



FINAL PRELIMINARY ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES

St. Louis Army Ammunition Plant, Missouri

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PRELIMINARY ASSESSMENT OF PFAS AT ST. LOUIS ARMY AMMUNITION PLANT, MISSOURI



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Preliminary Assessment of Per- and Polyfluoroalkyl Substances

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CONTENTS

Executive Summary	1
1 Introduction	1
1.1 Project Background	1
1.2 PA Objectives	1
1.3 PA Process Description.....	2
1.3.1 Pre-Site Visit	2
1.3.2 Preliminary Assessment Site Visit	2
1.3.3 Post Research.....	2
2 Installation Overview	3
2.1 Site Location.....	3
2.2 Mission and Brief Site History	3
2.3 Current and Projected Land Use.....	4
2.4 Climate	4
2.5 Topography	4
2.6 Geology	4
2.7 Hydrogeology	5
2.8 Surface Water Hydrology	5
2.9 Relevant Utility Infrastructure	5
2.9.1 Stormwater Management System Description	5
2.9.2 Sewer System Description.....	5
2.10 Potable Water Supply and Drinking Water Receptors	6
2.11 Ecological Receptors.....	6
2.12 Previous PFAS Investigations	6
3 Summary of PA Activities	7
3.1 Records Review	7
3.2 Personnel Interviews	7
3.3 Site Reconnaissance.....	7
4 Potential PFAS Use, Storage, and/or Disposal Areas.....	8
4.1 AFFF Use, Storage, and Disposal Areas	8

PRELIMINARY ASSESSMENT OF PFAS AT ST. LOUIS ARMY AMMUNITION PLANT, MISSOURI

4.2 Other PFAS Use, Storage, and/or Disposal Areas	8
4.3 Readily Identifiable Off-Post PFAS Sources	8
5 Summary and Discussion of PA Results	9
5.1 Areas Not Retained for Further Investigation	9
6 Conclusions and Recommendations	11
7 References	12
Acronyms	13

TABLES

Table 5-1	Installation Areas Not Retained for Further Investigation (in text)
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FIGURES

Figure 2-1	Site Location
Figure 2-2	Site Layout
Figure 2-3	Historic Building Map
Figure 2-4	Topographic Map
Figure 2-5	Off-Post Potable Supply Wells
Figure 5-1	AOPI Decision Flowchart (in text)

APPENDICES

Appendix A	Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.
Appendix B	Preliminary Assessment Quality Control Checklist
Appendix C	Antiterrorism/Operations Security Review Cover Sheet
Appendix D	Not Used
Appendix E	Installation EDR Survey Reports
Appendix F	Research Log
Appendix G	Compiled Interview Log

EXECUTIVE SUMMARY

The United States Army (Army) is performing preliminary assessments (PAs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations nationwide. The PA identifies areas of potential interest (AOPs) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. This St. Louis Army Ammunition Plant (SLAAP) PA was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, The National Oil and Hazardous Substance Pollution Contingency Plan, and Army/Department of Defense policy and guidance.

SLAAP is located in St. Louis, Missouri approximately 5 miles northwest of downtown St. Louis and 2.7 miles west of the Mississippi River. SLAAP occupies a total of 21 acres and is surrounded with residential, commercial, and light industrial applications, as well as area schools, parks, and daycare facilities. Once part of the St. Louis Ordnance Plant (SLOP), the northeast portion of SLOP was converted from small arms munitions production to 105-millimeter Howitzer shell production and this portion was designated as SLAAP. This PA focuses on the entire property designated as SLAAP.

Based on the results of the PA for the entire installation, no AOPs were identified. Therefore, further investigation for PFAS at SLAAP is not warranted at this time.

1 INTRODUCTION

The United States (U.S.) Army (Army) is performing preliminary assessments (PAs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The Army is the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Executive Order 12580 and is conducting the PA consistent with its authority under CERCLA, 42 United States Code §§ 9600, et seq. (as amended), and the Defense Environmental Restoration Program, 10 United States Code §§ 2701, et seq. The purpose of this PA is to identify locations that are areas of potential interest (AOPIs) at St. Louis Army Ammunition Plant (SLAAP) based on the use, storage and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances (Army 2018). This report provides the PA for SLAAP and was completed in accordance with the CERCLA, The National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense policy and guidance.

1.1 Project Background

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

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

1.2 PA Objectives

During the PA, investigators collect readily available information and conduct site reconnaissance. This PA will evaluate and document areas where PFAS-containing materials were used, stored, and/or

disposed, so the Army can distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation.

1.3 PA Process Description

For SLAAP, the PA development process is described in **Sections 1.3.1** through **1.3.3** below. **Section 3** provides a summary of the PA activities completed at SLAAP. The PA processes are documented in the PA Quality Control Checklist included as **Appendix B**. The Army PA operations security requirements package, which includes the antiterrorism/operations security review cover sheet, is included as **Appendix C**.

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 09 February 2021, to discuss the goals and scope of the PA, project scheduling, installation access, timeline for a potential site visit (if a site visit were to occur), access to installation-specific databases, and to request available records.

