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

Fort Wainwright, Alaska

Prepared For:
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Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

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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 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. The Fort Wainwright, Alaska (FTWW) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense (DoD) policy and guidance.

FTWW has oversight of approximately 1,578,340 acres in central Alaska and a current population of 7,374. FTWW is comprised of a cantonment area (located on the eastern boundary of Fairbanks) and various contiguous and non-contiguous land for military maneuvers and training. Several military sub-installations and facilities operate under the management of FTWW; however, the information discussed in this PA/SI Report is for the main FTWW post only.

The FTWW 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 PFBS. PFOS, PFOA, and PFBS were detected in soil and/or groundwater at all 14 AOPIs; eight of the 14 AOPIs had PFOS, PFOA, or PFBS present at concentrations greater than the risk-based screening levels. Additionally, PFOS, PFOA, and/or PFBS were detected (at concentrations less than the risk-based screening levels) in two groundwater samples collected near the downgradient installation boundary in the cantonment area and in one groundwater sample collected near the upgradient installation boundary in the cantonment area.

The FTWW PA/SI identified the need for further study in a CERCLA remedial investigation. **Table ES-1** summarizes the PA/SI results and provides recommendations for further study in a remedial investigation or no action at this time at each AOPI.

Table ES-1. Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at FTWW, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Fire Training Area (southeast portion of lot)	No	No	NS	NS	No action at this time
Taxiway D	Yes	No	Yes*	NS	Further study in a remedial investigation

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Taxiway E	Yes	Yes	Yes*	NA	Further study in a remedial investigation
Fire Training Pits-3A and -3B (FTWW-037, Operable Unit 4)	Yes	Yes (2014 data)	NS	NS	Further study in a remedial investigation
Fire Station #1 (CC-FTWW-103)	ND	No	NS	NS	No action at this time
Fire Station #2 (Building 4390) and Training Area	Yes	No	NS	NS	Further study in a remedial investigation
Ladd Army Airfield (LAAF) Hangar 1 (FTWW-094)	Yes	No	NS	NS	Further study in a remedial investigation
LAAF Hangar 6 (CC-FTWW-06 and -103)	Yes	No	NS	NS	Further study in a remedial investigation
North Refueling (FTWW-063)	No	No	NS	NS	No action at this time
B2118 Flight Line Refill Point (CC-FTWW-103)	No	ND	NS	NS	No action at this time
Landfill near Building 1190 (FTWW-038, Operable Unit 4)	No	NS	NS	NS	No action at this time
DRMO Yard and Drum Site – (CC-FTWW-114, FTWW-047, and FTWW-091)	Yes	NS	NS	NS	Further study in a remedial investigation
Biosolids Application Site	No	No	NS	NS	No action at this time
Fire Station #3 Building 1054 (CC-FTWW-109)	Yes	No	NS	NS	Further study in a remedial investigation

Notes:

*The surface water and sediment samples collected near the Taxiway E AOPI were collected downgradient of an outflow pipe on the west bank of Clear Creek. The installation later indicated that the outfall pipe is groundwater and stormwater infiltrating into utilidors (i.e., utility tunnels commonly built in Arctic climates to house and protect utility lines from harsh conditions) in the LAAF area. Therefore, the detected concentrations of PFOS, PFOA, and PFBS in those samples may be attributed to multiple AOPIs. The surface water data is therefore compared to the tap water OSD risk screening levels since the flow in the creek represented groundwater.

Light gray shading – detection greater than the OSD risk screening level

Acronyms:

GW – ground water

NA – not applicable (i.e., PFOS, PFOA, or PFBS detected, but comparison to OSD risk screening levels is not applicable for the sediment feature sampled)

ND – non-detect

NS – not sampled (i.e., with respect to soil, samples were not collected if there was concern of compromising a cap or if the ground has been significantly reworked in the area; with respect to surface water/sediment, no relevant surface water feature in the area to sample)
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 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 PFAS PA/SI included two distinct efforts. The PA identified locations that are areas of potential interest (AOPIs) at Fort Wainwright, Alaska (FTWW) 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 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 provides the PA/SI for FTWW and was completed in accordance with CERCLA and The National Oil and Hazardous Substances Pollution Contingency Plan.

1.1 Project Background

PFAS are a class of compounds that have been used in a wide range of industrial applications and commercial products due to their unique surface tension/leveling properties. Due to industry and regulatory concerns about the potential health effects and adverse environmental impacts, there has been a reduction in the manufacture and use of PFAS worldwide. In the U.S., significant reductions in the production, importation, and use of PFOS and PFOA (two individual compounds in the PFAS class) occurred between 2001 and 2015 (Interstate Technology 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 (LHA) 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 tap water and soil, calculated using the USEPA's regional screening level (RSL) calculator for residential and industrial/commercial worker receptor scenarios. Following the issuance of the 2019 OSD 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 04 August 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 (and used to evaluate groundwater or surface water used as drinking water sources) are 40 ng/L for PFOS and PFOA, and 600 ng/L for PFBS. The PFOS and PFOA soil screening levels for the residential and industrial/commercial scenarios are 0.13 milligrams per kilogram (mg/kg) (residential) and 1.6 mg/kg (industrial/commercial). The soil

screening levels for PFBS are 1.9 mg/kg (residential) and 25 mg/kg (industrial/commercial). These screening criteria are discussed further in **Section 6.5**.

1.2 PA/SI Objectives

This PA/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 FTWW, PA/SI development followed the process described in the subsections below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for FTWW. 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), FTWW, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred 29 June 2018, approximately 4 weeks before the site visit to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

Records review was conducted before the site visit to obtain electronically available documents from the installation and external sources for review. The purpose of the records research was to identify any area

on the installation that may have been a location where PFAS-containing materials were used, stored, and/or disposed, as well as to gather information on the physical setting and site history at FTWW.

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 Installation Management Command (IMCOM) 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 site visit was conducted on 06 to 09 August 2018. 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 FTWW. 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, was also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling. Photo documentation of the preliminary locations was collected, and access limitations or advantages related to potential future sampling activities were noted.

An informal exit briefing was offered to installation personnel at the conclusion of the site visit to raise any items identified during the site visit, discuss any follow-up items, and review the schedule for submitting deliverables. The exit briefing was conducted on 09 August 2018 with the installation, USAEC, and USACE to discuss preliminary findings of the PA site visit.

1.3.3 Post-Site Visit

Information collected before, during, and after the site visit was reviewed and corroborated by cross-referencing records and reviewing interview details and observations noted during 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**). The results of the site visit were also presented to FTWW, USAEC, and USACE during a post-site visit teleconference. 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 FTWW.

The objectives of the SI kickoff teleconference were to:

- discuss the AOPIs selected for sampling and the proposed sampling plan for each AOPI
- gauge regulatory involvement (i.e., USEPA and Alaska Department of Environmental Conservation [ADEC]) requirements or preferences
- discuss general SI deliverable and field work schedule information and logistics

Following development of the SI sampling technical approach, SI scoping teleconferences were held to obtain concurrence on the SI sampling plan at each AOPI from USAEC, USACE, the installation, ADEC, and the USEPA. Additional discussion topics included:

- identify overlapping unexploded ordnance or cultural resource areas
- confirm 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 for the SI work at FTWW, 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 FTWW (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 (Pace South Carolina) which is DoD Environmental Laboratory Accreditation Program (ELAP)-accredited for PFOS, PFOA, and PFBS analysis by liquid chromatography with tandem mass spectrometry (LC/MS/MS) and compliant with the DoD Quality Systems Manual (QSM) 5.3 (DoD and Department of Energy 2019). Pace South Carolina is also an approved laboratory by the Alaska Contaminated Sites Lab Approval Program for PFAS. Laboratory analytical results were then validated and verified by a project chemist to assess the usability of the data collected. Validated analytical results were summarized in the context of OSD risk screening levels (defined in **Section 6.5**).

2 INSTALLATION OVERVIEW

The following subsections provide general information about FTWW, 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. The information in the subsections below is excerpted from the various cited reports.

2.1 Site Location

FTWW is located in central Alaska within the Fairbanks North Star Borough on the eastern boundary of Fairbanks (**Figure 2-1**). FTWW has oversight of approximately 1,578,340 acres, with a main post cantonment area of 20,553 acres, a current population of 7,374, various ranges, and contiguous and non-contiguous land for military maneuvers and training (**Figure 2-2**) (FTWW 2017). FTWW also houses Ladd Army Airfield (LAAF).

Several military sub-installations and facilities operate under the management of FTWW, including three Haines-Fairbanks Pipeline facilities (Haines Fuel Terminal, Tok Fuel Tank Area, and Sears Creek Pump Station; **Figure 2-1**), which were evaluated under the contract for this PA. Abbreviated site histories and results of the PA evaluation of these sub-installations will be summarized in a stand-alone PA and desktop SI report provided under separate cover. Additional properties of Donnelly Training Area, Black Rapids Training Area, Whistler Creek Rock Climbing Area, and Gerstle River Test Site (which were originally part of U.S. Army Garrison Fort Greely) were transferred to management under FTWW in the mid-1990s (FTWW 2017). The Gerstle River Test Site was also evaluated under the contract for this PA, and results will be summarized in the separate PA and desktop SI report for the FTWW sub-installations.

2.2 Mission and Brief Site History

FTWW has been used by the DoD for military operations continuously since 1938. Originally known as LAAF, the installation was established to test aircraft operations in arctic conditions. In 1947, the newly formed U.S. Air Force assumed control of LAAF, which was then renamed Ladd Air Force Base. In 1961, the Army reassumed control of Ladd Air Force Base, and renamed the installation Fort Wainwright. The mission of FTWW is to execute continuous training and readiness oversight responsibilities for the Army Force Generation in Alaska. FTWW also provides the Pacific Region with focused, early entry battle command capability for the U.S. Army Pacific and Joint Force Land Component Commander for the Homeland Defense and Security in Alaska (FTWW 2017).

2.3 Current and Projected Land Use

FTWW hosts industrial operations including the maintenance of fixed-wing aircraft, helicopters, and support vehicles. Additionally, the Defense Reutilization and Marketing Office (DRMO) operates an area office at FTWW for salvaging military surplus items (yard) and disposing of other waste products (drum site) (Harding Lawson Associates 1993; FTWW 2017). FTWW has operational ranges for munitions testing, residential housing, and recreational facilities (including a golf course and Birch Hill ski lodge). The projected land use for FTWW is anticipated to remain the same.

2.4 Climate

FTWW is in the continental climate zone of interior Alaska. In general, this zone is characterized by extreme summer and winter temperatures and light precipitation. The warm season lasts from mid-May to early September, with an average daily high temperature above 59 degrees Fahrenheit. The hottest month of the year in Fairbanks is July, with an average high of 72 degrees Fahrenheit and low of 54 degrees Fahrenheit. The cold season lasts from early November to late February, with an average daily high temperature below 16 degrees Fahrenheit. The coldest month of the year in Fairbanks is January, with an average low of -13 degrees Fahrenheit and high of 3 degrees Fahrenheit. Over the course of the year, temperatures are rarely below -39 degrees Fahrenheit or above 83 degrees Fahrenheit (Weather Spark 2021).

The region is characterized as semiarid. Approximately 9.5 inches of the annual precipitation falls as rain during the warmer months; the remainder of the annual precipitation falls as snow, which averages a total depth accumulation of approximately 25 inches from mid-September to early May. Surface winds are generally light; wind direction is most often from the west in the warm months and from the east in the colder months (Weather Spark 2021). Severely dry summer conditions coupled with high winds and high fuel loading in some locations at FTWW increases the risk of wildland fires, and restrictions are imposed on live-fire training exercises during the summer (Harding Lawson Associates 1993).

2.5 Topography

FTWW is located on the east side of Fairbanks along the Chena River near the north side of the Tanana River Valley. The main post area is nearly level within the Chena River belt elevation and within the lowlands of the Tanana River floodplain. Terrain north of the Chena River includes bedrock hills of the Birch Creek schist rising from 550 feet to nearly 1,100 feet above mean sea level (amsl). South of the Chena River, topography is generally flat (**Figure 2-3**; USACE 1988).

2.6 Geology

The Yukon-Tanana Upland is composed of Precambrian and Paleozoic metamorphic rocks that have been intruded by Mesozoic- to Tertiary-age igneous rocks. The metamorphic assemblage extends southward beneath the Tanana-Kuskokwim Lowland to the Denali fault system in the Alaska Range, and northward to the Yukon flats and Tintina fault zone. The Tanana-Kuskokwim Lowland is overlain by several hundred feet of unconsolidated Quaternary sediment consisting of primarily glacial outwash and fluvial deposits. Depth to bedrock varies from a few feet near the upland areas (i.e., north of the Chena River) to several hundreds of feet near the Tanana River (Harding Lawson Associates 1993). FTWW is located at the southern edge of the upland and lies in the lowlands of the river basin, where a surficial layer of fine-grained soil overlies deeper alluvial deposits. The Tanana River is considered a floodplain alluvium formation in the FTWW area and is composed of unconsolidated alternating sands and gravels deposited by the Tanana River (USEPA 1997).

2.7 Hydrogeology

The main aquifer in the FTWW area is the Tanana Basin alluvium. The aquifer ranges from a few feet thick at the base of Birch Hill to at least 300 feet thick under the cantonment area and may reach thicknesses of up to 700 feet in the Tanana River valley. The water table is generally encountered within 10 to 20 feet below ground surface (bgs; Harding Lawson Associates 1993). In general, the groundwater flow direction is to the west-northwest and corresponds to the flow direction of the Chena and Tanana Rivers in the area, though localized variations can occur (ADEC 1990). However, in the vicinity of the landfill north of the cantonment area, groundwater flow direction is complicated by discontinuous permafrost (Fairbanks Environmental Services, Inc. [FES] 2019). The groundwater gradient in the area is generally quite flat but the monitoring well network associated with the landfill indicates that the flow in both shallow/intermediate and deep subpermafrost aquifers there is to the west-southwest. There are no confining layers between the shallow/intermediate and deep sub-permafrost aquifers (FES 2019).

The transmissivity of the aquifer is estimated to range from 2,500,000 to 4,500,000 gallons per day per foot (ADEC 1990). The aquifer generally recharges the Chena River (i.e., groundwater flows into the river) when the river stage is low, which occurs during the low precipitation periods of late fall through late winter and mid-summer to early fall. The Chena River recharges the aquifer (i.e., groundwater flows from the river into the surrounding aquifer) during the high river stage, which occurs during the high precipitation periods (USEPA 1997).

Where present, permafrost forms discontinuous confining layers in the mineral soil, which influences groundwater movement and distribution. The presence of near-surface permafrost usually retards groundwater movement within the shallow subsurface (USEPA 1997).

2.8 Surface Water Hydrology

FTWW lies within the Tanana and Chena river drainage basins. The Tanana River is approximately 3 miles south of the cantonment area and flows west, discharging at an average rate of 20,000 cubic feet per second (United States Geological Survey [USGS] 2019a). The river is a silt-laden, highly braided stream fed by glacial meltwaters from the Alaska Range. The Chena River flows through the northern portion of FTWW cantonment area and joins the Tanana River approximately 8 miles west-southwest of FTWW, discharging at a rate of about 2,000 cubic feet per second (USGS 2019b). The Chena River is a relatively clear, meandering river that drains an area of 2,000 square miles (Harding Lawson Associates 1993). The Chena River and groundwater aquifer are in communication as the Chena River is both a gaining and losing stream depending on the time of year.

FTWW's cantonment area is underlain by discontinuous permafrost, and most surface water on-post is in the form of marshes which drain through numerous drainages to the Chena River (U.S. Army Environmental Hygiene Agency 1991). Wetlands encompass a majority of the training lands and pose complications for maintenance and construction projects on-post; FTWW implements a watershed and wetlands management program to protect these resources (United States Army Garrison Fort Wainwright 2013). Other on-post surface water features include Clear Creek (which flows west through the center of the cantonment area, and then north through the west end of the LAAF), Monterey Lake, Bradley Pond, the fly ash and cooling ponds at the central energy facility, and the settling pond at the water treatment

plant. Overflow from the cooling ponds from the energy facility reportedly goes into the Chena River (U.S. Army Environmental Hygiene Agency 1991).

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 FTWW.

2.9.1 Stormwater Management System Description

The storm water drainage system at FTWW is almost entirely comprised of grass-covered surface channels. Ten outfalls for storm water discharge from industrial or industrial-like facilities (including maintenance facilities and motor pools, hangars and LAAF, the landfill, and the Badger Pit quarry). An additional 15 outfalls drain storm water from non-industrial areas. Eight of the 10 outfalls draining stormwater from the industrial facilities discharge directly to the Chena River at a pipe or defined channel (Center for Environmental Management of Military Lands 2016).

2.9.2 Sewer System Description

The sanitary sewer system at FTWW is more extensive than the stormwater management system and is composed of approximately 24 miles of gravity piping, lift stations, manholes, and force mains, primarily in the cantonment area. Nearly 70 percent (%) of the wastewater lines are located in an underground utilidor (i.e., a utility tunnel commonly built in Arctic climates to house and protect utility lines from harsh conditions), while the remainder of the lines are direct-buried, laid deeper, and are of larger diameter for freeze-protection. The wastewater generated at FTWW flows through the gravity collection lines to the southwest corner of the installation, where it travels under Richardson Highway to a Golden Heart Utilities lift station (owned and operated by Golden Heart Utilities, not a part of the FTWW wastewater system; Doyon Utilities 2019).

2.10 Potable Water Supply and Drinking Water Receptors

The well numbers for the supply wells described in this section also denotes the building number where the wells are located, unless otherwise noted. Currently, there are two on-post potable water wells used as the installation's main drinking water source, Wells 3559A and 3559B (both installed to a total depth of approximately 100 feet bgs and screened from approximately 60 to 80 feet bgs). The wells are located south of the Chena River on the western side of the installation and are set in the Tanana Basin alluvial aquifer. Wells 3563 and 3565 are backup drinking water supply wells (**Figure 2-2**). Well 3563 is installed to a total depth of approximately 109 feet bgs and Well 3565 is installed to a total depth of approximately 200 feet bgs. The zones of capture for the potable water supply wells are not well characterized.

There are also three fire support wells at FTWW (Wells 1032, 3405, and 4023; **Figure 2-2**); these wells are connected to the water system loop system but only engaged in case of emergency to support fire suppression efforts. FTWW's standard operating procedures (SOPs) dictate that if these fire support wells are engaged, then the drinking water loop system is to be flushed.

Additionally, there are ten stand-alone water supply wells (i.e., not connected to the main FTWW drinking water supply system) which are not currently used for drinking water. The locations and uses of these wells are as follows:

- Well 1170 at the Birch Hill recreational area ski hill, located north of the main cantonment area across the Chena River near the landfill. The well (a non-potable well) is used for making snow.
- Wells 2092 and 2095 at the Chena Bend golf course. The well at Building 2092 was formerly used for drinking water at the golf course club house; while it is no longer connected, it has not been decommissioned. The well at Building 2095 (a non-potable well) is used for irrigation at the golf course.
- Well 3003 located southwest of Fire Station #1. The well (a non-potable well) is used for construction and other activities.
- Wells 3594 and 3600 located at the Central Heat and Power Plant (CHPP). The well at Building 3594 (Well #4, a non-potable well) is used for cooling and process water functions within the plant. The well at Building 3600 (Well #5, a non-potable well) is used to generate steam for heat and power.
- Well 5008 located at the DRMO facility (housed in Building 5009). The well is used for potable drinking water.
- Wells 5108 and 5110 located at ranges. The well at Building 5108 has not been used since 2009 but is not decommissioned. The well at Building 5110 is used for latrines and a heating system.
- Unnamed well located north of the LAAF runways. This well is used by the Bureau of Land Management (BLM) for fire retardant purposes and is therefore also referred to as the BLM retardant well.

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 FTWW, which along with state and county GIS and data provided by the installation identified several off-post public and private wells within 5 miles of the installation boundary. The wells included in these various databases are shown on **Figure 2-4a** for the 5-mile radius of the installation boundary. **Figure 2-4b** provides a zoomed in view of the off-post potable wells within 5-miles of the cantonment area. The EDR report providing well search results provided as **Appendix E**. Other state databases (i.e., the Natural Resources Well Log Tracking System database) may contain additional or overlapping information provided in the EDR reports regarding off-post wells in the area.

The City of Fairbanks Municipal Utility System also uses the Tanana Basin alluvial aquifer and has four potable water supply wells located approximately 1 mile downgradient of the installation's boundaries, on the banks of the Chena River. These wells serve as the main drinking water supply for most of the city's population. The wells are completed at approximately 90 feet bgs and pump more than 5 million gallons per day (USEPA 1997).

2.11 Ecological Receptors

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

FTWW lies in the boreal forest ecosystem typical of the broad geographic lowland that covers interior Alaska. A variety of wildlife habitats exist at FTWW, including spruce-hardwood stands, shrub stands, wetlands including black spruce forest, black spruce scrub, willow-alder thicket, tussock low shrub bog and persistent emergent wetlands (Harding Lawson Associates 1993). Beneficial resources at FTWW include the forest and wildlife corridor offered by the dense forests and wetland areas providing habitat for many mammalian, avian, fish and insect species (Harding Lawson Associates 1993). No federally threatened or endangered species are reported to inhabit FTWW maneuver and training lands. However, some restrictions may be applied to operations during specific times of the year or at specific locations if certain wildlife species of concern are present (United States Army Garrison Fort Wainwright 2013). Hunting and fishing are permitted at FTWW training lands and on the main post (with the restriction of hunting being limited to north of the Chena River) with the acquisition of a recreation access permit. The Chena River is used for sport fishing.

2.12 Previous PFAS Investigations

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

In 2013, groundwater and soil samples were collected from boreholes advanced during an environmental investigation at fire training pits (FTPs) FTP-3A and -3B (**Tables 2-1** and **2-2**; FES 2014). PFOS, PFOA, and PFBS were detected in several of the grab groundwater and soil samples from both areas. PFOS and PFOA concentrations in several groundwater samples collected from these areas exceeded the OSD risk screening levels (**Table 2-1**). PFOS concentrations in two soil samples collected from these areas exceeded the OSD risk screening levels (**Table 2-2**). These samples were analyzed by Test America (Denver, Colorado) using Method DV-LC-0012; at the time of this sampling event there was no USEPA-approved analytical method for measuring PFAS in soil.

In May 2016, the USEPA issued a PFOS and PFOA LHA of 70 ng/L (USEPA 2016); subsequently, in June 2016, the Army issued a guidance publication for PFOS, PFOA, and PFBS contamination assessments (Army 2018). In response to these actions, the third Unregulated Contaminant Monitoring Rule (UCMR3), and IMCOM Operations Order 16-088, Army installations began initial PFAS sampling in 2016 at water supply wells. However, FTWW is served by a privatized water supplier (Doyon Utilities) and was not included in this sampling event. Environmental samples had been collected at FTWW for PFOS, PFOA, and PFBS analyses prior to these directives at the back-up drinking water supply well 3565 in December 2013 and in June 2014; PFOS, PFOA, and PFBS were not detected above the laboratory's minimum reportable level (40 ng/L, 20 ng/L, and 90 ng/L respectively; IMCOM 2018). The minimum reportable level was not defined (i.e., as a detection limit, limit of detection [LOD], or limit of quantitation [LOQ]) in the referenced IMCOM file or in the occurrence data available from the USEPA for the third Unregulated Contaminant Monitoring Rule. The laboratory that analyzed samples under UCMR3 met the

USEPA's UCMR3 Laboratory Approval Program application and Proficiency Testing criteria for USEPA Method 537 Version 1.1.

Additionally, Doyon Utilities has since performed PFAS sampling through 2020 at various FTWW potable water supply wells and at the process water well utilized by the CHPP to generate steam for heat and power (Well 5, Building 3600) and cooling and process water functions within the power plant (Well #4, Building 3594) (**Table 2-1**, **Figure 2-5**). PFOS and PFOA have been detected at low concentrations (i.e., less than the OSD risk screening levels) in the following wells during these sampling events:

- Primary drinking water supply well 3559A/B (maximum PFOS concentration of 2.6 ng/L detected in January 2019; PFOA was not detected in the samples)
- Fire support well 1032 (maximum PFOS concentration of 16 ng/L and PFOA concentration of 8.7 ng/L detected in September 2018)
- CHPP Well #5 at Building 3600 (maximum PFOA concentration of 14 ng/L detected in November 2018; PFOS was not detected in the sample)

PFBS was not analyzed for in these potable water supply well samples. Samples collected by Doyon Utilities were sent to Pollen Environmental, who subcontracted analyses (utilizing USEPA Method 537) to Eurofins Eaton Analytical Laboratory, and, sometimes, to Underwriters Laboratories. At the time of this PA/SI, other on-post water supply wells have not been sampled for PFAS constituents.

In April 2019, a sample was collected from an unnamed well (i.e., the BLM retardant well) at the North Refueling (FTWW-063) site northeast of the LAAF runways. PFOS, PFOA, and PFBS were detected in the well at concentrations of 7.96 ng/L, 5.38 ng/L, and 1.62 ng/L respectively (all less than the OSD risk screening levels; **Table 2-1**, **Figure 2-5**). However, the well has dedicated down-hole equipment that cannot be removed; it is suspected that the PFOS, PFOA, and PFBS detections observed in the well may be due to cross-contamination from potentially PFAS-containing equipment in the well.

In June 2019, a sample was collected at the Golden Heart Utilities treatment system where the wastewater from FTWW enters the system. The sample was analyzed for six PFAS by USEPA Method 537 Version 1.1 Modified. PFOS, PFOA, and PFBS were detected at concentrations of 13 ng/L, 3.6 ng/L, and 3.4 ng/L, respectively (**Table 2-3**).

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 FTWW, data was collected from three principal sources of information, which are described further 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 logs (**Appendix H**) during the PA process for FTWW is presented in **Section 4**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.1**, and further discussion regarding categorizing areas as AOPIs is presented in **Section 5.2**.

3.1 Records Review

The records reviewed for this PA included, but were not limited to, various Installation Restoration Program (IRP) administrative record documents, compliance documents, FTWW fire department records, FTWW Directorate of Public Works (DPW) 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 FTWW is provided in **Appendix F**.

3.2 Personnel Interviews

Interviews were conducted during the site visit and during follow-up telephone conversations following the site visit. If a previously identified interviewee was not available during the site visit, attempts were made to complete the interview via telephone before or following the site visit or by contacting an alternate interviewee identified by the installation POC. In some cases, contact information for additional interviewees was not provided or the contacts did not have additional information. If follow-up information was able to be obtained, it is included in **Appendix G**.

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

- IRP Manager
- Resource Planning Chief
- Airfield Manager
- Airfield Operations Support

- Range Manager
- Chief of Engineering
- Chief of Business Operations
- Cultural Resources Manager
- Pesticides Manager
- USACE Environmental Division POC
- Compliance Program Manager
- Site Manager (Doyon Utilities)
- Environmental Specialist (Doyon Utilities)
- Deputy Director (Doyon Utilities)
- Water Treatment Plant Operator (Doyon Utilities)
- Fire Chief

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 FTWW during the records review process, the installation in-brief meeting, and/or during the installation personnel interviews. The site reconnaissance logs are provided in **Appendix H**. The installation did not permit photographs to be taken during the PA site visit due to operations security concerns.

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

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

FTWW 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.

AFFF has historically been and is currently stored in LAAF Hangar 1 (Building 1557) and LAAF Hangar 6 (Building 2088), which are equipped with AFFF fire suppression systems. During the PA site visit, one 5-gallon container of AFFF concentrate was also observed in storage outside of LAAF Hangar 1 in a fenced-off area. Additionally, AFFF was stored historically and currently within the FTWW fire department buildings and various fire trucks and other mobile equipment (i.e., trailers). Some old AFFF was drained from mobile equipment in 2017 according to personnel interviews (**Appendix G**); the disposal of this AFFF was coordinated through the DRMO. The material was reportedly transported off-post, solidified in U.S. Ecology's pits (i.e., non-DoD owned property), and the solid waste was taken to Columbia Ridge Landfill in Oregon (**Appendix G**). At the time of the PA site visit in August 2018, some older fire trucks and a support trailer at Fire Station #1 still had legacy PFAS-containing formulations of AFFF in their tanks.

Several inventories of AFFF remaining on hand at FTWW have been provided during the PA and SI; discrepancies exist between each. The AFFF stored at FTWW as reported in each of the inventories is described below:

- At the time of the 2018 PA site visit, inventory documents provided by the Army indicated that 2,310 gallons of Chemguard 3% AFFF remained on hand at FTWW (IMCOM 2016):
    - An aircraft rescue firefighting apparatus reportedly contained 660 gallons (storage location of the apparatus not indicated)

  - The fire stations housed 395 gallons (the inventory did not specify which fire stations)
  - The B2118 Flight Line Refill Point housed 1,255 gallons of AFFF (IMCOM 2016)
- However, an inventory provided in December 2020 (which was completed in 2017 by the fire department chief) indicated that 6,200 gallons of AFFF remained on hand at FTWW (**Appendix G**):
  - Fire Station #1 (Building 3004) housed approximately 1,600 gallons of AFFF: 400 gallons in the C-98 apparatus, 200 gallons in the C-97 apparatus, and 1,000 gallons in the foam trailer
  - Fire Station #2 (Building 4390) housed approximately 180 gallons of AFFF: 40 gallons in the E-92 apparatus, 40 gallons in the E-93 apparatus, and 100 gallons stored in twenty 5-gallon buckets
  - Fire Station #3 (Building 1054) housed approximately 170 gallons of AFFF: 60 gallons in the C-99 apparatus, 10 gallons (stored in two 5-gallon buckets) on the E-91 apparatus, and 100 gallons stored in twenty 5-gallon buckets
  - Building 2118 Flight Line Refill Point on Montgomery Road housed 150, 5-gallon buckets of AFFF
  - LAAF Hangar 1 (Building 1557) housed three 1,000-gallon tanks for the AFFF suppression system
  - LAAF Hangar 6 (Building 2088) housed one 500-gallon tank for the AFFF suppression system (**Appendix G**)
- An updated inventory provided by FTWW in December 2020 for fiscal year 2020 indicated that a maximum of 7,110 gallons of AFFF remained on hand at FTWW (FTWW DPW 2020):
  - Fire Station #1 (Building 3004) housed a maximum of 1,465 gallons of C6 AFFF in multiple containers and/or tanks on mobile equipment.
  - Fire Station #2 (Building 4390) housed a maximum of 30 gallons of C6 AFFF in two 15-gallon containers and/or tanks on mobile equipment. Installation personnel indicated that the fire station likely began housing AFFF here since AFFF use began at the installation and continued until the disposal action in 2019 (**Appendix G**).
  - Fire Station #3 (Building 1054) housed a maximum of 15 gallons of C6 AFFF in a single 15-gallon tank on mobile equipment. Installation personnel indicated that this fire station likely began housing vehicles equipped with AFFF since AFFF use at the installation began and continued until the disposal action in 2019 (**Appendix G**).
  - LAAF Hangar 1 (Building 1557) housed a maximum of 4,800 gallons of AFFF in four 1,200-gallon tanks.
  - LAAF Hangar 6 (Building 2088) housed a maximum of 800 gallons of AFFF in a single 800-gallon tank (FTWW DPW 2020).

In December 2020, FTWW personnel indicated that the fire trucks and support trailer have since been emptied of AFFF and triple-rinsed (**Appendix G**). The procedure for the AFFF disposal was as follows: double-containment/catch pools were placed under the mobile equipment's AFFF tank drains. Six of the vehicles used a vehicle-sized containment pool and smaller 20-gallon catch pools to drain the vehicles' AFFF tanks. The on-board foam pumps were utilized for two of the fire department's other vehicles. After

the vehicles were drained, the empty foam tank was filled with water, the vehicle was driven for 5 minutes, and then the process was repeated to complete the triple-rinse process. In total, 1,705 gallons of AFFF concentrate were drained from these mobile apparatuses and poured in to multiple 275-gallon totes using an air-operated diaphragm pump. Rinse water was also transferred from the catch pools to the totes via this process. The diaphragm pump was later rinsed, then taken apart and further decontaminated. All foam barrels and totes were placed in secondary containment as well; the catch pools and hoses were bagged and turned in to the FTWW Hazardous Waste Facility along with the totes containing the AFFF concentrate and rinse-water. FTWW reported that AFFF and associated rinse water was shipped out by the Defense Logistics Agency on 15 October 2019 to National Response Corps Alaska. The liquid waste was then shipped to Heritage Environmental's Gum Springs, Missouri, facility, where it was incinerated (**Appendix G**). If the procedures described above only involved water rinses between the change-out from PFAS-containing foams to non PFAS-containing foams, or from C8 dominant AFFF to C6 dominant AFFF (and the vehicle tanks were not completely replaced), it is likely that residual PFAS (or C8 PFAS) remain in components of the apparatuses.

There are currently three fire stations on FTWW utilized by the FTWW fire department. At Fire Station #1, nozzle testing of the crash trucks was reported to occur north of Fire Station #1 into a former ditch structure. Soil from the ditch has since been excavated and regraded, and the area was paved over for construction of a new building during renovations to LAAF. Fire Station #2 has hosted fire training activities with a simulated helicopter fuselage fire in the gravel area east of the education center building (Building 4391). A photograph provided by LAAF indicated foam releases in the area in July 2011. Building 1054 was used as a motor vehicle and equipment repair shop until 1986, at which time it was converted into Fire Station #3 (north of LAAF Hangar 1; FTWW 2017). The south end of Building 1054 was demolished in 2008; soil from the northwest corner of Building 1054 was excavated for petroleum and lead-impacted soils, and the soil was disposed of off-post. No additional information was provided regarding historical operations at Fire Station #3 regarding the potential use of AFFF there. However, during the June 2021 follow-on field event, AFFF was observed being stored at the building (four 55-gallon drums of Phos-Chek C6 AFFF manufactured in 2019). The Battalion Chief onsite indicated that AFFF would be transferred from the 55-gallon drums to a smaller container via a hand pump. The four drums of AFFF had been stored at Fire Station #3 in that location since approximately March 2021.

Several other historical fire training areas have been identified within FTWW. AFFF was reportedly used during training activities at the Fire Training Area in the southeast portion of the installation near Bradley Pond and Building 2420; approximately 20 gallons of AFFF concentrate were reportedly released here during a single event in 2013 or 2014. Another historical fire training area consisting of two FTPs (FTP-3A and -3B; IRP site identification FTWW-037) operated between 1970 and 1988. Given the historical period of operation and the analytical data available for soil and groundwater at FTP-3A and -3B, historical AFFF use is also assumed in these areas. Some soil from the FTPs was remediated for contamination from petroleum, oil, and lubricant constituents using thermal desorption (treated off-post) then used as base cover of a landfill on-post. In 2013 or 2014, LAAF Taxiways D and E were authorized for fire training activities with AFFF during the construction of the new LAAF Hangar 4; foam was reportedly allowed to dry up and dissipate on the tarmac. The taxiways operated as training areas for approximately 2.5 years, and it is estimated that a combined 200 gallons of AFFF concentrate may have been used in these areas.

Findings from personnel interviews, site reconnaissance, and document research indicate the use of AFFF at FTWW has been primarily to assist with FTWW fire department operations, including equipment testing and firefighting training. AFFF use during wildfire or crash responses was not reported.

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

Potential PFAS use associated with metal plating activities may also be relevant to Army installations (as PFAS have been known to be used in some mist suppressants). However, review of data collected from site reconnaissance, installation personnel interviews, and historical documents did not identify any historical metal plating operations at FTWW.

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 and/or stored at Army installations and did not identify FTWW 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.

