FINAL
Site Inspection Report
Camp Adair
Corvallis, Oregon

Site Inspection for Perfluorooctanoic Acid (PFOA), Perfluorooctanesulfonic Acid (PFOS), Perfluorohexanesulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Hexafluoropropylene Oxide Dimer Acid (HFPO-DA), and Perfluorobutanesulfonic Acid (PFBS)
ARNG Installations, Nationwide

May 2023

Prepared for:

Army National Guard Headquarters
111 S. George Mason Drive
Arlington, VA 22204

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
%	Percent
µg/kg	Microgram(s) per kilogram
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous Film Forming Foam
amsl	Above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
ASTM	ASTM International
bgs	Below ground surface
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	Direct-push technology
DQI	Data quality indicator
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EFU	Exclusive Farm Use (zoning)
EIS	Extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
HQ	Hazard Quotient
HUC	Hydrologic Unit Code
IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council

LC/MS/MS	Liquid chromatography tandem mass spectrometry
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOQ	Limit of quantification
MIL-SPEC	military specification
MS	Matrix spike
MSD	Matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
No.	Number
ODFW	Oregon Department of Fish and Wildlife
ODPSST	Oregon Department of Public Safety Standards and Training
OMD	Oregon Military Department
ORARNG	Oregon Army National Guard
OSD	Office of the Secretary of Defense
OWRD	Oregon Water Resources Department
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PVC	polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RI	Remedial investigation
RPD	Relative percent difference
SI	Site Inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers

USEPA	United States Environmental Protection Agency
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment & Infrastructure Inc.

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EXECUTIVE SUMMARY

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS), with a focus on the six compounds presented in the memorandum regarding Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (Assistant Secretary of Defense 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA)[1]. These compounds are collectively referred to as “relevant compounds” throughout this document, and the applicable Screening Levels (SLs) are provided below in **Table ES-1**.

The PA identified one Area of Interest (AOI) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI location). The objective of the SI is to identify whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds. This SI was completed at the Najaf Training Center, a portion of Camp Adair, a former US Army installation established in 1942 in Corvallis, Oregon and determined that no further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1: Controlled Burn Tree at this time. Camp Adair will also be referred to as the “Facility” throughout this document.

The Facility, operated by Oregon ARNG (ORARNG) as a military training center, encompasses approximately 527 acres in Corvallis, Oregon. Camp Adair is in Benton County, approximately 9 miles northwest of the City of Corvallis. The Facility is located approximately 2 miles west of Highway 99 West (South Pacific Highway West). The mission of Camp Adair is to provide training facilities and terrain for military soldiers and other military organizations. Annual wildland firefighting training occurs at the Facility for both military and nonmilitary personnel, including local law enforcement agencies, fire departments, and the Oregon Department of Fish and Wildlife (ODFW). The Facility consists of the cantonment and live-fire rifle-range training areas (primarily in the eastern portion) and undeveloped vegetated land (primarily in the western portion). The Oregon Department of Public Safety Standards and Training (ODPSST) operates at the Facility with live-fire small arms at the firing range for law enforcement training. The southwestern and southeastern portions of the Facility are used for rotary-winged aircraft operations training (AECOM, 2020).

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[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

The PA identified one AOI for investigation during the SI phase. SI sampling results from the AOI were compared to OSD SLs. **Table ES-2** summarizes the SI results for the AOI. Based on the results of this SI, no further evaluation under CERCLA is warranted for the AOI identified in the PA.

Table ES-1. Screening Levels (Soil and Groundwater)

Analyte[2]	Residential (Soil) (µg/kg)[1] (0-2 feet bgs)	Industrial / Commercial Composite Worker (Soil) (µg/kg)[1] (2-15 feet bgs)	Tap Water (Groundwater) (ng/L)[1]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
1. Assistant Secretary of Defense. July 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. May 2022.
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Abbreviations:
µg/kg = microgram(s) per kilogram
bgs = below ground surface
ng/L = nanogram(s) per liter

Table ES-2. Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Controlled Burn Tree	◐	◐	No further action

Legend:
● = Detected; exceedance of screening levels
◐ = Detected; no exceedance of screening levels
○ = Not detected

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing preliminary assessments (PAs) and site inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS), with a focus on the six compounds presented in the memorandum regarding Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (Assistant Secretary of Defense 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum are referred to as "relevant compounds" throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA).[2] The ARNG performed this SI at the Najaf Training Center, a portion of Camp Adair in Corvallis, Oregon. Camp Adair is also referred to as the "Facility" throughout this report.

The SI project elements were performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (United States Environmental Protection Agency [USEPA] 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations, Part 300; USEPA 1994), and in compliance with United States Department of Army (DA) requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at Camp Adair (AECOM Technical Services, Inc. [AECOM] 2020) that identified one Area of Interest (AOI) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

[2] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The subject of this SI is the Najaf Training Center, a portion of Camp Adair, a former US Army installation established in 1942. Camp Adair is located in Benton County, approximately 9 miles northwest of the City of Corvallis and approximately 2 miles west of Highway 99 West (South Pacific Highway West) (**Figure 2-1**). The Facility is occupied and operated by the Oregon Army National Guard (ORARNG) as a military training center, encompassing 527 acres. The mission of Camp Adair is to provide training facilities and terrain for military soldiers and other military organizations. Annual wildland firefighting training occurs at the Facility for both military and nonmilitary personnel, including local law enforcement agencies, fire departments, and the Oregon Department of Fish and Wildlife (ODFW). The Facility consists of the cantonment and live-fire rifle-range training areas (primarily in the eastern portion) and undeveloped vegetated land (primarily in the western portion). The Oregon Department of Public Safety Standards and Training (ODPSST) operates at the Facility with live-fire small arms at the firing range for law enforcement training. The southwestern and southeastern portions of the Facility are used for rotary-winged aircraft operations training (AECOM, 2020).

The former 57,000-acre Camp Adair/Adair Air Force Station was used by the United States Army for troops training during World War II from 1942 to 1946, the United States Navy in 1945, and the United States Air Force in the 1960s. This former property encompassed 60 square miles (6 miles wide and 10 miles long) and was developed with over 1,700 buildings, extending to the City of Adair Village located approximately 3 miles southeast of the present-day Camp Adair Facility. The majority of the Camp Adair/Adair Air Force Station was declared surplus after the war and sold or transferred to various government and nongovernment entities between 1944 and 1946. Military use of the Camp Adair/Adair Air Force Station ended in 1970, and additional land was sold to various government and nongovernment entities (AECOM, 2020).

