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

Tooele Army Depot - South, Utah

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Final Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

Tooele Army Depot - South, Utah

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EXECUTIVE SUMMARY

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

The Tooele Army Depot (TEAD) collectively refers to two geographic areas: Tooele Army Depot - North and Tooele Army Depot - South (TEAD-S). TEAD-S, which encompasses 19,364 acres, is located in the Rush Valley in Tooele County, Utah, approximately 50 miles southwest of Salt Lake City, Utah. A separate PA/SI was conducted at TEAD – North for PFAS; the results are reported under a separate cover for that installation.

The TEAD-S PA identified 14 AOPIs for investigation during the SI phase. SI sampling results from the 14 AOPIs were compared to risk-based screening levels calculated by the Office of the Secretary of Defense (OSD) for PFOS, PFOA, and/or PFBS. PFOS, PFOA, and/or PFBS were detected in soil, groundwater, and/or sediment samples at 12 AOPIs; one of the 14 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels.

The TEAD-S PA/SI identified the need for further study in a CERCLA remedial investigation. **Table ES-1** below summarizes the PA/SI sampling results and provides recommendations for further study in a remedial investigation or no action at this time at each AOPI. Surface water and sediment were not sampled at all AOPIs as some AOPIs do not have nearby surface water features.

Table ES-1. Summary of AOPIs Identified during the Preliminary Assessment, the PFOS, PFOA, and PFBS Sampling at Tooele Army Depot-South, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NA/ND/NS)				Recommendation
	GW	SO	SW	SE	
Car Wash (Building 5166)	No*	No	NS	NS	No action at this time
SCBA/Fire Dept Laundry Extractor System (Building 5167)	No*	ND	NS	NS	No action at this time
Fire Truck Wash Area (Building 5165 Exterior)	No*	No	NS	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NA/ND/NS)				Recommendation
	GW	SO	SW	SE	
Fire Station Support/Former Motor Pool (Building 5118)	No*	No	NS	NS	No action at this time
Gas Station FFTA	No*	ND	NS	NS	No action at this time
Building 5108 Parking Lot FFTA	No*	ND	NS	NS	No action at this time
Fire Station #2 (Building 5010)	No*	**Yes**	NS	NS	Future study in a remedial investigation
Motor Pool (Building 5134)	No*	No	NS	NS	No action at this time
Former Fire Station #2 Support Building (Building 5144)	No*	ND	NS	NS	No action at this time
AFFF Fuel Spill Response in Area 2	NS	No	NS	NS	No action at this time
Deseret (Rainbow) Reservoir Pump Testing	NS	ND	ND	NS	No action at this time
Tooele Chemical Agent Disposal Facility (TOCDF) Lagoons	ND	ND	NA	ND	No action at this time
Former WWTP (SWMU 27, 49245.1014 and 49245.1035)	NS	No	NS	NS	No action at this time
Former Sanitary Landfill (SWMU 26, 49245.1013)	No	NS	NS	No	No action at this time

Notes:
* = Groundwater assessed through the sampling of two existing groundwater wells located downgradient of all main post AOPIs (S3690 and S3590). Detections in groundwater at well S3690 may be attributed to more than one AOPI, however no exceedances of the OSD risk screening level were observed.
Light gray shading – detection greater than the OSD risk screening level

Acronyms:
AFFF – aqueous film-forming foam
GW – groundwater

NA – not applicable (i.e., PFOS, PFOA, or PFBS detected, but comparison to OSD risk screening levels is not applicable for the surface water feature sampled)
ND – non-detect
NS – not sampled
SE – sediment
SO – soil
SW – surface water

1 INTRODUCTION

The United States (U.S.) Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The Army is the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Executive Order 12580 and is conducting the PA/SI as the lead agency, 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 per- and polyfluoroalkyl substances (PFAS) Preliminary Assessment (PA)/Site Inspection (SI) included two distinct efforts. The PA identified areas of potential interest (AOPIs) at Tooele Army Depot – South (TEAD-S) based on whether there was 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 SI included multi-media sampling at AOPIs to determine whether a release has occurred, and the PFOS, PFOA, and PFBS results were compared to the Office of the Secretary of Defense (OSD) PFOS, PFOA, and PFBS risk screening levels to determine whether further investigation is warranted. This report documents the PA/SI for TEAD-S and was completed in accordance with CERCLA and The National Oil and Hazardous Substances Pollution Contingency Plan.

1.1 Project Background

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

In 2016, the United States Environmental Protection Agency (USEPA) established a lifetime health advisory of 70 nanograms per liter (ng/L) in drinking water for PFOS or PFOA and for the sum of PFOS and PFOA when both are present (USEPA 2016). On 15 October 2019, the OSD provided guidance on the investigation of PFOS, PFOA, and PFBS at Department of Defense (DoD) restoration sites (OSD 2019). The DoD guidance provides risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) or soil, calculated using the USEPA's Regional Screening Level (RSL) calculator for residential and industrial/commercial worker receptor scenarios. Following the issuance of the 2019 OSD memo, on 08 April 2021, USEPA published an updated toxicity assessment for PFBS (USEPA 2021). Based on the updated toxicity assessment for PFBS, the OSD issued a memorandum on 15 September 2021 to include updated PFBS risk screening levels. The September 2021 Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program is provided for reference as **Appendix A**. The OSD risk screening levels for tap water (also used to evaluate groundwater) are 40 ng/L for PFOS and PFOA, and 600 ng/L for PFBS. The PFOS and PFOA soil screening levels for the residential and industrial/commercial scenarios are 0.13 milligrams per kilogram (mg/kg) (residential) and 1.6 mg/kg (industrial/commercial). The PFBS soil screening levels for the residential and

industrial/commercial scenarios are 1.9 mg/kg and 25 mg/kg, respectively. These screening criteria are discussed further in **Section 6.5**.

1.2 PA/SI Objectives

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

1.2.1 PA Objectives

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

1.2.2 SI Objectives

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

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

1.3 PA/SI Process Description

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

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact (POCs) from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), TEAD-S, Tooele Army Depot – North (TEAD-N), and Arcadis U.S., Inc. (Arcadis). The Tooele Army Depot (TEAD) collectively refers to two geographic areas: Tooele Army Depot - North (TEAD-N) and TEAD-S. Both areas of TEAD were discussed during the kickoff call. The kickoff call occurred 11 March 2019, approximately 5 months before the site visit to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

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

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

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

1.3.2 Preliminary Assessment Site Visit

The PA site visit was conducted on 23 to 26 September 2019. An in-brief meeting was held to provide installation staff with the objectives of the site visit and team introductions. **Section 3** includes information regarding personnel interviewed.

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

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

An exit briefing was offered to installation personnel at the conclusion of the site visit to raise any items identified during the site visit, discuss any follow-up items, and review the schedule for submitting deliverables. The installation declined an exit briefing.

1.3.3 Post-Site Visit

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

1.3.4 Site Inspection Planning and Field Work

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

The objectives of the SI kickoff teleconference were to:

- discuss and review the AOPIs identified during the PA and the project status for the SI phase of work
- gauge regulatory involvement requirements or preferences
- discuss general SI deliverable and field work schedule information and logistics

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

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

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

identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHP was designed to supplement the Accident Prevention Plan (Arcadis 2018), which was developed for Army installations nationwide. The QAPP Addendum and SSHP were submitted to the installation and finalized before commencement of field work.

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

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

1.3.5 Data Analysis, Validation, and Reporting

Environmental samples collected during the SI were submitted to a laboratory which is DoD Environmental Laboratory Accreditation Program (ELAP)-accredited for PFOS, PFOA, and PFBS analysis by liquid chromatography in tandem with mass spectrometry and compliant with the DoD Quality Systems Manual (QSM) 5.3 (DoD and Department of Energy 2019). Laboratory analytical results were validated and verified by a project chemist. The project chemist completed a Data Usability Summary Report (DUSR) for the 2020 sampling event. Validated analytical results were summarized in the context of OSD risk screening levels (defined in **Section 6.5**).

2 INSTALLATION OVERVIEW

The following subsections provide general information about TEAD-S, 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

TEAD-S is located on 19,364 acres approximately 50 miles southwest of Salt Lake City in Rush Valley, Tooele County, Utah (**Figure 2-1**). The area surrounding the installation is sparsely settled, with a population density of approximately three persons per square mile in the valley, concentrated in a few communities. The installation is surrounded by a few small towns with a combined population of approximately 1,200 people, including Rush Valley, Clover, Saint John, Big Hollow, Vernon, Hogan's Ranch, and Stockton. The town of Ophir, located in a narrow mountain canyon directly northeast of TEAD-S, has a year-round population of approximately 30 residents (Parsons 2017). An overview of the installation layout is shown on **Figure 2-2**.

2.2 Mission and Brief Site History

Information in this section is excerpted from the Integrated Natural Resources Management Plan (Tetra Tech 2015) and the Installation Action Plan for TEAD-S (USAEC 2016).

The mission of TEAD-S is to support service member readiness through receipt, storage, issuance, demilitarization, and renovation of conventional ammunition and through the design, manufacturing, fielding, and maintenance of ammunition equipment.

During World War II, the Defense Department ordered the construction of a storage depot for chemical agents. At that time, the facility was named the Deseret Chemical Warfare Depot. In May 1955, Deseret Chemical Warfare Depot was redesignated as the Deseret Chemical Depot and placed under the command of TEAD. In 1962, the Deseret Chemical Depot activity became part of TEAD and was designated as TEAD South Area. In October 1995, the TEAD South Area was made a separate installation from the TEAD North Area (TEAD-N), located approximately 11 miles to the north, and was named Tooele Chemical Activity. In October 1996, Tooele Chemical Activity was officially renamed Deseret Chemical Depot; subsequently, in July 2013, the Deseret Chemical Depot was closed, and the installation was transferred to and known as TEAD-S. The facility includes 208 earth covered magazines, two above ground magazines, and 32 storage warehouses.

2.3 Current and Projected Land Use

Information in this section is excerpted from the Integrated Natural Resources Management Plan for TEAD (Tetra Tech 2015).

The majority of the acreage at TEAD-S (about 96 percent [%] of the land area) is designated as minimal use areas, used for igloo munitions and ammunition storage, maintenance, and demolition, with buffer zones around the ammunition activity areas to provide for public safety and weapons security

considerations. The remaining land area is designated for administration/community support areas and includes TEAD-S' main entrance gate, cantonment area, and the Deseret (Rainbow) Reservoir recreation area. As most of the acreage at TEAD-S is designated for munitions storage and demolition activities, an unexploded ordnance escort is always required across the installation to address any dangers that may be present from any current or remaining munitions. The future land use is projected to remain consistent with the current industrial/commercial use.

2.4 Climate

Information in this section is excerpted from the TEAD-S Final Groundwater Management Plan (Parsons 2017). The climate of Rush Valley is semi-arid, with low relative humidity, and light precipitation. Minimum temperatures between December and February can drop below 10 degrees Fahrenheit. In summer, maximum daytime temperatures frequently exceed 90 degrees Fahrenheit. Nighttime temperatures decrease considerably as colder air subsides from the surrounding mountain slopes into Rush Valley (Parsons 2017).

Prevailing winds at TEAD-S are from the southeast, with occasional winds from the north-northwest (Gardner and Kirby 2011, as cited in Parsons 2017). Average annual precipitation ranges from less than 12 inches in the central lowlands of the valley to more than 40 inches at the highest altitudes of the Stansbury Mountains (located to the northwest of TEAD-S) and the Oquirrh Mountains (located to the northeast of TEAD-S). Most precipitation occurs during the winter and early spring months as snow, and the least precipitation occurs during the hot summer months of July and August (Gardner and Kirby 2011, as cited in Parsons 2017). All the precipitation that lands on the valley floor is consumed by evapotranspiration. The mountain precipitation is greater than what is consumed by evapotranspiration, and this precipitation either infiltrates into subsurface soil at higher altitudes or becomes overland runoff in streams that drain the mountains (Parsons 2017).

2.5 Topography

Information in this section is excerpted from the TEAD-S Final Groundwater Management Plan (Parsons 2017). TEAD-S is located on the eastern side of Rush Valley. The valley is a large, north-south trending, internally drained basin, defined by a series of narrow, normal fault-bounded bedrock mountain ranges and adjoining low hills that surround a broad, gently sloping valley floor. The surface topography of TEAD-S is generally flat with a gradual and gentle slope toward the west-southwest (Parsons 2017). Ground surface elevations across TEAD-S range from approximately 5,030 feet above mean sea level along the southern boundary to 5,600 feet above mean sea level along the northeastern boundary. **Figure 2-3** shows the topography of the installation and surrounding area.

2.6 Geology

Information in this section is excerpted from the TEAD-S Final Groundwater Management Plan (Parsons 2017). Seven geological units have been identified across Rush Valley; however, only two have been identified within the boundaries of TEAD-S: the unconsolidated upper basin-fill aquifer unit (UBFAU), and the lower basin-fill aquifer unit (LBFAU). The UBFAU extends from the ground surface to approximately 300 to 500 feet below ground surface (bgs) and is comprised of alluvial and lacustrine derived silty

gravels/gravelly silts in the Ophir Creek alluvial fan deposits near the northeastern border of the installation. Along the western and southern borders of the installation lies the LBFAU, consisting of fine-grained silty clay lacustrine deposits with fine sand seams (Gardner and Kirby 2011, as cited in Parsons 2017). The LBFAU, comprised of aged basin fill, is believed to extend as deep as 4,500 feet bgs, and is understood to underlie the younger deposits of the UBFAU (United States Geological Survey [USGS] 2011). These two regions are spanned by a transition zone of alluvial gravels and sands interbedded with clay-rich lacustrine deposits (Kleinfelder 1999, as cited by Parsons 2017).

2.7 Hydrogeology

Information in this section is excerpted from the TEAD-S Final Groundwater Management Plan (Parsons 2017). Depth to water across the installation ranges from approximately 5 feet bgs, where perched aquifers occur on the western and southern portions of the installation within the sand seams of the LBFAU, to approximately 280 feet bgs (Parsons 2017). A groundwater divide passes through TEAD-S, running from northeast to southwest. Groundwater flow on the northwestern side of this divide is predominantly to the west/southwest. Groundwater in the southeastern portion of the groundwater divide varies, with southeasterly flows in the northeastern portion of the installation shifting to southerly to southwesterly flows moving south across the installation. Groundwater flow across the southwestern border of the installation, where the installation is underlain by the LBFAU, is predominantly to the east (Parsons 2017).

The mostly southerly groundwater flow at TEAD-S may be due to the lack of groundwater recharge into Rush Valley from the Oquirrh Mountains as the groundwater flows predominantly to the south (especially south of Ophir Canyon; **Figure 2-2**) perpendicular to ground surface elevation contours. The presence of a significant recharge area (Ophir Canyon) from the Oquirrh Mountains just north of TEAD-S is a predominant factor affecting groundwater flow in the northeastern portion of TEAD-S as it flows southwest; flow then disperses, generating a mostly-southerly flow east of a groundwater divide (Parsons 2017). Mercur Creek (**Figure 2-2**) is another source of groundwater recharge to Rush Valley and the TEAD-S area.

2.8 Surface Water Hydrology

Information in this section is excerpted from the Final Groundwater Management Plan (Parsons 2017) and the Integrated Natural Resource Management Plan (Tetra Tech 2015). The surface water features at TEAD-S include several perennial and intermittent streams, one man-made reservoir (i.e., the Deseret [Rainbow] Reservoir), and two ponds. **Figure 2-2** shows several “connector” features in the area, which, according to the United States Geological Survey's National Hydrology Dataset, are known but nonspecific invisible connections between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.

The majority of the water from the snowmelt-fed streams either recharges the groundwater, is lost to evaporation, or is excessed to Clover Reservoir on Bureau of Land Management land west of TEAD-S via Ophir Creek and used for agricultural irrigation systems (Tetra Tech 2015). Precipitation on the Stansbury and Oquirrh Mountains is often greater than what is dissipated by evapotranspiration, resulting in runoff that either infiltrates into subsurface soil at higher altitudes or becomes overland runoff in streams (i.e.,

Ophir Creek) that drain from the mountains (Gardner and Kirby 2011, as cited by Parsons 2017). Following heavy storm events, local flooding may occur if the stream banks of Faust Creek overflow, and an intermittent shallow lake of pooled precipitation may form, occupying up to several hundred acres in a low area in the western portion of TEAD-S (depicted on **Figure 2-2**). Faust Creek flows north through the center of Rush Valley and receives water from Ophir, Mercur, and Clover Creeks (Tetra Tech 2015). East of the installation, surface flow at the mouth of Mercur Canyon is diverted to the south by way of a drainage ditch. This diversion ditch carries Mercur Creek surface water into a playa area southeast of TEAD-S and limits surface flow across the installation boundary. Although surface flow is diverted away from TEAD-S, water from the creek may infiltrate basin sediments near the mouth of Mercur Canyon and the diversion ditch (Parsons 2017).

There is no groundwater that discharges as surface water in Rush Valley. With such high rates of evapotranspiration, drinking water sources on and in the vicinity of TEAD-S come exclusively from the groundwater (Parsons 2017).

The only surface water body used for recreation (i.e., fishing) on the installation is the Deseret (Rainbow) Reservoir. The reservoir, constructed in 1987, is 3.5 acres and has a 20-million-gallon capacity (Tetra Tech 2015).

2.9 Relevant Utility Infrastructure

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

2.9.1 Stormwater Management System Description

Ponding of stormwater generally does not generally occur at TEAD-S, since virtually all precipitation evaporates. Stormwater is managed at TEAD-S through diversion ditches along creeks (i.e., Ophir Creek, Mercur Creek) and the Deseret (Rainbow) Reservoir as discussed in **Section 2.8**.

2.9.2 Sewer System Description

From its original construction in approximately 1942, sanitary sewage from the TEAD-S barracks, commissary, and support facilities in the northeastern portion of the installation was routed to the Former Wastewater Treatment Plant (WWTP; Solid Waste Management Unit [SWMU] 27). At the Former WWTP (SWMU 27), sewage was treated through settlement in an Imhoff tank, and was discharged to a series of unlined ditches adjacent to the tank. In 1980, two unlined sewage lagoons were constructed adjacent to the Imhoff tank. Discharge from the Imhoff tank was rerouted into the northern lagoon, with overflow capacity provided by the southern lagoon. Periodically, sludge was removed from the Imhoff tanks and lagoons and buried at the Former Sanitary Landfill (SWMU 26) (USAEC 2016).

In the 1990s, the Tooele Chemical Agent Disposal Facility (TOCDF) Lagoons were constructed, and sanitary waste and drainage across the installation was rerouted to the lagoons. The TOCDF Lagoons consist of three small lagoons which feed in series to a larger final lagoon, where a snow-making cannon facilitates wastewater evaporation. The lagoons are lined with black plastic sheeting and riprap.

2.10 Potable Water Supply and Drinking Water Receptors

TEAD-S obtains its water supply from groundwater and operates its own water supply and distribution system. The natural slope of the valley in the area maintains a gravity-based pressure in the supply system. There are two active potable supply wells (WW1 and WW2) in the northeast, upgradient corner of the installation and one inactive potable supply well (WW3) in the southwestern quadrant of the installation. WW1 and WW2 are screened from 290 to 404 feet bgs, and 312 to 412 feet bgs, respectively. In 1989, WW3 was deemed unproductive, and therefore unusable, resulting in WW3 being sealed and capped. As such, WW3 cannot be used in the future as a potable water source. Locations of the on-post potable wells and monitoring wells are shown on **Figure 2-2**.

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 TEAD-S, which along with state and county GIS provided by the installation identified several off-post public and private wells within 5 miles of the installation boundary. Drinking water supply wells identified off-post and within 5 miles of the installation boundaries include municipal supply well 461, and public water supply system well 120878 – BARRICK-MERCUR (**Figure 2-4**). Both wells are located approximately 0.5 mile potentially cross-gradient (Parsons 2017) from the nearest AOPI, the Former Sanitary Landfill (SWMU 26), and approximately 0.1 mile east of the installation boundary. Though additional drinking water supply wells are located within 5 miles of the installation boundary, no existing off-post drinking water supply wells are known to be located downgradient of areas where PFAS-containing materials were potentially used, stored, or disposed. The EDR report providing well search results is included as **Appendix E**.

2.11 Ecological Receptors

The PA team collected information regarding ecological receptors that was available in the installation documents. The following information, as excerpted from the Integrated Natural Resource Management Plan (Tetra Tech 2015), is provided for future reference should the Army decide to evaluate exposure pathways relevant to the ecological receptors.

The northern half of TEAD-S lies within the Sagebrush Basins and Slopes ecoregion of the Central Basin and Range. The region is semi-arid and is dominated by Wyoming big sagebrush, mountain big sagebrush, and pinyon-Utah juniper vegetation. Perennial bunchgrasses also occur in the region and become increasingly common northward as available moisture increases. The southern half of TEAD-S is primarily within the Shadscale-dominated Saline Basin ecoregion. The region is arid and dominated by shadscale, winterfat, and greasewood. There are no forested areas at TEAD-S. Invasive species of concern at TEAD-S include white top weed, Scotch thistle, saltcedar, and hemlock (Tetra Tech 2015).

Thirty-nine mammal species have been observed at TEAD-S, including the pronghorn, mule deer, coyote, porcupine, striped skunk, and spotted skunk. Small mammal species existing on site include shrews, bats, squirrels and chipmunks, ground squirrels, white-tailed antelope squirrel, rabbits and hares, gophers, kangaroo rats, pocket mice, voles, and woodrats. Black-tailed jackrabbit and rock squirrel are also common at TEAD-S and the upland shrub habitat supports badgers and Ord’s kangaroo rats (Tetra Tech 2015).

Eight reptile species, four amphibian species, and about 105 species of birds have been observed at TEAD-S. Little information exists on the fish and other aquatic species inhabiting TEAD-S; however, Least Chub, carp, and rainbow trout have been noted at the Johnson Ponds, ephemeral wetlands, and Deseret (Rainbow) Reservoir, respectively (Tetra Tech 2015).

2.12 Previous PFAS Investigations

Previous (i.e., pre-PA) PFAS investigations relative to TEAD-S, including both those conducted and not conducted by the Army, are summarized to provide full context of available PFAS data for TEAD-S. However, only data collected by the Army will be used to make recommendations for further investigation.

In November 2016, in response to the Third Unregulated Contaminant Monitoring Rule (UCMR3), the Army collected post-treatment drinking water samples at potable well WW1 and Building 5010 (Fire Station #2) to analyze for PFOS and PFOA. All sample results were non-detect, with reporting limits of 0.04 micrograms per liter (µg/L, or 40 ng/L) and 0.02 µg/L (or 20 ng/L) for PFOS and PFOA, respectively (Tetrahedron, Inc. 2018). The minimum detection limit, limit of detection [LOD], and limit of quantitation [LOQ] were not defined in the 2018 Tetrahedron report or in the occurrence data available from the USEPA for the UCMR3. Though the reporting limit of the PFOS sample was equal to the OSD risk screening level for PFOS, this result was not considered a historical exceedance as the results were non-detect.

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 TEAD-S, data was collected from three principal sources of information were used to develop this PA and are described in the subsections below:

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

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

3.1 Records Review

The records reviewed for this PA included, but were not limited to, various Installation Restoration Program (IRP) administrative record documents, compliance documents, TEAD fire department documents, TEAD directorate of public works 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 TEAD-S is provided in **Appendix F**.

3.2 Personnel Interviews

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

- IRP Manager
- Range Control Specialist
- Environmental Protection Specialist
- Environmental Chief
- Fire Chief
- Assistant Fire Chief
- Fire Captain

- Firefighters (current and former)
- Facilities Construction Representative
- Contractor for Vehicle Maintenance for TEAD-N and TEAD-S (Alliance Worldwide Distributing)

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

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at TEAD-S during the records review process, the installation in-brief meeting, and/or during the installation personnel interviews. These areas were classified as an area not retained for further investigation or an AOPI based on a combination of information collected (e.g., records reviewed, personnel interviews, internet searches) as described in **Sections 5.1** and **5.2**, respectively. A photo log from the site reconnaissance is provided in **Appendix H**; photos were used to assist in verification of qualitative data collected in the field. The site reconnaissance logs are provided in **Appendix I**.

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

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

TEAD-S 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.

Across most of TEAD-S, it is unknown if class A or class B (AFFF) firefighting foams were used. Therefore, to be conservative, where the use or storage of firefighting foams was identified, it is assumed class B foams (AFFF) were used or stored. In association with fire department activities, firefighting foams have historically been stored at various places on the installation; have been used during training exercises, fire responses, nozzle and pump testing, fire truck tank and hose flushing, and fire truck washing; and have been disposed at the installation.

For emergency preparedness, installation and fire department personnel were trained to perform nozzle testing with firefighting foams to ensure optimal flow and release of the foam mixture. Nozzle testing involved spraying foams through fire equipment, which could release AFFF to the environment if the mixture was not fully contained. Fire equipment training also included arc training to maximize the arc, reach, and distance covered by foams in an emergency response. The total number of trainings that occurred and the amount of foam used during the trainings or testing, and the amount of foam stored at various areas, are unknown.

During the PA, historical foam use and disposal activities were identified as follows:

- Storage: Inventory documents provided by the Army before the PA site visit indicated that a cumulative volume of 50 gallons of 3% AFFF firefighting foams were stored at TEAD-N and TEAD-S, but did not specify the quantity of AFFF stored at each of the two installations. PA site reconnaissance and personnel interviews provided information about AFFF storage at TEAD-N and TEAD-S, but the total quantity stored at each installation could not be established for comparison to the Army-provided

inventory information. It is assumed that the entire 50 gallons of AFFF is accounted for at the storage areas identified at TEAD-N and TEAD-S. During the PA site visit at TEAD-S, interviewees reported AFFF storage in containers and in fire truck tanks at the Fire Station Support/Former Motor Pool (Building 5118), Fire Station #2 (Building 5010) (referred to as Building 10 in previous reports), and at Former Fire Station #2 Support Building (Building 5144).

- Nozzle/hose and pump testing: These activities involving foam use occurred at the Motor Pool (Building 5134), Deseret (Rainbow) Reservoir, and at Fire Station #2 (Building 5010).
- Training exercises: Foam was used at various firefighting training areas (FFTAs), including the Gas Station FFTA and the Building 5108 Parking Lot FFTA.
- Fire responses: Foam was used to prevent a possible electrical fire in Area 2 (exact location is uncertain but is estimated based on personnel interviews).
- Tank and hose flushing: These foam use and disposal activities occurred at Fire Station #2 (Building 5010) and at the Fire Truck Wash Area (Building 5165 Exterior).
- Fire truck washing: These activities have been conducted at the Car Wash (Building 5166), Fire Station #2 (Building 5010), and at the Fire Truck Wash Area (Building 5165 Exterior) and may have resulted in release of residual foam from the trucks.

