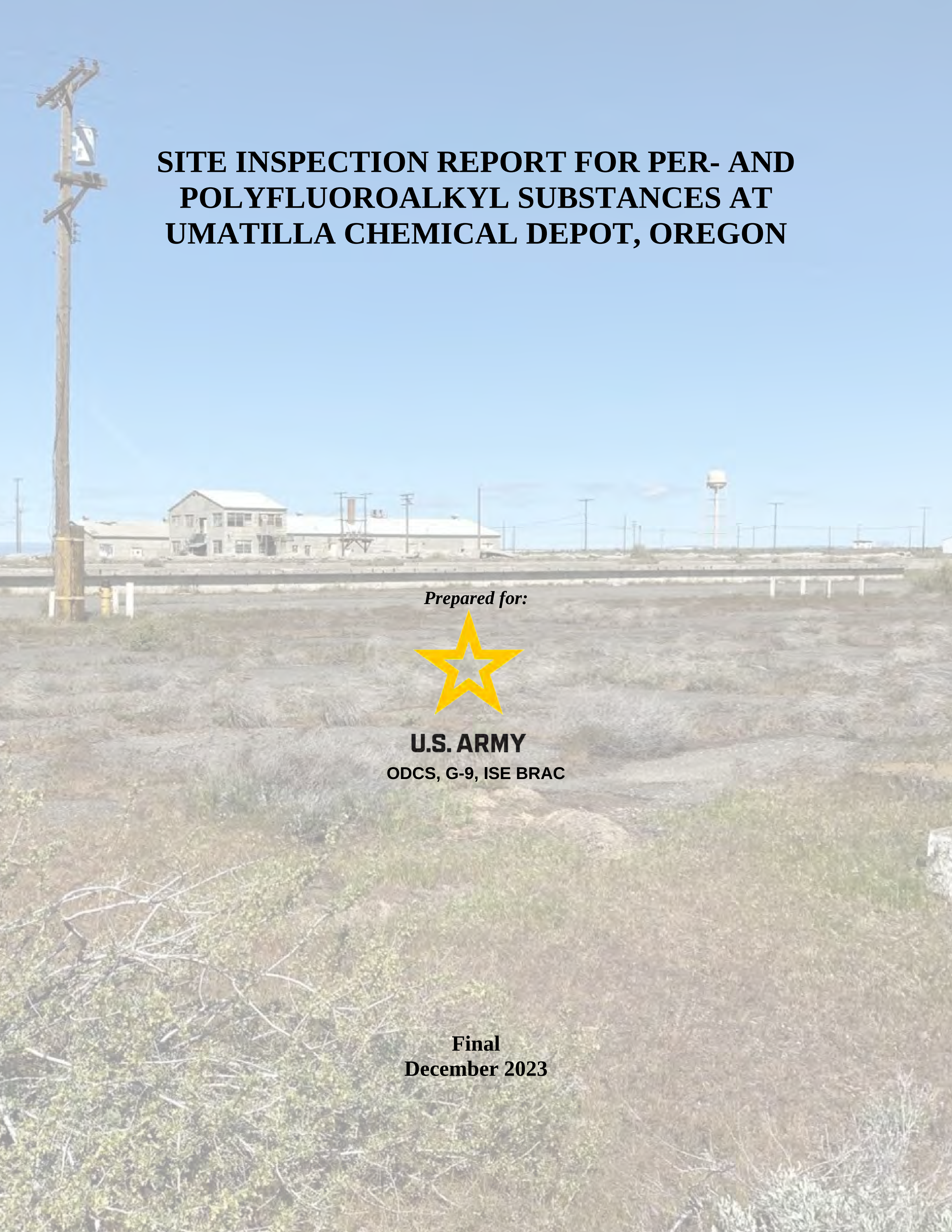

SITE INSPECTION REPORT FOR PER- AND POLYFLUOROALKYL SUBSTANCES AT UMATILLA CHEMICAL DEPOT, OREGON

Prepared for:

U.S. ARMY

ODCS, G-9, ISE BRAC

Final
December 2023

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Prepared for:

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LIST OF ACRONYMS AND ABBREVIATIONS

ADA	Ammunition Demolition Activity
AFFF	Aqueous Film-Forming Foam
amsl	Above Mean Sea Level
AOPI	Area of Potential Interest
Army	U.S. Army
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CDA	Columbia Development Authority
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CoC	Chain-of-Custody
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DQO	Data Quality Objective
DUA	Data Usability Assessment
ECOS	Environmental Conservation Online System
EIS	Extracted Internal Standard
FHA	Federal Highway Administration
GPS	Global Positioning System
HDPE	High-Density Polyethylene
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid (GenX)
HQ	Hazard Quotient
ID	Identifier
IDW	Investigation-Derived Waste
IPaC	Information for Planning and Consultation
LC/MS/MS	Liquid Chromatography with Tandem Mass Spectrometry
LCS	Laboratory Control Sample
LOD	Limit of Detection
LUC	Land Use Control
MEC	Munitions and Explosives of Concern
MPC	Measurement Performance Criteria
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NGB	National Guard Bureau
ODOT	Oregon Department of Transportation
ORARNG	Oregon Army National Guard
ORP	Oxygen-Reduction Potential
OSD	Office of the Secretary of Defense
P.E.	Professional Engineer
P.G.	Professional Geologist
PA	Preliminary Assessment
PDT	Project Delivery Team
PFAS	Per- and Polyfluoroalkyl Substances
PFBA	Perfluorobutanoic Acid
PFBS	Perfluorobutane Sulfonate
PFHxA	Perfluorohexanoic Acid

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMP	Project Management Professional
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppt	Parts per Trillion
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RPD	Relative Percent Difference
RSL	Regional Screening Level
RTC	Raymond F. Rees Training Center
SDG	Sample Delivery Group
SI	Site Inspection
SL	Screening Level
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
T&E	Threatened and Endangered
TCLP	Toxicity Characteristic Leaching Procedure
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
UMCD	Umatilla Chemical Depot
UMCDF	Umatilla Chemical Agent Disposal Facility
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

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

The PA identified areas where PFAS-containing materials were used, stored, and/or disposed of, or areas where known or suspected releases to the environment occurred. Based on recommendations from the PA, soil and/or groundwater samples were collected from the three AOPIs. The field investigation at UMCD was conducted in accordance with the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). Samples collected during this SI were analyzed for PFAS using procedures compliant with the DoD Quality Systems Manual (QSM) Version 5.4, Table B-15 (DoD 2021) and the laboratory standard operating procedure (SOP).

To determine if future investigation was warranted at each AOPI, this SI followed established USEPA guidance and DoD policy and guidance for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanoic acid (PFBA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexanoic acid (PFHxA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) (also known as GenX) (DoD 2023). Samples collected during this SI were compared to risk screening levels (SLs) established as the residential scenario SLs calculated using the USEPA regional screening level (RSL) calculator for soil and the tap water criteria for groundwater and published in the 2023 Office of the Secretary of Defense (OSD) Memorandum (DoD 2023). Since PFAS are a large grouping consisting of thousands of individual chemicals, PFOA, PFOS, PFBA, PFBS, PFNA, PFHxA, PFHxS, and HFPO-DA altogether will be referred to in this report as “Target PFAS.”

Conceptual site models (CSMs) were developed during the PA and then updated for each AOPI where Target PFAS were detected at concentrations exceeding the limit of detection (LOD). The updated CSMs detail site geological conditions; determine primary and secondary release mechanisms; identify potential human receptors; and detail complete, potentially complete, and incomplete exposure pathways for current and reasonably anticipated future exposure scenarios. PFAS were detected in soil and/or groundwater at two of the three AOPIs. Target PFAS concentrations did not exceed SLs in any samples at UMCD. PFOS, PFBS, and HFPO-DA were not detected at any AOPI. Figure ES-1 depicts the facility-wide map of AOPIs and PFAS groundwater results. Table ES-1 summarizes the AOPIs investigated during the SI and recommendations for further investigation.

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

AOPI Name	Exceedance of SLs		Recommendation
	Groundwater	Soil	
Former Fire Station Building T-104	No	No	No further investigation recommended
Former Airfield Hangar	No	No	No further investigation recommended
ADA Area Site 19	No	–	No further investigation recommended

– Not Collected

1. INTRODUCTION

The U.S. Army (Army) is conducting Preliminary Assessments (PAs, 40 Code of Federal Regulations [CFR] §300.420(b)) and Site Inspections (SIs, 40 CFR §300.420(c)) to investigate the presence or release of per- and polyfluoroalkyl substances (PFAS), by investigating the use, storage, or disposal of PFAS at multiple Base Realignment and Closure (BRAC) installations, nationwide. This SI is focused on the Umatilla Chemical Depot (UMCD) in Umatilla, Oregon, and was conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601 et seq.); the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2701 et seq.); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300); Army and U.S. Department of Defense (DoD) policy and guidance; and U.S. Environmental Protection Agency (USEPA) guidance. UMCD is on the National Priorities List (NPL), and the Army is responsible for compliance with CERCLA.

Based on results of the UMCD PFAS BRAC PA (Leidos 2023b), three areas of potential interest (AOPIs) were identified for investigation through multimedia sampling in an SI to determine whether a PFAS release occurred. UMCD is in northeastern Oregon, in Umatilla and Morrow Counties, as shown in Figure 1-1. The Oregon Army National Guard (ORARNG) performed a PFAS PA/SI at a portion of UMCD that is licensed for operations as the Raymond F. Rees Training Center (RTC). For purposes of this report, the area for which BRAC is responsible is referred to as the "site," "facility," or "installation" throughout this document. Any references to "offsite" refer to areas that are outside the original boundary of UMCD.

1.1 SCOPE AND OBJECTIVES

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

The SI scope included preparation of project planning documents, field investigation, validation and management of analytical data, comparison of analytical data to the Office of the Secretary of Defense (OSD) screening levels (SLs) published in the 2023 OSD Memorandum (DoD 2023), and documentation of the investigation results. This SI was conducted in accordance with the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). The field activities followed site-specific sampling and health and safety protocols, as identified in the Programmatic Accident Prevention Plan (Leidos 2022b) and the UMCD Site Safety and Health Plan (Appendix A of the UMCD UFP-QAPP Addendum [Leidos 2023a]).

1.2 UMCD DESCRIPTION

UMCD is a 17,148-acre property in northeastern Oregon in Umatilla and Morrow Counties, approximately 3 miles south of the Columbia River and 180 miles east of Portland. Situated on the southern edge of the Columbia Plateau that extends north across the Columbia River into the State of Washington, UMCD is positioned at the intersection of Interstate Highways 82 and 84, approximately 35 miles south of the Tri Cities area of the State of Washington, in a region of gently rolling hills sloping northwest to the Columbia River. The closest city to UMCD is Hermiston, Oregon, approximately 5 miles east of the facility's eastern border. The most prominent surface feature at UMCD is Coyote Coulee, a valley that cuts across the facility (AECOM 2020). An irrigation canal crosses UMCD in its northwestern corner, and a small reservoir and canal are located along the eastern boundary.

During the PA records reviews, interviews, aerial photographic analysis, and site reconnaissance, Leidos investigated available documentation and physical evidence for areas having a potential historical PFAS release. The sites evaluated include fire stations, fire training areas, landfills, wastewater treatment plants, pesticide facilities, maintenance shops, and laundry facilities. The UMCD PFAS PA recommended three AOPIs for further investigation in an SI due to known or potential historical PFAS use, storage, and/or disposal. Sites investigated as part of the ORARNG PFAS PA/SI for RTC were not included in the UMCD PFAS SI. The AOPIs, as well as the dates of operation and sizes of each area, are presented in Table 1-2 and illustrated in Figure 1-2.

Table 1-1. List of AOPIs at Umatilla Chemical Depot

AOPI Name	Dates of Operation	Size (acres)	Rationale
Former Fire Station Building T-104	Late 1940s to Early 1980s	0.37	Former fire station with suspected AFFF use or storage based on dates of operation.
Former Airfield Hangar	Early 1960s to 1998	3.16	Potential storage of AFFF in the fire suppression system of the hangar.
ADA Area Site 19	1945 to 1992	50	Potential release of AFFF and PFAS-containing firefighting foams.

1.3 REPORT ORGANIZATION

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

- ***Section 2. Environmental Setting***—This section discusses the environmental setting at UMCD. Demographics, land use, geology, hydrogeology, hydrology, soil, and climate are described.
- ***Section 3. Field Investigation Activities***—This section provides field procedures followed during the implementation of the SI.
- ***Section 4. Data Analysis and Quality Assurance Summary***—This section describes the laboratory chemical analysis program for the investigation. Sample handling procedures, laboratory equipment calibration, laboratory analytical methods, data reporting and validation, and sample data quality assurance (QA)/quality control (QC) are discussed.
- ***Section 5. Site Inspection Screening Levels***—This section presents the Target PFAS with SLs outlined in the 2023 OSD Memorandum (DoD 2023) and the SLs to which SI results are compared.
- ***Section 6. Site Inspection Results***—This section presents the data gathered during the SI activities and updated conceptual site models (CSMs).
- ***Section 7. Conclusions and Recommendations***—This section summarizes the SI conclusions and presents recommendations for the UMCD AOPIs.
- ***Section 8. References—***This section lists the references that were used in the preparation of this report.
- ***Appendices***—Appendices A through H include data from field activities or related assessments:
  - Appendix A. Daily Field Summary Notes
  - Appendix B. Photograph Log
  - Appendix C. Field Activity Logs
  - Appendix D. Boring Logs
  - Appendix E. Sampling Forms and Calibration Logs
  - Appendix F. Investigation-Derived Waste (IDW) Documents
  - Appendix G. Data Usability Assessment (DUA)
  - Appendix H. Data Presentation Tables.

2. ENVIRONMENTAL SETTING

This section provides general information about UMCD, including the site location, operational history, current and projected land use, climate, topography, geology, hydrogeology, surface water hydrology, potable wells within a 5-mile radius of the installation, and applicable ecological receptors.

2.1 SITE LOCATION

UMCD is a 17,148-acre property in northeastern Oregon, in Umatilla and Morrow Counties, approximately 3 miles south of the Columbia River and 180 miles east of Portland. Situated on the southern edge of the Columbia Plateau that extends north across the Columbia River into the State of Washington, UMCD is positioned at the intersection of Interstate Highways 82 and 84, approximately 35 miles south of the Tri Cities area of the State of Washington, in a region of gently rolling hills sloping northwest to the Columbia River. The closest city to UMCD is Hermiston, Oregon, approximately 5 miles east of the facility's eastern border. The only prominent surface feature at UMCD is Coyote Coulee, a valley that cuts across the facility (AECOM 2020). Figure 2-1 depicts the site features.

UMCD is currently entirely enclosed by fencing. The property's main features include 100 concrete igloo structures, active and inactive buildings, roads, and a chemical disposal facility (Umatilla Chemical Agent Disposal Facility [UMCDF]). The igloos that were once used to store conventional and chemical munitions are now empty, as the remaining chemical stockpiles were eliminated by October 2011. Other actively used buildings are predominantly in the Administration Area in the south-central portion of the installation, UMCDF, and K Block area (USACE 2013).

2.2 SITE OPERATIONAL HISTORY

UMCD property was used as farmland prior to the Federal Government's purchase of the parcels in 1941. The construction of 1,001 ammunition storage igloos began in February 1941. By the end of 1941, UMCD began functioning as an ammunition storage facility. In 1945, ammunition demolition began, and in 1947, an ammunition renovation complex was constructed. Two ammunition maintenance buildings were added in 1955 and 1958. The Army began storing chemical agent-filled munitions and 1-ton containers of chemical agents at the K Block igloos in 1962; however, no chemical weapons were used, manufactured, or tested at UMCD. The chemical munitions were received for storage at the site from 1962 through 1969 (USACE 2013).

In 1988, the BRAC Commission listed UMCD for realignment. From 1990 to 1994, the facility reorganized in preparation for eventual closure, shipping all conventional ammunition and supplies to other installations. At one time, UMCD stored 12 percent of the nation's stockpile of chemical weapons, but no chemical weapons were used, manufactured, or tested at UMCD. Construction of UMCDF began in 1997. Demolition of chemical agent began in 2004 and was completed in 2011. In 2005, BRAC identified UMCD for closure upon completion of demolition of chemical agent. After completion of the chemical weapon demolition, the incineration plant was demolished, but some non-agent-related structures were retained. UMCD was formally closed in 2012, resulting in approximately 17,148 acres available for redevelopment. In 2017, 7,500 acres was transferred to the ORARNG. In March 2023, 9,511.46 acres of UMCD were transferred to the Columbia Development Authority (CDA), which includes a wildlife conservation refuge and an industrial zone to promote economic growth in the area. A small parcel (Interstate I-82) measuring 109.27 acres is pending transfer to the Oregon Department of Transportation (ODOT).