Following document research, personnel interviews, and site reconnaissance at FTWW, two fueling facilities (at one it is known AFFF was stored) were identified as AOPIs. Additionally, soil from the FTPs that was likely impacted by AFFF use was used as base cover of a landfill on-post following its thermal remediation for petroleum, oil, and lubricant constituents. Potentially PFAS-impacted waste from the wastewater treatment plant (WWTP) (biosolids) were applied at an area at LAAF. These fueling facilities and waste disposal areas therefore prompted further research. Other potential PFAS source types were either not identified at the installation or did not prompt further research or constitute categorization as AOPIs.

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

4.3 Readily Identifiable Off-Post PFAS Sources

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

Nearby civilian operations could potentially be off-post sources of PFAS-containing materials within a 5-mile radius of FTWW. Three North Star Volunteer Fire Department fire stations are located upgradient of FTWW, based on regional (northwesterly) groundwater flow direction. The Fairbanks Fire Department fire station is approximately 0.5 mile northwest of FTWW; based on regional (northwesterly) groundwater flow direction, the facility is downgradient of the installation. Fairbanks International Airport is approximately 4 miles west of FTWW; based on regional (northwesterly) groundwater flow direction, the facility is downgradient to cross-gradient of the installation. Groundwater analytical data collected in the area around the Fairbanks International Airport indicate PFAS concentrations greater than the USEPA LHA (70 ng/L) and likely use of Class B AFFF at the facility (ADEC 2019a).

The City of Fairbanks Regional Training Fire Center is located within 2 miles of FTWW (west and cross-gradient of the FTWW cantonment area) and has been identified as a source of PFAS contamination in the area due to the use of Class B AFFF during fire training exercises. There is a burn pit located in the northwest corner of the training center that was used from the mid-1980s to the mid-2000s and is currently under investigation for PFAS. Sampling in 2018 showed detections of PFAS greater than the USEPA LHA (70 ng/L) more than 1 mile downgradient from the FTP (ADEC 2019a).

Other facilities that may have used PFAS-containing materials during operations may be located in the Fairbanks area.

5 SUMMARY AND DISCUSSION OF PA RESULTS

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

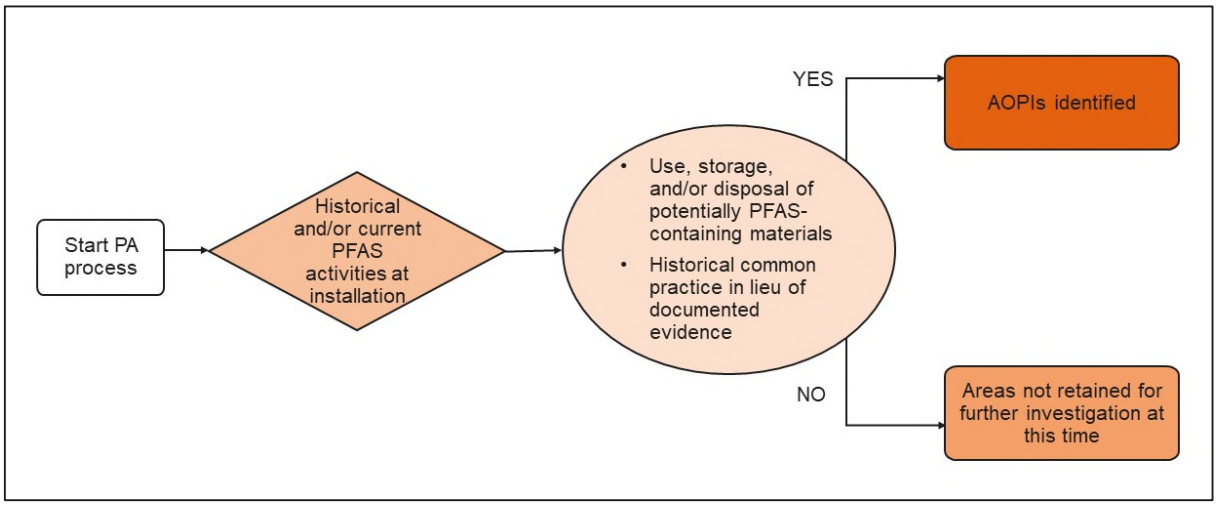

Figure 5-1: AOPI Decision Flowchart

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 FTWW are presented in **Section 8**.

5.1 Areas Not Retained for Further Investigation

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

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

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

Area Description	Dates of Operation	Relevant Site History	Rationale
LAAF Hangar 2	Unknown to present	LAAF Hangar 2 has been deconstructed (sometime between 2013 and 2018) and was equipped with water deluge fire suppression system only. From approximately 1994 to 1997, the hangar was partially occupied by Alaska Army National Guard (AKARNG; meaning, the AKARNG was a tenant conducting operations in the facility).	No evidence of AFFF or other PFAS-containing materials used, stored, and/or disposed of at this location.
LAAF Hangar 3	Unknown to present	LAAF Hangar 3 has been deconstructed (sometime between 2013 and 2018) and was equipped with water deluge fire suppression system only. From approximately 2004 to 2008, the hangar was partially occupied by AKARNG.	No evidence of AFFF of other PFAS-containing materials used, stored, and/or disposed of at this location.
LAAF Hangar 4	Unknown to present	LAAF Hangar 4 is equipped with Jet-X high expansion foam (HEF); up to 1,200 gallons of HEF remains in the fire suppression system at this hangar (FTWW DPW 2020).	No evidence of AFFF or other PFAS-containing products used, stored, and/or disposed of at this location.
LAAF Hangar 5	Unknown to present	LAAF Hangar 5 is equipped with Jet-X HEF; a release of Jet-X HEF was reported in August 2018, when the suppression system discharged from LAAF Hangar 5, and Jet-X HEF was released out of the Bay 6 door and onto the tarmac.	No evidence of AFFF or other PFAS-containing materials used, stored, and/or disposed of at this location.
LAAF Hangar 7	Unknown to present	LAAF Hangar 7 is equipped with a water deluge fire suppression system only.	No evidence of AFFF or other PFAS-containing materials used, stored, and/or disposed of at this location.
LAAF Hangar 8	Unknown to present	LAAF Hangar 8 is equipped with a water deluge fire suppression system only. LAAF Hangar 8 is partially occupied by AKARNG and may house AFFF-containing Trimax systems; however, the systems have reportedly never been used and are not the property of FTWW. A separate evaluation was conducted by the AKARNG at FTWW for areas where the AKARNG may have	No evidence of AFFF or other PFAS-containing materials used, stored, and/or disposed of at this location.

Area Description	Dates of Operation	Relevant Site History	Rationale
		used, stored, or disposed PFAS-containing materials during their occupancy.	
Former WWTP Building 1058 and associated sludge beds	Unknown to late 1970s	The WWTP was formerly located on North Post next to the Chena River and was reportedly connected to LAAF Hangar 1 (which has been designated as an AOPI). The location of the former sludge drying beds associated with the historical WWTP is unknown. Details of the closing of the sludge bed sites (i.e., excavation, material disposal, and backfilling) are unknown. Historical documents and FTWW personnel could not verify if this WWTP received AFFF-containing wastewater from hangars with AFFF fire suppression systems.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
Former WWTP Building 4072 and associated sludge beds	Unknown to 1977	The WWTP was formerly located near the main gate for the installation and was connected to several hangars at LAAF; none of the hangars the WWTP were connected to reportedly stored AFFF in their fire suppression systems. The WWTP was also reportedly connected to several fire stations. The location of the former sludge drying beds associated with the historical WWTP is unknown. Details of the closing of the sludge bed sites (i.e., excavation, material disposal, and backfilling) are unknown. Historical documents and FTWW personnel could not verify if this WWTP received AFFF-containing wastewater from hangars with AFFF fire suppression systems.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
Grizzly Fire Area	26 February 2006	A fire occurred at the coal-fired power plant, to which all fire departments in the Fairbanks North Star Borough responded. During a follow-up telephone interview, FTWW fire department personnel indicated that only water was used during the response and not AFFF as the AFFF would have ruined the coal stocked in the area. Additionally, the fire was inside the building and was not accessible with AFFF pumper equipment.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
Power Plant Coal Storage Yard -	Prior to 1940s	Coal is not a source of PFAS. The area was backfilled in the 1940s and debris found in	No evidence of PFAS-containing materials used,

Area Description	Dates of Operation	Relevant Site History	Rationale
108.38.070.01 (notation for Headquarters Army Environmental System [HQAES] site identifier)		the area is from that era, which pre-dates AFFF use.	stored, and/or disposed of at this location.
Former Communications Site (Taku Gardens) - 108.38.085	Unknown	The site was discovered during a housing construction project in 2005; photo research indicated the site formerly comprised communication equipment such as antenna arrays, barracks, and administration buildings. Thousands of cubic yards of debris and soil have been removed and taken to disposal locations as detailed in the 2016 Installation Action Plan (FTWW 2017). The site has been ruled out as a potential fire training area as documented in the Record of Decision for Operable Unit 6.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
North Town Sink Hole - 108.38.135	1930s to 1940s	An FTWW news release indicates the sink hole appears to be from permafrost subsidence and not a result of illegal disposal actions. There is no apparent odor, staining, or other indication of contamination in the hole. The debris found in the sink hole was from the 1930s and 1940s which is prior to the use of AFFF by the DoD.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
North Post Sites - 108.38.069.04	Unknown	Contamination was identified at the site from underground storage tanks that supported a medical research center. The remedial investigation for the site determined the only chemicals of concern present were petroleum, oil, and lubricants constituents; however, it was later determined that polychorinated biphenyls (from transformers located at the facilities) and metals were also of concern.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
Drum Site South of Landfill - 108.38.068.14	Prior to 1950s	This site has not been located, and it is suspected that the drums have been removed. The photo evidence of drum storage is from the 1940s and 1950s. Drum storage is suspected to be for petroleum, oil, and lubricant products.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.

Area Description	Dates of Operation	Relevant Site History	Rationale
Building 1599 Pesticide Storage - 108.38.065	Prior to 1986	Building 1599 was used for motor vehicle repair, hazardous waste storage, and other industrial operations including pesticide storage. The building was demolished in 1986. The IMCOM pesticide records do not indicate use, storage, or disposal of PFAS-containing pesticides at FTWW.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
Hangar Burn Pit FTW357 - 108.38.130	Prior to 1944	The referenced burn pit was in use during hangar construction, which was completed in 1944, pre-dating AFFF use.	No evidence of PFAS-containing materials used, stored, and/or disposed of at this location.
Various crash sites	Various	Several vehicle and aircraft fires have been reported across FTWW. The details regarding timeline and exact locations of each crash are unknown, and there was no evidence of use of AFFF.	Exact locations of crashes unknown; no evidence of use of AFFF.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Eight of the AOPIs partially overlap with FTWW 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, only one of the overlapping AOPI/IRP sites had historically been investigated for the possible presence of PFOS, PFOA, and PFBS (FTWW-037, the FTP-3A and -3B).

The AOPI locations are shown on **Figure 5-2**. Aerial photographs of each AOPI that also show the approximate extent of AFFF use (if applicable) are presented on **Figures 5-3** through **5-11** and include active monitoring wells in the vicinity of each AOPI. All AOPIs are located in areas that are currently designated for industrial/commercial use and are expected to remain so for the foreseeable future according to the installation's Master Plan; however, some AOPIs are adjacent to residential use areas. The AOPIs are located on relatively flat ground (except the Landfill [FTWW-038]); surface water drainage from the AOPIs ultimately flows to the Chena River.

5.2.1 Fire Training Pits (FTP-3A and -3B [Operable Unit 4]; FTWW-037; 02871.1022)

FTPs-3A and -3B (**Figure 5-3**) were collectively identified as an AOPI following document research, personnel interviews, and site reconnaissance due to review of historical data and the likely use of AFFF during firefighter training given its period of operation. The FTPs are located south of LAAF, approximately 1 mile from the Chena River.

FTP-3A is the more recently used fire training area, operating from approximately 1978 to 1988. It was historically described as a large, cleared grassy area surrounded by trees and is bounded on its northeast

corner by a gate restricting vehicular traffic. During the PA site visit, FTP-3A was observed to be a fenced gravel pad area with several Conex containers and vehicle props remaining onsite. A row of charred cars and trucks lines the west edge and a portion of the north edge of the cleared area. Within the FTP-3A area was an approximately 50-foot diameter area of black stained soil which was presumed to be the FTP; however, additional smaller areas of stained soil were identified in other areas of the FTP-3A site (FES 2014).

FTP-3B is the older and larger of the two FTP areas, operating from sometime after 1967 up until approximately 1978. This area was historically described as a cleared area, approximately 7.5 acres, in a depression approximately 1 to 3 feet lower than the surrounding forest. The northern two-thirds of the cleared area was covered with gravel and grass and the southern third was vegetated with saplings and grass. FTP-3B is currently largely vegetated with some gravel roads and lot areas. A 5- to 10-foot diameter area filled with gravel and small pieces of concrete was also identified as a possible FTP in this area (FES 2014). It is suspected that this area may have been the area referenced as FTP-3C.

FTP-3C was identified as a possible third FTP based on vegetation and terrain characteristics observed in historical aerial imagery (Ecology and Environment, Inc. 1992). The site was not located nor sampled during a 1991 investigation, and therefore was not included on figures in this report due to the uncertainty of the location and historical use of the pit (FES 2014). For the purposes of this PA, FTP-3C is mentioned herein only to ensure a complete and accurate assessment is completed of the FTP area.

The FTPs are also referred to as IRP site identifier FTWW-037 and are included in Operable Unit 4 (site identifiers under which they were investigated). The bottoms of the FTPs were not lined with impervious materials. The area has been remediated for petroleum, oil and lubricants. During the summer of 1996, a total of 1,885 cubic yards of petroleum-impacted soil was excavated from five sites within the FTPs and thermally treated (FES 2014). Soil was reportedly treated at the Organic Incineration Technology facility in North Pole, Alaska using thermal desorption; then the treated soil was transported back on-post and used as base cover of the Landfill (FTWW-038, which is also identified as an AOPI below in **Section 5.2.10**).

In 2012 the FTP areas were proposed as a potential location to construct mission critical facilities. However, after detections above human health screening levels for chlorinated compounds and their degradation products, it was determined this area would instead be paved over and used as a parking lot for the mission critical buildings. PFAS analytical data from groundwater and soil sampled in 2013 indicate the presence of PFOS, PFOA, and PFBS at this AOPI (FTP-3A and -3B; **Tables 2-1** and **2-2**).

5.2.2 Ladd Army Airfield Hangar 6 (CC-FTWW-103; 02871.1100)

The LAAF Hangar 6 (**Figure 5-3**) was identified as an AOPI following document research, personnel interviews, and site reconnaissance due to AFFF storage in and discharge from the fire suppression system during accidental releases and fire responses. In the early 2000s, a helicopter fire on the north side of LAAF Hangar 6 was suspected to have been responded to with AFFF as the aircraft was reportedly destroyed. AKARNG temporarily leased a portion (25%) of the hangar from approximately 1997 to 2004; however, AKARNG personnel were deployed at the time of the helicopter fire. LAAF Hangar 6 is located to the south of the LAAF runways, approximately 1 mile from the Chena River, and the AOPI boundary partially overlaps with the CC-FTWW-103 Aviation Task Force IRP site (02871.1100). It is also within the boundaries of closed IRP site CC-FTWW-06 (02871.1115), the LAAF Hangar 6 Soil

Disposal area. It is surrounded by pavement, grass cover, and other buildings. Up to 800 gallons of AFFF may remain in the fire suppression system in this hangar (FTWW DPW 2020).

5.2.3 Fire Station #1 (CC-FTWW-103; 02871.1100)

Fire Station #1 (**Figure 5-4**) was identified as an AOPI following personnel interviews and site reconnaissance due to reported AFFF use during crash truck nozzle testing activities. During the 1990s to 2000s, crash truck nozzles were tested and AFFF discharge was directed into a ditch near the station on the south side of LAAF. The ditch has since been excavated and paved over, though some trucks at the station still have older foam in their tanks. It is not known from personnel interviews or historical documents where the soil excavated from the ditch at Fire Station #1 was disposed or spread. Additionally, a container of AFFF was observed outside of a shed east of the building during the PA site visit; access to the shed was restricted and it is unknown whether the container was full. The Fire Station #1 AOPI boundary partially overlaps with the CC-FTWW-103 Aviation Task Force IRP site (02871.1100). The fire station is surrounded by other buildings, grass cover, and pavement. Fire Station #1 is approximately 1 mile from the Chena River.

5.2.4 Taxiway D

Taxiway D (**Figure 5-4**) was identified as an AOPI following personnel interviews due to reported AFFF use during firefighter training activities. Taxiway D was used for firefighter training activities in 2013 and 2014 while the new LAAF Hangar 4 was being constructed. During this time, AFFF was sprayed from fire trucks and allowed to dissipate and dry on the tarmac. Former FTWW personnel indicated that cumulative use of AFFF concentrate during the time the area was used as a fire training area was approximately 200 gallons between Taxiways D and E. The Taxiway D AOPI boundary does not overlap with any IRP sites. Taxiway D is located near the center of LAAF between Fire Station #1 and the runway. It is surrounded by paved runways and grass cover. The Chena River is approximately 0.5 mile downgradient of this taxiway.

5.2.5 Taxiway E

Taxiway E (**Figure 5-4**) was identified as an AOPI following personnel interviews due to reported AFFF use during firefighter training activities. Taxiway E was used for firefighter training activities in 2013 and 2014 while the new LAAF Hangar 4 was being constructed. During this time, AFFF was sprayed from fire trucks and allowed to dissipate and dry on the tarmac. Former FTWW personnel indicated that cumulative use of AFFF concentrate during this time the area was used as a fire training area was approximately 200 gallons between Taxiways E and D. The Taxiway E AOPI boundary does not overlap with any IRP sites. Taxiway E is located on the west end of LAAF runways. It is surrounded by paved runways and grass cover. The Chena River is approximately 0.25 mile downgradient of this taxiway.

5.2.6 B2118 Flight Line Refill Point (CC-FTWW-103; 02871.1100)

The B2118 Flight Line Refill Point (**Figure 5-4**) was identified as an AOPI following document research. The AOPI has been noted as a historical storage location of approximately 1,255 gallons of AFFF according to a 2016 inventory of AFFF provided by IMCOM (however, most of the AFFF at FTWW has

since been disposed [see **Section 4.1**]). It is unknown if any historical spills have occurred. The B2118 Flight Line Refill Point is located within the Alert Holding and Pallet Processing facility, south-central to the LAAF and approximately 0.8 mile from the Chena River. The AOPI boundary partially overlaps with the CC-FTWW-103 Aviation Task Force IRP site (02871.1100). The area surrounding the refill point building is asphalt-covered with grassy areas between the building and the LAAF taxiway.

5.2.7 Ladd Army Airfield Hangar 1 (FTWW-094; 02871.1071)

LAAF Hangar 1 (**Figure 5-5**) was identified as an AOPI following personnel interviews and site reconnaissance due to AFFF storage in, and discharge from, the fire suppression system from approximately 2010 to the time of the PA/SI for FTWW. During these releases, AFFF has been observed by installation personnel to flow outside of the hangar and onto the ramp. LAAF Hangar 1 is located to the north of the LAAF runways, approximately 0.3 mile from the Chena River. The western edge of this hangar and AOPI boundary abuts IRP site FTWW-094 (02871.1071), the Former Quartermaster's Fueling System (East and West). It is surrounded by pavement, grass cover, and other buildings. Up to 4,800 gallons of AFFF may remain in the fire suppression system in this hangar (FTWW DPW 2020). From approximately 1992 or 1993 to 1994, the hangar was partially occupied by AKARNG.

5.2.8 Fire Station #2 (Building 4390) and Training Area

The Fire Station #2 (Building 4390) and Training Area (**Figure 5-6**) was identified as an AOPI following personnel interviews and site reconnaissance due to reported and photographic evidence of foam expelled on the gravel ground surface during firefighter training activities in 2011. The gravel lot between the hospital and the education center building (Building 4391) to the east of the Fire Station #2 (Building 4390) was used to stage a helicopter fuselage fire simulator for the training activities. The frequency of firefighting training activities performed here is unknown. The Fire Station #2 (Building 4390) and Training Area AOPI boundary does not overlap with an IRP site at FTWW. Following the PA and SI field work, FTWW provided an inventory from fiscal year 2020 which indicated that AFFF was being stored at the Fire Station #2 (Building 4390) in mobile equipment (**Appendix G**); storage of this mobile equipment at Fire Station #2 (Building 4390) was not indicated during the PA site visit. The dates of storage at this location are not known. The Fire Station #2 (Building 4390) and Training Area (the most westerly AOPI) is located in an industrial/commercial use area; however, several residential use areas surround the AOPI (i.e., Tanana Trails housing to the south, former Taku housing to the west, and Bear Paw housing to the northwest). Ground cover at the AOPI includes gravel, grass, and pavement. Fire Station #2 (Building 4390) and Training Area is approximately 0.3 mile from the Chena River.

5.2.9 Fire Training Area

The Fire Training Area (**Figure 5-7**) near Building 2420 in the southeast portion of the installation was identified as an AOPI following document research, personnel interviews, and site reconnaissance due to the reported historical use of AFFF during firefighting training activities. There is a known use of approximately 20 gallons of AFFF concentrate in the southeastern portion of this lot (i.e., the training area) during 2013 or 2014. The Fire Training Area AOPI boundary does not overlap with any IRP sites. The Fire Training Area is a fenced lot which slopes slightly to the east. The ground cover in the lot is

mostly gravel with grass surrounding the area outside of the fence. Stacks of Conex containers and a concrete pile remain within the fence. The site is approximately 2 miles from the Chena River.

5.2.10 Landfill (FTWW-038, 02871.1023)

This sanitary landfill (**Figure 5-8**) was identified as an AOPI following document research and installation personnel interviews due to documents indicating that excavated soil from the FTP-3A and -3B fire training area was emplaced here. This 14-acre landfill is located near Building 1190, and soil removed from the FTPs was used as a cap to cover the inactive portion of this landfill in 1996 (exact location is unknown). Prior to the soil being placed as a cap, it was treated for petroleum, oil, and lubricants constituents using low temperature thermal desorption. The active portion of the Landfill is located adjacent to the closed and capped portion north of River Road. Analytical samples for analysis of PFAS constituents were not collected at the Landfill as part of (or as a follow up to) the historical PFAS investigation at the FTPs.

The Landfill is included in the IRP site identified as FTWW-038 (and Operable Unit 4), investigated for the landfill plume. Landfills in this area were filled with unsegregated waste, burned and covered. Historical documents indicate that the landfill has operated since the mid-1950s, is unlined and unbermed, and does not have a leachate collection system. The Landfill is built up topographically higher than the surrounding terrain and is partially constructed within a wetland and on top of discontinuous permafrost. Sampling results from this area in 1994 indicated elevated levels of volatile organic compounds, semi-volatile organic compounds, and metals in groundwater. Discharge to the Chena River and transport to downgradient wells from this AOPI are of concern. The Landfill is approximately 0.6 mile from the Chena River. Monitored natural attenuation and cap inspections will continue for the foreseeable future (FTWW 2017).

The Landfill is located in an industrial/commercial use area; however, several housing units (i.e., residential use areas) exist west of the AOPI (i.e., Siku Basin housing [on-post] and the 801, Shannon Park, Hamilton Acres, and Island Homes housing [off-post]). These on- and off-post housing units west of the landfill are supplied water through the City of Fairbanks Municipal Utility System.

5.2.11 Defense Reutilization and Marketing Office Yard and Drum Site (CC-FTWW-114, FTWW-047, and FTWW-091)

The DRMO Yard and Drum Site (**Figure 5-9**) was included as an AOPI at the request of ADEC due to the potential use, storage, and/or disposal of PFAS-containing materials during site operations. One portion of the DRMO site, a 75-acre site, was used as a motor pool and for storing waste products such as used solvents, oils, and fuels in the 1950s (i.e., what is referred to in this report as the Drum Site); the site was then used as a landfill (e.g., for porcelain products, refrigerators, signposts) until the early 1970s. It is unknown what was stored in the motor pool or disposed in the landfill; therefore the area was sampled to evaluate presence or absence of PFOS, PFOA, and PFBS. Another portion of the DRMO site, a 25-acre military surplus salvage yard (i.e., what is referred to in this report as the Yard), was historically identified as a site impacted with petroleum products and solvents in soil and groundwater due to routine spills. The yards were used from the 1950s to approximately 2015. No historical storage of AFFF was noted at either DRMO area (i.e., the Yard or the Drum Site portions) during the PA site visit. However, during follow-up discussions with FTWW personnel, additional information was provided about the historical operations at

the DRMO Yard. Debris was reportedly burned in the yard area (sub-area 3) once per year until the mid-1990s. This area has had known dioxin contamination. Therefore, the originally proposed AOPI boundary, which included only the Drum Site portion, was extended eastward to include the salvage yard.

The AOPI is located in the southeast portion of the installation, approximately 2 miles from the Chena River. The western portion of the area is now largely forested with some access roads cutting through the area, and the eastern portion of the area contains administrative buildings, weigh stations, and salvage yards. The AOPI boundary overlaps with three IRP sites: CC-FTWW-114 (02871.1111) Drum Site West of DRMO, FTWW-047 (02871.1024) DRMO Salvage Yard, and FTWW-091 (02871.1068) DRMO POL Sites.

5.2.12 North Refueling (FTWW-063; 02871.1040)

The North Refueling area (**Figure 5-10**) was identified as an AOPI after PFOS, PFOA, and PFBS were detected in a sample collected in April 2019 at an unnamed well in the area (**Table 2-1**). The well is reportedly a supply well for the Alaska Fire Service Mix Plant and is used by the BLM for fire retardant. It is suspected the detected results may be impacts from down-hole equipment; however, the dedicated pump is not removable. The area has previously been referred to as the BLM Hot Point Refueling Station. While ADEC has reported that fire training activities have been historically conducted at this site, the installation did not have additional details to provide regarding the site's history to confirm these reported activities. Buildings associated with the fueling facility were demolished in the 1990s, but other office, barracks, and housing structures exist in the adjacent area. The area of suspected AFFF use is a grassy area located to the northeast of the LAAF runways, approximately 0.5 mile from the Chena River. This AOPI boundary partially overlaps with IRP site FTWW-063 (02871.1040) North Refueling. This area (along with adjacent office and barracks structures) is considered light industrial/commercial use; however, the housing units adjacent to the area are considered residential use.

5.2.13 Biosolids Application Site

The Biosolids Application Site (**Figure 5-11**) was identified as an AOPI based on the information provided by the installation that biosolids (which may potentially contain PFAS constituents) generated from the Golden Heart Utilities' wastewater treatment facility were spread at a location southeast of LAAF. The volume of biosolids and the exact dates of application are unknown. The AOPI is sparsely vegetated by grass and is located to the southeast of LAAF, approximately 0.3 mile from the Chena River.

5.2.14 Fire Station #3 Building 1054 (CC-FTWW-109)

Fire Station #3 Building 1054 (CC-FTWW-109, **Figure 5-5**) was identified as an AOPI based on the information provided by the installation that AFFF has been and is currently stored at the station (**Appendix G**). Building 1054 was historically used as a motor vehicle and equipment repair shop until 1986, when it was converted into Fire Station #3 (north of LAAF Hangar 1; FTWW 2017). The south end of Building 1054 was demolished in 2008; soil from the northwest corner of Building 1054 was excavated for petroleum and lead-impacted soils, and the soil was disposed of off-post.

As described in **Section 4.1**, according to inventories provided by the installation in December 2020 (**Appendix G**), AFFF has historically been stored in fire truck apparatuses and on fire trucks in storage

containers, as well as in the storage containers in the station. AFFF storage at the fire station likely began since AFFF use at the installation. C8 AFFF in storage in equipment and containers at FTWW was reportedly disposed off-post in 2019 (**Section 4.1**). During the June 2021 follow-on field event, four 55-gallon drums of C6 Phos-Chek 3% AFFF was observed being stored at the building. No additional information was provided regarding potential historical use of AFFF at Fire Station #3 Building 1054 (CC-FTWW-109). The station is surrounded by an asphalt lot and some grassy areas. This area is considered light industrial/commercial use. Building 1054 overlaps with IRP site CC-FTWW-109 and is located approximately 200 feet from the Chena River.

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at FTWW, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at FTWW 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/or sediment pathways as potentially complete which guided the SI sampling. The QAPP Addendum details the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed in August 2020 and during a follow-on event in June 2021 through the collection of field data and analytical samples.

The SI field work was completed in accordance with the 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 FTWW. Field changes to the prescribed procedures in the PQAPP and QAPP Addendum are described in **Section 6.3.4**. Analytical results obtained through SI field activities are summarized in **Section 7**.

6.1 Data Quality Objectives

As identified during the DQO process and outlined in the site-specific QAPP Addendum (Arcadis 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, or PFBS presence or absence at each of the sampled AOPIs.

6.2 Sampling Design and Rationale

The rationale used to determine whether sampling should be conducted at each AOPI during the SI is illustrated on **Figure 6-1** below.

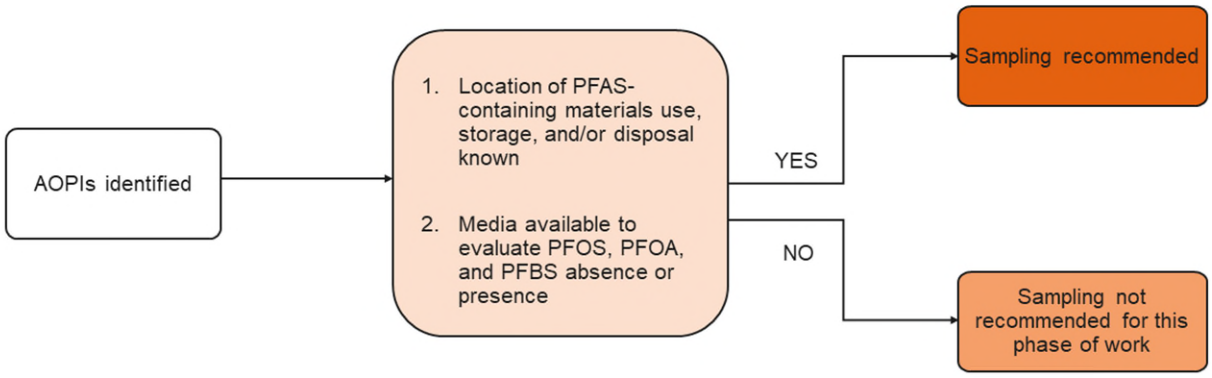

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at FTWW is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). If a medium was available to sample and was considered a valid medium to help answer the presence/absence question at each individual AOPI, the medium was proposed to be sampled at an AOPI. At many AOPIs, surface water and sediment were not sampled since there were no pertinent surface water bodies at or near the AOPI. At some AOPIs, soil may not have been sampled because the location of potential PFAS release was uncertain (e.g., Landfill, FTPs), the ground has been significantly reworked (e.g., FTPs), or dig restrictions are in place (e.g., Landfill).

Groundwater, soil, surface water, and sediment were sampled to identify presence or absence of PFOS, PFOA, and PFBS; field parameters (temperature, pH, dissolved oxygen, oxidation-reduction potential, and specific conductivity) were also measured for water samples.

Generally, if available, one to three monitoring or supply wells were sampled in association with the AOPIs. The wells were generally located downgradient of the AOPIs and suspected area of use, storage, or disposal of PFAS-containing materials. In some cases, the supply wells sampled during the SI may have been located cross-gradient of the AOPIs; however, the capture zones of these wells are not well characterized, and it is possible that the wells may draw down groundwater from adjacent AOPIs (e.g., at Well 3003 next to the Fire Station #1 AOPI and the unnamed well (i.e., the BLM retardant well) near the North Refueling AOPI). Additionally, Well 1032 (north of LAAF Hangar 1) and the unnamed well were sampled during this SI due to historical detections of PFAS constituents in the well (**Table 2-1**).

Additionally, 10 boreholes were advanced via direct-push technology (DPT) drilling methods for grab groundwater sample collection via installation of temporary well casing. The temporary boreholes included two locations at the upgradient and three locations at the downgradient installation boundaries. Data collected from DPT sampling locations is considered definitive for the purpose of the SI. The three DPT sampling points at the downgradient boundary of the installation were located across the Chena River from the AOPIs, to assess groundwater quality flowing off-post. The two DPT sampling points at the upgradient boundary were located near the Chena River, upgradient of the AOPIs, to assess groundwater quality before it flows on-post. At FTP-3A and -3B, PFAS presence had already been identified in groundwater and soil (FES 2014); however, groundwater samples were collected from one monitoring well per FTP to confirm current PFOS, PFOA, and PFBS concentrations. The two wells proposed at this AOPI represent the highest detected PFOS, PFOA, and PFBS concentrations in groundwater at each

FTP. Monitoring wells AP-6006 (downgradient of Taxiway D area) and AP-6386 (downgradient of LAAF Hangar 1) are located near the Chena River and were also sampled to evaluate PFOS, PFOA, and PFBS presence or absence in groundwater before the water flows to the Chena River.

Shallow soil samples were collected from the upper 2 feet of the ground surface to evaluate PFOS, PFOA, and PFBS presence or absence, type, and concentrations at potential use, storage, and/or disposal. Additionally, soil samples were analyzed for total organic carbon (TOC), pH, and grain size at one soil sampling location per AOPI sampled for soil. TOC, pH, and grain size data were collected as they may be useful in future fate and transport studies.

Co-located grab surface water and sediment samples were collected along Clear Creek (near the Chena River, to the west of LAAF) to inform the presence or absence of PFOS, PFOA, and PFBS in runoff from Taxiways E and D.

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 in the SI were consistent with conventional sampling techniques used in the environmental industry and in accordance with State of Alaska guidance (ADEC 2013, 2019b), 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., soil boring logs, groundwater purging logs, equipment calibration forms, tailgate health and safety forms, and sample collection logs) documenting the SI sampling activities are included in **Appendices I** and **J**, respectively.

6.3.1 Field Methods

At most existing monitoring wells and all of the temporary wells, groundwater samples were collected using low-flow purging methods via peristaltic or decontaminated portable bladder pump and high-density polyethylene (HDPE) tubing from approximately the center of the saturated screened interval (**Table 6-1**) in accordance with the TGI for PFAS Sampling Procedures and Low-Flow Groundwater Purging for Monitoring Wells (P-11 in Appendix A to the PQAPP; Arcadis 2019). At three existing wells, samples were collected via the existing pump infrastructure. The construction details for the monitoring wells sampled during the SI are included in **Table 6-1**. The samples collected via DPT were collected at first encountered groundwater (depths noted in **Table 6-1**) through a pre-packed screen.

Soil samples were collected using a decontaminated stainless-steel hand auger, and the sediment sample was collected using a decontaminated stainless-steel trowel from the upper 10 centimeters of

sediment (decanted before bottling for laboratory analysis). The surface water sample was collected via direct-fill methods just below the water surface.

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 (EBs), source blanks for water used in the initial decontamination step for drill tooling, and field blanks for laboratory-supplied water used in the final decontamination step.

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020). Field duplicates and matrix spike/matrix spike duplicate samples were collected for media sampled for PFOS, PFOA, and PFBS only (not for TOC, pH, or grain size for soil samples). Field duplicates were collected at a rate of one per 10 parent samples as required by the State of Alaska. Matrix spike/matrix spike duplicate samples were collected at a rate of 1 per 20 parent samples. EBs were collected for media sampled for PFAS, including PFOS, PFOA, and PFBS, at a frequency of one per piece of relevant equipment applicable to the sampled media for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which EBs were collected include tubing, screen-point samplers, drill casing and cutting shoe, hand augers, water-level meters, and bailers, as applicable to the sampled media. An additional QC sample was collected at well AP-6006 (FTWW-DEB-2-08112020) by pouring laboratory-supplied PFAS-free water over the tubing after the normal (parent) groundwater sample was collected through a new length of HDPE tubing placed downhole. While the sample identification indicated dedicated equipment background (DEB) notation (see **Section 6.3.3**), the collection method was that typical of EB collection. However, this tubing on which the sample was collected was not used for purging the well or collecting the parent sample at the well.