Further discussion regarding areas retained as AOPIs based on the use, storage, and disposal of potentially PFAS-containing foam is presented in **Section 5.2**.

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

Following document research, personnel interviews, and site reconnaissance at TEAD-S, areas related to personal protective equipment (PPE) laundering, wastewater treatment, solid waste disposal, and metals plating operations were also identified as preliminary locations for use, storage, and/or disposal of PFAS-containing materials. A summary of information gathered in the PA for each of these preliminary locations is described below. Specific discussion regarding areas not retained for further investigation is presented in **Section 5.1** and specific discussion regarding areas retained as AOPIs is presented in **Section 5.2**.

Four areas were identified as potential locations for use, storage, and/or disposal of PFAS-containing materials. Firefighting personal protective equipment (PPE) was laundered at the self-contained breathing apparatus (SCBA)/Fire Department Laundry Extractor System (Building 5167), and the washing machines have overflowed almost every time the machines were used, according to firefighter interviews. Two WWTPs and one landfill were identified: TOCDF Lagoons, Former WWTP (SWMU 27), and Former Sanitary Landfill (SWMU 26). Sewage and wastewater originating from various AOPIs, including the SCBA/Fire Department Laundry Extractor System (Building 5167) and the Car Wash (Building 5166) drain to the TOCDF Lagoons. Sewage from the northeastern portion of the installation, including Fire Station #2 (Building 5010), was processed at the Former WWTP (SWMU 27). Sludge from the Former WWTP (SWMU 27) was buried at the Former Sanitary Landfill (SWMU 26).

The September 2018 Army Guidance for Addressing Release of Per- and Polyfluoroalkyl Substances indicates the mechanisms for potential use, storage, and/or disposal of PFAS-containing materials including metal plating operations (Army 2018). Three former metals plating areas were identified at

TEAD-S during site reconnaissance: Former Metals Plating (Building 4553), Former Potential Metals Plating (Building 5108; SWMU 14), and Former Potential Metals Plating/Painting, Drainage Pond and Pit (Building T-600; SWMU 5). None of these areas were retained as an AOPI for further investigation as no evidence of the use of PFAS-containing mist suppressants for metal plating operations was discovered during historical records review, personnel interviews, or site reconnaissance during the PA process. Further description of each of these areas is included in **Table 5-1.**

During a telephonic interview with the IMCOM Pest Management Consultant, it was noted that products containing Sulfluramid (i.e., associated with insecticides) may have contained PFAS and were phased out in 1996. During the PA records review, the IMCOM Pest Management Consultant provided records of potentially PFAS-containing pesticides and insecticides used at and/or stored at Army installations, and did not identify TEAD-S as an installation having used or stored PFAS-containing pesticides/insecticides. Additionally, the PA team reviewed available pesticide use inventory documentation provided by the installation and did not identify PFAS-containing pesticides use, storage or disposal.

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 TEAD-S) is not part of the PA/SI. However, potential off-post PFAS sources within a 5-mile radius of the installation that were identified during the records search and site visit are described in **Table 4-1** below. It is uncertain, based on the information provided, if firefighting foams used during the historical activities at any of the off-post sources were class A or class B (AFFF) firefighting foams.

Table 4-1. Potential Use, Storage, or Disposal Areas of PFAS-Containing Material Off-Post

Site Identifier	Date(s) of Relevant PFAS Use	Relevant Site History
Wildfire Responses	Various	There are numerous wildfires each year, both on- and off-post, and foam is often used to extinguish the fires. The TEAD fire department does not keep records of when and where they have used foam in wildfire responses, both on-post and during off-post mutual-aid responses (e.g., with county and city fire departments), nor the type of foam used.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage and/or disposal of PFAS-containing materials at TEAD-S were further refined during the PA process and identified either as an area not retained for further investigation or as an AOPI. In accordance with the established process for the PA/SI, 14 areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

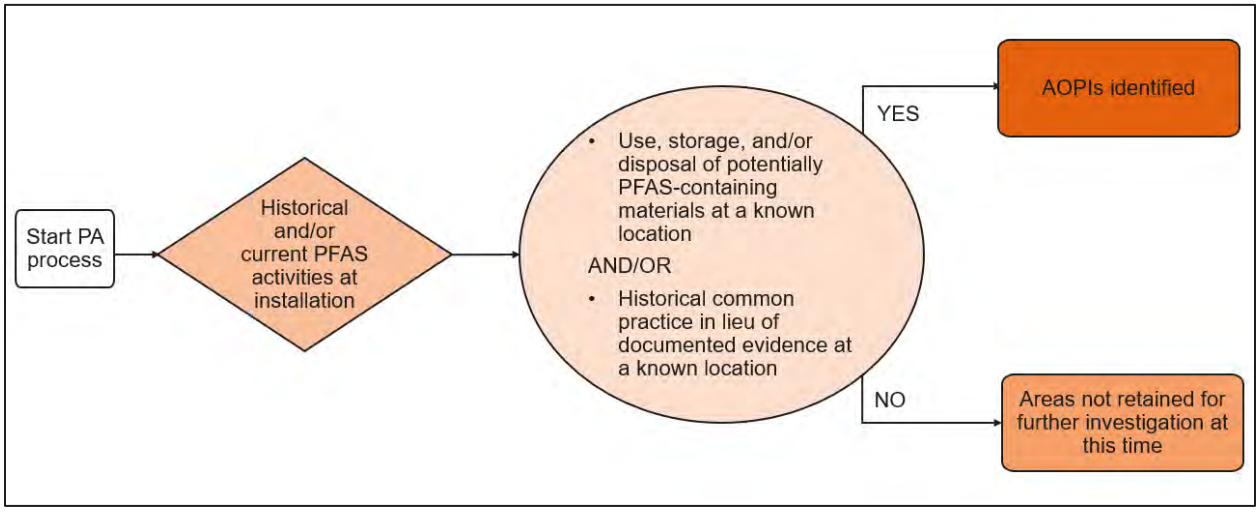

Figure 5-1: AOPI Decision Flowchart

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

Data limitations for this PA/SI at TEAD-S are presented in **Section 8**.

5.1 Areas Not Retained for Further Investigation

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

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

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

Area Description	Dates of Operation	Relevant Site History	Rationale
Inactive Landfill Area (7 acres) (SWMU 28, 49245.1015)	Unknown to 1972	The landfill was partially excavated and sampled to depth. Based on the constituent of concern concentrations (metals, explosives, and anions) detected in subsurface soil, the landfill was closed with a non-engineered cap (EBASCO 1993). SWMU 28 has on-going land use controls and is a Resource Conservation and Recovery Act-permitted site in the TEAD-S Part B permit (Module VI).	No evidence of disposal of PFAS-containing material in landfill
Old Chemical Agent Munitions Destruction System (CAMDS) Lab (Building 454) (CC-007, 49245.1040)	Unknown, likely approximately 1979 to 2012	This was a research and development lab used for chemical agent testing and mixing. There is no evidence that PFAS-containing materials were used here (EA Engineering, Science, and Technology, Inc. 1988)	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
DCD-001-R-01 Fire	Approximately 1997	A brush fire burned through IRP Site DCD-001-R-01 (Combat Training Area) in approximately 1997 (USAEC 2016). No TEAD fire department staff interviewed during the PA site visit recollect this specific fire, and therefore could not confirm its occurrence, or if AFFF was used in the firefighting process. However, it is standard procedure to use Class A firefighting foams (which do not contain PFAS constituents) in brush fire response. There has been at least one other brush fire in this area since 1997.	No evidence of PFAS containing materials used, stored, and/or disposed of at this location
Wildfire Responses (On-post)	Unknown	There are numerous wildfires each year both on- and off-post, and foam was often used to extinguish the fires. The TEAD fire department does not keep records of when and where they have used foam in wildfire responses, both on-post or during off-post mutual aid responses (e.g., with county and city fire departments), nor the type of foam used.	Locations of possible PFAS-containing material use are unknown
Former Vehicle Wash Rack (Building T-136)	Approximately 1957 to unknown	This wash rack was installed in 1957 and operated for an unknown period of time. The wash rack was demolished (year unknown) but the pad still exists. It is not known whether fire trucks were ever cleaned here.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
Former CAMDS Landfill (CC-003; SWMU 30, 49245.1019 and 49245.1036)	Approximately 1956 to unknown	The CAMDS Landfill was comprised of three Burn Trenches (used 1956 to approximately early 1970s, so it predates the CAMDS Facility), a Boiler Blow-Down Ditch and Ponding Area, Construction Debris Piles, and a former CAMDS lagoon ("Southwest Wastewater Lagoon," which was constructed in 1988). The burn trenches were used for wood burning and dunnage disposal. No hazardous materials reportedly were disposed of in these trenches. The soil/debris piles east of the former burn trenches received road-renovation waste such as soil, asphalt, and polyvinyl chloride pipe. During a remedial action, the SWMU 30 lagoon and burn trenches were excavated, sampled, and backfilled with clean soil.	No evidence of receipt of potential PFAS-containing waste
Former CAMDS Lagoon (SWMU 30, 49245.1019 and 49245.1036)	1988 to approximately 2012 (or earlier)	This lagoon ("Southwest Wastewater Lagoon") or pit received sewage effluent from saturation of the leach field. Very little information is available about this lagoon and its use, including its relationship to the former CAMDS lagoons located along the northwest perimeter of the CAMDS. No specific evidence was identified suggesting that waste from the CAMDS facilities may have included PFAS-containing materials.	No evidence of receipt of potential PFAS-containing wastewater
Former CAMDS Lagoons	1987 to approximately 2012	The four former lagoons ("Northwest Wastewater Lagoons") received sanitary sewage from the CAMDS facilities. The original ("old") lagoon was constructed in approximately1987 and ceased operation prior to July 1997, as indicated by satellite imagery. Three lagoons were constructed in approximately 1991 just to the west of the "old" lagoon. A final lagoon was constructed sometime after July 1997 and before October 2003 and appeared to be lined (satellite imagery). The lagoons received sanitary waste from the CAMDS facilities, likely including the Old Laundry (Building 4544, prior to the 1990s) and the former CAMDS PPE laundry (7000 series building; precise building number is unknown).	No evidence of receipt of potential PFAS-containing wastewater
Former CAMDS Laundry (Building 4544)	Approximately 1979 to 1990s	CAMDS Old Laundry (Building. 4544; formerly T4544). This laundry was used prior to the laundry in Building 5165 which was constructed sometime in the 1990s. No PPE was laundered in Building	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
		4544. Waste likely went to the former CAMDS Northwest Lagoons.	
Former CAMDS PPE Laundry	Unknown; likely 1979 to approximately 2012	This laundry facility was located in a 7000-series building (exact building is unknown) in CAMDS and was used to launder outer PPE worn by CAMDS staff. There were reports of laundering waterproof or fire-retardant PPE here based on personnel interviews, however the laundry was never observed to have overflown, leaked, or spilled.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Shower/Laundry and Effluent Pond (Building S-3200) (SWMU 36, 49245.1005)	Prior to 1959 to unknown	Based on an SI of Building S-3200 during a Phase I investigation conducted in 1992 to 1993, the building may have been used as a laundry and/or shower facility with an unlined pond receiving the wastewater. The Shower/Laundry and Effluent Pond measured approximately 53 feet by 27 feet and was 7 feet deep. A historical photograph from 1959 was inspected as part of the investigation and a second, larger pond was identified to the north of the Shower/Laundry and Effluent Pond. It is unknown whether these two ponds were connected. In a 1996 photograph, the larger, northern pond was closed and filled in.	No evidence of receipt of potential PFAS-containing wastewater
Former Drycleaner (Building S/T125)	1943 to 1960s/1970s	The former drycleaner drained to the sanitary sewer and then to the Former WWTP (SWMU 27). The building was removed (year unknown) and repurposed elsewhere.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Soil Spoil Area	Unknown	This soil spoil area encompasses 443 acres and is located along the central portion of the northern installation boundary. It was a repository for excess and unsuitable soil material. This material was used as landfill cover. Installation staff did not know where the soil piles came from. No specific evidence was identified suggesting PFAS-containing materials may be present within the soil piles.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Demilitarization Area (SWMU 01, 49245.1001)	1945 to 1978	This demilitarization area was used for chemical agent munitions demilitarization and disposal. There is no evidence that PFAS-containing items were burned/disposed here.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Demilitarization Area (SWMU 25, 49245.1018)	1945 to 1978	This demilitarization area was used for chemical agent munitions demilitarization and disposal at this location. The western portion of the SWMU	No evidence of PFAS-containing materials used, stored, and/or

Area Description	Dates of Operation	Relevant Site History	Rationale
		includes numerous clusters of explosion craters, with each cluster encompassing approximately 3 to 4 acres. The eastern portion of the SWMU includes numerous burning and disposal trenches. In the north central portion of SWMU 25, two windrows of scrap munitions occupied shallow trenches. The windrows contained tail sections of cluster bombs, cluster bars, nose plates, hangers, fire-bomb casings, and M50-type thermite bombs. There is no evidence that PFAS-containing items were burned/disposed here.	disposed of at this location
Old Demo Pit (Building C4002) (SWMU 15, 49245.1009)	1949	There was an accidental explosion of mortars at this location in 1949. The Old Demo Pit is a Military Munitions Response Program site. This explosion pre-dates the use of AFFF in military activities.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Disposal Pit (SWMU 3, 49245.1003)	Unknown	This Disposal Pit encompassed 12 acres southeast of Area 2 and was used for the storage, maintenance, and decontamination of leaking chemical munitions. The pit was excavated completely, and the waste was disposed off post. There is no evidence that the historical activities at this location (period of use is not known) involved the use of PFAS.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
TOCDF	Early 1990s to 2012	Constructed in the early 1990s, this 32-building facility was used for dismantling chemical weapons and consisted of several incinerators. Disposal activities occurred from 1996 to 2012. During dismantling of this facility, some debris went offsite as F999 waste, a waste category encompassing residues from demilitarization, treatment, and testing of nerve, military, and chemical agents. Demolition of the facility was completed in July 2014.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Stormwater Retention Pond	Approximately 1990s to present	The stormwater retention pond drains parking lots via underground pipes and captures stormwater runoff from the TOCDF. The pond is lined with black plastic sheeting and rip rap. There is an outfall (overflow) in case it is needed (e.g., spring runoff).	No confirmed receipt of potential PFAS-containing runoff
Former Dispensary (Building 5010)	Approximately 1967 to 1985	Prior to 2013, the medical dispensary shared Building 5010 with Fire Station #2. An x-ray facility and a dental lab were in the building from the	No evidence of PFAS-containing materials used, stored, and/or

Area Description	Dates of Operation	Relevant Site History	Rationale
		1940s to sometime prior to 1985. All waste from this facility went to the Former WWTP (SWMU 27).	disposed of at this location
Former Paint Shop (Building S/T-105)	Approximately 1940s to 1960s	Building S/T-105 was used as a paint shop. The building was demolished but the foundation remains. The building drained to the Former WWTP (SWMU 27).	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Former Metals Plating (Building 4553)	Unknown	This former metals plating operation was used to plate munitions. The period of operation is not known. A wastewater pipe led from the building to a holding lagoon, which overflowed to a drainage ditch.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Former Potential Metals Plating (Building S-108/5108) (SWMU 14, 49245.1022)	Unknown, prior to 1979	Building 5108 is currently an office building but was historically a motor pool. Sometime prior to 1979, at least part of this building was used for processing M12 machine gun links and welding. However, it is unknown whether metals plating was also conducted here. The building likely drained to the Former WWTP (SWMU 27). The oil-water separator, floor drains, and plumbing reportedly were removed in 2013 or 2014.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location
Former Potential Metals Plating/Painting, Drainage Pond and Pit (Building T-600) (SWMU 5, 49245.1004)	Approximately 1967 to 1970s	Building T-600 was used from the late-1940s to the early-1970s for renovation of munitions, including chemical munitions, as well as the washout of high explosive cluster bombs. During renovation, munitions were placed in acid baths and then repainted in spray booths within the building. In the 1970s, the building reportedly was used for retort operations of the pilot test for the CAMDS. The waste generated during renovation of munitions drained into an unlined drainage pond (approximately 100 feet by 50 feet) located approximately125 feet east of the building. A nearby ditch received flow from the drainage pond. An unlined pond (pit) (approximately 32 feet by 95 feet and 10-feet deep) received rinse water from the bomb washout operations. SWMU 5 was contaminated with hexavalent chromium as a result of the bomb washout activities. However, it is unknown whether munitions renovation activities included metals plating. The building was demolished and all that remains is its foundation and the concrete settling basin. As	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
		part of a remedial action, the pond and pit were excavated, and 40 dump truck loads of hexavalent chromium-contaminated soil were removed and disposed off-site. An additional 25 feet of soil were excavated from the ponding area. SWMU 5 now covers only the drainage pond.	
Helipad	Late 1980s to present	Fire Station #2 staff would be on standby whenever a helicopter took off or landed at the helipad (as well as two additional helipads - one located in Area 2 and the other to the west of CAMDS). There are no known incidents at the helipad (or the other two helipads) that required the use of AFFF. A wheeled fire extinguisher containing Purple K was staged on the edge of the helipad during the PA site reconnaissance. According to a retired firefighter, the helipad was used for training with Purple K a couple of times. He added that training with AFFF was most likely conducted in front of the adjacent Fire Station #2.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location

In addition to installation areas not retained for further investigation, the PA identified three off-installation potential releases of PFAS-containing material.

- Railroad Ties Fire (located approximately 14 miles to the north of TEAD-S): In approximately the 2010s, the TEAD fire department and county/city fire departments responded to a railroad ties fire on/near the Base Realignment and Closure as part of a mutual aid agreement. Firefighters had to re-fill the foam tank with 1 or 2 5-gallon buckets of foam (unknown if Class A or Class B) and refilled the water reservoir two to three times to extinguish the fire. Latitude/Longitude of fire: 40.530573, -112.331913.
- Garbage Dump Fire (located approximately 10 miles to the north of TEAD-S): In 2018, the TEAD fire department and county/city fire departments responded to help extinguish a garbage dump fire as part of a mutual aid agreement. Fire trucks applied foam (unknown if Class A or Class B) multiple times because the fire continued to burn below the surface. Latitude/Longitude of fire: 40.476541, -112.356312.
- Stockton Hay Bale Fire (located approximately 6 miles north of TEAD-S): In approximately 2017, the TEAD fire department and county/city fire departments responded to a hay bale fire near/in the town of Stockton as part of a mutual age agreement. The firefighters used approximately 1.5, 5-gallon buckets of foam (unknown if Class A or Class B) to extinguish the fire. Latitude/Longitude of fire: 40.426113, -112.346541.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Two of the AOPIs overlap with TEAD-S IRP sites and/or HQAES sites (**Figure 5-2**). The AOPI, overlapping IRP site identifier, HQAES number, and current site status are discussed within each AOPI subsection presented below. At the time of this PA, none of the TEAD-S IRP sites have historically been investigated or are currently being investigated for the possible presence of PFAS.

The AOPI locations are shown on **Figure 5-2.** Aerial photographs of each AOPI that also show the approximate extent of firefighting foam use (unknown if class A or class B), if applicable, are presented on **Figures 5-3** through **5-11** and include monitoring wells in the vicinity of each AOPI. The AOPIs are downgradient of the two active potable water wells (WW1 and WW2) at TEAD-S. Groundwater originating at the AOPIs flows off-installation through the installation's southern boundary. The future land use of the AOPIs is projected to remain consistent with the current industrial/commercial use.

5.2.1 Car Wash (Building 5166)

The Car Wash (Building 5166) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the rinsing of foam (unknown if class A or class B) tanks. The car wash was operated with water only. Fire Station #2 trucks containing foam were rinsed here. Vehicles exiting the car wash, including fire trucks containing foam, would drip water residue onto the apron.

The Car Wash (Building 5166) AOPI does not overlap with IRP sites and consists of Building 5166 and paved surfaces. **Figure 5-3** shows the aerial extent of this AOPI.

5.2.2 SCBA/Fire Department Laundry Extractor System (Building 5167)

The SCBA/Fire Department Laundry Extractor System (Building 5167) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to laundry extractor system leaks. The TEAD fire department uses the extractor system in Building 5167 to launder its turnout gear (PPE). The extractor system experiences frequent leaks that flood the floor of the building, and bubbles are observed on the floor during these leaks. According to firefighter interviews, these leaks occur almost every time the extractor system is used. The floor drain is connected to the TOCDF Lagoons. Fire department personnel have also pushed the floodwater out the building door on numerous occasions, and floodwaters may have also leaked out the back of the building.

The SCBA/Fire Department Laundry Extractor System (Building 5167) AOPI does not overlap with IRP sites and consists of Building 5167 and paved surfaces. **Figure 5-3** shows the aerial extent of this AOPI.

5.2.3 Fire Truck Wash Area (Building 5165 Exterior)

The Fire Truck Wash Area (Building 5165 Exterior) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to foam (unknown if class A or class B) tank flushing activities. Sometimes after wildland fire responses involving use of foam, brush trucks were washed, and foam tanks were flushed near the fire hydrant in the paved parking area next to Building 5165 before the fire trucks returned to the station.

The Fire Truck Wash Area (Building 5165 Exterior) AOPI does not overlap with IRP sites and consists of Building 5165 and paved surfaces. **Figure 5-3** shows the aerial extent of this AOPI.

5.2.4 Fire Station Support/Former Motor Pool (Building 5118)

The Fire Station Support/Former Motor Pool (Building 5118) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF storage and usage. The TEAD fire department has used this building (former motor pool) since 2013 to store trucks, equipment, and AFFF. The floor drains and associated oil-water separator were removed in 2013 before the TEAD fire department began using the building. AFFF (Chemguard 3%) is currently stored there in 5-gallon pails. At an unknown date, a leak in the bottom of a 5-gallon pail of AFFF on brush truck #112 was observed when the truck was to be serviced, and approximately 1 inch of concentrate leaked from the pail onto the bay floor. The pail was retained and turned upside down. Water was used to rinse the spilled concentrate out of the bay. The rinse water was pushed out the west facing bay door and it flowed down the east side of the street. The compromised pail of AFFF was still present during the PA site reconnaissance in 2019. Additionally, in 2017 or 2018, AFFF leaked into the water reservoir of brush truck #112. The water reservoir was drained and flushed for approximately 10 minutes onto the paved parking lot in front of the east bay by the hydrant.

The Fire Station Support/Former Motor Pool (Building 5118) AOPI does not overlap with IRP sites and consists of Building 5118 and paved surfaces. **Figure 5-4** shows the aerial extent of this AOPI.

5.2.5 Gas Station FFTA

The Gas Station FFTA is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to foam use. The TEAD fire department conducted firefighting training with foam more than once on the west side of the gas station. Foam was sprayed to the west onto a gravel area and onto an unpaved, vegetated area.

The Gas Station FFTA AOPI does not overlap with IRP sites and consists of paved surfaces, dirt, and vegetation. **Figure 5-4** shows the aerial extent of this AOPI.

5.2.6 Building 5108 Parking Lot FFTA

The Building 5108 Parking Lot FFTA is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting training activities potentially using PFAS-containing material. This large parking lot is located immediately south of Building 5108 (former motor pool Headquarters office building) and east of Building 5118 (Fire Station #2's support building). The lot was covered in gravel prior to being paved in approximately 1995. The Fire Station #2 staff currently train with water in this parking lot. The lot has also been used for annual hose pressure testing and occasional testing on the fire truck engines.

The Building 5108 Parking Lot FFTA does not overlap with IRP sites and consists of paved surfaces. **Figure 5-4** shows the aerial extent of this AOPI.

5.2.7 Fire Station #2 (Building 5010)

Fire Station #2 (Building 5010) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use. AFFF is currently (and was historically) stored in the engines at the station. The station also has two brush trucks and at least one used to carry AFFF in its reservoir until approximately 2016. Fire trucks were usually washed on the station apron. Water tanks were flushed on the apron whenever firefighting foams entered the tanks. Since approximately 2015, annual pump testing is conducted at the station by a contractor. Firefighting training has been conducted on the apron with protein foams and AFFF.

The Fire Station #2 (Building 5010) AOPI does not overlap with IRP sites and consists of Building 5010, paved surfaces, and dirt. **Figure 5-5** shows the aerial extent of this AOPI.

5.2.8 Motor Pool (Building 5134)

The Motor Pool (Building 5134) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use. In the 1980s, the TEAD fire department provided a pail of AFFF to the maintenance crew for their use in testing a repair of the plumbing system on a fire engine. Reportedly 2.6 gallons of the AFFF in the container was sprayed to the west or northwest from the back apron (on the west side of Building 5134).

The Motor Pool (Building 5134) AOPI does not overlap with IRP sites and consists of Building 5134, paved surfaces, and dirt. **Figure 5-6** shows the aerial extent of this AOPI.

5.2.9 Former Fire Station #2 Support Building (Building 5144)

The Former Fire Station #2 Support Building (Building 5144) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use and storage. This building was used to house/store one brush truck, hoses, AFFF, and other items for Fire Station #2. The building has no floor drains. TEAD fire department staff are unaware of any historical AFFF leaks or spills inside or outside of this building, and trucks were not filled there with AFFF. In 2013, Fire Station #2 was reassigned Building 5118 as their support building.

The Former Fire Station #2 Support Building (Building 5144) AOPI does not overlap with IRP sites and consists of Building 5144, paved surfaces, and dirt. **Figure 5-6** shows the aerial extent of this AOPI.

5.2.10 AFFF Fuel Spill Response in Area 2

The AFFF Fuel Spill Response in Area 2 is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use. According to a retired firefighter, sometime in the 1980s, a firefighters used AFFF in response to a fuel spill near a utility pole with electrical lines. The AFFF was deployed to cover the spilled fuel to prevent electrical equipment from igniting the spilled fuel . Mechanical difficulties with a fire truck's AFFF deployment system required firefighters to spray additional AFFF and then flush the system with water repeatedly at the location of the response and near an adjacent building. Approximately 2.5 gallons of AFFF concentrate were used during the response. The retired firefighter estimated at which building in Area 2 this response occurred. However, the Environmental Protection Specialist at TEAD-S provided historical site plans and drawings indicating that

none of the buildings in the area indicated by the retired firefighter had been wired for electricity in the 1980s, so the specific location of AFFF use for this fire response is uncertain. The location of this AOPI has been mapped based on the recollection of the retired firefighter.

The AFFF Fuel Spill Response in Area 2 AOPI does not overlap with IRP sites and consists of a building surrounded by paved and unpaved surfaces. **Figure 5-7** shows the aerial extent of this AOPI.