2.3 DEMOGRAPHICS, PROPERTY TRANSFER, AND LAND USE

Towns near UMCD include Umatilla, Hermiston, and Irrigon, Oregon, located 3, 4, and 2 miles from the site, respectively. UMCD is approximately 2 miles south of the Columbia River and the border with the

State of Washington. Nearby towns in Washington include Kennewick, Pasco, and Richland, approximately 22, 23, and 25 miles from UMCD, respectively (USACE 2013). According to the 2020 Census, the city of Umatilla had a population of 7,363. The other nearby towns of Hermiston and Irrigon had 2020 populations of 19,354 and 2,011, respectively (U.S. Census Bureau 2020).

The majority of the area surrounding UMCD is rural agricultural. The primary agricultural use includes wheat, potatoes, watermelon, onions, carrot, and livestock. Major employers include food processing plants, Amazon, Walmart Distribution, Union Pacific Railroad, and Good Shepherd Medical Center.

In 2017, 7,500 acres of the property were transferred to the National Guard Bureau (NGB) and licensed to ORARNG to provide training to soldiers in the ORARNG and other military branches. The NGB parcel was withdrawn from Federal Surplus on June 16, 2017, and transferred in December 2017. Of the remaining property, 9,511 acres were transferred to CDA in 2023, 109 acres will be transferred to the Federal Highway Administration (FHA) in 2023, and another 28 acres (currently being remediated) will be transferred to CDA in 2024. Future land uses for the CDA property include a wildlife conservation refuge (most of which will go to the Confederated Tribes of the Umatilla Indian Reservation) and an industrial zone to promote economic growth in the area. The FHA parcel will transfer to ODOT (Interstate I-82 easement) (U.S. Army 2020).

Based on the current and anticipated future industrial land use, institutional controls are in place at the closed solid and hazardous waste management units. Land use restrictions in these areas include residential or agricultural use of any kind, child care or recreational facilities, and educational facilities for children in grades K-12. The groundwater underlying the Explosives Washout Lagoons Groundwater Pump and Treat Area and the Former Landfill are subject to restrictions. In addition, excavation activities of any kind (i.e., digging, drilling, or any other excavation or disturbance of the land surface or subsurface) or other activities are prohibited near the Former Landfill. The Army is responsible for conducting annual property inspections and CERCLA 5-Year Reviews for these areas. However, the subsequent owner will assume the inspection responsibilities following transfer of the property outside of Army ownership (U.S. Army 2022).

2.4 TOPOGRAPHY

The portion of Oregon within an approximate 50-mile radius of UMCD includes parts of two geomorphic regions: the Deschutes-Umatilla plateau and the Blue Mountains. Elevations on UMCD range from 400 to 677 feet above mean sea level (amsl). The northern, western, and central portions of UMCD are generally flat to very gently rolling. The only predominant geological feature on UMCD is an escarpment that cuts across the facility along a north 30 degrees east axis. The western edge of the escarpment slopes at 5 to 10 percent, and the eastern edge rises 60 to 90 feet at a 30 to 45 percent slope. The western (downhill) side of the escarpment is called Coyote Coulee. The lands east and west of the Coulee consist of gently rolling hills (Earth Technology Corporation 1994, Earth Technology Corporation 1995, USACE 2013).

2.5 GEOLOGY

The geology of northeastern Oregon is dominated by basaltic lava flows of the Columbia River Group, Miocene and Pliocene in age and approximately 10,000 feet thick. These lava flows underlie the lowlands areas and form the down-warped bedrock surface of the Dalles-Umatilla Syncline. The three uppermost basalt flows and interbeds are part of the Saddle Mountain Formation and include, from youngest to oldest, the Elephant Mountain Member, the Rattlesnake Ridge Interbed, the Pomona Member, the Selah Interbed, the Umatilla Member, and the Mabton Interbed. UMCD is near the base of the southern flanks of this broad syncline (USACE 2013).

The underlying basalt is composed of layers of separate basaltic lava flows, each of which is up to 100 feet thick. Dense, hard olivine basalt at the base of each layer grades upward to softer, vesicular, and scoriaceous zones at the top. Some interlayers of clay, or clay and tuffaceous sand, up to 100 feet thick, are present in the group. Below the 751-foot elevation, which includes the entire UMCD, the basaltic bedrock is generally covered with as much as 200 feet of Pleistocene alluvial deposits. These surface deposits are generally permeable silts, sands, and gravels, with some cobbles to the west of Coyote Coulee. Much coarser permeable deposits containing considerable quantities of boulders occur along the eastern wall of the Coulee and toward the eastern side of the installation. Soils at UMCD consist of sandy loam and coarse sand developed primarily from the alluvial deposits. The soils have been modified by wind action. The upper 8 inches of soil consist of a noncalcareous, loose, fine to medium loamy sand. The 8- to 32-inch depths consists of fine to medium sand, which overlies 8 inches of sand containing no organic matter. Below 40 inches, the soil consists of gravel and gravelly sand with varying amounts of cobbles (Earth Technology Corporation 1994, USACE 2013).

2.6 HYDROGEOLOGY

Groundwater occurs beneath UMCD in several distinct hydrogeologic settings, in a series of relatively deep confined basalt aquifers and in a highly productive permeable unconfined aquifer to the south of UMCD (extending off-post). The unconfined aquifer at UMCD consists of the alluvial deposits and weathered surface of the Elephant Mountain Member basalt and is overlain by approximately 20 to 125 feet of unsaturated alluvial sand and gravel. Depth to groundwater ranges from 60 to 100 feet below ground surface (bgs).

Groundwater flow beneath UMCD exhibits seasonal variation due to groundwater extraction for irrigation and recharge from agricultural canals in the vicinity. In the summer and fall, groundwater flow direction is generally to the east and south, while in the winter and early spring, groundwater flow direction is generally to the northwest, toward the Columbia River (USACE 2013).

2.7 SURFACE WATER HYDROLOGY

The closest surface water sources near UMCD are the Umatilla River and the Columbia River, which are approximately 2 and 3 miles from the property, respectively. An irrigation canal crosses UMCD in its northwestern corner, and a small reservoir and canal are located along the eastern boundary. These canals remove water from the Umatilla River for irrigation of the local agriculture (AECOM 2022). Stormwater runoff is minimal at UMCD because of the small amount of precipitation and permeable soils. The UMCD Administration Area storm sewer stormwater is carried by gravity to an outfall west of the sewage treatment plant within the ORARNG property. The outfall is to an open ditch, where it is allowed to percolate into the ground. Natural surface drainage channels control any stormwater runoff that accumulates (Earth Technology Corporation 1994, Earth Technology Corporation 1995, USACE 2013). Stormwater runoff is minimal at UMCD due to low precipitation rates and permeable soils. Surface runoff in the area east of Coyote Coulee is toward the southern boundary into a shallow, elongated depression running parallel to the Union Pacific Railroad and Interstate Highway 84. The central part of UMCD lacks any well-defined drainage pattern. The minimal runoff generated in this area generally flows into the numerous shallow depressions found in the flat and gently rolling topography in the area. The most significant of these depressions are at the base of the west-facing bluff of Coyote Coulee. Several of the buildings at the top of the bluff have drainage going into these depressions (USACE 2013).

2.8 WATER USAGE

UMCD used seven on-post wells to extract water from the basalt aquifer; none of the drinking water supplies at UMCD draw water from the overlying unconfined alluvial aquifer. Four of the seven wells were active (wells 4, 5, 6, and 7) when UMCD closed in 2012. The wells range from 327 to 600 feet bgs, and their pumping capacity ranges from 400 to 800 gallons per minute.

Wells 4 and 5 are on the CDA property in the southwestern corner. These wells supply all water use for both the BRAC UMCD and NGB property. NGB intends to have wells 6 and 7 on the northern part of their property online in early 2023 to provide water for the NGB and will sever their connection to wells 4 and 5.

Three municipal water systems (Hermiston, Umatilla, and Irrigon) draw from groundwater within a 4-mile radius of UMCD. The Columbia River is a major source of potable and irrigation water in the region and is used for recreation, fishing, and the generation of hydroelectric power. The Umatilla River is a tributary to the Columbia River, and its principal use is for irrigation (USACE 2016). According to the Oregon Water Resources Department, more than 1,000 wells are within a 4-mile radius of UMCD. Most of these wells are primarily used for domestic, irrigation, and industrial purposes. The locations with the highest concentration of wells are near the two towns of Hermiston and Irrigon, as well as the southern portion of UMCD (OWRD 2022).

2.9 ECOLOGICAL PROFILE

UMCD is a 17,148-acre property. Approximately 5,613 acres will be used as a wildlife refuge to preserve shrub-steppe habitat for existing and potential wildlife species. Vegetation at UMCD is typical of a cold desert. In general, land at UMCD supports large communities of shrublands, dominated by sagebrush and bitterbrush, with an understory of annual grasses and forbs; and grasslands, dominated by a mixture of native and exotic species such as Sandberg's bluegrass (*Poa secunda*), cheatgrass (downy brome grass) (*Bromus tectorum*), and crested wheatgrass (*Agropyron cristatum*). UMCD contains the largest remnant of bitterbrush habitat in the Columbia Basin, as well as high-quality needle-and-thread sandy grasslands (USACE 2016). No wetlands or surface water are present on the installation (NWI 2023).

Wildlife species present are typical of those found in Columbia Basin native shrub-steppe and grassland habitats: coyote (*Canis latrans*), American badger (*Taxidea taxus*), jackrabbits (*Lepus californicus*) and cottontail rabbits (*Sylvilagus floridanus*), Swainson's (*Buteo swainsoni*) and redtail hawks (*Buteo jamaicensis*), burrowing owl (*Athene cunicularia*), long-billed curlew (*Numenius americanus)*, and many other species common to this habitat (USACE 2016). Pronghorn (*Antilocapra americana*) were previously present at UMCD until 2013. The herd of pronghorn were relocated from UMCD to Beulah Wildlife Management Unit near Ontario, Oregon, after chemical demilitarization activities were completed at UMCD in 2013 (Spokesman-Review 2013). While the pronghorns were at Umatilla, the burrowing owl population declined in response to the trapping and relocating of coyotes and inadvertently badgers to protect the herd. Rather than digging their own, burrowing owls reuse the burrows created by badgers, prairied dogs, or ground squirrels. With the removal of the badgers, the owls lacked critical nesting sites. Artificial burrows were placed at UMCD with plans to reintroduce the badger and the burrowing owl population has rebounded (Greenburg 2019).

The U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC) tool identified two federally listed threatened and endangered (T&E) species potentially occurring on or near UMCD (USFWS 2023). The listed species consist of the federally endangered gray wolf (*Canis lupus*) and the threatened bull trout (*Salvelinus confluentus*). There is also a candidate species, the monarch butterfly (*Danaus plexippus*), identified by IPaC as potentially occurring at UMCD (USFWS 2023). The potential for these T&E and candidate species to occur does not mean they are present at UMCD. For example, UMCD has no surface water bodies; all of the water infiltrates into the desert soils before running off onto lower surrounding lands. The closest aquatic habitat for the bull trout are the Columbia River (3 miles north) and the Umatilla River (2 miles east). Gray wolves have never been observed at UMCD (ORARNG 2018). There are no federally listed T&E species currently recorded on UMCD grounds (USACE 2016).

Eleven migratory birds of particular concern are identified by the IPaC tool as potentially occurring on UMCD. These birds include species such as the American white pelican (*Pelecanus erythrorhynochos*), evening grosbeak (*Coccothraustes vespertinus*), long-eared owl (*Asio otus*), lesser yellowlegs (*Tringa flavipes*), and olive-sided flycatcher (*Contopus cooperi*) (USFWS 2023).

2.10 CLIMATE

UMCD is influenced by the air from the Pacific Ocean. Predominating, stagnant, high-pressure systems in the north or east in the summer or early fall can result in dry and hot southerly air in the region surrounding UMCD. It is this southerly air that increases the risk of wildfires. The lowest temperatures in the winter tend to occur when high pressure systems in central Canada force cold air down and southwesterly across the Rocky Mountains and into the Columbia Basin.

The average temperature typically varies from 27 to 93°F over the course of a year. During the summer months, average daily high temperatures are typically above 82°F, with the hottest temperatures occurring in July. The coldest month of the year in the Umatilla area is December, with an average low of 28°F and an average high of 40°F. The wetter season for the area typically lasts from October to June. November has an average of 6.2 days, with at least 0.04 inches of precipitation, making it the wettest month for the region. July is typically the driest month, with an average rainfall total of 0.2 inches. The area experiences snowfall from November to February, with an average snowfall total of 2.4 inches in December, the month with the highest snowfall totals (Weather Spark 2022).

Wind in the UMCD vicinity tends to be channeled by the Columbia River system. Channeling of winds along the Columbia River valley, in conjunction with a prevailing westerly wind direction in the area, results in a prevailing west-southwest wind at UMCD (AMEC 2012). Average wind speeds for the area are approximately 8.2 miles per hour (Weather Spark 2022).

3. FIELD INVESTIGATION ACTIVITIES

This section provides field procedures followed during the implementation of the SI (40 CFR §300.420(c)(4)(i)). The principal guidance documents for the field investigation activities and procedures used for the UMCD SI were consistent with the requirements presented in the *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018).

3.1 SITE INSPECTION DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) were developed to define the problem at the AOPIs, identify the necessary decisions, specify decision-making rules and the level of confidence necessary to resolve the problem, identify the number of samples necessary to support the decision, and obtain agreement from the decision makers before the sampling program was initiated. The UMCD sample locations were determined based on current site conditions (i.e., groundwater flow direction); presence or absence of site media (e.g., sediment and surface water may not be sampled at a given site); historical data (e.g., suspected location of PFAS release); and historical activities (e.g., remedial activities, disposal of potentially contaminated materials). The project stakeholders concurred that selected sampling schemes would be representative of site conditions prior to initiation of field investigation activities. The field investigation at UMCD was conducted in accordance with the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). The field activities employed to execute the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a), including any variances or deviations, are described below.

3.2 SAMPLE DESIGN AND RATIONALE

Three AOPIs were investigated during the UMCD SI to determine the presence or absence of PFAS in the environment. Information inputs from the preliminary CSMs presented on Worksheet #10 of the UMCD UFP-QAPP Addendum (Leidos 2023a) are the basis for the sample design at each AOPI. All samples were analyzed for the Target PFAS list of perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanoic acid (PFBA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexanoic acid (PFHxA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) (also known as GenX).

The general approach for the determination of the presence or absence of PFAS at an AOPI consists of the collection of three soil samples (surface and subsurface soil samples) from three soil borings and the collection of groundwater samples from open boreholes and existing monitoring wells within or proximal to the AOPI.

Each location that was sampled, with a unique set of coordinates, was assigned a specific site location: UMCD-XXX-##.

Where:

- XXX = abbreviation for the AOPI being sampled
- ## = sequential number of each sample location within the AOPI.

For existing monitoring wells, the sequential number of each sample location was replaced with the existing monitoring well identifier (ID).

Each sample that was collected received a unique sample number, related to the site ID above, in the format of UMXXX##-ZZzz.

Where:

- XXX = abbreviation for the AOPI being sampled
- ## = sequential number of each sample location within the AOPI
- ZZ = sample media (i.e., GW = groundwater, SS = surface soil, SB = subsurface soil), or existing monitoring well ID (e.g., 18-1)
- zz = sequence number for the sample at the location.

For existing monitoring wells, the unique sample number used UMXXX where XXX is the abbreviation for the AOPI that was sampled followed by the monitoring well ID.

QA/QC samples were denoted according to the sample type. Rinsate blanks, field duplicates, and matrix spike (MS) and matrix spike duplicate (MSD) samples were denoted by appending "RB," "FD," "MS," and "MSD," respectively, to the parent sample ID. Field blanks and potable/source water blanks were named using the format of UM-YY-##.

Where:

- YY = FB (field blank) or SRC (source blank)
- ## = sequential number of each type of blank sample collected.

3.3 FIELD INVESTIGATION ACTIVITIES

SI field activities were conducted from June 13 to June 17, 2023. The locations and methods of sample collection during the SI are described in the following sections. Sampling procedures adhered to the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a), and relevant information is summarized below.

Sampling activities at UMCD included collecting surface and subsurface soil samples from soil borings, collecting grab groundwater samples from open boreholes, and collecting groundwater samples from existing monitoring wells. Samples were analyzed for 26 PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Table B-15 of the DoD Quality Systems Manual (QSM) Version 5.4 (DoD 2021) to determine the presence or absence of PFAS. Twenty-eight samples were collected among the 3 AOPIs and included 6 existing monitoring well groundwater samples, 4 open borehole groundwater samples, 6 surface soil samples, and 12 subsurface soil samples. A breakdown of samples collected at each AOPI is provided in Table 3-1. Prior to beginning sampling, site reconnaissance and utility clearance were performed. Sampling was completed at one AOPI before moving to the next AOPI when feasible. Any variances in sampling procedure, such as moving a location or sample point elimination, were discussed with the project team and communicated in daily field summary emails (Appendix A). Field procedures and any variances are discussed in the following sections. Photographs of SI field activities are provided in Appendix B.