Similar tubing was also encountered at the following wells:

- AP-7559 (a well near the upgradient boundary of the installation)
- B2077-MW01 (downgradient of the Biosolids Application Site AOPI)
- MW-77, MW-38, and MW-82 (Fire Station #2 [Building 4390] and Training Area AOPI)
- AP-10257 (which also contained a transducer down-hole) and AP-6574A (Landfill FTWW-038 AOPI)

Since the tubing encountered in the wells listed above was similar to that observed at AP-6006 at which the EB sample was collected, additional QC samples were not collected at the other seven wells listed above. Furthermore, as described above, the down-hole tubing was left in the well while a new length of HDPE tubing was placed downhole to collect samples at these wells (i.e., the old tubing was not used for purging and sample collection); therefore, the analytical results for this EB were not used as an EB or as a DEB sample to qualify data from the parent sample during data validation.

One source blank was collected from the water obtained at FTWW to fill the drillers' water tote for use in pressure-washing drill tooling; this water was obtained through a potable water spigot attached to the main post water treatment plant at Building 3565. However, this spigot is not directly attached to the

drinking water distribution system. Field blanks were collected using laboratory-supplied PFAS-free deionized water.

Analytical results for blank samples are discussed in **Section 7.18**.

6.3.3 Dedicated Equipment Background

DEB samples were collected at a frequency of one DEB per AOPI at AOPIs where groundwater sampling was conducted at existing monitoring wells that contained dedicated, down-hole equipment. One DEB sample was collected during the SI field event at the unnamed well (i.e., the BLM retardant well at the North Refueling AOPI) where a dedicated pump could not be removed (FTWW-REFUEL-DEB-1-08102020). When collecting the samples from this well, two water samples were taken. The DEB sample was collected from the first water produced through the existing pump and tubing and was used to evaluate whether the dedicated equipment may be impacting the PFOS, PFOA, and/or PFBS results, as it is unknown if the dedicated equipment was comprised of PFAS-containing components; PFOS, PFOA, and/or PFBS concentrations in the DEBs reflect concentrations of stagnant groundwater, and they may be biased high by contributions from equipment that contains PFOS, PFOA, and/or PFBS components. The parent sample was collected after the well was purged until the field parameters stabilized. Further discussion of the DEB analytical results is included in **Section 7.18**.

Additionally, as discussed in **Section 6.3.2**, one additional QC sample was collected at well AP-6006 (downgradient of the Taxiway D AOPI, where large diameter tubing of unknown length was encountered down-hole). This sample was identified as a DEB sample, but the collection method did not follow the process outlined above and was more typical of the process for EB collection.

6.3.4 Field Change Reports

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

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

- Moved locations: The FTWW-DPT-4-GW location was moved approximately 475 feet east-northeast due to thick vegetation prohibiting access; the FTWW-DPT-5-GW location was sequentially moved approximately 320 feet east-northeast. The FTWW-DPT-8-GW location was moved approximately 200 feet to the northeast, from the west side of the building to the north side. FTWW-DPT-10-GW was shifted south approximately 20 feet due to a fence line with Conex boxes along the fence prohibiting access.
- Sample identifications: Identifications for all samples collected included the full year (2020) in the date suffix instead of just the last two digits of the year (20).
- Both surface water and sediment samples were collected at the FTWW-TAXIE-4-SW location.

- After the initial SI sampling event, a new AOPI was added for sampling (i.e., the Fire Station #3 Building 1054 AOPI). Two groundwater samples and three soil samples were collected at the AOPI in June 2021 to evaluate PFAS presence or absence in the media.

6.3.5 Decontamination

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

6.3.6 Investigation-Derived Waste

IDW generated during purging of existing groundwater monitoring wells, water supply wells, and temporary boreholes advanced via DPT was temporarily containerized during sampling. IDW generated from decontamination of sampling equipment was also temporarily containerized and combined with purge water. A total of approximately 40 gallons of liquid IDW was stored in a labeled drum at Building 3476 at the direction of the installation, pending analysis of the composite IDW characterization sample collected. Results of the IDW characterization sample are discussed in **Section 7.16**.

Soil cuttings from shallow hand-augered boreholes were used to backfill their respective holes. Soil cuttings from temporary boreholes advanced via DPT were spread to the ground at the point of collection, and the boreholes were backfilled with bentonite grout in accordance with the ADEC Field Sampling Guidance (ADEC 2019). Other wastes generated during sampling (i.e., personal protective equipment, tubing, plastic sheeting) that may have contacted sampling media was bagged and disposed of in waste receptacles at FTWW.

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 LC/MS/MS. Laboratory analyses associated with the SI were completed in accordance with Worksheets #12.1 through #12.5 in the PQAPP (Arcadis 2019). Eighteen PFAS-related compounds, including PFOS, PFOA, and PFBS, were analyzed for in groundwater, 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). Copies of laboratory analytical reports generated during the SI are included as attachments to the Data Usability Summary Report (DUSR) in **Appendix L**.

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.

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 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 L**).

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 L**.

6.4.3 Data Usability Assessment and Summary

A data usability assessment was completed for all analytical data associated with SI sampling at FTWW. Documentation generated during the data usability assessments, which were compiled into a DUSR (**Appendix L**), 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.

Based on the final data usability assessment, the environmental data collected at FTWW 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 L**), and as indicated in the full analytical tables (**Appendix M**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and FTWW QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at FTWW 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:

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, and 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. 2019. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. October 15 (**Appendix A**). The risk screening levels for PFBS in tap water and soil were updated in April 2021 based on the updated toxicity values published by the USEPA (USEPA 2021).
2. All soil data will be screened against both the Residential Scenario and Industrial/Commercial risk screening levels (if collected from less than 2 feet bgs), regardless of the current and projected land use of the AOPI.

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 and surface water data for this Army PFAS PA/SI. While the OSD risk screening levels are for tap water, the surface water sampled at FTWW during the SI is representative of groundwater from beneath multiple AOPIs (i.e., the surface water in Clear Creek included groundwater that is pumped out of utility corridors; water was observed flowing out of a pipe [i.e., from the pump] and into the creek) and groundwater is used as a drinking water source at FTWW. The surface water PFOS, PFOA, and PFBS analytical results were therefore compared to the tap water OSD risk screening levels. While the current and most likely future land uses of the AOPIs at FTWW are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil concentrations. Sediment data were not compared to the soil OSD risk screening levels as the exposure route is not the same; the sediment samples were collected only to re-evaluate 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 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 FTWW (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). 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 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** 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 FTWW 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 described in **Section 6.4.3**) are presented on the analytical tables. Groundwater and surface water data collected during the SI are reported in ng/L, or parts per trillion, and soil 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 J**. Soil and sediment descriptions are provided on the field forms in **Appendix J**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Groundwater was generally encountered between 5 and 12 feet bgs at the temporary well locations advanced via DPT.

The Chena River is gauged and discharge measurements are collected at a USGS monitoring station approximately 0.5 mile downstream of the installation boundary near where the river goes under Highway A2 (USGS Station 15514000 [CHAF2], located at latitude 64°50'45", longitude -147°42'04") (USGS 2020a). The gauge datum lies at approximately 428.02 feet amsl. During the field event completed from 04 to 12 August 2020, the gauge height of the stream at the USGS Station ranged from approximately 4 to 5.1 feet, and discharge was estimated to be 4,000 to 5,000 cubic feet per second (USGS 2020b); the peak gauge heights and discharge volumes observed during the time of the SI field event occurred on 06 August 2020 (USGS 2020b). The reported discharge of the river during the time of the field event is greater than average (approximately 2,000 cubic feet per second [**Section 2.7**]; USGS 2019b).

The calculated elevation of the Chena River ranged from approximately 432 to 433 feet amsl 0.5 mile downstream of the installation. Two wells near the Chena River which were sampled during the SI field event (AP-6006 and AP-6386, for which surveyed measuring points are provided in **Table 6-1**) had calculated groundwater elevations of approximately 431.3 feet amsl and 433.3 feet amsl, respectively. Since it can be assumed that the elevation of the Chena River is higher upstream of the USGS monitoring station, it is inferred that the Chena River was in a losing stage (i.e., the stream was recharging groundwater at the installation) during the timing of the SI field event.

Table 7-5 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Fire Training Area (southeast portion of site)	No
Taxiway D	Yes
Taxiway E	Yes
FTP-3A and -3B (FTWW-037, Operable Unit 4)	Yes
Fire Station #1 (CC-FTWW-103)	No
Fire Station #2 (Building 4390) and Training Area	Yes
LAAF Hangar 1 (FTWW-094)	Yes
LAAF Hangar 6 (CC-FTWW-06 and -103)	Yes
North Refueling (FTWW-063)	No
B2118 Flight Line Refill Point (CC-FTWW-103)	No
Landfill near Building 1190 (FTWW-038, Operable Unit 4)	No
DRMO Yard and Drum Site – (CC-FTWW-114, FTWW-047, and FTWW-091)	Yes
Biosolids Application Site	No
Fire Station #3 Building 1054 (CC-FTWW-109)	Yes

7.1 Boundary Monitoring Groundwater Samples

Two grab groundwater samples were collected south of the Chena River via DPT at the upgradient boundary of the installation to evaluate water quality before it flows on post. Three grab groundwater samples were collected north of the Chena River via DPT at the downgradient boundary of the installation, across the Chena River from the AOPIs to evaluate water quality flowing off post, and, potentially, across the river. The results of the upgradient and downgradient boundary monitoring groundwater samples are discussed in the subsections below.

7.1.1 Upgradient Boundary Sampling

Groundwater was encountered at approximately 12 feet bgs at the two upgradient boundary sampling points installed via DPT (FTWW-DPT-1 and FTWW-DPT-2); the boreholes were completed to a total depth of 15 feet bgs. PFOS and PFOA were detected at the upgradient boundary monitoring point adjacent to the Chena River (FTWW-DPT-1); concentrations were 4.2 ng/L PFOS (5.9 ng/L PFOS in the field duplicate) and 2.9 J ng/L PFOA (3.0 J ng/L in the field duplicate). The PFOS and PFOA concentrations observed in groundwater at FTWW-DPT-1 were less than the OSD risk screening levels. PFBS was not detected at FTWW-DPT-1. PFOS, PFOA, and PFBS were not detected in the groundwater sample collected at FTWW-DPT-2, approximately 330 feet south of the Chena River (**Figure 7-2**, **Table 7-1**).

7.1.2 Downgradient Boundary Sampling

Groundwater was encountered at approximately 5 feet bgs at FTWW-DPT-3, and the borehole was completed to total depth of 10 feet bgs. PFOS, PFOA, and PFBS were not detected in the groundwater sample collected at FTWW-DPT-3, the northern-most sampling point of the three downgradient boundary sampling locations (**Figure 7-2**, **Table 7-1**).

Groundwater was encountered at approximately 9 feet bgs at FTWW-DPT-4 and FTWW-DPT-5; the boreholes were completed to a total depth of 15 feet bgs. At FTWW-DPT-4, detected concentrations include 4.3 ng/L PFOS, 5.9 ng/L PFOA, and 6.2 ng/L PFBS. This sample was collected just north of a small inlet pond off the Chena River. At FTWW-DPT-5, only PFOS was detected (2.6 J ng/L); this sample was collected approximately parallel to FTWW-DPT-4 and the Chena River, west of the inlet pond (**Figure 7-2**, **Table 7-1**).

Detected concentrations of PFOS, PFOA, and/or PFBS in groundwater at FTWW-DPT-4 and FTWW-DPT-5 are less than the OSD risk screening levels.

The observed low concentrations of PFOS, PFOA, and PFBS at the downgradient boundary sampling locations may be in part due to the diluting influence that the Chena River's losing conditions may have on groundwater.

7.2 Fire Training Pits (FTP-3A and -3B; FTWW-037; 02871.1022)

Two groundwater samples were collected at the FTPs, one in each the FTP-3A and -3B pits. The monitoring wells selected for sampling during the SI previously exhibited the greatest concentrations of PFOS, PFOA, and PFBS observed in groundwater in each of the pits. When these wells were sampled in 2013, the PFOS, PFOA, and PFBS concentrations observed at AP-10266MW were 3,300 ng/L, 340 ng/L, and 270 ng/L, respectively. At AP-10278MW, the 2013 concentrations observed for PFOS, PFOA, and PFBS were 720 ng/L, 58 ng/L, and 12 ng/L, respectively (**Table 2-1**). It should be noted that the field sampling and laboratory procedures have changed notably since the 2013 sampling event and that these data are provided for historical context only.

During the SI conducted in August 2020, at FTWW-AP-10266MW (within the footprint of FTP-3A), detections were 370 ng/L PFOS, 1,200 ng/L PFOA, and 3,900 DJ ng/L PFBS (a D-flag indicates that the analyte was analyzed at dilution). These concentrations of PFOS, PFOA, and PFBS were all greater than the OSD risk screening levels. At FTWW-AP-10278MW (within the footprint of FTP-3B), detections were 2,300 DJ ng/L PFOS, 200 ng/L PFOA, and 6.4 ng/L PFBS. The PFOS and PFOA concentrations in groundwater at this well exceed the OSD risk screening levels (**Figure 7-3**, **Table 7-1**). These two wells are in upgradient areas in each of the pits; the August 2020 SI results indicate that a PFOS, PFOA, and/or PFBS source is likely still present after excavation activities (**Section 5.2.1**).

7.3 Ladd Army Airfield Hangar 6 (CC-FTWW-103; 02871.1100)

Three shallow soil samples were collected in association with the LAAF Hangar 6 AOPI. PFOS was detected in soil at FTWW-H6-1 (0.024 mg/kg), FTWW-H6-2 (0.005 mg/kg), and FTWW-H6-3 (0.00053 J mg/kg); however, PFOA and PFBS were not detected in these samples. All detected concentrations of

PFOS in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-3**, **Table 7-2**).

A groundwater sample (FTWW-DPT-9) was collected at soil sampling location FTWW-H6-1. Groundwater was encountered at approximately 8 feet bgs, and the borehole was completed to a total depth of 11 feet bgs. Detections at this sampling location included PFOS (3,300 DJ ng/L), PFOA (39 ng/L), and PFBS (25 ng/L). The PFOS concentration in groundwater at this sampling location exceeds the OSD risk screening level (**Figure 7-3**, **Table 7-1**).

7.4 Fire Station #1 (CC-FTWW-103; 02871.1100)

Two shallow soil samples were collected in association with the Fire Station #1 AOPI. In addition, groundwater was sampled from supply well 3003 near the AOPI. PFOS was detected at both FTWW-FS1-1 (0.014 mg/kg) and FTWW-FS1-2 (0.0011 mg/kg); however, PFOA and PFBS were not detected in either soil sample. The detected concentrations of PFOS in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-4**, **Table 7-2**).

Well 3003, a supply well located adjacent to this AOPI, may be located cross-gradient of the AOPI. However, the capture zones of this well are not well characterized, and it is possible that the well may draw down groundwater from beneath Fire Station #1. PFOS, PFOA, and PFBS were not detected in groundwater at Well 3003 (**Figure 7-4**, **Table 7-1**).

7.5 Taxiway D

Three shallow soil samples and two groundwater samples were collected in association with the Taxiway D AOPI. PFOS was detected in all three soil samples: 0.072 mg/kg at FTWW-TAXID-1, 0.0035 mg/kg at FTWW-TAXID-2, and 0.019 mg/kg at FTWW-TAXID-3. However, PFOA and PFBS were not detected in any of the three samples. All detected concentrations of PFOS in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-4**, **Table 7-2**).

A groundwater sample (FTWW-DPT-7) was collected at soil sampling location FTWW-TAXID-1. Groundwater was encountered at approximately 10 feet bgs, and the borehole was completed to a total depth of 15 feet bgs. Detections included PFOS (58 ng/L), PFOA (29 ng/L), and PFBS (29 ng/L). The PFOS concentration in groundwater at this sampling location exceeds the OSD risk screening level (**Figure 7-4**, **Table 7-1**).

Existing monitoring well AP-6006 was also sampled downgradient of the Taxiway AOPIs, near the Chena River. Detections at FTWW-AP-6006 included PFOS (17 ng/L), PFOA (7.3 ng/L), and PFBS (4.9 ng/L). Concentrations observed at well AP-6006 were less than the OSD risk screening levels. The observed low concentrations of PFOS, PFOA, and PFBS at the downgradient boundary sampling locations may be in part due to dilution that the Chena River's losing conditions may have on groundwater. Dedicated tubing was encountered at this well during the SI field sampling event as noted in **Section 6.3.3**.

7.6 Taxiway E

Three shallow soil samples, one groundwater sample, one surface water sample, and one sediment sample were collected in association with the Taxiway E AOPI.

PFOS was detected in soil at FTWW-TAXIE-1 (0.084 mg/kg) and FTWW-TAXIE-2 (0.0013 mg/kg) at concentrations less than the residential OSD risk screening level; however, PFOA and PFBS were not detected in these two samples. Detections at FTWW-TAXIE-3 included PFOS (2.0 mg/kg), PFOA (0.0040 mg/kg), and PFBS (0.0019 mg/kg). The detected concentration of PFOS in the FTWW-TAXIE-3 sample exceeded both the residential and the industrial/commercial OSD risk screening levels (**Figure 7-4**, **Table 7-2**). The PFOA and PFBS concentrations detected at FTWW-TAXIE-3 were less than the OSD risk screening levels.

A groundwater sample (FTWW-DPT-6) was collected at soil sampling location FTWW-TAXIE-1. Groundwater was encountered at approximately 10 feet bgs, and the borehole was completed to a total depth of 15 feet bgs. Detections at this sampling location included PFOS (340 ng/L), PFOA (77 ng/L), and PFBS (55 ng/L). PFOS and PFOA concentrations in groundwater at this sampling location exceed the OSD risk screening levels (**Figure 7-4**, **Table 7-1**).

One surface water sample was collected along Clear Creek downgradient of the AOPI at location FTWW-TAXIE-4-SW. The field team indicated that flow observed in this creek during the time of the field event was partially attributed to outflow from a pipe on the west bank of Clear Creek. The installation later indicated that the outfall pipe is groundwater and stormwater infiltrating into utilidors in the LAAF area; this water gets pumped out to Clear Creek which serves as an ephemeral stream to the Chena River (**Appendix G**). The results from this sample are therefore compared to the tap water OSD risk screening levels as the sample represents groundwater. Detections in this surface water sample included PFOS (880 DJ ng/L), PFOA (69 ng/L), and PFBS (70 ng/L); the PFOS and PFOA concentrations exceed the OSD risk screening levels. A co-located sediment sample was also collected at this FTWW-TAXIE-4 location. PFOS was detected in the sediment sample at a concentration of 0.010 mg/kg; PFOA and PFBS were not detected in the sample. The sediment sample results are not compared to the OSD risk screening levels for soil as the exposure route is not the same as for soil.

7.7 B2118 Flight Line Refill Point (CC-FTWW-103; 02871.1100)

Two shallow soil samples and one groundwater sample were collected in association with the B2118 Flight Line Refill Point AOPI. PFOS, PFOA, and PFBS were not detected in soil at FTWW-FLRP-1 or FTWW-FLRP-2 (**Figure 7-4**, **Table 7-2**).

A groundwater sample (FTWW-DPT-8) was collected at soil sampling location FTWW-FLRP-1. Groundwater was encountered at approximately 10 feet bgs, and the borehole was completed to a total depth of 15 feet bgs. Detections included PFOS (36 ng/L), PFOA (7.3 ng/L), and PFBS (9.0 ng/L); these detections in groundwater were less than the OSD risk screening levels (**Figure 7-4**, **Table 7-1**).

7.8 Ladd Army Airfield Hangar 1 (FTWW-094; 02871.1071)

Two shallow soil samples and two groundwater samples were collected in association with the LAAF Hangar 1 AOPI. PFOS was detected in soil at FTWW-H1-1 (0.0011 mg/kg) and FTWW-H1-2 (0.0013 mg/kg); however, PFOA and PFBS were not detected in these samples. Detected concentrations of PFOS in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-5**, **Table 7-2**).

Groundwater monitoring well AP-6386 and supply well 1032 were sampled downgradient or near this AOPI. Detections at AP-6386 included PFOS (32 ng/L), PFOA (110 ng/L), and PFBS (15 ng/L). The detected concentration of PFOA at AP-6386 exceeded the OSD risk screening level. Detections at supply well 1032 included PFOS (11 ng/L), PFOA (22 ng/L), and PFBS (1.9 J ng/L). The detected concentrations of PFOS, PFOA, and PFBS at supply well 1032 were less than the OSD risk screening levels (**Figure 7-5**, **Table 7-1**).

7.9 Fire Station #2 (Building 4390) and Training Area

Two shallow soil samples and three groundwater samples were collected in association with the Fire Station #2 (Building 4390) and Training Area AOPI.

PFOS was detected at both FTWW-FS2-1 (0.0027 mg/kg) and FTWW-FS2-2 (0.0015 mg/kg); however, PFOA and PFBS were not detected in either soil sample. The detected concentrations of PFOS in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-6**, **Table 7-2**).

At groundwater monitoring well MW-77 (which lies within the estimated footprint of AFFF use), PFOA and PFBS were detected at concentrations of 21 ng/L and 6,500 DJ ng/L, respectively. The detected concentration of PFBS exceeds the OSD risk screening level. The detected concentration of PFOA was less than the OSD risk screening level, and PFOS was not detected at MW-77. At MW-38 (east of the estimated footprint of AFFF use), PFOS, PFOA, and PFBS were detected at concentrations of 20 ng/L, 4.6 ng/L, and 12 ng/L, respectively. These detections of PFOS, PFOA, and PFBS concentrations are less than the OSD risk screening levels. Downgradient of the AOPI at MW-82, PFOS was detected at 40 ng/L (equal to the OSD risk screening level); PFBS was also detected at 2.5 J ng/L (less than the OSD risk screening level). PFOA was not detected in MW-82 (**Figure 7-6**, **Table 7-1**).

7.10 Fire Training Area

Three shallow soil samples and one groundwater sample were collected at the Fire Training Area AOPI. PFOS was detected in all three soil samples as follows: 0.0090 mg/kg at FTWW-FTA-1, 0.0011 J mg/kg at FTWW-FTA-2, and 0.0030 mg/kg at FTWW-FTA-3. PFOA and PFBS were not detected in any of the three soil samples (**Figure 7-7**, **Table 7-2**). All detected PFOS concentrations in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels.

A groundwater sample (FTWW-DPT-10) was collected at soil sampling location FTWW-FTA-1. Groundwater was encountered at approximately 8 feet bgs, and the borehole was completed to a total depth of 15 feet bgs. PFOS (2.0 J ng/L), PFOA (28 ng/L), and PFBS (220 ng/L) were detected at this sampling location; these concentrations in groundwater were less than the OSD risk screening levels (**Figure 7-7**, **Table 7-1**).

7.11 Landfill (FTWW-038)

Three groundwater samples were collected at existing monitoring wells in association with the Landfill (FTWW-038) AOPI. At well AP-10257MW south of the landfill, PFBS was detected at a concentration of 2.4 J ng/L; PFOS and PFOA were not detected in the well. At well AP-6574A southwest of the landfill,

PFOA and PFBS were detected at concentrations of 13 ng/L and 5.5 ng/L, respectively; PFOS was not detected in the well. This well, AP-6574A, is considered to be the most representative downgradient location sampled during the SI at the landfill, given the west-southwest groundwater flow direction at this AOPI. The well (which is 58 feet in depth) is reportedly screened below the water table but above the discontinuous permafrost in the area. Detected concentrations of PFOA and PFBS at this AOPI were less than the OSD risk screening levels. PFOS, PFOA, and PFBS were not detected in groundwater sampled at monitoring well FWLF-03 east and upgradient of the landfill (**Figure 7-8**, **Table 7-1**).

7.12 Defense Reutilization and Marketing Office Yard and Drum Site (CC-FTWW-114, FTWW-047, and FTWW-091)

A groundwater sample was collected in association with the DRMO Yard and Drum Site AOPI at monitoring well AP-5966. Detections in groundwater sampled at this well include PFOS (3.7 ng/L) and PFOA (35 ng/L); PFBS was not detected in the sample (**Figure 7-9**, **Table 7-1**). Detected concentrations of PFOS and PFOA at this AOPI were less than the OSD risk screening levels.

At the existing monitoring well AP-7559 which is located near the upgradient boundary of the installation in the eastern portion of the AOPI (i.e., the yard), detections included PFOS (970 DJ ng/L), PFOA (49 ng/L), and PFBS (11 ng/L). Detected concentrations of PFOS and PFOA at this groundwater monitoring well exceed the OSD risk screening levels (**Figure 7-9**, **Table 7-1**).

7.13 North Refueling (FTWW-063; 02871.1040)

Two shallow soil samples and one groundwater sample were collected in association with the North Refueling AOPI. The unnamed well (i.e., the BLM retardant well) at the site was also sampled during the SI due to detections of PFAS observed in the well in April 2019 (**Table 2-1**; **Section 2.12**). PFOS was detected in soil at FTWW-REFUEL-1 (0.00088 J mg/kg) and FTWW-REFUEL-2 (0.0018 mg/kg); however, PFOA and PFBS were not detected in either of these samples. Detected concentrations of PFOS in shallow soil at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-10**, **Table 7-2**).

A DEB sample (FTWW-REFUEL-DEB-1) was collected at the unnamed well from the first produced water prior to purging and stabilization of the well for parent sample collection. This sample was collected as the downhole equipment could not be removed to assess potential for cross-contamination in the water sample from the equipment. The DEB is not used in the data validation process and is used to supplement interpretation of PFOS, PFOA, and PFBS analytical results at the groundwater well. Concentrations in the DEB sample included PFOS (3.3 J ng/L), PFOA (3.3 J ng/L), and PFBS (1.8 J ng/L).

Concentrations in the parent sample from the unnamed well at this AOPI (FTWW-UNNAMED, i.e., the BLM retardant well) included PFOS (3.9 ng/L) and PFOA (4.3 ng/L), less than the OSD risk screening levels. PFBS was not detected in the groundwater sample (**Figure 7-10**, **Table 7-1**). This well was purged at the spigot via the dedicated pump for approximately 10 minutes prior to sample collection; three parameter readings were collected, but the well was sampled prior to parameter stabilization because the frac tank that contains the excess flow for the well was full. Based on similar results observed for the FTWW-REFUEL-DEB-1 (DEB sample) and the FTWW-UNNAMED parent sample, it cannot be

determined whether the dedicated sampling equipment is influencing the groundwater sample results. For reference, if the PFOS, PFOA, and/or PFBS concentrations in the DEB sample were much greater than those observed in the parent sample (or if the parent sample results were non-detect), that would indicate with more confidence that the dedicated equipment was influencing the groundwater results.

7.14 Biosolids Application Site

Three shallow soil samples and one groundwater sample were collected in association with the Biosolids Application Site AOPI.

PFOS was detected in soil at FTWW-BSAS-1 (0.00057 J mg/kg), FTWW-BSAS-2 (0.048 mg/kg), and FTWW-BSAS-3 (0.00053 J mg/kg). PFOA was also detected in the sample collected at FTWW-BSAS-2 (0.00057 J mg/kg). PFBS was not detected in any of the three soil samples. Detected PFOS and PFOA concentrations at this AOPI were less than the residential and industrial/commercial OSD risk screening levels (**Figure 7-11**, **Table 7-2**).

Monitoring well B2077-MW01 was also sampled downgradient of this AOPI. PFOS was detected in groundwater at this sampling location (3.5 J ng/L, less than the OSD risk screening levels). PFOA and PFBS were not detected in the well (**Figure 7-11**, **Table 7-1**).

7.15 Fire Station #3 Building 1054 (CC-FTWW-109)

The storage of AFFF was discovered following the initial SI sampling event at FTWW. Therefore, samples were not collected in association with this AOPI during the August 2020 event. Two groundwater monitoring wells at the fire station (**Figure 7-5**;15B1055-MW01 and 15B1054-MW03) were sampled in a follow-up June 2021 mobilization. Three soil samples were also collected at the AOPI based on the C6 AFFF observed being stored outside of the building during the June 2021 field event; the soil samples were collected downgradient from where the pallet of AFFF drums was observed, in locations likely to receive surface runoff from areas where the AFFF would be transferred from the drums to smaller containers.

PFOS, PFOA, and PFBS were detected in groundwater at both sampled wells. The concentrations at FTWW-15B1054-MW01 were 5.4 ng/L PFOS, 32 ng/L PFOA, and 31 J- ng/L PFBS, all below the OSD risk screening levels. The concentrations at FTWW-15B1054-MW03 were 24 ng/L PFOS, 59 ng/L PFOA, and 54 ng/L PFBS; the PFOA concentration observed at this well exceeded the OSD risk screening level (**Table 7-1**).

PFOS was detected in all three soil samples collected at the AOPI as well, all less than the OSD risk screening levels. Detected concentrations of PFOS ranged from 0.0023 mg/kg (FTWW-FS3-1-SO) to 0.0047 mg/kg (FTWW-FS3-2-SO). PFOA and PFBS were not detected in any of the three soil samples.

7.16 Investigation Derived Waste

One composite sample of the purge and decontamination wastewater was collected from the 55-gallon drum (which contained approximately 40 gallons of liquid) currently in storage at Building 3476. The results indicated the following concentrations in the wastewater: 360 ng/L PFOS, 62 ng/L PFOA, and 280 ng/L PFBS (**Appendix M**). The PFOS and PFOA concentrations detected in the IDW sample are greater

than the OSD risk screening levels. The final IDW disposal is pending per direction from the installation. The full analytical results (i.e., for all constituents analyzed) for the IDW sample collected during the SI are included in **Appendix M**.

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 (**Appendix M**). The TOC in the soil samples ranged from 998 mg/kg at LAAF Hangar 1 (FTWW-H1-1) to 39,800 mg/kg at Fire Station #2 (Building 4390) and Training Area (FTWW-FS2-1). On average, the organic content in soil (approximately 9,386 mg/kg) at this installation was consistent with that typically observed in topsoil (5,000 to 30,000 mg/kg). The combined percentage of fines in soils at FTWW ranged from 2% to 65% with an average of 36%. PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The average percent moisture of the soil at FTWW (13%) was typical for fine loams (loam [0 to 12%]). The pH of the soil was neutral (average of approximately 7.0 standard units). Considering the shallow depth to groundwater at the installation, the groundwater-surface water interaction with the Chena River (i.e., the gaining and losing stages of the Chena River; **Sections 2.7** and **7.1**), and the large volume of water moving through the aquifer daily, leaching of PFOS, PFOA, and PFBS from soil to groundwater would be expected. PFAS constituents may be relatively more mobile in soils at FTWW than typically expected in finer soils with greater TOC content (as exists at FTWW), as greater fines and TOC content can slow transport.

7.18 Blank Samples

Eight EBs were collected during the SI field event. EBs were collected on the following types of non-dedicated equipment used to collect environmental samples: HDPE tubing (EB-1), water level meter (EB-2), bladder pump (EB-3), Geoprobe SP17 extendable well screen (EB-4, used during collection of groundwater samples at DPT sampling points), hand auger (EB-5), Geoprobe macro core sampler (EB-6, used to advance boreholes at DPT sampling points), a transducer which was encountered in well AP-10257MW (EB-7), and a new HDPE bailer prior to its use for the IDW composite sample collection (EB-8). Additionally, three field blanks (FB-1 through -3) were collected to satisfy the collection frequency of 1 per 20 parent samples (independent of media type). One source blank (SB-1) was also collected to evaluate the PFOS, PFOA, and PFBS concentrations in water used to fill the drillers tote for use in the decontamination of tooling via a pressure washer.

PFOS, PFOA, and PFBS were not detected in the EB or field blank samples. However, PFOS was detected at a concentration of 2.8 J ng/L (an estimated concentration) in the source blank. The source water was not used during the drilling process (i.e., it was only used in the initial decontamination step on the drill tooling between sampling locations). Additionally, as noted above, PFOS, PFOA, and PFBS were not detected in the equipment blank collected from the macro-core drill tooling used to complete the boreholes (**Appendix M**). Therefore, the associated samples were not qualified due to detections in the source blank.

The full analytical results for blank 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 **7-16** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

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

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

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

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

- The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.

- PFOS, PFOA, and/or PFBS were detected in groundwater at all AOPIs, except for Fire Station #1. Groundwater originating at these AOPIs flows off-post through the installation's northwestern and western boundaries (see groundwater elevations from monitoring well locations sampled during the SI on **Figure 7-17**) and there are no land use controls in place outside the boundary prohibiting groundwater use as drinking water in the future. Additionally, PFOS, PFOA, and/or PFBS have been detected at low concentrations (less than 10 ng/L) at installation boundary sampling locations (FTWW-DPT-4 and FTWW-DPT-5). Therefore, the groundwater exposure pathway for off-installation drinking water receptors is considered potentially complete.
- Recreational users are not likely to contact groundwater during outdoor recreational activities; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.

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

Figure 7-12 shows the CSM for the following AOPIs: FTP-3A and -3B (FTWW-037) and B2118 Flight Line Refill Point. PFOS, PFOA, and PFBS were potentially released to soil and paved surfaces at FTP-3A and -3B (FTWW-037) AOPI due to use of AFFF during firefighter training exercises. PFOS, PFOA, and PFBS were potentially released to soil and paved surfaces at B2118 Flight Line Refill Point due to storage of AFFF.

- Soil was not sampled at FTP-3A and -3B (FTWW-037) during the SI; however, PFOS, PFOA, and PFBS have historically been detected in soil here (**Table 2-2**). It is not likely that the historical soil excavations at the FTPs (see **Section 5.2.1**) removed all soil impacted by PFOS, PFOA and PFBS (based on the concentrations observed in groundwater at the AOPI), as the removal actions were completed to address other constituents. Site workers (i.e., installation personnel) 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 considered potentially complete.
- PFOS, PFOA, and PFBS were not detected in soil but were detected in groundwater at B2118 Flight Line Refill Point. Detections of PFAS in groundwater at B2118 Flight Line Refill Point AOPI may be from other upgradient PFOS, PFOA, and PFBS sources (e.g., LAAF Hangar 6, FTP-3A and -3B) or from unsampled soil locations at the AOPI. Due to the uncertainty regarding the source of PFOS, PFOA, and PFBS in groundwater at the AOPI and the limited soil sampling completed, the soil exposure pathway is considered potentially complete for on-installation site workers that could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the FTP-3A and -3B (FTWW-037) and B2118 Flight Line Refill Point AOPIs. The FTP-3A and -3B (FTWW-037) and B2118 Flight Line Refill Point AOPIs are generally cross-gradient of drinking water wells used to supply potable water at FTWW. The capture zone of the drinking water wells is not well defined. Although a 1996 groundwater modeling report indicates that the capture zone of drinking water wells 3559A/B and 3563 is approximately 1,600 feet in width (i.e., not extending to beneath these two AOPIs; CH2M Hill 1996), the study utilized limited data available from the USGS and focused on potential capture from an adjacent site impacted with diesel range organics. Additionally, low level detections (less than 5 ng/L) of PFOS have been observed in the drinking water supply wells 3559A/B and 3565 at FTWW (it is not known if the pump components at these wells have PFOS, PFOA, and/or PFBS containing parts). Since the source of PFOS, PFOA, and/or PFBS detected in the drinking water supply wells is uncertain, and to account for potential future use of the downgradient on-post groundwater, the

groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are considered potentially complete.