Records research was conducted 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 SLAAP.

A research summary report (RSR) was prepared to document and summarize all information regarding the current and historical use, storage, and/or disposal of PFAS-containing materials obtained during the research activities conducted February through July 2021. This report included the following:

- A list of interviewed personnel, affiliation, roles, and contact information
- Interview logs detailing all interviews that took place during the PA
- A list of the data sources collected and reviewed
- A table of sites identified during research with description and relevance
- An operations timeline
- A site figure with potential AOPIs

1.3.2 Preliminary Assessment Site Visit

The installation is not active, is vacant, and has no buildings. Therefore, a site visit was not conducted.

1.3.3 Post Research

After the RSR was submitted, a teleconference was scheduled to discuss the preliminary findings and finalize the list of any potential AOPIs. The post-RSR teleconference took place 29 November 2021 and determined that site-inspection phase sampling was not warranted.

2 INSTALLATION OVERVIEW

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

2.1 Site Location

SLAAP is located in St. Louis, Missouri at the intersection of Goodfellow Boulevard and Interstate Highway 70. The installation is approximately 5 miles northwest of downtown St. Louis and approximately 2.7 miles west of the Mississippi River (**Figures 2-1 and 2-2**). SLAAP occupies a total of 21 acres and is surrounded with residential, commercial, and light industrial applications, as well as area schools, parks, and daycare facilities (URS Group, Inc. 2004). There is no permanent resident population and there are no recreational activities at the installation.

2.2 Mission and Brief Site History

St. Louis Ordnance Plant (SLOP) was constructed in 1941 as a 276-acre, small arms ordnance plant that produced .30- and .50-caliber munitions. In 1944, 21 acres in the northeast portion of SLOP were converted from small arms munitions production to 105-millimeter (mm) Howitzer shell production and this portion was designated as SLAAP. The SLAAP property contained seven buildings that were used to house SLAAP's main operating processes (URS Group, Inc. 2004).

After World War II, SLAAP was placed on standby status. It was reactivated from November 1951 to December 1954 and again from November 1966 to December 1969 to support 105-mm Howitzer shell production. The plant was maintained and operated by the Chevrolet Shell Division of General Motors from 1951 until 1958, by the U.S. Defense Corporation from 1958 to 1966, and by the Chevrolet Motor Division of General Motors from 1966 until 1972, when Donovan Construction Company was awarded the maintenance and surveillance contract (URS Group, Inc. 2004).

In 1984, buildings at SLAAP were renovated to house filing and administrative operations by more than 500 personnel from the U.S. Army Aviation Systems Command. From 1986 to 1990, SLAAP was under the command of the U.S. Army Armament, Munitions, and Chemical Command. In 1989, the Department of the Army determined that SLAAP was no longer required to support its munitions mission, and most industrial equipment was removed from the plant. In 1990, plant ownership and control were placed under the U.S. Army Aviation and Troop Command. As of 1993, SLAAP maintenance and surveillance activities were being subcontracted by Donovan Construction Company to Plant Facilities and Engineering, Inc. From 1998 to the spring of 2003, SLAAP was vacant and under the control of U.S. Army Aviation and Missile Command. Base Realignment and Closure became the responsible party for the installation in the spring of 2003 (URS Group, Inc. 2004). Satellite imagery shows that all buildings were demolished by 2007 except for a small storage shed near the center of property that was demolished by 2009.

2.3 Current and Projected Land Use

SLAAP has been largely vacant since the mid-1990s and currently has no buildings or structures, recreational activity, or residents. According to a brief historical summary provided by SLAAP, the St. Louis Development Corporation has been engaged in administrative liaison work with the Federal government to develop a land use initiative at the installation.

2.4 Climate

The climate near SLAAP is characteristic of temperate continental, with warm to hot summers and cool winters. The heaviest rains occur in spring and early summer when moist air from the Gulf of Mexico interacts with drier continental air. The daily temperature for the St. Louis area averages about 55 degrees Fahrenheit (°F). The temperature averages about 33°F in winter, and about 77°F in the summer. Total annual precipitation is 33.8 inches, with the greatest amount falling in June. Average seasonal snowfall for the region is 18 inches, with most accumulation occurring in March. Wind prevails from the south with the highest wind speed averaging 12 miles per hour in March (USACE 2005).

2.5 Topography

SLAAP is located in the southern portion of the Dissected Till Plains Section of the Central Lowland Province. The topography of this area (**Figure 2-3**) consists of rolling uplands with slopes of 2 to 5 percent (%), and an elevation range of 500 to 550 feet above mean sea level sloping gently to the south within a 2-mile radius of the SLAAP property (URS Group, Inc. 2004).