5.2.11 Deseret (Rainbow) Reservoir Pump Testing

The Deseret (Rainbow) Reservoir Pump Testing is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to pump testing and AFFF tank flushing. Fire Station #2 historically used Deseret (formerly Rainbow) Reservoir for annual pump testing, during which residual AFFF in the truck's pumping system was flushed and sprayed over the ground and into the reservoir. Trucks parked on the northwest side of the reservoir pulled water from the reservoir and then sprayed to the southeast back into the reservoir. Annual pump testing has been conducted by a contractor at Fire Station #2 since 2014. The reservoir is clay-lined and receives water from Ophir Creek. The reservoir releases water almost constantly, via a pipe, back into the Ophir Creek or for agricultural/grazing use.

The Deseret (Rainbow) Reservoir Pump Testing AOPI does not overlap with IRP sites and consists of the reservoir. **Figure 5-8** shows the aerial extent of this AOPI.

5.2.12 TOCDF Lagoons

The TOCDF Lagoons are identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the receipt of potentially-PFAS containing waste. The TOCDF Lagoons have been the sanitary WWTP for TEAD-S since the 1990s. The TOCDF Lagoons receive waste from the TEAD-S fire station, the SCBA/Fire Department Laundry Extractor System (Building 5167), the Car Wash (Building 5166), and from other vehicle maintenance buildings. The TOCDF Lagoons are comprised of three small lagoons that feed into a large final lagoon. The lagoons are lined with black plastic sheeting and rip rap. The large lagoon has a snow-making cannon that is used to facilitate wastewater evaporation and has a built-in overflow system that reportedly has never been deployed.

The TOCDF Lagoons AOPI does not overlap with IRP sites and consists of the lagoons. **Figure 5-9** shows the aerial extent of this AOPI.

5.2.13 Former WWTP (SWMU 27, 49245.1014 and 49245.1035)

The Former WWTP (SWMU 27) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to the receipt of potential PFAS-containing material. The sewage treatment plant consisted of an Imhoff tank, two unlined sewage lagoons, and drainage ditches. The Former WWTP is located in the northeastern portion of the post, approximately 2,000 feet south of the administration area. It is estimated that the tank and sewer lines were installed in 1942, during post construction. The tank and lines served the barracks, commissary, and support facilities located in the northeastern part of the installation, including Fire Station #2 (Building 5010). The unlined sewage lagoons were constructed in 1980. The northern lagoon received effluent from the Imhoff tank and was designed to overflow into the southern lagoon, which was open at its southwest corner. Before construction of the sewage lagoons in 1980, discharge from the Imhoff tank flowed into ditches adjacent to the lagoon on the east side. In 2012,

the Imhoff tank and associated soils were removed. A corrective action was undertaken in 2016 to 2017, during which the berms of the lagoon were destroyed and regraded to prevent ponding water, and the eastern and western septic tanks were removed during a soil excavation which was completed to a depth of 12 feet. All three of the oil-water separators were also removed during a soil excavation which was completed to a depth of 8 to 12 feet. SWMU 27 has received clean closure under the Resource Conservation and Recovery Act. Potential remaining soil impacts include the soil associated with the ditches.

The Former WWTP (SWMU 27) overlaps with IRP site HQAES 49245.1014 and 49245.1035. The corrective action at the Former WWTP (SWMU 27) includes soil excavation and tank removal. **Figure 5-10** shows the aerial extent of this AOPI.

5.2.14 Former Sanitary Landfill (SWMU 26, 49245.1013)

The Former Sanitary Landfill (SWMU 26) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to receipt of potential PFAS-containing material. The Former Sanitary Landfill (SWMU 26) operated from 1956 to approximately 1994 and occupied approximately 44 acres in the northeastern portion of the installation. It was comprised of multiple trenches. Only one trench was open in 1993 when the landfill was receiving approximately 1 ton of sanitary waste a day. Packing materials for munitions were disposed in the older portions of the former landfill. The former landfill is unlined and has no gas vents. In late 2020, the entire landfill was capped with a geosynthetic clay liner and graded to manage run-on and runoff to prevent any ponding water. The Former Sanitary Landfill (SWMU 26) was approved for post closure control in the IRP in 2020. The former landfill reportedly received sewage sludge from the Former WWTP (SWMU 27), which received waste from Fire Station #2 (Building 5010) and the Car Wash (Building 5166).

The Former Sanitary Landfill (SWMU 26) AOPI overlaps with IRP site SWMU 26, identified by HQAES 49245.1013. **Figure 5-11** shows the aerial extent of this AOPI.

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at TEAD-S, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at TEAD-S at all 14 AOPIs to evaluate presence or absence of PFOS, PFOA, and PFBS in comparison with the OSD risk screening levels. As such, an installation-specific QAPP Addendum (Arcadis 2020) was developed to supplement the general information provided in the PQAPP (Arcadis 2019) and to detail the site-specific proposed scopes of work for the SI. A preliminary CSM was prepared for each of the installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified soil, groundwater, surface water, and sediment pathways as potentially complete which guided the SI sampling. The QAPP Addendum details the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed in October 2020 through the collection of field data and analytical samples.

The SI field work was completed in accordance with the standard operating procedures (SOPs), technical guidance instructions (TGIs), sampling design, and QA/QC requirements as detailed in the QAPP Addendum (Arcadis 2020) and PQAPP (Arcadis 2019). The subsections below summarize the DQOs, sampling design and rationale, sampling activities and methods, and data analyses procedures for the SI phase at TEAD-S. Non-conformances to the prescribed procedures in the PQAPP and QAPP Addendum are described in **Section 6.3.3**. Analytical results obtained through SI field activities are summarized in **Section 7**.

6.1 Data Quality Objectives

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

6.2 Sampling Design and Rationale

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

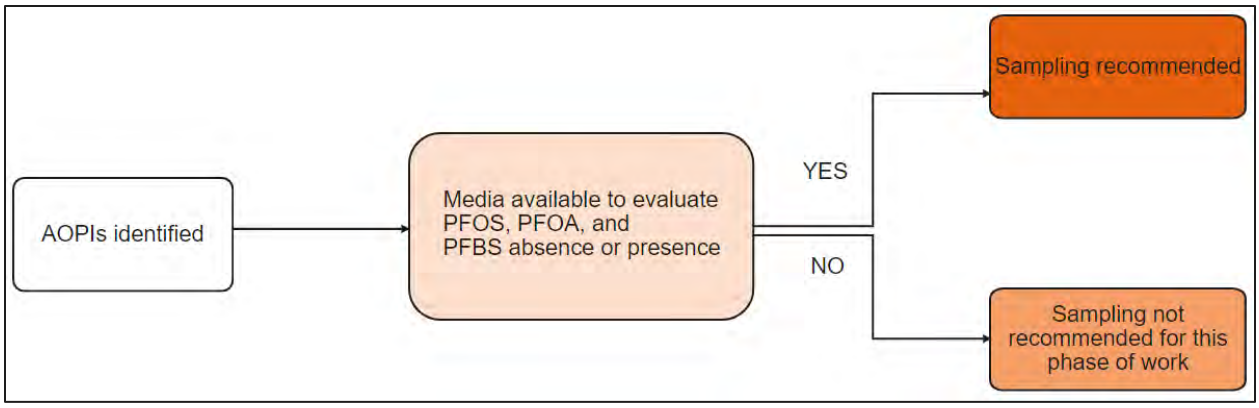

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at TEAD-S is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). Briefly, samples were collected from the soil underlying potential PFAS use, storage, or disposal areas, and from existing downgradient on-post monitoring wells where available. Due to the significant depth to water (greater than 200 feet bgs [Parsons 2017]) across the installation, where existing downgradient on-post monitoring wells did not exist in proximity to an AOPI, soil, surface water, and/or sediment samples were assessed in place of groundwater sampling, as agreed upon during the SI scoping call with USAEC, USACE, and TEAD-S personnel. Soil samples were not collected at AOPIs where damage to linings was a concern (e.g., the plastic lining at the TOCDF Lagoons, the cap at the Former Sanitary Landfill, and the clay liner at the Deseret [Rainbow] Reservoir Pump Testing AOPI). Where soil samples could not be collected, downgradient groundwater, surface water, and/or sediment samples were proposed instead at each AOPI. Where a surface water body existed near an AOPI, surface water samples were collected where suspected PFAS-containing material may have been transported or deposited within each AOPI. Sediment samples were collected from intermittent surface water bodies where damage to linings was not a concern. At AOPIs where no intermittent or permanent surface water features exist nearby, no surface water or sediment sampling was proposed.

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

6.3 Sampling Methods and Procedures

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

but special considerations were made regarding PFAS-containing materials and equipment and cross-contamination potential.

The sampling methods employed during the SI are detailed in the PQAPP (Arcadis 2019) and QAPP Addendum (Arcadis 2020). The subsections below provide a summary of the field methods and procedures utilized to complete the SI scope of work. Field notes and field forms (i.e., groundwater purging logs, equipment calibration forms, tailgate health and safety forms, and sample collection logs) documenting the SI sampling activities are included in **Appendices J** and **K**, respectively. Photos taken during the SI are included as part of the field forms in **Appendix H**.

6.3.1 Field Methods

Composite soil samples were collected via hand auger from the top 2 feet of surface soil at each sampling location. Where necessary, a decontaminated electric coring drill was used to remove concrete and asphalt above soil sampling locations. Soil descriptions were documented on field forms. Once sampling was complete, these locations were repaired using Quikrete Cold Patch (blacktop repair material). Soil cuttings were containerized, and sand was used to backfill the boreholes.

Groundwater samples were collected at existing monitoring wells from approximately the center of the saturated screened interval either using low-flow purging methods, or using no-flow collection methods (i.e., at deeper wells where lift could not be achieved with a portable pump). Where samples were collected via low-flow methods, a peristaltic pump or decontaminated portable bladder pump was used with PFAS-free disposable high-density polyethylene tubing (and PFAS-free disposable bladder, where the bladder pump was used). Where samples were collected via no-flow methods, PFAS-free disposable Hydrasleeves™ were used; the Hydrasleeves™ were set in the middle of the saturated screened interval and left overnight to reduce turbidity of the samples before collection the following day.

Grab surface water samples were collected via direct fill methods directly beneath the water surface. Sediment samples were collected from the upper 10 centimeters using a decontaminated stainless-steel trowel; sediment samples were decanted (if surface water was present at the feature) before bottling for laboratory analysis. Some of these samples included notation of sediment samples in the sample identification (i.e., “-SE”) based on the hydrologic data provided by the USGS (USGS 2018), which indicated that a surface water feature was present in the area. However, it is understood that these features are intermittent and most precipitation at TEAD-S is evaporated; therefore, these sediment samples may be more accurately described as soil samples. Sediment descriptions were documented on the field forms.

Coordinates for each sampling location were recorded using a handheld global positioning system device. Decontamination procedures for non-dedicated equipment used during sampling are described in **Section 6.3.4**.

6.3.2 Quality Assurance/Quality Control

Worksheets #20 of the PQAPP and QAPP Addendum provide QA/QC requirements for field duplicates, matrix spike/matrix spike duplicates, equipment blanks, and field blanks for laboratory-supplied water used in the final decontamination step.

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020), typically at a rate of 1 per 20 parent samples. Field duplicates and matrix spike/matrix spike duplicate samples were collected only for media sampled for PFOS, PFOA, and PFBS. Equipment blanks were collected for media sampled for PFOS, PFOA, and PFBS, at a frequency of one per piece of relevant equipment for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which equipment blanks were collected include tubing, Hydrasleeves™, Hydrasleeve™ clips and weights, bladder pumps, bladders, coring bits, hand augers, water-level meters, and stainless-steel trowels as applicable to the sampled media. Analytical results for blank samples are discussed in **Section 7.18**.

6.3.3 Field Change Reports

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

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

- Former Sanitary Landfill (SWMU 26): Field parameters could not be collected for the groundwater sample TEADS-S3990-102020 due to an insufficient sample volume. Field parameters were collected for three other groundwater samples associated with the Former Sanitary Landfill (SWMU 26), and geochemical conditions are assumed to be similar at all four wells sampled for this AOPI. Additionally, surface water sample TEADS-14-1-SW was not collected due to the sampling location being dry. An alternative surface water sampling location could not be proposed for the AOPI.
- SCBA/Fire Department Laundry Extractor System (Building 5167): Due to an insufficient sample volume at planned location TEADS-02-1-SO-102120, the sample volumes for total organic carbon (TOC), pH, and grain size analysis were collected at location TEADS-02-2-102120 as an alternative to TEADS-02-1-102120.
- TOCDF Lagoons: Surface water sample TEADS-12-1-SW was not collected during the SI field event due to the sampling location being dry. An alternative surface water sampling location could not be proposed for the TOCDF Lagoons, however two other surface water samples were collected in association with this AOPI.

6.3.4 Decontamination

Non-dedicated reusable sampling equipment (e.g., stainless-steel trowels, hand augers, screen-point samplers, water-level meters) that came into direct contact with sampling media was decontaminated before first use, between sampling locations/intervals, and before demobilization in accordance with P-09, TGI - Groundwater and Soil Sampling Equipment Decontamination (Arcadis 2019, Appendix A).

6.3.5 Investigation-Derived Waste

Per the Final QAPP Addendum for the PFAS SI at TEAD-S (Arcadis 2020), all liquid IDW (i.e., groundwater purged during sampling and water from decontamination of sampling equipment) and solid IDW (i.e., soil cuttings from hand augering) that may potentially contain PFAS was temporarily containerized separately (i.e., liquid and solid) in 55-gallon drums. The IDW was properly labeled and stored at Building 5124 on-post pending the composite waste characterization results. The PFAS analytical results and final disposal actions for the IDW are discussed in detail in **Section 7.16**.

Equipment waste, including personal protective equipment and other disposable materials (e.g., gloves, Lexan tubes, plastic sheeting, and high-density polyethylene and silicon tubing) that may have come in contact with sampling media, was drained of water, bagged, and disposed in the waste receptacles on post. Non-IDW wastes were removed from the site upon completion of each day's field activities.

6.4 Data Analysis

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

6.4.1 Laboratory Analytical Methods

Analytical samples collected during the SI were submitted to Pace South Carolina (formerly Shealy Environmental Services, Inc.), an ELAP-accredited laboratory for PFAS analysis, including PFOS, PFOA, and PFBS, by liquid chromatography with tandem mass spectrometry. Laboratory analyses associated with the SI were completed in accordance with Worksheets #12.1 through #12.5 in the PQAPP (Arcadis 2019). Eighteen PFAS-related constituents, including PFOS, PFOA, and PFBS, were analyzed for in groundwater, soil, surface water, and sediment samples using an analytical method that is ELAP-accredited and compliant with QSM 5.3, Table B-15 (DoD and Department of Energy 2019).

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

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

These data are collected as they may be useful in future fate and transport studies, and the results are included in the full analytical results provided in **Appendix M**.

The laboratory LOD is defined as "the lowest concentration for reliable reporting of a non-detect of a specific analyte in a specific matrix with a specific method at 99 percent confidence" (DoD 2017). The lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias is known as the limit of quantitation (LOQ; DoD 2017). Concentrations detected between the LOD and LOQ, therefore, are considered estimates and are qualified as such on laboratory analytical reports. Instrument-specific detection limits (e.g., the smallest analyte concentration that can be

demonstrated to be different from zero or a blank concentration with 99 percent confidence; DoD 2017), as provided for each analyte by the laboratory, are reported along with the LODs and LOQs in the laboratory analytical reports included in the DUSR (**Appendix N**).

6.4.2 Data Validation

All analytical data generated during the SI, except grain size and data generated from IDW profiling, were verified and validated in accordance with the data verification procedures described in Worksheets #34 through #36 of the PQAPP (Arcadis 2019). Each laboratory data package/sample delivery group underwent Stage 3 data validation in accordance with DoD QSM 5.3 (DoD and Department of Energy 2019). Additionally, 10% of the data underwent Stage 4 data validation. Copies of the data validation reports for each sample delivery group are included as attachments to the DUSR in **Appendix N**.

6.4.3 Data Usability Assessment and Summary

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

Additional factors potentially affecting the overall completeness of the data set, as outlined in the QAPP (Arcadis 2019), include the inability to collect samples and/or measure field parameters due to unforeseen field conditions, as described in the Field Change Reports discussed in **Section 6.3.3**, and included in **Appendix L**. At locations where surface water (and field parameters) could not be collected at the planned locations, sediment samples were collected to evaluate presence or absence of PFOS, PFOA, and PFBS to meet the DQOs. Additionally, the turbidity meter used to collect field parameters was calibrated using expired calibration solutions (**Appendix J**). Calibration expiration dates are provided to ensure calibration standards do not drift so far out of range as to cause an instrument to fail calibration. If a unit were to fail calibration, data collected after the calibration expiration date would be considered suspect. However, if a unit successfully calibrates, then the data collected are likely reliable, even if the calibration standard has expired. The equipment passed the calibration check, and the use of the expired calibration solutions did not affect analytical data quality.

Based on the Stage 3 and Stage 4 data validation and final data usability assessment, the environmental data collected at TEAD-S during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUSR and its associated data validation reports (**Appendix N**) and indicated in the full analytical tables (**Appendix M**) provided for the SI results (except for ten results for 8:2 fluorotelomer sulfonic acid [FTS], discussed further below). These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and TEAD-S QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at TEAD-S are provided in the data tables, data validation reports, and the Data Usability Summary Table located at the end of DUSR. Qualifiers for data shown on figures are defined in the notes of figures:

Though the DUSR (**Appendix N**) concluded that the overall completeness of the data set met the criteria of 90%, ten 8:2 FTS results were qualified as potentially unusable with an "X" qualifier due to instrument sensitivity check recoveries less than 50%. The presence or absence of the analyte cannot be substantiated by the data provided, and these data were therefore rejected. The "X" data qualifiers have been updated to an "R" qualifier in the full analytical tables (**Appendix M**) to indicate the rejection of these data.

6.5 Office of the Secretary of Defense Risk Screening Levels

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

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

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

Notes:
1. Risk screening levels for tap water and soil provided by the OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15 (**Appendix A)**.
2. All soil data will be screened against both the residential scenario and industrial/commercial risk screening levels, regardless of the current and projected land use of the AOPI.

mg/kg = milligram per kilogram
ng/L = nanograms per liter
ppm = parts per million
ppt = parts per trillion

The OSD residential tap water risk screening levels will be used to compare all groundwater data. Surface water data collected at TEAD-S are not compared to the OSD risk screening levels as the surface water features sampled were not expressions of groundwater (i.e., seeps/springs), and surface water is not used for drinking water in the area, including on-post. While the current and most likely future land uses of the AOPIs at TEAD-S are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil and/or sediment data; the sediment data are compared to the soil risk screening levels as the sediment data collected at TEAD-S were from dry streambeds/drainageways, and the exposure scenario is therefore similar to that of soil. The surface water data are collected only to determine presence or absence and to support re-evaluation of the CSMs. The data from the SI sampling event are compared to the OSD risk screening levels in **Section 7**. If concentrations of PFOS, PFOA, or PFBS are detected greater than or

equal to the applicable OSD risk screening levels, further study in a remedial investigation is recommended in **Section 8**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

This section summarizes the analytical results obtained from samples collected during the SI at TEAD-S (field duplicate results are provided in the associated tables). Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the QAPP Addendum (Arcadis 2020) via liquid chromatography with tandem mass spectrometry, compliant with the QSM 5.3, Table B-15 (DoD and Department of Energy 2019). The sample results discussion below focuses on the PFOS, PFOA, and PFBS analytical results because they have OSD risk screening levels. The Army will make subsequent investigation decisions based on these constituents' concentrations relative to the OSD risk screening levels.

Tables 7-1 through **7-4** provide a summary of the groundwater, soil, surface water, and sediment analytical results for PFOS, PFOA, and PFBS. **Table 7-5** below summarizes AOPIs and whether their SI results exceed the OSD risk screening levels. **Appendix M** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at TEAD-S with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-11** show the PFOS, PFOA, and PFBS analytical results in groundwater, soil, and surface water and sediment for each AOPI. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and/or PFBS greater than the applicable OSD risk screening levels are highlighted in summary tables and on figures. Final qualifiers applied to the data by the laboratory and the project chemist (as defined in **Section 6.4.3**) are presented on the analytical tables. Groundwater and surface water data collected during the SI are reported in ng/L, or ppt, and soil and sediment data are reported in mg/kg, or parts per million.

Field parameters measured for groundwater during low-flow purging and sample collection and for surface water during sample collection are provided on the field forms in **Appendix K**. Soil and sediment descriptions are provided on the field forms in **Appendix K**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Depths to groundwater observed ranged from approximately 193.9 to 259.72 feet bgs near the Main Post AOPIs, 80.7 to 96.17 feet bgs near the TOCDF Lagoons, and 19.68 to 71.09 feet bgs along the southern border of TEAD-S.

Table 7-5 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Car Wash (Building 5166)	No
SCBA/Fire Dept Laundry Extractor System (Building 5167)	No
Fire Truck Wash Area (Building 5165 Exterior)	No
Fire Station Support/Former Motor Pool (Building 5118)	No
Gas Station FFTA	No
Building 5108 Parking Lot FFTA	No
Fire Station #2 (Building 5010)	Yes
Motor Pool (Building 5134)	No
Former Fire Station #2 Support Building (Building 5144)	No

AOPI Name	OSD Exceedances (Yes/No)
AFFF Fuel Spill Response in Area 2	No
Deseret (Rainbow) Reservoir Pump Testing	No
Tooele Chemical Agent Disposal Facility (TOCDF) Lagoons	No
Former WWTP (SWMU 27, 49245.1014 and 49245.1035)	No
Former Sanitary Landfill (SWMU 26, 49245.1013)	No

7.1 Car Wash (Building 5166)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Car Wash (Building 5166) AOPI.

7.1.1 Soil

Two soil samples were collected around the Car Wash (Building 5166) AOPI. PFBS and PFOA were not detected in soil at either of the sampling locations. PFOS was detected at concentrations of 0.00046 J mg/kg (TEADS-01-1) and 0.00094 J mg/kg (TEADS-01-2), less than the OSD risk screening level of 0.13 mg/kg at both sampling locations. The “J” qualifier indicates that the analyte was positively identified, but the associated numerical value is an estimated concentration only. Analytical concentrations are displayed on **Table 7-2** and **Figure 7-2**.

7.1.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, including Fire Station #2 (Building 5010), Building 5108 Parking Lot FFTA, Fire Station Support/Former Motor Pool (Building 5118), Gas Station FFTA, Motor Pool (Building 5134), Former Fire Station #2 Support Building (Building 5144), Car Wash (Building 5166), SCBA/Fire Department Laundry Extractor (Building 5167), and Fire Truck Wash Area (Building 5165 Exterior). PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (i.e., TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-2** and **7-11**.

7.2 SCBA/Fire Department Laundry Extractor System (Building 5167)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the SCBA/Fire Department Laundry Extractor System (Building 5167) AOPI.

7.2.1 Soil

Two soil samples were collected around the SCBA/Fire Department Laundry Extractor System (Building 5167) AOPI. PFOS, PFOA, and PFBS were not detected in soil at either of the sampling locations (**Table 7-2** and **Figure 7-2**).

7.2.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-2** and **7-11**.

7.3 Fire Truck Wash Area (Building 5165 Exterior)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Fire Truck Wash Area (Building 5165 Exterior) AOPI.

7.3.1 Soil

Three soil samples and one soil field duplicate sample were collected around the Fire Truck Wash Area (Building 5165 Exterior) AOPI. PFBS and PFOA were not detected in soil at any of the three sampling locations. PFOS was detected at a concentration of 0.00055 J mg/kg, less than the OSD risk screening level of 0.13 mg/kg at one sampling location (TEADS-03-3). PFOS was not detected at the other two sampling locations. Analytical concentrations are displayed on **Table 7-2** and **Figure 7-2.**

7.3.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-2** and **7-11**.

7.4 Fire Station Support Building/Former Motor Pool (Building 5118)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Fire Station Support Building/Former Motor Pool (Building 5118) AOPI.

7.4.1 Soil

Four soil samples and one soil field duplicate sample were collected around the Fire Station Support Building/Former Motor Pool (Building 5188) AOPI. The AOPI boundary for Building 5108 Parking Lot

FFTA overlaps with the AOPI boundary for the Fire Station Support/Former Motor Pool (Building 5118). Two soil samples were collected in this overlapping region. PFBS and PFOA were not detected in soil at any of the four sampling locations. PFOS was detected less than the OSD risk screening level of 0.13 mg/kg at one sampling location (TEADS-04-1), at a concentration of 0.0013 mg/kg. PFOS was not detected in soil at the other three sampling locations, including the two soil samples collected in the region overlapping the AOPI boundary for Building 5108 Parking Lot FFTA. Analytical concentrations are displayed on **Table 7-2** and **Figure 7-3**.

7.4.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected in groundwater at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-3** and **7-11**.

7.5 Gas Station FFTA

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Gas Station FFTA AOPI.

7.5.1 Soil

Three soil samples were collected around the Gas Station FFTA AOPI. PFOS, PFOA, and PFBS were not detected in soil at any of the three sampling locations (**Table 7-2** and **Figure 7-3**).

7.5.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-3** and **7-11**.

7.6 Building 5108 Parking Lot FFTA

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Building 5108 Parking Lot FFTA AOPI.

7.6.1 Soil

Four soil samples were collected around the Building 5108 Parking Lot FFTA AOPI. PFOS, PFOA, and PFBS were not detected at any of the four sampling locations (**Table 7-2** and **Figure 7-3**). The AOPI boundary for Building 5108 Parking Lot FFTA overlaps with the AOPI boundary for the Fire Station

Support/Former Motor Pool (Building 5118). Two soil samples were collected in this overlapping region as discussed in **Section 7.4.1**.

7.6.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690) at a concentration of 30 ng/L. PFOA was not detected at the other sampling location (i.e., TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-3** and **7-11**.

7.7 Fire Station #2 (Building 5010)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Fire Station #2 (Building 5010) AOPI.

7.7.1 Soil

Five soil samples were collected around the Fire Station #2 (Building 5010) AOPI. PFBS was not detected in soil at any of the five sampling locations. PFOA was detected at all five sampling locations with concentrations ranging from 0.00081 J mg/kg (TEADS-07-3 and TEADS-07-4) to 0.011 mg/kg (TEADS-07-5), less than the OSD risk screening level of 0.13 mg/kg. PFOS was detected at all five sampling locations, with concentrations ranging from 0.0016 mg/kg (TEADS-07-3) to 0.13 mg/kg (TEADS-07-1). The PFOS concentration at TEADS-07-01 is equal to the OSD risk screening level of 0.13 mg/kg. PFOS, PFOA, and PFBS concentrations at all other sampling locations were lower than the OSD risk screening levels (**Table 7-2** and **Figure 7-4**).

