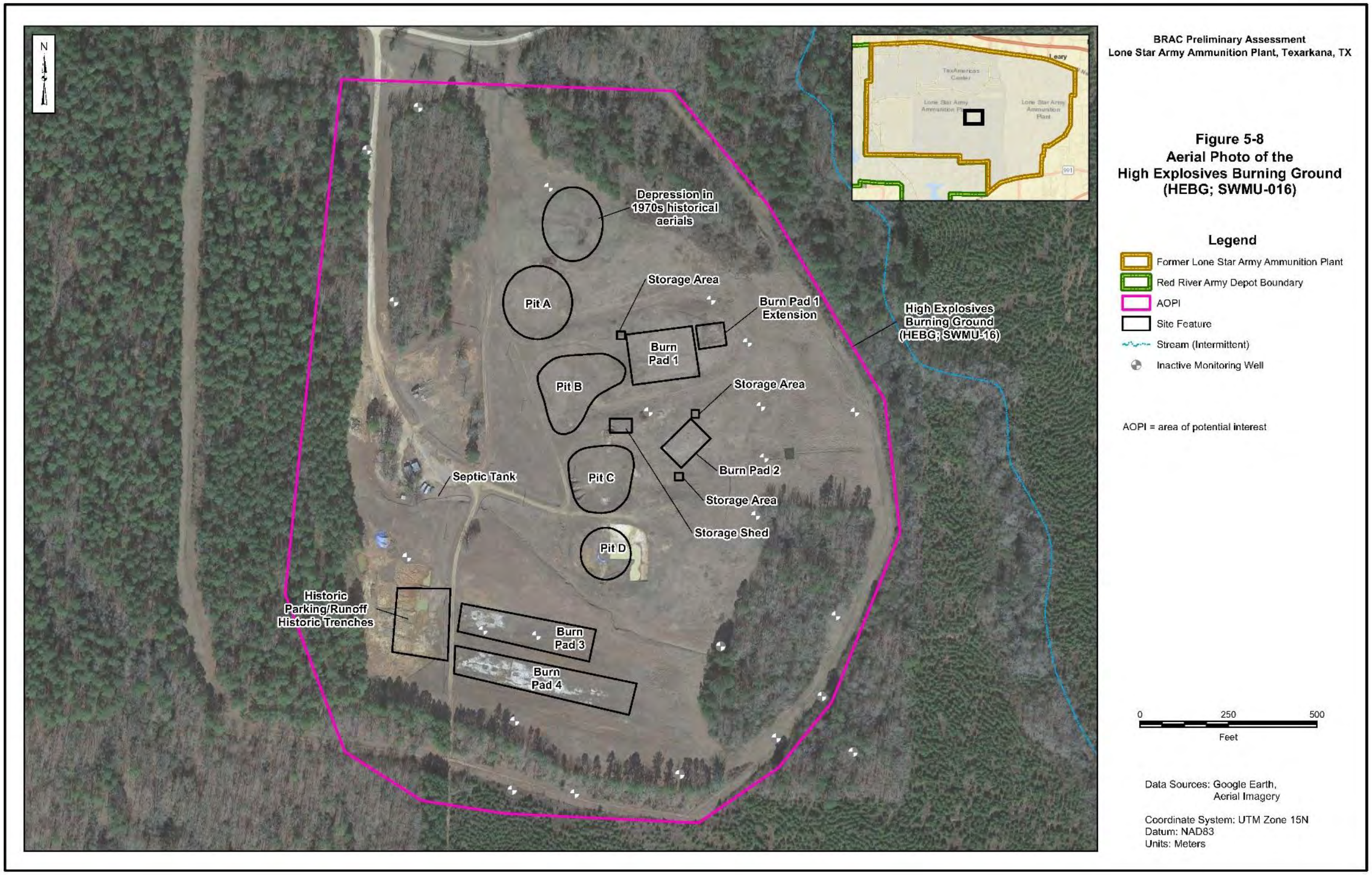


Figure 5-9: Aerial Photo of the WISL (WISL; SWMU-002)