2.6 Geology

The geology of the SLAAP property generally consists of fill materials, lean clay (silty clay), fat clay, and cherty gravel overlying Pennsylvanian age shale. Underlying the shale is the Mississippian age St. Genevieve limestone. Fill material consisting of a thin layer of gravel (typically one foot thick) is usually present underneath asphalt and concrete. In addition, fill material consisting of lean clay is encountered throughout the site generally ranging in thickness from 1 to 8 feet. However, since the fill material was likely cut from adjacent lean clay portions of the installation, the interface is not clear, and the true depth of the fill may be significantly deeper in some portions of the installation than described on any available boring logs. Underlying the fill material is lean clay with fat clay underlying the lean clay. The thickness of the fill/lean clay/fat clay overburden materials overlying the shale range from approximately 14 to 26 feet (URS Group, Inc. 2004).

Shale was encountered in 10 of 13 monitoring well borings and 12 soil borings completed during the comprehensive environmental baseline survey (EBS) and site-specific EBS investigations at depths ranging from 12 to 31.9 feet below ground surface (bgs). The maximum thickness of shale encountered was 15 feet. However, all these borings were terminated prior to reaching the bottom of the shale unit. According to the comprehensive EBS, a soil boring drilled in 1971 at SLAAP encountered a medium-hard, medium- to fine-grained limestone (St. Genevieve limestone) at 65 feet, and the bedrock units beneath the site were reported as flat lying (URS Group, Inc. 2004).

2.7 Hydrogeology

Bedrock units in and around St. Louis can yield varying amounts of groundwater. Well yield depends on site-specific geologic and well characteristics. Most wells in the St. Louis area yield a maximum of 50 gallons per minute from depths down to 800 feet bgs. These wells are screened in limestones and sandstones ranging in age from Mississippian to Ordovician. Water yields of up to 1,955 gallons per minute can be expected from wells drilled in thick alluvial deposits that contain little silt or clay-like material. However, no potable water wells are reported to exist within 3 miles downgradient of SLAAP. Regional groundwater flow in the SLAAP area is north-northeast toward the Mississippi River.

2.8 Surface Water Hydrology

No surface water is present on the SLAAP property. The closest body of water, the Mississippi River, is located approximately 2.7 miles east from the property. Surface water from the installation enters the Metropolitan St. Louis Sewer District combined sewer system.

2.9 Relevant Utility Infrastructure

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

2.9.1 Stormwater Management System Description

Stormwater on the property is collected by catch basins that discharge to the Metropolitan St. Louis Sewer District combined sewer system. The stormwater runoff in St. Louis County discharges to the Missouri River to the north, the Mississippi River to the east, and the Meramec River to the south (URS Group, Inc. 2004).

2.9.2 Sewer System Description

No wastewater treatment facilities were known to exist at SLAAP. Historical maps of the installation show drain lines connected the buildings, converged into larger diameter pipes, and routed effluent east of SLAAP (Marc Enviro Services 2002). Wastewater discharges from SLAAP were monitored periodically by the Metropolitan St. Louis Sewer District, and discharges complied with applicable city ordinances. Solid wastes and some liquid wastes were removed from SLAAP for off-site disposal and recycling by a local contractor.

The combined sewer system was installed during construction of the facility in 1941 and 1944. The system consisted mostly of vitrified clay pipe ranging in size from 4-inch floor drains to 18-inch mains and contained brick-lined manholes (Marc Enviro Services 2002; URS Group, Inc. 2004). Some concrete sections of pipe were installed during subsequent modifications to the installation, usually for additional storm runoff control, as more of the installation was paved to provide additional parking (URS Group, Inc. 2004).

2.10 Potable Water Supply and Drinking Water Receptors

The City of St. Louis Water Division provided potable water to the property. There was no permanent on-site residential population, but water was needed for employee and facility operations. According to the USEPA Safe Drinking Water Information System, the water supplied to the property met Federal water quality standards. The city maintains two water treatment plants that draw water from the area's two main rivers. The Chain of Rocks Plant is located on the Mississippi River about 11 miles north of the center of the city and about 5 miles south of the confluence of the Missouri and Mississippi Rivers. The Howard Bend Treatment Facility is located on the Missouri River about 37 miles above the confluence of the Missouri and Mississippi Rivers and 15 miles west of the city limits of St. Louis (United States Army Center for Health Promotion and Preventative Medicine 2008).

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 SLAAP, which along with state and county geographical information system (GIS) provided by the installation identified several off-post public and private wells within 5 miles of the installation boundary (**Figure 2-4**). The EDR report providing well search results provided as **Appendix E**.

2.11 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.

Except for small grassy areas, remnants of building foundations and asphalt cover the SLAAP property. Most vegetative growth on the site is volunteer weeds and small trees. The site serves as a habitat for a variety of insects and occasional mammals (e.g., opossum, raccoon) typical of vacant property/buildings in an urban area. No endangered or threatened species have been identified on the property (URS Group, Inc. 2004).

A 1994 National Wetlands Inventory map of the area within 2 miles of SLAAP was reviewed to identify surface water bodies and wetlands. According to the map, the closest wetland is approximately 1.4 miles east of SLAAP, and another wetland lies approximately 1.5 miles northwest of SLAAP. No wetlands were identified on the SLAAP property or in its immediate vicinity (URS Group, Inc. 2004).

2.12 Previous PFAS Investigations

PFAS sampling has not previously been undertaken at SLAAP.