Table 3-1. UMCD AOPI SI Sample Collection

AOPI Name	Open Borehole Groundwater Samples	Existing Monitoring Wells	Soil Borings	Surface Soil Samples	Subsurface Soil Samples
Former Fire Station Building T-104	2	0	3	3	6
Former Airfield Hangar	2	0	3	3	6
ADA Area Site 19	0	6	0	0	0
Total	**4**	**6**	**6**	**6**	**12**

3.4 FIELD PROCEDURES

The following sections describe the field activities and procedures for utility clearance, PFAS-free source water sampling, soil boring installation and sampling, open borehole sampling, groundwater sampling, equipment calibration, and location survey. Specific details regarding each of these activities are documented on Task Team Activity Log Sheets in Appendix C.

Because many materials routinely used during environmental investigations can potentially contain PFAS, the field crew conducted SI activities in accordance with the PFAS sampling standard operating procedure (SOP) presented in Appendix A of the Programmatic UFP-QAPP (Leidos 2022a). Procedures include requirements for equipment, containers, handling, and sampling, including PFAS-specific requirements, to ensure that sample contamination does not occur during collection and transport. New, clean nitrile gloves were donned prior to each new sample collected. Sampling containers were labeled with the following information: site name, sample ID, date and time of sample collection, name of sampler, sample preservation, and type of analysis (i.e., PFAS).

3.4.1 Utility Clearance

Prior to initiating intrusive activities, the site was verified to be free of underground utilities. The Field Manager coordinated underground utility clearances through BRAC and Oregon811"Call Before You Dig." Other utility clearance activities included consulting individual utility companies (as needed), reviewing available as-built drawings, walking the areas to verify that utilities were marked, looking for signs of unidentified utilities (including overhead utilities), and completion of a Subsurface Clearance Checklist prior to initiating drilling operations. Prior to conducting powered drilling within 25 feet of known or suspected subsurface utilities, boreholes were excavated to a minimum of 5 feet bgs using a low-impact technique (i.e., hand auger) to confirm the absence of a utility at the borehole location.

3.4.2 PFAS-Free Source Water Sampling

Prior to beginning work, one source water sample (UM-SRC-01) was collected on April 20, 2023, for PFAS analysis to determine if the source water was PFAS-free and could be used for drilling and decontamination. Sample UM-SRC-01 was collected from an overhead hydrant, supplied by facility water wells, and located along D Street on ORARNG property. Water sources were purged for a minimum of 1 minute prior to filling high-density polyethylene (HDPE) bottles. Water from the fire hydrant was determined to be PFAS-free (i.e., PFAS were not detected at concentrations exceeding the limit of detection [LOD]) and was used as a drilling and decontamination water source during field sampling.

3.4.3 Soil Boring Installation and Sampling

All soil samples were collected in accordance with the procedures outlined in the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). QC samples, including duplicates, rinsate blanks, and MS/MSDs, were also collected.

Soil samples were collected through sonic drilling with some surface samples being collected with a stainless steel hand auger. Each soil core was logged for lithology in accordance with USACE guidance (ASTM International D2488 [ASTM 2017]) and recorded on a boring log (provided in Appendix D). Soil sample intervals were homogenized in disposable HDPE bags prior to placing the soil into HDPE sample bottles. Sample bottles were labeled and sealed in zip-lock bags and placed on wet ice for cooling to ≤6°C. Additional details on protocols for obtaining soil samples are outlined on Worksheet #18 and the Leidos SOP "Soil Sampling" provided in the Programmatic UFP-QAPP (Leidos 2022a).

Surface soil samples from 0 to 1 foot bgs were collected from each of the AOPIs. Surface soil sample depths did not exceed 1 foot bgs.

Three soil samples were collected from each soil boring advanced at each AOPI. During the advancement of the soil borings, soil cuttings were evaluated for recording lithology and documenting visual observations. Surface soil samples were collected as grab samples from 1-foot intervals based on the presence of native soil beneath the top layer of asphalt. Subsurface soil samples were collected as grab samples from 2-foot intervals. The interval from which the sample was collected was recorded on the boring log. Samples for laboratory analysis were biased toward organic-rich zones, as PFAS may sorb to organics, but were collected at 4 to 6 feet bgs in accordance with USEPA Region 10 requests and previous technical approaches taken by ORARNG. A lower depth sample was collected at 15 feet bgs for soil borings terminated at 15 feet bgs and above the soil/groundwater interface for soil borings colocated with groundwater sampling locations.

Soil borings were abandoned following sample collection by backfilling the borehole with bentonite and hydrating with PFAS-free water. Surface restoration matched the surrounding surface (e.g., concrete, asphalt, grass).

3.4.4 Groundwater Sampling and Well Redevelopment

All groundwater samples were collected in accordance with the procedures outlined in the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). QC samples, including equipment blanks, duplicates, and MS/MSDs, were also collected. Boreholes were drilled using sonic drill rigs and supporting equipment. Two open boreholes per location were used at the Former Fire Station Building T-104 and Former Airfield Hangar AOPI to collect groundwater elevation data to evaluate groundwater flow direction. Once groundwater was encountered at a borehole location, a grab groundwater sample was collected using a PFAS-free bailer.

Prior to sampling the existing monitoring wells, bonded Teflon-lined low-density polyethylene tubing, which was present in the wells, was removed. The existing monitoring wells were then redeveloped by pumping out three well volumes of water to ensure any remaining contaminants from previous sampling equipment that could potentially contain PFAS would not cross-contaminate the samples. Static water level measurements were collected to the nearest 0.01 foot prior to sampling. Groundwater samples were collected as grab samples using stainless steel bladder pumps and HDPE tubing. QC samples, including equipment blanks, duplicates, and MS/MSDs, were also collected. Following completion of monitoring well purging and stabilization, samples were collected in laboratory-supplied HDPE bottles. Sample bottles were labeled and sealed in zip-lock bags and placed on wet ice for cooling to ≤6°C. New, clean, non-powdered, disposable nitrile gloves were donned prior to each new sample collected. Sampling containers were labeled with the following information: site name, sample ID, date and time of sample collection, name of sampler, sample preservation, and type of analysis (i.e., PFAS). Sampling activities were recorded on the Task Team Activity Log Sheets completed daily and compiled in Appendix C.

All open boreholes were abandoned in accordance with the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). Open boreholes were abandoned by backfilling the borehole from the bottom to the surface with bentonite pellets, chips, or slurry. Surface completion matched the surrounding surface (e.g., concrete, asphalt, grass).

3.4.5 Equipment Calibration

Water quality instruments (e.g., Horiba U-52) used during groundwater sampling were calibrated daily per Worksheet #24 of the Programmatic UFP-QAPP (Leidos 2022a) against known standards in accordance with the manufacturer's instructions and documented on the calibration logs provided in Appendix E.

3.4.6 Location Survey

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

3.4.7 Deviations and Field Change Requests

No instances of field modifications impacting project scope and/or data usability/quality were encountered during the SI fieldwork. The following minor deviations from the UMCD UFP-QAPP Addendum (Leidos 2023a) were implemented during the field investigation and summarized for USACE in daily field notes:

- The sampling approach at UMCD-FAH-01 was revised to include a surface soil sample due to the presence of native soil below the 3-inch layer of asphalt.
- Shallow subsurface samples were collected between 4 and 6 feet bgs. This approach achieved objectives stated in the UMCD UFP-QAPP Addendum (Leidos 2023a), but altered the depth to follow the approach taken by ORARNG at Camp Umatilla and the requests made by USEPA Region 10 on the Camp Umatilla SI QAPP Addendum (AECOM 2022).

3.5 DECONTAMINATION PROCEDURES

To ensure that chemical analysis results reflect the actual concentrations at sample locations, the non-dedicated, reusable equipment used in redevelopment and sampling activities was rigorously cleaned and decontaminated between sample locations in accordance with the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). The non-disposable sampling equipment used to conduct sampling activities (e.g., hand augers, stainless steel pumps, water level meters) was decontaminated before sampling activities began, between locations, between sampling events, and after sampling activities were completed. Wastewater generated from decontamination activities was handled as IDW. Decontamination water was combined with well development and sampling purge water and managed as one medium.

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

3.6 DISPOSITION OF FIELD INVESTIGATION-DERIVED WASTE

The IDW generated during the SI at UMCD included solids (soil), liquids (well purge water and decontamination rinse water), and contact waste (sample liners and HDPE bags). These materials were managed in accordance with the IDW Management Plan provided in Appendix B of the UMCD UFP-QAPP Addendum (Leidos 2023a).

All IDW generated at UMCD was placed in United Nations-rated, 55-gallon drums for storage, transport, and disposal. Permanent labels for the drums included a unique container number, a description of the contents (i.e., soil or wastewater), the fill date, the source location, the generator's name (i.e., UMCD), and a telephone number for the generator's point of contact (e.g., the Army BRAC Environmental Coordinator). Each bucket or carboy used to temporarily store liquid IDW before it was transferred to a 55-gallon drum was marked "Nonpotable Water" or "Decontamination Waste" to comply with requirements of the IDW Management Plan.

The contents of the IDW drums were sampled for characterization and profiling. A solid waste sample was composited by collecting aliquots from the solid waste drums using a decontaminated stainless steel hand auger. The solids were homogenized in an HDPE plastic bag and then placed into laboratory-supplied sample containers. Solid, non-regulated waste and general refuse, including disposable, non-recyclable HDPE bailers and personal protective equipment (PPE), were contained in separate drums. For drums containing liquid IDW, nitrile gloves were donned and sample bottles were filled directly from the drum. The waste hauler (US Ecology) was contacted prior to sampling to determine parameters required for disposal of waste potentially containing PFAS. The waste hauler provided guidance to analyze for suspected contaminants based on site history and previous investigations. The sample was analyzed for PFAS, toxicity characteristic leaching procedure (TCLP) volatile organic compounds, TCLP semivolatile organic compounds, TCLP metals, TCLP pesticides, TCLP herbicides, pH, and flashpoint. Based on the analytical results, the waste was classified as non-hazardous.

On September 21, 2023, US Ecology removed the solid and liquid IDW waste drums from UMCD for disposal. Both solid and liquid waste was disposed of at the US Ecology Idaho, Inc. Grand View Idaho facility. Copies of the waste manifest and certificates of disposal are included in Appendix F.

4. DATA ANALYSIS AND QUALITY ASSURANCE SUMMARY

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

Pace Analytical Services, LLC, in West Columbia, South Carolina, was the analytical laboratory under contract for the analysis of PFAS during the UMCD SI field activities. Sections 4.1 through 4.4 summarize sample handling procedures, laboratory analytical methods, data QA/QC, data reporting and validation, and sample QA/QC. A QA summary of the analytical data is presented in Section 4.5. Appendix G provides the DUA, which details the quality and usability of the SI analytical data and the process performed to evaluate the data for compliance with established QC criteria.

4.1 SAMPLE HANDLING PROCEDURES

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

4.1.1 Chain-of-Custody Record

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

Shipping containers were sealed with custody tape. Sealed coolers were transported to the commercial carrier for overnight delivery to the laboratory. The air bill number, written on the CoC form, acted as the custody documentation while the sealed coolers were in the possession of the commercial carrier. The CoC form was placed in a resealable plastic bag and taped to the inside lid of the cooler.

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

4.1.2 Laboratory Sample Receipt

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

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

Samples received by the laboratory were considered to be physical evidence and were handled according to USEPA procedural safeguards. In addition, all data generated from the sample analyses, including all associated calibrations, method blanks, and other supporting QC analyses, were identified with the project name, project number, and sample delivery group (SDG) designation. All data were maintained under the proper custody. The laboratory provided complete security for samples, analyses, and data.

4.2 LABORATORY ANALYTICAL METHODS

The chemical analysis program for the UMCD SI conforms to the analytical requirements presented in the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a) for the chemical analysis of field investigation samples. All samples were analyzed for PFAS using LC/MS/MS procedures compliant with DoD QSM Version 5.4, Table B-15 (DoD 2021) and the laboratory SOP.

4.3 DATA QUALITY ASSURANCE/QUALITY CONTROL

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

4.3.1 Laboratory Quality Assurance/Quality Control

Samples were analyzed for PFAS using LC/MS/MS in compliance with DoD QSM Version 5.4, Table B-15 (DoD 2021). QC checks included holding times, method blanks, calibration standards, extracted internal standards (EISs), laboratory control samples (LCSs), MS/MSDs, and detection limits. The acceptance criteria and laboratory SOP are provided in the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a).

Method Blanks—Method blanks were used to monitor the possibility of laboratory-induced contamination by running a volume of approved reagent water through the entire analytical scheme (i.e., extraction, concentration, analysis). Blank requirements are specified in the DoD QSM Version 5.4, Table B-15 (DoD 2021) and the laboratory SOP.

Matrix Spike/Matrix Spike Duplicates—Additional sample volume was collected from select field sample locations to evaluate accuracy and precision using MS/MSD analyses. MS/MSDs are aliquots of environmental samples to which known concentrations of certain target analytes have been added before sample preparation, cleanup, and determinative procedures have been implemented (SW846 Chapter One). Accuracy was expressed as the percent recovery of each added compound. Precision was expressed as the relative percent difference (RPD) between the MS and MSD results. MS/MSD samples were collected and analyzed at a frequency of 1 for every 20 samples of similar matrix received at the laboratory.

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

4.3.2 Field Quality Assurance/Quality Control

Table 4-1 summarizes the frequency of field QC samples that were collected during the UMCD field investigation. The requirements for field QC were established on Worksheet #20 of the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a).

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

QC Sample	Frequency
Field Blank	1 per water source used as final rinse of equipment
Source Water Blank	1 per bulk rinse water source
Equipment Rinsate Blank	1 for every 10 or fewer investigative samples
Field Duplicate	1 for every 10 or fewer investigative samples
Reagent Blank	1 per drinking water sampling event; none required for this event
MS/MSD	1 for every 20 or fewer investigative samples

4.4 DATA REPORTING AND VALIDATION

The Leidos QA Manager or designee initiated a validation of the analytical data packages. One hundred percent of the data were validated using objective criteria taken from the requirements of the Programmatic UFP-QAPP (Leidos 2022a) and DoD QSM Version 5.4 (DoD 2021) and qualified in accordance with DoD Data Validation Guidelines Module 3 (DoD 2020) and the revised table for sample qualification in the presence of blank contamination (DoD 2022).

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

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

4.5 QUALITY ASSURANCE SUMMARY

A comprehensive QA/QC program was implemented during the sampling event in June 2023 at UMCD. Samples and associated QC samples (e.g., field duplicates, equipment rinsate blanks, source water blanks, MSs, MSDs) were collected and analyzed for PFAS using methods specified in the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a). Consistent with the data quality requirements established in the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a) and DQOs, all sample data and associated QC data were evaluated during the review and validation process. Individual sample results were qualified, as necessary, to designate usability of the data toward meeting project objectives. Data qualifiers were applied as appropriate to results for 28 primary samples and 3 field duplicates (approximately 744 data points were evaluated), based on deviations from the measurement performance criteria in the Programmatic UFP-QAPP (Leidos 2022a). Results of the validation are provided in the DUA (Appendix G). The analyses associated with each data quality indicator are summarized below, with details of the results of the QC checks provided in the DUA (Appendix G).

4.5.1 Precision

Precision was evaluated by the analysis of MS/MSDs and field duplicate samples and the RPD between the duplicate spike results. QC results associated with analytical precision met measurement performance criteria (MPC).

4.5.2 Accuracy

Bias introduced due to blank contamination (in method, instrument, or field blanks) and any impact on accuracy were evaluated during validation. Analytical accuracy was measured through the use of LCSs, MS/MSDs, isotope dilution standards, initial and continuing calibration, and target compound quantitation requirements. Instrument blank contamination resulted in one result qualified as X. Low EIS recoveries (<20 percent) resulted in eight data points qualified as unusable during validation. With approval from the Project Delivery Team (PDT), results qualified X due to accuracy non-conformances were rejected (R) and not used as part of the data set used to evaluate project objectives. Additional results that were qualified as estimated based on QC samples associated with accuracy that did not meet MPC were considered estimated but usable for evaluating project objectives.

4.5.3 Sensitivity

Sensitivity requirements were evaluated against minimum required limits of quantitation and LODs in the Programmatic UFP-QAPP (Leidos 2022a), and these criteria were met.

4.5.4 Representativeness

Representativeness was satisfied by ensuring that the Programmatic UFP-QAPP (Leidos 2022a) and UMCD UFP-QAPP Addendum (Leidos 2023a) protocols were followed, appropriate sampling techniques were used, established analytical procedures were implemented, and analytical holding times of the samples were not exceeded. Sample temperature upon receipt was exceeded for seven samples and one field duplicate, and these results were qualified as estimated. Based on an overall evaluation of sample collection and receipt, holding times, and precision and accuracy, the samples collected during the UMCD SI sampling and analysis event are considered to be representative of the environmental conditions.