The present-day Camp Adair (527 acres) property is owned by the federal government and administered by the United States Army Corps of Engineers (USACE), licensing use to the Oregon Military Department (OMD) since the 1950s. The ODPSST operates at the Facility under a separate USACE license. The ORARNG took over the property Facility operations in the late 1960s. On-post operations conducted by the ORARNG at Camp Adair have involved both military and nonmilitary training operations. Operations include military personnel training of weaponry (small arms firing range), infantry field exercises (land navigation), equipment staging and storage, and rotary-winged aircraft landings. Training can involve blank ammunition, pyrotechnics, and smoke. Nonmilitary operations include use of the firing ranges by ODPSST civilian law enforcement (not controlled by OMD). Additionally, civilian high school groups and local college Reserve Officers Training Corps groups train on the ropes courses. Annual prescribed burns are conducted on-post by OMD Fire Rangers, the local fire department, and ODFW. Extinguishing materials are primarily water-based, with the exception of a single use of aqueous film-forming foam (AFFF) during an OMD-facilitated controlled burn in 2011 (AECOM, 2020).

Prior to the military's use of Camp Adair in the early 1940s, the property was primarily undeveloped and agricultural land. Native Americans historically inhabited the land and by 1846, the land was acquired by a homesteader for agricultural use. Based on review of historical aerial photographs, development of Camp Adair appears to date back to at least 1944 with limited changes relative to the facility configuration observed during the site visit, with the exception of road development in the eastern and western portions (by at least 2005 and 2010, respectively) (AECOM, 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

Topography at Camp Adair varies from flat in the eastern portion to rolling hills in the western portion (**Figure 2-2**). Elevation ranges from approximately 230 feet (ft) to 740 ft above mean sea level (amsl). From the west/central to the east/central boundaries, elevation ranges from approximately 660 to 230 ft amsl. From the south/central to north/central boundaries, elevation ranges from approximately 430 to 270 ft amsl. Three hills are present at Camp Adair, contributing to the higher elevations: Oak Hill in the north/central portion, Smith Hill along the western boundary, and Hill 655T along the southwestern boundary. Slopes generally range from 0 to 12 percent (%), with Smith Hill and Hill 655T exhibiting over 20% slopes (AECOM, 2020).

Camp Adair is in the Pacific Border Province, Pacific Mountain System. The Facility is bordered by agricultural land on all four borders, in addition to forest to the west. Wetlands, streams, and rivers are interspersed in the area surrounding the Facility (**Figure 2-3 and Figure 2-4**). The Willamette River is located approximately 5 miles to the east, flowing from south to north. Camp Adair is located in a rural area of the Willamette Valley, with some residential properties located south of the Facility (AECOM, 2020).

2.2.1 Geology

Camp Adair is in a geologic area characterized as two distinct features. The western portion of the Facility is underlain by Siletz River Volcanics and related rocks. The eastern portion of the Facility is underlain by lacustrine and fluvial sedimentary rocks. The Siletz is characterized by aphanitic to porphyritic massive lava flows and sills of alkali basalt. The upper part of the sequence contains interbeds of basaltic siltstone and sandstone with rocks of marine origin. The lacustrine zone is characterized by unconsolidated to semi-consolidated lacustrine clay, silt, sand, and gravel, including mudflow and fluvial deposits and layers of peat. Unconsolidated deposits have a maximum thickness of approximately 125 ft locally (AECOM, 2020). At the AOI, located on a hill underlain by the Siletz Formation, overburden exceeds 20 feet in thickness based on SI results.

During the SI, low to medium plasticity fines (primarily silty clay) were observed as the dominant lithology below the Facility. The borings were completed at depths ranging from 14.5 to 20 feet below ground surface (bgs). Minor amounts of sand and gravel were noted. Samples for grain size analyses were collected at one location, AOI01-04, and analyzed via ASTM International (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of silt (35.2%). These results and Facility observations are consistent with the reported depositional environment of the region.

2.2.2 Hydrogeology

Soils beneath Camp Adair are characterized as 12 different mapping units that are collectively highly variable with complex patterns. The soils range from silt loams to silty clay loams, which all have low permeability. The Waldo, Amity, Concord, Dayton, and Witham soil series are poorly drained, while the remaining soil series are well drained. The soil series include the following (AECOM, 2020):

- Silt loams – Amity, Concord, Dayton, and Woodburn soil series
- Silty clay loams – Dixonville, Jory, McAlpin, Waldo, and Witham soil series
- Complex – Jory-Nekia, Price-MacDunn-Ritner, and Witzel-Ritner soil series.

The Jory-Nekia complex comprises 28% of the total acreage of soils beneath Camp Adair, followed by Witzel-Ritner complex (21%), and Dayton silt loam (12%). The remaining soil series comprise less than 10% of the total acreage of soils beneath Camp Adair (AECOM, 2020). Camp Adair is in the west/central portion of the Willamette Valley. A limited water-supplying aquifer is located beneath the Facility (and the surrounding region). Drinking water in this region is primarily obtained from groundwater; however, water-bearing units in the immediate vicinity of Camp Adair do not meet Facility needs and are not utilized. Drinking water is supplied to Camp Adair by the Luckiamute River Water System. Four wells supply drinking water to the Luckiamute River Water System, located between the cities of Buena Vista and Independence. Both cities are northeast of Camp Adair (by approximately 5 and 10 miles, respectively). Groundwater is typically supplied from sand and gravel aquifers beneath the Willamette River floodplain (to the east of Camp Adair). Saturated sands and gravel in unconsolidated deposits are the most productive water-bearing geologic units in the region (AECOM, 2020).

Camp Adair is situated above the Willamette lowland basin-fill aquifers, characterized as unconsolidated sand and gravel aquifers at or near the land surface. The principal aquifer system of this region is identified as the Puget-Willamette Trough Regional Aquifer System, which is composed of unconsolidated-deposit and Miocene basaltic-rock aquifers. Deposits are thicker in the northern portion of the Willamette Valley, gradually thinning from 800 ft in the Portland area (60 miles northeast of Camp Adair) to 200 ft in the Salem area (18 miles northeast of Camp Adair). In the western portion of the aquifer system, Miocene basaltic-rock aquifers are the most productive. In Benton County, depth to water is reported in the range of 10 to 35 ft bgs, with yields ranging from less than 500 to 1,000 gallons per minute (AECOM, 2020).

Regionally, recharge occurs from precipitation and varies greatly. Variation is a result of the permeability of surface deposits and percolation rates of underlying soils. Groundwater recharge also occurs along streams and is also possible in areas located within several hundred feet of the Willamette River. Annual recharge is estimated at 2 to 5 inches in the volcanic formations (and older alluviums) and 8 to 15 inches for younger alluviums. No younger alluviums are present beneath Camp Adair; therefore, recharge of groundwater is within 2 to 5 inches (AECOM, 2020).