- Surface water bodies on-post are not used for drinking water. However, on-installation site workers may contact surface water and sediment (i.e., Clear Creek or other intermittent streams which receive runoff from the cantonment area). Clear Creek also receives groundwater that is pumped out of utility corridors that are potentially beneath the AOPIs, and PFOS, PFOA, and/or PFBS have been detected in surface water and sediment in Clear Creek. Therefore, the exposure pathways for surface water and sediment (via incidental ingestion and dermal contact) are considered complete for site workers. These exposure pathways are also considered complete for recreational users based on the PFOS, PFOA, and/or PFBS detections in Clear Creek, which flows to the Chena River since the Chena River can be accessed by on-installation recreational users. Residents are not likely to contact surface water and sediment on-post (i.e., in Clear Creek or the Chena River); therefore, these exposure pathways are incomplete.
- The Chena River is not directly used for drinking water. However, off-installation recreational users could contact constituents in surface water and sediment in the Chena River through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-13 shows the CSM for the following AOPIs: LAAF Hangar 6, Fire Station #1, Taxiway D, Taxiway E, LAAF Hangar 1, Fire Station #3 Building 1054, North Refueling, and the Biosolids Application Site. PFOS, PFOA, and PFBS were potentially released to soil and paved surfaces at these AOPI due to use of AFFF during firefighter training exercises or fire responses, leaks/spills from storage of potentially PFOS, PFOA, and PFBS containing materials, or from receipt of potentially PFOS, PFOA, and PFBS-containing material.

- PFOS, PFOA, and/or PFBS were detected in soil at these AOPIs and site workers (i.e., installation personnel) 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 considered complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at each AOPI, except for Fire Station #1 (at which an up- or cross-gradient well was sampled and impacts in groundwater are possible downgradient of the former AFFF use area). The AOPIs are generally cross-gradient of drinking water wells used to supply potable water at FTWW. The capture zone of the drinking water wells is not well defined. Although a 1996 groundwater modeling report indicates that the capture zone of drinking water wells 3559A/B and 3563 is approximately 1,600 feet in width (i.e., not extending to beneath these two AOPIs; CH2M Hill 1996), the study utilized limited data available from the USGS and focused on potential capture from an adjacent site impacted with diesel range organics. Additionally, low level detections (less than 5 ng/L) of PFOS have been observed in the drinking water supply wells 3559A/B and 3565 at FTWW (it is not known if the pump components at these wells have parts containing PFOS, PFOA, and/or PFBS). Since the source of PFAS detected in the drinking water supply wells is uncertain, and to account for potential future use of the downgradient on-post groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are considered potentially complete.
- Surface water bodies on-post are not used for drinking water. However, on-installation site workers may contact surface water and sediment (i.e., Clear Creek or other intermittent streams which receive runoff from the cantonment area). Clear Creek also receives groundwater that is pumped out of utility

corridors that are potentially beneath the AOPIs, and PFOS, PFOA, and/or PFBS have been detected in surface water and sediment in Clear Creek. Therefore, the exposure pathways for surface water and sediment (via incidental ingestion and dermal contact) are considered complete for site workers. These exposure pathways are also considered complete for recreational users based on the PFOS, PFOA, and/or PFBS detections in Clear Creek, which flows to the Chena River since the Chena River can be accessed by on-installation recreational users. Residents are not likely to contact surface water and sediment on-post (i.e., in Clear Creek or the Chena River); therefore, these exposure pathways are considered incomplete.

- The Chena River is not directly used for drinking water. However, off-installation recreational users could contact constituents in surface water and sediment in the Chena River through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-14 shows the CSM for the following AOPIs: Fire Station #2 (Building 4390) and Training Area and the Fire Training Area. PFOS, PFOA, and/or PFBS were potentially released to soil and paved surfaces at these AOPI due to use of AFFF during firefighter training exercises or fire responses.

- PFOS, PFOA, and/or PFBS were detected in soil at these AOPIs and site workers (i.e., installation personnel) 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 considered complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs and the AOPIs are cross-gradient (Fire Station #2 [Building 4390] and Training Area) and upgradient (Fire Training Area) of drinking water wells used to supply potable water at FTWW. The capture zone of the drinking water wells is not well defined. Although a 1996 groundwater modeling report indicates that the capture zone of drinking water wells 3559A/B and 3563 is approximately 1,600 feet in width (i.e., not extending to beneath the AOPIs, however, Fire Station #2 (Building 4390) and Training Area is near the estimated capture zone; CH2M Hill 1996), the study utilized limited data available from the USGS and focused on potential capture from an adjacent site impacted with diesel range organics. Additionally, low level detections (less than 5 ng/L) of PFOS have been observed in the drinking water supply wells 3559A/B and 3565 at FTWW (it is not known if the pump components at these wells have PFOS, PFOA, and/or PFBS containing parts). Since the source of PFAS detected in the drinking water supply wells is uncertain, and to account for potential future use of the downgradient on-post groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are considered potentially complete.
- There are no permanent surface water bodies in the vicinity of these AOPIs, and surface water bodies on-post are not used for drinking water. However, there is a potential for runoff in the stormwater drainages from these AOPIs, or shallow groundwater may discharge to Engineer Lake (i.e., from Fire Training Area AOPI) or the Chena River (i.e., from Fire Station #2 [Building 4390] and Training Area AOPI). These features are not likely to be accessed by site workers or residents; therefore, these exposure pathways are considered incomplete. However, on-installation recreational users may contact surface water and sediment in the Chena River or Engineer Lake. Therefore, these exposure pathways for surface water and sediment are considered potentially complete for on-installation recreational users.
- The Chena River is not directly used for drinking water. However, off-installation recreational users could contact constituents in surface water and sediment in the Chena River through incidental

ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-15 shows the CSM for the on-installation Landfill (FTWW-038) where excavated and thermally treated soil (likely still containing PFOS, PFOA, and/or PFBS) from the FTP-3A and -3B AOPI was used as cover and buried.

- Site workers (i.e., installation personnel) would not contact constituents in subsurface soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the subsurface soil exposure pathway for on-installation site workers is considered incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPI. The AOPI is across the Chena River from the drinking water wells used to supply potable water at FTWW and is not likely to affect the installation's potable water supply (groundwater flow in this area is to the west-southwest, not towards the water supply wells). However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Considering the potential constituent source at this landfill AOPI is in the subsurface, surface runoff is not an applicable migration pathway. Additionally, based on the available data provided by the installation, there is no connection between the landfill groundwater and the Chena River. Therefore, surface water and sediment are not included as potential exposure media in the CSM figure.

Figure 7-16 shows the CSM for the DRMO Yard and Drum Site AOPI. PFOS, PFOA, and/or PFBS were potentially released to soil and paved surfaces at this AOPI due to storage, use, and/or disposal of materials containing PFOS, PFOA, and/or PFBS.

- Soil samples were not collected from this AOPI. If PFOS, PFOA, and/or PFBS are present in soil, site workers (i.e., installation personnel) could contact constituents via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is considered potentially complete in the absence of soil data.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPI. The AOPI is upgradient of drinking water wells used to supply potable water at FTWW. The capture zone of the drinking water wells is not well defined. Although a 1996 groundwater modeling report indicates that the capture zone of drinking water wells 3559A/B and 3563 is approximately 1,600 feet in width (i.e., not extending to beneath this AOPI; CH2M Hill 1996), the study utilized limited data available from the USGS and focused on potential capture from an adjacent site impacted with diesel range organics. Additionally, low level detections (less than 5 ng/L) of PFOS have been observed in the drinking water supply wells 3559A/B and 3565 at FTWW (it is not known if the pump components at these wells have parts containing PFOS, PFOA, and/or PFBS). Since the source of PFAS detected in the drinking water supply wells is uncertain, and to account for potential future use of the downgradient on-post groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are considered potentially complete.
- There are no permanent surface water bodies in the vicinity of this AOPI, and surface water bodies on-post are not used for drinking water. However, there is a potential for runoff in the stormwater drainages from these AOPIs, or shallow groundwater from beneath the AOPI may discharge to Engineer Lake or the Chena River. These features are not likely to be accessed by site workers or residents; therefore, these exposure pathways are considered incomplete. However, on-installation recreational users may contact surface water and sediment in the Chena River or Engineer Lake.

Therefore, the surface water and sediment exposure pathways are considered potentially complete for recreational users.

- The Chena River is not directly used for drinking water. However, off-installation recreational users could contact constituents in surface water and sediment in the Chena River through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Following the SI sampling, all 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 FTWW 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 FTWW. Following the evaluation, 14 AOPIs were identified.

Currently, there are two on-post potable water wells used as the installation's main drinking water source, wells 3559A and 3559B (both installed to a total depth of approximately 55 feet bgs). The wells are located south of the Chena River on the western side of the installation and are set in the Tanana Basin alluvial aquifer. Wells 3563 and 3565 are backup drinking water supply wells for the installation. Low-level (less than 5 ng/L) detections of PFOS have been observed in the 3559A/B and 3565 wells.

All 14 AOPIs were sampled during the SI field events at FTWW 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 FTWW QAPP Addendum (Arcadis 2020). All 14 AOPIs had detections of PFOS, PFOA, and PFBS, and eight AOPIs exceeded the OSD risk screening levels in soil and/or groundwater. The data are summarized below by media type.

Groundwater: For the purposes of 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. PFOS, PFOA, and/or PFBS were detected in 21 of the 28 parent groundwater samples collected. At eight AOPIs (Taxiway D, Taxiway E, FTP-3A and-3B, Fire Station #2 [Building 4390] and Training Area, LAAF Hangar 6, LAAF Hangar 1, and the DRMO Yard and Drum Site, and Fire Station #3 Building 1054), concentrations of PFOS, PFOA, and/or PFBS exceeded the OSD risk screening levels. The maximum PFOS, PFOA, and PFBS concentrations observed include 3,300 DJ ng/L PFOS (at DPT-9 downgradient of the LAAF Hangar 6 release area), 1,200 ng/L PFOA (at existing well AP-10266MW at FTP-3A and -3B), and 6,500 DJ ng/L PFBS (at existing well MW-77 downgradient of the Fire Station #2 (Building 4390) and Training Area).

Two groundwater samples were collected at the upgradient installation boundary near the Chena River (DPT-1 and DPT-2, south of the river). PFOS and PFOA were detected at DPT-1 at concentrations less than OSD risk screening levels; PFBS was not detected in the sample. PFOS, PFOA, and PFBS were not detected in the sample collected at DPT-2. Three groundwater samples were collected at the downgradient installation boundary near the Chena River (DPT-3 through DPT-5, north of the river). PFOS, PFOA, and PFBS were detected at DPT-4 and PFOS was detected at DPT-5, all at concentrations less than the OSD risk screening levels. PFOS, PFOA, and PFBS were not detected at DPT-3.

Shallow Soil (0 to 2 feet): For the purposes of 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 (residential receptor

scenario). For the industrial/commercial receptor scenario, the OSD risk screening levels are: 1.6 mg/kg for PFOS and PFOA and 25 mg/kg for PFBS. PFOS, PFOA, and/or PFBS were detected in 26 of the 28 parent soil samples collected (i.e., excluding the two samples collected at the B2118 Flight Line Refill Point). At one AOPI (Taxiway E), the PFOS concentration in soil (2.0 DJ mg/kg) exceeded the residential and industrial/commercial risk screening levels. The maximum PFOS, PFOA, and PFBS concentrations observed include 2.0 DJ mg/kg PFOS, 0.0040 mg/kg PFOA, and 0.0019 mg/kg PFBS (all observed at Taxiway E).

Surface Water and Sediment: For the purposes of this evaluation, the tap water OSD risk screening levels (i.e., 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS) are used to compare surface water data as the sample represented groundwater. The soil OSD risk screening levels are not used to compare sediment data as the exposure route is not the same. Detections in the one surface water sample (TAXIE-4, collected along Clear Creek downgradient of Taxiway E) collected during the SI include PFOS (880 ng/L), PFOA (69 ng/L), and PFBS (70 ng/L); the PFOS and PFOA concentrations exceed the OSD risk screening levels. PFOS was detected in the sediment sample (TAXIE-4, co-located at the surface water sample collection location) at a concentration of 0.010 mg/kg; PFOA and PFBS were not detected in the sample.

Following the SI sampling, all 14 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have complete or potentially complete exposure pathways.

Complete exposure pathways include:

- Soil exposure pathways for site workers at the LAAF Hangar 6, Fire Station #3 Building 1054, Fire Station #1, Taxiway D, Taxiway E, LAAF Hangar 1, North Refueling, Biosolids Application Site, Fire Station #2 (Building 4390) and Training Area, and Fire Training Area AOPIs.
- Surface water and sediment exposure pathways for site workers and recreational users at the LAAF Hangar 6, Fire Station #3 Building 1054, Fire Station #1, Taxiway D, Taxiway E, LAAF Hangar 1, Fire Station #3 Building 1054, North Refueling, FTP-3A and -3B, Biosolids Application Site, and the B2118 Flight Line Refill Point.

Potentially complete exposure pathways include:

- Groundwater exposure pathways for site workers and residents from the LAAF Hangar 6, Fire Station #1, Taxiway D, Taxiway E, LAAF Hangar 1, Fire Station #3 Building 1054, North Refueling, FTP-3A and -3B, Biosolids Application Site, Fire Station #2 (Building 4390) and Training Area, Fire Training Area, B2118 Flight Line Refill Point, and DRMO Yard and Drum Site AOPIs. These AOPIs are upgradient or cross-gradient of installation potable water supply wells.
- Groundwater exposure pathways for site workers and residents at the Landfill AOPI to account for potential future use of the downgradient on-post groundwater.
- Groundwater, surface water, and sediment exposure pathways for off-installation receptors from all 14 AOPIs due to a lack of land use controls off-installation and downgradient of FTWW.
- Soil exposure pathways for site workers at the FTP-3A and -3B, B2118 Flight Line Refill Point, and the DRMO Yard and Drum Site AOPIs.

- Surface water and sediment exposure pathways for on-installation recreational users from the Fire Station #2 (Building 4390) and Training Area, Fire Training Area and DRMO Yard and Drum Site AOPIs. There is a potential for runoff in the stormwater drainages from these AOPIs, or shallow groundwater may discharge to Engineer Lake (i.e., from Fire Training Area and the DRMO Yard and Drum Site AOPIs) or to the Chena River (i.e., from Fire Station #2 [Building 4390] and Training Area AOPI).
- Surface water and sediment exposure pathways for off-installation recreational users from all 14 AOPIs.

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for future study in a remedial investigation or no action at this time is based on the comparison of the SI analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 8-1** below summarizes the AOPIs identified at FTWW, the PFOS, PFOA, and PFBS sampling, and recommendations for each AOPI; further investigation is warranted at FTWW. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 8-1 Summary of AOPIs Identified During the PA, PFOS, PFOA, and PFBS Sampling at FTWW, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Fire Training Area (southeast portion of site)	No	No	NS	NS	No action at this time
Taxiway D	Yes	No	Yes*	NS	Further study in a remedial investigation
Taxiway E	Yes	Yes	Yes*	NA	Further study in a remedial investigation
FTP-3A and -3B (FTWW-037, Operable Unit 4)	Yes	Yes (2014 data)	NS	NA	Further study in a remedial investigation
Fire Station #1 (CC-FTWW-103)	ND	No	NS	NS	No action at this time
Fire Station #2 (Building 4390) and Training Area	Yes	No	NS	NS	Further study in a remedial investigation
LAAF Hangar 1 (FTWW-094)	Yes	No	NS	NS	Further study in a remedial investigation
LAAF Hangar 6 (CC-FTWW-06 and -103)	Yes	No	NS	NS	Further study in a remedial investigation
North Refueling (FTWW-063)	No	No	NS	NS	No action at this time
B2118 Flight Line Refill Point (CC-FTWW-103)	No	ND	NS	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS/NA)				Recommendation
	GW	SO	SW	SE	
Landfill near Building 1190 (FTWW-038, Operable Unit 4)	No	NS	NS	NS	No action at this time
DRMO Yard and Drum Site – (CC-FTWW-114, FTWW-047, and FTWW-091)	Yes	NS	NS	NS	Further study in a remedial investigation
Biosolids Application Site	No	No	NS	NS	No action at this time
Fire Station #3 Building 1054 (CC-FTWW-109)	Yes	No	NS	NS	Further study in a remedial investigation

Notes:
*The surface water and sediment samples collected near the Taxiway E AOPI were collected downgradient of an outflow pipe on the west bank of Clear Creek. The installation later indicated that the outfall pipe is groundwater and stormwater infiltrating into utilidors in the LAAF area. Therefore, the detected concentrations of PFOS, PFOA, and PFBS in those samples may be attributed to multiple AOPIs. The surface water data is therefore compared to the tap water OSD risk screening levels since the flow in the creek represented groundwater.
Light gray shading – detection greater than the OSD risk screening level

Acronyms:
GW – ground water
NA – not applicable (i.e., PFOS, PFOA, or PFBS detected, but comparison to OSD risk screening levels is not applicable for the sediment feature sampled)
ND – non-detect
NS – not sampled (i.e., with respect to soil, samples were not collected if there was concern of compromising a cap or if the ground has been significantly reworked in the area; with respect to surface water/sediment, no relevant surface water feature in the area to sample)
SE – sediment
SO – soil
SW – surface water

Data collected during the PA (**Section 3**, **Section 4**, and **Section 5**) and SI (**Section 6** and **Section 7**) were sufficient to draw the conclusions summarized in **Section 9**. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at FTWW 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 (or other PFAS-containing materials) may have been limited (e.g., each AFFF use; procurement records of PFAS-containing products, 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 or use, storage, or disposal of other PFAS-containing materials. Anecdotal accounts of AFFF use (and therefore likely PFOS, PFOA, and PFBS use) were limited to available installation personnel, whose knowledge of AFFF use may have been restricted by their time spent at the installation or previous roles held that limited their relevant knowledge of potential AFFF (or other PFAS-containing material) use.

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

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.

Finally, the available PFOS, PFOA, and PFBS analytical data is limited to the historical data provided by the installation (as presented in **Tables 2-1** and **2-2**) and the data collected during this SI. The 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 boundary wells did not delineate the extent of PFOS, PFOA, and PFBS impacts or identify the primary migration pathways for the chemicals. Available data, including PFOS, PFOA, and PFBS, is listed in **Appendix M**, which were analyzed per the selected analytical method.

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

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ACRONYMS

%	percent
ADEC	Alaska Department of Environmental Conservation
AFFF	aqueous film-forming foam
AKARNG	Alaska Army National Guard
amsl	above mean sea level
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CHPP	Central Heat and Power Plant
CSM	conceptual site model
DEB	dedicated equipment background
DoD	Department of Defense
DPT	direct-push technology
DPW	Directorate of Public Works
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FES	Fairbanks Environmental Services, Inc.
FTP	fire training pit
FTWW	Fort Wainwright, Alaska
GIS	geographic information system
GW	ground water
HDPE	high-density polyethylene

HEF	high expansion foam
HQAES	Headquarters Army Environmental System
IDW	investigation-derived waste
IMCOM	Installation Management Command
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
LAAF	Ladd Army Airfield
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LHA	lifetime health advisory (USEPA)
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram (parts per million)
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
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

SE	sediment
SI	site inspection
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SW	surface water
TGI	technical guidance instruction
TOC	total organic carbon
U.S.	United States
UCMR3	third Unregulated Contaminant Monitoring Rule
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WWTP	wastewater treatment plant

TABLES

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	3405	Fire Well 3405
Location		Bldg 1032	Bldg 1032	Bldg 1032	Bldg 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Fire Well 1032	Bldg 3405	Bldg 3405
Laboratory		Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen
Sample Date		10/16/2017	6/20/2018	9/12/2018	11/7/2018	2/12/2019	4/17/2019	7/17/2019	10/2/2019	3/18/2020	4/15/2020	7/12/2020	10/16/2017	6/20/2018
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	**0.0094**	**0.0089**	**0.016**	**0.014**	**0.014**	**0.016**	**0.0065**	**0.011**	**0.013**	**0.013**	**0.015**	< 0.002	< 0.002
Perfluorooctanoic acid (PFOA)	0.040	**0.0032**	**0.0052**	**0.0087**	**0.0073**	**0.0075**	**0.0083**	**0.0035**	**0.0056**	**0.0071**	**0.007**	**0.0072**	< 0.002	< 0.002
Perfluorobutane Sulfonate (PFBS)	0.600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutyric acid (PFBTA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexane Sulfonate (PFHXS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		Fire Well 3405	Fire Well 3405	Fire Well 3405	Fire Well 3405	Fire Well 3405	Fire Well 3405	Fire Well 3405	Fire Well 3405	Fire Well 3405	Bldg 3559 Main Well	Bldg 3559A	Bldg 3559A	Bldg 3559A
Location		Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3405	Bldg 3559	Bldg 3559A	Bldg 3559A	Bldg 3559A
Laboratory		Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen
Sample Date		8/22/2018	11/7/2018	2/6/2019	4/17/2019	7/17/2019	10/2/2019	3/18/2020	4/15/2020	7/12/2020	8/22/2018	9/18/2018	11/7/2018	1/29/2019
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	**0.0023**	**0.0022**	**0.0021**	**0.0026**
Perfluorooctanoic acid (PFOA)	0.040	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Perfluorobutane Sulfonate (PFBS)	0.600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutyric acid (PFBTA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexane Sulfonate (PFHXS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559A	3559 Well B	Bldg 3559B	Bldg 3559B	Bldg 3559B	Bldg 3559 Entry Point	Bldg 3559 Entry Point	Bldg 3559B
Location		Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559A	Bldg 3559B	Bldg 3559B	Bldg 3559B	Bldg 3559B	Bldg 3559	Bldg 3559	Bldg 3559B
Laboratory		Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen
Sample Date		4/10/2019	7/17/2019	10/2/2019	1/4/2020	4/13/2020	7/12/2020	10/16/2017	9/18/2018	11/7/2018	1/29/2019	1/29/2019	4/10/2019	7/17/2019
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	**0.0024**	**0.0021**	**0.0024**	< 0.002	**0.0027**	**0.0026**	< 0.002	< 0.002	< 0.002	**0.0023**	**0.0025**	< 0.002	< 0.002
Perfluorooctanoic acid (PFOA)	0.040	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Perfluorobutane Sulfonate (PFBS)	0.600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutyric acid (PFBTA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexane Sulfonate (PFHXS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		Bldg 3559B	Bldg 3559B	Bldg 3559B	Bldg 3559B	3563	In House Bldg 3563	Bldg 3563	In House Bldg 3563	Raw Well 3563	In House Bldg 3563	Bldg 3563	Well House Bldg 3563	Well House Bldg 3563
Location		Bldg 3559B	Bldg 3559B	Bldg 3559B	Bldg 3559B	Bldg 3563	Bldg 3563	Bldg 3563	Bldg 3563	Bldg 3563	Bldg 3563	Bldg 3563	Bldg 3563	Bldg 3563
Laboratory		Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen
Sample Date		10/2/2019	1/4/2020	4/13/2020	7/12/2020	10/16/2017	8/15/2018	11/7/2018	1/30/2019	4/10/2019	7/17/2019	10/2/2019	3/18/2020	4/15/2020
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	**0.0022**	< 0.002	**0.0023**	**0.0021**	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Perfluorooctanoic acid (PFOA)	0.040	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Perfluorobutane Sulfonate (PFBS)	0.600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutyric acid (PFBTA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexane Sulfonate (PFHXS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		Well House Bldg 3563	Bldg 3565	Bldg 3565	3565	Bldg 3565 Entry Point	Bldg 3565 Entry Point	Bldg 3565 Entry Point	Bldg 3565 Entry Point	Bldg 3565 Entry Point	Bldg 3565 Entry Point	Bldg 3565 Entry Point	Well House Bldg 3565	4023
Location		Bldg 3563	Treatment Plant DSEP	Treatment Plant DSEP	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 3565	Bldg 4023
Laboratory		Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen
Sample Date		7/12/2020	12/17/2013	6/5/2014	10/16/2017	9/18/2018	4/10/2019	7/17/2019	10/2/2019	1/4/2020	4/13/2020	7/12/2020	8/11/2020	10/16/2017
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	< 0.002	< 0.04	< 0.04	< 0.002	**0.0024**	**0.0025**	**0.0022**	**0.0022**	**0.0024**	**0.0024**	**0.0029**	< 0.002	< 0.002
Perfluorooctanoic acid (PFOA)	0.040	< 0.002	< 0.02	< 0.02	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Perfluorobutane Sulfonate (PFBS)	0.600	NA	< 0.09	< 0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutyric acid (PFBTA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHPA)	NA	NA	< 0.01	< 0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexane Sulfonate (PFHXS)	NA	NA	< 0.03	< 0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	NA	NA	< 0.02	< 0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	Fire Well 4023	CHPP Well 5-3600	CHPP Well 5-3600	CHPP Well 5
Location		Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 4023	Bldg 3600	Bldg 3600	Bldg 3600
Laboratory		Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen	Pollen
Sample Date		6/20/2018	8/22/2018	11/7/2018	2/6/2019	4/10/2019	7/17/2019	10/2/2019	3/18/2020	4/15/2020	7/12/2020	6/20/2018	8/22/2018	11/7/2018
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Perfluorooctanoic acid (PFOA)	0.040	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	**0.0066**	**0.008**	**0.014**
Perfluorobutane Sulfonate (PFBS)	0.600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutyric acid (PFBTA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexane Sulfonate (PFHXS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		CHPP Well 4 3594	CHPP Well 4	FWA-19-095-GW001	FWA-19-095-GW002	13FWFP01WG	13FWFP02WG	13FWFP03WG	13FWFP04WG	13FWFP05WG	13FWFP06WG	13FWFP07WG	13FWFP08WG	13FWFP09WG
Location		Bldg 3594	Bldg 3594	Unnamed Well	Unnamed Well	AP-10261MW	AP-10265MW	AP-10266MW	AP-10267MW	AP-10267MW	AP-10283MW	AP-10285MW	AP-6149	AP-6148
Laboratory		Pollen	Pollen	SGS North America, Inc.	SGS North America, Inc.	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Sample Date		8/22/2018	11/7/2018	4/5/2019	4/5/2019	11/06/2013	11/06/2013	11/06/2013	11/06/2013	11/06/2013	11/06/2013	11/07/2013	11/07/2013	11/07/2013
Sample Type		N	N	N	FD	N	N	N	N	FD	N	N	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**													
Perfluorooctane Sulfonate (PFOS)	0.040	< 0.002	< 0.002	**0.00796**	**0.00853**	< 0.021	< 0.020	**3.3**	**0.22**	**0.25**	**0.28**	**0.020 J**	**0.11**	**0.20**
Perfluorooctanoic acid (PFOA)	0.040	< 0.002	< 0.002	**0.00538**	**0.00543**	< 0.011	< 0.010	**0.34**	**0.070**	**0.077**	**0.029**	**0.011 J**	**0.012 J**	< 0.0099
Perfluorobutane Sulfonate (PFBS)	0.600	NA	NA	**0.00162**	**0.00160**	< 0.0095	< 0.0092	**0.27**	**0.14**	**0.14**	**1.9**	**0.013 J**	< 0.0088	< 0.0089
Perfluorobutyric acid (PFBTA)	NA	NA	NA	**0.00331**	**0.00328**	**0.017 J**	**0.028**	**0.42**	**0.052**	**0.055**	**0.61**	**0.038**	< 0.0098	**0.016 J**
Perfluorodecane Sulfonate (PFDCS)	NA	NA	NA	< 0.0020	< 0.0020	< 0.011	< 0.010	< 0.010	< 0.0098	< 0.011	< 0.010	< 0.011	< 0.0098	< 0.0099
Perfluorododecanoic acid (PFDOA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.021	< 0.020	< 0.021	< 0.020	< 0.021	< 0.020	< 0.022	< 0.020	< 0.020
Perfluorohexanoic acid (PFHA)	NA	NA	NA	**0.00426**	**0.00407**	**0.0044 J**	**0.031**	**0.73**	**0.23**	**0.24**	**3.1**	**0.068**	**0.013 J**	**0.015 J**
Perfluoroheptanoic acid (PFHPA)	NA	NA	NA	**0.00258**	**0.00268**	< 0.021	< 0.020	**0.33**	**0.052**	**0.069**	**0.13**	**0.017 J**	< 0.020	< 0.020
Perfluorohexane Sulfonate (PFHXS)	NA	NA	NA	**0.0121**	**0.0117**	**0.026 J**	**0.017 J**	**1.2**	**0.34**	**0.36**	**0.71**	**0.038**	**0.11**	**0.082**
Perfluorononanoic acid (PFNA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.021	< 0.020	**0.034 J**	< 0.020	< 0.021	< 0.020	< 0.022	< 0.020	< 0.020
Perfluorodecanoic acid (PFNDCA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.011	< 0.010	< 0.010	< 0.0098	< 0.011	< 0.010	< 0.011	< 0.0098	< 0.0099
Perfluorooctane Sulfonamide (PFOSA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.016	< 0.016	< 0.016	< 0.015	< 0.015	< 0.016	< 0.015	< 0.016	< 0.015
Perfluoropentanoic acid (PFPA)	NA	NA	NA	**0.00336**	**0.00334**	**0.015 J**	**0.069**	**0.80**	**0.20**	**0.21**	**2.3**	**0.12**	< 0.0098	< 0.0099
Perfluorotetradecanoic acid (PFTEDA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.021	< 0.020	< 0.021	< 0.020	< 0.021	< 0.020	< 0.022	< 0.020	< 0.020
Perfluorotridecanoic acid (PFTRIDA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.021	< 0.020	< 0.021	< 0.020	< 0.021	< 0.020	< 0.022	< 0.020	< 0.020
Perfluoroundecanoic acid (PFUNDCA)	NA	NA	NA	< 0.0020	< 0.0020	< 0.011	< 0.010	< 0.010	< 0.0098	< 0.011	< 0.010	< 0.011	< 0.0098	< 0.0099

Table 2-1 - Historical Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP10 WG	13FWFP11 WG	13FWFP12 WG	13FWFP13 WG	13FWFP14 WG	13FWFP15 WG
Location		AP-10281MW	AP-10274MW	AP-10274MW	AP-10278MW	AP-10280MW	AP-10276MW
Laboratory		TADC	TADC	TADC	TADC	TADC	TADC
Sample Date		11/11/2013	11/11/2013	11/11/2013	11/11/2013	11/11/2013	11/11/2013
Sample Type		N	N	FD	N, MS/MSD	N	N
Analyte (µg/L)	**OSD Risk Screening Level (µg/L)**						
Perfluorooctane Sulfonate (PFOS)	0.040	< 0.020	< 0.020	< 0.020	**0.72 ML**	**0.015 J**	**0.17**
Perfluorooctanoic acid (PFOA)	0.040	< 0.010	< 0.010	< 0.0098	**0.058**	< 0.0099	**0.44**
Perfluorobutane Sulfonate (PFBS)	0.600	< 0.0091	< 0.0092	< 0.0088	**0.012 J**	< 0.0089	**0.024**
Perfluorobutyric acid (PFBTA)	NA	< 0.010	< 0.010	< 0.0098	< 0.011	< 0.0099	< 0.011
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.010	< 0.010	< 0.0098	< 0.011	< 0.0099	< 0.011
Perfluorododecanoic acid (PFDOA)	NA	< 0.020	< 0.020	< 0.020	< 0.021	< 0.020	< 0.021
Perfluorohexanoic acid (PFHA)	NA	< 0.010	**0.011 JB**	< 0.0098	**0.059**	< 0.0099	**0.14**
Perfluoroheptanoic acid (PFHPA)	NA	< 0.020	< 0.020	< 0.020	< 0.021	< 0.020	**0.031 J**
Perfluorohexane Sulfonate (PFHXS)	NA	**0.017 JB**	**0.022 JB**	**0.023 JB**	**0.63 ML**	**0.014 JB**	**0.55**
Perfluorononanoic acid (PFNA)	NA	< 0.020	< 0.020	< 0.020	< 0.021	**0.022 J**	< 0.021
Perfluorodecanoic acid (PFNDCA)	NA	< 0.010	< 0.010 ML	< 0.0098	< 0.011	< 0.0099	< 0.011
Perfluorooctane Sulfonamide (PFOSA)	NA	< 0.016	< 0.015	< 0.015	< 0.015	< 0.016	< 0.015
Perfluoropentanoic acid (PFPA)	NA	< 0.010	< 0.010	< 0.0098	**0.013 J**	< 0.0099	**0.019 J**
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.020	< 0.020	< 0.020	< 0.021	< 0.020	< 0.021
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.020	< 0.020	< 0.020	< 0.021	< 0.020	< 0.021
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.010	< 0.010	< 0.0098	< 0.011 ML	< 0.0099	< 0.011

Notes:

1. Historical data are as provided by the laboratory in source reports:
   Fairbanks Environmental Services, Inc. 2014. Former Fire Training Pits Investigation, Fort Wainwright Alaska. April.
   Various stand-alone laboratory reports provided by Doyon Utilities and the United States Army Corps of Engineers.
2. **Bolded** data indicate detections.
3. Grey shaded data indicate concentrations greater than the residential tap water risk screening levels provided by the Office of the Secretary of Defense (OSD; Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).
4. Pollen Environmental, LLC. subcontracts analyses to Eurofins Eaton Analytical.
5. The FWA-19-095-GW001 sample was analyzed for eight additional PFAS compounds; of these eight, detected compounds include perfluoropentane sulfonic acid (0.00149 µg/L) and 6:2 fluorotelemer sulfonate (0.00321 µg/L).