3 SUMMARY OF PA ACTIVITIES

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

1. Records review
2. Personnel interviews

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 SLAAP 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, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. A list of the specific documents reviewed for SLAAP is provided in **Appendix F**.

3.2 Personnel Interviews

The list of roles for the personnel interviewed during the PA process for SLAAP is presented below.

- St. Louis Fire Department, Representative
- St. Louis Citizens Service Bureau, Representative
- St. Louis Ordinances Department, Representative
- Missouri History Museum Library and Research Center, Historian

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

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were not conducted at the preliminary locations identified at SLAAP during the records review process because the site is inactive, vacant, and has no buildings. Preliminary locations of potential use, storage, and/or disposal of PFAS-containing materials were then evaluated in the PA (during records review and personnel interviews) and were categorized as AOPIs or as areas not retained for further investigation at this time based on a combination of information collected (e.g., records reviewed, personnel interviews, internet searches). A summary of the observations made, and data collected through records reviews (**Appendix F**) and personnel interviews (**Appendix G**) during the PA process for SLAAP are presented in **Section 4**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.1**.

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

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

4.1 AFFF Use, Storage, and Disposal Areas

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

Information gathered from the PA research indicates that AFFF was not used, stored, or disposed at SLAAP.

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

Following document research, personnel interviews, and site reconnaissance at SLAAP, other potential PFAS source types were either not identified at the installation or did not prompt further research or constitute categorization as AOPIs.

Further discussion regarding areas not retained for further investigation is presented in **Section 5.1**.

4.3 Readily Identifiable Off-Post PFAS Sources

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

Nearby community fire departments within close proximity of SLAAP could potentially be off-post PFAS sources if they use AFFF. Twenty-four fire departments and/or fire stations appear to be 0.5 and 5 miles from the installation boundary.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage, and/or disposal of PFAS-containing materials at SLAAP, 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, no areas have been identified as AOPIs at SLAAP. The process used for refining these areas is presented on **Figure 5-1**, below.

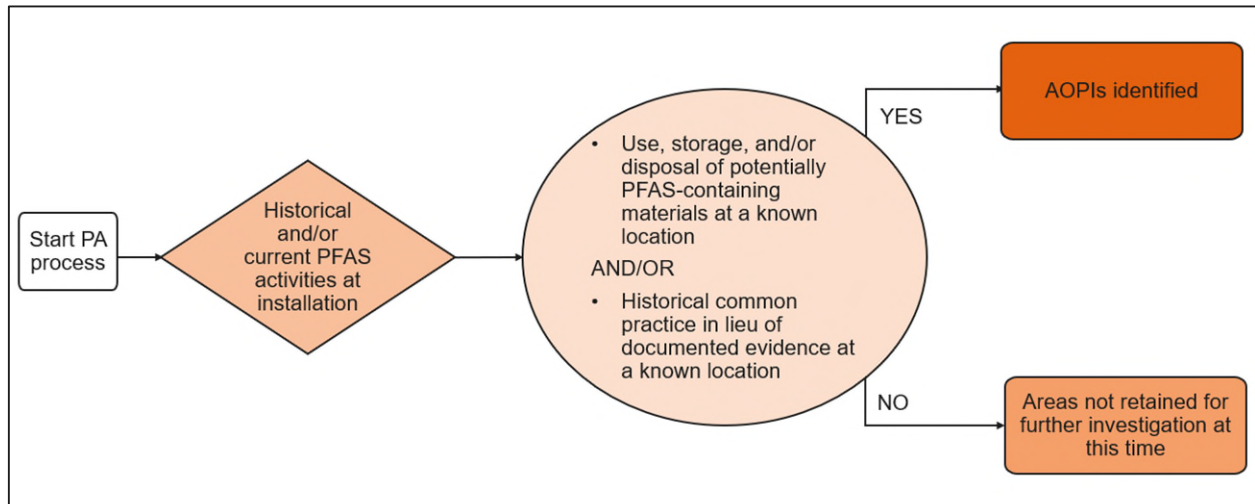


Figure 5-1: AOPI Decision Flowchart

The areas not retained for further investigation are presented in **Section 5.1**. Data limitations for this PA at SLAAP are presented in **Section 6**.

5.1 Areas Not Retained for Further Investigation

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

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

PRELIMINARY ASSESSMENT OF PFAS AT ST. LOUIS ARMY AMMUNITION PLANT, MISSOURI

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

Area Description	Dates of Operation	Relevant Site History	Rationale
<p>Building 11 – Foamite Generator Building & Buildings 11A and 11B – Hose Cart Shelters</p>	<p>1944 to 1958 (original buildings – constructed in 1944)</p> <p>1966 to 1969 (reconstructed buildings – constructed in 1958)</p>	<p>The original Building 11 operated as a 105-mm Howitzer shell production area from 1944 to 1945 and from 1952 to 1954. The original system included a 15-horsepower pump system, a foamite generator, and a 4-inch foamite line that left the south corner of Building 11 and split into two main lines. Building 11A contained flexible hoses and hose carts associated with Building 11. The reconstructed Building 11 also operated as a 105-mm Howitzer shell production area from 1966 to 1969. The generation of foamite involved the addition of dry foamite powder to pressurized water through an education system. Buildings 11 and 11A were demolished in 1958 during the relocation of Building 8.</p>	<p>This AOPI was eliminated because Building 11 was demolished and nonoperational before the use of AFFF by the DoD in 1969.</p>

6 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA at SLAAP 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 Per- and Polyfluoroalkyl Substances (Army 2018). A combination of document review, internet searches, and personnel interviews were used to identify preliminary locations of suspected use, storage, and/or disposal of PFAS-containing materials at SLAAP. Following the evaluation, no AOPIs were identified. Therefore, further investigation for PFAS at SLAAP is not warranted at this time.