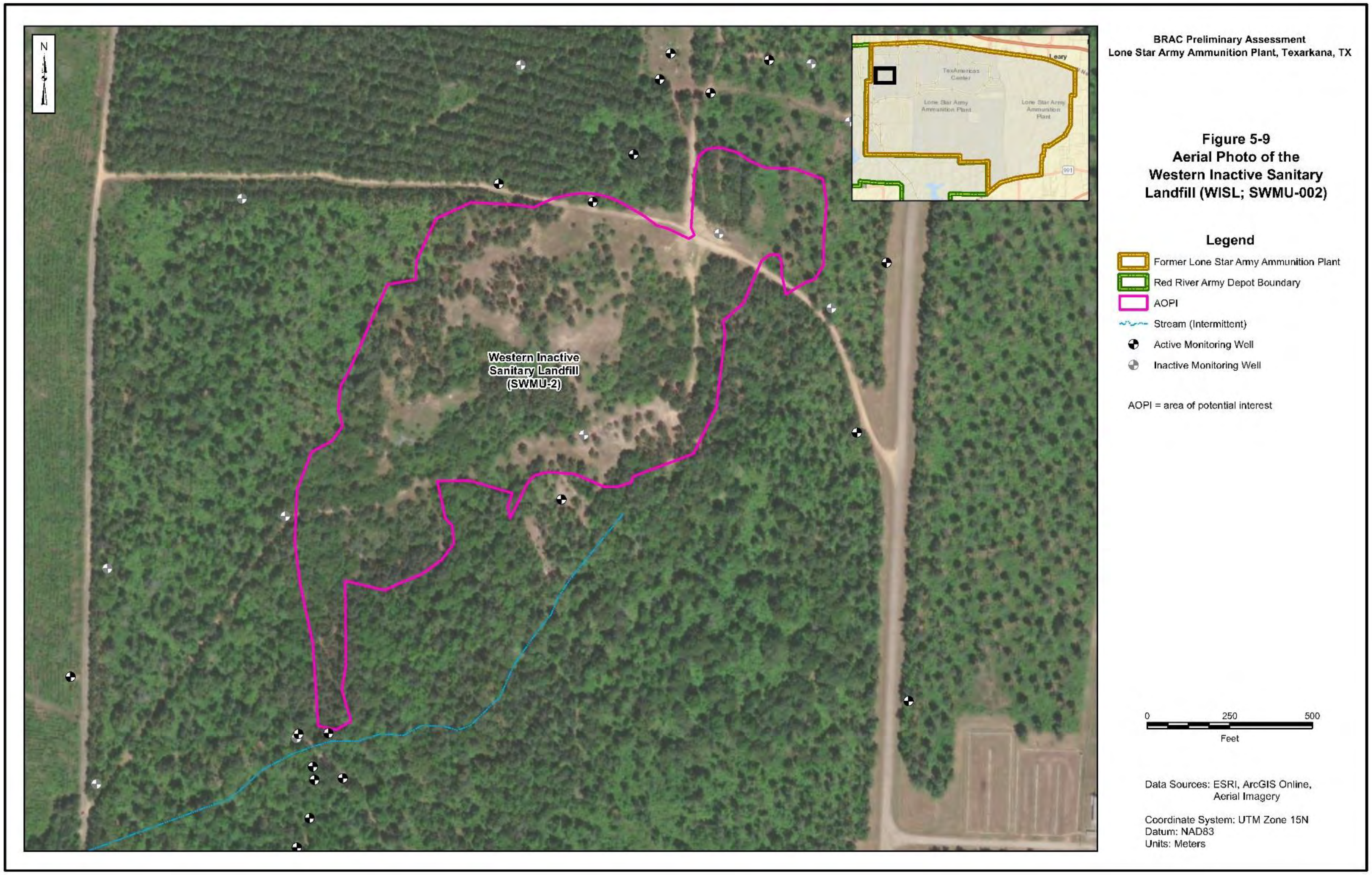
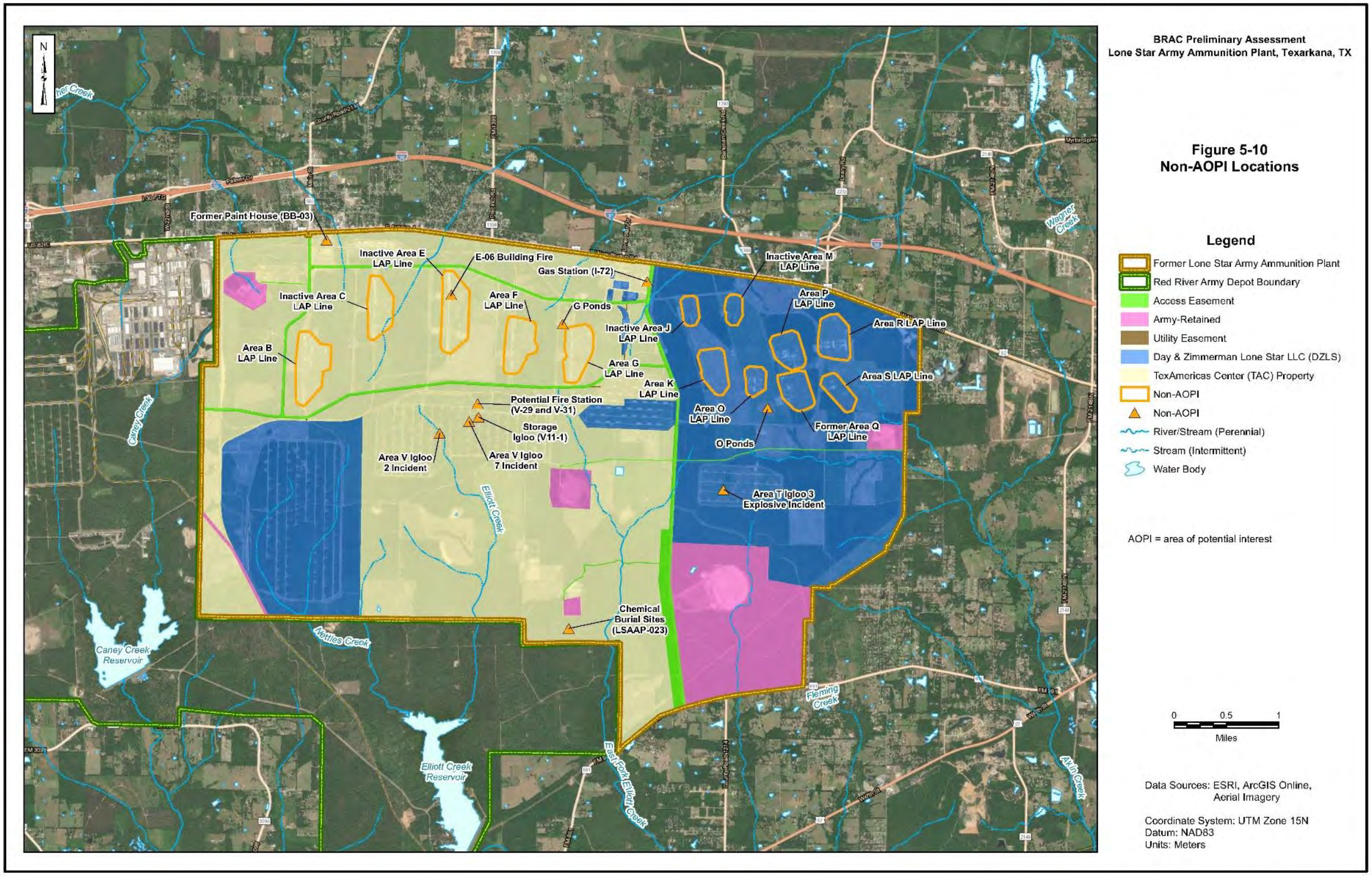