Acronym/Abbreviations:

< - analyte not detected at a concentration greater than the limit of detection; concentration is provided as less than the limit of detection
µg/L - micrograms per liter (parts per billion)
Bldg. - building
CHPP - Central Heat and Power Plant
FD - field duplicate
ID - identification
N - normal
NA - not applicable
PFAS - per- and polyfluoroalkyl substances
TADC - Test America (Denver, Colorado)
MS - matrix spike
MSD - matrix spike duplicate

Qualifiers:

B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the limit of quantitation
M - result considered an estimate (L - low; H - high) due to matrix interference

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP01SS	13FWFP01SO	13FWFP02SO	13FWFP02SS	13FWFP03SO	13FWFP04SO	13FWFP03SS	13FWFP05SO	13FWFP06SO	13FWFP07SO	13FWFP04SS	13FWFP08SO
Permanent Borehole ID		AP-10261	AP-10261	AP-10261	AP-10262	AP-10262	AP-10262	AP-10263	AP-10263	AP-10263	AP-10263	AP-10264	AP-10264
Temporary Borehole ID		BH0101	BH0106	BH0115	BH0201	BH0206	BH0215	BH0301	BH0306	BH0317	BH03	BH0402	BH0406
Sample Date		10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013
Sample Depth (feet bgs)		0-1	5-6	14-15	0-1	5-6	14-15	0-1	5-6	16-17	16-17	0-2	5-6
Sample Type		N	N	N	N	N	N	N	N	N	FD	N	N
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	**210 J**	< 0.57	< 0.66	**6.6**	**65**	**4.9**	**11**	**200**	**0.18 JQ**	**0.32 JQ**	**85**	**0.28 J**
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	**0.36 J**	< 0.57	< 0.66	< 0.64	**2.5**	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	**8.7**	< 0.62
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	**0.35 J**	**0.57 J**
Perfluorobutyric acid (PFBTA)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	**0.27 J**	< 0.62
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	**0.48 J**	< 0.70	< 0.69	< 0.67	< 0.62
Perfluorododecanoic acid (PFDOA)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	< 0.67	< 0.62
Perfluorohexanoic acid (PFHA)	NA	**0.22 J**	**0.14 J**	< 0.66	< 0.64	< 0.64	< 0.61	**0.18 J**	**0.22 J**	< 0.70	< 0.69	**2.4**	**2.9**
Perfluoroheptanoic acid (PFHPA)	NA	**0.22 J**	< 0.57	< 0.66	**0.19 J**	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	**1.1**	**0.55 J**
Perfluorohexane Sulfonate (PFHXS)	NA	**1.4**	**1.5**	**0.86 J**	**1.2**	**11**	**1.5**	**1.4**	**3.7**	< 0.70	< 0.69	**16**	**7.3**
Perfluorononanoic acid (PFNA)	NA	**1.2**	< 0.57	< 0.66	< 0.64	**0.31 J**	< 0.61	< 0.64	**0.83 J**	< 0.70	< 0.69	**8.1**	< 0.62
Perfluorodecanoic acid (PFNDCA)	NA	**0.49 J**	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	< 0.67	< 0.62
Perfluorooctane Sulfonamide (PFOSA)	NA	**0.68 J**	< 0.57	< 0.66	**0.14 J**	**0.14 J**	< 0.61	**0.25 J**	**0.31 J**	< 0.70	< 0.69	**0.14 J**	< 0.62
Perfluoropentanoic acid (PFPA)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	**0.44 J**	< 0.70	< 0.69	< 0.67	**1.5**
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	< 0.67	< 0.62
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	< 0.67	< 0.62
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.63	< 0.57	< 0.66	< 0.64	< 0.64	< 0.61	< 0.64	< 0.65	< 0.70	< 0.69	< 0.67	< 0.62

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP09SO	13FWFP05SS	13FWFP10SO	13FWFP11SO	13FWFP06SS	13FWFP07SS	13FWFP12SO	13FWFP13SO	13FWFP08SS	13FWFP14SO	13FWFP15SO	13FWFP16SO
Permanent Borehole ID		AP-10264	AP-10265	AP-10265	AP-10265	AP-10266	AP-10266	AP-10266	AP-10266	AP-10267	AP-10267	AP-10267	AP-10267
Temporary Borehole ID		BH0416	BH0501	BH0506	BH0515	BH0601	BH06	BH0606	BH0616	BH0701	BH0706	BH0716	BH07
Sample Date		10/31/2013	10/31/2013	10/31/2013	10/31/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
Sample Depth (feet bgs)		15-16	0-1	5-6	14-15	0-1	0-1	5-6	15-16	0-1	5-6	15-16	15-16
Sample Type		N	N	N	N	N	FD	N	N	N	N	N	FD
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	< 0.75	**5.5**	**0.42 J**	< 0.77	**650**	**500**	< 0.61	**1.3**	**1800 ML**	**60**	**1.2 Q**	**0.60 JQ**
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	< 0.75	**0.37 J**	< 0.62	< 0.77	**17**	**18**	< 0.61	< 0.73	**12**	**16**	< 0.61	< 0.66
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	< 0.75	< 0.66	**0.29 J**	< 0.77	< 0.68	< 0.64	**1.6**	< 0.73	< 0.65	**4.1**	< 0.61	< 0.66
Perfluorobutyric acid (PFBTA)	NA	< 0.75	**0.58 J**	< 0.62	< 0.77	**0.41 J**	**0.36 J**	< 0.61	< 0.73	**1.1**	**0.99**	< 0.61	< 0.66
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.75	< 0.66	< 0.62	< 0.77	< 0.68	< 0.64	< 0.61	< 0.73	**7.5**	< 0.62	< 0.61	< 0.66
Perfluorododecanoic acid (PFDOA)	NA	< 0.75	< 0.66	< 0.62	< 0.77	< 0.68	< 0.64	< 0.61	< 0.73	< 0.65	< 0.62	< 0.61	< 0.66
Perfluorohexanoic acid (PFHA)	NA	< 0.75	**0.43 J**	**1.3**	< 0.77	**1.6**	**2.1**	**3.4**	< 0.73	**3.6**	**27**	< 0.61	< 0.66
Perfluoroheptanoic acid (PFHPA)	NA	< 0.75	**0.52 J**	**0.36 J**	< 0.77	**1.2**	**1.5**	**0.26 J**	< 0.73	**5.2**	**5.9**	< 0.61	< 0.66
Perfluorohexane Sulfonate (PFHXS)	NA	**0.91 J**	**1.1 B**	**1.7 B**	< 0.77	**21**	**19**	**0.83 B**	**1.0**	**39**	**160**	**1.1 B**	**1.0 B**
Perfluorononanoic acid (PFNA)	NA	< 0.75	< 0.66	**0.25 J**	< 0.77	**11**	**10**	< 0.61	< 0.73	**4.8 ML**	< 0.62	< 0.61	< 0.66
Perfluorodecanoic acid (PFNDCA)	NA	< 0.75	< 0.66	< 0.62	< 0.77	< 0.68	< 0.64	< 0.61	< 0.73	**1.7**	< 0.62	< 0.61	< 0.66
Perfluorooctane Sulfonamide (PFOSA)	NA	< 0.75	< 0.66	< 0.62	< 0.77	**0.14 J**	**0.16 J**	< 0.61	< 0.73	**2.0**	< 0.62	< 0.61	< 0.66
Perfluoropentanoic acid (PFPA)	NA	< 0.75	**1.0**	**1.0**	< 0.77	**1.7**	**1.9**	**1.1**	**0.36 J**	**1.1**	**10**	< 0.61	< 0.66
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.75	< 0.66	< 0.62	< 0.77	< 0.68	< 0.64	< 0.61	< 0.73	< 0.65	< 0.62	< 0.61	< 0.66
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.75	< 0.66	< 0.62	< 0.77	< 0.68	< 0.64	< 0.61	< 0.73	< 0.65	< 0.62	< 0.61	< 0.66
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.75	< 0.66	< 0.62	< 0.77	< 0.68	< 0.64	< 0.61	< 0.73	< 0.65	< 0.62	< 0.61	< 0.66

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP09SS	13FWFP17SO	13FWFP18SO	13FWFP10SS	13FWFP19SO	13FWFP20SO	13FWFP11SS	13FWFP21SO	13FWFP22S0	13FWFP12SS	13FWFP23SO	13FWFP24SO
Permanent Borehole ID		AP-10268	AP-10268	AP-10268	AP-10269	AP-10269	AP-10269	AP-10270	AP-10270	AP-10270	AP-10271	AP-10271	AP-10271
Temporary Borehole ID		BH0802	BH0806	BH0816	BH0902	BH0906	BH0918	BH1001	BH1006	BH1016	BH1101	BH1106	BH11
Sample Date		11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
Sample Depth (feet bgs)		0-2	5-6	15-16	0-2	5-6	17-18	0-1	5-6	15-16	0-1	5-6	5-6
Sample Type		N	N	N	N	N	N	N	N	N	N	N	FD
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	**800**	**0.19 J**	**0.31 J**	**1500**	**23**	< 0.61	**88**	**0.43 J**	**0.22 J**	**7600 ML**	**150**	**190**
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	**46**	**0.40 J**	< 0.63	**28**	**2.7**	< 0.61	**8.3**	**0.25 J**	< 0.62	**48**	**8.4**	**8.5**
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	**1.0 J**	**2.9**	< 0.63	**4.9**	**2.7**	< 0.61	**2.1**	**0.89**	< 0.62	**0.64 J**	**65**	**54**
Perfluorobutyric acid (PFBTA)	NA	**2.2**	**0.58 J**	< 0.63	**2.3**	**1.3**	< 0.61	**1.4**	**0.39 J**	< 0.62	**0.77 J**	**10**	**11**
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.82	< 0.67	< 0.63	< 0.67	< 0.64	< 0.61	< 0.62	< 0.60	< 0.62	< 0.65	< 0.72	< 0.72
Perfluorododecanoic acid (PFDOA)	NA	< 0.82	< 0.67	< 0.63	< 0.67	< 0.64	< 0.61	< 0.62	< 0.60	< 0.62	< 0.65	< 0.72	< 0.72
Perfluorohexanoic acid (PFHA)	NA	**6.3**	**34**	**0.30 J**	**18**	**10**	< 0.61	**2.9**	**1.9**	< 0.62	**4.5**	**100**	**100**
Perfluoroheptanoic acid (PFHPA)	NA	**4.9**	**11**	< 0.63	**9.6**	**8.0**	< 0.61	**1.4**	< 0.60	< 0.62	**6.3**	**15**	**15**
Perfluorohexane Sulfonate (PFHXS)	NA	**67**	**3.3**	**0.87 B**	**78**	**55**	< 0.61	**18**	**0.90**	**0.12 J**	**62**	**160**	**130**
Perfluorononanoic acid (PFNA)	NA	**65**	< 0.67	< 0.63	**9.1**	**0.28 J**	< 0.61	**11**	< 0.60	< 0.62	**18 ML**	< 0.72	< 0.72
Perfluorodecanoic acid (PFNDCA)	NA	**1.4**	< 0.67	< 0.63	< 0.67	< 0.64	< 0.61	< 0.62	< 0.60	< 0.62	**3.3**	< 0.72	< 0.72
Perfluorooctane Sulfonamide (PFOSA)	NA	**0.24 J**	< 0.67	< 0.63	**0.13 J**	< 0.64	< 0.61	**0.13 J**	< 0.60	< 0.62	**3.4**	**0.13 J**	**0.15 J**
Perfluoropentanoic acid (PFPA)	NA	**6.1**	**10**	< 0.63	**8.3**	**7.7**	< 0.61	**2.3**	**1.4**	**0.59 J**	**2.5**	**41**	**41**
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.82	< 0.67	< 0.63	< 0.67	< 0.64	< 0.61	< 0.62	< 0.60	< 0.62	< 0.65	< 0.72	< 0.72
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.82	< 0.67	< 0.63	< 0.67	< 0.64	< 0.61	< 0.62	< 0.60	< 0.62	< 0.65	< 0.72	< 0.72
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.82	< 0.67	< 0.63	< 0.67	< 0.64	< 0.61	< 0.62	< 0.60	< 0.62	< 0.65	< 0.72	< 0.72

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP25SO	13FWFP13SS	13FWFP26SO	13FWFP28SO	13FWFP27SO	13FWFP14SS	13FWFP29SO	13FWFP30SO	13FWFP15SS	13FWFP31SO	13FWFP32SO	13FWFP16SS
Permanent Borehole ID		AP-10271	AP-10272	AP-10272	AP-10272	AP-10272	AP-10273	AP-10273	AP-10273	AP-10274	AP-10274	AP-10274	AP-10275
Temporary Borehole ID		BH1116	BH1201	BH1206	BH12	BH1216	BH1301	BH1306	BH1319	BH1401	BH1406	BH1416	BH1502
Sample Date		11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013
Sample Depth (feet bgs)		15-16	0-1	5-6	11-12	15-16	0-1	5-6	18-19	0-1	5-6	15-16	0-2
Sample Type		N	N	N	FD	N	N	N	N	N	N	N	N
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	**16**	**630**	**2.1**	**0.41 J**	**0.60 J**	**36**	**22**	< 0.65	**20**	< 0.60	< 0.64	**0.72 JQ**
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	**0.40 J**	**3.5**	**0.48 J**	< 0.72	< 0.76	**3.2**	**0.60 J**	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	**0.33 J**	< 0.62	< 0.58	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorobutyric acid (PFBTA)	NA	< 0.71	**0.33 J**	**0.79**	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.71	< 0.62	< 0.58	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorododecanoic acid (PFDOA)	NA	< 0.71	< 0.62	**1.3 J**	< 0.72 Q	**2.0 JQ**	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorohexanoic acid (PFHA)	NA	**1.2**	**0.59 J**	**0.78**	**0.18 J**	**0.26 J**	**0.24 J**	**0.27 J**	< 0.65	< 0.69	**0.15 J**	< 0.64	< 0.66
Perfluoroheptanoic acid (PFHPA)	NA	< 0.71	**0.43 J**	**0.31 J**	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	**0.39 J**	< 0.60	< 0.64	< 0.66
Perfluorohexane Sulfonate (PFHXS)	NA	**3.5**	**3.2**	**7.8**	< 0.72	< 0.76	**2.5**	**0.94**	< 0.65	**0.59 J**	< 0.60	< 0.64	**0.92**
Perfluorononanoic acid (PFNA)	NA	< 0.71	**15**	< 0.58	< 0.72	< 0.76	**0.55 J**	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorodecanoic acid (PFNDCA)	NA	< 0.71	**0.46 J**	< 0.58	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorooctane Sulfonamide (PFOSA)	NA	< 0.71	**0.23 J**	< 0.58	< 0.72 Q	**0.12 JQ**	**0.78 J**	< 0.60	< 0.65	**0.11 J**	< 0.60	< 0.64	< 0.66
Perfluoropentanoic acid (PFPA)	NA	**0.69 J**	**0.76 J**	**1.0**	**0.48 J**	**0.37 J**	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.71	< 0.62	< 0.58	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.71	< 0.62	< 0.58	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.71	< 0.62	< 0.58	< 0.72	< 0.76	< 0.62	< 0.60	< 0.65	< 0.69	< 0.60	< 0.64	< 0.66

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP17SS	13FWFP33SO	13FWFP34SO	13FWFP18SS	13FWFP35SO	13FWFP36SO	13FWFP19SS	13FWFP37SO	13FWFP38SO	13FWFP20SS	13FWFP39SO	13FWFP40SO
Permanent Borehole ID		AP-10275	AP-10275	AP-10275	AP-10276	AP-10276	AP-10276	AP-10277	AP-10277	AP-10277	AP-10278	AP-10278	AP-10278
Temporary Borehole ID		BH15	BH1505	BH1516	BH1601	BH1605	BH1611	BH1701	BH1705	BH1716	BH1801	BH1805	BH1812
Sample Date		11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013
Sample Depth (feet bgs)		0-2	4-5	15-16	0-1	4-5	10-11	0-1	4-5	15-16	0-1	4-5	11-12
Sample Type		FD	N	N	N	N	N	N	N	N	N	N	N
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	**0.38 JQ**	< 0.66	< 0.61	**4.1**	< 0.63	< 0.73	< 0.65	< 0.59	**0.24 J**	**0.77 J**	**5.3**	< 0.64
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	< 0.66	**0.64 J**	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorobutyric acid (PFBTA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorododecanoic acid (PFDOA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorohexanoic acid (PFHA)	NA	< 0.66	**0.25 J**	< 0.61	< 0.64	**0.47 J**	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluoroheptanoic acid (PFHPA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorohexane Sulfonate (PFHXS)	NA	< 0.66	**3.5**	< 0.61	**1.1**	**1.3**	< 0.73	**0.90**	< 0.59	**1.0**	**0.38 J**	**2.0**	**0.91**
Perfluorononanoic acid (PFNA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorodecanoic acid (PFNDCA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorooctane Sulfonamide (PFOSA)	NA	< 0.66	< 0.66	< 0.61	**0.12 J**	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	**0.17 J**	< 0.60	< 0.64
Perfluoropentanoic acid (PFPA)	NA	< 0.66	**0.29 J**	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	**0.37 J**	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.66	< 0.66	< 0.61	< 0.64	< 0.63	< 0.73	< 0.65	< 0.59	< 0.74	< 0.62	< 0.60	< 0.64

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP21SS	13FWFP22SS	13FWFP41SO	13FWFP42SO	13FWFP23SS	13FWFP43SO	13FWFP44SO	13FWFP45SO	13FWFP24SS	13FWFP46SO	13FWFP47SO	13FWFP25SS
Permanent Borehole ID		AP-10279	AP-10279	AP-10279	AP-10279	AP-10280	AP-10280	AP-10280	AP-10280	AP-10281	AP-10281	AP-10281	AP-10282
Temporary Borehole ID		BH1901	BH19	BH1906	BH1915	BH2001	BH2005	BH2016	BH20	BH2101	BH2105	BH2117	BH2201
Sample Date		11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013
Sample Depth (feet bgs)		0-1	0-1	5-6	14-15	0-1	4-5	15-16	15-16	0-1	4-5	16-17	0-1
Sample Type		N	FD	N	N	N	N	N	FD	N	N	N	N
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	**270**	**190**	**58**	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	**490**
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	**2.5**	**2.6**	**15**	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	**9.3**
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluorobutyric acid (PFBTA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluorododecanoic acid (PFDOA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluorohexanoic acid (PFHA)	NA	**0.88**	**0.69 J**	**1.2**	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	**0.67 J**
Perfluoroheptanoic acid (PFHPA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	**1.0**
Perfluorohexane Sulfonate (PFHXS)	NA	**12**	**8.7**	**36**	**0.64 J**	**0.94**	**0.65 J**	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	**22**
Perfluorononanoic acid (PFNA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	**14**
Perfluorodecanoic acid (PFNDCA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluorooctane Sulfonamide (PFOSA)	NA	**1.8**	**2.9**	**0.11 J**	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	**0.12 J**	< 0.60	< 0.64	**0.20 J**
Perfluoropentanoic acid (PFPA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	**0.33 J**	< 0.64	**0.72 J**
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.65	< 0.69	< 0.61	< 0.62	< 0.65	< 0.60	< 0.66	< 0.65	< 0.73	< 0.60	< 0.64	< 0.77

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP48SO	13FWFP49SO	13FWFP50SO	13FWFP26SS	13FWFP51SO	13FWFP52SO	13FWFP53SO	13FWFP27SS	13FWFP54SO	13FWFP55SO	13FWFP28SS	13FWFP56SO
Permanent Borehole ID		AP-10282	AP-10282	AP-10282	AP-10283	AP-10283	AP-10283	AP-10283	AP-10284	AP-10284	AP-10284	AP-10285	AP-10285
Temporary Borehole ID		BH2206	BH22	BH2216	BH2301	BH2306	BH2315	BH23	BH2401	BH2406	BH2415	BH2501	BH2506
Sample Date		11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013
Sample Depth (feet bgs)		5-6	5-6	15-16	0-1	5-6	14-15	14-15	0-1	5-6	14-15	0-1	5-6
Sample Type		N	FD	N	N	N	N	FD	N	N	N	N	N
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**												
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	**0.79**	**0.96**	< 0.76	**42**	**710**	< 0.74	< 0.73	**15**	< 0.62	< 0.74	**11**	**4.0**
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	**1.0**	**1.5**	< 0.76	**5.7**	**2.4**	< 0.74	< 0.73	**12**	**0.24 J**	< 0.74	< 0.63	**0.40 J**
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	**0.48 J**	**0.37 J**	< 0.76	< 0.68	**0.92**	**0.28 J**	**0.29 J**	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65
Perfluorobutyric acid (PFBTA)	NA	< 0.59	< 0.60	< 0.76	**0.92**	**0.25 J**	< 0.74	**0.32 JQ**	**1.7**	**0.19 J**	< 0.74	< 0.63	< 0.65
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.59	< 0.60	< 0.76	< 0.68	**0.86**	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65
Perfluorododecanoic acid (PFDOA)	NA	< 0.59	< 0.60	< 0.76	< 0.68	< 0.61	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65
Perfluorohexanoic acid (PFHA)	NA	**1.8**	**2.1**	< 0.76	**1.9**	**3.7**	**0.63 J**	**0.55 J**	**3.4**	**1.4**	< 0.74	< 0.63	< 0.65
Perfluoroheptanoic acid (PFHPA)	NA	**0.71 J**	**0.86**	< 0.76	**3.6**	**0.73 J**	< 0.74	< 0.73	**3.5**	**0.17 J**	< 0.74	< 0.63	**0.18 J**
Perfluorohexane Sulfonate (PFHXS)	NA	**17**	**18**	**0.92 J**	**8.2**	**14**	**1.0**	< 0.73	**4.2**	**1.0**	< 0.74	< 0.63	**1.4**
Perfluorononanoic acid (PFNA)	NA	< 0.59	< 0.60	< 0.76	**1.6**	**0.62 J**	< 0.74	< 0.73	**2.9**	< 0.62	< 0.74	< 0.63	< 0.65
Perfluorodecanoic acid (PFNDCA)	NA	< 0.59	< 0.60	< 0.76	**2.2**	< 0.61	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65
Perfluorooctane Sulfonamide (PFOSA)	NA	< 0.59	< 0.60	< 0.76	**4.0**	**0.40 J**	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	**0.27 J**	< 0.65
Perfluoropentanoic acid (PFPA)	NA	**0.83**	**1.3**	< 0.76	**1.8**	**1.6**	**0.60 J**	**0.56 J**	**3.3**	**3.7**	< 0.74	**0.30 J**	< 0.65
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.59	< 0.60	< 0.76	< 0.68	< 0.61	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.59	< 0.60	< 0.76	< 0.68	< 0.61	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.59	< 0.60	< 0.76	**1.5**	< 0.61	< 0.74	< 0.73	< 0.64	< 0.62	< 0.74	< 0.63	< 0.65

Table 2-2 - Historical Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID		13FWFP57SO
Permanent Borehole ID		AP-10285
Temporary Borehole ID		BH2515
Sample Date		11/04/2013
Sample Depth (feet bgs)		14-15
Sample Type		N
Analyte (µg/kg)	**OSD Risk Screening Level (µg/kg)**	
Perfluorooctane Sulfonate (PFOS)	130 (R); 1600 (I/C)	< 0.59
Perfluorooctanoic acid (PFOA)	130 (R); 1600 (I/C)	< 0.59
Perfluorobutane Sulfonate (PFBS)	1,900 (R); 25,000 (I/C)	< 0.59
Perfluorobutyric acid (PFBTA)	NA	< 0.59
Perfluorodecane Sulfonate (PFDCS)	NA	< 0.59
Perfluorododecanoic acid (PFDOA)	NA	< 0.59
Perfluorohexanoic acid (PFHA)	NA	< 0.59
Perfluoroheptanoic acid (PFHPA)	NA	< 0.59
Perfluorohexane Sulfonate (PFHXS)	NA	< 0.59
Perfluorononanoic acid (PFNA)	NA	< 0.59
Perfluorodecanoic acid (PFNDCA)	NA	< 0.59
Perfluorooctane Sulfonamide (PFOSA)	NA	< 0.59
Perfluoropentanoic acid (PFPA)	NA	< 0.59
Perfluorotetradecanoic acid (PFTEDA)	NA	< 0.59
Perfluorotridecanoic acid (PFTRIDA)	NA	< 0.59
Perfluoroundecanoic acid (PFUNDCA)	NA	< 0.59

Notes:

1. Historical data are as provided by the laboratory in source reports (Fairbanks Environmental Services, Inc. 2014. Former Fire Training Pits Investigation, Fort Wainwright Alaska. April.)

2. **Bolded** data indicate detections.

3. If samples were collected from less than 2 feet bgs, soil data are screened against both the residential receptor scenario and industrial/commercial scenario risk screening levels provided by the Office of the Secretary of Defense (OSD; Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.). If samples were collected from 2 feet to 15 feet bgs, soil data are screened against the industrial/commercial scenario risk screening levels only. Soil data from samples collected deeper than 15 feet bgs are not compared to screening criteria.

4. Grey shaded data indicate concentrations greater than the residential receptor scenario risk screening levels (OSD 2021).

5. Underlined data indicate concentrations greater than the industrial/commercial receptor scenario risk screening levels (OSD 2021).

Acronyms/Abbreviations:
< - analyte not detected at a concentration greater than the limit of detection; concentration is provided as less than the limit of detection
µg/kg - micrograms per kilogram (parts per billion)
bgs - below ground surface
FD - field duplicate
I/C - industrial/commercial receptor scenario
ID - identification
N - normal
NA - not applicable
PFAS - per- and polyfluoroalkyl substances
R - residential receptor scenario

Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the limit of quantitation
M - result considered an estimate (L - low; H - high) due to matrix interference
Q - result considered an estimate (L - low; H - high) due to a quality control failure

Table 2-3 - Historical Wastewater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Sample ID	FTWW Grab Composite*	KKV706 (MH-1153)*
Location	Unknown (Golden Heart Utilities)	Unknown (Golden Heart Utilities)
Laboratory	Pollen	Bureau Veritas
Sample Date	6/19/2019	7/30/2019
Sample Type	N	N
Analyte (µg/L)		
Perfluorooctane Sulfonate (PFOS)	**0.013**	**0.037**
Perfluorooctanoic acid (PFOA)	**0.0036**	< 0.0074
Perfluorobutane Sulfonate (PFBS)	**0.0034**	NA
Perfluorobutyric acid (PFBTA)	NA	NA
Perfluorodecane Sulfonate (PFDCS)	NA	NA
Perfluorododecanoic acid (PFDOA)	NA	NA
Perfluorohexanoic acid (PFHA)	NA	NA
Perfluoroheptanoic acid (PFHPA)	**0.0011**	< 0.0071
Perfluorohexane Sulfonate (PFHXS)	**0.0063**	< 0.0052
Perfluorononanoic acid (PFNA)	**0.0011 J**	< 0.0049
Perfluorodecanoic acid (PFNDCA)	NA	NA
Perfluorooctane Sulfonamide (PFOSA)	NA	NA
Perfluoropentanoic acid (PFPA)	NA	NA
Perfluorotetradecanoic acid (PFTEDA)	NA	NA
Perfluorotridecanoic acid (PFTRIDA)	NA	NA
Perfluoroundecanoic acid (PFUNDCA)	NA	NA

Notes:

1. Historical data are as provided in various stand-alone laboratory reports provided by Doyon Utilities and the United States Army Corps of Engineers.
2. **Bolded** data indicate detections.
3. *Samples were collected from Golden Heart Utilities' wastewater collection system. Locations of sample collection are unknown.

Acronym/Abbreviations:

< - analyte not detected at a concentration greater than the limit of detection; concentration is provided as less than the limit of detection
µg/L - micrograms per liter (parts per billion)
FTWW - Fort Wainwright
ID - identification
N - normal
NA - not applicable
PFAS - per- and polyfluoroalkyl substances

Qualifiers:

J - result qualified as estimate because it is less than the limit of quantitation

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

Area of Potential Interest	Sampling Location ID[1]	Total Well Depth	Measuring Point Elevation	Measuring Point	August 2020 Depth to Groundwater from MP	August 2020 Groundwater Elevation	Screened Interval	Casing Diameter	Dedicated Bladder Pump
		(ft bgs)	(ft amsl)		(ft)	(ft amsl)	(ft bgs)	(inches)	(Y/N)
Boundary Monitoring Points	FTWW-DPT-1-GW	15	NM	GS	12.0	NC	11 - 15	NA	N
	FTWW-DPT-2-GW	15	NM	GS	12.0	NC	11 - 15	NA	N
	FTWW-DPT-3-GW	10	NM	GS	5.0	NC	4 - 8	NA	N
	FTWW-DPT-4-GW	15	NM	GS	9.5	NC	8.5 - 12.5	NA	N
	FTWW-DPT-5-GW	15	NM	GS	9.0	NC	8 - 12	NA	N
	FTWW-AP-7559	16	456	TOC	9.6	446.4	6 - 16	2	N
Taxiway E	FTWW-DPT-6-GW	15	NM	GS	9.7	NC	9 - 13	NA	N
Taxiway D	FTWW-DPT-7-GW	15	NM	GS	10.0	NC	9 - 13	NA	N
	FTWW-AP-6006	29.15	444.97	TOC	13.7	431.3	8.8 - 24.15	2	N
B2118 Flight Line Refill Point	FTWW-DPT-8-GW	15	NM	GS	10.0	NC	9 - 13	NA	N
Hangar 6	FTWW-DPT-9-GW	11	NM	GS	8.0	NC	7 - 11	NA	N
Fire Training Area	FTWW-DPT-10-GW	11	NM	GS	8.0	NC	7 - 11	NA	N
FTP-3A and 3B	FTWW-AP-10266MW	19	451.9	TOC	9.9	442.0	9 - 19	NA	N
	FTWW-AP-10278MW	18	449.9	TOC	6.6	443.2	8 - 18	NA	N
Hangar 1	FTWW-AP-6386	25.24	450.8	TOC	17.6	433.3	12 - 22	2	N
Fire Station #2 Training Area	FTWW-MW-38	19	449.6	TOC	12.4	437.2	NA	NA	N
	FTWW-MW-77	22.7	448 [2]	TOC	15.6	432.4	10.0 - 19.5	NA	N
	FTWW-MW-82	21.7	448 [2]	TOC	15.0	433.0	NA	NA	N
Landfill (FTWW-038)	FTWW-FWLF-03	25.3	447.0	TOC	14.1	432.9	13.5 - 23.5	NA	N
	FTWW-AP-10257MW	21.5	452 [2]	TOC	15.9	436.1	NA	NA	N
	FTWW-AP-6574A	57.3	440.6	TOC	10.1	430.5	47.7 - 57.3	NA	N
Drum Site West of DRMO	FTWW-AP-5966	15.7	449.6	TOC	6.9	442.7	7 - 17.3	NA	N
North Refueling	FTWW-Unnamed [2]	2	454 [2]	NA	NA	NA	NA	NA	Y
Biosolids Application Site	FTWW-B2077-MW01	25	455 [2]	TOC	11.8	443.2	13.0 - 23.0	2	N
Potable Water Supply Wells	FTWW-DW-1032 [3]	58	453 [2]	TOC	NA	NA	NA	12	N
	FTWW-DW-3003 [3]	160	451 [2]	TOC	NA	NA	NA	8	N

Notes:
1. Permanent wells were not installed at the DPT sampling locations. The total depth listed indicates the total depth of the temporary borehole; the screened interval listed for DPT sampling points indicates the interval at which the drill casing was retracted for collection of a grab groundwater sample through a decontaminated screen-point sampler.

2. A dedicated pump in the well prohibited measuring depth to water.
3. Potable water supply wells were sampled through the sampling port. Depths to water could not be measured.

Acronyms/Abbreviations:
amsl - above mean sea level
bgs - below ground surface
DPT - direct push technology (drilling method)
DRMO - Defense Reutilization and Marketing Office
ft - feet
FTP - fire training pit
FTWW - Fort Wainwright
GS - ground surface
ID - identification
MP - measuring point
NA - not available
NC - not calculated
NM - not measured (not surveyed)
TOC - top of casing

Sources:
1. United States Army Corps of Engineers. 1992. Groundwater Monitoring Network, Fort Wainwright, AK. August.
2. Communications with Fort Wainwright.

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

					Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
					OSD Tapwater RiskScreening Level	40		40		600	
Associated AOPI	Location Type	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Boundary Monitoring	Temporary (DPT)	FTWW-DPT-1	FTWW-DPT-1-GW-08052020	08/05/2020	N	**4.2**		**2.9**	J	3.8	U
					FD	**5.9**		**3.0**	J	3.8	U
		FTWW-DPT-2	FTWW-DPT-2-GW-08052020	08/05/2020	N	3.7	U	3.7	U	3.7	U
		FTWW-DPT-3	FTWW-DPT-3-GW-08072020	08/07/2020	N	3.8	U	3.8	U	3.8	U
		FTWW-DPT-4	FTWW-DPT-4-GW-08052020	08/05/2020	N	**4.3**		**5.9**		**6.2**	
		FTWW-DPT-5	FTWW-DPT-5-GW-08072020	08/07/2020	N	**2.6**	J	3.8	U	3.8	U
FTP-3A and 3B	Monitoring Well	FTWW-AP-10266MW	FTWW-AP-10266MW-08122020	08/12/2020	N	**370**		**1200**		**3900**	DJ
				08/12/2020	FD	**360**		**1100**		**4000**	DJ
	Monitoring Well	FTWW-AP-10278MW	FTWW-AP-10278MW-08122020	08/12/2020	N	**2300**	DJ	**200**		**6.4**	
LAAF Hangar 6	Temporary (DPT)	FTWW-DPT-9	FTWW-DPT-9-GW-08062020	08/06/2020	N	**3300**	DJ	**39**		**25**	
Taxiway E	Temporary (DPT)	FTWW-DPT-6	FTWW-DPT-6-GW-08062020	08/06/2020	N	**340**		**77**		**55**	
Taxiway D	Monitoring Well	FTWW-AP-6006	FTWW-AP-6006-08112020	08/11/2020	N	**17**		**7.3**		**4.9**	
	Temporary (DPT)	FTWW-DPT-7	FTWW-DPT-7-GW-08062020	08/06/2020	N	**58**		**29**		**29**	
Fire Station #1	Supply Well	FTWW-DW-3003	FTWW-DW-3003-08102020	08/10/2020	N	3.5	U	3.5	U	3.5	U
					FD	3.7	U	3.7	U	3.7	U
B2118 Flight Line Refill Point	Temporary (DPT)	FTWW-DPT-8	FTWW-DPT-8-GW-08062020	08/06/2020	N	**36**		**7.3**		**9.0**	
LAAF Hangar 1	Monitoring Well	FTWW-AP-6386	FTWW-AP-6386-08102020	08/10/2020	N	**32**		**110**		**15**	
	Supply Well	FTWW-DW-1032	FTWW-DW-1032-08102020	08/10/2020	N	**11**		**22**		**1.9**	J
Fire Station #2 (Building 4390) and Training Area	Monitoring Well	FTWW-MW-38	FTWW-MW-38-08122020	08/12/2020	N	**20**		**4.6**		**12**	
	Monitoring Well	FTWW-MW-77	FTWW-MW-77-08122020	08/12/2020	N	3.9	U	**21**		**6500**	DJ
	Monitoring Well	FTWW-MW-82	FTWW-MW-82-08122020	08/12/2020	N	**40**		4.0	U	**2.5**	J
Fire Training Area	Temporary (DPT)	FTWW-DPT-10	FTWW-DPT-10-GW-08072020	08/07/2020	N	**2.0**	J	**28**		**220**	
Landfill	Monitoring Well	FTWW-AP-10257MW	FTWW-AP-10257MW-08122020	08/12/2020	N	3.9	U	**2.7**	J	**2.4**	J
	Monitoring Well	FTWW-AP-6574A	FTWW-AP-6574A-08122020	08/12/2020	N	4.0	U	**13**		**5.5**	
	Monitoring Well	FTWW-FWLF-03	FTWW-FWLF-03-08122020	08/12/2020	N	4.2	U	4.2	U	4.2	U
DRMO Yard and Drum Site	Monitoring Well	FTWW-AP-5966	FTWW-AP-5966-08112020	08/11/2020	N	**3.7**		**35**		3.7	U
	Monitoring Well	FTWW-AP-7559	FTWW-AP-7559-08112020	08/11/2020	N	**970**	DJ	**49**		**11**	
North Refueling	Supply Well	FTWW-UNNAMED	FTWW-UNNAMED-WELL-08102020	08/10/2020	N	**3.9**		**4.3**		3.6	U
Biosolids Application Site	Monitoring Well	FTWW-B2077-MW01	FTWW-B2077-MW01-08112020	08/11/2020	N	**3.5**	J	3.8	U	3.8	U
Fire Station #3 Building 1054	Monitoring Well	FTWW-15B1054-MW01	FTWW-15B1054-MW01-060721	06/07/2021	N	**5.4**		**32**		**31**	J-
	Monitoring Well		FTWW-FD-1-GW-060721	06/07/2021	FD	**6.2**		**37**		**28**	
	Monitoring Well	FTWW-15B1054-MW03	FTWW-15B1054-MW03-060721	06/07/2021	N	**24**		**59**		**54**	

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection.

2. Gray shaded values indicate the result was detected greater than the residential tapwater risk screening levels provided by the Office of the Secretary of Defense (OSD; OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Acronyms/Abbreviations:

AOPI - Area of Potential Interest
DPT - direct push technology
DRMO - Defense Reutilization and Marketing Office
FD - field duplicate sample
FTWW - Fort Wainwright
GW - groundwater
ID - identification
LAAF - Ladd Army Airfield
MW - monitoring well
N - primary sample
ng/L - nanograms per liter (parts per trillion)
PFAS - per- and polyfluoroalkyl substances
PFBS - perfluorobutanesulfonic acid
PFOA - perfluorooctanoic acid
PFOS - perfluorooctane sulfonate
Qual - qualifier

Qualifiers:

DJ = The analyte was analyzed at dilution and the result is an estimated quantity.
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but the result was not detected above the limit of quantitation.