According to online information available from the Oregon Water Resources Department (OWRD), approximately 11 water supply wells are plotted within ¾ mile downgradient (northeast) of the Camp Adair Facility. However, several of those wells do not have detailed location information and it is unclear where they are relative to the Camp Adair boundary. Two wells on the OWRD website plot within the Facility boundary of Camp Adair. One of these wells, BENT 51305, is located on a street just south of Camp Adair and upgradient of the AOI. According to location information on the downloaded well log, the other well, BENT 029, is actually located more than 6 miles south of the Facility, upgradient of the AOI (OWRD, 2021).

The PA identified two private drinking water wells located off-post approximately 0.25 mile (#50381) and 0.5 mile (#50378) south (upgradient) of Camp Adair. The wells were drilled in 1997 with reported depths to groundwater of 45 and 126 feet bgs, respectively. According to a 1983 study of the Dallas-Monmouth area (between 8 and 13 miles to the north of Camp Adair in Polk County but also including the northern portion of Benton County), a total of 12 observation wells were measured by the OWRD in the 1960s and 1970s. Groundwater occurs in rocks under unconfined, confined, and perched conditions. The study indicated that groundwater recharge balances with groundwater discharge, and changes in groundwater storage occur according to the season. Groundwater is supplied from sand and gravel in older alluvium. Depth to groundwater in the observation wells was reported to range from 5 to 15 ft bgs. Groundwater in the region is used for irrigation, public drinking water, domestic/stock, and industrial purposes. Most of these uses are supplied from groundwater in unconsolidated deposits. Based on the anticipated shallow depth to groundwater and the topographic relief at and in the area surrounding Camp Adair, groundwater is estimated to flow generally to the north/northeast (**Figure 2-3**) (AECOM, 2020).

A United States Geological Survey monitoring well is located approximately 7 miles to the northeast of the Facility (Site No. POLK0053369; **Figure 2-3**). Depth to groundwater has been measured at a maximum of 13.9 ft bgs, with shallowest groundwater readings at the surface, and an average of 7.4 ft bgs. This well was drilled to 58 ft bgs (AECOM, 2020).

During the SI in September 2021, depth to water was measured at 17.2 and 18.3 ft below ground surface in temporary wells. Groundwater elevations from the SI are presented on **Figure 2-5.** The groundwater data collected during the SI did not provide enough information to calculate a gradient or flow direction; however, groundwater elevation measurements are consistent with anticipated shallow groundwater flow to the north-northeast.

2.2.3 Hydrology

Camp Adair is within the Berry Creek and Upper Soak Creek subwatersheds (Hydrologic Unit Code [HUC] 12), which are within the Luckiamute watershed (HUC 10) of the Upper Willamette subbasin (HUC 8) of the Willamette River basin (HUC 6). The northern portion of the Facility is located within the Berry Creek subwatershed (HUC 12), and the southern portion of the Facility is located within the Upper Soap Creek subwatershed (HUC 12) (**Figure 2-4**) (AECOM, 2020).

Surface water bodies at the Facility consist of a single seasonal unnamed creek flowing from Smith Hill in the western portion of the property in a southwest to northeast direction, exiting along the eastern property boundary. The creek continues to flow northeasterly towards Berry Creek, ultimately discharging into the Willamette River located approximately 5 miles to the east. Flood plains or 100-year floodplains are not located within the property boundary of Camp Adair. Wetlands are located in the southeastern corner of the property boundary. A narrow riverine wetland is in the north/central portion of the property, extending off-post to the north (AECOM, 2020).

Surface stormwater runoff from paved areas of the Facility (only in the central/eastern portion) enter stormwater junction points, discharging off-facility. Stormwater runoff in the remaining unpaved areas infiltrates the ground or enters ephemeral drainage streams and wetlands. Surface water runoff at Camp Adair would occur during heavy precipitation events where precipitation exceeds the infiltration rate of the soil (AECOM, 2020).

2.2.4 Climate

Camp Adair is in the west/central portion of the Willamette Valley, where the climate is considered to be relatively mild throughout most of the year. Winters are cool and wet, and summers are warm and dry. Approximately 50% of the annual precipitation in the Willamette Valley occurs during the fall and winter months from October through March, coinciding with cooler temperatures. Elevation and temperature are the driving factors determining precipitation in the Willamette Valley. An average of 47 inches of precipitation occurs annually in the Willamette Valley, as recorded at Eugene, Oregon, located within the Willamette Valley approximately 45 miles south-southeast of Camp Adair (NOAA, 2020a). Annual precipitation in the form of snow recorded during the 1981 to 2010 period totaled 3.1 inches (AECOM, 2020).

The nearest weather station with recorded historical data is located approximately 6 miles southeast of Camp Adair at the Corvallis Oregon State University Station (Station ID USC00351862). Annual precipitation recorded during the 1981 to 2010 period at this weather station averages approximately 43 inches. Annual temperature recorded during the 1981 to 2010 period averaged 52.6 degrees Fahrenheit (NOAA, 2020b).

2.2.5 Current and Future Land Use

Camp Adair comprises a cantonment area, live-fire small-arms ranges, a ropes course, and open area. Several buildings are located in the cantonment area for office, workshop, and warehousing purposes. Paved roads are located in the eastern portion. These developed areas are limited to 55 acres in the eastern portion of the Facility. The remaining 472 acres of Camp Adair is undeveloped vegetated land, including wetlands and unpaved roads for land navigation training. Access to the Facility is controlled, and the Facility is at least partially fenced. Land use to the north, east, and south is a mixture of residential and agriculture with interspersed wetlands (AECOM, 2020).

Camp Adair is zoned by Benton County as Open Space. The Facility is along the northern boundary of Benton County, adjacent to Polk County. Land to the east and southeast is zoned Exclusive Farm Use (EFU). Land to the south, southwest, and west is zoned Forest Conservation. Land to the north of the Facility is zoned by Polk County as EFU. Camp Adair is federally owned land leased by USACE, and its use is unlikely to change in the future. The

Luckiamute watershed consists primarily of agricultural and forested land. Based on review of historical Google Earth aerial imagery and the Benton and Polk County zoning maps, it is likely that surrounding land uses in the future will remain the same (AECOM, 2020).

The nearest urban areas are Adair Village and Corvallis, approximately 3 and 9 miles to the southeast and south of Camp Adair, respectively. According to the 2017 United States Census, the estimated populations of Adair Village and Corvallis were 859 and 57,961, respectively. Based on the population estimates, the populations of Adair Village and Corvallis have only increased by 15 and 1,000 since 2010, respectively (AECOM, 2020).