Figure 5-10: Areas not retained as AOPI Locations



6.0 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA at LSAAP evaluated preliminary locations for the use, storage, and/or disposal of PFAS-containing materials in accordance with the 2018 Army Guidance for Addressing Releases of PFAS (Army 2018). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit was used to identify preliminary locations (potential AOPIs) of suspected use, storage, and/or disposal of PFAS-containing materials at LSAAP.

Based on the results of the PA for the entire installation, 11 AOPIs were identified. Therefore, further investigation for PFAS at LSAAP is warranted at this time. ***Table 6-1*** below summarizes the preliminary locations evaluated and AOPIs identified at LSAAP during the PA and recommendations.

Table 6-1: Summary of Preliminary Locations Evaluated & AOPIs Identified During the PA, & Recommendations			
Location Name	**AOPI**	**Recommendation**	**Land Ownership**
Building I-04 Former Fire Department Headquarters (I-04)	**Yes**	**Further study in SI**	**TAC**
Building I-71 **New Fire Department Headquarters (I-71)**	**Yes**	**Further study in SI**	**DZLS**
Building I-29 **Automotive Repair Facility (I-29)**	**Yes**	**Further study in SI**	**DZLS**
Building I-30 Chrome Plating Machine Shop (I-30)	**Yes**	**Further study in SI**	**DZLS**
Central Stores Building (I-32)	**Yes**	**Further study in SI**	**DZLS**
Former West Fire Station (BB-27)	**Yes**	**Further study in SI**	**TAC**
Railroad Fire Response (Area BB)	**Yes**	**Further study in SI**	**TAC**

Table 6-1: Summary of Preliminary Locations Evaluated & AOPIs Identified During the PA, & Recommendations			
Location Name	**AOPI**	**Recommendation**	**Land Ownership**
Former East Fire Station (M-11)	**Yes**	**Further study in SI**	**DZLS**
Natural Gas Leak Foam Response	**Yes**	**Further study in SI**	**TAC**
High Explosive Burning Ground (HEBG)	**Yes**	**Further study in SI**	**BRAC**
Western Inactive Sanitary Landfill (WISL)	**Yes**	**Further study in SI**	**TAC**
Area B LAP Line *	**No**	**No action at this time**	**TAC**
Inactive Area C LAP Line *	**No**	**No action at this time**	**TAC**
Inactive Area E LAP Line *	**No**	**No action at this time**	**TAC**
Area F LAP Line *	**No**	**No action at this time**	**TAC**
Area G LAP Line *	**No**	**No action at this time**	**Expansion Ammunition**
G Ponds *	**No**	**No action at this time**	**Expansion Ammunition**
Inactive Area J LAP Line *	**No**	**No action at this time**	**DZI**
Area K LAP Line *	**No**	**No action at this time**	**DZI**
Inactive Area M LAP Line *	**No**	**No action at this time**	**DZI**
Area O LAP Line *	**No**	**No action at this time**	**DZI**
O Ponds *	**No**	**No action at this time**	**DZI**
Area P LAP Line *	**No**	**No action at this time**	**DZI**