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

				Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	1.6		1.6		25	
				OSD Residential RiskScreening Levels	0.13		0.13		1.9	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
LAAF Hangar 6	FTWW-H6-1	FTWW-H6-1-SO-08062020	08/06/2020	N	**0.0024**		0.0010	U	0.0010	U
				FD	**0.0030**		0.0011	U	0.0011	U
	FTWW-H6-2	FTWW-H6-2-SO-08112020	08/11/2020	N	**0.0050**		0.0011	U	0.0011	U
	FTWW-H6-3	FTWW-H6-3-SO-08112020	08/11/2020	N	**0.00053**	J	0.00099	U	0.00099	U
Taxiway E	FTWW-TAXIE-1	FTWW-TAXIE-1-SO-08062020	08/06/2020	N	**0.084**		0.0013	U	0.0013	U
				FD	**0.070**		0.0010	U	0.0010	U
	FTWW-TAXIE-2	FTWW-TAXIE-2-SO-08112020	08/11/2020	N	**0.0013**		0.0010	U	0.0010	U
	FTWW-TAXIE-3	FTWW-TAXIE-3-SO-08102020	08/10/2020	N	***2.0***	DJ	**0.0040**		**0.0019**	
Taxiway D	FTWW-TAXID-1	FTWW-TAXID-1-SO-08062020	08/06/2020	N	**0.072**		0.0013	U	0.0013	U
	FTWW-TAXID-2	FTWW-TAXID-2-SO-08112020	08/11/2020	N	**0.0035**		0.0012	U	0.0012	U
	FTWW-TAXID-3	FTWW-TAXID-3-SO-08112020	08/11/2020	N	**0.019**		0.0011	U	0.0011	U
Fire Station #1	FTWW-FS1-1	FTWW-FS1-1-SO-08102020	08/10/2020	N	**0.014**		0.0010	U	0.0010	U
	FTWW-FS1-2	FTWW-FS1-2-SO-08102020	08/10/2020	N	**0.0011**		0.0011	U	0.0011	U
B2118 Flight Line Refill Point	FTWW-FLRP-1	FTWW-FLRP-1-SO-08062020	08/06/2020	N	0.0010	U	0.0010	U	0.0010	U
	FTWW-FLRP-2	FTWW-FLRP-2-SO-08112020	08/11/2020	N	0.0010	U	0.0010	U	0.0010	U
LAAF Hangar 1	FTWW-H1-1	FTWW-H1-1-SO-08102020	08/10/2020	N	**0.0011**		0.0009	U	0.0009	U
				FD	**0.0011**		0.00093	U	0.00093	U
	FTWW-H1-2	FTWW-H1-2-SO-08102020	08/10/2020	N	**0.0013**		0.00093	U	0.00093	U
Fire Station #2 (Building 4390) and Training Area	FTWW-FS2-1	FTWW-FS2-1-SO-08072020	08/07/2020	N	**0.0027**		0.0013	U	0.0013	U
	FTWW-FS2-2	FTWW-FS2-2-SO-08072020	08/07/2020	N	**0.0015**		0.0009	U	0.0009	U
Fire Training Area	FTWW-FTA-1	FTWW-FTA-1-SO-08072020	08/07/2020	N	**0.0090**		0.00097	U	0.00097	U
	FTWW-FTA-2	FTWW-FTA-2-SO-08072020	08/07/2020	N	**0.0011**	J	0.0012	U	0.0012	U
	FTWW-FTA-3	FTWW-FTA-3-SO-08072020	08/07/2020	N	**0.0030**		0.00098	U	0.00098	U
North Refueling	FTWW-REFUEL-1	FTWW-REFUEL-1-SO-08102020	08/10/2020	N	**0.00088**	J	0.0010	U	0.0010	U
	FTWW-REFUEL-2	FTWW-REFUEL-2-SO-08102020	08/10/2020	N	**0.0018**		0.0011	U	0.0011	U
Biosolids Application Site	FTWW-BSAS-1	FTWW-BSAS-1-SO-08112020	08/11/2020	N	**0.00057**	J	0.0011	U	0.0011	U
	FTWW-BSAS-2	FTWW-BSAS-2-SO-08112020	08/11/2020	N	**0.048**		**0.00057**	J	0.00097	U
	FTWW-BSAS-3	FTWW-BSAS-3-SO-08112020	08/11/2020	N	**0.00053**	J	0.0010	U	0.0010	U
Fire Station #3 Building 1054	FTWW-FS3-1	FTWW-FS3-1-SO-060721	06/07/2021	N	**0.0023**		0.00097	U	0.00097	U
	FTWW-FS3-2	FTWW-FS3-2-SO-060721	06/07/2021	N	**0.0047**		0.00086	U	0.00086	U
	FTWW-FS3-3	FTWW-FS3-3-SO-060721	06/07/2021	N	**0.0041**	J-	0.0011	U	0.0011	U
		FTWW-FD-1-SO-060721	06/07/2021	FD	**0.0042**		0.00098	U	0.00098	U

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection
2. Data are compared to the 2019 Office of the Secretary of Defense (OSD) risk screening levels for the residential and commercial/industrial scenario (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).
3. Grey shaded values indicate the result was detected greater than or equal to the OSD risk screening level for the residential scenario. Italicized values indicate the result was detected greater than the OSD risk screening level for the industrial/commercial and residential scenario.

Acronyms/Abbreviations:

AOPI - Area of Potential Interest
FD - field duplicate sample
FTWW - Fort Wainwright
ID - identification
LAAF - Ladd Army Airfield
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
SO - soil

Qualifier	Description
DJ	The analyte was analyzed at dilution and the result is an estimated quantity.
J	The analyte was positively identified; however the associated numerical value is an estimated concentration only.
J-	The result is an estimated quantity; the result may be biased low.
U	The analyte was analyzed for but the result was not detected above the limit of quantitation.

Table 7-3 - Surface Water PFOS, PFOA, and PFBS Analytical Results
USAEC Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

				Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				OSD Tapwater RiskScreening Level	40		40		600	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Taxiway E	FTWW-TAXIE-4	FTWW-TAXIE-4-SW-08102020	08/10/2020	N	**880**	DJ	**69**		**70**	
				FD	**480**	J	**65**		**68**	

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection.

2. Gray shaded values indicate the result was detected greater than the residential tapwater risk screening levels provided by the Office of the Secretary of Defense (OSD; 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
FTWW - Fort Wainwright
ID - identification
N - primary sample
ng/L - nanograms per liter (parts per trillion)
PFAS - per- and polyfluoroalkyl substances
PFBS - perfluorobutanesulfonic acid
PFOA - perfluorooctanoic acid
PFOS - perfluorooctane sulfonate
Qual - qualifier
SW - surface water

Qualifiers:

DJ = The analyte was analyzed at dilution and the result is an estimated quantity.
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.

Table 7-4 - Sediment PFOS, PFOA, and PFBS Analytical Results
USAEC Preliminary Assessment/Site Inspection
Fort Wainwright, Alaska

					Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Taxiway E	FTWW-TAXIE-4	FTWW-TAXIE-4-SE-08112020	08/11/2020	N	**0.010**		0.0014	U	0.0014	U
			08/11/2020	FD	**0.0092**		0.0013	U	0.0013	U

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection.

Acronyms/Abbreviations:

AOPI = Area of Potential Interest
FD = field duplicate sample
ID = identification
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
OSD - Office of the Secretary of Defense
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SE - sediment

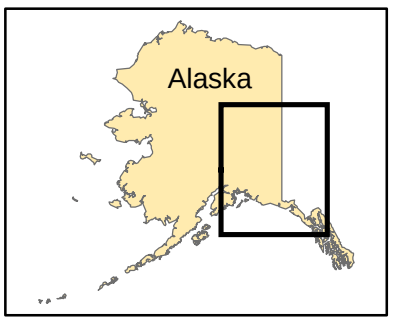
Qualifiers;

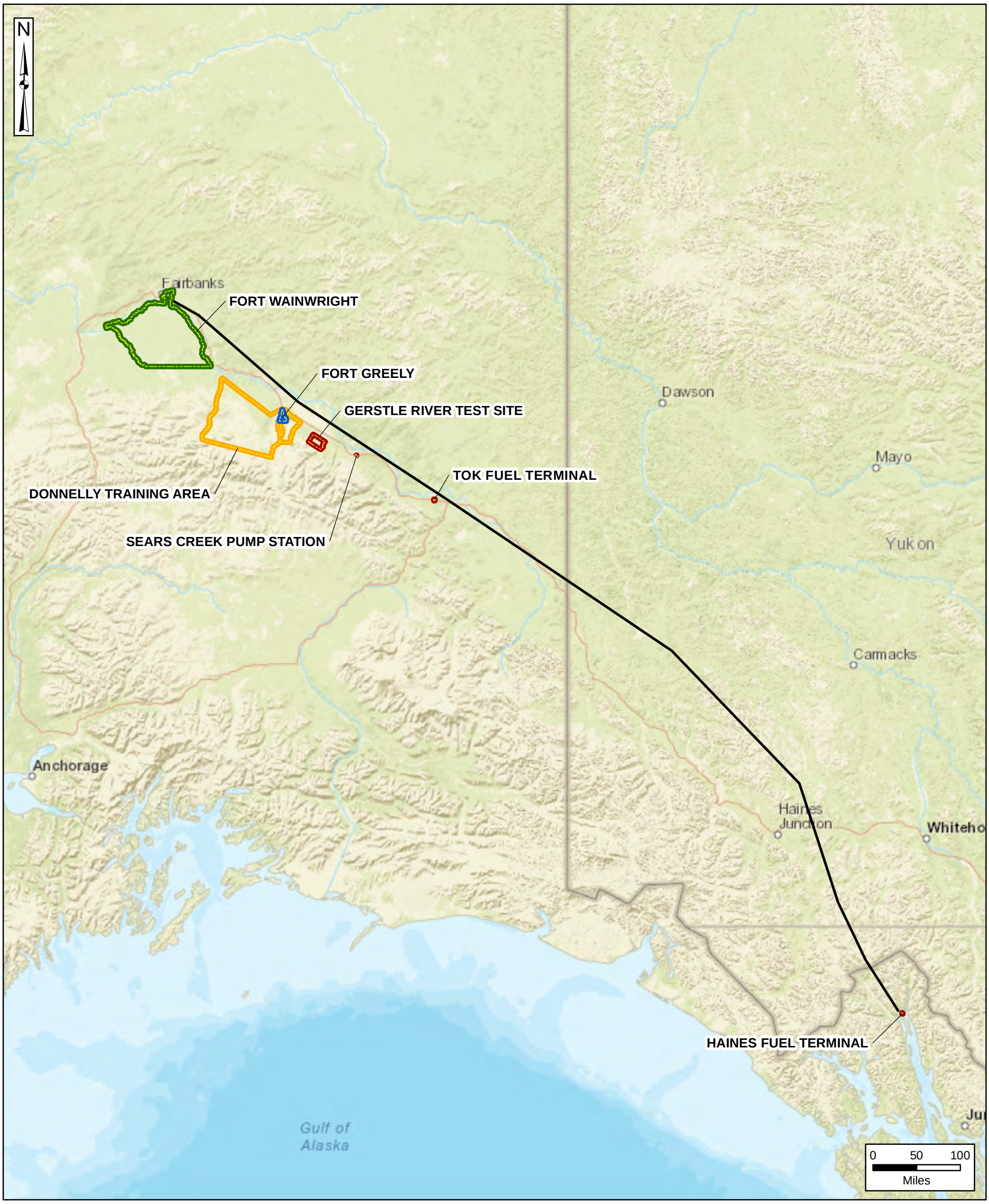
U = The analyte was analyzed for but the result was not detected above the limit of quantitation.

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 2-1
Site Location





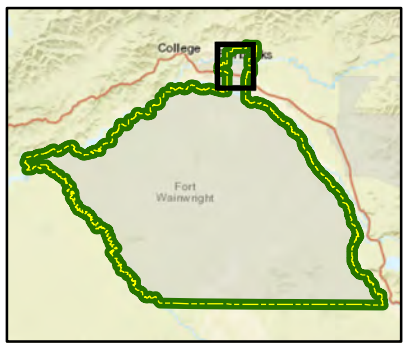
Fort Wainwright
Fort Wainwright Sub-Installation
Donnelly Training Area Not Part of Program Scope
Fort Greely
Haines-Fairbanks Pipeline

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, World Street Map

Coordinate System:
World Mercator

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 2-2
Site Layout



Installation Boundary
Building
River/Stream
Water Body

Installation Water Supply Well

BLM = Bureau of Land Management
CHPP=Central Heat and Power Plant

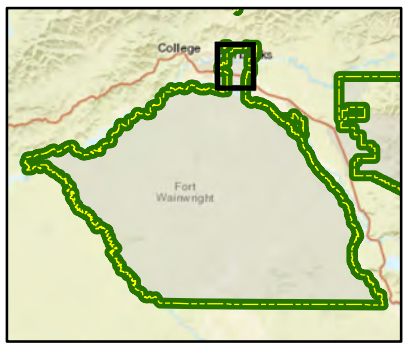
Note:
1. *Only potable water wells 3559A/B are used for drinking water supply. Wells 3565 and 3563 are backup potable water supply wells, and the remainder are used for back-up fire support or are stand alone potable wells.
2. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

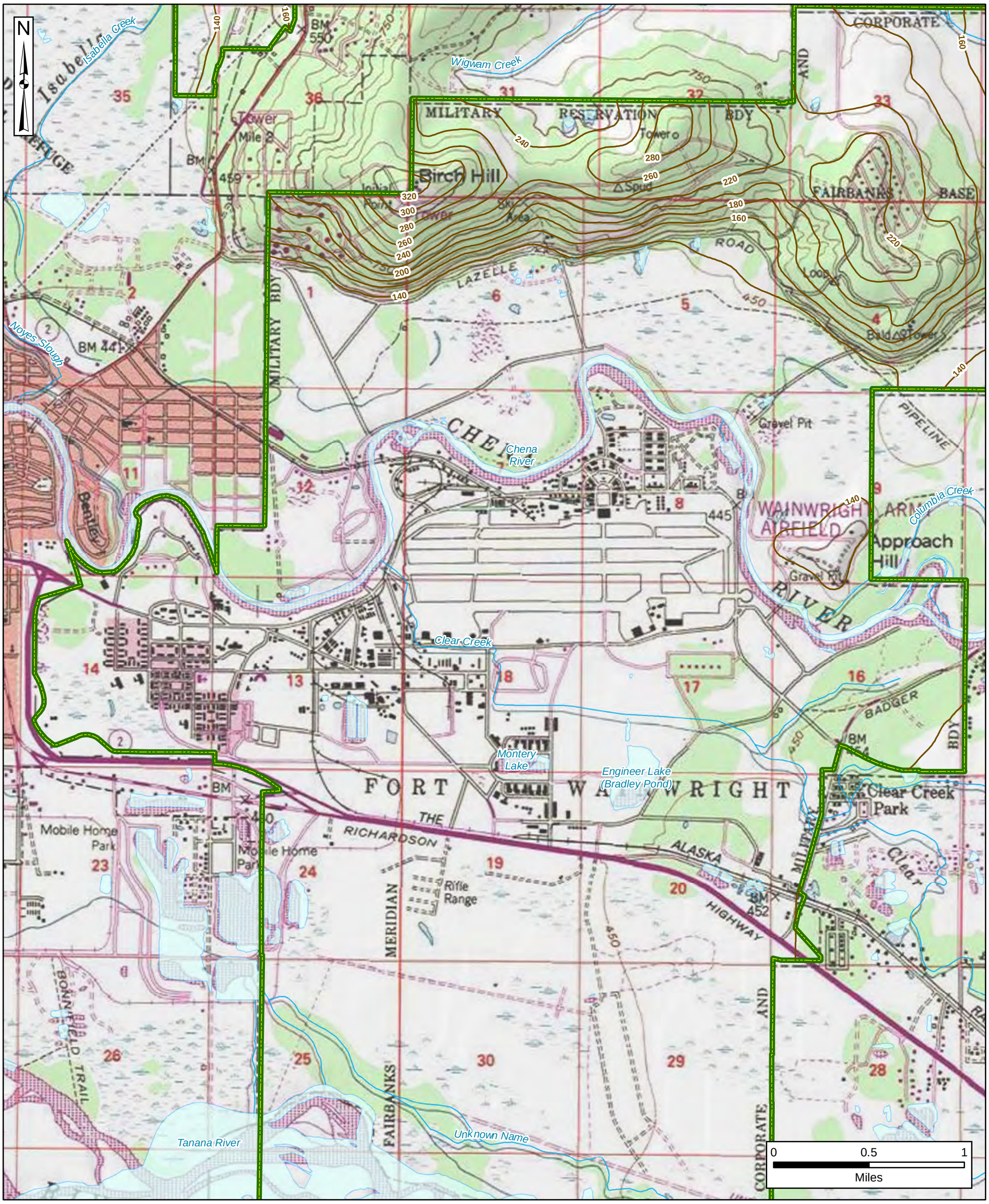
Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 2-3
Topographic Map





- Installation Boundary
- River/Stream
- Water Body
- Elevation Contour (feet)

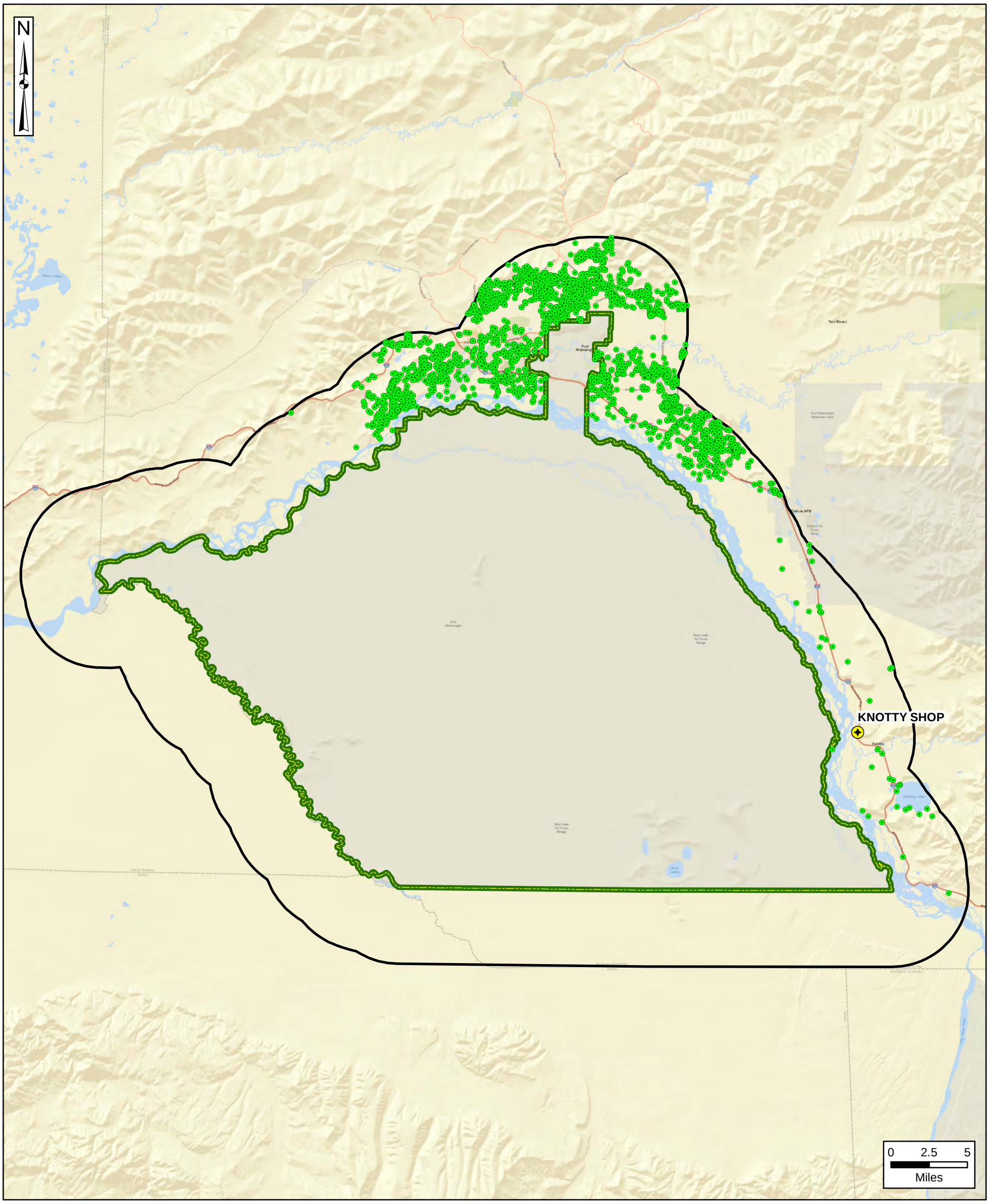
Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Topo Map

Coordinate System:
WGS 1984, UTM Zone 6 North

Note:
1. Elevation contours shown were provided by For Wainwright.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 2-4a
Off-Post Potable Wells



Installation Boundary

5-Mile Radius

Public Supply Well

Alaska DNR Water Well*

*Well data was obtained from Alaska Department of Natural Resources (DNR). Well use designation and status were not provided.

Data Sources:
Fort Wainwright, GIS Data, 2018
EDR, Well Data, 2018
AK DNR, Well Data, 2020
ESRI ArcGIS Online, World Street Map

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

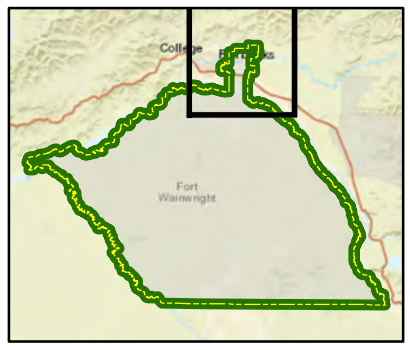


Figure 2-4b
Off-Post Potable Wells within 5 Miles of the Cantonment Area

N

0 1 2
Miles

Installation Boundary

5-Mile Radius

Alaska DNR Water Well*

Data Sources:
Fort Wainwright, GIS Data, 2018
AK DNR, Well Data, 2020
ESRI ArcGIS Online, World Street Map

Coordinate System:
WGS 1984, UTM Zone 6 North

*Well data was obtained from Alaska Department of Natural Resources (DNR). Well use designation and status were not provided.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

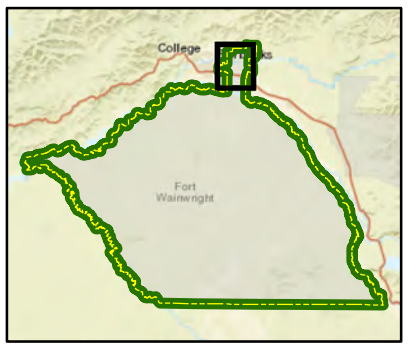
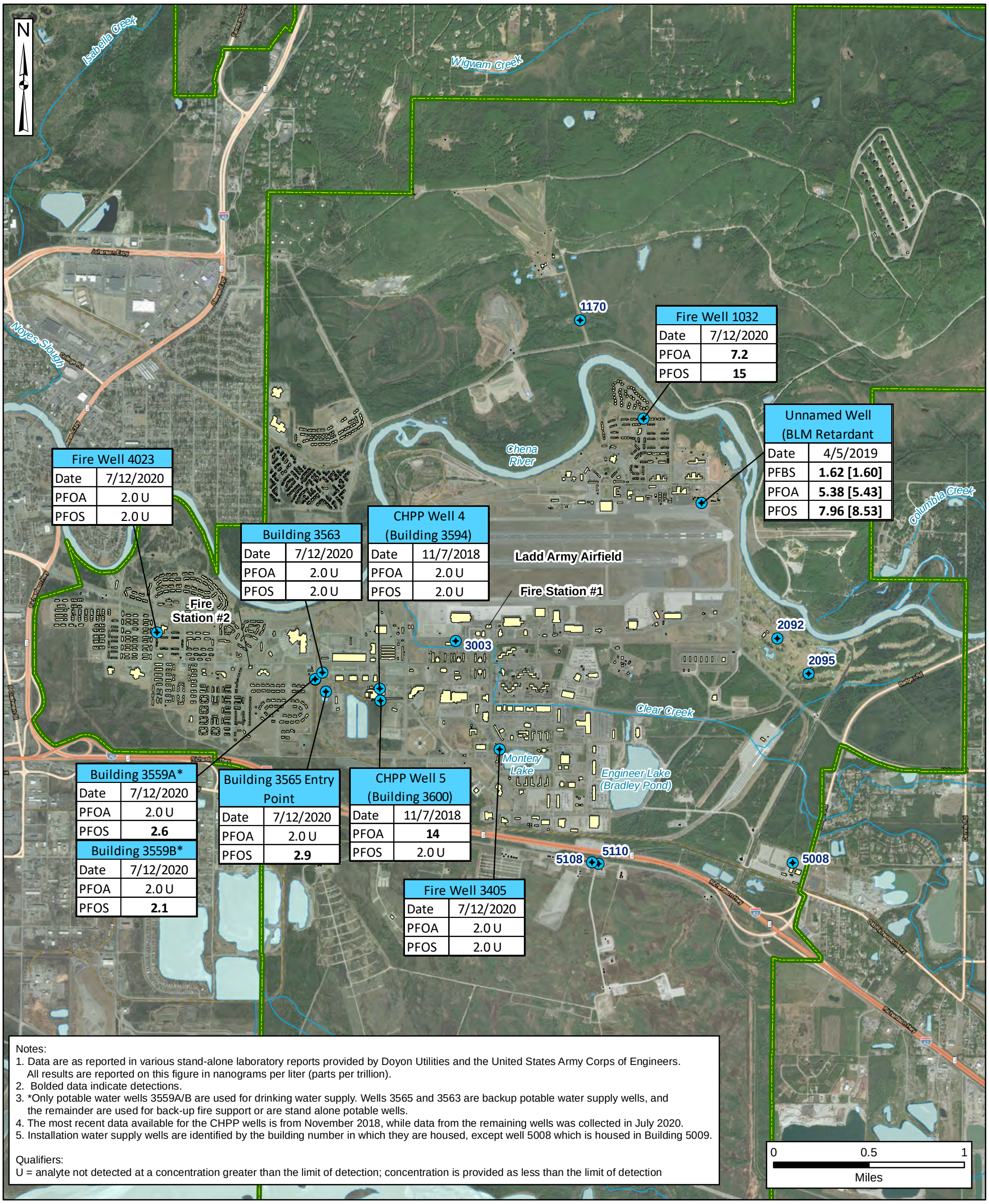


Figure 2-5
Previous PFOS and PFOA Analytical Results at Installation Supply Wells



Notes:
1. Data are as reported in various stand-alone laboratory reports provided by Doyon Utilities and the United States Army Corps of Engineers. All results are reported on this figure in nanograms per liter (parts per trillion).
2. Bolded data indicate detections.
3. *Only potable water wells 3559A/B are used for drinking water supply. Wells 3565 and 3563 are backup potable water supply wells, and the remainder are used for back-up fire support or are stand alone potable wells.
4. The most recent data available for the CHPP wells is from November 2018, while data from the remaining wells was collected in July 2020.
5. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

Qualifiers:
U = analyte not detected at a concentration greater than the limit of detection; concentration is provided as less than the limit of detection

Installation Boundary
Building
River/Stream
Water Body
Installation Water Supply Well

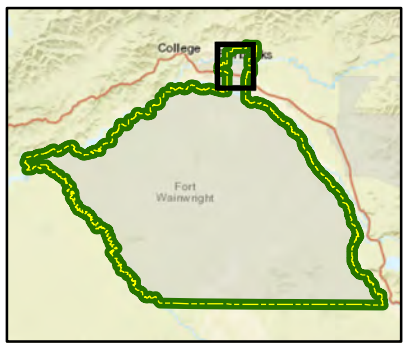
BLM = Bureau of Land Management
CHPP = Central Heating and Power Plant
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

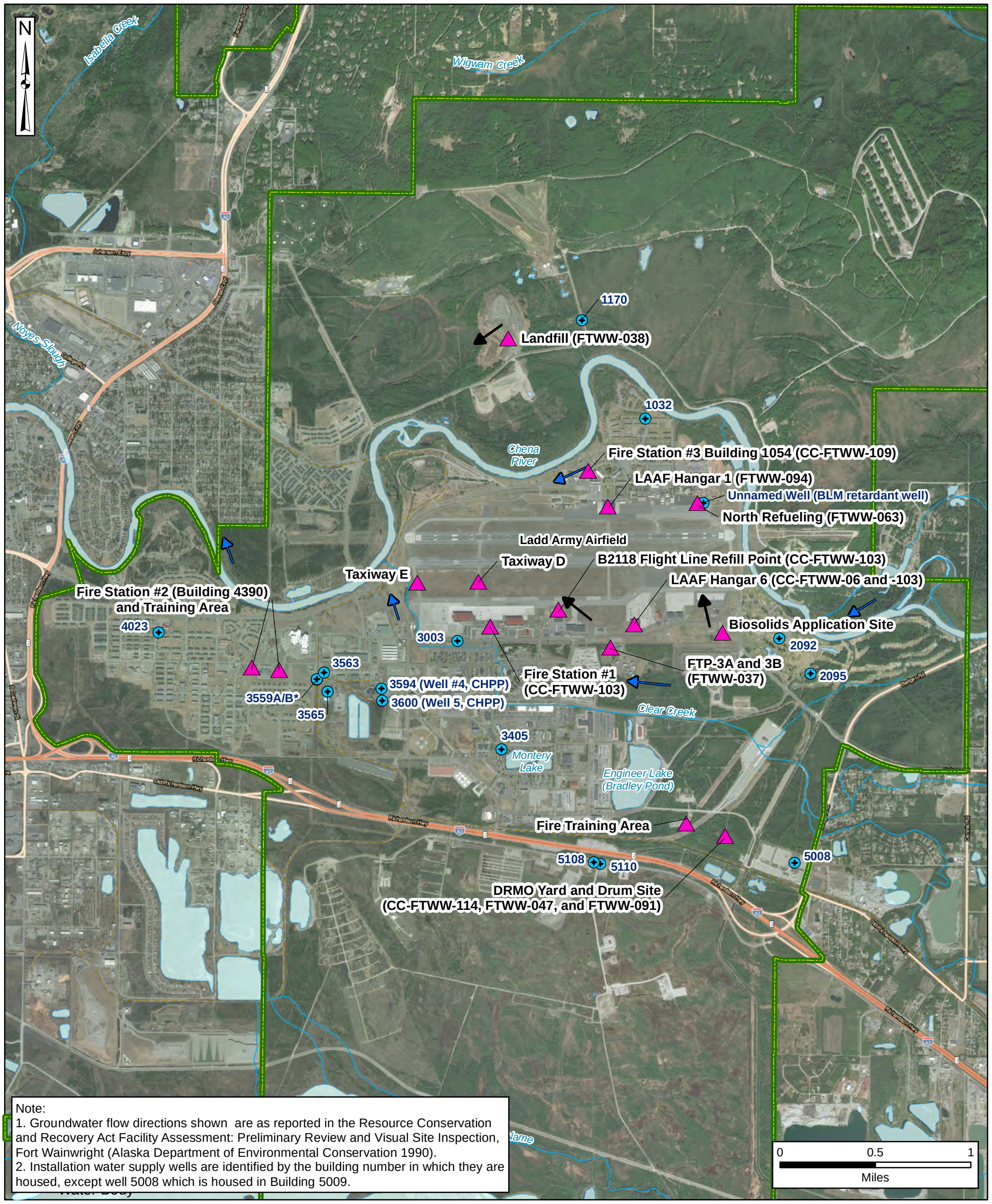
Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 5-2
AOPI Locations





Note:
1. Groundwater flow directions shown are as reported in the Resource Conservation and Recovery Act Facility Assessment: Preliminary Review and Visual Site Inspection, Fort Wainwright (Alaska Department of Environmental Conservation 1990).
2. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

AOPI Location

Installation Water Supply Well

Groundwater Flow Direction

Surface Water Flow Direction

AOPI = area of potential interest
BLM = Bureau of Land Management
CHPP = Central Heat and Power Plant
DRMO = Defense Reutilization and Marketing Office
FTP = fire training pit
FTWW = Fort Wainwright
LAAF = Ladd Army Airfield

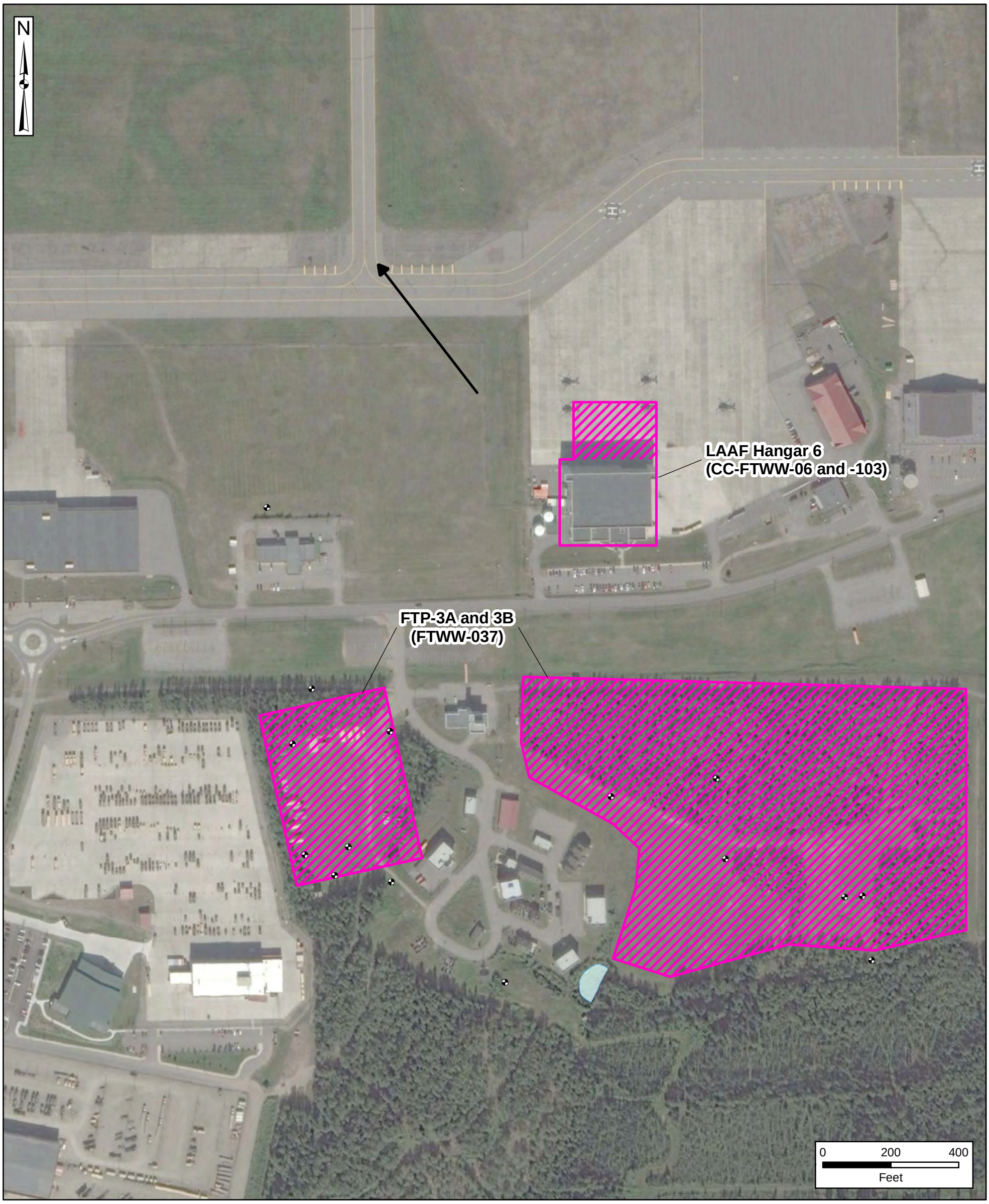
*Only potable water wells DW-3559A/B are used for drinking water supply. Wells DW-3565 and DW-3563 are backup potable water supply wells, and the remainder are used for back-up fire support or are stand alone potable wells. Water from the fire protection wells is not circulated into the potable/drinking water supply.