2.2.6 Sensitive Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the facility. The following species have not been identified at the Facility according to documents reviewed but may be present in the surrounding area and are listed as federally endangered, threatened, proposed, and/or candidate species at or in the vicinity of Camp Adair (USFWS, 2022):

- Birds: marbled murrelet, *Brachyramphus marmoratus* (threatened); northern spotted owl, *Strix occidentalis caurina* (threatened); streaked horned lark, *Eremophila alpestris strigata* (threatened)

- Flowering Plants: Kincaid's lupine, *Lupinus sulphureus ssp. kincaidii* (threatened); Nelson's checker-mallow, *Sidalcea nelsoniana* (threatened); Willamette daisy, *Erigeron decumbens* (endangered)

- Insects: monarch butterfly, *Danaus plexippus* (candidate); Fender's blue butterfly, *Icaricia icarioides fender* (endangered); Taylor's checkerspot, *Euphydryas editha taylori* (endangered)

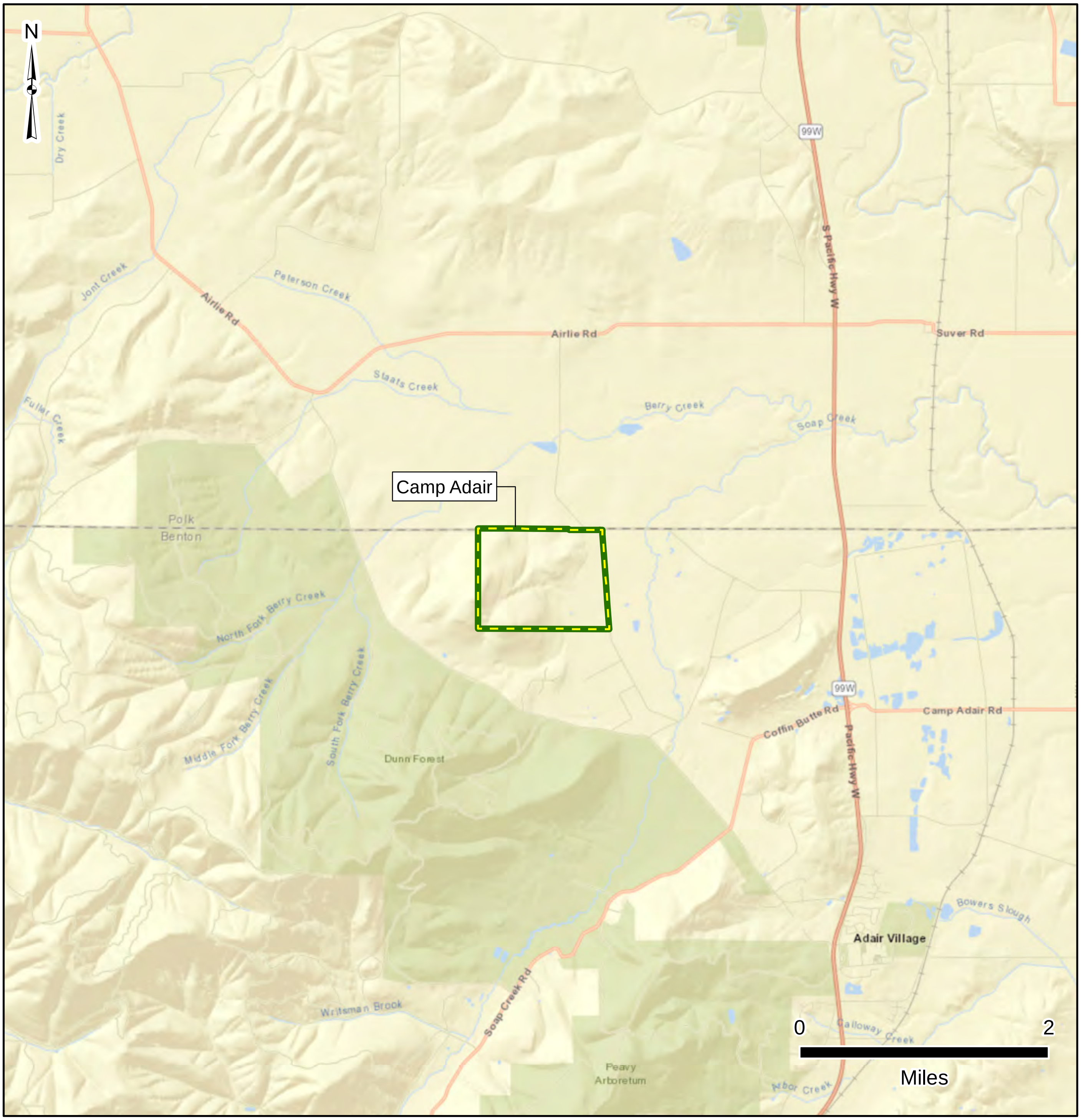
- Mammals: Pacific marten, *Martes caurina* (threatened); red tree vole, *Arborimus longicaudus* (candidate)

2.3 HISTORY OF PFAS USE

One potential PFAS release area was identified at the Facility during the PA (AECOM, 2020). Interviews and records obtained during the PA indicate that PFAS were potentially released to soil, groundwater, and surface water within the boundary of Camp Adair during one event in 2011 in an area where a prescribed burn of vegetation took place (AOI 1). A description of the AOI is presented in **Section 3**.

Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

Figure 2-1
Facility Location



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:...............................May 2023
Prepared By:...........................WSP
Prepared For:.....................USACE
Projection:...........NAD 83 UTM 10N