4.5.5 Comparability

Comparability was achieved by using consistent, documented, and Programmatic UFP-QAPP approved methods and meeting project accuracy and precision objectives. Based on the results of QC samples that assessed precision and accuracy assessment, along with the use of established method criteria (i.e., DoD QSM Version 5.4, Table B-15 [DoD 2021]), the data collected during the UMCD SI are considered to meet project objectives for comparability.

4.5.6 Completeness

Completeness measures the amount of valid data obtained from the sampling and analysis effort. For analytical data to be usable, each data point must be validated and meet criteria without significant non-conformance. The DQOs for the UMCD SI were set at 90 percent for field sampling and laboratory completeness. All groundwater and soil samples proposed were collected. An additional surface soil sample (UMFFS03-SS01) was collected. Analytical completeness was impacted by nine results qualified as X and later rejected (R) by the PDT; objectives were met with a completeness of 98.8 percent.

4.5.7 Data Usability Assessment

Data that have been qualified as estimated (J, UJ) during validation indicate accuracy, precision, or sensitivity QC measurements may have exceeded criteria, but the results are considered valid. Nine data points within two samples (UMFFS02-GW01 and UMFAH01-GW01) were recommended for exclusion due to EIS exceedance or blank contamination, as detailed in the DUA (Appendix G). Results recommended for exclusion are included in the Notice of Deficient Data in the DUA (Appendix G); upon review by the PDT, these data were rejected (R) and were not used to evaluate project objectives.

5. SITE INSPECTION SCREENING LEVELS

Detected concentrations of the Target PFAS in samples collected during this SI are compared to residential scenario SLs calculated using the USEPA regional screening level (RSL) calculator for soil and the tap water criteria for groundwater, as published in the 2023 OSD Memorandum (DoD 2023). This SI uses the SLs and a target hazard quotient (HQ) of 0.1 to evaluate the Target PFAS concentrations. These SLs (Table 5-1) are used to evaluate the data and determine if future investigation is warranted at each AOPI. SLs for the other PFAS analyzed during this SI currently do not exist.

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

Chemical	Residential Tap Water HQ = 0.1 (ng/L or ppt)	Residential Soil HQ = 0.1 (µg/kg or ppb)
HFPO-DA	6	23
PFBA	1,800	7,800
PFBS	600	1,900
PFHxA	990	3,200
PFHxS	39	130
PFNA	5.9	19
PFOA	6	19
PFOS	4	13

Note: The residential tap water SLs are used to evaluate groundwater data. The residential soil SLs are used to evaluate soil data. Laboratory results are reported to two significant figures.

6. SITE INSPECTION RESULTS

This section presents the background, summary of analytical results, and a CSM for each AOPI at UMCD where Target PFAS were detected. Sampled media and QA/QC samples were analyzed for the list of 26 PFAS specified in the Programmatic UFP-QAPP (Leidos 2022a). The sample results discussed below by AOPI focus on the eight Target PFAS outlined in the 2023 OSD Memorandum (DoD 2023): PFOS, PFOA, PFBA, PFBS, PFNA, PFHxA, PFHxS, and HFPO-DA. Analytical data presentation tables for all PFAS analyzed using approved methods are provided in Appendix H.

Surface water and sediment were not present at UMCD.

6.1 CONCEPTUAL SITE MODELS

The preliminary CSMs developed for each AOPI during the PA were further refined for each AOPI where Target PFAS were detected at concentrations greater than the LOD in sampled media. Based on the SI sample results, CSMs presented for each AOPI represent the current understanding of site conditions with respect to known or suspected sources of PFAS-containing materials, potential transport mechanisms and migration pathways, and potentially exposed current and reasonably anticipated future human receptors.

The CSMs evaluate ingestion, dermal contact, and inhalation exposure routes for human receptors. The exposure pathways are evaluated as complete, potentially complete, or incomplete in the CSMs presented in figures in each AOPI-specific CSM section. In the absence of toxicity information for the inhalation route, the inhalation exposure pathway of PFAS (via dust) is considered potentially complete for soil where Target PFAS are detected. The remaining exposure pathway designations are determined as follows:

- ***Complete*** – Human exposure pathways are considered complete where Target PFAS have been detected at concentrations exceeding SLs, and no land use controls (LUCs) are in place restricting access or use of the media.
- ***Potentially Complete*** – Human exposure pathways are considered potentially complete if Target PFAS have been detected at concentrations less than the SLs for soil, groundwater, surface water, or sediment or if SLs have been exceeded along the migration pathway. For example, if Target PFAS are not detected in soil but are detected at concentrations exceeding SLs in groundwater, the exposure pathway for soil is considered potentially complete. In addition, a groundwater exposure pathway is considered potentially complete where Target PFAS have been detected and could migrate from the AOPI source area to offsite groundwater that is used for drinking water. Exposure pathways are also potentially complete for media where existing LUCs are in place for non-PFAS because the LUCs are not Target PFAS specific.
- ***Incomplete*** – Human exposure pathways are considered incomplete for media where Target PFAS have not been detected at concentrations greater than the LODs.

Multiple LUCs are in place at the UMCD. Based on the current and anticipated future industrial land use, institutional controls are in place at the closed solid and hazardous waste management units. Land use restrictions in these areas include restrictions against residential or agricultural use of any kind, childcare or recreational facilities, and educational facilities for children in grades K-12.

The groundwater underlying the Explosives Washout Lagoons Groundwater Pump and Treat Area and the Former Landfill is subject to use restrictions. In addition, excavation activities of any kind (i.e., digging, drilling, or any other excavation or disturbance of the land surface or subsurface) are prohibited near the Former Landfill.

LUCs that apply to the AOPIs are discussed in the relevant AOPI sections below.

6.2 FORMER FIRE STATION BUILDING T-104 AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Former Fire Station Building T-104 AOPI.

6.2.1 AOPI Background

The Former Fire Station Building T-104 AOPI is near the southwestern corner of the Army property. The Former Fire Station operated from the late 1940s until the early 1980s (Dames & Moore 1990). Based on aerial photograph analysis, the building was demolished by 1994. The property currently belongs to CDA. According to a former Army personnel interview, fire trucks were parked outside on the fire station ramp during operation. Fire trucks were reportedly used during nozzle testing in the past. Fire trucks used during nozzle testing events were aqueous film-forming foam (AFFF)-capable fire trucks. The locations of the nozzle testing areas are unknown (AECOM 2022). Based on the operational dates of the Former Fire Station and information obtained from the former Fire Chief, the potential exists that AFFF was historically used, stored, or released. No LUCs are in place for this AOPI.

6.2.2 SI Sampling and Results

Soil and groundwater samples were collected from the Former Fire Station Building T-104 AOPI at the following locations (Figure 6-1):

- Nine soil samples and one QC duplicate were collected from three soil borings (UMCD-FFS-01, UMCD-FFS-02, and UMCD-FFS-03) within the suspected release area. One surface soil and two subsurface soil samples were collected from each boring.
- Two groundwater samples were collected from two open boreholes (UMCD-FFS-01 and UMCD-FFS-02) within the suspected release area.

Surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for soil and groundwater samples collected at the Former Fire Station Building T-104 AOPI are summarized below and presented in Table 6-1 and Figure 6-2.

6.2.2.1 Soil

Target PFAS were not detected at concentrations greater than the LODs in any of the soil samples collected at the Former Fire Station Building T-104 AOPI.

6.2.2.2 Groundwater

Target PFAS were not detected at concentrations greater than the LODs in any of the groundwater samples collected at the Former Fire Station Building T-104 AOPI.

6.2.3 Recommendation

Target PFAS were not detected greater than the LODs at the Former Fire Station Building T-104 AOPI in soil or groundwater; therefore, further investigation is not recommended.

Table 6-1. Target PFAS Results and Screening for the Former Fire Station Building T-104 AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBA	PFBS	PFHxA	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**7800**	**1900**	**3200**	**130**	**19**	**19**	**13**
UMCD-FFS-01	UMFFS01-SS01	SURF	0.00-1.00	06/16/2023	1.7 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
	UMFFS01-SB02	BORE	4.00-6.00	06/16/2023	2 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
	UMFFS01-SB03	BORE	68.00-70.00	06/17/2023	2.1 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U
UMCD-FFS-02	UMFFS02-SS01	SURF	0.00-1.00	06/16/2023	1.8 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
	UMFFS02-SB02	BORE	4.00-6.00	06/16/2023	2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	UMFFS02-SB02FD	BORE	4.00-6.00 (D)	06/16/2023	1.8 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
	UMFFS02-SB03	BORE	68.00-70.00	06/16/2023	1.8 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
UMCD-FFS-03	UMFFS03-SS01	SURF	0.00-1.00	06/17/2023	2.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	UMFFS03-SB02	BORE	4.00-6.00	06/17/2023	2.1 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U
	UMFFS03-SB03	BORE	13.00-15.00	06/17/2023	1.8 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**1800**	**600**	**990**	**39**	**5.9**	**6**	**4**
UMCD-FFS-01	UMFFS01-GW01	WELL	71.00-71.00	06/17/2023	3.7 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
UMCD-FFS-02	UMFFS02-GW01	WELL	71.00-71.00	06/16/2023	5 UJ	2.6 UJ	2.6 UJ	2.6 UJ	2.6 UJ	2.2 UJ	2.6 UJ	2.2 UJ

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the August 2023 OSD Memorandum for Tap Water using an HQ = 0.1.
(D) = Field duplicate sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.

6.3 FORMER AIRFIELD HANGAR AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Former Airfield Hangar AOPI.

6.3.1 AOPI Background

A former airfield is located on the southeastern portion of UMCD. The airfield consisted of an air strip runway, parking lot, and plane parking since the early 1960s. An airplane hangar was located at the airfield from the mid-1960s until the mid-1980s. The airfield was listed as closed by 1998. The property currently belongs to CDA. Based on the operational dates of the airfield and the presence of an airplane hangar, the potential exists that AFFF was historically used, stored, or released at the former airfield hangar. Hangars typically have fire suppression systems or other types of mobile fire extinguishers to aid in emergency response activities on or near the flightline, which often include the use or storage of AFFF.

6.3.2 SI Sampling and Results

Soil and groundwater samples were collected from the Former Airfield Hangar AOPI at the following locations (Figure 6-3):

- Nine soil samples and one QC duplicate were collected from three soil borings (UMCD-FAH-01, UMCD-FAH -02, and UMCD-FAH -03) within the suspected release area. One surface soil sample and two subsurface soil samples were collected from each boring.
- Two groundwater samples were collected from two open boreholes (UMCD-FAH-01 and UMCD-FAH-02) within the suspected release area.

Surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for soil and groundwater at the Former Airfield Hangar AOPI are summarized below and presented in Table 6-2 and Figure 6-4.

6.3.2.1 Soil

PFNA was detected at concentrations less than the SL in surface and shallow subsurface soil at boring locations UMCD-FAH-01 and UMCD-FAH-03 (estimated concentrations).

PFOS, PFOA, PFBA, PFBS, PFHxA, PFHxS, and HFPO-DA were not detected at concentrations greater than the LODs in any soil samples collected at the Former Airfield Hangar AOPI.

6.3.2.2 Groundwater

PFBA, PFHxA, and PFHxS (estimated) were detected at concentrations less than SLs in groundwater collected from UMCD-FAH-01. Target PFAS were not detected at concentrations greater than the LODs at UMCD-FAH-02.

PFOS, PFOA, PFNA, PFBS, and HFPO-DA were not detected at concentrations greater than the LOD in any groundwater samples collected at the Former Airfield Hangar AOPI.

6.3.3 CSM

The Former Airfield Hangar AOPI is located within the approximate 83 acres of the former airfield, which is predominantly a grassy field. The Former Airfield Hangar AOPI includes 3.16 acres of the concrete air strip, ramp, and hangar foundation that is surrounded by grassy vegetation. The surface elevation at the AOPI is at 593 feet amsl.

The soil at UMCD consist of sandy loam and coarse sand developed primarily from alluvial deposits. During the SI, groundwater was encountered at approximately 80 feet bgs at the Former Airfield Hangar AOPI. In the summer and fall, groundwater flow direction is generally to the east and south, while in the winter and early spring, groundwater flow direction is generally to the northwest, toward the Columbia River (USACE 2013). The nearest surface water body is the Umatilla River, approximately 3 miles east of the former airfield.

Due to the possible fire response activities and fire suppression system at the former airfield hangar, which have the potential for use of AFFF, the surface soil at the AOPI is the source medium for potential PFAS contamination. The primary release mechanism is the potential release of PFAS to surface soils related to the emergency response activities at the Former Airfield Hangar AOPI. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via leaching and percolation.

Based on the current and future industrial land use and the land use restrictions preventing residential use of most of the property at UMCD, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the UMCD property.

The onsite soil exposure pathways are potentially complete because Target PFAS were detected at concentrations less than the SLs in soil at the Former Airfield Hangar AOPI. The offsite soil exposure pathways are incomplete because migration of soil is not expected.

Target PFAS were detected in groundwater at concentrations less than the SLs, making the onsite groundwater exposure pathways potentially complete for onsite workers. Because drinking water wells exist downgradient from the UMCD boundary and Target PFAS were detected in onsite groundwater, the groundwater exposure pathways for offsite residents are potentially complete.

Due to small amounts of precipitation and permeable soils, surface water and sediment media are not present at the AOPI.

Figure 6-5 presents the CSM for the Former Airfield Hangar AOPI.

6.3.4 Recommendation

Target PFAS were not detected at concentrations greater than the SLs in soil or groundwater at the Former Airfield Hangar AOPI; therefore, further investigation is not recommended.

Table 6-2. Target PFAS Results and Screening for the Former Airfield Hangar AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBA	PFBS	PFHxA	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**7800**	**1900**	**3200**	**130**	**19**	**19**	**13**
UMCD-FAH-01	UMFAH01-SS01	SURF	0.00-1.00	06/16/2023	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U
	UMFAH01-SB02	BORE	4.00-6.00	06/15/2023	2 U	0.5 U	0.5 U	0.5 U	0.5 U	**1.5**	0.5 U	0.5 U
	UMFAH01-SB03	BORE	78.00-80.00	06/15/2023	2.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
UMCD-FAH-02	UMFAH02-SS01	SURF	0.00-1.00	06/14/2023	1.8 UJ	0.44 UJ	0.44 UJ	0.44 UJ	0.44 UJ	0.44 UJ	0.44 UJ	0.44 UJ
	UMFAH02-SB02	BORE	4.00-6.00	06/14/2023	2.0 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
	UMFAH02-SB02FD	BORE	4.00-6.00 (D)	06/14/2023	2.0 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ
	UMFAH02-SB03	BORE	78.00-80.00	06/14/2023	2.3 UJ	0.60 UJ	0.60 UJ	0.60 UJ	0.60 UJ	0.60 UJ	0.60 UJ	0.60 UJ
UMCD-FAH-03	UMFAH03-SS01	SURF	0.00-1.00	06/13/2023	1.9 UJ	0.46 UJ	0.46 UJ	0.46 UJ	0.46 UJ	**13 J**	0.46 UJ	0.46 UJ
	UMFAH03-SB02	BORE	4.00-6.00	06/13/2023	2.0 UJ	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ	**0.29 J**	0.50 UJ	0.50 UJ
	UMFAH03-SB03	BORE	13.00-15.00	06/13/2023	2.0 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ	0.49 UJ
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**1800**	**600**	**990**	**39**	**5.9**	**6**	**4**
UMCD-FAH-01	UMFAH01-GW01	WELL	80.00-80.00	06/15/2023	4.3 U	**4.8**	2.2 U	**9.5**	**1.8 J**	2.2 U	2.2 U	2.2 U
UMCD-FAH-02	UMFAH02-GW01	WELL	80.00-80.00	06/14/2023	3.8 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the August 2023 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
(D) = Field duplicate sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.

6.4 ADA AREA SITE 19 AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Ammunition Demolition Activity (ADA) Area Site 19 AOPI.

6.4.1 AOPI Background

The ADA Area is in the northwestern portion of UMCD and is presently owned by NGB and operated by ORARNG. Several open burn areas were identified in the 1,750-acre ADA Area that was operational from 1945 to 1992 (Earth Technology Corporation 1994). The ADA Area was used to dispose of ordnance by burning, detonation, dumping, or burial (USACE 2013). Located within the ADA Area, a 50-acre area referred to as Site 19 included approximately 10 open burning trenches/pads and an adjoining burn field. Burning of sludges containing explosive constituents was conducted in the northernmost trenches of Site 19.

Remedial activities to address munitions and explosives of concern (MEC) removed 1 foot of surface soil from Site 19 with some isolated areas requiring deeper soil removals. The remedial activities were conducted between June 1996 and August 1997. During the remedial construction, additional areas of contaminated soil were identified near the two burn trenches (Site 19E/F) (U.S. Army 1994). Additional soils were excavated, treated, and disposed of in the Active Landfill at UMCD under the original remedial action contract. After June 2002, additional quantities of soil from Site 19E/F were excavated, treated offsite (i.e., off-post) by solidification/stabilization, and disposed of in an off-post landfill (Bay West, LLC 2021). The frequency of use and size of the ADA Area Site 19 AOPI suggest that the fire department may have used foam onsite for fire suppression.