Table 6-1: Summary of Preliminary Locations Evaluated & AOPIs Identified During the PA, & Recommendations			
Location Name	**AOPI**	**Recommendation**	**Land Ownership**
Former Area Q LAP Line *	**No**	**No action at this time**	**DZI**
Area R LAP Line *	**No**	**No action at this time**	**DZI**
Area S LAP Line *	**No**	**No action at this time**	**DZI**
Area T Igloo 3 Explosive Incident	**No**	**No action at this time**	**DZI**
Area V Igloo 2 Incident *	**No**	**No action at this time**	**DZI**
Area V Igloo 7 Explosive Incident	**No**	**No action at this time**	**DZI**
Chemical Burial Site *	**No**	**No action at this time**	**TAC**
Gas Station (I-72)	**No**	**No action at this time**	**DZI/TAC**
Paint House (BB-03) *	**No**	**No action at this time**	**TAC**
Potential Fire Station (V-29, V-31)	**No**	**No action at this time**	**TAC**
Storage Igloo (V11-1) *	**No**	**No action at this time**	**TAC**
Railcar Fire (Area C)*	**No**	**No action at this time**	**TAC**
Building Fire (E-6)*	**No**	**No action at this time**	**TAC**

*Area is not retained for further investigation but there is data gap due to lack of adequate information (e.g., records available for review, or knowledgeable personnel available for interview).

Data collected during the PA (**Sections 3** through **5**) were sufficient to draw conclusions and recommendations summarized above. The data limitations relevant to the development of this PA at LSAAP are discussed below.

In the years since the BRAC transfer in 2010, most DoD personnel associated with active Army presence and DZI personnel responsible for operations at LSAAP have transferred to alternate assignments, retired, or passed away. Therefore, interviewees with recollections of historical site activities were typically unavailable. Additionally, many active Army records from LSAAP were transferred to other DoD facilities and many pre-BRAC environmental records were not available.

While the PA identified many ordnance manufacturing processes (e.g., preparing, blending, mixing, melt loading, pelleting, painting, spraying, coating, chrome plating, composing, etc.) at LSAAP that may have used PFAS containing materials, specific documentation or interviews identifying PFAS use during the pre-BRAC event period were mostly unavailable. Some records available for review do show that some materials containing PFAS (e.g., Viton A, PTFE, and a fluorocarbon telomer likely similar to PTFE) were stored on site but do not go into detail on the utilization of those materials (URS 2006). Other records available for review show that PFAS-containing materials were applied in the Chrome Plating Machine Shop in lubricating (LSAAP 1999, DZI 2003). Therefore, if available records, site reconnaissance, and interviews did not document the presence of PFAS use as part of specific activities and a known location, the location was identified as an area not retained for further investigation instead of an AOPI. However, use of PFAS containing materials in many site areas is possible. As a result, this represents a data gap.

Records gathered for the use, storage and/or disposal of PFAS-containing materials were reviewed during the PA process. Documentation specific to AFFF may have been limited (e.g., each AFFF use; procurement records, documentation of AFFF used during crash responses or fire training activities) due to lack of recordkeeping requirements for the full timeline of common AFFF practices. Anecdotal accounts of AFFF use (and therefore related PFAS use) were limited to available installation personnel, whose knowledge of AFFF use may have been restricted by their time spent at the installation or previous roles held that limited their relevant knowledge of potential AFFF (or other PFAS-containing material) use. Fire stations and fire department storage areas which were active after 1970 are likely to have been used for AFFF storage but are not listed as AOPIs due to lack of concrete evidence or relevant site knowledge. As a result, this presents as a data gap.

Furthermore, much of the information used to determine the activities conducted within a building (e.g., preparing, blending, mixing, melt loading, etc.) was based on building inventories prepared in the 1940s and 1990s. Buildings may have undergone multiple renovations or use-changes between these two dates, and the length of time they were used for any of these activities is not well understood.

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

The searches for ecological receptors and off-post PFAS sources were not exhaustive and were limited to easily identifiable and readily available information evaluated during the relevant records review, installation personnel interviews, and site reconnaissance.

Following the PA evaluation, 11 AOPIs were identified. Therefore, further investigation of potential PFAS impacts as part of a SI at LSAAP is warranted at this time.

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