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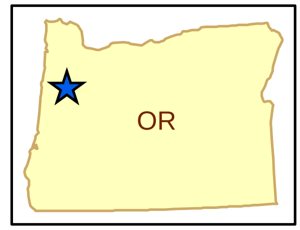
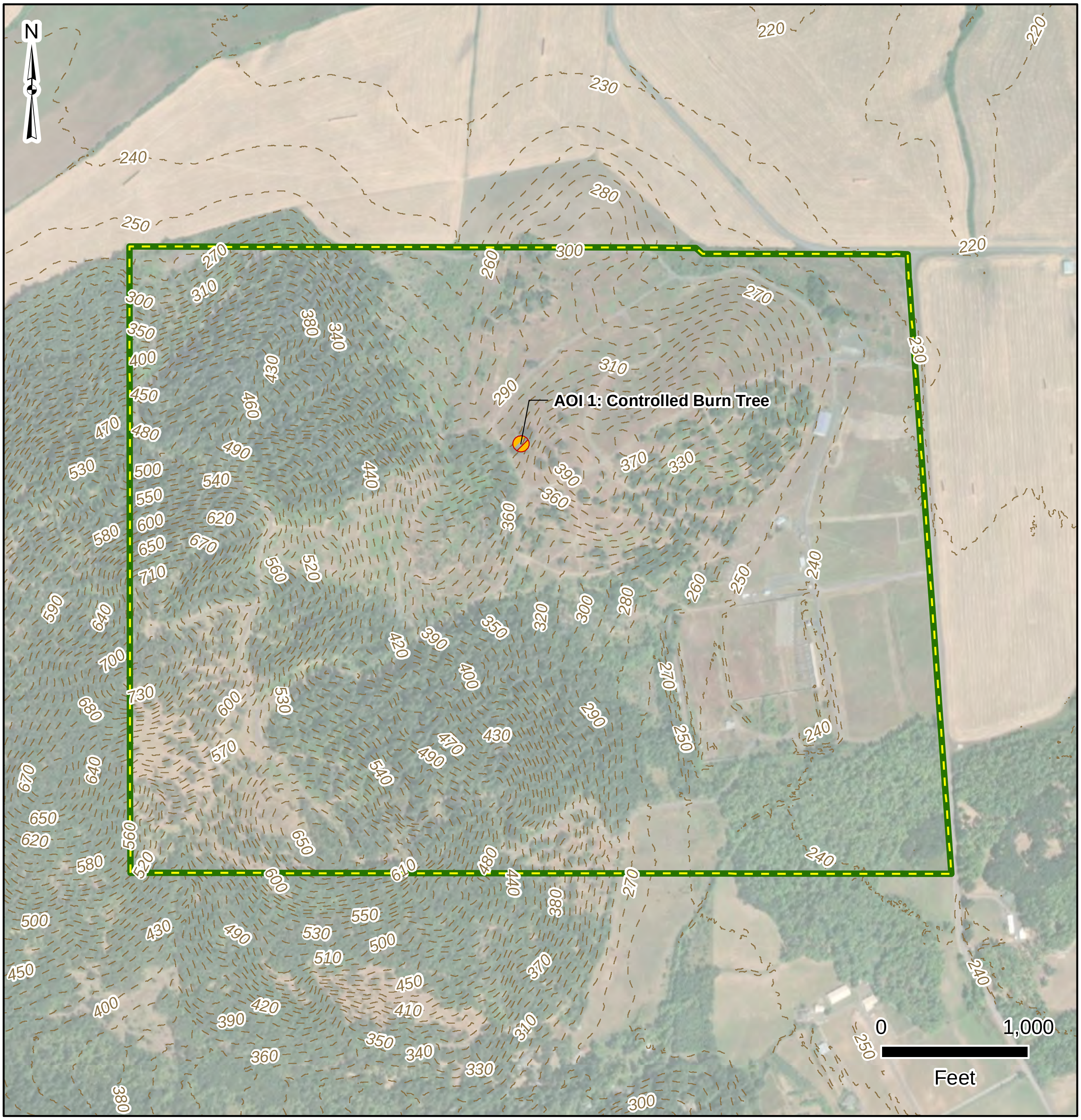


Figure 2-2
Facility Topography



Facility Data

Facility Boundary

Potential PFAS Release

Topography

Elevation Contour
(10 ft. interval, NAVD88 datum)

Data Sources:
ESRI 2020
AECOM 2020
NOAA 2021

Date:..................................May 2023
Prepared By:.............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

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Figure 2-3
Groundwater Features

Facility Data
Facility Boundary

Hydrogeology
Inferred Shallow Groundwater Flow Direction

Well Type
Domestic
Monitoring

Hydrology
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

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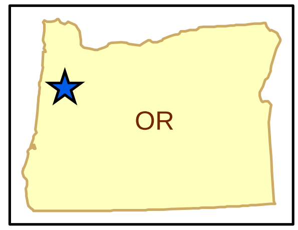
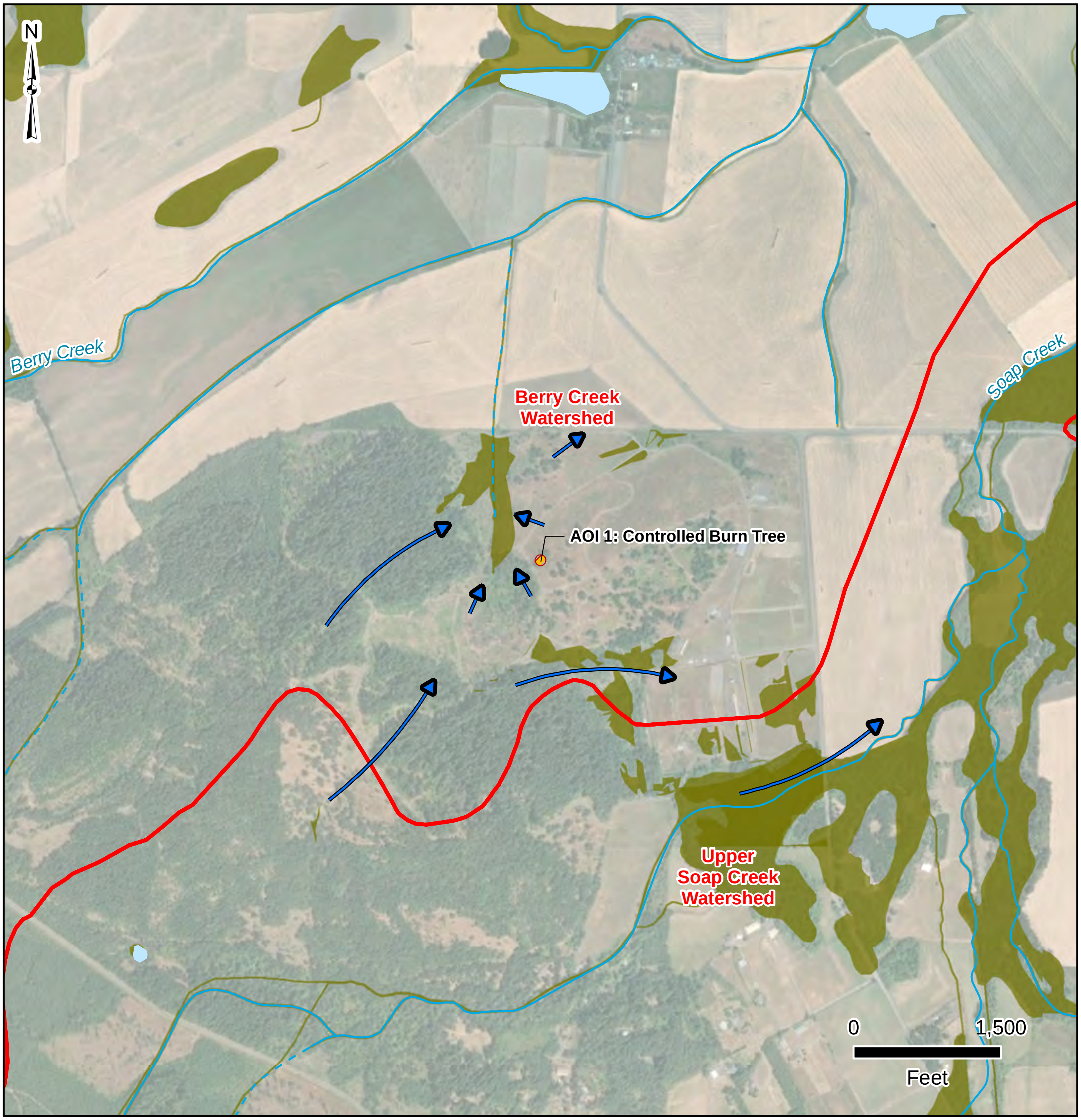
Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