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 5-3
Aerial Photo of
FTP-3A and -3B and LAAF Hangar 6 AOPIs



Installation Boundary
AOPI
Inferred AFFF Release Area
Water Body
Groundwater Flow Direction
Monitoring Well

AFFF = aqueous film-forming foam
AOPI = area of potential interest
FTP = fire training pit
FTWW = Fort Wainwright
LAAF = Ladd Army Airfield

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection Fort Wainwright, AK

ARCADIS

Figure 5-4 Aerial Photo of Fire Station #1, Taxiway D, Taxiway E, and B2118 Flight Line Refill Point AOPIs

Legend

- Installation Boundary
- AOPI
- AOPI Location
- Inferred AFFF Release Area
- River/Stream
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Installation Water Supply Well
- Monitoring Well
- Monitoring Well (not in use)

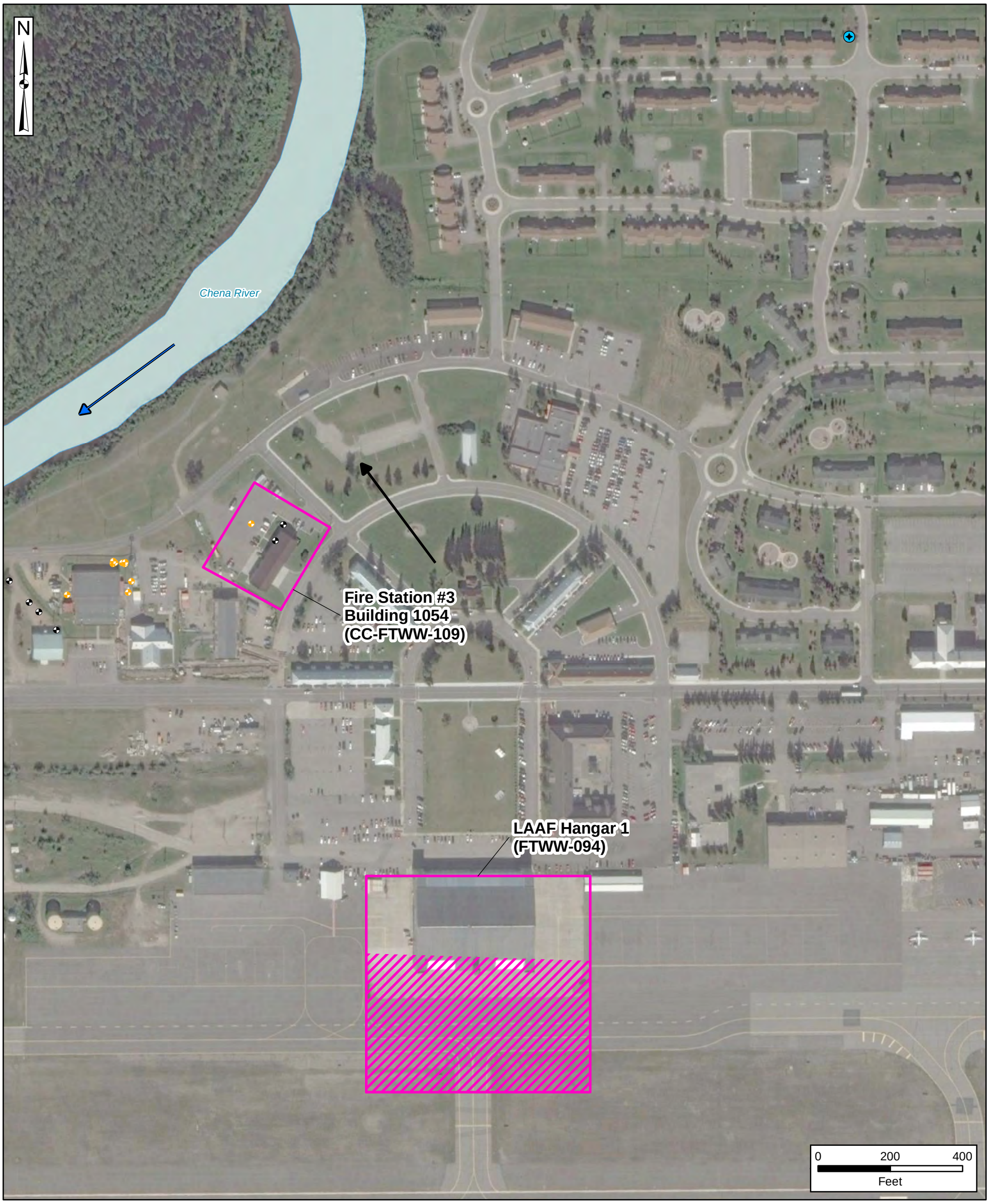
AFFF = aqueous film-forming foam
AOPI = area of potential interest

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 5-5
Aerial Photo of
LAAF Hangar 1 and Fire Station #3 Building 1054 AOPI



Installation Boundary
AOPI
Inferred AFFF Release Area
Water Body
Surface Water Flow Direction
Groundwater Flow Direction
Monitoring Well
Monitoring Well (not in use)

AFFF = aqueous film-forming foam
AOPI = area of potential interest
LAAF = Ladd Army Airfield

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

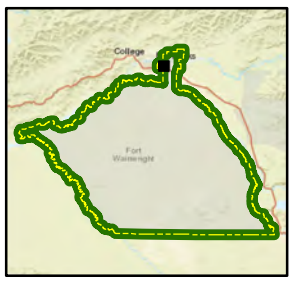
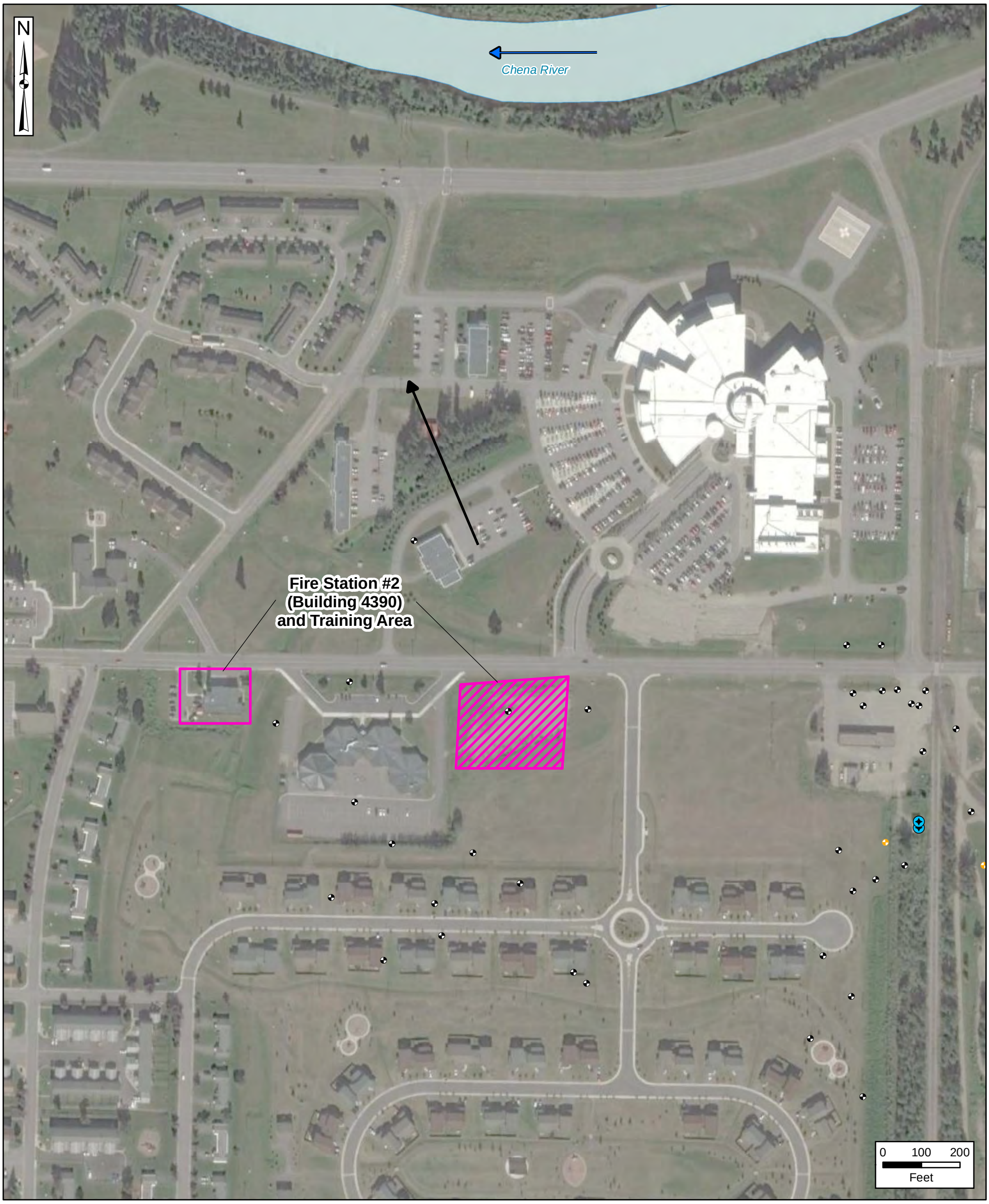


Figure 5-6
Aerial Photo of
Fire Station #2 (Building 4390) and Training Area AOPI

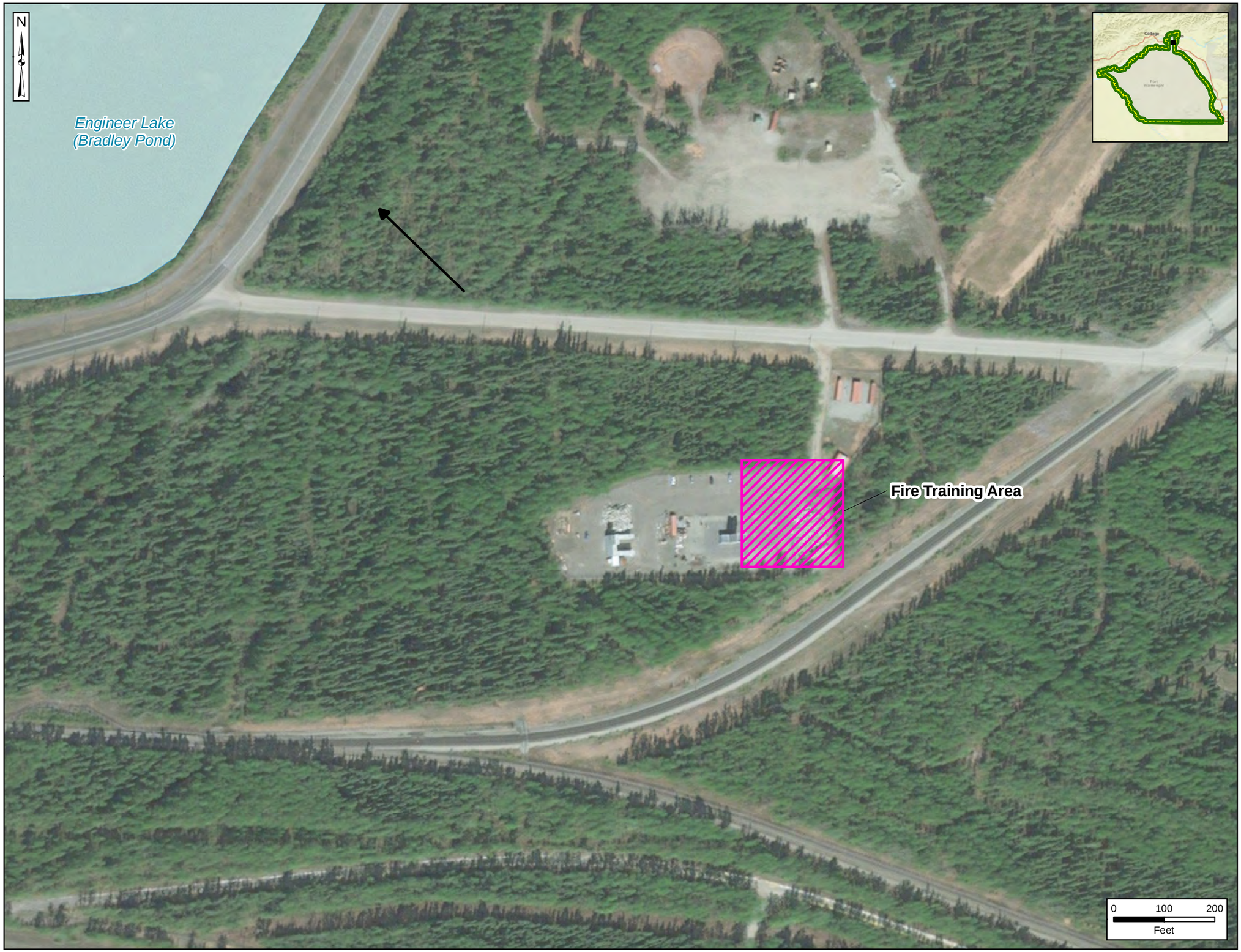


Installation Boundary
AOPI
Inferred AFFF Release Area
Water Body
Surface Water Flow Direction
Groundwater Flow Direction
Installation Water Supply Well
Monitoring Well
Monitoring Well (not in use)

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

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North



USAEC PFAS
Preliminary Assessment / Site Inspection
Fort Wainwright, AK

ARCADIS

Figure 5-7
Aerial Photo of
Fire Training Area AOPI

Legend

- Installation Boundary
- AOPI
- Inferred AFFF Release Area
- Water Body
- Groundwater Flow Direction

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

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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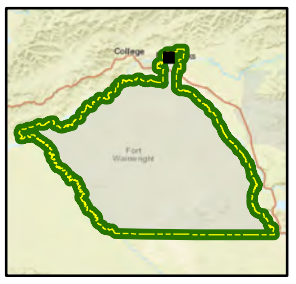
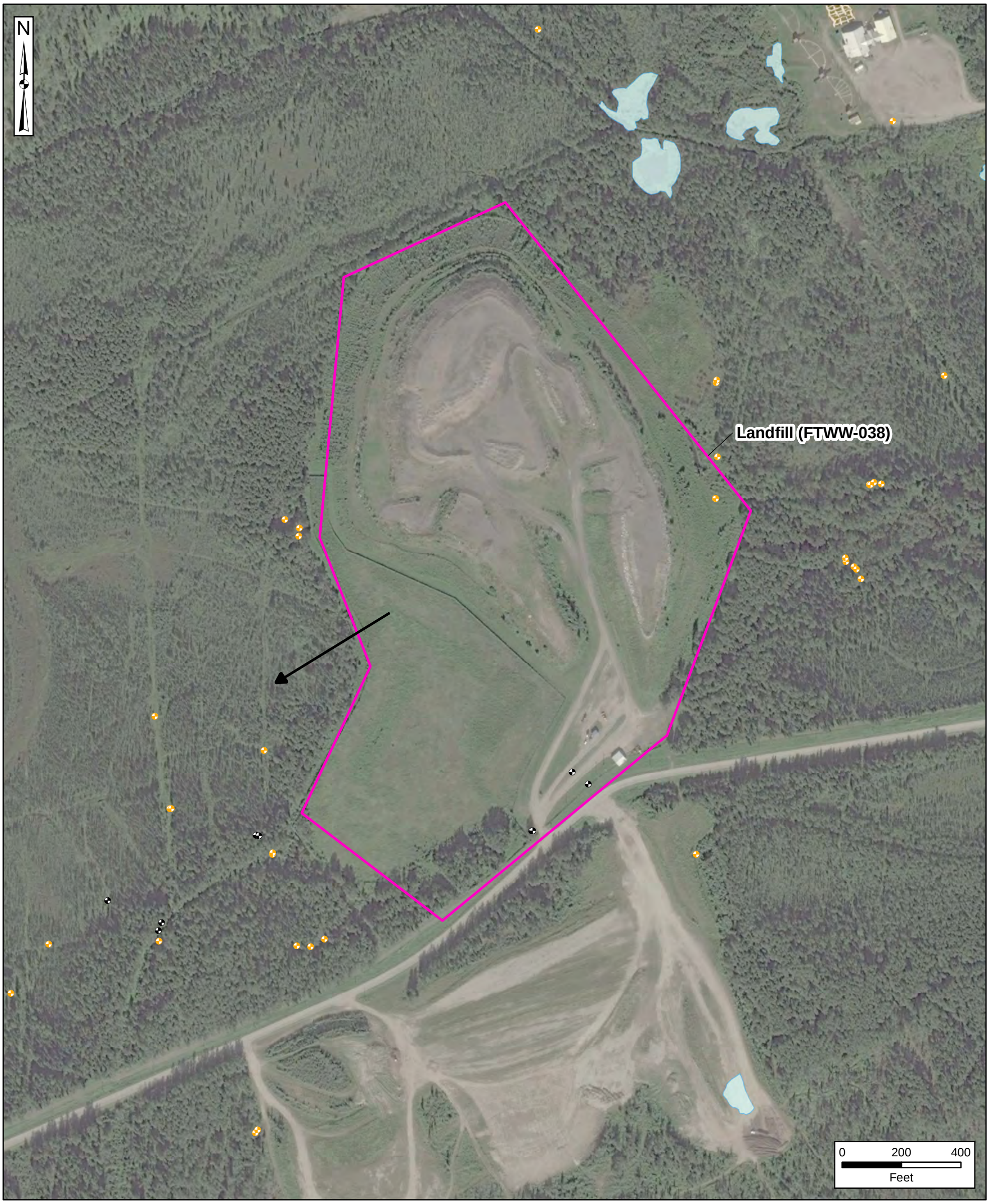


Figure 5-8
Aerial Photo of
Landfill (FTWW-038) AOPI



Installation Boundary
AOPI
Water Body
Groundwater Flow Direction
Monitoring Well
Monitoring Well (not in use)

AOPI = area of potential interest
FTWW = Fort Wainwright

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

Groundwater flow direction source:
Fairbanks Environmental Services. 2019. Final 2018 Annual Sampling Report, Operable Unit 4, U.S. Army Garrison Alaska. July

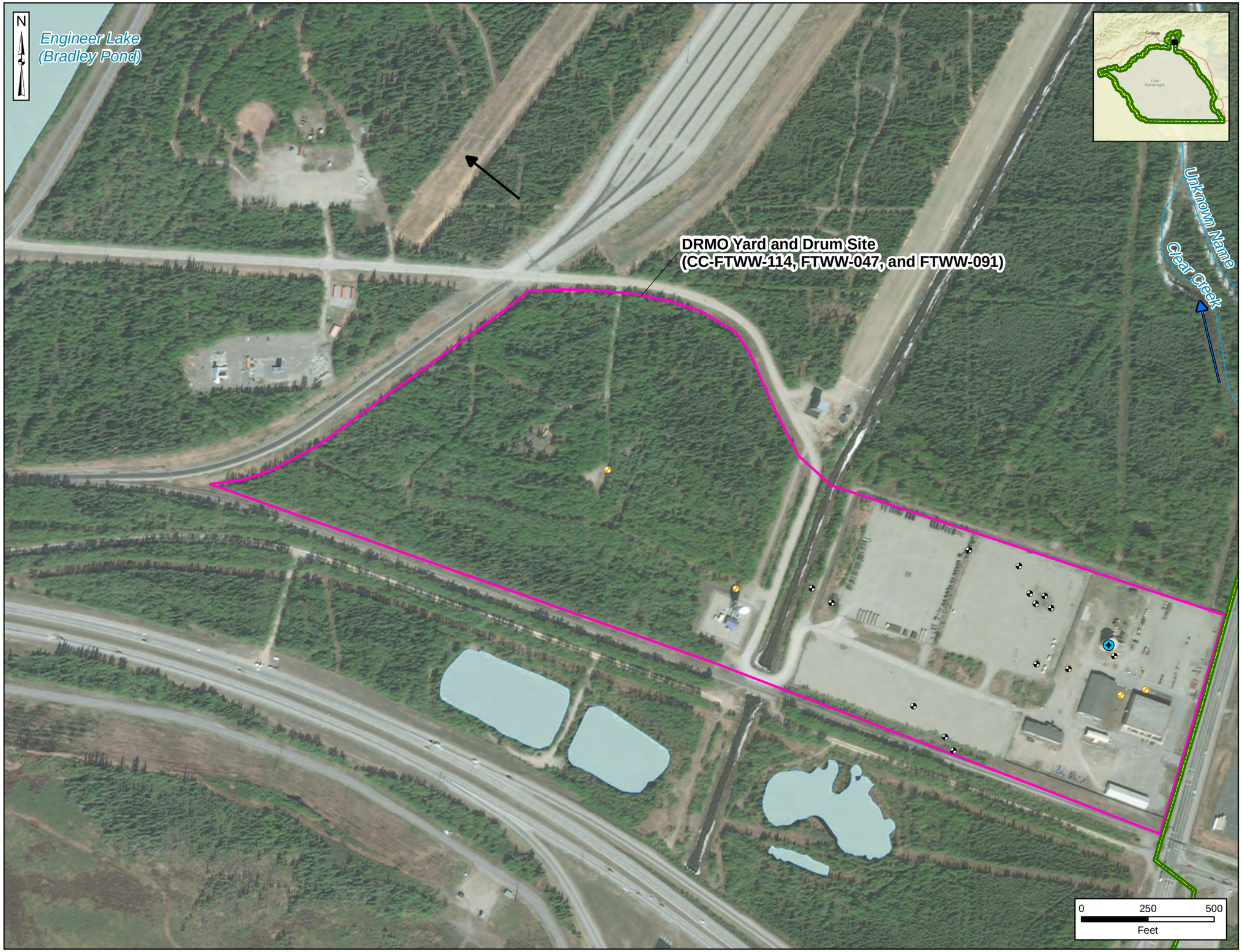


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Figure 5-9
Aerial Photo of
DRMO Yard and Drum Site AOPI

Legend

- Installation Boundary
- AOPI
- River/Stream
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Installation Water Supply Well
- Monitoring Well
- Monitoring Well (not in use)

AOPI = area of potential interest
DRMO = Defense Reutilization and Marketing Office

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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Fort Wainwright, AK

Figure 5-10
Aerial Photo of
North Refueling AOPI

Installation Boundary
Installation Water Supply Well
AOPI Location
Groundwater Flow Direction

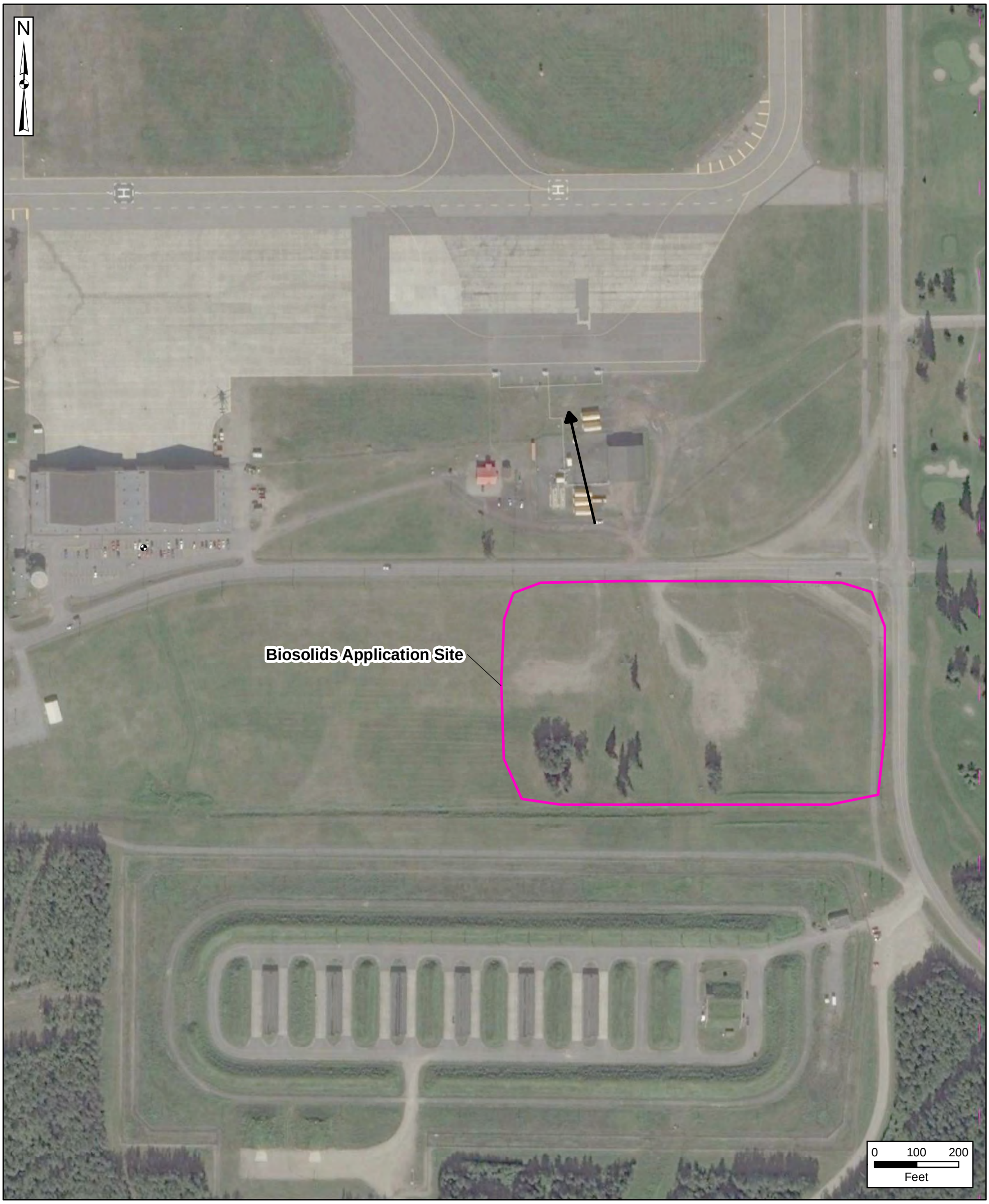
IRP = Installation Restoration Program

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 5-11
Aerial Photo of
Biosolids Application Site AOPI



Installation Boundary

AOPI

Groundwater Flow Direction

Monitoring Well

AOPI = area of potential interest

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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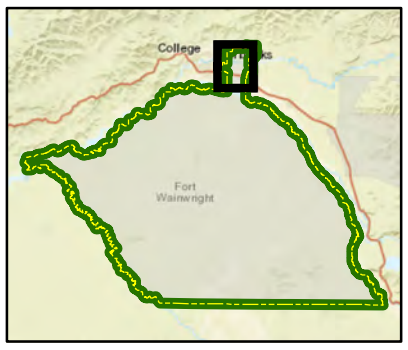
Fort Wainwright, AK

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



Note:
1. Groundwater flow directions shown are as reported in the Resource Conservation and Recovery Act Facility Assessment: Preliminary Review and Visual Site Inspection, Fort Wainwright (Alaska Department of Environmental Conservation 1990).
2. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

- Installation Boundary
- AOPI Location
- AOPI with OSD Risk Screening Level Exceedance
- Installation Water Supply Well
- River/Stream
- Water Body
- Groundwater Flow Direction
- Surface Water Flow Direction

AOPI = area of potential interest
BLM = Bureau of Land Management
CHPP = Central Heat and Power Plant
DRMO = Defense Reutilization and Marketing Office
FTP = fire training pit
FTWW = Fort Wainwright
LAAF = Ladd Army Airfield
OSD = Office of the Secretary of Defense

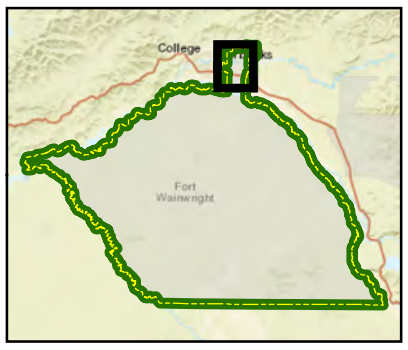
*Only potable water wells DW-3559A/B are used for drinking water supply. Wells DW-3565 and DW-3563 are backup potable water supply wells, and the remainder are used for back-up fire support or are stand alone potable wells.

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 7-2
Upgradient and Downgradient Installation Boundary Sampling Locations PFOS, PFOA, and PFBS Analytical Results



FTWW-DPT-3	
Date	08/07/2020
PFBS	3.8 U
PFOA	3.8 U
PFOS	3.8 U

FTWW-DPT-4	
Date	08/05/2020
PFBS	**6.2**
PFOA	**5.9**
PFOS	**4.3**

FTWW-DPT-5	
Date	08/07/2020
PFBS	3.8 U
PFOA	3.8 U
PFOS	**2.6 J**

FTWW-DPT-1	
Date	08/05/2020
PFBS	3.8 U [3.8 U]
PFOA	**2.9 J [3.0 J]**
PFOS	**4.2 [5.9]**

FTWW-DPT-2	
Date	08/05/2020
PFBS	3.7 U
PFOA	3.7 U
PFOS	3.7 U

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

Qualifiers:
J = The analyte was positively identified but 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).

Installation Boundary
AOPI Location
River/Stream
Water Body
Groundwater Flow Direction
Surface Water Flow Direction
DPT Groundwater Sampling Location (first encountered)

AOPI = area of potential interest
DPT = direct-push technology
DRMO = Defense Reutilization and Marketing Office
FTP = fire training pit
FTWW = Fort Wainwright
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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Fort Wainwright, AK

Figure 7-3
FTP-3A and -3B and LAAF Hangar 6 AOPIs
PFOS, PFOA, and PFBS Analytical Results

FTWW-DPT-9	
Date	08/06/2020
PFBS	**25**
PFOA	**39**
PFOS	**3,300 DJ**

FTWW-H6-1	
Date	08/06/2020
PFBS	0.0010 U [0.0011 U]
PFOA	0.0010 U [0.0011 U]
PFOS	**0.0024 [0.0030]**

FTWW-H6-3	
Date	08/11/2020
PFBS	0.00099 U
PFOA	0.00099 U
PFOS	**0.00053 J**

FTWW-H6-2	
Date	08/11/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.005**

LAAF Hangar 6
(CC-FTWW-06 and -103)

FTP-3A and 3B
(FTWW-037)

FTWW-AP-10266MW	
Date	08/12/2020
PFBS	**3,900 DJ [4,000 DJ]**
PFOA	**1,200 [1,100]**
PFOS	**370 [360]**

FTWW-AP-10278MW	
Date	08/12/2020
PFBS	**6.4**
PFOA	**200**
PFOS	**2,300 DJ**

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. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.
6. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.
7. Concentrations of PFBS that exceed the OSD residential tap water risk screening level of 600 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
D = The reported value is from a dilution.
J = The analyte was positively identified but 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).

0 200 400
Feet

- Installation Boundary
- AOPI
- Inferred AFFF Release Area
- Water Body
- Groundwater Flow Direction
- Monitoring Well
- Groundwater Sampling Location (Existing Well)
- Shallow Soil Sampling Location
- DPT Shallow Soil Sampling and Groundwater (first encountered) Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
DPT = direct-push technology

FTP = fire training pit
FTWW = Fort Wainwright
LAAF = Ladd Army Airfield
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection Fort Wainwright, AK

Figure 7-4
Fire Station #1, Taxiway D, Taxiway E, and B2118 Flight Line Refill Point AOPIs PFOS, PFOA, and PFBS Analytical Results

Notes:
1. Groundwater and 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. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.
6. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.
7. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

Qualifiers:
D = The reported value is from a dilution.
J = The analyte was positively identified but 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).