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 SLAAP are discussed below.

Data limitations were encountered during the PA process. There were limited personnel to interview and the personnel that were interviewed indicated that there was no information available. Additionally, the installation is inactive, vacant, and has no buildings. Therefore, a site visit was not conducted. Site records were also limited, especially with regards to foamite operations.

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 and personnel interviews.

Finally, PFAS sampling has not previously been undertaken at SLAAP. Therefore, no PFOS, PFOA, and/or PFBS analytical data were available.

7 REFERENCES

- Army. 2018. Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances. September 4. Available online at: <https://www.fedcenter.gov/admin/itemattachment.cfm?attachmentid=1150>.
- Interstate Technology Regulatory Council. 2017. History and Use of Per-and Polyfluoroalkyl Substances (PFAS). November. Available online at: https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use_11_13_17.pdf.
- Interstate Technology Regulatory Council. 2020. Section 3.1 Firefighting Foams. Updated April 14. Available online at: https://pfas-1.itrcweb.org/3-firefighting-foams/#3_1
- Marc Enviro Services. 2002. Phase I Environmental Site Assessment. January 24.
- Office of the Secretary of Defense (OSD). 2019. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. October.
- OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.
- URS Group, Inc. 2004. Site-specific Environmental Baseline Survey. February.
- USACE. 2005. Technical Memorandum-Final Hanley Area Phase I Remedial Investigation Former St. Louis Ordnance Plant (SLOP). May.
- U.S. Army Center for Health Promotion and Preventative Medicine. 2008. Environmental Condition of Property Report Former St. Louis Ordnance Plant Site. October.
- USEPA. 2016. Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate. EPA-HQ-OW-2014-0138; FRL-9946-91-OW. Federal Register/ Vol. 81. No. 101. May 25. Available online at: <https://www.govinfo.gov/content/pkg/FR-2016-05-25/pdf/2016-12361.pdf>.
- USEPA. 2021. Human Health Toxicity Values for Perfluorobutane Sulfonic Acid (CASRN 375-73-5) and Related Compound Potassium Perfluorobutane Sulfonate (CASRN 29420-49-3). EPA/600/R-20/345F. Center for Public Health and Environmental Assessment, Office of Research and Development, Washington DC. April.

ACRONYMS

°F	degrees Fahrenheit
%	percent
AFFF	aqueous film-forming foam
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DoD	Department of Defense
EBS	environmental baseline survey
EDR	Environmental Data Resources, Inc.
GIS	geographic information system
installation	United States Army or Reserve installation
mm	millimeter
OSD	Office of the Secretary of Defense
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
RSR	research summary report
SLAAP	St. Louis Army Ammunition Plant
SLOP	St. Louis Ordnance Plant
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency



FIGURES

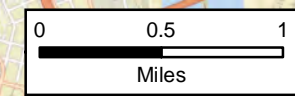
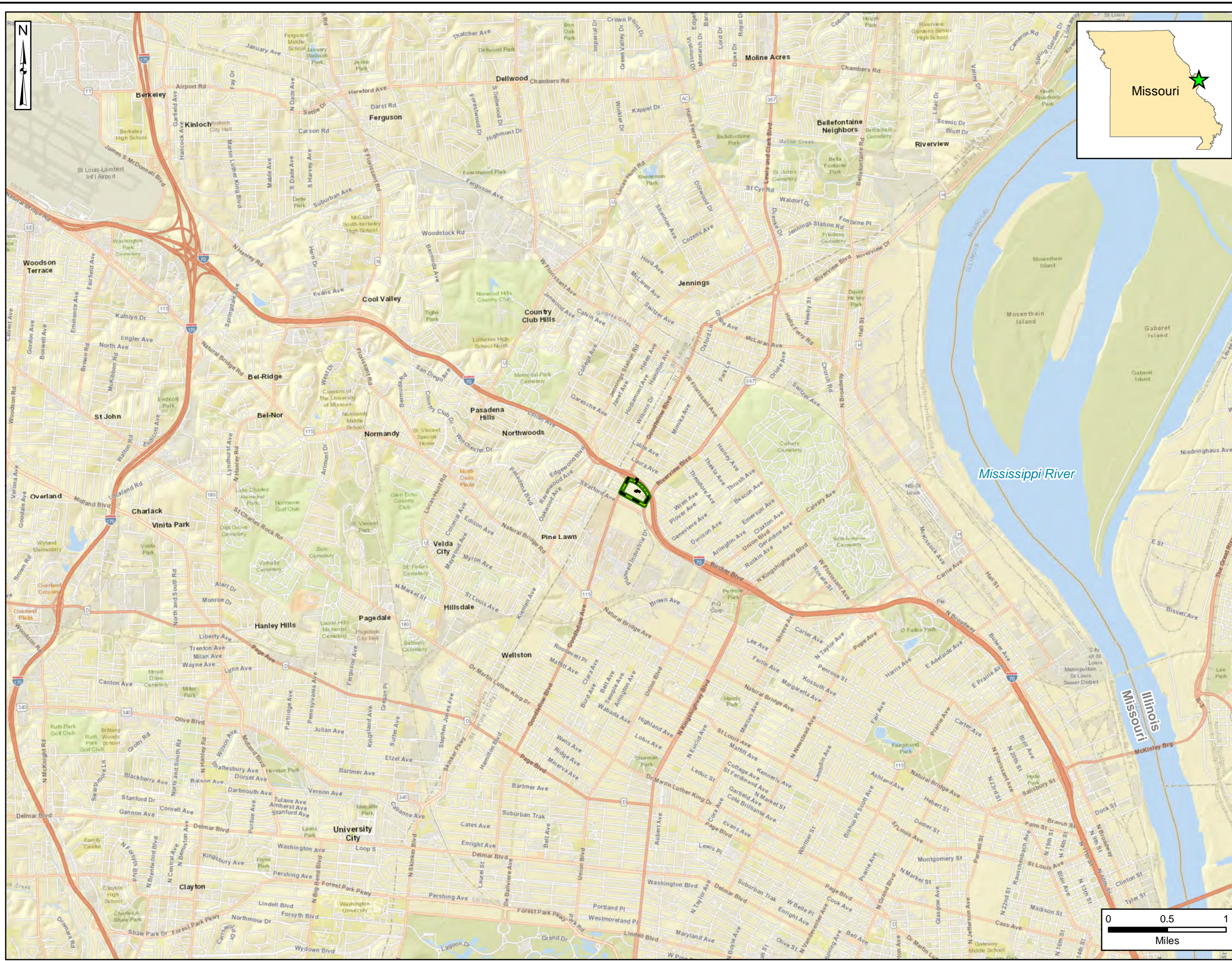




Figure 2-1
Site Location

Legend

-  Installation Boundary (1958+)
-  Installation Boundary (1944-1958)





Data Sources:
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 16 North



Figure 2-2
Site Layout

Legend

-  Installation Boundary (1958+)
-  Installation Boundary (1944-1958)