Figure 2-4
Surface Water Features





Facility Data

- Facility Boundary
- Potential PFAS Release

Hydrology

- Surface Water Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Waterbody
- Wetlands
- Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

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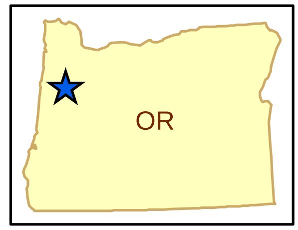
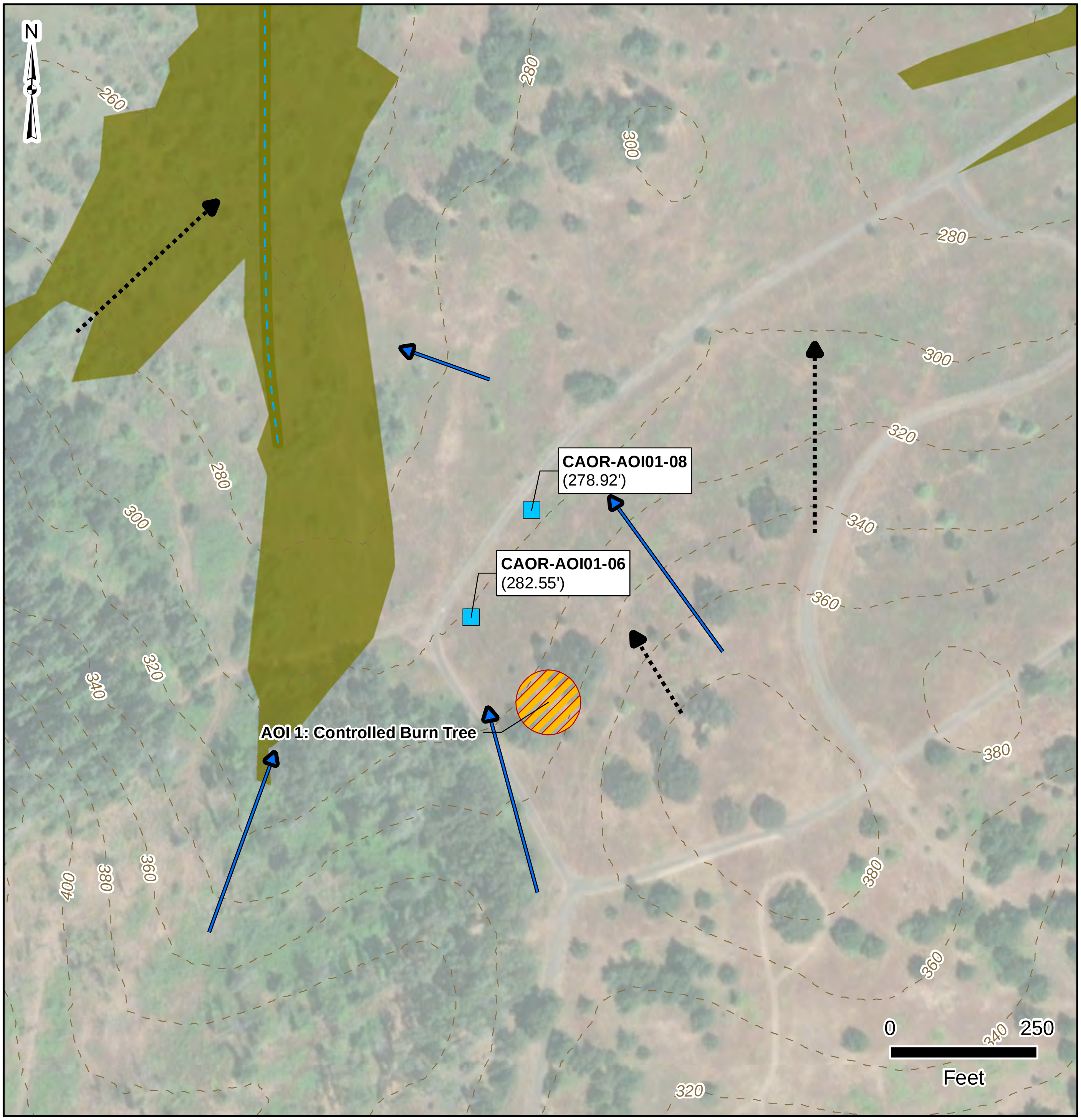
Figure 2-5
Groundwater Elevations - September 2021





Facility Data

Potential PFAS Release

Topography

Elevation Contour
(20 ft. interval, NAVD88 datum)

Sample Location

Temporary Groundwater Well Location (groundwater elevation in feet as measured on 21 September 2021, NAVD88 datum)

Hydrology

Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Intermittent Creek/Stream
Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

NOTE: Facility boundary extends beyond the limits of this figure.

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 2-5 Groundwater Elevations - September 2021.mxd - stephane.descombes - 5/1/2023 - 12:53:32 PM

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3. SUMMARY OF AREAS OF INTEREST

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, one potential release area was identified at Camp Adair: AOI 1, Controlled Burn Tree. The AOI is shown on **Figure 3-1**.

3.1 AOI 1 – CONTROLLED BURN TREE

AOI 1 is the Controlled Burn Tree and its immediately surrounding area (**Figure 3-1**). A one-time release of AFFF by the OMD occurred at AOI 1 in 2011. The OMD conducted a controlled burn in the north/central portion of the Facility. One larger tree remained burning at the end of the day's exercise, and OMD fire rangers doused the burning tree and the immediately surrounding vegetation with less than 1 gallon of AFFF to extinguish the fire. The known use of AFFF occurred only once in 2011; the exact date is unknown. The type and concentration of AFFF used was not reported (AECOM, 2020).

3.2 ADJACENT SOURCES

The final PA does not indicate any potential sources of PFAS upgradient from or adjacent to Camp Adair (AECOM, 2020). Because no potential upgradient sources of PFAS were identified in the PA, samples were not collected at the upgradient Facility boundary at Camp Adair.