6.4.2 SI Sampling and Results

Six groundwater samples were collected from six existing monitoring wells at the ADA Area Site 19 AOPI (Figure 6-6). Four monitoring wells (UMCD-ADA-19-2, UMCD-ADA-19-3, UMCD-ADA-19-4, and UMCD-ADA-18-1) were within the suspected release area. Two monitoring wells (UMCD-ADA-19-1 and UMCD-ADA-SB-4) were downgradient from the suspected release area.

Soil samples were not collected at the ADA Area because of ongoing MEC remediation activities, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for groundwater at the ADA Area Site 19 AOPI are summarized below and presented in Table 6-3 and Figure 6-7.

6.4.2.1 Groundwater

PFOA, PFBA, PFHxA, and PFNA were detected at concentrations less than the SLs in groundwater samples collected at the ADA Area Site 19 AOPI. All four aforementioned Target PFAS were detected at downgradient monitoring well UMCD-ADA-SB-4. In addition, PFBA, PFOA (estimated concentration), and PFHxA (estimated concentration) were detected in downgradient monitoring well UMCD-ADA-19-1. PFBA was also detected within the suspected release area at monitoring wells UMCD-ADA-18-1 (estimated concentration) and UMCD-ADA-19-4.

PFOS, PFBS, PFHxS, and HFPO-DA were not detected at concentrations greater than the LODs in any groundwater samples collected at the ADA Area Site 19 AOPI.

6.4.3 CSM

The ADA Area Site 19 AOPI is 50 acres and is within the approximately 1,750 acres of the ADA Area. The ground surface includes grassy and barren areas. The surface elevation at the AOPI is at 467 feet amsl.

Soils at UMCD consist of sandy loam and coarse sand developed primarily from alluvial deposits. During the SI, depth to groundwater at the AOPI ranged from 60 to 75 feet bgs. In the summer and fall, the groundwater flow direction at UMCD is generally to the east and south, while in the winter and early spring, the groundwater flow direction at UMCD is generally to the northwest, toward the Columbia River (USACE 2013). Based on depth to water observed during the SI, groundwater flow direction at this AOPI appeared to be trending to the northwest. The nearest surface water body is an irrigation canal along the northwestern boundary of UMCD.

The primary release mechanism is the potential release of PFAS to surface soils related to fire training and materials burning activities at the ADA Area Site 19 AOPI. However, because surface soils have been removed by MEC remedial activities, the subsurface soil at the AOPI is the source medium for potential PFAS contamination. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via leaching and percolation.

Based on the current and future industrial land use and the land use restrictions preventing residential use of most of the property at UMCD, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the UMCD property.

During this SI, soil was actively being excavated as part of ongoing MEC remedial activities at the AOPI; therefore, soil samples were not collected. The primary release mechanism is the potential release of PFAS to surface soils; however, because surface soils are undergoing munitions removal action at this AOPI, a surface soil exposure pathway for human receptors does not exist. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were detected at concentrations less than the SLs in groundwater, the subsurface soil exposure pathways for onsite workers are potentially complete. The subsurface soil exposure pathways for offsite residents are incomplete because soil is not expected to migrate from the AOPI.

Target PFAS were detected in groundwater at concentrations less than the SLs, making the onsite groundwater exposure pathways potentially complete. Because drinking water wells exist downgradient from the UMCD boundary and Target PFAS were detected in onsite groundwater, the groundwater exposure pathways for offsite residents are potentially complete. Due to small amount of precipitation and permeable soils, surface water and sediment media are not present at the AOPI.

Figure 6-8 presents the CSM for the ADA Area Site 19 AOPI.

6.4.4 Recommendation

Target PFAS were not detected at concentrations greater than the SLs at the ADA Area Site 19 AOPI in groundwater; therefore, further investigation is not recommended.

Table 6-3. Target PFAS Results and Screening for the ADA Area Site 19 AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBA	PFBS	PFHxA	PFHxS	PFNA	PFOA	PFOS
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**1800**	**600**	**990**	**39**	**5.9**	**6**	**4**
UMCD-ADA-18-1	UMADA181	WELL	62.50-62.50	06/14/2023	3.6 U	**1.1 J**	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
UMCD-ADA-19-1	UMADA191	WELL	75.00-75.00	06/14/2023	3.4 U	**3.3**	1.7 U	**2.2 J**	1.7 U	1.7 U	**0.88 J**	1.7 U
UMCD-ADA-19-2	UMADA192	WELL	60.00-60.00	06/14/2023	3.4 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
UMCD-ADA-19-3	UMADA193	WELL	75.00-75.00	06/14/2023	3.5 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
	UMADA193FD	WELL	75.00-75.00	06/14/2023 (D)	3.4 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
UMCD-ADA-19-4	UMADA194	WELL	70.00-70.00	06/14/2023	3.5 U	**3.4**	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
UMCD-ADA-SB-4	UMADASB4	WELL	70.00-70.00	06/14/2023	3.5 U	**5**	1.8 U	**9.2**	1.8 U	**0.93 J**	**5.9**	1.8 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the August 2023 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
(D) = Field duplicate sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

7. CONCLUSIONS AND RECOMMENDATIONS

An SI is conducted when the PFAS PA determines an AOPI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOPIs to determine whether a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required (40 CFR §300.420(5)). This SI Report used the findings from the PFAS PA in conjunction with soil and groundwater sampling data for each AOPI to determine whether Target PFAS have been released to the environment and whether a release has affected or may affect specific human health targets.

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

PFNA was detected at concentrations less than the SLs in one surface soil sample and two subsurface soil samples collected at the Former Airfield Hangar AOPI. Target PFAS were not detected at concentrations greater than the LODs in any other soil samples collected.

Target PFAS were detected in groundwater samples collected from one open borehole at the Former Airfield Hangar AOPI and from four existing monitoring wells at the ADA Area Site 19 AOPI. Detected concentrations of PFBA, PFHxA, and PFHxS at the Former Airfield Hangar AOPI and PFOA, PFBA, PFHxA, and PFNA at the ADA Area Site 19 AOPI did not exceed their respective SLs. The remaining Target PFAS were not detected at concentrations greater than the LODs in any groundwater samples.

PFOS, PFBS, and HFPO-DA were not detected at concentrations greater than the LODs in any samples collected at UMCD.

The CSMs were updated for each AOPI where Target PFAS were detected at concentrations greater than the LODs. The updated CSMs detail site geological conditions; determine primary and secondary release mechanisms; identify potential human receptors; and detail complete, potentially complete, and incomplete exposure pathways for current and reasonably anticipated future exposure scenarios.

Potentially complete soil exposure pathways are present at the Former Airfield Hangar AOPI because Target PFAS were detected at concentrations less than the SLs. Soil samples were not collected at the ADA Area Site 19 AOPI because soils are undergoing munitions removal activities. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. A surface soil exposure pathway for human receptors at the ADA Area Site 19 AOPI does not exist due to the ongoing remedial actions. The onsite subsurface soil exposure pathways are potentially complete because Target PFAS were detected in groundwater at concentrations less than the SLs.

The onsite groundwater exposure pathways are potentially complete at the Former Airfield Hangar AOPI and the ADA Area Site 19 AOPI because Target PFAS were detected at concentrations less than the SLs. The offsite groundwater exposure pathways are also potentially complete for these two AOPIs due to the potential for migration to potable groundwater wells downgradient from the UMCD boundary.

Due to the small amount of precipitation and permeable soils, surface water and sediment media are not present at any of the AOPIs; therefore, surface water and sediment exposure pathways for human receptors do not exist.

SI sampling results were compared to the OSD risk-based SLs presented in Section 5 to determine if further investigation is warranted at each AOPI as follows:

- If the maximum detected concentration for a given analyte in soil or groundwater exceeds the SL, it is concluded that further investigation is warranted.
- If the maximum detected concentration is less than the SL, it is concluded that further investigation is not warranted.

Table 7-1 summarizes the conclusions and recommendations for each AOPI. None of the AOPIs are recommended for further investigation or evaluation.

Table 7-1. Summary of PFAS Detected and Recommendations

AOPI	Detection of HFPO-DA, PFBA, PFBS, PFHxA, PFHxS, PFNA, PFOS, and/or PFOA		Recommendation and Rationale
	Groundwater	Soil	
Former Fire Station Building T-104	Not Detected	Not Detected	No Target PFAS detected; no further investigation recommended
Former Airfield Hangar	Detected	Detected	SLs were not exceeded in soil or groundwater; no further investigation recommended
ADA Area Site 19	Detected	–	SLs were not exceeded in groundwater; no further investigation recommended

– Not Collected

8. REFERENCES

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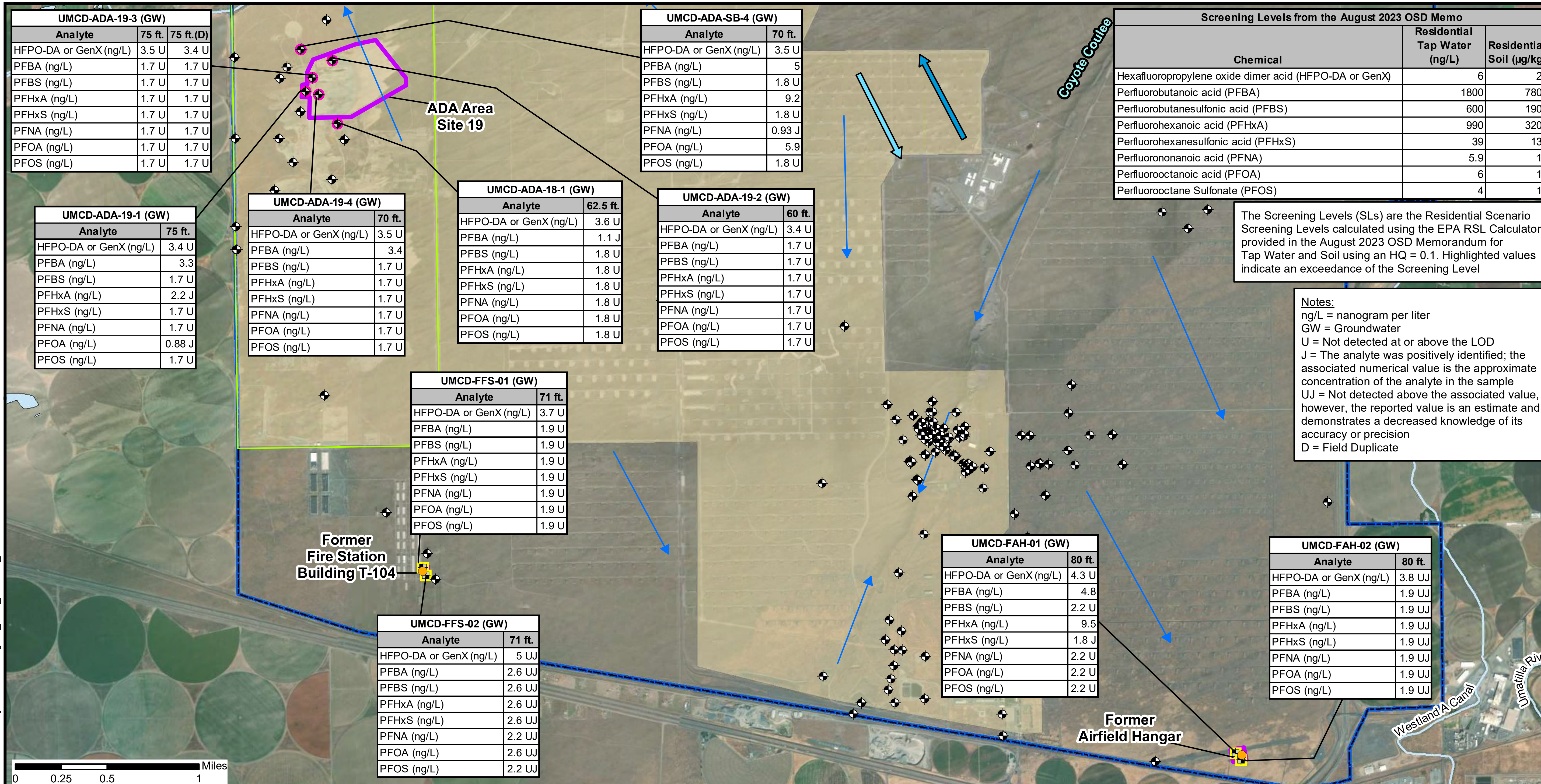
FIGURES



UMCD-ADA-19-3 (GW)

Analyte	75 ft.	75 ft.(D)
HFPO-DA or GenX (ng/L)	3.5 U	3.4 U
PFBA (ng/L)	1.7 U	1.7 U
PFBS (ng/L)	1.7 U	1.7 U
PFHxA (ng/L)	1.7 U	1.7 U
PFHxS (ng/L)	1.7 U	1.7 U
PFNA (ng/L)	1.7 U	1.7 U
PFOA (ng/L)	1.7 U	1.7 U
PFOS (ng/L)	1.7 U	1.7 U

UMCD-ADA-SB-4 (GW)

Analyte	70 ft.
HFPO-DA or GenX (ng/L)	3.5 U
PFBA (ng/L)	5
PFBS (ng/L)	1.8 U
PFHxA (ng/L)	9.2
PFHxS (ng/L)	1.8 U
PFNA (ng/L)	0.93 J
PFOA (ng/L)	5.9
PFOS (ng/L)	1.8 U

Screening Levels from the August 2023 OSD Memo

Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA or GenX)	6	23
Perfluorobutanoic acid (PFBA)	1800	7800
Perfluorobutanesulfonic acid (PFBS)	600	1900
Perfluorohexanoic acid (PFHxA)	990	3200
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	5.9	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the August 2023 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

Notes:
ng/L = nanogram per liter
GW = Groundwater
U = Not detected at or above the LOD
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
UJ = Not detected above the associated value, however, the reported value is an estimate and demonstrates a decreased knowledge of its accuracy or precision
D = Field Duplicate

UMCD-ADA-19-1 (GW)

Analyte	75 ft.
HFPO-DA or GenX (ng/L)	3.4 U
PFBA (ng/L)	3.3
PFBS (ng/L)	1.7 U
PFHxA (ng/L)	2.2 J
PFHxS (ng/L)	1.7 U
PFNA (ng/L)	1.7 U
PFOA (ng/L)	0.88 J
PFOS (ng/L)	1.7 U

UMCD-ADA-19-4 (GW)

Analyte	70 ft.
HFPO-DA or GenX (ng/L)	3.5 U
PFBA (ng/L)	3.4
PFBS (ng/L)	1.7 U
PFHxA (ng/L)	1.7 U
PFHxS (ng/L)	1.7 U
PFNA (ng/L)	1.7 U
PFOA (ng/L)	1.7 U
PFOS (ng/L)	1.7 U

UMCD-ADA-18-1 (GW)

Analyte	62.5 ft.
HFPO-DA or GenX (ng/L)	3.6 U
PFBA (ng/L)	1.1 J
PFBS (ng/L)	1.8 U
PFHxA (ng/L)	1.8 U
PFHxS (ng/L)	1.8 U
PFNA (ng/L)	1.8 U
PFOA (ng/L)	1.8 U
PFOS (ng/L)	1.8 U

UMCD-ADA-19-2 (GW)

Analyte	60 ft.
HFPO-DA or GenX (ng/L)	3.4 U
PFBA (ng/L)	1.7 U
PFBS (ng/L)	1.7 U
PFHxA (ng/L)	1.7 U
PFHxS (ng/L)	1.7 U
PFNA (ng/L)	1.7 U
PFOA (ng/L)	1.7 U
PFOS (ng/L)	1.7 U

UMCD-FFS-01 (GW)

Analyte	71 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBA (ng/L)	1.9 U
PFBS (ng/L)	1.9 U
PFHxA (ng/L)	1.9 U
PFHxS (ng/L)	1.9 U
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.9 U
PFOS (ng/L)	1.9 U

UMCD-FAH-01 (GW)

Analyte	80 ft.
HFPO-DA or GenX (ng/L)	4.3 U
PFBA (ng/L)	4.8
PFBS (ng/L)	2.2 U
PFHxA (ng/L)	9.5
PFHxS (ng/L)	1.8 J
PFNA (ng/L)	2.2 U
PFOA (ng/L)	2.2 U
PFOS (ng/L)	2.2 U

UMCD-FAH-02 (GW)

Analyte	80 ft.
HFPO-DA or GenX (ng/L)	3.8 UJ
PFBA (ng/L)	1.9 UJ
PFBS (ng/L)	1.9 UJ
PFHxA (ng/L)	1.9 UJ
PFHxS (ng/L)	1.9 UJ
PFNA (ng/L)	1.9 UJ
PFOA (ng/L)	1.9 UJ
PFOS (ng/L)	1.9 UJ

UMCD-FFS-02 (GW)

Analyte	71 ft.
HFPO-DA or GenX (ng/L)	5 UJ
PFBA (ng/L)	2.6 UJ
PFBS (ng/L)	2.6 UJ
PFHxA (ng/L)	2.6 UJ
PFHxS (ng/L)	2.6 UJ
PFNA (ng/L)	2.2 UJ
PFOA (ng/L)	2.6 UJ
PFOS (ng/L)	2.2 UJ

PROJECT: \GIS_DATA\BRAC_PFAS\Umatilla\Projects\QAPP\Figure_17-1_Umatilla_AOPI.mxd

Legend
- BRAC Parcel Boundary
- Oregon ARNG – Raymond F. Rees Training Center
- Area of Potential Interest (AOPI)
- Ammunition Demolition Activity Area
- Surface Water Flow Direction
- Stream/River/Canal
- Waterbody
- Sample Existing Well (6)
- Sample Soil Boring
- Sample Temporary Well/Soil Boring (4)
- Existing Well

NOTES:
1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. Rivers and streams are from the USGS National Hydrography Dataset (NHD).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.
4. Wells (USACE).

- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

N
OR STATE PLANE NORTH (NAD83)

US Army Corps of Engineers
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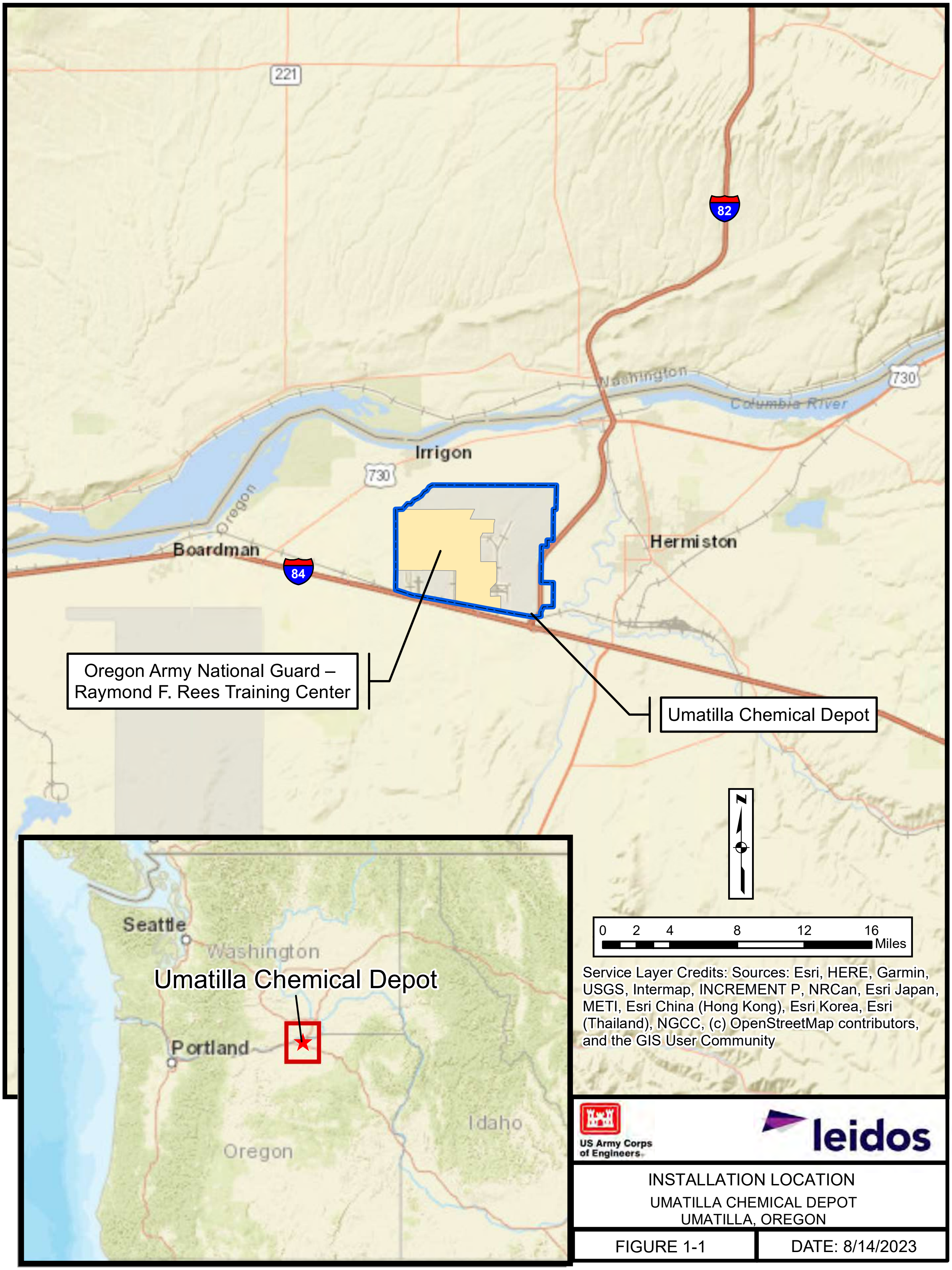
SUMMARY OF TARGET PFAS IN GROUNDWATER
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE ES-1 | DATE: 10/13/2023



INSTALLATION LOCATION
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 1-1 DATE: 8/14/2023

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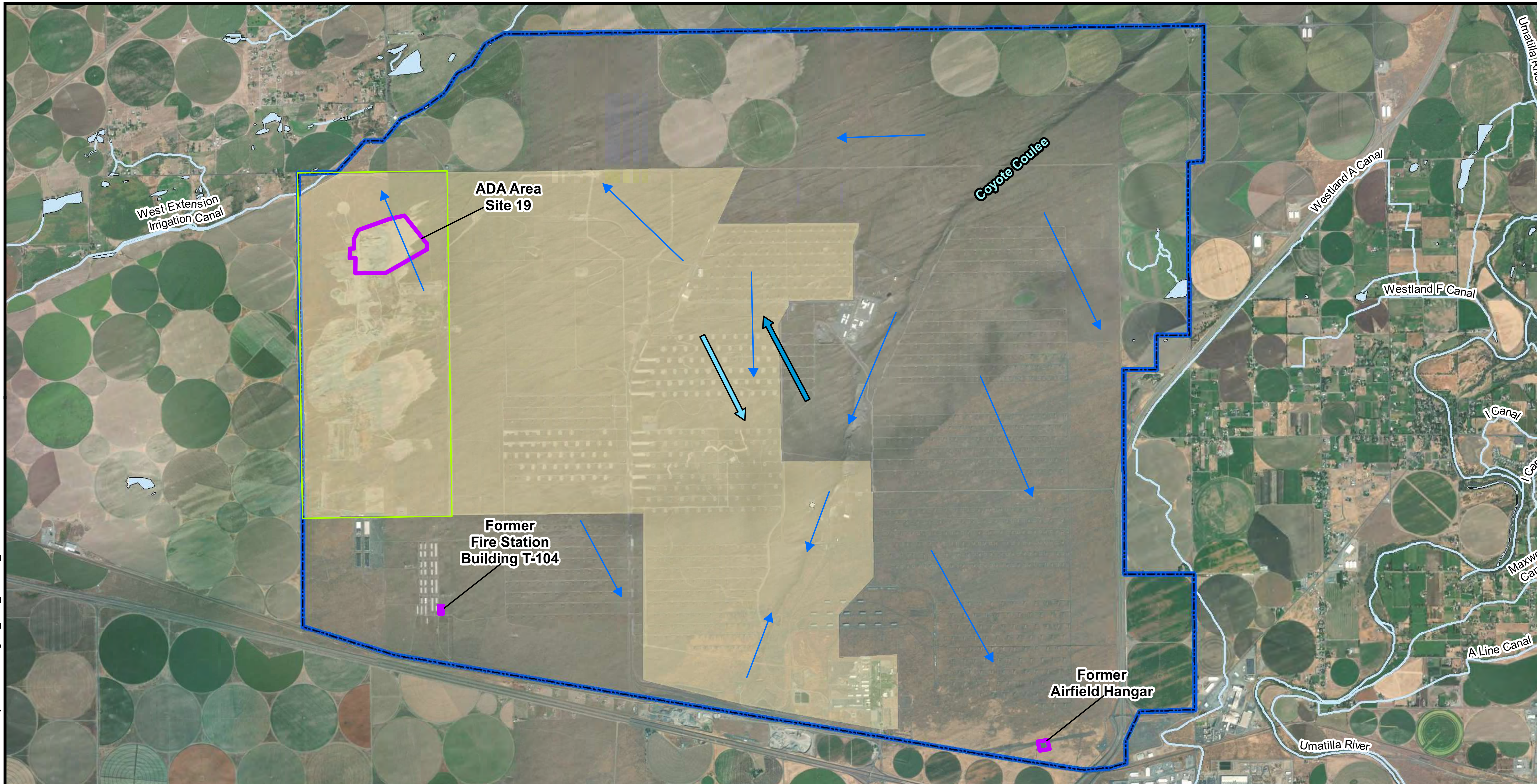

Legend

- BRAC Parcel Boundary
- Area of Potential Interest (AOPI)
- Ammunition Demolition Activity Area
- Surface Water Flow Direction
- Oregon ARNG – Raymond F. Rees Training Center
- Waterbody
- Stream/River/Canal
- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

NOTES:

1. Background Source: ESRI World Imagery (Vivid/Maxar,4/2020).
2. Rivers and streams are from the USGS National Hydrography Dataset (NHD).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.

0 0.5 1 2 Miles

OR STATE PLANE NORTH (NAD83)

US Army Corps of Engineers

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AOPI LOCATIONS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 1-2 | DATE: 10/13/2023

PROJECT: \GIS_DATA\BRAC_PFAS\Umatilla\Projects\QAPP\Figure_17-1_Umatilla_AOPI.mxd

Legend

- BRAC Parcel Boundary
- Oregon ARNG – Raymond F. Rees Training Center
- Surface Water Flow Direction
- Elevation Contours (500 ft)
- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow
- Stream/River/Canal
- Waterbody

NOTES:

1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. USGS National Hydrography Dataset (NHD) (streams, water bodies)
3. .USGSNational ElevatioN Dataset (NED) (elevation contours)
4. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.

0 0.5 1 2 Miles

OR STATE PLANE NORTH (NAD83)

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US Army Corps of Engineers

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SITE FEATURES
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 2-1 | DATE: 8/15/2023

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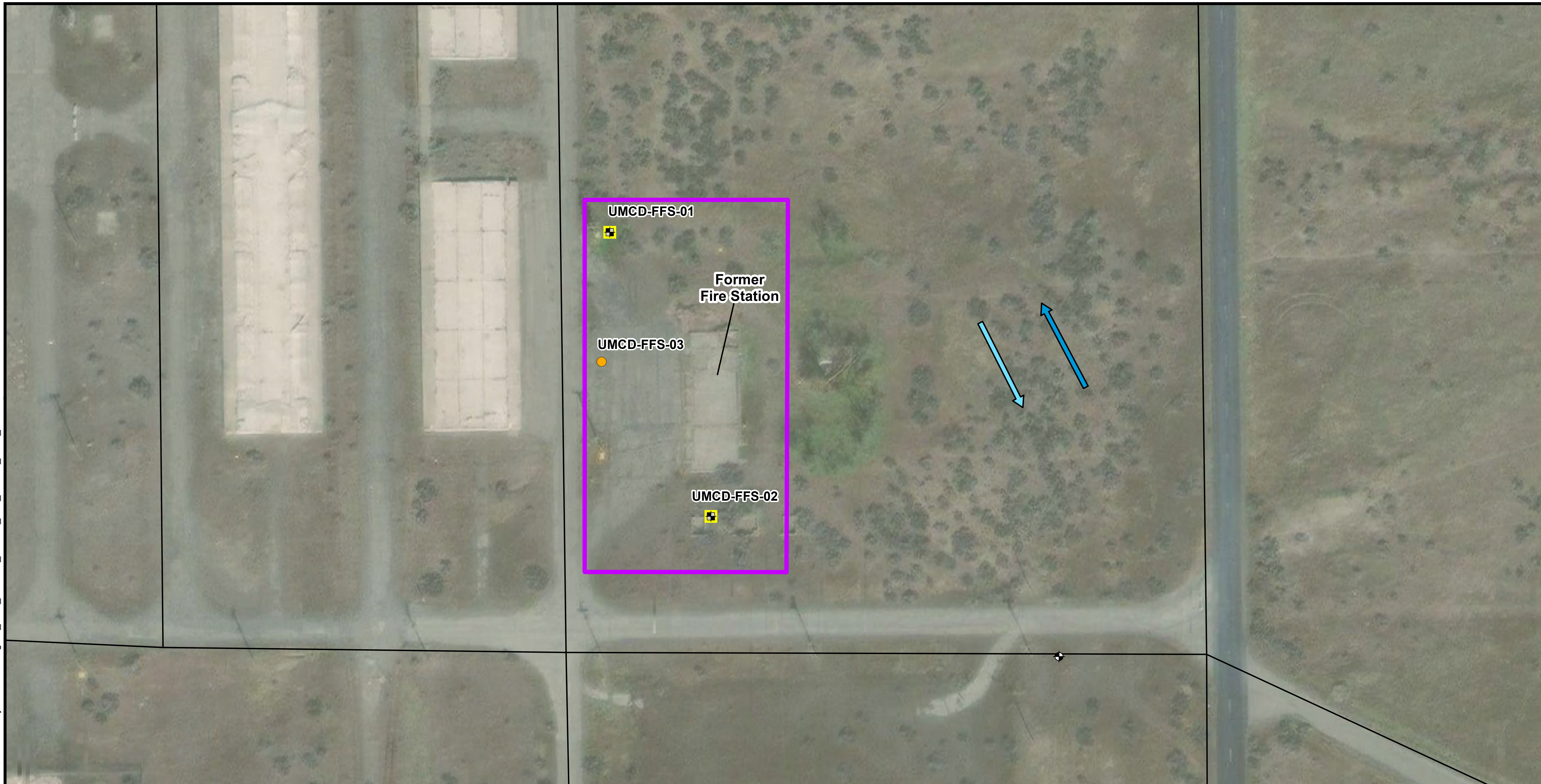

Legend

- BRAC Parcel Boundary
- Area of Potential Interest (AOPI)
- Road
- Soil Boring Sample (1)
- Temporary Well/Soil Boring (2)
- Existing Well

- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

NOTES:
1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. USGS National Hydrography Dataset (NHD) (streams, water bodies).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.