7.7.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-4** and **7-11**.

7.8 Motor Pool (Building 5134)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Motor Pool (Building 5134) AOPI.

7.8.1 Soil

Three soil samples were collected around the Motor Pool (Building 5134) AOPI. PFBS and PFOA were not detected in soil at any of the three sampling locations. PFOS was detected at concentrations of

0.00058 J mg/kg (TEADS-08-2) and 0.00075 J mg/kg (TEADS-08-1), less than the OSD risk screening level of 0.13 mg/kg at two sampling locations. PFOS was not detected at the third sampling location. Analytical concentrations are displayed on **Table 7-2** and **Figure 7-5**.

7.8.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected in samples from either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (i.e., TEADS-S3690). PFOA was not detected at the other sampling location (i.e., TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-5** and **7-11**.

7.9 Former Fire Station #2 Support Building (Building 5144)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Former Fire Station #2 Support Building (Building 5144) AOPI.

7.9.1 Soil

Three soil samples and one soil field duplicate sample were collected around the Former Fire Station #2 Support Building (Building 5144) AOPI. PFOS, PFOA, and PFBS were not detected in soil at any of the three sampling locations (**Table 7-2** and **Figure 7-5**).

7.9.2 Groundwater

Two groundwater samples were collected from existing monitoring wells located downgradient of this and other main post AOPIs, as described in **Section 7.1.2**. PFBS and PFOS were not detected at either of the sampling locations. PFOA was detected at a concentration of 30 ng/L, less than the OSD risk screening level of 40 ng/L at one of the sampling locations (TEADS-S3690). PFOA was not detected at the other sampling location (TEADS-S3590). Analytical concentrations are displayed on **Table 7-1** and **Figures 7-5** and **7-11**.

7.10 AFFF Fuel Spill Response in Area 2

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the AFFF Fuel Spill Response in Area 2 AOPI.

7.10.1 Soil

Four soil samples were collected around the building at the AFFF Fuel Spill Response in Area 2 AOPI. PFBS and PFOA were not detected in soil at any of the four sampling locations. PFOS was detected at concentrations of 0.00084 J mg/kg (TEADS-10-4) and 0.00099 J mg/kg (TEADS-10-2), less than the OSD risk screening level of 0.13 mg/kg, at two sampling locations. PFOS was not detected at the other two sampling locations. Analytical concentrations are displayed on **Table 7-2** and **Figure 7-6**.

7.10.2 Groundwater

No groundwater samples were collected for this AOPI due to the lack of nearby existing downgradient monitoring wells and the significant depth to groundwater (greater than 200 feet bgs [Parsons 2017]) across the installation. During the SI Scoping Call, participants concurred that only soil samples would be collected to evaluate AOPIs without existing downgradient wells. If SI soil samples at a given AOPI contained PFOS, PFOA, and/or PFBS concentrations exceeding the OSD risk screening levels, the AOPI would be recommended for additional investigation. PFOS, PFOA, and/or PFBS was not detected in soil samples collected at this AOPI. .

7.11 Deseret (Rainbow) Reservoir Pump Testing

The subsections below summarize the surface water, soil, and groundwater PFOS, PFOA, and PFBS analytical results associated with the Deseret (Rainbow) Reservoir Pump Testing AOPI.

7.11.1 Surface Water

One surface water sample and one surface water field duplicate sample were collected from the reservoir at this AOPI. PFOS, PFOA, and PFBS were not detected in the samples (**Table 7-3** and **Figure 7-7**).

7.11.2 Soil

Four soil samples were collected around the reservoir at this AOPI. Three samples were collected north of the reservoir in the area where the TEAD-S fire trucks would park to spray AFFF, and one sample was collected south (downgradient) of the reservoir. PFOS, PFOA, and PFBS were not detected in soil at any of the four sampling locations (**Table 7-2** and **Figure 7-7**).

7.11.3 Groundwater

No downgradient existing monitoring wells were identified in proximity to this AOPI. Due to the significant depth to water (greater than 200 feet bgs [Parsons 2017]) across the installation, it was determined during the scoping call that soil samples would be assessed in place of groundwater sampling. If soil concentrations were reported in exceedance of the OSD risk screening levels, the AOPI would be recommended for additional investigation or remedial action, where monitoring well installation would be proposed. As no exceedances of the OSD risk screening levels were observed in soil samples, further investigation into groundwater conditions is not deemed necessary at this time.

7.12 TOCDF Lagoons

The subsections below summarize the groundwater, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with the TOCDF Lagoons AOPI.

7.12.1 Groundwater

Two groundwater samples were collected downgradient of this AOPI at existing monitoring wells. PFOS, PFOA, and PFBS were not detected in either sample (**Table 7-1** and **Figure 7-8**).

7.12.2 Surface Water

Two surface water samples were collected from the northwestern and central northern lagoons. PFBS and PFOS were not detected in either sample. PFOA was detected in surface water at both sampling locations at concentrations of 2.3 J ng/L (TEADS-12-2) and 2.9 J ng/L (TEADS-12-3). A third surface water sample was proposed for collection downgradient of this AOPI along the ephemeral stream to the southwest but could not be collected due to the location being dry, as described in **Section 6.3.3**. Analytical concentrations are displayed on **Table 7-3** and **Figure 7-8**.

7.12.3 Sediment

One sediment sample was collected downgradient of this AOPI along the ephemeral stream feature to the southeast. PFOS, PFOA, and PFBS were not detected in the sample (**Table 7-4** and **Figure 7-8**).

7.12.4 Soil

One soil sample was collected downgradient of this AOPI along the ephemeral stream feature to the southeast. PFOS, PFOA, and PFBS were not detected in the sample (**Table 7-2** and **Figure 7-8**).

7.13 Former WWTP (SWMU 27, 49245.1014 and 49245.1035)

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Former WWTP (SWMU 27) AOPI.

7.13.1 Soil

Four soil samples were collected along the ditches of the Former WWTP (SWMU 27) AOPI. PFBS was not detected in soil at any of the four sampling locations. PFOA was detected at a concentration of 0.00073 J mg/kg, less than the OSD risk screening level of 0.13 mg/kg at one of the sampling locations (TEADS-13-3). PFOA was not detected in soil at the other three sampling locations. PFOS was detected at concentrations less than the OSD risk screening level of 0.13 mg/kg at three of the four sampling locations: 0.0030 mg/kg (TEADS-13-1), 0.0046 mg/kg (TEADS-13-4), and 0.011 mg/kg (TEADS-13-3). PFOS was not detected at the fourth sampling location (TEADS-13-2). Analytical concentrations are displayed on **Table 7-2** and **Figure 7-9**.

7.13.2 Groundwater

No downgradient existing monitoring wells were identified in proximity to this AOPI. Due to the significant depth to water (greater than 200 feet bgs [Parsons 2017]) across the installation, it was determined during the scoping call that soil samples would be assessed in place of groundwater sampling. If soil concentrations were reported in exceedance of the OSD risk screening levels, the AOPI would be recommended for additional investigation or remedial action, where monitoring well installation would be proposed. As no exceedances of the OSD risk screening levels were observed in soil, further investigation into groundwater conditions is not deemed necessary at this time.

7.14 Former Sanitary Landfill (SWMU 26, 49245.1013)

The subsections below summarize the groundwater and sediment PFOS, PFOA, and PFBS analytical results associated with the Former Sanitary Landfill (SWMU 26) AOPI. Surface water sampling could not be completed at the proposed location downgradient of the AOPI, along the ephemeral stream feature to the southeast, as described in **Section 6.3.3**.

7.14.1 Groundwater

Four groundwater samples were collected downgradient of this AOPI at existing monitoring wells. PFBS and PFOS were not detected at any of the four sampling locations. PFOA was detected at two sampling locations at concentrations of 7.7 ng/L (TEADS-S3790) and 31 ng/L (TEADS-S3990), less than the OSD risk screening level of 40 ng/L. PFOA was not detected at the other two sampling locations. Analytical concentrations are displayed on **Table 7-1** and **Figure 7-10**.

7.14.2 Sediment

One sediment sample and one sediment field duplicate sample were collected downgradient of this AOPI along the ephemeral stream feature to the southeast. PFBS and PFOA were not detected in either the parent sediment sample or the field duplicate. PFOS was detected less than the OSD risk screening level of 0.13 mg/kg (i.e., for soil) in both the parent and field duplicate samples, at concentrations of 0.00098 J mg/kg and 0.0010 J mg/kg, respectively. Analytical concentrations are displayed on **Table 7-4** and **Figure 7-10**.

7.15 Downgradient Boundary Monitoring Wells

Three groundwater samples and one groundwater field duplicate sample were collected from existing monitoring wells along the downgradient installation boundary. PFOS, PFOA, and PFBS were not detected in groundwater at any of the three sampling locations or in the field duplicate (**Table 7-1** and **Figure 7-11**).

7.16 Investigation Derived Waste

Composite samples were collected from both the containerized liquid and solid IDW for waste characterization. PFOS was detected in the solid IDW sample at a concentration of 0.0062 mg/kg, less than the OSD residential risk screening level of 0.13 mg/kg. Neither PFOA nor PFBS were detected in the solid IDW sample. PFOS and PFOA were detected in the liquid IDW sample at concentrations of 4.1 ng/L and 1.9 J ng/L, respectively, less than the respective OSD tap water risk screening levels of 40 ng/L. PFBS was not detected in the liquid IDW sample. The full analytical results (i.e., for all constituents analyzed) for IDW samples collected during the SI are included in **Appendix M**.

As the analytical results indicated the PFAS, PFOS, and PFBS concentrations in both the liquid and solid IDW did not exceed the OSD risk screening levels, the IDW was disposed on-post as agreed upon by the TEAD-S POC for the PA/SI. The liquid IDW (approximately 15 gallons) was disposed at the WWTP. The solid IDW (approximately one 5-gallon bucket full) was spread to the ground surface at the Former

Sewage Lagoon at the direction of TEAD-S personnel. IDW disposal was completed in Spring 2021 (**Appendix K**).

7.17 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI was analyzed for TOC, pH, moisture content, and grain size data as they may be useful in future fate and transport studies. The TOC in the soil samples ranged from 2,210 and 35,800 mg/kg occurring at the Former Fire Station #2 Support Building (Building 5144) and Fire Station #2 (Building 5010) respectively. The TOC at TEAD-S was generally within range of the typical organic content for topsoil (5,000 to 30,000 mg/kg) except for the samples collected at the Former Fire Station #2 Support Building (Building 5144), and Fire Station #2 (Building 5010). The combined percentage of fines in soils at TEAD-S ranged from 35.4% to 99.7% with an average of approximately 63.0%. In general, PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The percent moisture of the soil (0.5 to 20.9%) was typical for clay (0 to 20%). The pH of the soil, which ranged from 7.9 to 9.7 standard units, was slightly alkaline (i.e., 7 to 9 standard units). Based on these geochemical and physical soil characteristics (i.e., high percentage of fines and higher TOC) observed underlying the installation during the SI, PFAS are expected to be relatively less mobile at TEAD-S than in soils with lower percentages of fines and lower TOC.

7.18 Blank Samples

Detections of PFOS, PFOA, and PFBS constituents are summarized in this section for QA/QC samples. Concentrations of PFOS, PFOA, and/or PFBS were not detected in any of the QA/QC samples with one exception: PFBS was detected in the field blank TEADS-FB-2-101920 collected on 19 October 2020, with an estimated concentration of 3.7 J ng/L. No other qualification of the sample results was required. The full analytical results for QA/QC samples collected during the SI are included in **Appendix M**.

7.19 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-12** through **7-18** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

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

Based on the use, storage, and/or disposal of PFAS-containing materials at the AOPIs, affected media are likely to consist of soil, groundwater, surface water, and sediment. Release and transport

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

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

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

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

- There are no permanent residents on TEAD-S. Therefore, all exposure pathways for on-installation residents are incomplete.
- The Deseret (Rainbow) Reservoir is the only location on TEAD-S that is used for recreational activity, and PFOS, PFOA, and PFBS were not detected in soil and surface water samples collected at the reservoir. Therefore, all exposure pathways for recreational users are incomplete.
- The AOPIs are located wholly within the installation, and off-installation receptors are not likely to access the AOPIs. Therefore, the soil exposure pathway for off-installation receptors is incomplete.
- The only major surface water bodies associated with or flowing through the AOPIs are the Deseret (Rainbow) Reservoir and the TOCDF Lagoons. There are no major drainages that flow out of either of these water bodies and off the installation, and intermittent stormwater occurring as surface water at other AOPIs is lost to evaporation. Shallow groundwater underlying the installation does not discharge to surface water. Therefore, the surface water and sediment exposure pathways for off-installation receptors are incomplete.

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

Figure 7-12 shows the CSM for a subset of the Main Post AOPIs, where PFOS, PFOA, and PFBS were not detected in soil. This includes the Building 5108 Parking Lot FFTA, Gas Station FFTA, SCBA/Fire Department Laundry Extractor (Building 5167), and Former Fire Station #2 Support Building (Building 5144). All these AOPIs had AFFF released to soil or a paved surface during firefighting activities (e.g., firefighting response, firefighting training, AFFF storage, fire truck pump system testing, fire truck washing, firefighting PPE laundering).

- PFOS, PFOA, and PFBS were not detected in soil samples collected at these AOPIs. Therefore, the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater samples collected from downgradient sampling points associated with all Main Post AOPIs (**Figures 7-12** and **7-13**). However, as PFOS, PFOA, and/or PFBS were not detected in soil samples from the AOPIs addressed by **Figure 7-12**, and PFOS, PFOA, and/or PFBS were detected in soil samples from the AOPIs addressed by **Figure 7-13**, it is less likely that the AOPIs addressed in **Figure 7-12** are the source of PFAS observed in groundwater. Therefore, the groundwater exposure pathway for all on-post site workers and off-installation receptors is incomplete.
- There are no surface water bodies or major drainage courses near the Main Post AOPIs, and intermittent stormwater is lost to evaporation. Therefore, surface water and sediment are not included as potential exposure media on **Figure 7-12**.

Figure 7-13 shows the CSMs for a subset of the Main Post AOPIs, where PFOS, PFOA, and/or PFBS were detected in soil. This includes Fire Station #2 (Building 5010), Fire Station Support/Former Motor Pool (Building 5118), Motor Pool (Building 5134), Fire Truck Wash Area (Building 5165 Exterior), and Car Wash (Building 5166). All these AOPIs had AFFF released to soil or a paved surface during firefighting activities (e.g., firefighting response, firefighting training, AFFF storage, fire truck pump system testing, fire truck washing, firefighting PPE laundering).

- PFOS, PFOA, and/or PFBS were detected in soil at these AOPIs, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater samples collected from downgradient monitoring wells S3590 and S3690 (**Figure 7-11**) associated with all the Main Post AOPIs (**Figures 7-12** and **7-13**). Drinking water in the vicinity of the installation is pumped from the local aquifer. The confirmed presence of PFOS, PFOA, and/or PFBS in soil at these AOPIs and in downgradient groundwater indicates the potential for PFOS, PFOA, and/or PFBS presence in groundwater. Though the AOPIs are downgradient or outside the vicinity of the on-post drinking water wells, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for site workers is potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at these AOPIs flows to the east and then southeast, potentially flowing off-post through the installation's southern boundary. PFAS were not detected in the southern boundary wells. Therefore, impacted groundwater is not observed to be flowing off-post across the southern boundary, and the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is incomplete.

- There are no surface water bodies or major drainage courses near the Main Post AOPIs, and intermittent stormwater is lost to evaporation. Therefore, surface water and sediment are not included as potential exposure media on **Figure 7-13**.

Figure 7-14 shows the CSM for the AFFF Fuel Spill Response in Area 2 AOPI, where AFFF was sprayed over soil in response to a fuel spill to prevent a potential electrical fire.

- PFOS, PFOA, and/or PFBS was detected in soil at the AFFF Fuel Spill Response in Area 2, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- Groundwater samples associated with this AOPI were not collected during the SI as no existing downgradient monitoring wells were identified in proximity to the AOPI. Drinking water in the vicinity of the installation is pumped from the local aquifer. The confirmed presence of PFOS, PFOA, and/or PFBS in the soil at this AOPI indicates the potential for groundwater impacts. Though the AFFF Fuel Spill in Area 2 is downgradient of and outside the vicinity of the on-post drinking water wells, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for site workers is potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at the AFFF Fuel Spill Response in Area 2 flows to the south-southeast, flowing off-post through the installation's southern boundary. PFOS, PFOA, and PFBSwere not detected in the southern boundary wells. Therefore, impacted groundwater is not observed to be flowing off-post across the southern boundary, and the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is incomplete.
- There are no surface water bodies or major drainage courses near the AFFF Fuel Spill Response in Area 2 AOPI, and intermittent stormwater is lost to evaporation and infiltration. Therefore, surface water and sediment are not included as potential exposure media on **Figure 7-14**.

Figure 7-15 shows the CSM for the Deseret (Rainbow) Reservoir Pump Testing AOPI, where installation personnel regularly flushed water from fire trucks from the reservoir through their pumping systems, spraying water potentially containing AFFF over soil and into the reservoir.

- PFOS, PFOA, and PFBS were not detected in soil at the Deseret (Rainbow) Reservoir. Therefore, the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and PFBS were not detected in surface water at the Deseret (Rainbow) Reservoir. Therefore, the surface water exposure pathway for on-installation site workers is incomplete.
- Sediment samples were not collected at this AOPI, to protect the reservoir’s clay liner. However, given that PFOS, PFOA, and PFBS were not detected in soil or surface water at the Deseret (Rainbow) Reservoir, it is reasonable to conclude PFOS, PFOA, and PFBS are not likely present in the sediment. Therefore, the sediment exposure pathway for on-installation site workers is incomplete.
- As PFOS, PFOA, and PFBS were non-detect in the soil and surface water samples collected at the Deseret (Rainbow) Reservoir, it is reasonable to conclude PFOS, PFOA, and PFBS are not likely present in the groundwater that could migrate off-post or potentially used in a future downgradient on-post drinking water source. Therefore, the groundwater exposure pathway for all on-post site workers and off-installation receptors is incomplete.

Figure 7-16 shows the CSM for the TOCDF Lagoons. Potential AFFF-containing wastes were carried through the sewage system from various AOPIs, including the SCBA/Fire Department Laundry Extractor (Building 5167), and released into the lagoons to evaporate.

- PFOS, PFOA, and PFBS were not detected in soil at the outflow of the TOCDF Lagoons. Therefore, the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in surface water at the TOCDF Lagoons. On-installation site workers could contact constituents in surface water via incidental ingestion and dermal contact. Therefore, the surface water exposure pathway for on-installation site workers is complete.
- PFOS, PFOA, and PFBS were not detected in the sediment at the outflow of the TOCDF Lagoons, however the lagoon sediment was not sampled to protect the lagoon liner. The presence of PFOS, PFOA, and/or PFBS in the lagoon surface water indicates the potential for PFOS, PFOA, and/or PFBS presence in the lagoon sediment. Therefore, the sediment exposure pathway for on-installation site workers remains potentially complete.
- PFOS, PFOA, and PFBS were not detected in groundwater downgradient of the TOCDF Lagoons. Therefore, the groundwater exposure pathway for all on-post site workers and off-installation receptors is incomplete.

Figure 7-17 shows the CSM for the Former WWTP (SWMU 27), which historically consisted of an Imhoff tank and settling/evaporation lagoons. Potential AFFF-containing wastes were carried to the Former WWTP (SWMU 27) through the sewage system from various northeastern AOPIs, including Fire Station #2 (Building 5010), for treatment.

- Soil near the former Imhoff tank containing any potential historical impacts has been excavated; therefore, the soil exposure pathway for on-installation site workers is incomplete.
- There are no permanent surface water bodies at the Former WWTP (SWMU 27) as the former lagoons have dried up, and the lagoon embankments have been destroyed and regraded to prevent ponding water. Therefore, the surface water exposure pathway for on-installation site workers is incomplete.
- Sediment/soil samples were not collected from the former lagoons due to safety concerns following the observation of white phosphorous in the lagoon walls. However, PFOS, PFOA, and/or PFBS were detected in the sediment/soil of the intermittent drainage ditches at this AOPI. On-installation site workers could contact constituents in the sediment/soil via incidental ingestion and dermal contact. Therefore, the sediment/soil exposure pathway for on-installation site workers is complete.
- Groundwater samples associated with this AOPI were not collected during the SI as no existing downgradient monitoring wells were identified in proximity to the AOPI. Drinking water in the vicinity of the installation is pumped from the local aquifer. The confirmed presence of PFOS, PFOA, and/or PFBS in the sediment/soil of the intermittent drainage ditches indicates the potential for groundwater impacts. Though the Former WWTP (SWMU 27) is downgradient or outside the vicinity of the on-post drinking water wells, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for site workers is potentially complete to account for potential future use of the downgradient on-post groundwater.

- Groundwater originating at this AOPI flows to the east and then southeast, potentially flowing off-post through the installation's southern boundary. PFAS were not detected in the southern boundary wells. Therefore, impacted groundwater is not observed to be flowing off-post across the southern boundary, and the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is incomplete.

Figure 7-18 shows the CSM for the Former Sanitary Landfill (SWMU 26). Potentially AFFF-containing waste sludge from the Former WWTP (SWMU 27) was deposited and buried at the unlined landfill.

- All potentially impacted soil at the Former Sanitary Landfill (SWMU 26) has been covered with a cap, preventing human contact. Therefore, the subsurface soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in the sediment/soil downgradient of the landfill in the suspected flow path of the historical intermittent stream at the Former Sanitary Landfill (SWMU 26). On-installation site workers could contact constituents in the sediment/soil via incidental ingestion and dermal contact. Therefore, the sediment/soil exposure pathway for on-installation site workers is complete.
- Surface water samples were not collected, as surface water was not present in the intermittent stream at the Former Sanitary Landfill (SWMU 26) at the time of the SI sampling event. In late 2020, the Former Sanitary Landfill (SWMU 26) was capped and regraded to address run-on and runoff and prevent ponding, effectively removing all surface water features from this AOPI. Therefore, the surface water exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater samples collected downgradient of this AOPI. Drinking water in the vicinity of the installation is pumped from the local aquifer. Though the Former WWTP (SWMU 27) is downgradient or outside the vicinity of the on-post drinking water wells, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for site workers is potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at this AOPI flows to the east and then southeast, potentially flowing off-post through the installation's southern boundary. PFAS were not detected in the southern boundary wells. Therefore, impacted groundwater is not observed to be flowing off-post across the southern boundary, and the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is incomplete.

Following the SI sampling, nine out of the 14 AOPIs were considered to have complete or potentially complete exposure pathways. Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**).

8 CONCLUSIONS AND RECOMMENDATIONS

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

The OSD provided residential risk screening levels based on the USEPA oral reference dose for PFOS, PFOA, and PFBS in soil and groundwater (tap water) and industrial/commercial risk screening levels for PFOS, PFOA, and PFBS in soil (**Appendix A**). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit were used to identify specific areas of suspected PFOS, PFOA, and PFBS use, storage, and/or disposal at TEAD-S. Following the evaluation, 14 AOPIs were identified.

On-post drinking water is sourced from the regional aquifer, and supplied by potable wells WW1, WW2, and WW3; WW3 is currently inactive. The only known sampling for PFAS at the installation occurred in November 2016. Post-treatment drinking water samples were collected at potable well WW1 and Building 5010; samples were analyzed for PFOS and PFOA only. All sample results were non-detect, with reporting limits of 0.04 µg/L (or 40 ng/L) and 0.02 µg/L (or 20 ng/L) for PFOS and PFOA respectively (Tetrahedron, Inc. 2018).

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

Nine AOPIs had detections of PFOS, PFOA, and PFBS in groundwater, soil, sediment, and/or surface water, and an exceedance of the OSD screening level was observed in soil at one AOPI (i.e. Fire Station #2 (Building 5166). Below is a summary of the SI sampling event and results.

Groundwater

For this evaluation, the OSD risk screening levels used to compare groundwater data are 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. Neither PFOS nor PFBS were detected in any of the 11 primary groundwater samples collected across the installation.

- PFOA was detected in three of the 11 primary groundwater samples collected, though none of the detected concentrations exceeded the OSD tap water risk screening level. All three wells where PFOA was detected are located downgradient of the Main Post AOPIs, including Fire Station #2 (Building 5010). Two of the three wells where PFOA was detected also border the downgradient edge of the Former Sanitary Landfill (SWMU 26). The maximum PFOA concentration was observed at monitoring well TEADS-S3990 with a concentration of 31 ng/L.

Shallow Soil (0 to 2 feet)

For this evaluation, the OSD risk screening levels used to compare soil data are 0.13 mg/kg for PFOS and PFOA and 1.9 mg/kg for PFBS (i.e., for the residential receptor scenarios).

- PFOS was detected in 16 of the 42 primary soil samples collected, with detections occurring at the following AOPIs: Fire Station Support/Former Motor Pool (Building 5118), Car Wash (Building 5166),

Fire Truck Wash Area (Building 5165 Exterior), Fire Station #2 (Building 5010), Motor Pool (Building 5134), AFFF Fuel Spill Response in Area 2, and the Former WWTP (SWMU 27). The maximum detected concentration occurred at Fire Station #2 (Building 5010), with a concentration of 0.13 mg/kg, which is equal to the OSD risk screening level, and considered an exceedance. No other exceedances of the OSD risk screening levels were observed at TEAD-S.

- PFOA was detected in six of the 42 primary soil samples, at concentrations below the OSD risk screening levels. PFOA was detected in samples from Fire Station #2 (Building 5010) and the Former WWTP (SWMU 27). The maximum detected concentration occurred at Fire Station #2 (Building 5010) (0.011 mg/kg).
- PFBS was not detected in any of the 42 primary samples collected across the installation.

Surface Water

For this evaluation, the OSD risk screening levels were not used to compare surface water data as the surface water samples were neither an expression of groundwater (i.e., seeps/springs), nor is surface water used as a drinking water source nearby.

- Neither PFOS nor PFBS were detected in any of the surface water samples collected across the installation.
- PFOA was detected in two of the three surface water samples collected. Both PFOA detections occurred at the TOCDF Lagoons, with a maximum concentration of 2.9 J ng/L.

Sediment

For this evaluation, the sediment data are compared to the OSD risk screening levels for soil: 0.13 mg/kg for PFOS and PFOA and 1.9 mg/kg for PFBS (i.e., for the residential receptor scenarios).