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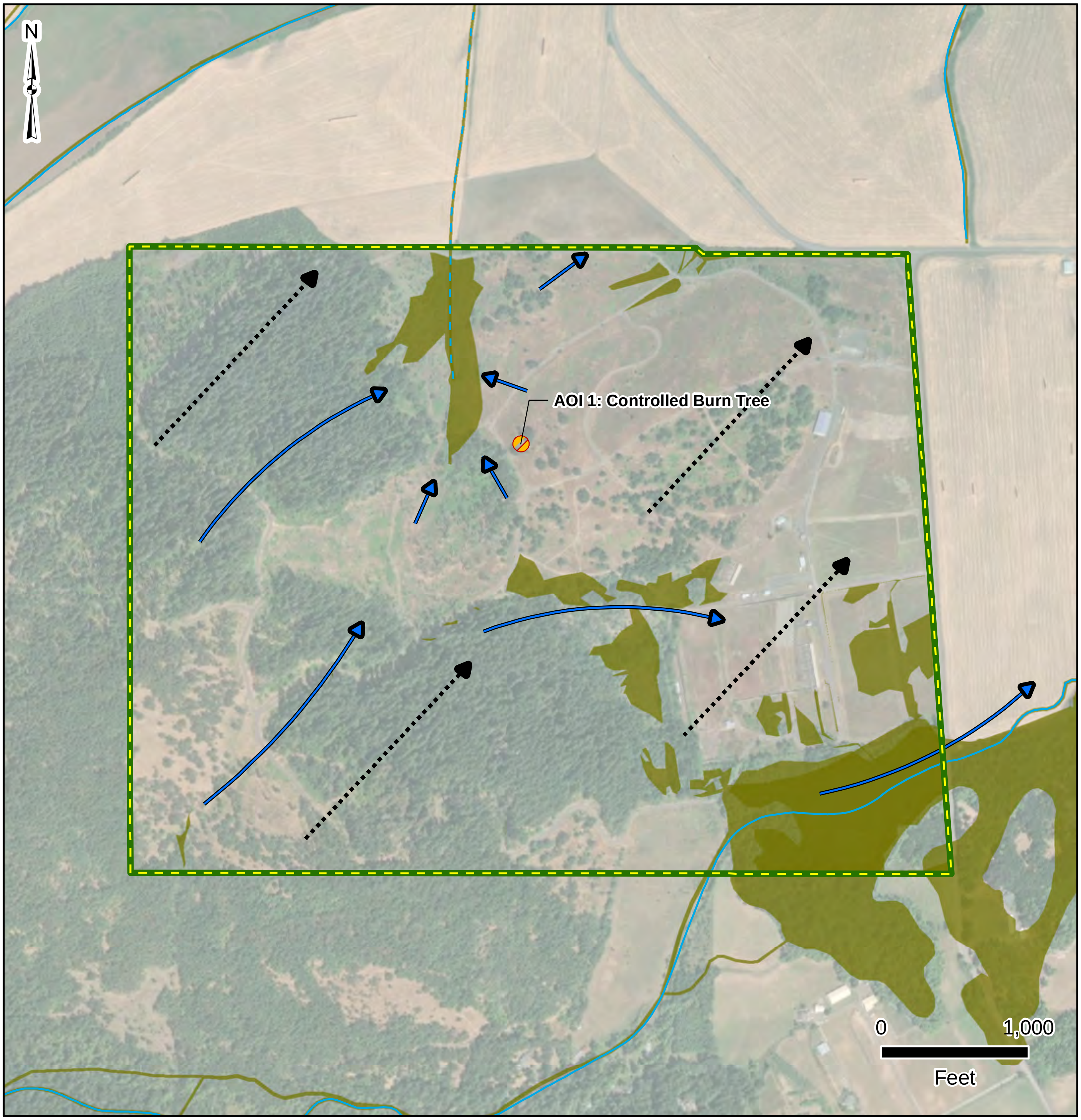
Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

Figure 3-1
Area of Interest



Facility Data

- Facility Boundary
- Potential PFAS Release

Hydrology

- Surface Water Flow Direction
- Inferred Shallow Groundwater Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Waterbody
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 3-1 Area of Interest.mxd - stephane.descombes - 5/1/2023 - 12:52:36 PM

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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the Data Quality Objective (DQO) process and outlined in the SI Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) Addendum (EA/Wood [3] 2021a), the objective of the SI is to identify whether there has been a release to the environment at the AOI identified in the PA. For the AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for the presence or absence of relevant compounds at the AOI.

4.1 PROBLEM STATEMENT

ARNG will recommend an AOI for remedial investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based SLs. The SLs are presented in **Section 6.1** of this report.

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for Camp Adair (AECOM 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP – QAPP Addendum (EA/Wood 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figure 2-1** and **Figure 2-2**). The scope of the SI was bounded vertically by the depth of temporary monitoring wells installed within groundwater, where encountered (maximum depth of 20 feet bgs). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 1.01) and the National

[3] Wood Environment & Infrastructure Solutions, Inc (“Wood”), EA’s primary subcontractor on the PFAS SI’s was acquired by WSP on September 21, 2022. Due to the acquisition, we have changed our name to WSP USA Environment & Infrastructure Inc. (“WSP”). No other aspects of our legal entity or capabilities have changed for this project. The Term Wood has been replaced with WSP where applicable. Documents prepared by Wood are still refenced as Wood.

Environmental Laboratory Accreditation Program (NELAP; Certificate Number 021). Data were compared to applicable SLs within this document and decision rules as defined in the UFP-QAPP Addendum (EA/Wood 2021a).

4.5 DATA USABILITY ASSESSMENT

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD 2019a, DoD 2019b, USEPA 2017).

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the UFP-QAPP Addendum (EA/Wood 2021a).

5. SITE INSPECTION ACTIVITIES

This section describes the environmental investigation and sampling activities that occurred as part of the SI. The SI sampling approach was based on the findings of the PA and was implemented in accordance with the following approved documents.

- *Final Preliminary Assessment Report, Camp Adair, Oregon,* dated February 2020 (AECOM 2020)
- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide,* dated December 2020 (EA 2020a)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Camp Adair, Oregon* dated August 2021 (EA/Wood 2021a)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2020 (EA 2020b)
- *Final Accident Prevention Plan/Site Safety and Health Plan Addendum* for Camp Adair, Oregon, dated April 2021 (EA/Wood 2021b).

The proposed sample locations were marked on 7 September 2021 prior to the public utility locate. The SI field activities were conducted on 21 September 2021 and consisted of direct-push technology (DPT) borings, temporary monitoring well installation, sampling, surveying, and site restoration activities. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood 2021a), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for 24 compounds via liquid chromatography/tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) Version 5.3 Table B-15 to fulfill the project DQOs:

- 15 primary soil samples from five boring locations;
- Two primary grab groundwater samples from two temporary well locations; and
- Five samples for quality assurance (QA) and quality control (QC).

Figure 5-1 provides the sample locations for all media across the Facility. **Table 5-1** presents the list of samples collected for each medium. Field documentation is provided in **Appendix B**. A log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, land survey data are provided in **Appendix B3**, and a Field Change Request form is provided in **Appendix B4.** Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 PRE-INVESTIGATION ACTIVITIES

In preparation for the SI field activities, project team members participated in Technical Project Planning (TPP) meetings, performed utility clearance, and sampled decontamination source water. Details of these activities are presented below.