FTWW-AP-6006	
Date	08/11/2020
PFBS	**4.9**
PFOA	**7.3**
PFOS	**17**

FTWW-DPT-6	
Date	08/06/2020
PFBS	**55**
PFOA	**77**
PFOS	**340**

FTWW-TAXIE-4	
Date	08/10/2020
PFBS	**70 [68]**
PFOA	**69 [65]**
PFOS	**880 DJ [480 J]**

FTWW-TAXIE-1	
Date	08/06/2020
PFBS	0.0013 U [0.0010 U]
PFOA	0.0013 U [0.0010 U]
PFOS	**0.084 [0.070]**

FTWW-DPT-7	
Date	08/06/2020
PFBS	**29**
PFOA	**29**
PFOS	**58**

FTWW-TAXID-1	
Date	08/06/2020
PFBS	0.0013 U
PFOA	0.0013 U
PFOS	**0.072**

FTWW-TAXIE-4	
Date	08/11/2020
PFBS	0.0014 U [0.0013 U]
PFOA	0.0014 U [0.0013 U]
PFOS	**0.010 [0.0092]**

FTWW-TAXIE-2	
Date	08/11/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.0013**

FTWW-TAXID-2	
Date	08/11/2020
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	**0.0035**

FTWW-DPT-8	
Date	08/06/2020
PFBS	**9.0**
PFOA	**7.3**
PFOS	**36**

FTWW-FLRP-1	
Date	08/06/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

FTWW-TAXID-3	
Date	08/11/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.019**

FTWW-TAXIE-3	
Date	08/10/2020
PFBS	**0.0019**
PFOA	**0.0040**
PFOS	**2.0**

FTWW-FS1-2	
Date	08/10/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.0011**

FTWW-FS1-1	
Date	08/10/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.014**

FTWW-FLRP-2	
Date	08/11/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

FTWW-DW-3003	
Date	08/10/2020
PFBS	3.5 U [3.7 U]
PFOA	3.5 U [3.7 U]
PFOS	3.5 U [3.7 U]

Chena River
Taxiway E
Taxiway D
B2118 Flight Line Refill Point (CC-FTWW-103)
Hangar 4
Fire Station #1 (CC-FTWW-103)
Clear Creek
0 200 400 Feet

Legend
- Installation Boundary
- AOPI
- AOPI Location
- Inferred AFFF Release Area
- River/Stream
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Installation Water Supply Well
- Monitoring Well
- Monitoring Well (not in use)
- Groundwater Sampling Location (Existing Well)
- Shallow Soil Sampling Location
- DPT Shallow Soil Sampling and Groundwater (first encountered) Sampling Location
- Sediment Sampling Location
- Surface Water Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
DPT = direct-push technology
FTWW = Fort Wainwright
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 7-5
LAAF Hangar 1 and Fire Station #3 Building 1054 AOPI
PFOS, PFOA, and PFBS Analytical Results

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. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.
6. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.
7. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

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

FTWW-DW-1032	
Date	08/10/2020
PFBS	**1.9 J**
PFOA	**22**
PFOS	**11**

N

Chena River

FTWW-15B1054-MW01	
Date	06/07/2021
PFBS	**31 J- [28]**
PFOA	**32 [37]**
PFOS	**5.4 [6.2]**

FTWW-15B1054-MW03	
Date	06/07/2021
PFBS	**54**
PFOA	**59**
PFOS	**24**

Fire Station #3
Building 1054
(CC-FTWW-109)

FTWW-AP-6386	
Date	08/10/2020
PFBS	**15**
PFOA	**110**
PFOS	**32**

FTWW-FS3-2	
Date	06/07/2021
PFBS	0.00086 U
PFOA	0.00086 U
PFOS	**0.0047**

LAAF Hangar 1
(FTWW-094)

0 10 20
Feet

FTWW-FS3-1	
Date	06/07/2021
PFBS	0.00097 U
PFOA	0.00097 U
PFOS	**0.0023**

FTWW-FS3-3	
Date	06/07/2021
PFBS	0.0011 U [0.00098 U]
PFOA	0.0011 U [0.00098 U]
PFOS	**0.0041 J- [0.0042]**

FTWW-H1-1	
Date	08/10/2020
PFBS	0.00090 U [0.00093 U]
PFOA	0.00090 U [0.00093 U]
PFOS	**0.0011 [0.0011]**

FTWW-H1-2	
Date	08/10/2020
PFBS	0.00093 U
PFOA	0.00093 U
PFOS	**0.0013**

0 200 400
Feet

Installation Boundary
AOPI
Inferred AFFF Release Area
Water Body
Surface Water Flow Direction
Groundwater Flow Direction
Installation Water Supply Well
Monitoring Well
Monitoring Well (not in use)
Groundwater Sampling Location (Existing Well)
Shallow Soil Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
FTWW = Fort Wainwright
LAAF = Ladd Army Airfield
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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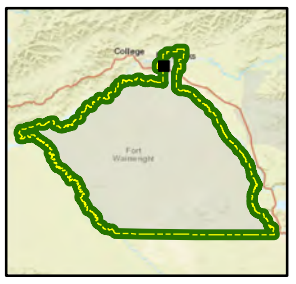
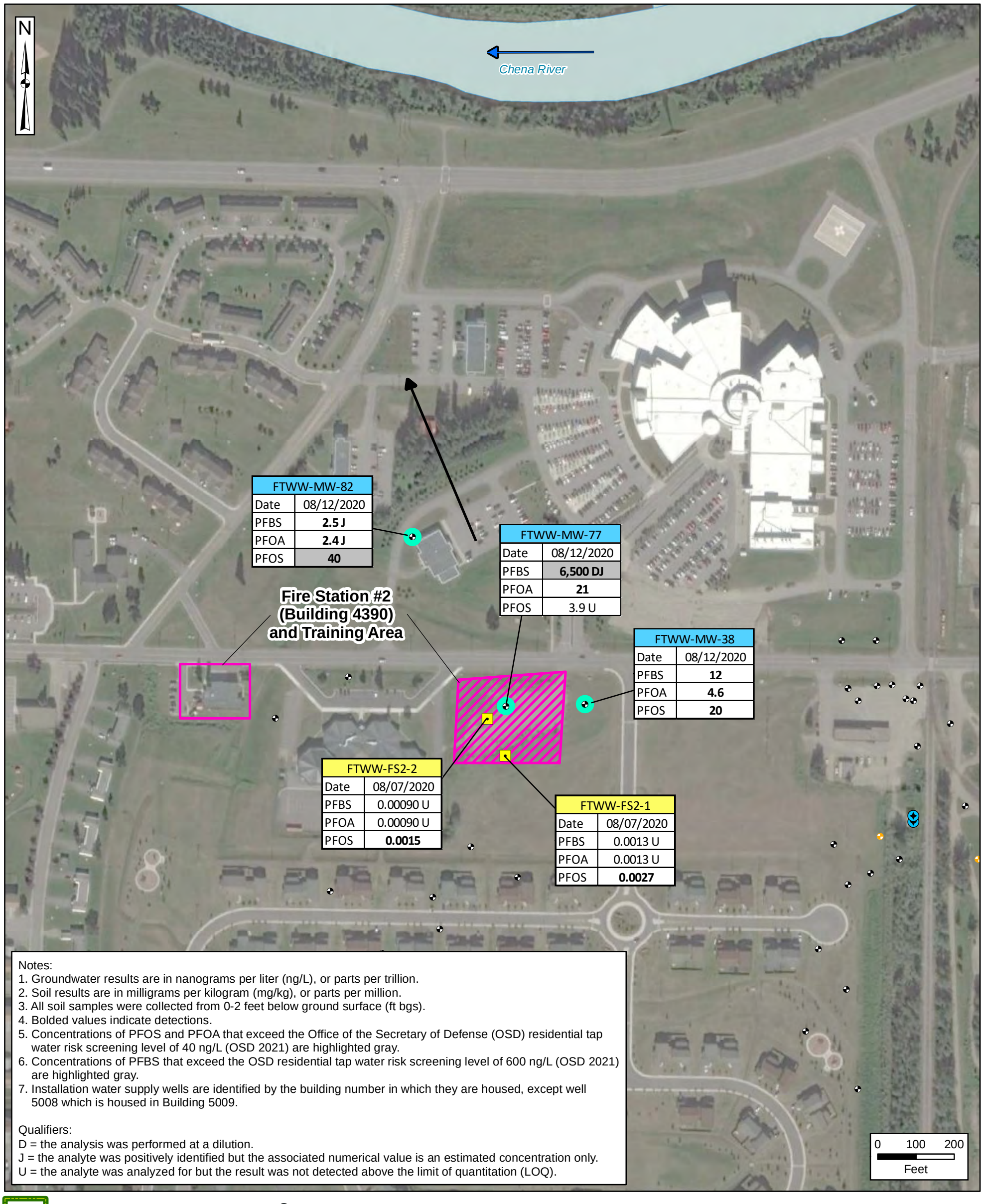


Figure 7-6
Fire Station #2 (Building 4390) and Training Area AOPI PFOS, PFOA, and PFBS Analytical Results



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 tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.
6. Concentrations of PFBS that exceed the OSD residential tap water risk screening level of 600 ng/L (OSD 2021) are highlighted gray.
7. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

Qualifiers:
D = the analysis was performed at a dilution.
J = the analyte was positively identified but 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).

- Installation Boundary
- AOPI
- Inferred AFFF Release Area
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Installation Water Supply Well
- Monitoring Well
- Monitoring Well (not in use)
- Groundwater Sampling Location (Existing Well)
- Shallow Soil Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
FTWW = Fort Wainwright
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection Fort Wainwright, AK

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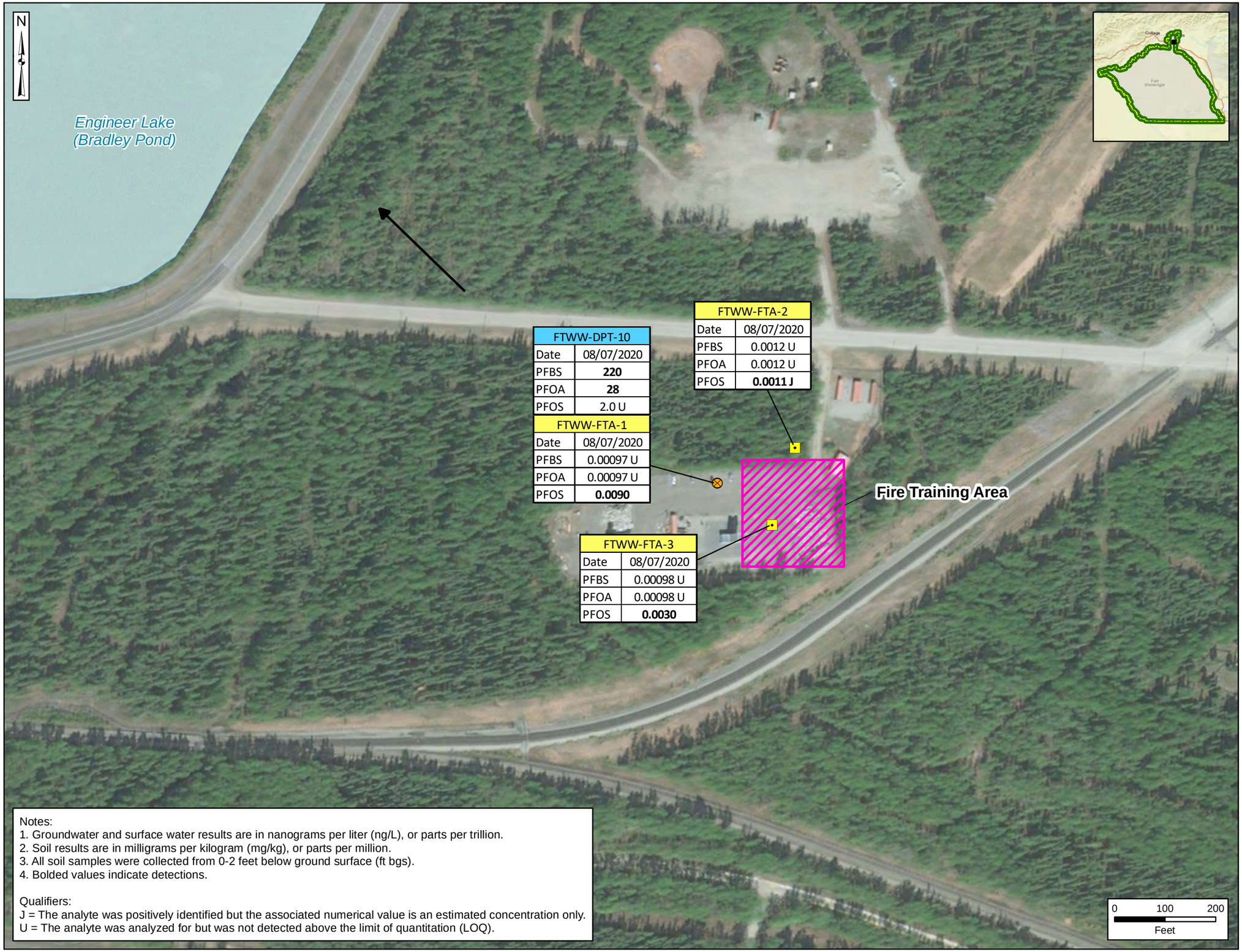
Figure 7-7
Fire Training Area AOPI PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater and 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. Bolded values indicate detections.

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

Legend

- Installation Boundary
- AOPI
- Inferred AFFF Release Area
- Water Body
- Groundwater Flow Direction
- Shallow Soil Sampling Location
- DPT Shallow Soil Sampling and Groundwater (first encountered) Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
DPT = direct-push technology
FTWW = Fort Wainwright
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 7-8
Landfill (FTWW-038) AOPI
PFOS, PFOA, and PFBS Analytical Results

N

Landfill (FTWW-038)

FTWW-FWLF-03	
Date	08/12/2020
PFBS	4.2 U
PFOA	4.2 U
PFOS	4.2 U

FTWW-AP-6574A	
Date	08/12/2020
PFBS	**5.5**
PFOA	**13**
PFOS	4.0 U

FTWW-AP-10257MW	
Date	08/12/2020
PFBS	**2.4 J**
PFOA	3.9 U
PFOS	3.9 U

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

Qualifiers:
J = The analyte was positively identified but 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).

0 200 400
Feet

Installation Boundary
AOPI
Water Body
Groundwater Flow Direction
Monitoring Well
Monitoring Well (not in use)
Groundwater Sampling Location (Existing Well)

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

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

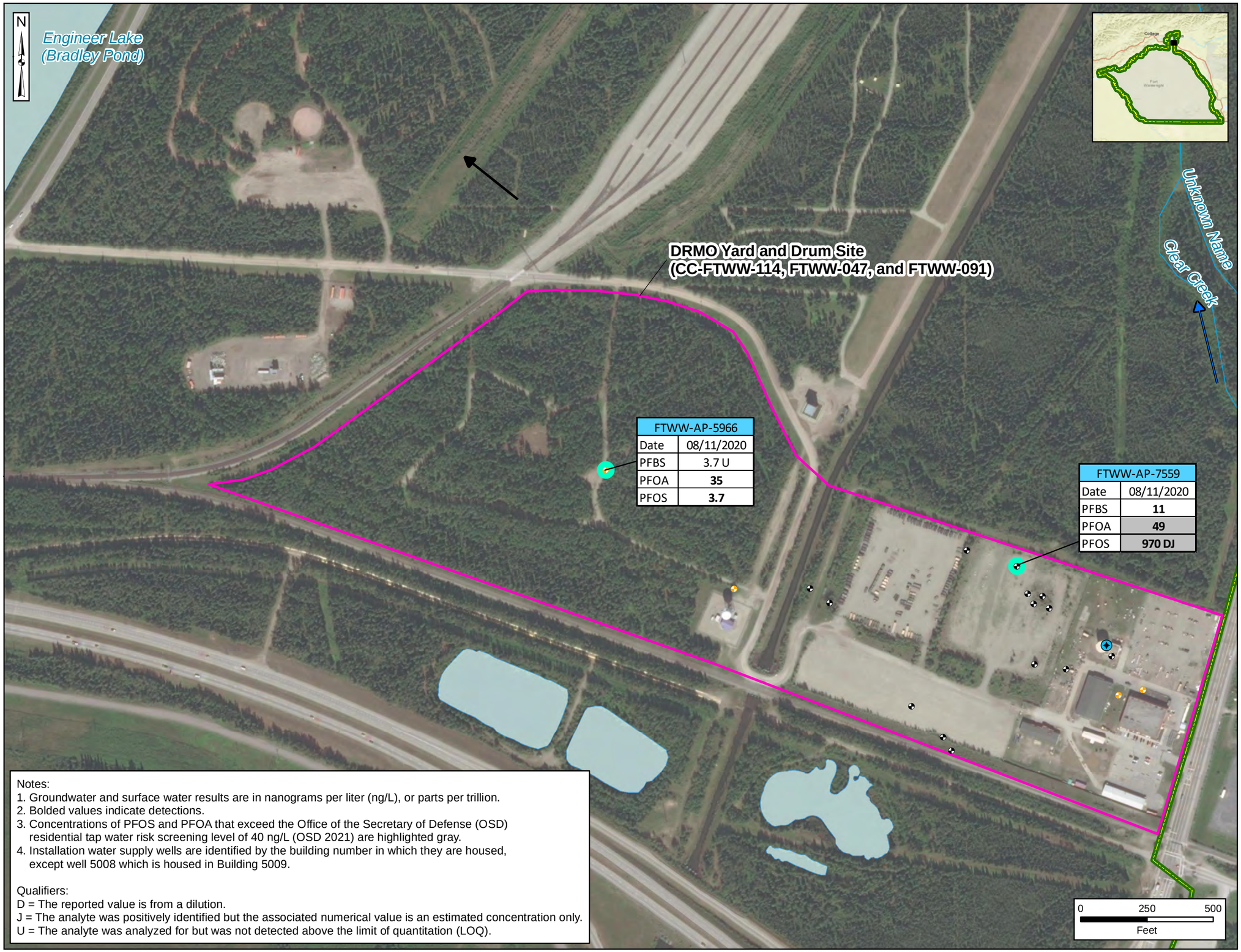
Groundwater flow direction source:
Fairbanks Environmental Services. 2019. Final 2018 Annual Sampling Report, Operable Unit 4, U.S. Army Garrison Alaska. July

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection Fort Wainwright, AK

ARCADIS

Figure 7-9
DRMO Yard and Drum Site AOPI PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.
3. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.
4. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

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

Legend

- Installation Boundary
- AOPI
- River/Stream
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Installation Water Supply Well
- Monitoring Well
- Monitoring Well (not in use)
- Groundwater Sampling Location (Existing Well)

AOPI = area of potential interest
DRMO = Defense Reutilization and Marketing Office
FTWW = Fort Wainwright
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 7-10
North Refueling AOPI
PFOS, PFOA, and PFBS Analytical Results

N

North Refueling (FTWW-063)

FTWW-REFUEL-1	
Date	08/10/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00088 J**

FTWW-UNNAMED	
Date	08/10/2020
PFBS	3.6 U
PFOA	**4.3**
PFOS	**3.9**

FTWW-REFUEL-2	
Date	08/10/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.0018**

25

Notes:
1. The water spigot/sampling point of the unnamed well that was sampled is located about 20 feet from the well itself.
2. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
3. Soil 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. Bolded values indicate detections.

Qualifiers:
J = The analyte was positively identified but 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).

0 100 200
Feet

Installation Boundary
AOPI Location
Groundwater Flow Direction
Installation Water Supply Well
Monitoring Well
Groundwater Sampling Location (Existing Well)
Shallow Soil Sampling Location

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

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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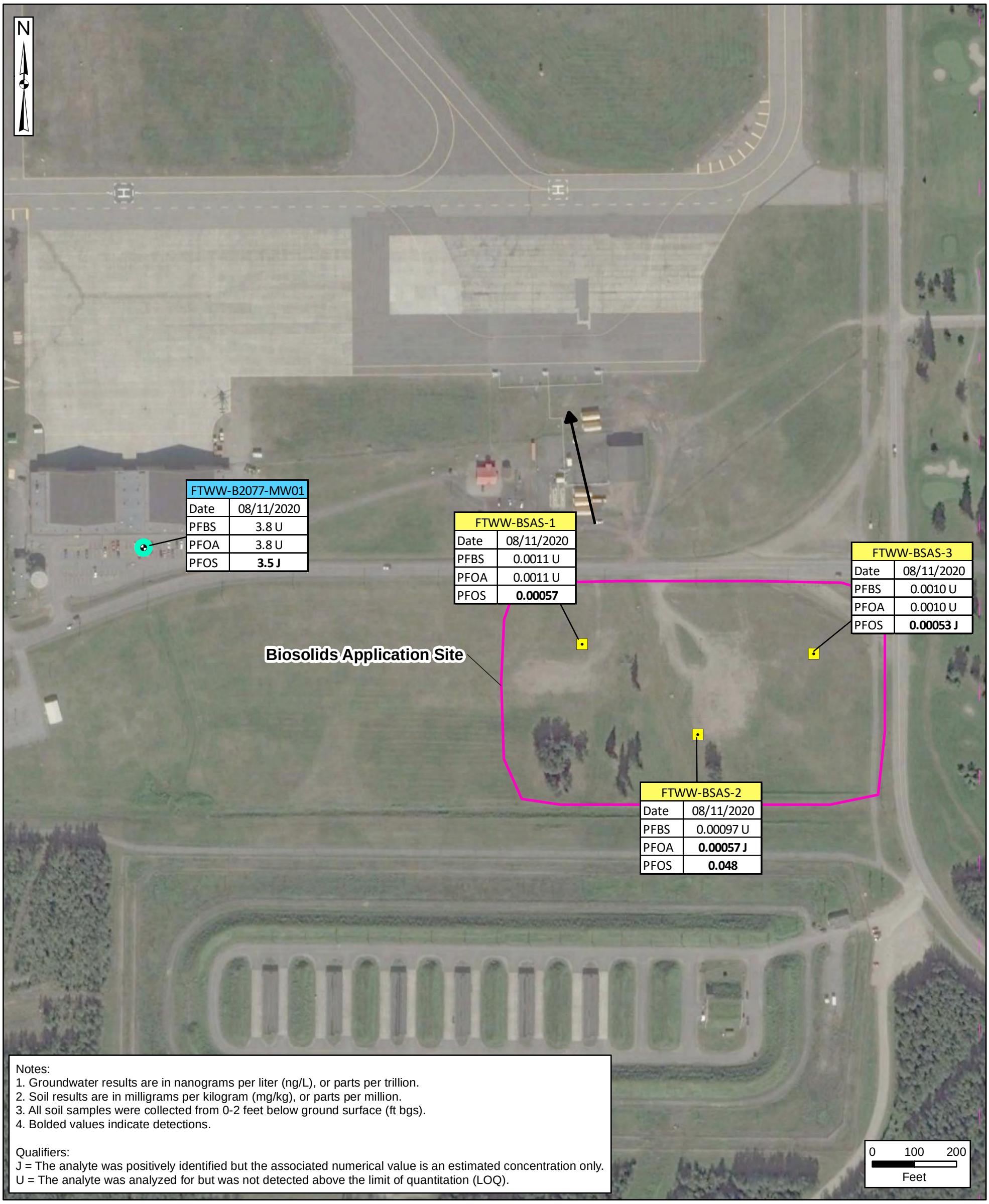
Fort Wainwright, AK

Figure 7-11
Biosolids Application Site AOPI
PFOS, PFOA, and PFBS Analytical Results



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.

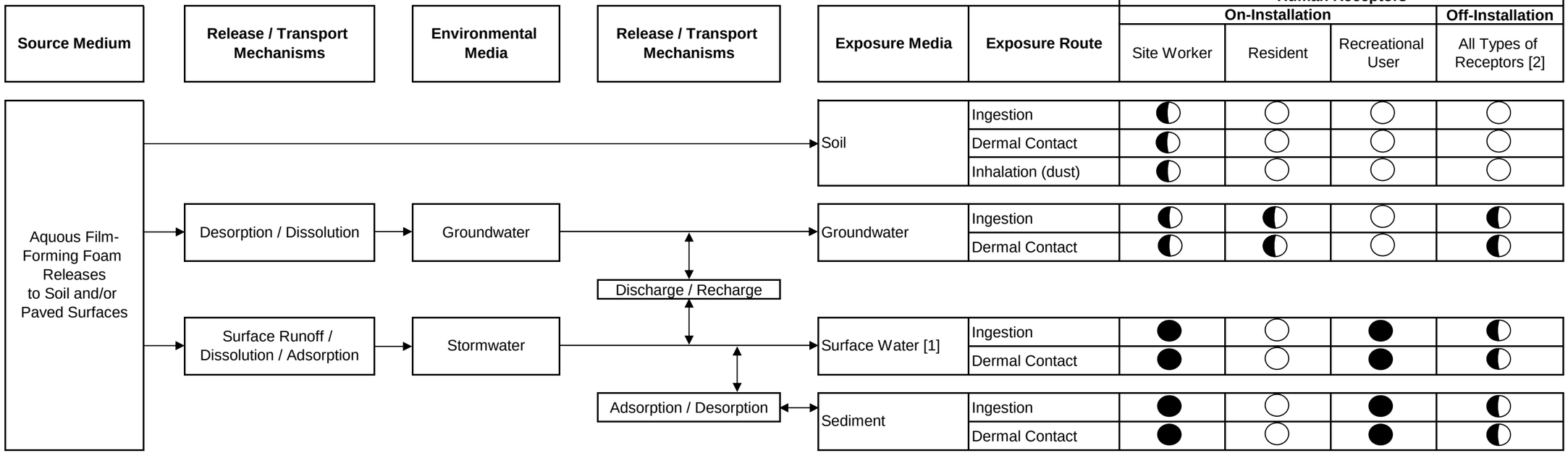
Qualifiers:
J = The analyte was positively identified but the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for but was not detected above the limit of quantitation (LOQ).

Installation Boundary
AOPI
Groundwater Flow Direction
Monitoring Well
Groundwater Sampling Location (Existing Well)
Shallow Soil Sampling Location

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

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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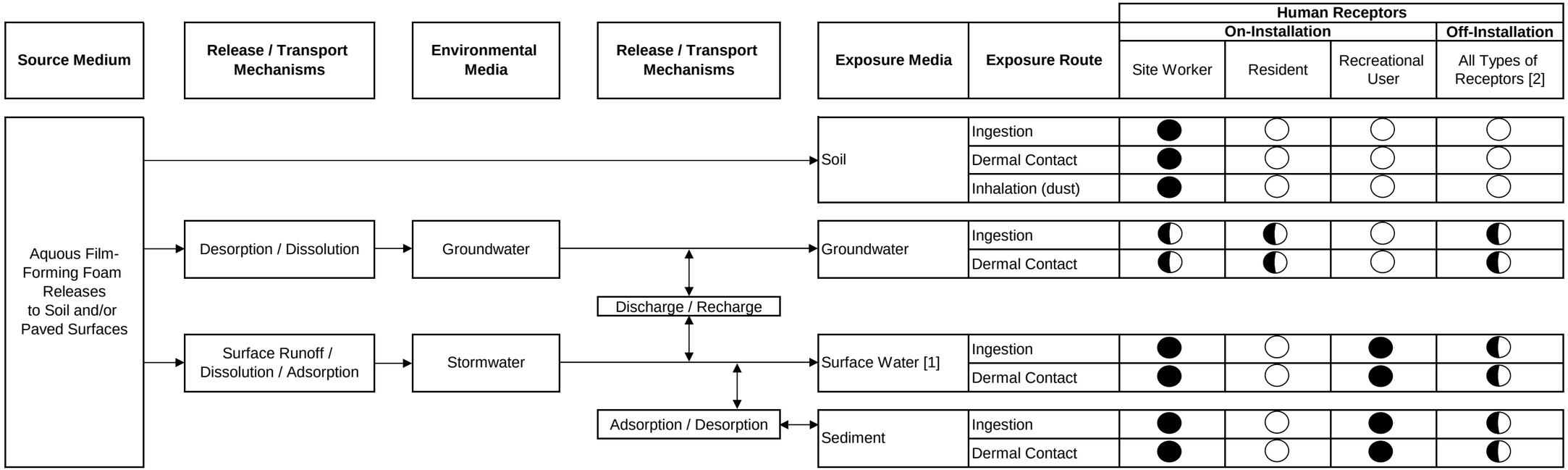
Conceptual Site Model - Fire Training Pits-3A and -3B and B2118 Flight Line Refill Point
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, Alaska

Figure 7-12



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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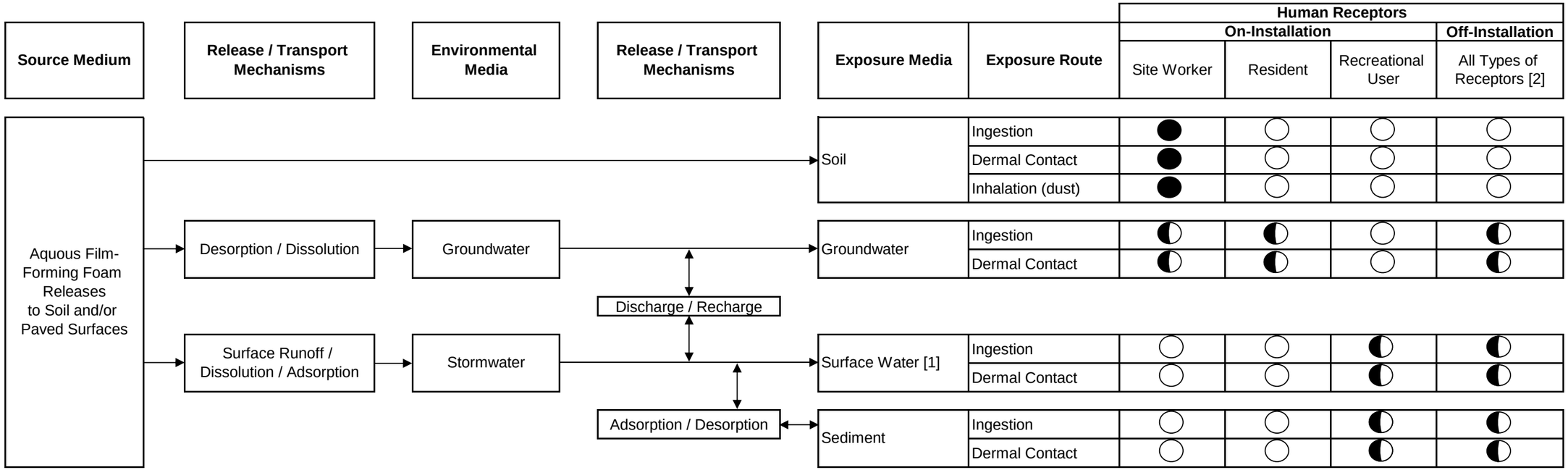
Conceptual Site Model - Ladd Army Airfield Hangar 6, Fire Station #1, Taxiway D, Taxiway E, Ladd Army Airfield Hangar 1, Fire Station #3 Buildling 1054, North Refueling, and Biosolids Application Site
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, Alaska

Figure 7-13



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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Conceptual Site Model - Fire Station #2 (Building 4390) and Training Area and Fire Training Area
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, Alaska

Figure 7-14

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]
Per- and Polyfluoroalkyl Substances-Containing Material Emplaced in Subsurface Soil (landfill seepage)				Subsurface 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.

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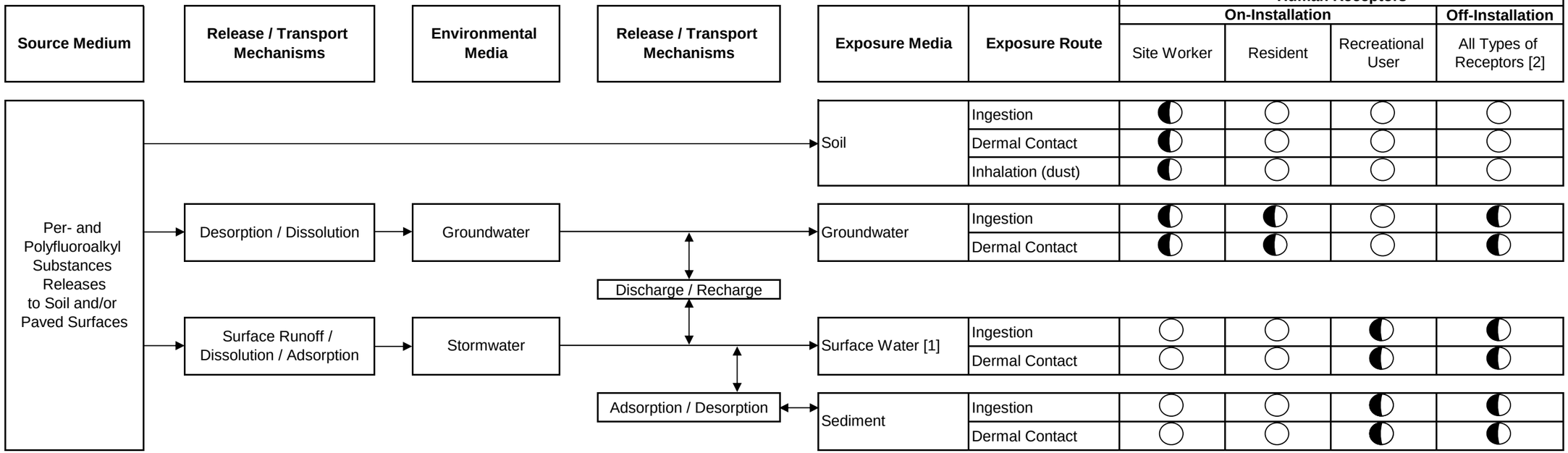
Conceptual Site Model - Landfill (FTWW-038)
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, Alaska

Figure 7-15



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

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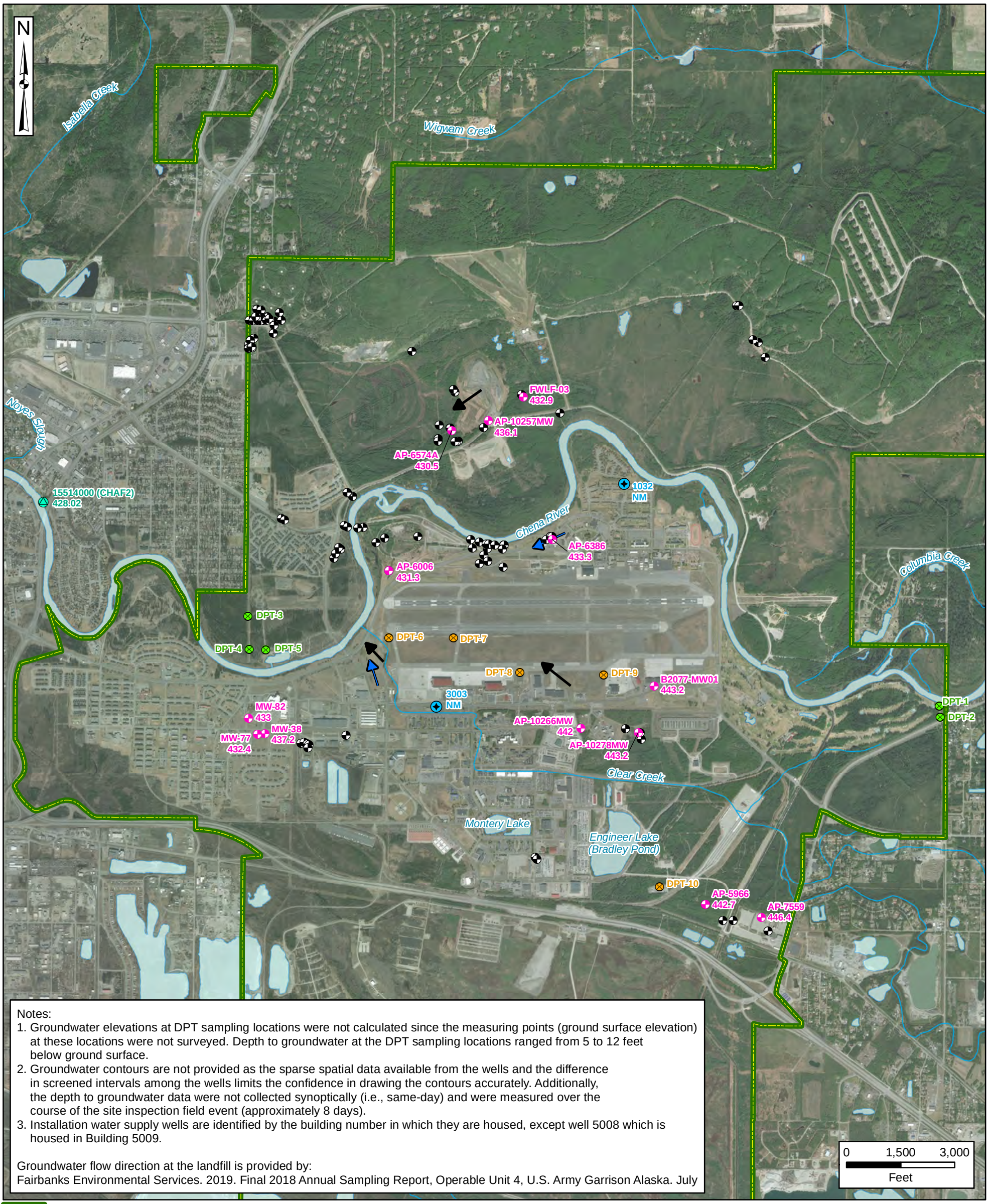
Conceptual Site Model - Defense Reutilization and Marketing Office Yard and Drum Site
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, Alaska

Figure 7-16

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Wainwright, AK

Figure 7-17
August 2020 Groundwater and Stream Elevations



Notes:
1. Groundwater elevations at DPT sampling locations were not calculated since the measuring points (ground surface elevation) at these locations were not surveyed. Depth to groundwater at the DPT sampling locations ranged from 5 to 12 feet below ground surface.
2. Groundwater contours are not provided as the sparse spatial data available from the wells and the difference in screened intervals among the wells limits the confidence in drawing the contours accurately. Additionally, the depth to groundwater data were not collected synoptically (i.e., same-day) and were measured over the course of the site inspection field event (approximately 8 days).
3. Installation water supply wells are identified by the building number in which they are housed, except well 5008 which is housed in Building 5009.

Groundwater flow direction at the landfill is provided by:
Fairbanks Environmental Services. 2019. Final 2018 Annual Sampling Report, Operable Unit 4, U.S. Army Garrison Alaska. July

- Installation Boundary
- River/Stream
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Monitoring Well
- Sampled Monitoring Well
- Installation Water Supply Well
- DPT Groundwater Sampling Location (first encountered)
- DPT Shallow Soil Sampling and Groundwater (first encountered) Sampling Location
- USGS Stream Gauging Station
- **MW-77** Location ID
- **432.4** Groundwater elevation (ft amsl)

DPT = direct-push technology
ft amsl = feet above mean sea level
NM = not measured
USGS = United States Geological Survey

Data Sources:
Fort Wainwright, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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