- PFOS was detected in one of the two sediment samples collected, with concentrations occurring below the OSD risk screening level. The maximum concentration was observed in the field duplicate collected at the Former Sanitary Landfill (SWMU 26) (0.0010 J mg/kg).
- Neither PFOA nor PFBS were detected in either of the sediment samples collected across the installation.

Following the SI sampling, the nine AOPIs with confirmed PFAS presence have complete or potentially complete exposure pathways.

Complete exposure pathways include:

- Soil exposure pathways for site workers at the Fire Station Support/Former Motor Pool (Building 5118), Fire Station #2 (Building 5010), Motor Pool (Building 5134), Fire Truck Wash Area (Building 5165 Exterior), Car Wash (Building 5166), and AFFF Fuel Spill Response in Area 2.
- Surface water exposure pathways for site workers at the TOCDF Lagoons.
- Sediment exposure pathways for site workers at the Former Sanitary Landfill (SWMU 26) and the Former WWTP (SWMU 27).

Potentially complete exposure pathways include:

- Surface water exposure pathways for site workers at the Former Landfill (SWMU 26).
- Sediment exposure pathways for site workers at the TOCDF Lagoons.
- Groundwater exposure pathways for on-post site workers at the confirmed Main Post AOPIs (Fire Station Support/Former Motor Pool [Building 5118], Fire Station #2 [Building 5010], Motor Pool [Building 5134], Fire Truck Wash Area [Building 5165 Exterior], Car Wash [Building 5166]), the AFFF Fuel Spill Response in Area 2, the Former WWTP (SWMU 27), and the Former Sanitary Landfill (SWMU 26).

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 8-1** below summarizes the sampling at TEAD-S, PFOS, PFOA, and PFBS sampling, and recommendations for each AOPI; further investigation is warranted at TEAD-S. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 8-1 Summary of AOPIs identified during the Preliminary Assessment, PFOS, PFOA, and PFBS Sampling at Tooele Army Depot – South, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/NA/ND/NS)				Recommendation
	GW	SO	SW	SE	
Car Wash (Building 5166)	No*	No	NS	NS	No action at this time
SCBA/Fire Department Laundry Extractor System (Building 5167)	No*	ND	NS	NS	No action at this time
Fire Truck Wash Area (Building 5165 Exterior)	No*	No	NS	NS	No action at this time
Fire Station Support/Former Motor Pool (Building 5118)	No*	No	NS	NS	No action at this time
Gas Station FFTA	No*	ND	NS	NS	No action at this time
Building 5108 Parking Lot FFTA	No*	ND	NS	NS	No action at this time
Fire Station #2 (Building 5010)	No*	**Yes**	NS	NS	Further study in a remedial investigation
Motor Pool (Building 5134)	No*	No	NS	NS	No action at this time
Former Fire Station #2 Support Building (Building 5144)	No*	ND	NS	NS	No action at this time
AFFF Fuel Spill Response in Area 2	NS	No	NS	NS	No action at this time
Deseret (Rainbow) Reservoir Pump Testing	NS	ND	ND	NS	No action at this time
TOCDF Lagoons	ND	ND	NA	ND	No action at this time
Former WWTP (SWMU 27, 49245.1014 and 49245.1035)	NS	No	NS	NS	No action at this time
Former Sanitary Landfill (SWMU 26, 49245.1013)	No	NS	NS	No	No action at this time

Notes:

1. Shading indicates a media where PFAS was identified above the OSD risk screening level, indicating a need for further investigation.

Acronyms:
* = Groundwater assessed through the sampling of two existing groundwater wells located downgradient of all main post AOPIs (S3690 and S3590). PFOA detected in the groundwater sample from well S3690 may be attributed to more than one AOPI, however no exceedances of the OSD risk screening level were observed..
GW – groundwater
NA – not applicable (i.e., PFOS, PFOA, or PFBS detected, but comparison to OSD risk screening levels is not applicable for the surface water feature sampled)
ND – non-detect
NS – not sampled
SE – sediment
SO – soil
SW – surface water

Three downgradient monitoring wells were also sampled along the southern border of TEAD-S as part of the SI to assess potential off-post migration of PFOS, PFOA, and/or PFBS. The samples from all three wells were non-detect for PFOS, PFOA, and PFBS, indicating no obvious potential for PFOS, PFOA, and/or PFBS off-post migration to the south of the installation.

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

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

Results of the PA confirm the use of AFFF at TEAD-S during firefighting training activities and fire department equipment testing and maintenance. Estimates of the volume of AFFF were provided in some cases; however, other specifics such as AFFF brand and mixture concentrations and overall volume of AFFF used per event or collectively are uncertain.

Though site reconnaissance and interviews with site personnel indicated areas where firefighting foams were used or stored, interviewees were uncertain in many cases if these foams were class A or class B. To be conservative, the PA assumed that all reports of firefighting foam usage and storage may have been Class B foams (containing AFFF).

Interviewees provided conflicting information regarding the location of the AFFF Fuel Spill Response in Area 2. A retired firefighter stated that AFFF was deployed in response to a fuel spill near a building in the early 1980s. The foam was deployed to prevent ignition of the fuel by potential sparks from the electrical power supply to the building. However, another interviewee provided documents indicating that that electricity had not yet been extended to this part of Area 2 in the 1980s. The location indicated by the

firefighter was designated an AOPI, and SI sampling was performed there; however, it is possible that the actual location of the fuel spill response and AFFF application was at one of the other buildings within another portion of Area 2 that did have electrical power in the early 1980s.

Groundwater sampling locations were limited to existing monitoring wells during the SI. In some cases, these wells were miles away from the associated AOPI, or were used to assess multiple AOPIs. If groundwater monitoring wells had been installed nearer to each AOPI, the results of the samples collected would be more definitive with respect to AOPI impacts to groundwater.

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 PFOS, PFOA, and PFBS sources were not exhaustive and were limited to easily identifiable and readily available information evaluated during the relevant documents research, installation personnel interviews, and site reconnaissance.

Additionally, the CSMs do not include ecological receptors and exposure pathways. The potential for ecological exposures to PFOS, PFOA, and PFBS may be evaluated at a future date if those pathways warrant further consideration.

Finally, the available PFOS, PFOA, and PFBS analytical data is limited to historical data provided by the installation (as described in **Section 2.12**) and the data collected during the SI. Available data, including PFOS, PFOA, and/or PFBS, is listed in **Appendix M**, which were analyzed per the selected analytical method. The approved sampling scope of the SI focused on identifying presence or absence of PFOS, PFOA, and PFBS at the AOPIs. SI sampling at locations at or in close proximity of the AOPIs and along the southern installation boundary did not delineate the extent of PFOS, PFOA, and PFBS impacts or identify the primary migration pathways for the chemicals.

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

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ACRONYMS

%	percent
µg/L	micrograms per liter
AFFF	aqueous film-forming foam
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
CAMDS	chemical agent munitions destruction system
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DoD	Department of Defense
DQO	data quality objective
DUSR	Data Usability Summary Report
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FFTA	firefighting training area
FTS	fluorotelomer sulfonic acid
GIS	geographic information system
GW	groundwater
HQAES	Headquarters Army Environmental System
IDW	investigation-derived waste
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
LBFAU	lower basin-fill aquifer unit
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram (parts per million)
N	no
NA	not applicable

ND	non-detect
ng/L	nanograms per liter (parts per trillion)
NS	not sampled
OSD	Office of the Secretary of Defense
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
PPE	personal protective equipment
ppm	parts per million
ppt	parts per trillion
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RSL	Regional Screening Level
SCBA	self-contained breathing apparatus
SE	sediment
SI	site inspection
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SW	surface water
SWMU	solid waste management unit
TEAD	Tooele Army Depot
TEAD-N	Tooele Army Depot - North
TEAD-S	Tooele Army Depot - South
TGI	technical guidance instruction

TOC	total organic carbon
TOCDF	Tooele Chemical Agent Disposal Facility
U.S.	United States
UCMR3	Third Unregulated Contaminant Monitoring Rule
UBFAU	upper basin-fill aquifer unit
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UXO	unexploded ordnance
WWTP	Wastewater Treatment Plant
Y	yes

TABLES

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Tooele Army Depot South, Utah

ARCADIS

Well ID	Well Installation Date	Ground Elevation	TOC Elevation	TOC Stick Up	Total Depth Measured	Depth to TOS	Depth to BOS	Screen Length	Depth to Water[1]	Well Diameter	Well Casing Material
		ft amsl	ft amsl	ft	ft bgs	ft bgs	ft bgs	ft	ft bgs	inches	
S-12-88	1/23/1982	5054.92	5056.40	1.48	40.92	34.50	39.50	5.00	9-17	4.00	PVC
S-17-88	2/10/1988	5079.32	5081.11	1.79	80.35	57.50	77.50	20.00	68-69	4.00	PVC
S-18-88	2/11/1988	5039.80	5041.43	1.63	39.47	16.70	36.70	20.00	18-22	4.00	PVC
S-35-90	5/23/1990	5371.90	5373.75	1.85	293.87	266.60	276.60	10.00	261-267	3.86	PVC
S-36-90	7/31/1990	5311.80	5313.86	2.06	243.62	205.40	226.00	20.60	192-200	3.86	PVC
S-37-90	6/4/1990	5310.99	5312.91	1.92	247.70	204.00	224.00	20.00	194-202	3.86	PVC
S-38-90	6/19/1990	5321.25	5323.31	2.06	246.87	210.50	230.50	20.00	210-216	3.86	PVC
S-39-90	6/30/1990	5335.13	5337.11	1.98	269.87	235.00	255.00	20.00	224-230	3.86	PVC
S-40-90	6/14/1990	5352.92	5354.80	1.88	285.67	250.95	270.95	20.00	245-250	3.86	PVC
S-47-90	5/19/1990	5157.03	5157.97	0.94	124.47	103.70	113.70	10.00	98-104	3.86	PVC
S-48-90	6/14/1990	5140.08	5141.87	1.79	113.27	100.00	110.00	10.00	83-91	3.86	PVC

Acronyms:
amsl = above mean sea level
bgs = below ground surface
BOS = bottom of screen
ft = feet
ID = identification
PVC = polyvinyl chloride
TOC = top of casing
TOS = top of screen

Notes:
1. Approximate depth to water is provided as a range from monitoring events from December 1999 to July 2012 as reported in Parsons 2013.

References:
Parsons. 2013. Final Hydrogeological Assessment and Recommendations Report, Deseret Chemical Depot, Stockton, Utah. Table A.1 - Groundwater Monitoring Well Construction Data, Deseret Chemical Depot, Utah. July.

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

				Analyte	PFBS (ng/L)		PFOA (ng/L)		PFOS (ng/L)	
				OSD Tapwater Risk Screening Level	600		40		40	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
TOCDF Lagoons	TEADS-S4790	TEADS-S4790-102020	10/20/2020	N	3.7	U	3.7	U	3.7	U
TOCDF Lagoons	TEADS-S4890	TEADS-S4890-101920	10/19/2020	N	4.1	U	4.1	U	4.1	U
Former Sanitary Landfill (SWMU 26)	TEADS-S3790	TEADS-S3790-102020	10/20/2020	N	4.2	U	**7.7**		4.2	U
Former Sanitary Landfill (SWMU 26)	TEADS-S3890	TEADS-S3890-102020	10/20/2020	N	3.9	U	3.9	U	3.9	U
Former Sanitary Landfill (SWMU 26)	TEADS-S3990	TEADS-S3990-102020	10/20/2020	N	4.0	U	**31**		4.0	U
Former Sanitary Landfill (SWMU 26)	TEADS-S4090	TEADS-S4090-102020	10/20/2020	N	3.8	U	3.8	U	3.8	U
Main Post AOPIs[1]	TEADS-S3590	TEADS-S3590-102120	10/21/2020	N	3.6	U	3.6	U	3.6	U
Main Post AOPIs[1]	TEADS-S3690	TEADS-S3690-102020	10/20/2020	N	3.6	U	**30**		3.6	U
Southern Boundary Wells[2]	TEADS-S1288	TEADS-S1288-102620	10/26/2020	N	3.8	U	3.8	U	3.8	U
		TEADS-FD-1-GW-102620	10/26/2020	FD	3.7	U	3.7	U	3.7	U
Southern Boundary Wells[2]	TEADS-S1788	TEADS-S1788-102120	10/21/2020	N	4.0	U	4.0	U	4.0	U
Southern Boundary Wells[2]	TEADS-S1888	TEADS-S1888-102020	10/20/2020	N	3.2	U	3.2	U	3.2	U

Footnotes:

[1] The Main Post AOPIs include Fire Station #2 (Building 5010), Building 5108 Parking Lot FFTA, Fire Station Support/Former Motor Pool (Building 5118), Gas Station FFTA, Motor Pool (Building 5134), Former Fire Station #2 Support Building (Building 5144), Car Wash (Building 5166), SCBA/Fire Department Laundry Extractor (Building 5166), and Fire Truck Wash Area (Building 5165 exterior).

[2] Southern Boundary Wells are not related to a specific AOPI, but instead are selected to assess off-post migration of PFAS along the southern installation boundary.

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).
2. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for the residential tapwater exposure scenario (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Acronyms/Abbreviations:

AFFF = aqueous film-forming foam
AOPI = area of potential interest
FD = field duplicate sample
FFTA = Former Firefighting Training Area
ID = identification
LOD = limit of detection
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SCBA = Self-Contained Breathing Apparatus
SWMU = solid waste management unit
TOCDF = Tooele Chemical Agent Disposal Facility
USAEC = United States Army Environmental Command

Qualifier

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

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

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Car Wash (Building 5166)	TEADS-01-01	TEADS-01-1-SO-102120	10/21/2020	N	0.00089	U	0.00089	U	**0.00046**	J
Car Wash (Building 5166)	TEADS-01-02	TEADS-01-2-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	**0.00094**	J
SCBA/Fire Dept Laundry Extractor System (Building 5167)	TEADS-02-01	TEADS-02-1-SO-102120	10/21/2020	N	0.00081	U	0.00081	U	0.00081	U
SCBA/Fire Dept Laundry Extractor System (Building 5167)	TEADS-02-02	TEADS-02-2-SO-102120	10/21/2020	N	0.00086	U	0.00086	U	0.00086	U
Fire Truck Wash Area (Building 5165 exterior)	TEADS-03-01	TEADS-03-1-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	0.0010	U
Fire Truck Wash Area (Building 5165 exterior)	TEADS-03-02	TEADS-03-2-SO-102120	10/21/2020	N	0.00088	U	0.00088	U	0.00088	U
		TEADS-FD-1-SO-102120	10/21/2020	FD	0.0010	U	0.0010	U	0.0010	U
Fire Truck Wash Area (Building 5165 exterior)	TEADS-03-03	TEADS-03-3-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	**0.00055**	J
Fire Station Support/Former Motor Pool (Building 5118)	TEADS-04-01	TEADS-04-1-SO-102320	10/23/2020	N	0.00093	U	0.00093	U	**0.0013**	
Fire Station Support/Former Motor Pool (Building 5118)	TEADS-04-02	TEADS-04-2-SO-102320	10/23/2020	N	0.0011	U	0.0011	U	0.0011	U
Fire Station Support/Former Motor Pool (Building 5118)		TEADS-FD-2-SO-102320	10/23/2020	FD	0.00098	U	0.00098	U	0.00098	U
Fire Station Support/Former Motor Pool (Building 5118)	TEADS-04-03	TEADS-04-3-SO-102320	10/23/2020	N	0.0010	U	0.0010	U	0.0010	U

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

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Fire Station Support/Former Motor Pool (Building 5118)	TEADS-04-04	TEADS-04-4-SO-102320	10/23/2020	N	0.00094	U	0.00094	U	0.00094	U
Gas Station FFTA	TEADS-05-01	TEADS-05-1-SO-102120	10/21/2020	N	0.0012	U	0.0012	U	0.0012	U
Gas Station FFTA	TEADS-05-02	TEADS-05-2-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	0.0010	U
Gas Station FFTA	TEADS-05-03	TEADS-05-3-SO-102120	10/21/2020	N	0.00085	U	0.00085	U	0.00085	U
Building 5108 Parking Lot FFTA	TEADS-06-01	TEADS-06-1-SO-102320	10/23/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 5108 Parking Lot FFTA	TEADS-06-02	TEADS-06-2-SO-102120	10/21/2020	N	0.00091	U	0.00091	U	0.00091	U
Building 5108 Parking Lot FFTA	TEADS-06-03	TEADS-06-3-SO-102120	10/21/2020	N	0.00094	U	0.00094	U	0.00094	U
Building 5108 Parking Lot FFTA	TEADS-06-04	TEADS-06-4-SO-102120	10/21/2020	N	0.0011	U	0.0011	U	0.0011	U
Fire Station #2 (Building 5010)	TEADS-07-01	TEADS-07-1-SO-102120	10/21/2020	N	0.00092	U	**0.0027**		**0.13**	
Fire Station #2 (Building 5010)	TEADS-07-02	TEADS-07-2-SO-102120	10/21/2020	N	0.00081	U	**0.0029**		**0.0053**	
Fire Station #2 (Building 5010)	TEADS-07-03	TEADS-07-3-SO-102120	10/21/2020	N	0.0010	U	**0.00081**	J	**0.0016**	
Fire Station #2 (Building 5010)	TEADS-07-04	TEADS-07-4-SO-102120	10/21/2020	N	0.0010	U	**0.00081**	J	**0.0034**	
Fire Station #2 (Building 5010)	TEADS-07-05	TEADS-07-5-SO-102120	10/21/2020	N	0.00097	U	**0.011**		**0.0046**	
Motor Pool (Building 5134)	TEADS-08-01	TEADS-08-1-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	**0.00075**	J
Motor Pool (Building 5134)	TEADS-08-02	TEADS-08-2-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	**0.00058**	J
Motor Pool (Building 5134)	TEADS-08-03	TEADS-08-3-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	0.0010	U

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

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Former Fire Station #2 Support Building (Building 5144)	TEADS-09-01	TEADS-09-1-SO-102620	10/26/2020	N	0.00097	U	0.00097	U	0.00097	U
		TEADS-FD-3-SO-102620	10/26/2020	FD	0.00087	U	0.00087	U	0.00087	U
Former Fire Station #2 Support Building (Building 5144)	TEADS-09-02	TEADS-09-2-SO-102120	10/21/2020	N	0.0010	U	0.0010	U	0.0010	U
	TEADS-09-03	TEADS-09-3-SO-102620	10/26/2020	N	0.00098	U	0.00098	U	0.00098	U
AFFF Fuel Spill Response in Area 2	TEADS-10-01	TEADS-10-1-SO-102120	10/21/2020	N	0.0011	U	0.0011	U	0.0011	U
AFFF Fuel Spill Response in Area 2	TEADS-10-02	TEADS-10-2-SO-102120	10/21/2020	N	0.0011	U	0.0011	U	**0.00099**	J
AFFF Fuel Spill Response in Area 2	TEADS-10-03	TEADS-10-3-SO-102120	10/21/2020	N	0.00093	U	0.00093	U	0.00093	U
AFFF Fuel Spill Response in Area 2	TEADS-10-04	TEADS-10-4-SO-102120	10/21/2020	N	0.00093	U	0.00093	U	**0.00084**	J
Deseret (Rainbow) Reservoir Pump Testing	TEADS-11-01	TEADS-11-1-SO-102220	10/22/2020	N	0.00097	U	0.00097	U	0.00097	U
Deseret (Rainbow) Reservoir Pump Testing	TEADS-11-02	TEADS-11-2-SO-102220	10/22/2020	N	0.0010	U	0.0010	U	0.0010	U
Deseret (Rainbow) Reservoir Pump Testing	TEADS-11-03	TEADS-11-3-SO-102220	10/22/2020	N	0.00099	U	0.00099	U	0.00099	U
Deseret (Rainbow) Reservoir Pump Testing	TEADS-11-04	TEADS-11-4-SO-102220	10/22/2020	N	0.0010	U	0.0010	U	0.0010	U
TOCDF Lagoons	TEADS-12-01	TEADS-12-1-SO-102220	10/22/2020	N	0.0010	U	0.0010	U	0.0010	U
Former WWTP (SWMU 27)	TEADS-13-01	TEADS-13-1-SO-102220	10/22/2020	N	0.00093	U	0.00093	U	**0.0030**	
Former WWTP (SWMU 27)	TEADS-13-02	TEADS-13-2-SO-102220	10/22/2020	N	0.00091	U	0.00091	U	0.00091	U
Former WWTP (SWMU 27)	TEADS-13-03	TEADS-13-3-SO-102220	10/22/2020	N	0.00095	U	**0.00073**	J	**0.011**	
Former WWTP (SWMU 27)	TEADS-13-04	TEADS-13-4-SO-102220	10/22/2020	N	0.0010	U	0.0010	U	**0.0046**	

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).
2. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for the residential and industrial/commercial receptor scenarios (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).
3. Gray shaded value indicates the detected concentration is greater than or equal to the Office of the Secretary of Defense (OSD) risk screening level for the residential exposure scenario.

Acronyms/Abbreviations:

AFFF = aqueous film-forming foam
AOPI = area of potential interest
FD = field duplicate sample
FFTA = firefighting training area
ID = identification
LOD = limit of detection
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SCBA = Self-Containing Breathing Apparatus
SWMU = solid waste management unit
TOCDF = Tooele Chemical Agent Disposal Facility
USAEC = United States Army Environmental Command
WWTP = wastewater treatment plant

Qualifier

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

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

				Analyte	PFBS (ng/L)		PFOA (ng/L)		PFOS (ng/L)	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Deseret (Rainbow) Reservoir Pump Testing	TEADS-11-01	TEADS-11-1-SW-102220	10/22/2020	N	3.4	U	3.4	U	3.4	U
		TEADS-FD-1-SW-102220	10/22/2020	FD	3.4	U	3.4	U	3.4	UJ
TOCDF Lagoons	TEADS-12-02	TEADS-12-2-SW-102220	10/22/2020	N	3.6	U	**2.3**	J	3.6	U
	TEADS-12-03	TEADS-12-3-SW-102220	10/22/2020	N	3.6	U	**2.9**	J	3.6	U

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).

Acronyms/Abbreviations:
AOPI = area of potential interest
FD = field duplicate sample
ID = identification
LOD = limit of detection
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
TOCDF = Tooele Chemical Agent Disposal Facility
USAEC = United States Army Environmental Command

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

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

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
TOCDF Lagoons	TEADS-12-01	TEADS-12-1-SE-102220	10/22/2020	N	0.00091	U	0.00091	U	0.00091	U
Former Sanitary Landfill (SWMU 26)	TEADS-14-01	TEADS-14-1-SE-102120	10/21/2020	N	0.0010	U	0.0010	U	**0.00098**	J
		TEADS-FD-1-SE-102120	10/21/2020	FD	0.0011	U	0.0011	U	**0.0010**	J

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).
2. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for the residential and industrial/commercial receptor scenarios for soil, since the exposure route would be the same for the sediment encountered in dry streambeds (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Acronyms/Abbreviations:
AOPI = Area of Potential Interest
FD = field duplicate sample
ID = identification
LOD = limit of detection
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SWMU = solid waste management unit
TOCDF = Tooele Chemical Agent Disposal Facility
USAEC = United States Army Environmental Command

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

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

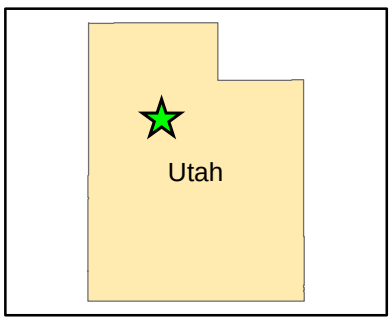
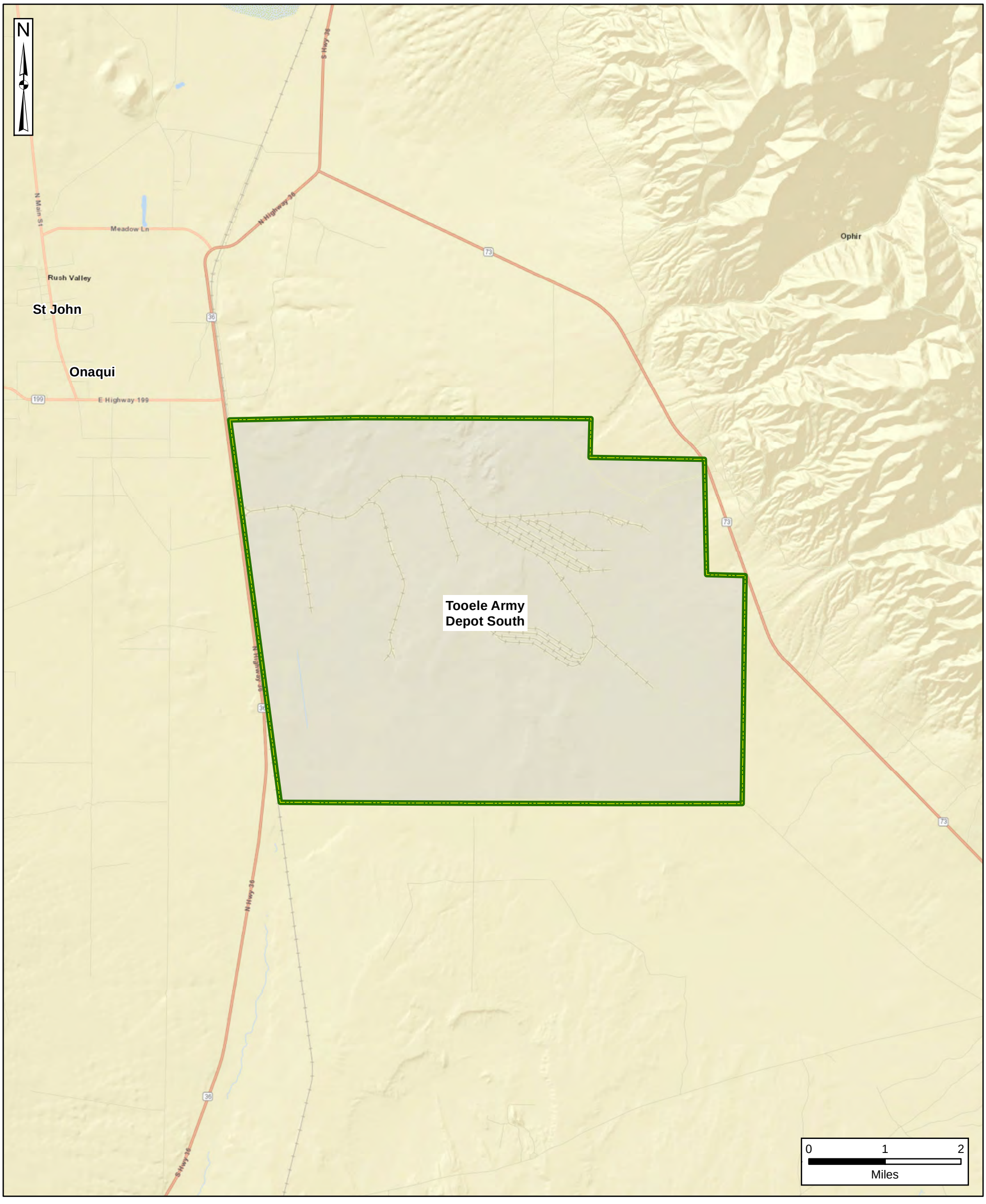