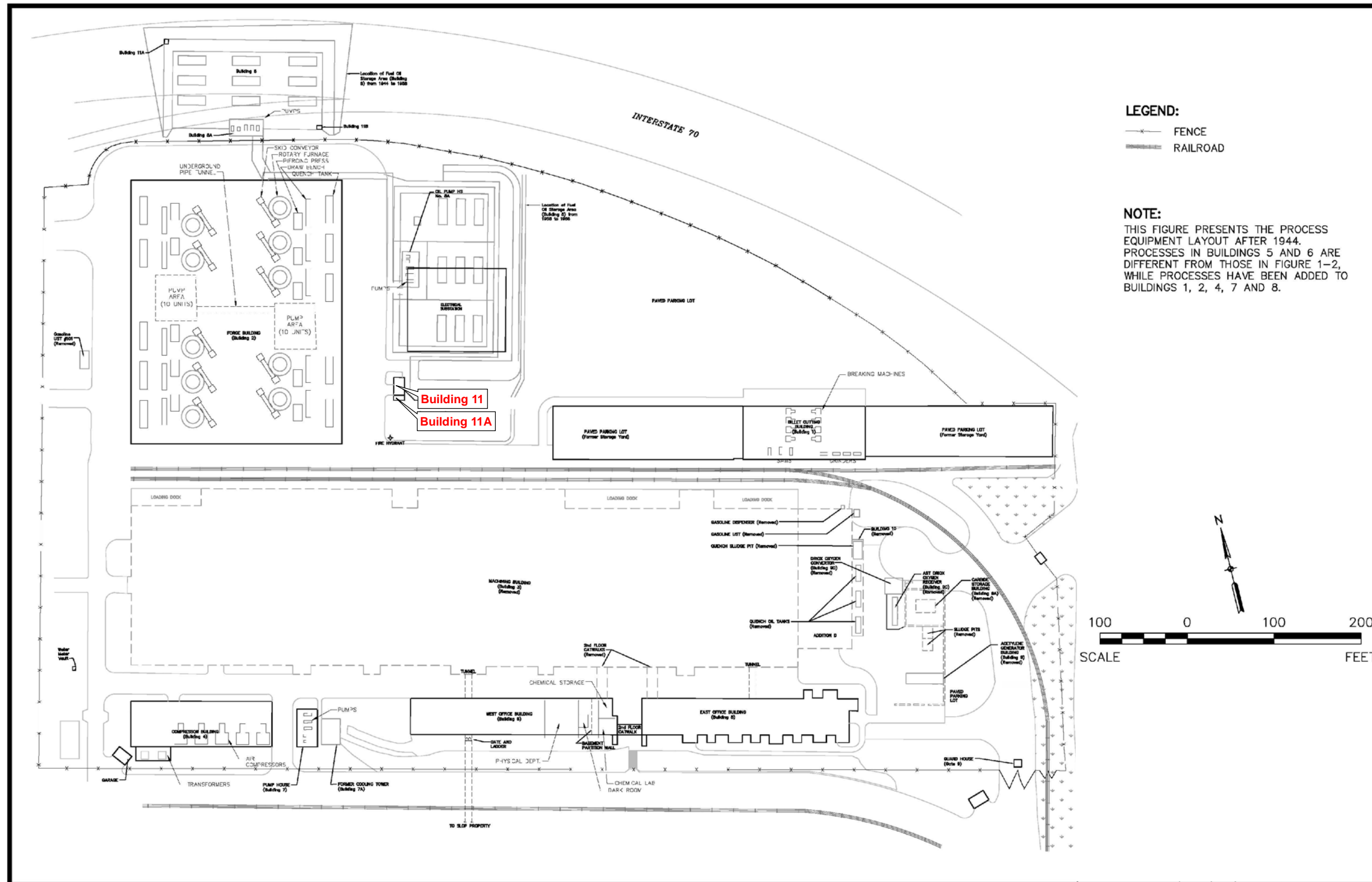


Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 16 North






**Figure 2-3
Historic Building Map**



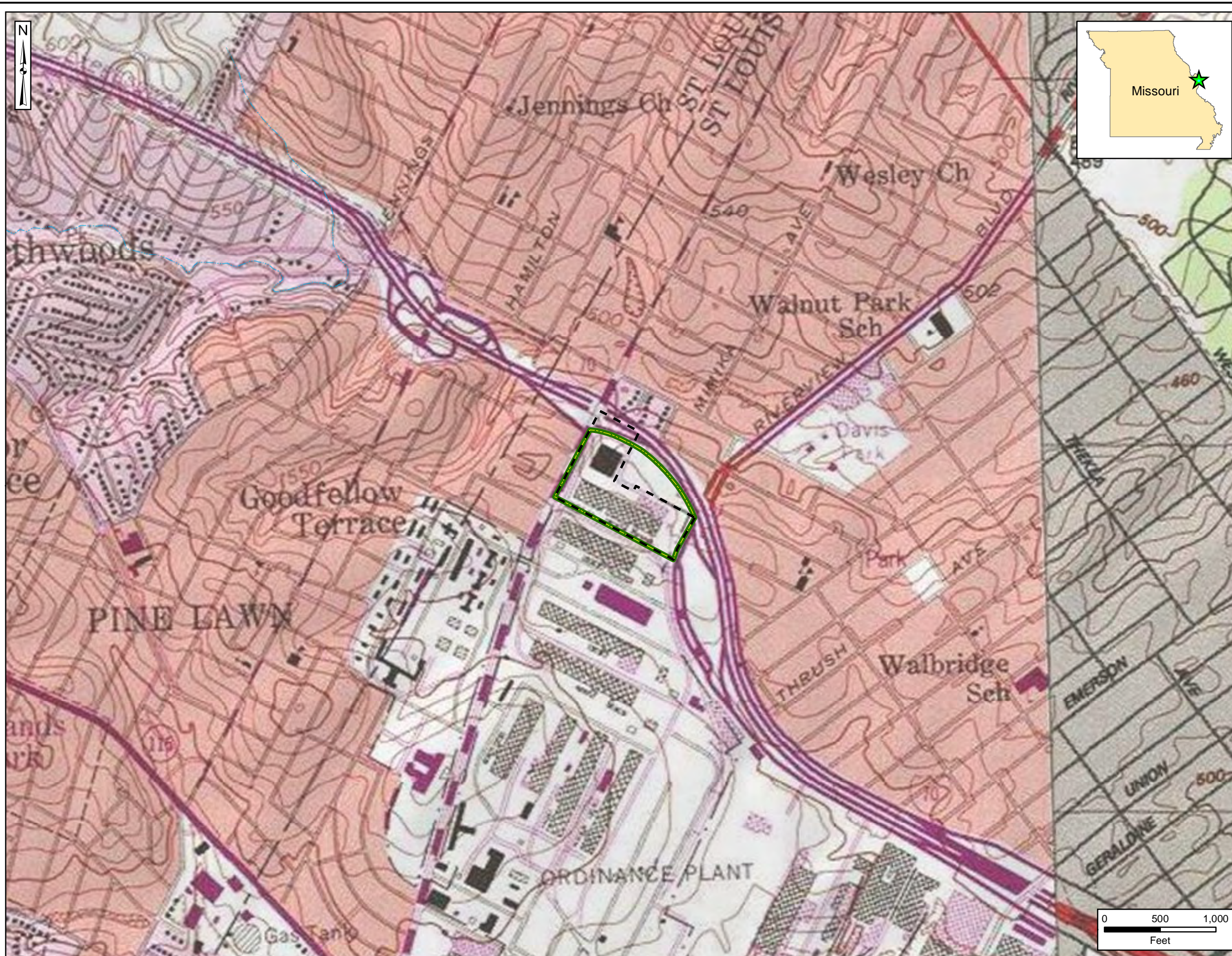


**Figure 2-4
Topographic Map**

Legend

-  Installation Boundary (1958+)
-  Installation Boundary (1944-1958)
-  Stream (Intermittent)

Note:
Elevation contour labels are in feet.