Feet: 0 50 100 200

OR STATE PLANE NORTH (NAD83)

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FORMER FIRE STATION BUILDING T-104
AOPI SAMPLE LOCATIONS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 6-1	DATE: 10/13/2023

PROJECT: \GIS_DATA\BRAC_PFAS\Umatilla\Projects\QAPP\Figure_17-2_Umatilla_Former_Fire_Station_T104_AOPI.mxd

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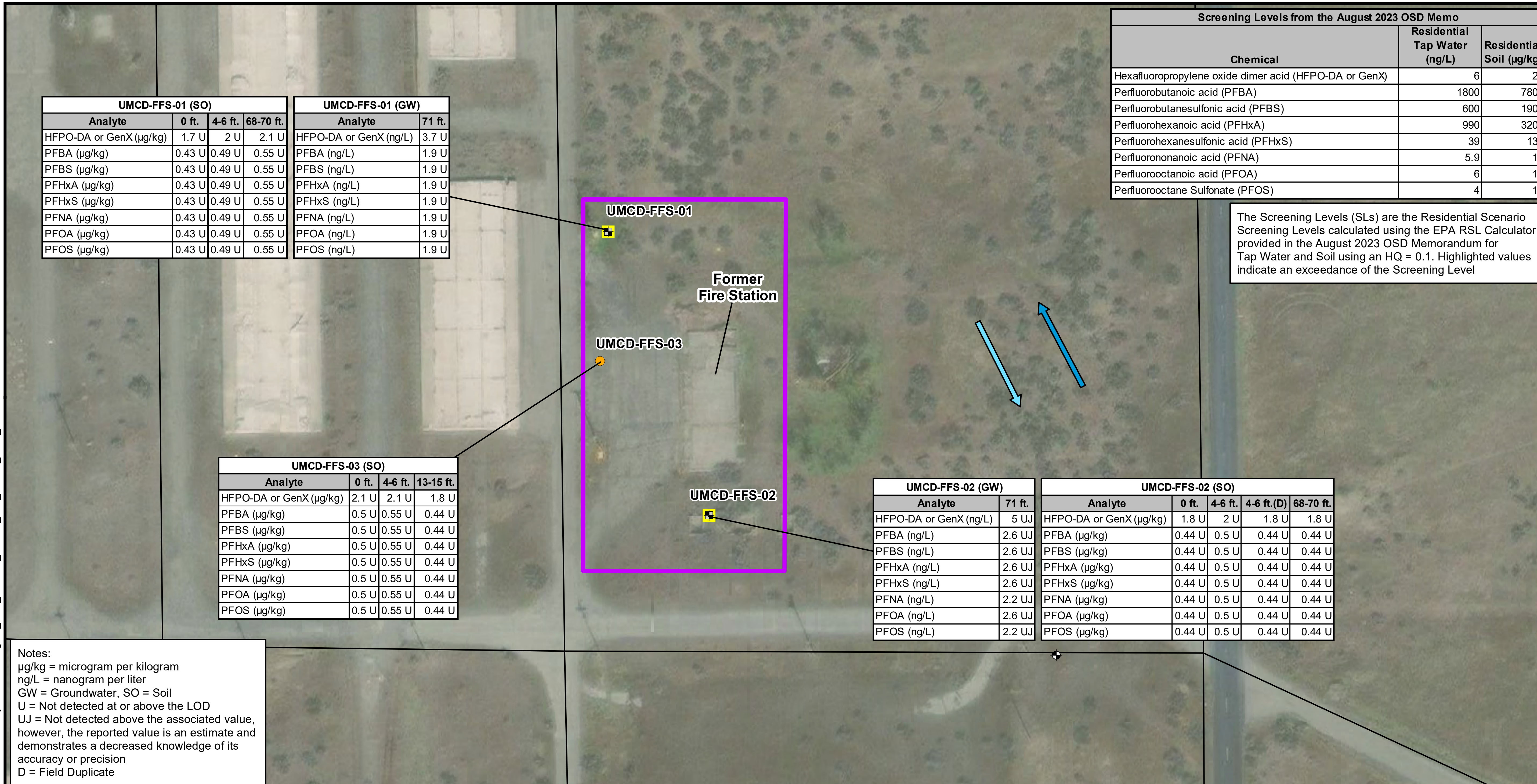

Screening Levels from the August 2023 OSD Memo		
Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA or GenX)	6	23
Perfluorobutanoic acid (PFBA)	1800	7800
Perfluorobutanesulfonic acid (PFBS)	600	1900
Perfluorohexanoic acid (PFHxA)	990	3200
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	5.9	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the August 2023 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

UMCD-FFS-01 (SO)			
Analyte	0 ft.	4-6 ft.	68-70 ft.
HFPO-DA or GenX (µg/kg)	1.7 U	2 U	2.1 U
PFBA (µg/kg)	0.43 U	0.49 U	0.55 U
PFBS (µg/kg)	0.43 U	0.49 U	0.55 U
PFHxA (µg/kg)	0.43 U	0.49 U	0.55 U
PFHxS (µg/kg)	0.43 U	0.49 U	0.55 U
PFNA (µg/kg)	0.43 U	0.49 U	0.55 U
PFOA (µg/kg)	0.43 U	0.49 U	0.55 U
PFOS (µg/kg)	0.43 U	0.49 U	0.55 U

UMCD-FFS-01 (GW)	
Analyte	71 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBA (ng/L)	1.9 U
PFBS (ng/L)	1.9 U
PFHxA (ng/L)	1.9 U
PFHxS (ng/L)	1.9 U
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.9 U
PFOS (ng/L)	1.9 U

UMCD-FFS-03 (SO)			
Analyte	0 ft.	4-6 ft.	13-15 ft.
HFPO-DA or GenX (µg/kg)	2.1 U	2.1 U	1.8 U
PFBA (µg/kg)	0.5 U	0.55 U	0.44 U
PFBS (µg/kg)	0.5 U	0.55 U	0.44 U
PFHxA (µg/kg)	0.5 U	0.55 U	0.44 U
PFHxS (µg/kg)	0.5 U	0.55 U	0.44 U
PFNA (µg/kg)	0.5 U	0.55 U	0.44 U
PFOA (µg/kg)	0.5 U	0.55 U	0.44 U
PFOS (µg/kg)	0.5 U	0.55 U	0.44 U

UMCD-FFS-02 (GW)	
Analyte	71 ft.
HFPO-DA or GenX (ng/L)	5 UJ
PFBA (ng/L)	2.6 UJ
PFBS (ng/L)	2.6 UJ
PFHxA (ng/L)	2.6 UJ
PFHxS (ng/L)	2.6 UJ
PFNA (ng/L)	2.2 UJ
PFOA (ng/L)	2.6 UJ
PFOS (ng/L)	2.2 UJ

UMCD-FFS-02 (SO)				
Analyte	0 ft.	4-6 ft.	4-6 ft.(D)	68-70 ft.
HFPO-DA or GenX (µg/kg)	1.8 U	2 U	1.8 U	1.8 U
PFBA (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U
PFBS (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U
PFHxA (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U
PFHxS (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U
PFNA (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U
PFOA (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U
PFOS (µg/kg)	0.44 U	0.5 U	0.44 U	0.44 U

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
GW = Groundwater, SO = Soil
U = Not detected at or above the LOD
UJ = Not detected above the associated value, however, the reported value is an estimate and demonstrates a decreased knowledge of its accuracy or precision
D = Field Duplicate

Legend
- BRAC Parcel Boundary
- Area of Potential Interest (AOPI)
- Road
- Soil Boring Sample (1)
- Temporary Well/Soil Boring (2)
- Existing Well
- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

NOTES:
1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. USGS National Hydrography Dataset (NHD) (streams, water bodies).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.

Feet
0 50 100 200

OR STATE PLANE NORTH (NAD83)

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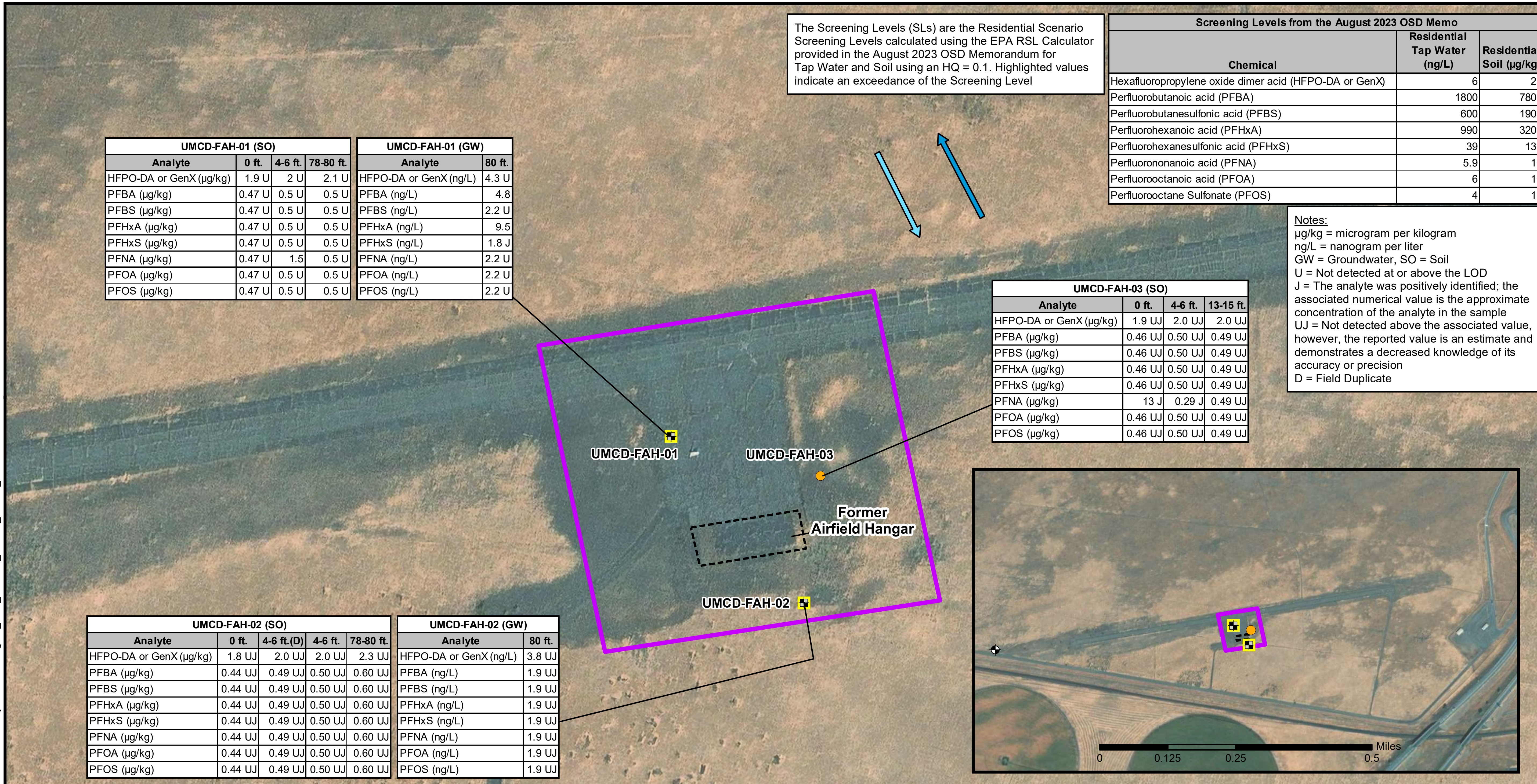
FORMER FIRE STATION BUILDING T-104 AOPI
SAMPLE RESULTS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 6-2 | DATE: 10/13/2023


UMCD-FAH-01
UMCD-FAH-03
Former Airfield Hangar
UMCD-FAH-02
0 0.125 0.25 0.5 Miles
Legend
BRAC Parcel Boundary
Area of Potential Interest (AOPI)
Soil Boring Sample (1)
Temporary Well/Soil Boring (2)
Existing Well
Summer/Fall Inferred Groundwater Flow
Winter/Spring Inferred Groundwater Flow
NOTES:
1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. USGS National Hydrography Dataset (NHD) (streams, water bodies).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.
0 50 100 200 Feet
OR STATE PLANE NORTH (NAD83)
N
Irrigon
Hermiston
Area Shown
US Army Corps of Engineers
leidos
FORMER AIRFIELD HANGAR AOPI
SAMPLE LOCATIONS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON
FIGURE 6-3
DATE: 10/9/2023
PROJECT: \GIS_DATA\BRAC_PFAS\Umatilla\Projects\QAPP\Figure_17-3_Umatilla_Former_Airfield_AOPI.mxd



The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the August 2023 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

Screening Levels from the August 2023 OSD Memo		
Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
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Perfluorobutanoic acid (PFBA)	1800	7800
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Perfluorohexanoic acid (PFHxA)	990	3200
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Perfluorononanoic acid (PFNA)	5.9	19
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Perfluorooctane Sulfonate (PFOS)	4	13

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
GW = Groundwater, SO = Soil
U = Not detected at or above the LOD
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
UJ = Not detected above the associated value, however, the reported value is an estimate and demonstrates a decreased knowledge of its accuracy or precision
D = Field Duplicate

UMCD-FAH-01 (SO)			
Analyte	0 ft.	4-6 ft.	78-80 ft.
HFPO-DA or GenX (µg/kg)	1.9 U	2 U	2.1 U
PFBA (µg/kg)	0.47 U	0.5 U	0.5 U
PFBS (µg/kg)	0.47 U	0.5 U	0.5 U
PFHxA (µg/kg)	0.47 U	0.5 U	0.5 U
PFHxS (µg/kg)	0.47 U	0.5 U	0.5 U
PFNA (µg/kg)	0.47 U	1.5	0.5 U
PFOA (µg/kg)	0.47 U	0.5 U	0.5 U
PFOS (µg/kg)	0.47 U	0.5 U	0.5 U

UMCD-FAH-01 (GW)	
Analyte	80 ft.
HFPO-DA or GenX (ng/L)	4.3 U
PFBA (ng/L)	4.8
PFBS (ng/L)	2.2 U
PFHxA (ng/L)	9.5
PFHxS (ng/L)	1.8 J
PFNA (ng/L)	2.2 U
PFOA (ng/L)	2.2 U
PFOS (ng/L)	2.2 U

UMCD-FAH-03 (SO)			
Analyte	0 ft.	4-6 ft.	13-15 ft.
HFPO-DA or GenX (µg/kg)	1.9 UJ	2.0 UJ	2.0 UJ
PFBA (µg/kg)	0.46 UJ	0.50 UJ	0.49 UJ
PFBS (µg/kg)	0.46 UJ	0.50 UJ	0.49 UJ
PFHxA (µg/kg)	0.46 UJ	0.50 UJ	0.49 UJ
PFHxS (µg/kg)	0.46 UJ	0.50 UJ	0.49 UJ
PFNA (µg/kg)	13 J	0.29 J	0.49 UJ
PFOA (µg/kg)	0.46 UJ	0.50 UJ	0.49 UJ
PFOS (µg/kg)	0.46 UJ	0.50 UJ	0.49 UJ

UMCD-FAH-02 (SO)				
Analyte	0 ft.	4-6 ft.(D)	4-6 ft.	78-80 ft.
HFPO-DA or GenX (µg/kg)	1.8 UJ	2.0 UJ	2.0 UJ	2.3 UJ
PFBA (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ
PFBS (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ
PFHxA (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ
PFHxS (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ
PFNA (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ
PFOA (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ
PFOS (µg/kg)	0.44 UJ	0.49 UJ	0.50 UJ	0.60 UJ

UMCD-FAH-02 (GW)	
Analyte	80 ft.
HFPO-DA or GenX (ng/L)	3.8 UJ
PFBA (ng/L)	1.9 UJ
PFBS (ng/L)	1.9 UJ
PFHxA (ng/L)	1.9 UJ
PFHxS (ng/L)	1.9 UJ
PFNA (ng/L)	1.9 UJ
PFOA (ng/L)	1.9 UJ
PFOS (ng/L)	1.9 UJ

Legend
- BRAC Parcel Boundary
- Area of Potential Interest (AOPI)
- Soil Boring Sample (1)
- Temporary Well/Soil Boring (2)
- Existing Well
- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

NOTES:
1. Background Source: ESRI World Imagery (Vivid/Maxar,4/2020).
2. USGS National Hydrography Dataset (NHD) (streams, water bodies).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.

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FORMER AIRFIELD HANGAR AOPI
SAMPLE RESULTS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 6-4 | DATE: 10/9/2023

PROJECT: \GIS_DATA\BRAC_PFAS\Umatilla\Projects\QAPP\Figure_17-3_Umatilla_Former_Airfield_AOPI.mxd