Figure 2-1
Site Location



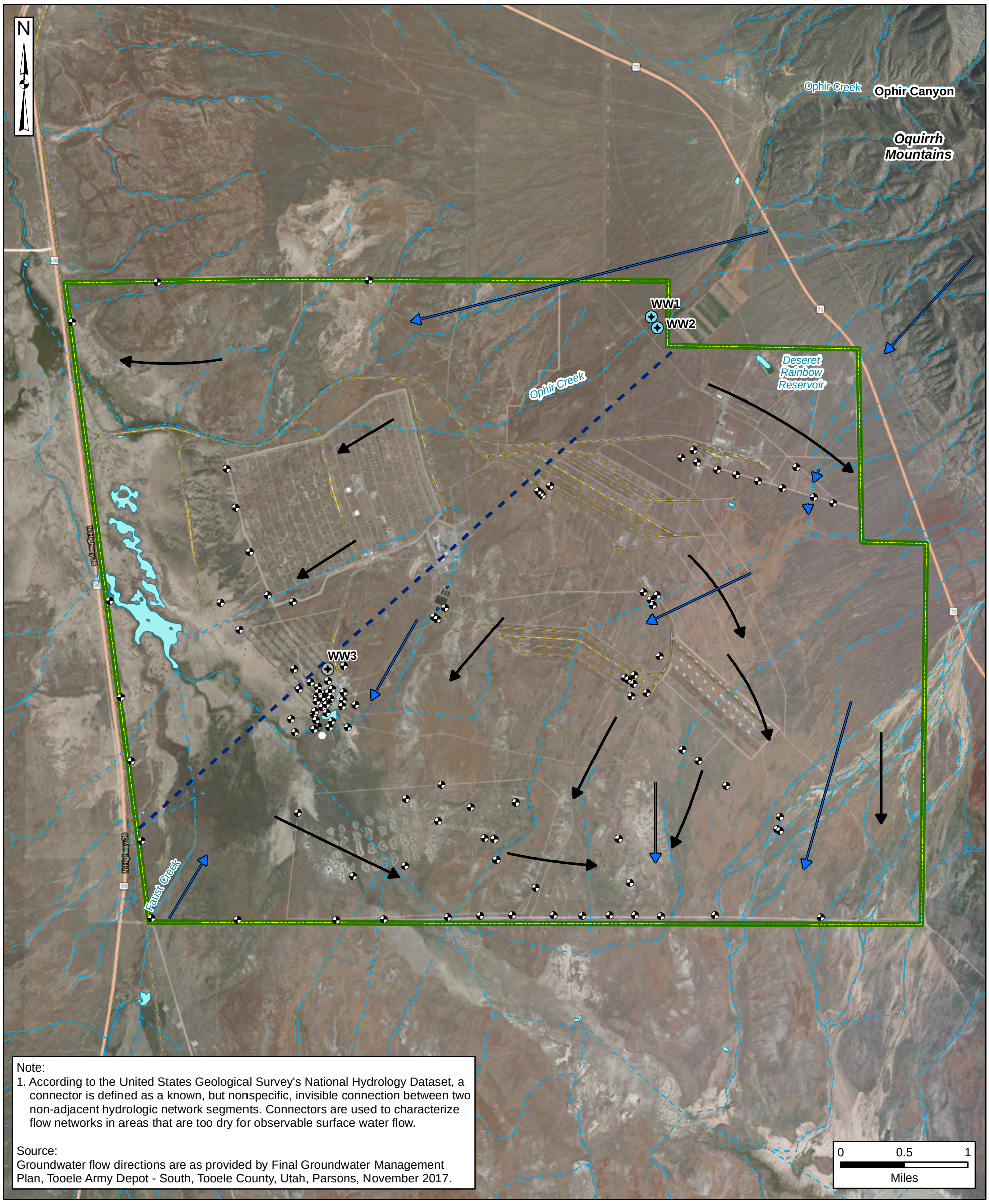
Installation Boundary

Data Sources:
ESRI ArcGIS Online, Street Map Data

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 2-2
Site Layout



Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but nonspecific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

- Installation Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Connector[1]
- Water Body (Intermittent)
- Approximate Groundwater Divide
- Surface Water Flow Direction
- Groundwater Flow Direction
- Potable Well (Active)
- Potable Well (Inactive)
- Monitoring Well

Data Sources:
USGS NHD, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 2-3
Topographic Map

Installation Boundary

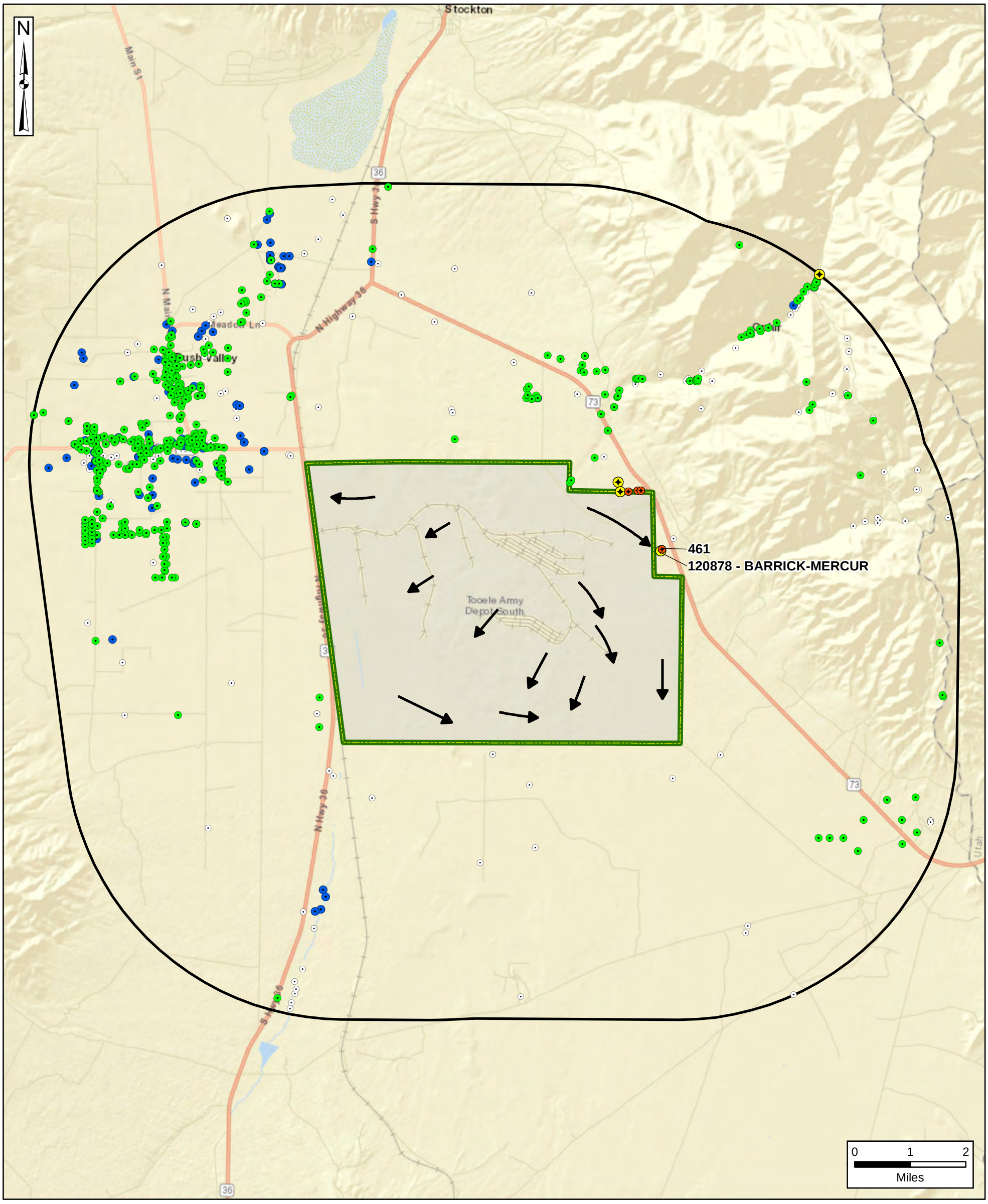
Elevation Contour (10 feet)

Data Sources:
ESRI ArcGIS Online, USGS Topo Map

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 2-4
Off-Post Potable Supply Well Locations



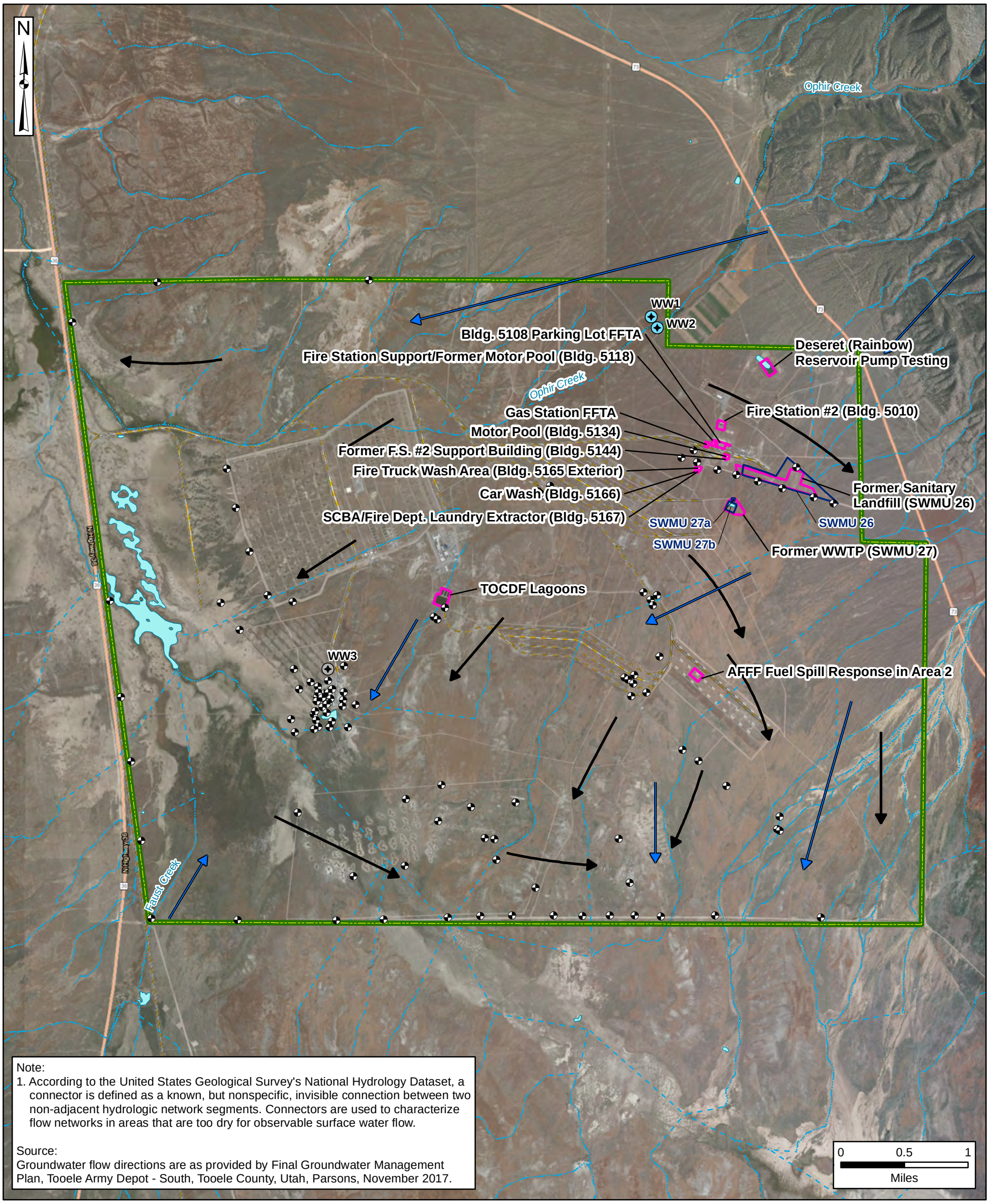
Installation Boundary
5-Mile Radius
Groundwater Flow Direction
Public Water Supply System Well
Municipal Well
Domestic Well
Irrigation Well
Other Designated Use Water Well

Data Sources:
EDR Well Data, 2018
Utah DNR Well Data, 2019
ESRI ArcGIS Online, Street Map Data

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 5-2
AOPI Locations



Installation Boundary
River/Stream (Perennial)
Stream (Intermittent)
Connector[1]
Water Body (Intermittent)
Surface Water Flow Direction
Groundwater Flow Direction
AOPI Boundary
IRP Boundary
Potable Well (Active)
Potable Well (Inactive)
Monitoring Well

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
FFTA = firefighting training area
F.S. = fire station
IRP = Installation Restoration Program
SCBA = self-contained breathing apparatus
SWMU = solid waste management unit
TOCDF = Tooele Chemical Agent Disposal Facility
WWTP = wastewater treatment plant

Data Sources:
USGS NHD, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

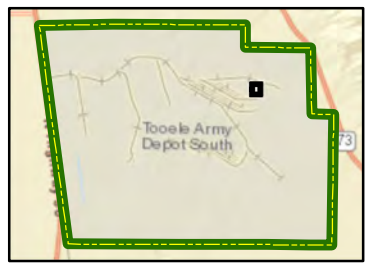


Figure 5-3
Aerial Photo of Fire Truck Wash Area (Building 5165 Exterior), Car Wash (Building 5166), and SCBA/Fire Department Laundry Extractor (Building 5167) AOPIs

Installation Boundary
AOPI Boundary
Inferred Firefighting Foam Use Area*
Groundwater Flow Direction
Monitoring Well

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
Dept. = department
SCBA = self-contained breathing apparatus

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

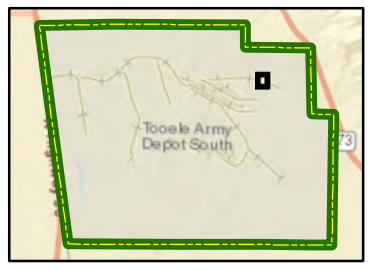


Figure 5-4
Aerial Photo of Gas Station FFTA, Building 5108 Parking Lot FFTA, and Fire Station Support/Former Motor Pool (Building 5118) AOPIs

N

Fire Station
Support/Former
Motor Pool (Bldg. 5118)

Bldg. 5108 Parking Lot FFTA

Gas Station FFTA

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

0 50 100
Feet

Installation Boundary

AOPI Boundary

Inferred Firefighting Foam Use Area*

Groundwater Flow Direction

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
FFTA = firefighting training area

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

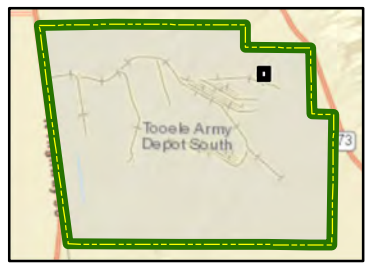
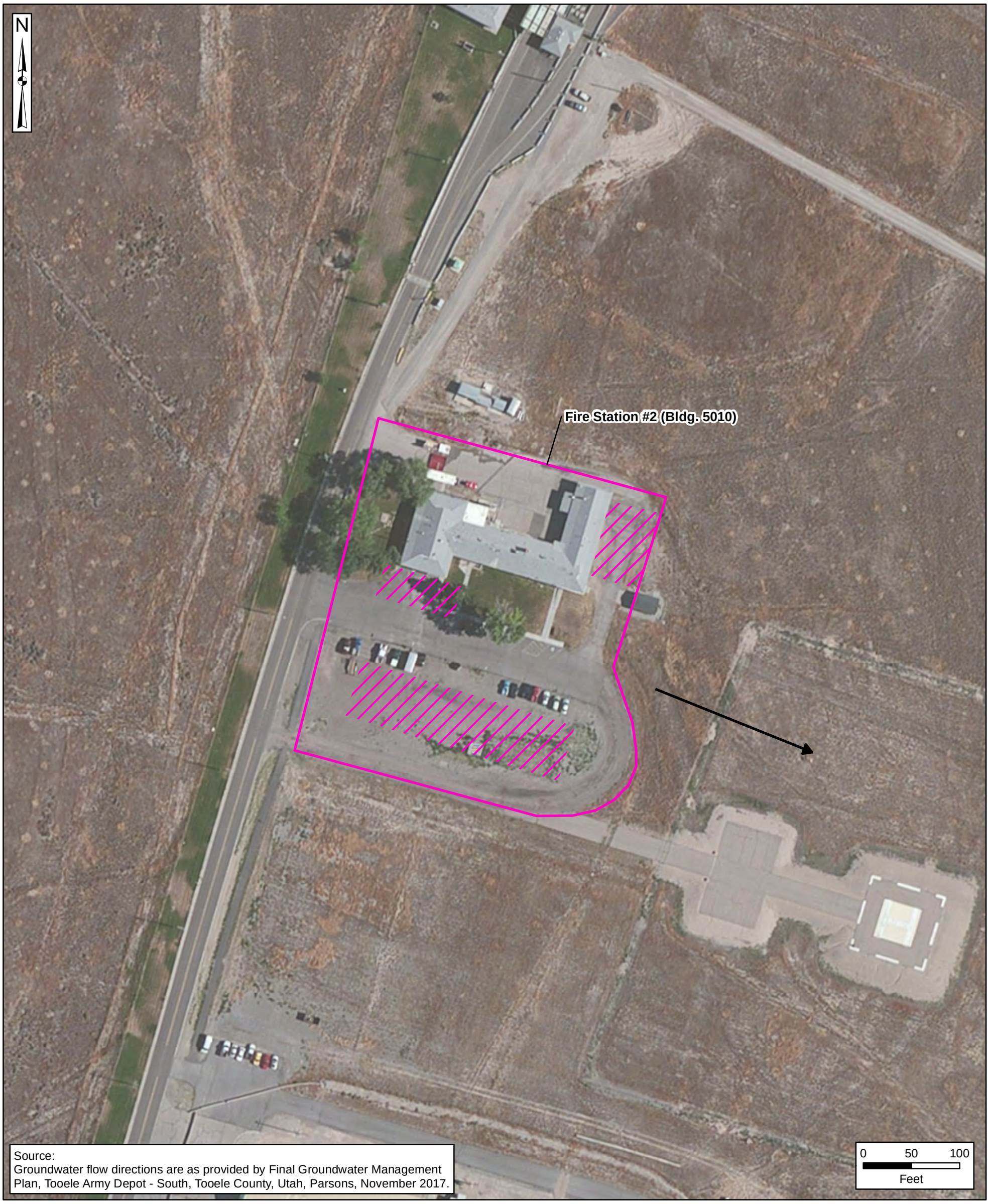


Figure 5-5
Aerial Photo of Fire Station #2 (Building 5010) AOPI



Installation Boundary

AOPI Boundary

Inferred Firefighting Foam Use Area*

Groundwater Flow Direction

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

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 5-6
Aerial Photo of Motor Pool (Building 5134), and Former Fire Station #2 Support Building (Building 5144) AOPIs

Installation Boundary

AOPI Boundary

Inferred Firefighting Foam Use Area*

Groundwater Flow Direction

Monitoring Well

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
F.S. = fire station

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

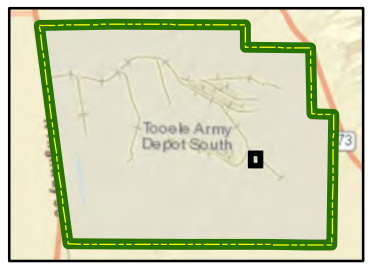
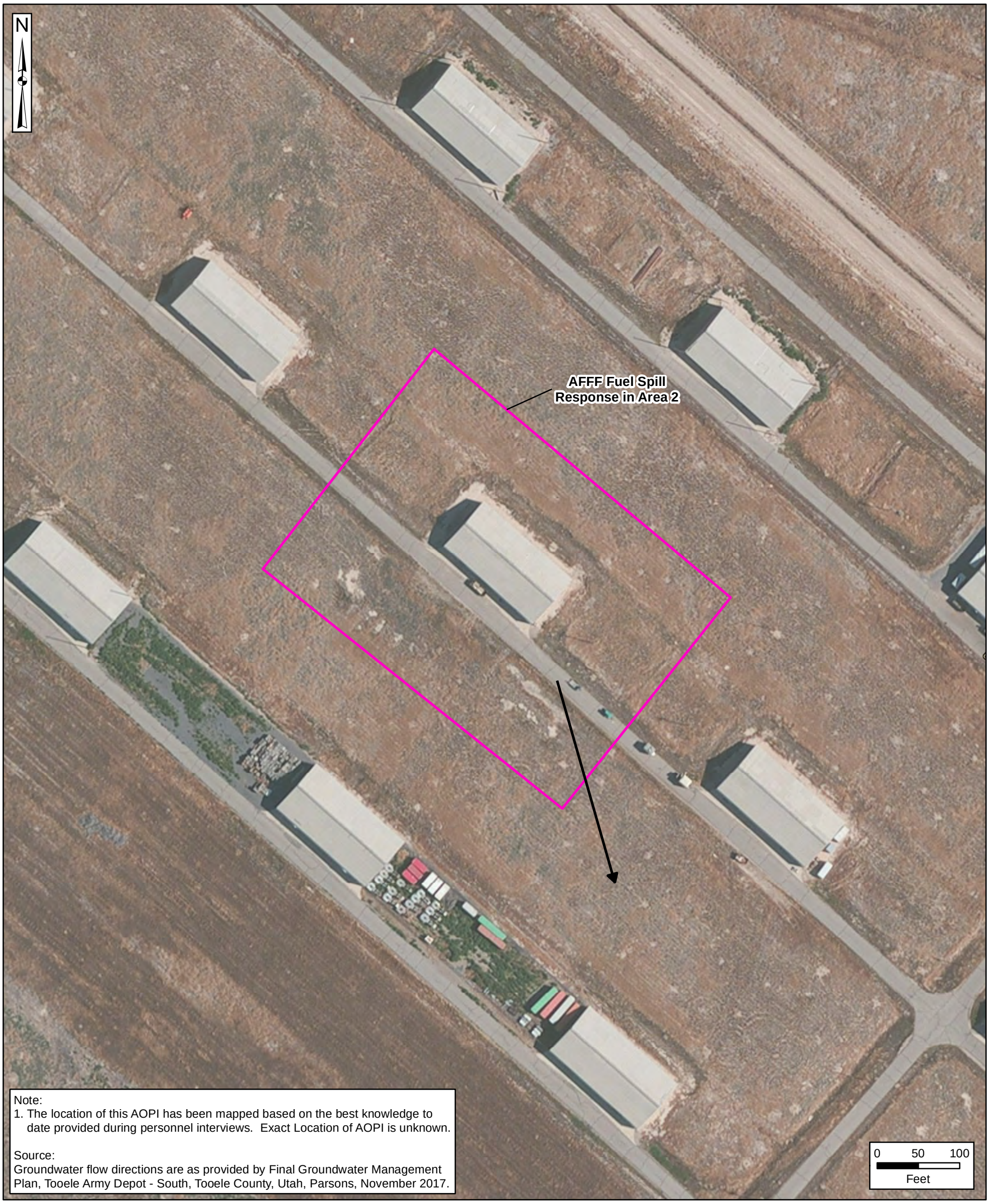


Figure 5-7
Aerial Photo of AFFF Fuel Spill Response in Area 2 AOPI



Note:
1. The location of this AOPI has been mapped based on the best knowledge to date provided during personnel interviews. Exact Location of AOPI is unknown.