Data Sources:
USGS, NHD Data
ESRI ArcGIS Online, USA Topo Map

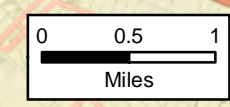
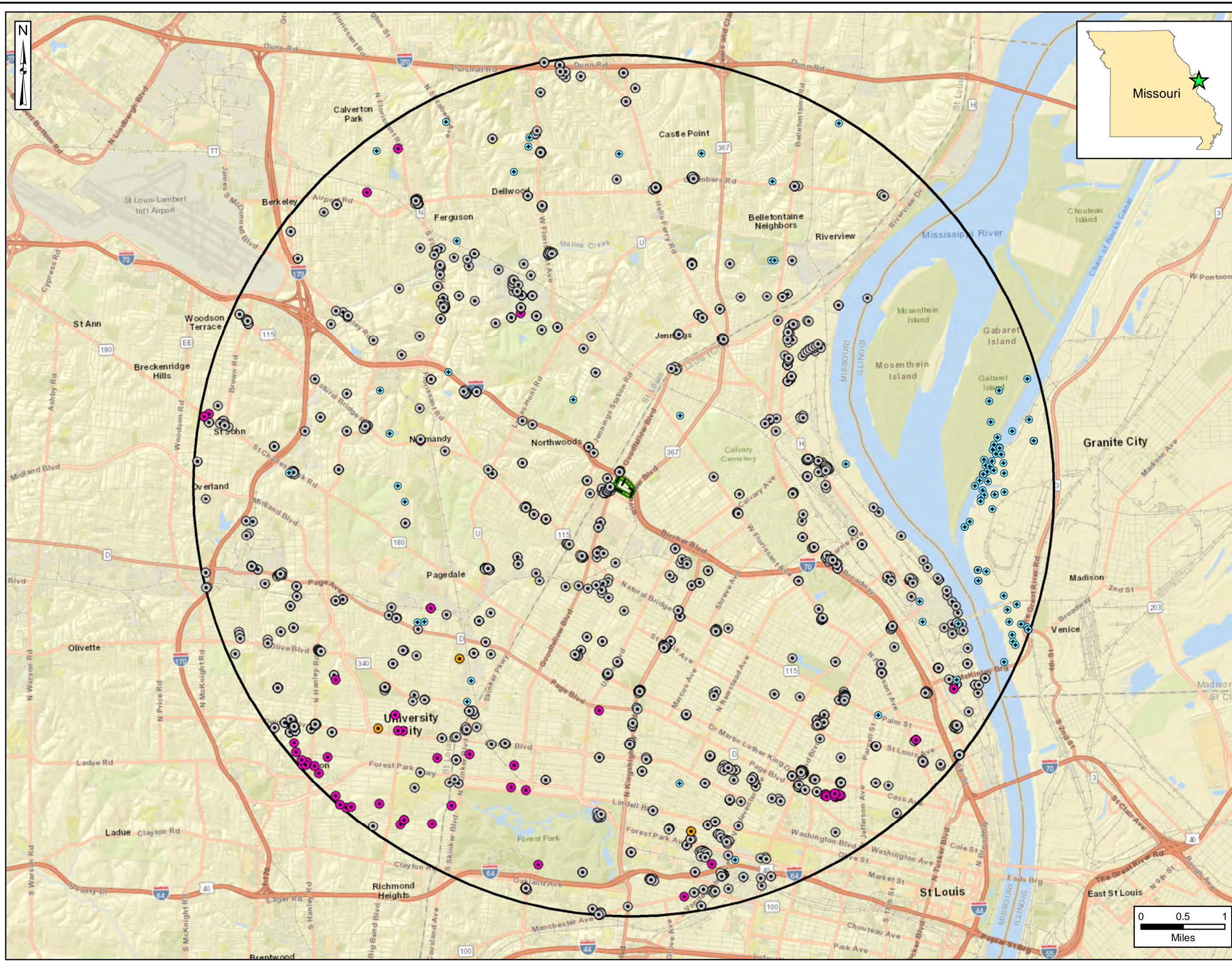
Coordinate System:
WGS 1984, UTM Zone 16 North



Figure 2-5
Off-Post Potable Supply Wells

Legend

- Installation Boundary (1958+)
 - Installation Boundary (1944-1958)
 - 5-Mile Radius
 - State Water Well
- Missouri Well Locations**
- Domestic Use Well
 - Industrial, Remedial, and Other
 - Well - Unspecified Use Type



Data Sources:
EDR, Well Data, 2021
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 16 North

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