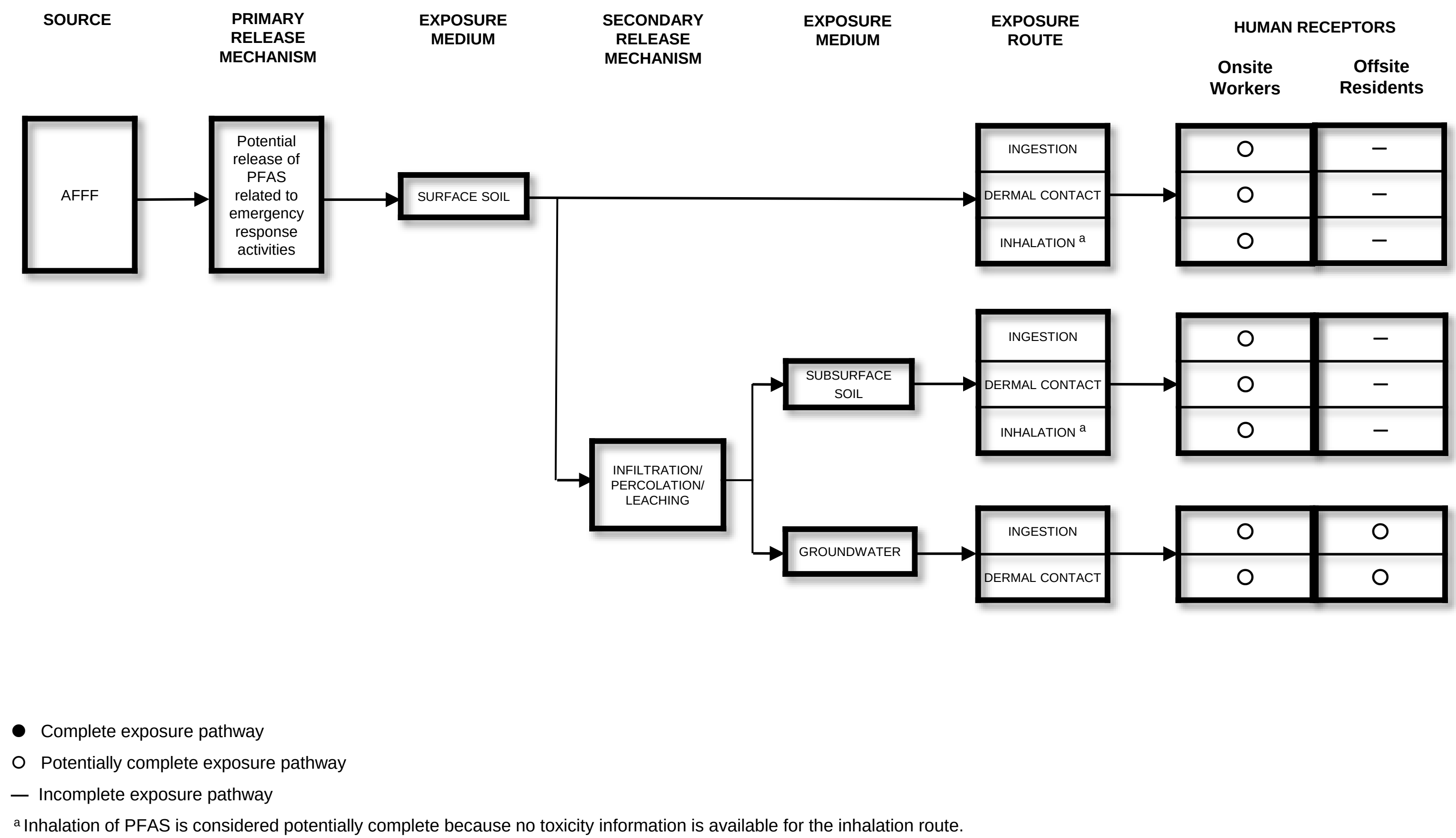
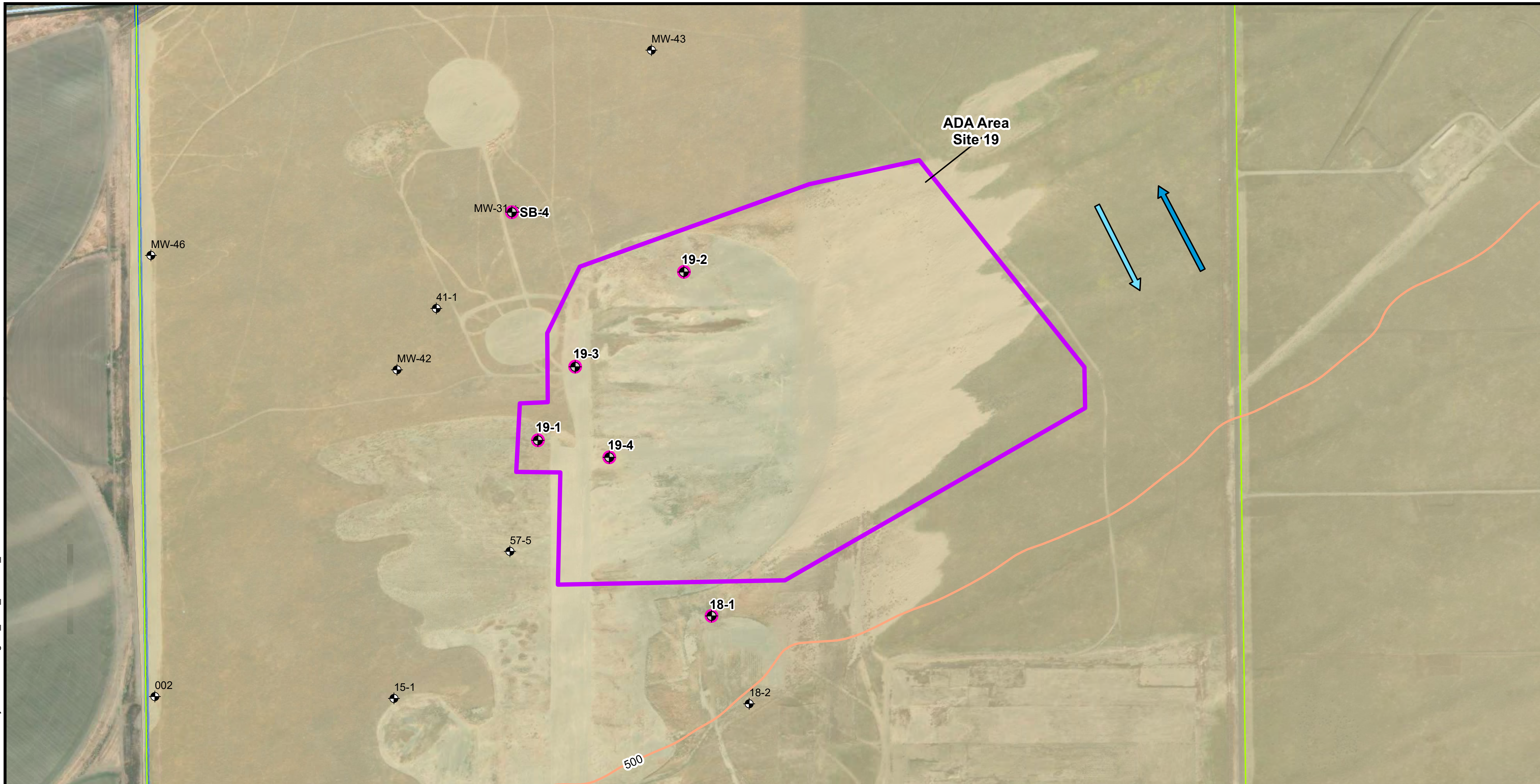


Figure 6-5. Human Health CSM for Former Airfield Hangar AOPI



Legend

- BRAC Parcel Boundary
- Area of Potential Interest (AOPI)
- Oregon ARNG – Raymond F. Rees Training Center
- Ammunition Demolition Activity Area (ADA)
- Stream/River/Canal
- Elevation Contour (500 ft)
- Existing Well
- Proposed Sample Existing Well (6)
- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

NOTES:

1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. USGS National Hydrography Dataset (NHD) (streams).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.
4. USGS National ElevatioN Dataset (NED) (elevation contours).
5. Wells (USACE).

Feet 0 250 500 1,000

OR STATE PLANE NORTH (NAD83)

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ADA AREA SITE 19 AOPI
SAMPLE LOCATIONS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 6-6 | DATE: 10/9/2023

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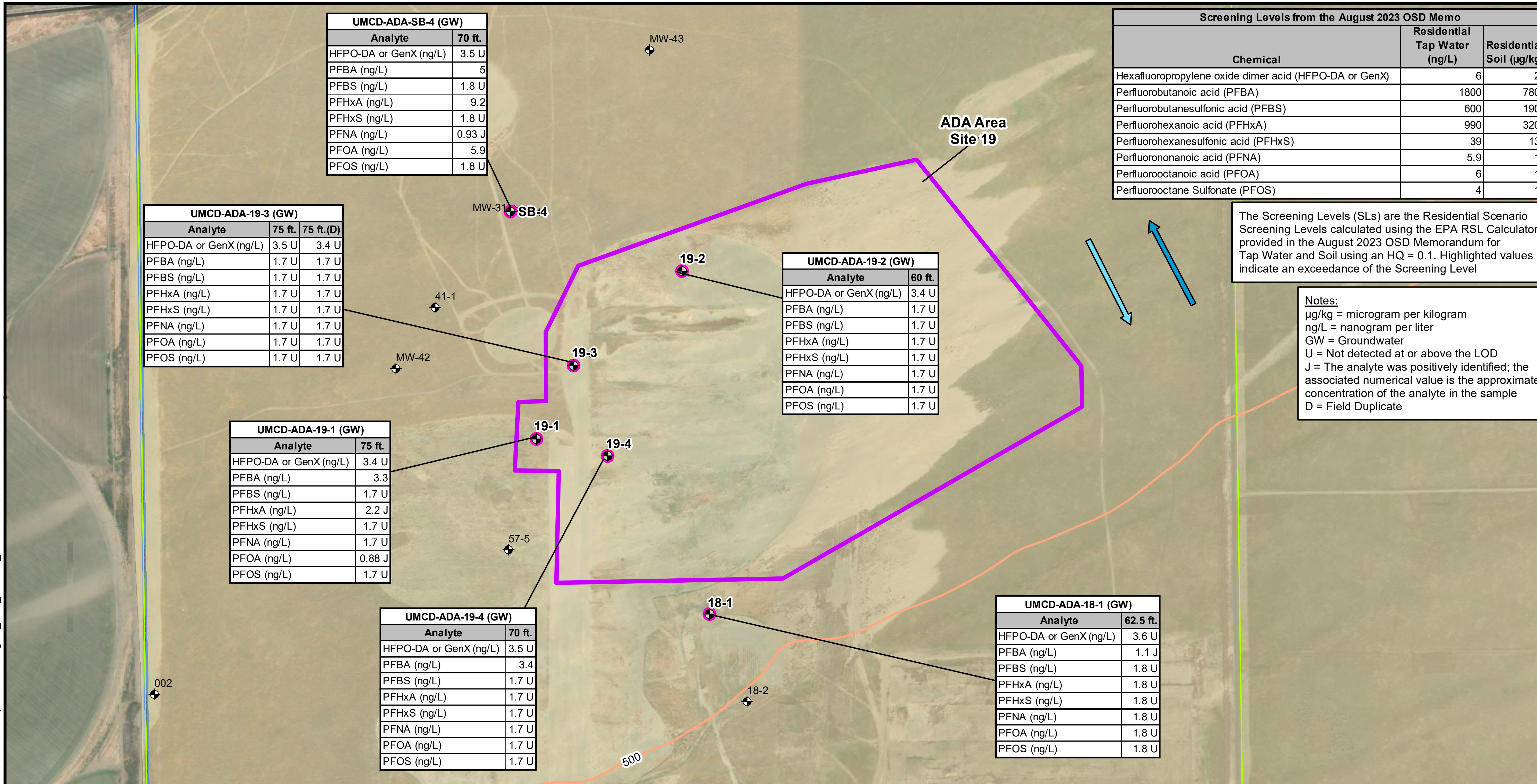

UMCD-ADA-SB-4 (GW)	
Analyte	70 ft.
HFPO-DA or GenX (ng/L)	3.5 U
PFBA (ng/L)	5
PFBS (ng/L)	1.8 U
PFHxA (ng/L)	9.2
PFHxS (ng/L)	1.8 U
PFNA (ng/L)	0.93 J
PFOA (ng/L)	5.9
PFOS (ng/L)	1.8 U

UMCD-ADA-19-3 (GW)		
Analyte	75 ft.	75 ft.(D)
HFPO-DA or GenX (ng/L)	3.5 U	3.4 U
PFBA (ng/L)	1.7 U	1.7 U
PFBS (ng/L)	1.7 U	1.7 U
PFHxA (ng/L)	1.7 U	1.7 U
PFHxS (ng/L)	1.7 U	1.7 U
PFNA (ng/L)	1.7 U	1.7 U
PFOA (ng/L)	1.7 U	1.7 U
PFOS (ng/L)	1.7 U	1.7 U

UMCD-ADA-19-2 (GW)	
Analyte	60 ft.
HFPO-DA or GenX (ng/L)	3.4 U
PFBA (ng/L)	1.7 U
PFBS (ng/L)	1.7 U
PFHxA (ng/L)	1.7 U
PFHxS (ng/L)	1.7 U
PFNA (ng/L)	1.7 U
PFOA (ng/L)	1.7 U
PFOS (ng/L)	1.7 U

UMCD-ADA-19-1 (GW)	
Analyte	75 ft.
HFPO-DA or GenX (ng/L)	3.4 U
PFBA (ng/L)	3.3
PFBS (ng/L)	1.7 U
PFHxA (ng/L)	2.2 J
PFHxS (ng/L)	1.7 U
PFNA (ng/L)	1.7 U
PFOA (ng/L)	0.88 J
PFOS (ng/L)	1.7 U

UMCD-ADA-19-4 (GW)	
Analyte	70 ft.
HFPO-DA or GenX (ng/L)	3.5 U
PFBA (ng/L)	3.4
PFBS (ng/L)	1.7 U
PFHxA (ng/L)	1.7 U
PFHxS (ng/L)	1.7 U
PFNA (ng/L)	1.7 U
PFOA (ng/L)	1.7 U
PFOS (ng/L)	1.7 U

UMCD-ADA-18-1 (GW)	
Analyte	62.5 ft.
HFPO-DA or GenX (ng/L)	3.6 U
PFBA (ng/L)	1.1 J
PFBS (ng/L)	1.8 U
PFHxA (ng/L)	1.8 U
PFHxS (ng/L)	1.8 U
PFNA (ng/L)	1.8 U
PFOA (ng/L)	1.8 U
PFOS (ng/L)	1.8 U

Screening Levels from the August 2023 OSD Memo		
Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA or GenX)	6	23
Perfluorobutanoic acid (PFBA)	1800	7800
Perfluorobutanesulfonic acid (PFBS)	600	1900
Perfluorohexanoic acid (PFHxA)	990	3200
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	5.9	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the August 2023 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
GW = Groundwater
U = Not detected at or above the LOD
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
D = Field Duplicate

Legend
- BRAC Parcel Boundary
- Area of Potential Interest (AOPI)
- Oregon ARNG – Raymond F. Rees Training Center
- Ammunition Demolition Activity Area (ADA)
- Elevation Contour (500 ft)
- Existing Well
- Sample Existing Well (6)
- Summer/Fall Inferred Groundwater Flow
- Winter/Spring Inferred Groundwater Flow

NOTES:
1. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).
2. USGS National Hydrography Dataset (NHD) (streams).
3. Groundwater and surface water flow from Site Inspection UFP-QAPP Addendum, Aecom 2022.
4. USGS National ElevatioN Dataset (NED) (elevation contours).
5. Wells (USACE).

Feet 0 250 500 1,000

OR STATE PLANE NORTH (NAD83)

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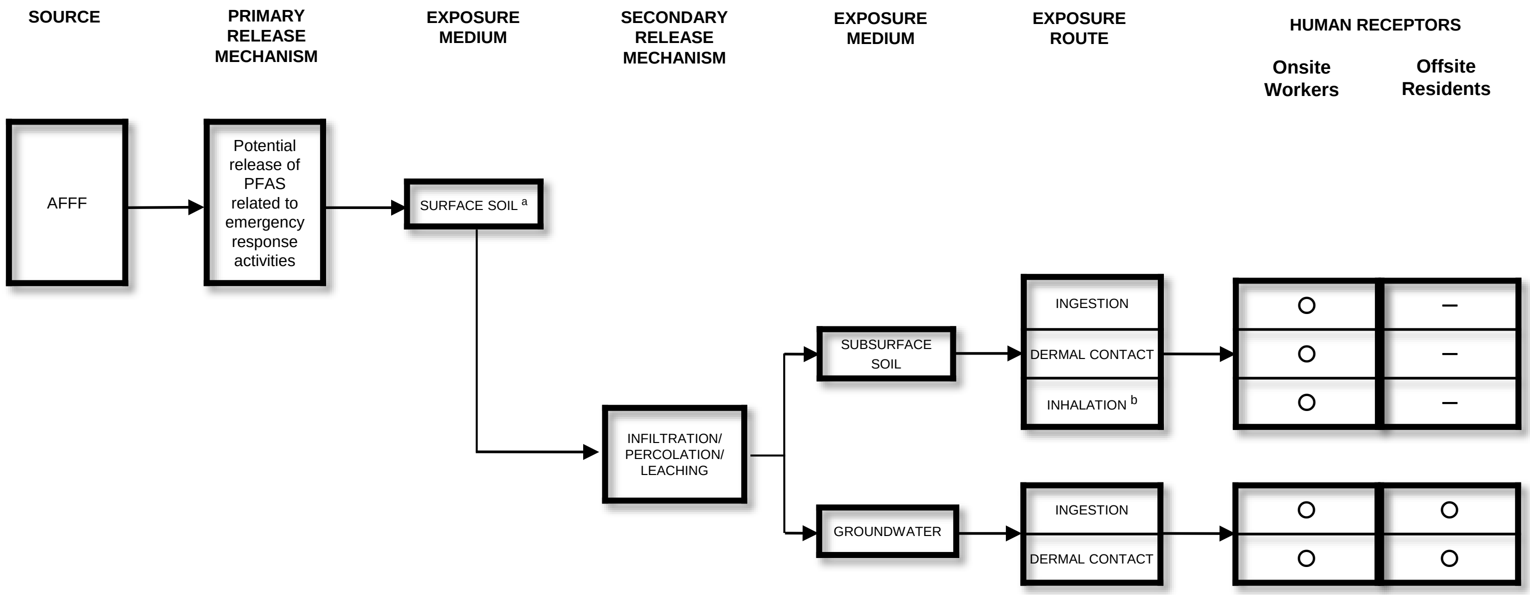
ADA AREA SITE 19 AOPI
SAMPLE RESULTS
UMATILLA CHEMICAL DEPOT
UMATILLA, OREGON

FIGURE 6-7 DATE: 10/9/2023

PROJECT: \GIS_DATA\BRAC_PFAS\Umatilla\Projects\QAPP\Figure_17-1_Umatilla_AOPI.mxd



● Complete exposure pathway

○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] The primary release mechanism is the potential release of PFAS to surface soils; however, because surface soils are undergoing munitions removal action at this AOPI, an exposure pathway for human receptors does not exist

[b] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

Figure 6-8. Human Health CSM for ADA Area Site 19 AOPI