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary

AOPI Boundary

Groundwater Flow Direction

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

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

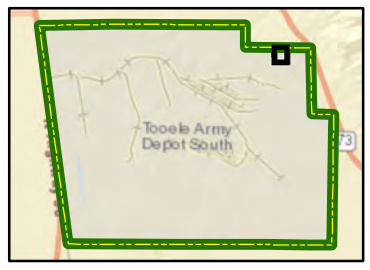


Figure 5-8
Aerial Photo of Deseret (Rainbow) Reservoir Pump Testing AOPI

Installation Boundary

AOPI Boundary

Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

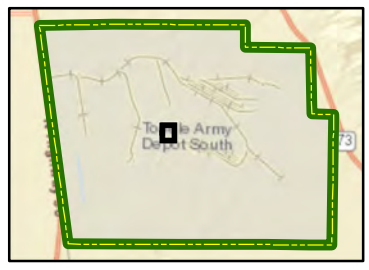
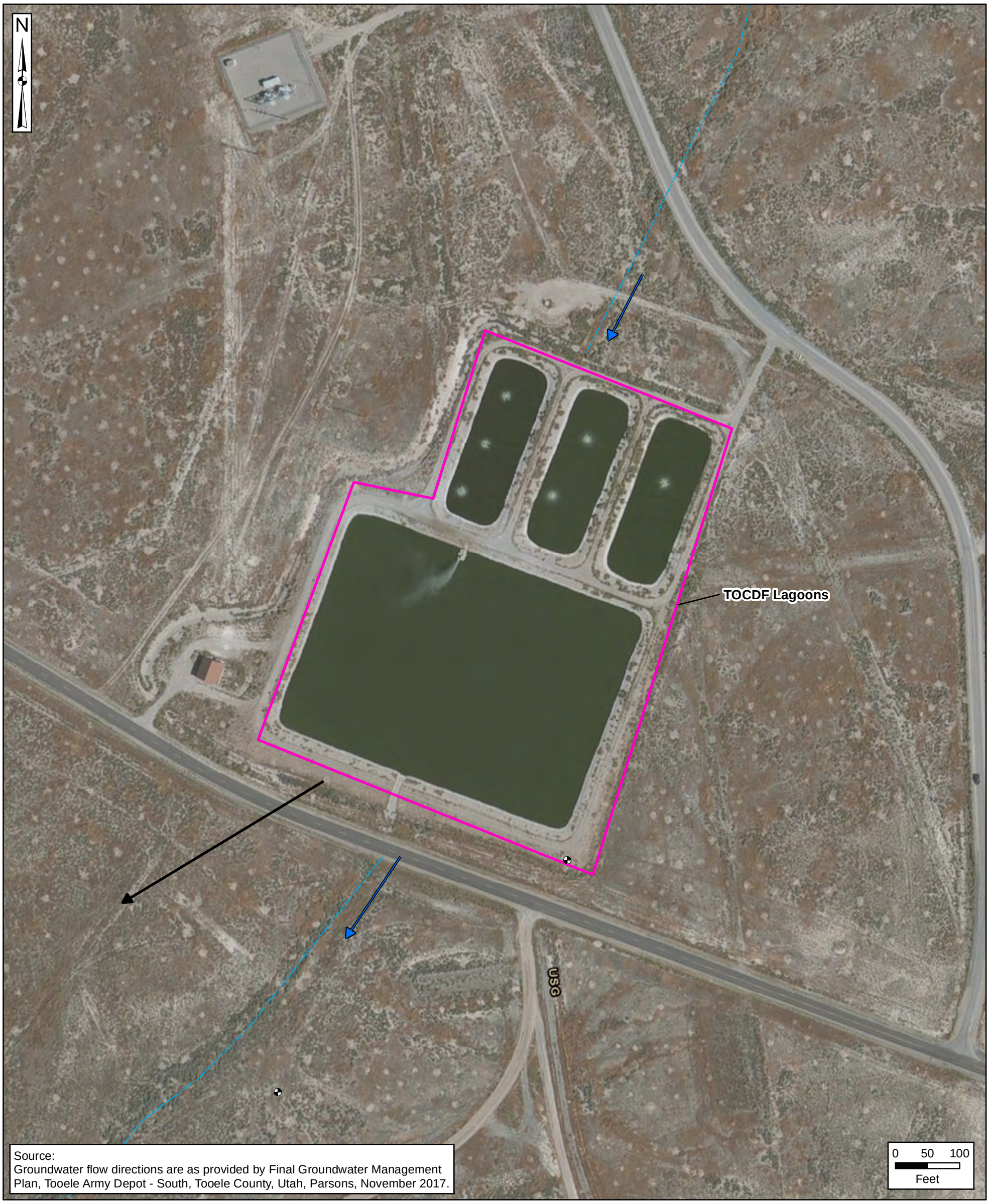


Figure 5-9
Aerial Photo of TOCDF Lagoons AOPI



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

AOPI = area of potential interest
TOCDF = Tooele Chemical Agent Disposal Facility

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

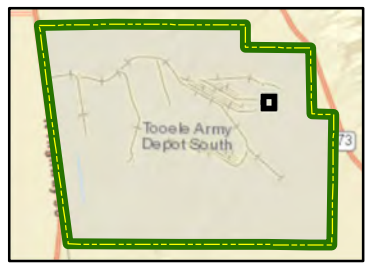
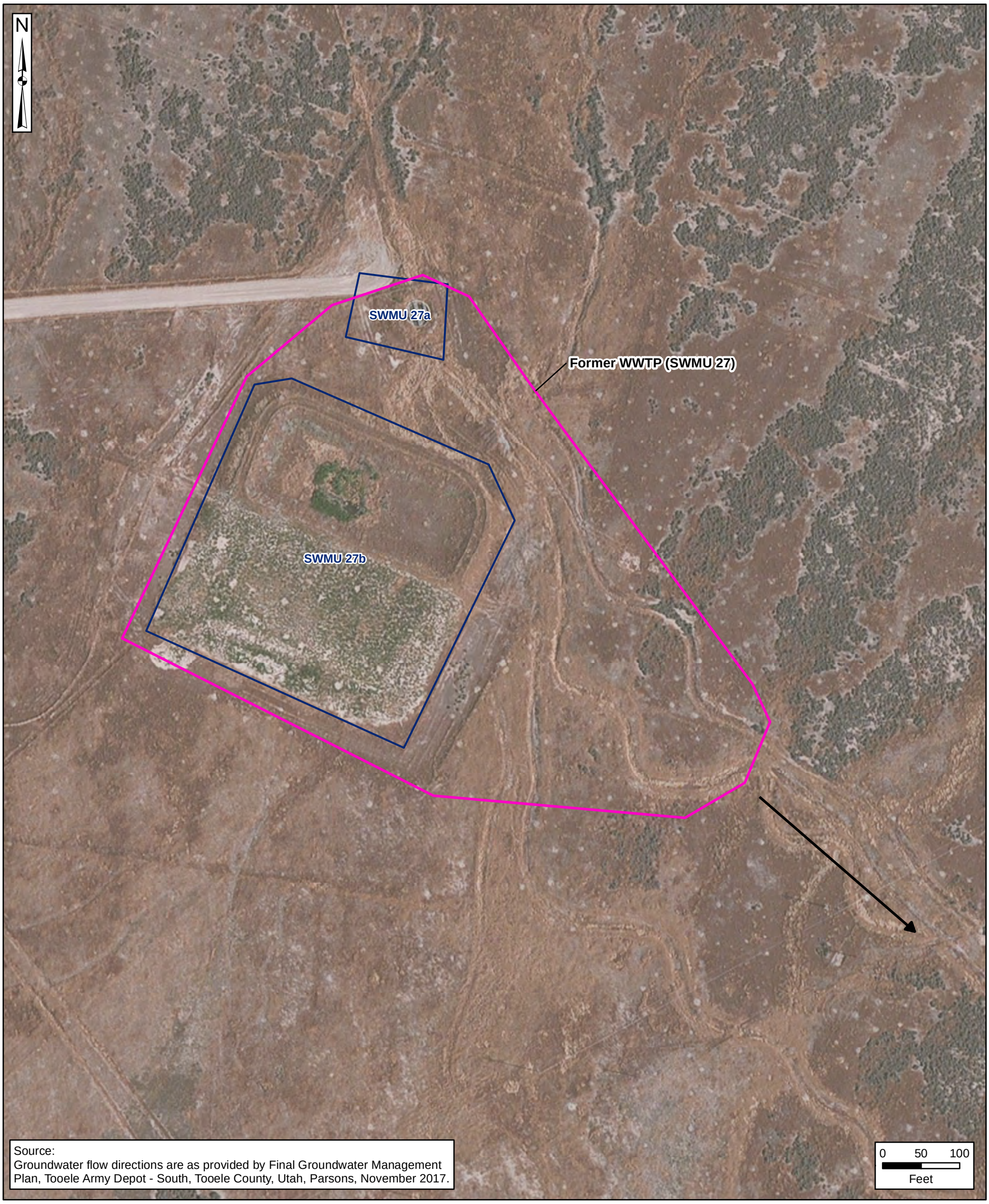


Figure 5-10
Aerial Photo of Former WWTP (SWMU 27) AOPI



Installation Boundary
AOPI Boundary
IRP Boundary
Groundwater Flow Direction

AOPI = area of potential interest
IRP = Installation Restoration Program
SWMU = solid waste management unit
WWTP = wastewater treatment plant

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

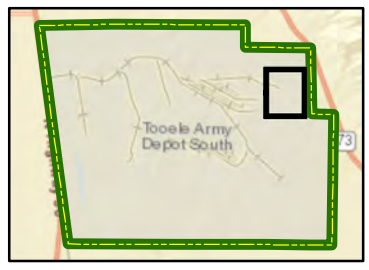
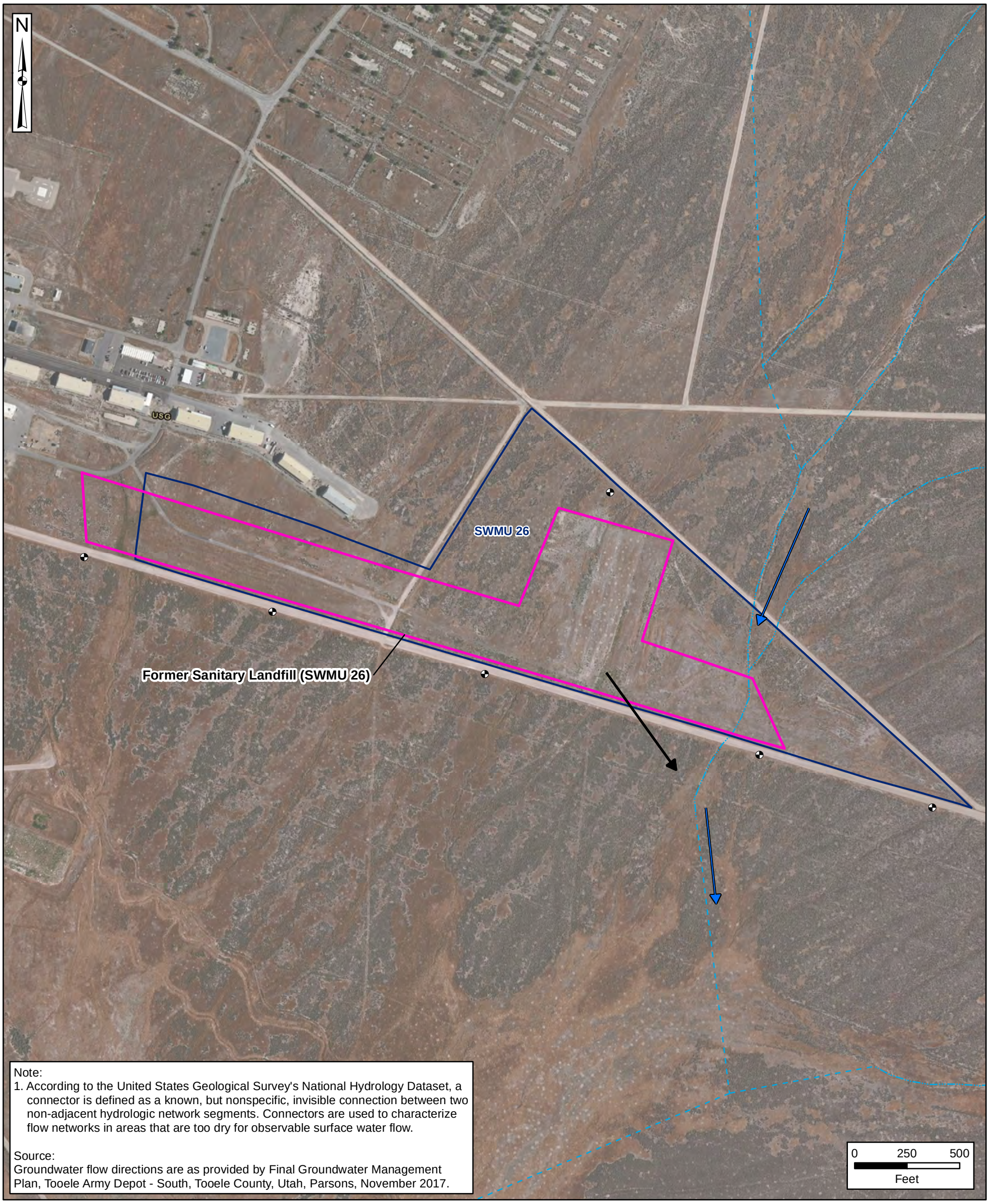


Figure 5-11
Aerial Photo of Former Sanitary Landfill (SWMU 26) AOPI



Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but nonspecific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary
AOPI Boundary
IRP Boundary
Stream (Intermittent)
Connector[1]
Surface Water Flow Direction
Groundwater Flow Direction
Monitoring Well

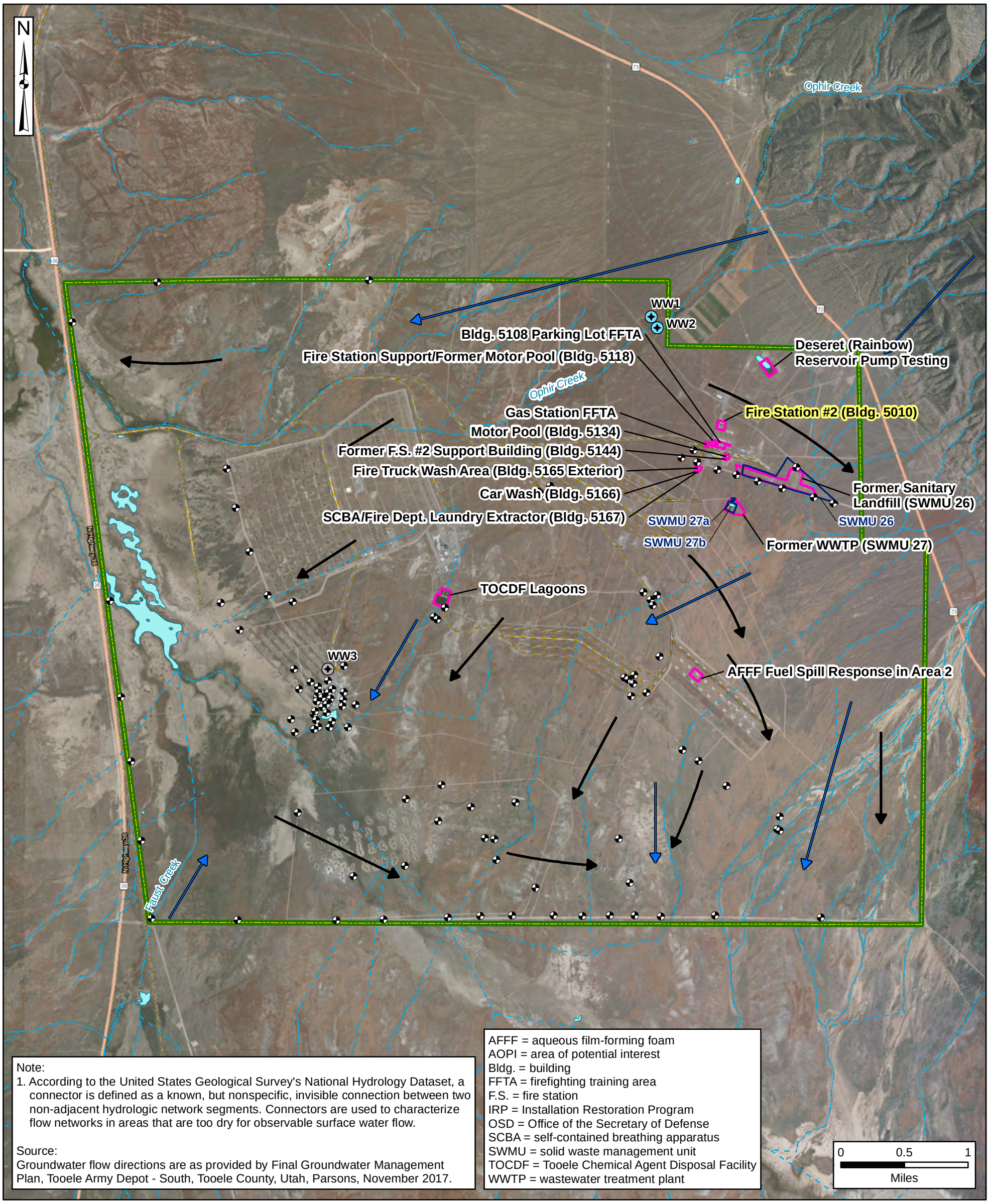
AOPI = area of potential interest
IRP = Installation Restoration Program
SWMU = solid waste management unit

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

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



Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

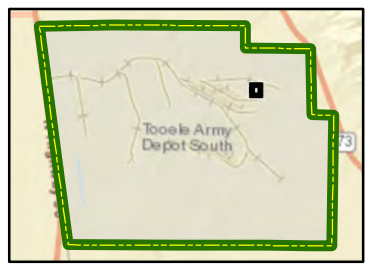


Figure 7-2
PFOS, PFOA, and PFBS Analytical Results for Fire Truck Wash Area (Building 5165 Exterior), Car Wash (Building 5166), and SCBA/Fire Department Laundry Extractor (Building 5167)

N

TEADS-S3590	
Date	10/21/2020
PFBS	3.6 U
PFOA	3.6 U
PFOS	3.6 U

Fire Truck Wash Area (Bldg. 5165 Exterior)

SCBA/Fire Dept. Laundry Extractor (Bldg. 5167)

Car Wash (Bldg. 5166)

TEADS-S3690	
Date	10/20/2020
PFBS	3.6 U
PFOA	**30**
PFOS	3.6 U

0 1,000 Feet

TEADS-03-2-SO	
Date	10/21/2020
PFBS	0.00088 U [0.0010 U]
PFOA	0.00088 U [0.0010 U]
PFOS	0.00088 U [0.0010 U]

TEADS-03-3-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00055 J**

TEADS-03-1-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

Fire Truck Wash Area (Bldg. 5165 Exterior)

TEADS-01-2-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00094 J**

TEADS-02-2-SO	
Date	10/21/2020
PFBS	0.00086 U
PFOA	0.00086 U
PFOS	0.00086 U

Car Wash (Bldg. 5166)

SCBA/Fire Dept. Laundry Extractor (Bldg. 5167)

TEADS-01-1-SO	
Date	10/21/2020
PFBS	0.00089 U
PFOA	0.00089 U
PFOS	**0.00046 J**

TEADS-02-1-SO	
Date	10/21/2020
PFBS	0.00081 U
PFOA	0.00081 U
PFOS	0.00081 U

0 50 100 Feet

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Field duplicate sample results are shown in brackets.
5. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary
AOPI Boundary
Inferred Firefighting Foam Use Area*
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location - Existing Well

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
Dept. = department
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SCBA = self-contained breathing apparatus
SO = soil

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 7-3
PFOS, PFOA, and PFBS Analytical Results for Gas Station FFTA, Building 5108 Parking Lot FFTA, and Fire Station Support/Former Motor Pool (Building 5118)

N

Gas Station FFTA

Fire Station Support/ Former Motor Pool (Bldg. 5118)

Bldg. 5108 Parking Lot FFTA

TEADS-S3590	
Date	10/21/2020
PFBS	3.6 U
PFOA	3.6 U
PFOS	3.6 U

TEADS-S3690	
Date	10/20/2020
PFBS	3.6 U
PFOA	**30**
PFOS	3.6 U

0 1,000 Feet

Fire Station Support/Former Motor Pool (Bldg. 5118)

TEADS-04-3-SO	
Date	10/23/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

TEADS-05-2-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

TEADS-04-1-SO	
Date	10/23/2020
PFBS	0.00093 U
PFOA	0.00093 U
PFOS	**0.0013**

Bldg. 5108 Parking Lot FFTA

TEADS-06-4-SO	
Date	10/21/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

Gas Station FFTA

TEADS-04-2-SO	
Date	10/23/2020
PFBS	0.0011 U [0.00098 U]
PFOA	0.0011 U [0.00098 U]
PFOS	0.0011 U [0.00098 U]

TEADS-05-1-SO	
Date	10/21/2020
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	0.0012 U

TEADS-05-3-SO	
Date	10/21/2020
PFBS	0.00085 U
PFOA	0.00085 U
PFOS	0.00085 U

TEADS-04-4-SO	
Date	10/23/2020
PFBS	0.00094 U
PFOA	0.00094 U
PFOS	0.00094 U

TEADS-06-1-SO	
Date	10/23/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

TEADS-06-3-SO	
Date	10/21/2020
PFBS	0.00094 U
PFOA	0.00094 U
PFOS	0.00094 U

TEADS-06-2-SO	
Date	10/21/2020
PFBS	0.00091 U
PFOA	0.00091 U
PFOS	0.00091 U

USG

0 50 100 Feet

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Results in brackets are field duplicate sample results.
5. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary
AOPI Boundary
Inferred Firefighting Foam Use Area*
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location - Existing Well

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

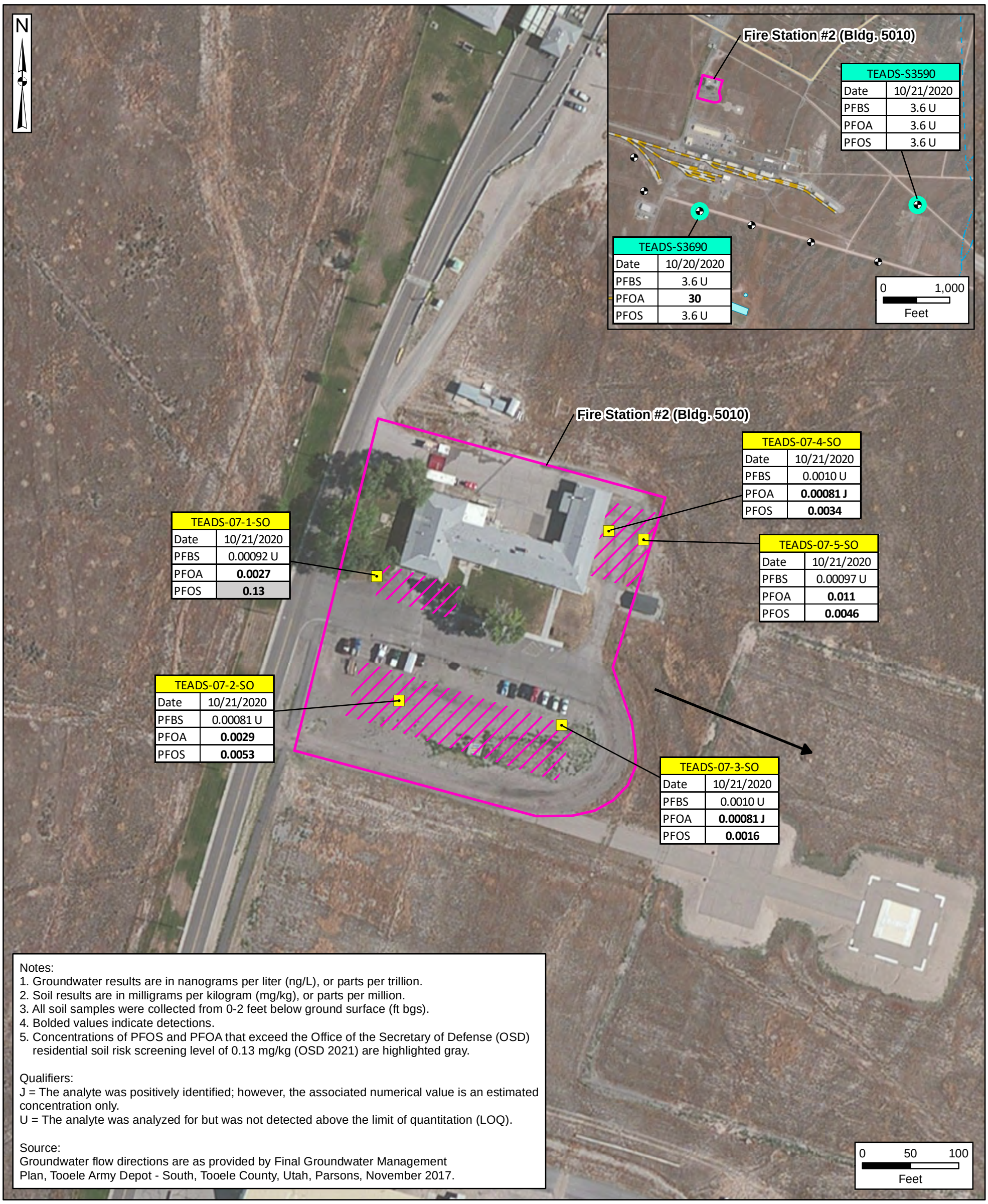
AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
FFTA = firefighting training area
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SO = soil

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 7-4
PFOS, PFOA, and PFBS Analytical Results for Fire Station #2 (Building 5010)



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential soil risk screening level of 0.13 mg/kg (OSD 2021) are highlighted gray.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary
AOPI Boundary
Inferred Firefighting Foam Use Area*
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location - Existing Well

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SO = soil

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 7-5
PFOS, PFOA, and PFBS Analytical Results for Motor Pool (Building 5134), and Former Fire Station #2 Support Building (Building 5144)

N

TEADS-S3590	
Date	10/21/2020
PFBS	3.6 U
PFOA	3.6 U
PFOS	3.6 U

Motor Pool (Bldg. 5134)

Former F.S. #2 Support Building (Bldg. 5144)

TEADS-S3690	
Date	10/20/2020
PFBS	3.6 U
PFOA	**30**
PFOS	3.6 U

0 1,000 Feet

TEADS-08-2-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00058 J**

Motor Pool (Bldg. 5134)

TEADS-08-1-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00075 J**

TEADS-08-3-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

TEADS-09-1-SO	
Date	10/26/2020
PFBS	0.00087 U
PFOA	0.00087 U
PFOS	0.00087 U

Former F.S. #2 Support Building (Bldg. 5144)

TEADS-09-2-SO	
Date	10/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

TEADS-09-3-SO	
Date	10/26/2020
PFBS	0.00098 U
PFOA	0.00098 U
PFOS	0.00098 U

0 50 100 Feet

Notes:
1. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
3. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary
AOPI Boundary
Inferred Firefighting Foam Use Area*
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location - Existing Well

*Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
F.S. = fire station
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SO = soil

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

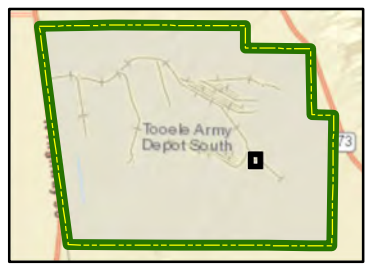


Figure 7-6
PFOS, PFOA, and PFBS Analytical Results for AFFF Fuel Spill Response in Area 2

N

TEADS-10-1-SO	
Date	10/21/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

AFFF Fuel Spill Response in Area 2

TEADS-10-2-SO	
Date	10/21/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.00099 J**

TEADS-10-3-SO	
Date	10/21/2020
PFBS	0.00093 U
PFOA	0.00093 U
PFOS	0.00093 U

TEADS-10-4-SO	
Date	10/21/2020
PFBS	0.00093 U
PFOA	0.00093 U
PFOS	**0.00084 J**

Notes:
1. Exact location of AOPI is uncertain. AOPI location mapped based on best knowledge to date provided by the installation. Sample locations selected based on interviewees indication of where response occurred.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

0 50 100
Feet

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Soil Sampling Location

AOPI = area of potential interest
AFFF = aqueous film-forming foam
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SO = soil

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

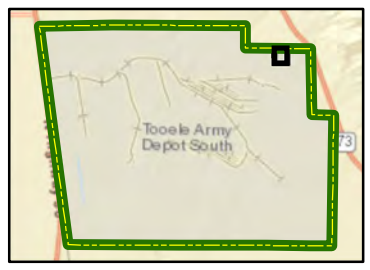


Figure 7-7
PFOS, PFOA, and PFBS Analytical Results for Deseret (Rainbow) Reservoir Pump Testing

TEADS-11-2-SO	
Date	10/22/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

TEADS-11-1-SO	
Date	10/22/2020
PFBS	0.00097 U
PFOA	0.00097 U
PFOS	0.00097 U

TEADS-11-3-SO	
Date	10/22/2020
PFBS	0.00099 U
PFOA	0.00099 U
PFOS	0.00099 U

TEADS-11-1-SW	
Date	10/22/2020
PFBS	3.4 U [3.4 U]
PFOA	3.4 U [3.4 U]
PFOS	3.4 U [3.4 UJ]

TEADS-11-4-SO	
Date	10/22/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

Deseret (Rainbow) Reservoir Pump Testing

Notes:
1. Surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Field duplicate sample results are shown in brackets.
5. TEADS-11-4-SO is located at the outfall.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

0 50 100
Feet

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Soil Sampling Location
Surface Water Sampling Location

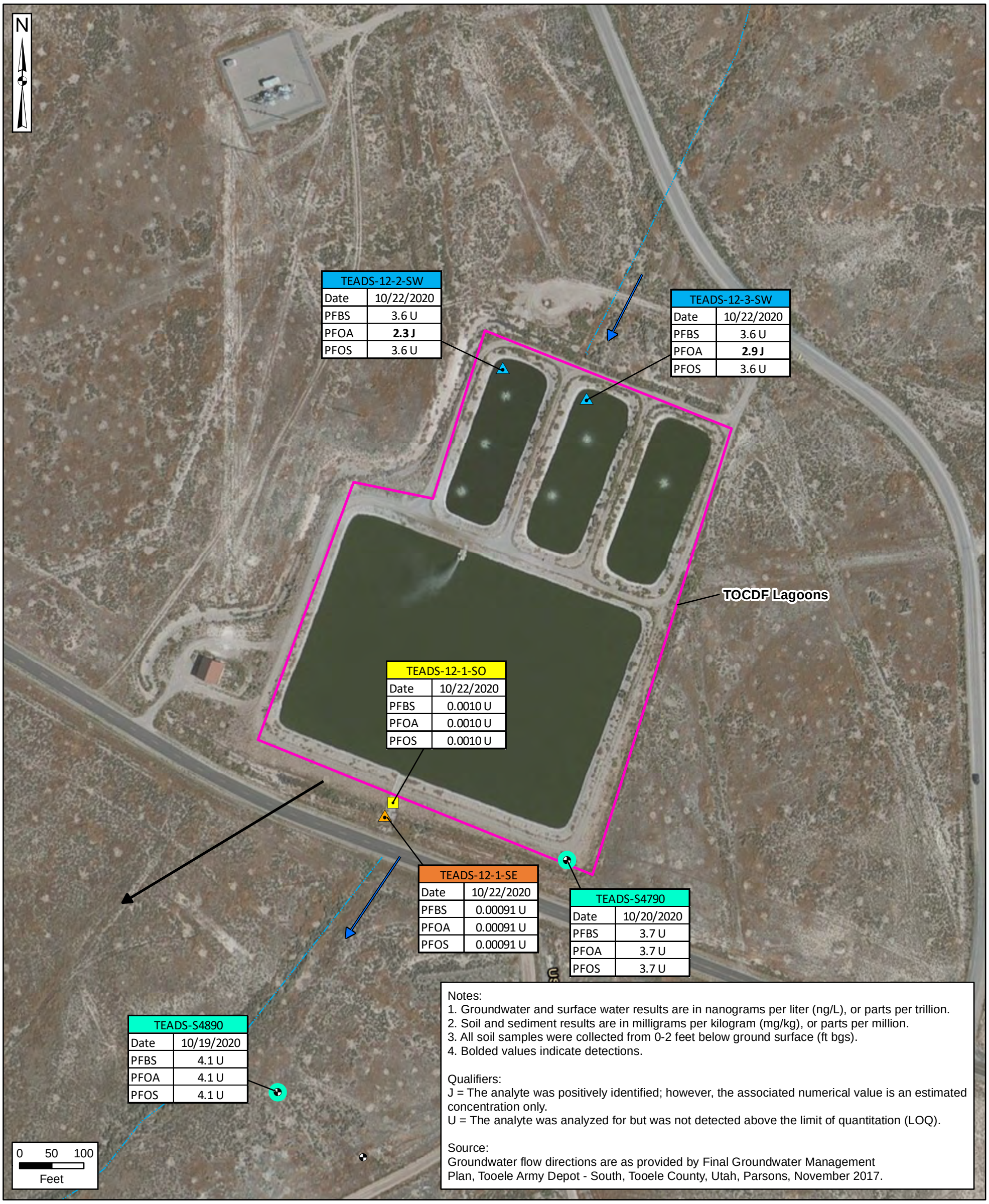
AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SO = soil
SW = surface water

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 7-8
PFOS, PFOA, and PFBS Analytical Results for TOCDF Lagoons



Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil and sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

- Installation Boundary
- Stream (Intermittent)
- AOPI Boundary
- Surface Water Flow Direction
- Groundwater Flow Direction
- Monitoring Well
- Soil Sampling Location
- Surface Water Sampling Location
- Sediment Sampling Location
- Groundwater Sampling Location - Existing Well

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
TOCDF = Tooele Chemical Agent Disposal Facility
SE = sediment
SO = soil
SW = surface water

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 7-9
PFOS, PFOA, and PFBS Analytical Results for Former WWTP (SWMU 27)

N

SWMU 27a

SWMU 27b

Former WWTP (SWMU 27)

TEADS-13-1-SO	
Date	10/22/2020
PFBS	0.00093 U
PFOA	0.00093 U
PFOS	**0.0030**

TEADS-13-4-SO	
Date	10/22/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.0046**

TEADS-13-2-SO	
Date	10/22/2020
PFBS	0.00091 U
PFOA	0.00091 U
PFOS	0.00091 U

TEADS-13-3-SO	
Date	10/22/2020
PFBS	0.00095 U
PFOA	**0.00073 J**
PFOS	**0.011**

0 50 100
Feet

Notes:
1. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
3. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

Installation Boundary
AOPI Boundary
IRP Boundary
Groundwater Flow Direction
Soil Sampling Location

AOPI = area of potential interest
IRP = Installation Restoration Program
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SO = soil
SWMU = solid waste management unit
WWTP = wastewater treatment plant

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

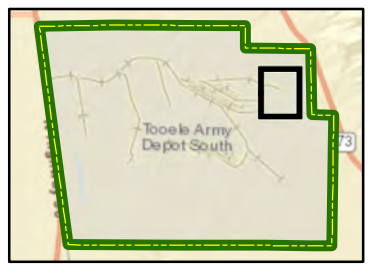
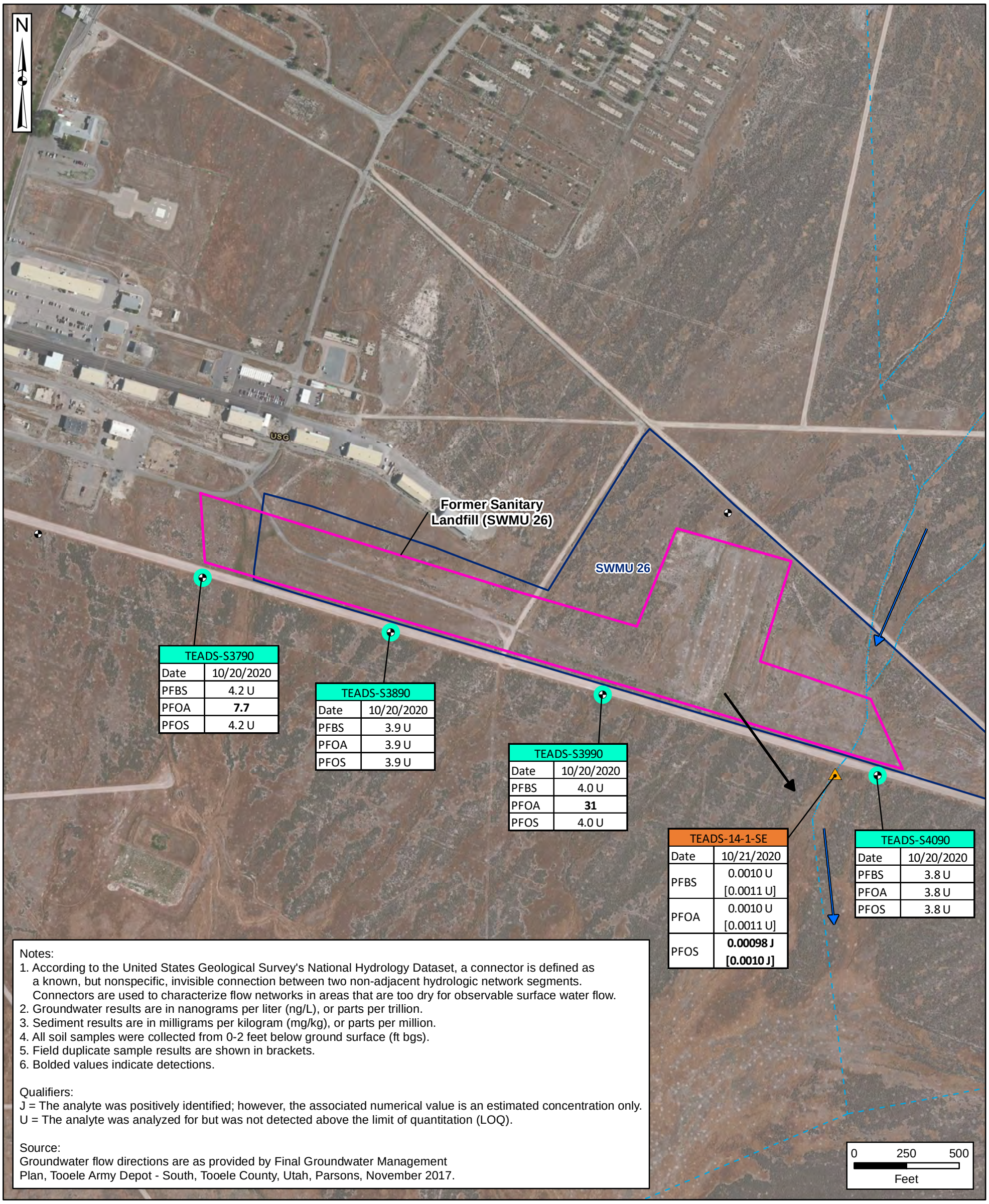


Figure 7-10
PFOS, PFOA, and PFBS Analytical Results for Former Sanitary Landfill (SWMU 26)



Notes:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but nonspecific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.
2. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
3. Sediment results are in milligrams per kilogram (mg/kg), or parts per million.
4. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
5. Field duplicate sample results are shown in brackets.
6. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

- Installation Boundary
- Stream (Intermittent)
- Connector[1]
- AOPI Boundary
- IRP Boundary
- Surface Water Flow Direction
- Groundwater Flow Direction
- Monitoring Well
- Sediment Sampling Location
- Groundwater Sampling Location - Existing Well

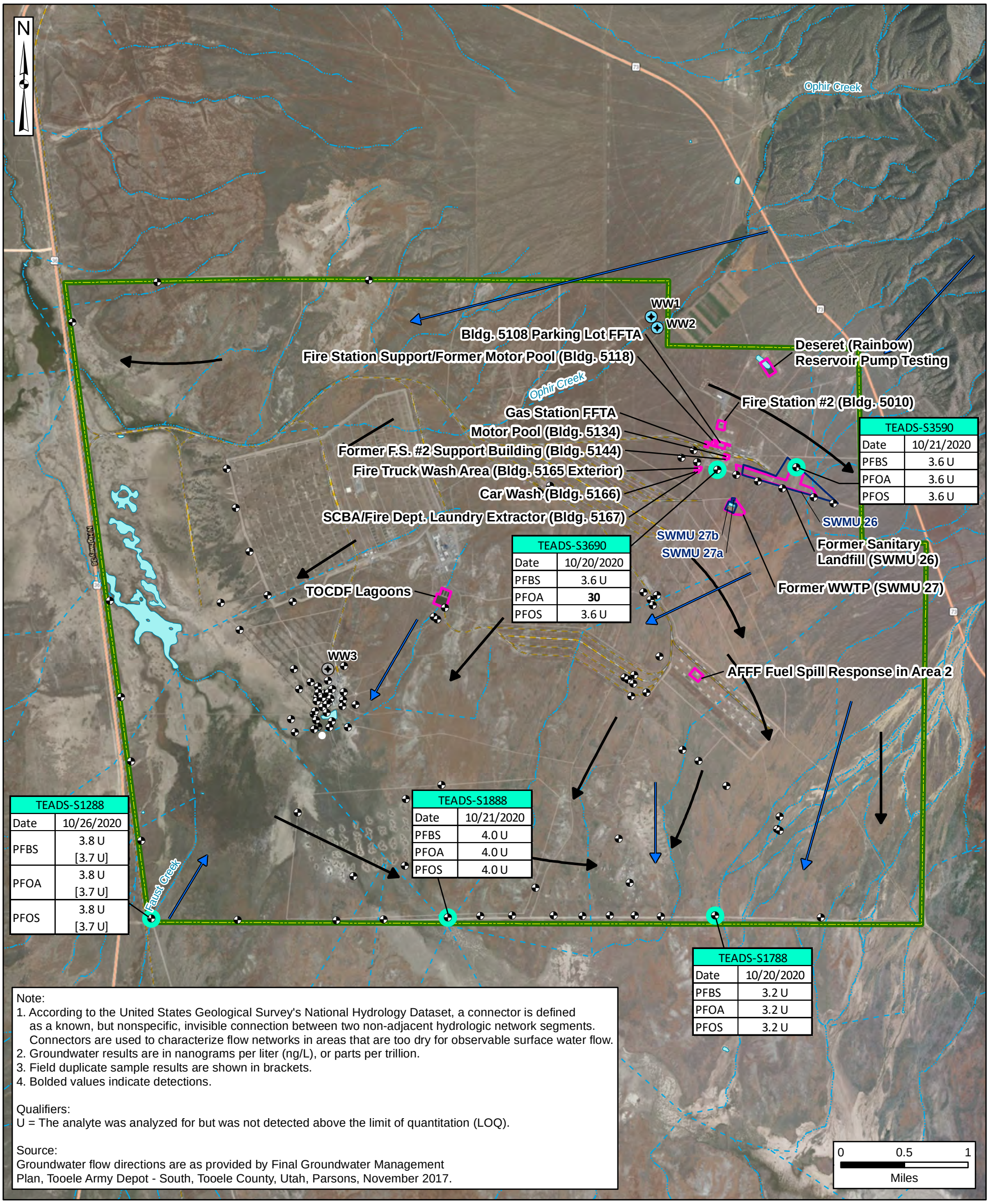
AOPI = area of potential interest
IRP = Installation Restoration Program
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SWMU = solid waste management unit
SE = sediment

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, UT

Figure 7-11
PFOS, PFOA, and PFBS Analytical Results for Boundary Monitoring Wells and Wells Downgradient of Main Post AOPIs



Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but nonspecific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.
2. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
3. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.

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

Source:
Groundwater flow directions are as provided by Final Groundwater Management Plan, Tooele Army Depot - South, Tooele County, Utah, Parsons, November 2017.

- Installation Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Connector[1]
- Water Body (Intermittent)
- Surface Water Flow Direction
- Groundwater Flow Direction
- AOPI Boundary
- IRP Boundary
- Potable Well (Active)
- Potable Well (Inactive)
- Monitoring Well
- Groundwater Sampling Location - Existing Well

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg. = building
FFTA = firefighting training area
F.S. = fire station
IRP = Installation Restoration Program
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SCBA = self-contained breathing apparatus
SWMU = solid waste management unit
TOCDF = Tooele Chemical Agent Disposal Facility
WWTP = wastewater treatment plant

Data Sources:
USGS NHD, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors			
						On-Installation			Off-Installation
						Site Worker	Resident	Recreational User	All Types of Receptors [1]
Aqueous Film-Forming Foam (AFFF) Releases to Soil and/or Paved Surfaces				Soil	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯
					Inhalation (dust)	◯	◯	◯	◯
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

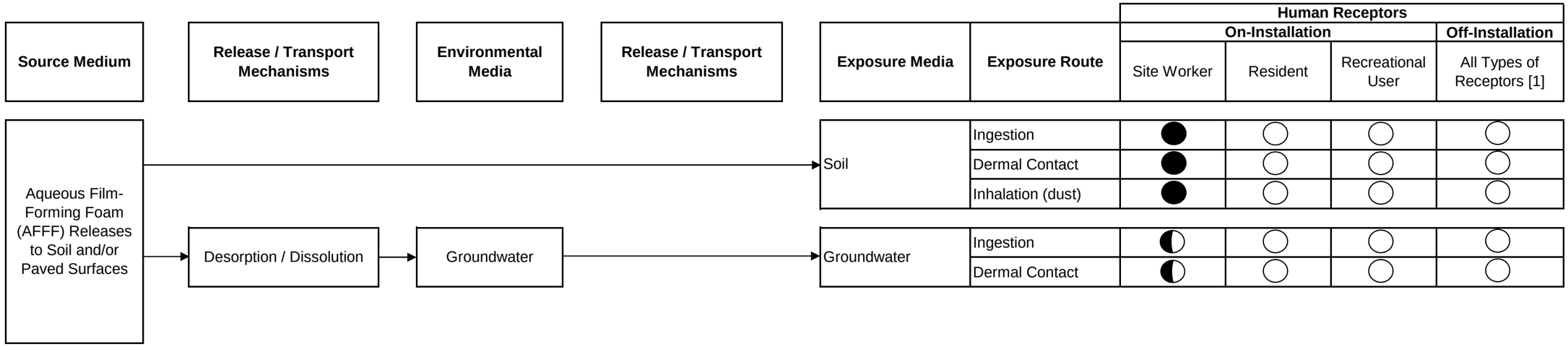
Notes:
[1] All types of off-installation human receptors include drinking water receptors and recreational users.

Acronyms:
FFTA = firefighting training area
SCBA = self-contained breathing apparatus

ARCADIS

Conceptual Site Model for Building 5108 Parking Lot FFTA, Gas Station FFTA, SCBA/Fire Department Laundry Extractor (Building 5167), and Former Fire Station #2 Support Building (Building 5144)
USAEC PFAS Preliminary Assessment / Site Inspection

Figure 7-12



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] All types of off-installation human receptors include drinking water receptors and recreational users.

ARCADIS

Conceptual Site Model for Fire Station #2 (Building 5010), Fire Station Support/Former Motor Pool (Building 5118), Motor Pool (Building 5134), Fire Truck Wash Area (Building 5165 Exterior), and Car Wash (Building 5166)

USAEC PFAS Preliminary Assessment / Site Inspection

Tooele Army Depot-South, Utah

Figure 7-13

Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors			
						On-Installation			Off-Installation
						Site Worker	Resident	Recreational User	All Types of Receptors [1]
Aqueous Film-Forming Foam (AFFF) Releases to Soil and/or Paved Surfaces				Soil	Ingestion	●	○	○	○
					Dermal Contact	●	○	○	○
					Inhalation (dust)	●	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] All types of off-installation human receptors include drinking water receptors and recreational users.

Acronyms:
AFFF = aqueous film-forming foam

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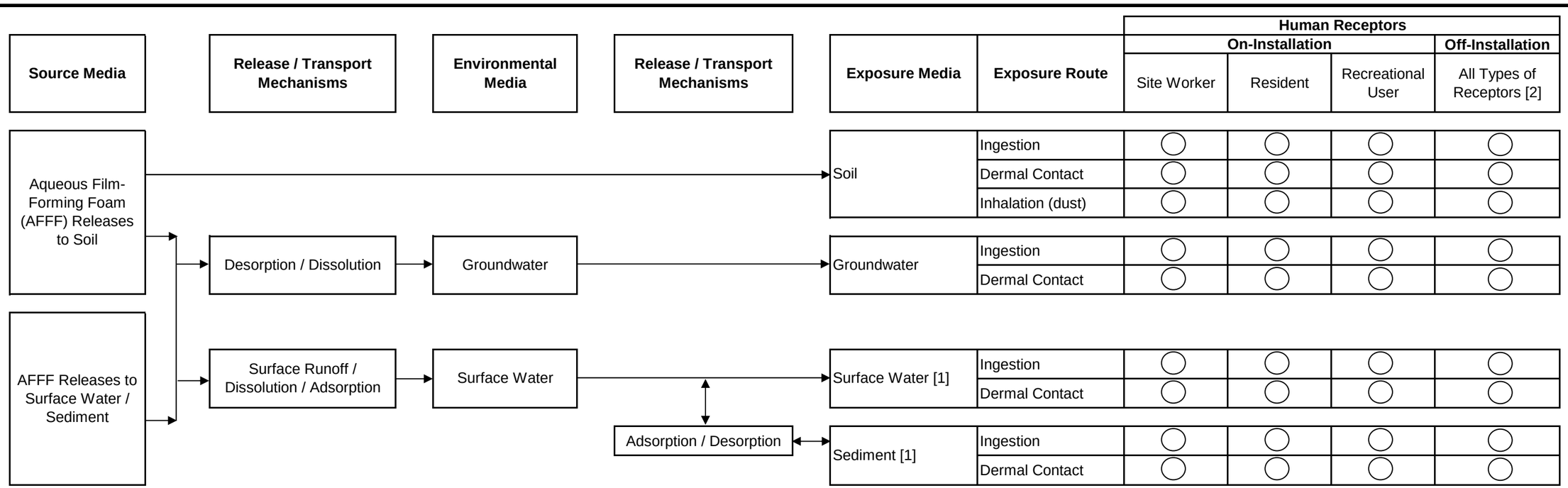
Conceptual Site Model for AFFF Fuel Spill Response in Area 2
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, Utah

Figure 7-14



Legend:

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

Notes:
[1] Surface water and sediment exposure pathways for Site Workers and Recreational Users describe incidental ingestion and dermal contact during outdoor maintenance work or recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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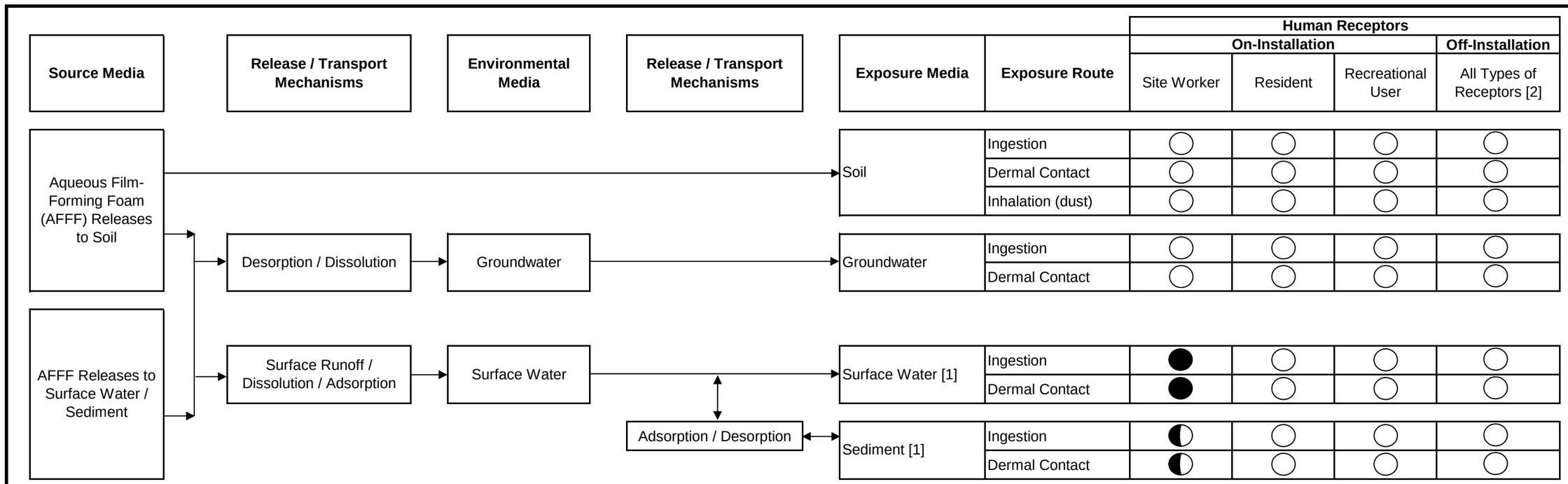
Conceptual Site Model for Deseret (Rainbow) Reservoir Pump Testing
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, Utah

Figure 7-15



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during outdoor maintenance work.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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Conceptual Site Model for Tooele Chemical Agent Disposal Facility Lagoons
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, Utah

Figure 7-16

Source Media	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	Human Receptors: On-Installation: Resident	Human Receptors: On-Installation: Recreational User	Human Receptors: Off-Installation: All Types of Receptors [2]
Historic AFFF Releases to Soil near former Imhoff Tank				Soil (Excavated) near former Imhoff Tank	Ingestion	○	○	○	○
					Dermal Contact	○	○	○	○
					Inhalation (dust)	○	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○
Historic AFFF Releases to Former Lagoons (Surface Water/Sediment)	Historical Surface Runoff / Dissolution / Adsorption	Surface Water		Surface Water [1]	Ingestion	○	○	○	○
					Dermal Contact	○	○	○	○
			Adsorption / Desorption	Sediment/Soil of Intermittent Drainage Ditches and Former Lagoons	Ingestion	●	○	○	○
					Dermal Contact	●	○	○	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water would have been present when WWTP was operational but the ground surface of the area of potential interest is currently dry.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

Acronyms:
AFFF = aqueous film-forming foam
SWMU = solid waste management unit
WWTP = wastewater treatment plant

ARCADIS

Conceptual Site Model for Former Wastewater Treatment Plant (SWMU 27)
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, Utah

Figure 7-17

Source Media	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	Human Receptors: On-Installation: Resident	Human Receptors: On-Installation: Recreational User	Human Receptors: Off-Installation: All Types of Receptors [2]
Sludge from Former WWTP potentially containing AFFF disposed of in Landfill				Subsurface Soil (landfill is capped)	Ingestion	○	○	○	○
					Dermal Contact	○	○	○	○
					Inhalation (dust)	○	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○
	Historical Surface Runoff / Dissolution / Adsorption	Surface Runoff		Surface Water [1]	Ingestion	○	○	○	○
					Dermal Contact	○	○	○	○
			Adsorption / Desorption	Sediment / Soil	Ingestion	●	○	○	○
					Dermal Contact	●	○	○	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers describes incidental ingestion and dermal contact during outdoor maintenance work.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

Acronyms:
AFFF = aqueous film-forming foam
SWMU = solid waste management unit
WWTP = wastewater treatment plant

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Conceptual Site Model for Former Sanitary Landfill (SWMU 26)
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-South, Utah

Figure 7-18

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