5.1.1 Technical Project Planning

The USACE TPP Process, Engineer Manual (EM) 200-1-2 (Department of the Army 2016a) defines four phases to project planning: (1) defining the project phase; (2) determining data needs; (3) developing data collection strategies; and (4) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOI identified in the PA.

A combined TPP Meeting 1 and 2 was held on 14 July 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI consist of the ARNG, ORARNG, Oregon Department of Environmental Quality, and USACE representatives familiar with the Facility, the regulators, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the UFP-QAPP Addendum (EA/Wood 2021a).

A TPP Meeting 3 was held after the field event to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. TPP meetings provided an opportunity to discuss results, findings, and future actions, where warranted.

5.1.2 Utility Clearance

Wood[4] contacted the Oregon Utility Notification Center to notify them of intrusive work at the Facility. The proposed sample locations were marked on 7 September 2021, two weeks prior to the scheduled drilling activities and within the requirement for public utility location services. Public utility clearance was performed along the boundary of the Camp Adair Facility for the Benton County Public Works, Consumers Power, Luckiamute Domestic Water Cooperative, and Century Link utilities. Public utility clearance was not conducted within the sampling area. General locating services and ground-penetrating radar were not used due to the rural nature of the sampling area. In place of private utility location, each boring was precleared to the extent reasonably feasible by Wood's drilling subcontractor, Steadfast Services LLC, using a hand auger to verify utility clearance in the shallow subsurface. where utilities would typically be encountered.

[4] Work was conducted by Wood Environment & Infrastructure Solutions, Inc. prior to the acquisition by WSP on 21 September 2022.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

PFAS-free water used for decontamination of drilling equipment and equipment blanks was provided by Eurofins. Prior to mobilization, the water from Eurofins was certified by the laboratory to be PFAS-free by analysis for PFAS by LC/MS/MS compliant with QSM Version 5.3, Table B-15 (DoD/DOE, 2019). The analyzed water was then bottled and shipped to WSP for use as decontamination and equipment blank water during the SI field work.

Materials used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures appendix to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA 2021*).* A Geoprobe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect surface soil samples and to clear utilities in compliance with utility clearance procedures as discussed in **Section 5.1.2**. The soil boring locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. Sampling locations were agreed upon by stakeholders during the TPP Meeting and adjusted as noted in the field change requests (FCRs) (**Appendix B4**).

Three discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was collected approximately 1 ft above the groundwater table (or at total depth of boring if groundwater was not encountered) and one collected at the mid-point between the surface and the groundwater table (not to exceed 15 ft bgs). Groundwater was encountered at depths ranging from 17 to 19 ft bgs during drilling at two boring locations. Total boring completion depths ranged from 14.5 to 20 ft bgs.

During the drilling, the soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System. A photoionization detector (PID) was used to screen the breathing zone during boring activities as a part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook. Depth interval, recovery thickness, PID concentrations, moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix E**.

Soil borings completed during the SI found fines with minor amounts of sand and gravel as the dominant lithology of the unconsolidated material below the Facility. Most of the soil observed during the SI consisted of silty clay. These observations are consistent with the understood depositional environment of the region. The borings were completed at depths ranging from 14.5 to 20 feet bgs.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain-of-custody (COC) procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic carbon (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the UFP-QAPP Addendum (EA/Wood 2021a).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, one equipment blank (EB) was collected per day and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

Borings not converted to temporary wells were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA/Wood 2021a). Boreholes were filled with bentonite chips, hydrated, and covered with surrounding soil. Borings were installed in unpaved areas to avoid disturbing concrete or asphalt surfaces.

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 10-ft section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. Three of the temporary wells did not produce measurable water and could not be sampled. After the recharge period, groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing from the other two temporary wells. The temporary wells were purged at a rate determined in the field to reduce turbidity and drawdown prior to sampling; both temporary wells were purged dry and allowed to recharge prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected in a separate container. Shaker testing was not completed during this SI, because water volume was limited.

Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA/Wood 2021a).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field blank (FB) was collected in accordance with the UFP-QAPP Addendum (EA/Wood 2021a). Because disposable sampling equipment was used for groundwater sampling, an equipment blank was not collected. A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI UFP-QAPP Addendum (EA/Wood 2021a) by removing the PVC, and then the hole was backfilled with bentonite chips, hydrated, and covered with surrounding soil.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor facility-wide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements were not possible given the limited amount of water in each well, slow recovery, and time limitations on field work. However, depths to water were measured from the newly installed temporary monitoring wells prior to sampling, taken from the survey mark on the northern side of the well casing. Groundwater was encountered in only two boring locations during the sampling event, so groundwater elevation data are not sufficient to estimate groundwater flow rate or direction; however, the groundwater elevation at CAOR-AOI01-08 was lower than at CAOR-AOI01-06, which is consistent with the anticipated northeast groundwater flow direction and surface topography. Groundwater elevation data are provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a Trimble R12i real-time kinematic Global Navigation Satellite System Receiver on the Oregon Real-Time Network. Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected on 21 September 2021 and are provided in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the UFP-QAPP Addendum (EA/Wood 2021a).

Soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities were drummed separately in 55-gallon steel drums approved by the United States Department of Transportation. The IDW drums were subsequently stored within secondary containment in a dedicated indoor area within the Camp

Adair Facility. The IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location. The IDW disposal is being managed under a separate contract by EA. Specifics on the disposal of solid and liquid IDW will be addressed in an IDW Technical Memorandum.

The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples collected from that source location.

Other solids, such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other environmental media generated during the field activities, were disposed of at a licensed solid waste landfill.

5.7 LABORATORY ANALYTICAL METHODS

Samples were analyzed by LC/MS/MS, compliant with QSM Version 5.3 Table B-15, at Eurofins Lancaster Laboratories Environmental, Pennsylvania, a DoD ELAP and NELAP-certified laboratory.

One soil sample was also analyzed for TOC using USEPA Method 9060A, pH by USEPA Method 9045D, and grain size using ASTM Method D-422.

5.8 DEVIATIONS FROM SI UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on conditions encountered during field activities. These deviations were discussed among WSP, EA, ARNG, USACE, and ORARNG. Six deviations from the UFP-QAPP Addendum are noted below

- After evaluation of drainage patterns in AOI 1 and in the vicinity of the proposed boring and/or temporary well locations during the utility locate site visit, the field team determined the proposed boring locations as shown in the UFP-QAPP Addendum did not adequately represent the area most likely to be affected by drainage from the potential source area. As a result, the following relocations of boring and/or temporary well locations were made:

  - Temporary well locations CAOR-AOI01-06, CAOR-AOI01-07, and CAOR-AOI01-08 were adjusted to the north-northwest.

  - Soil boring/temporary well location CAOR-AOI01-05 was adjusted slightly to the west.

  - The location of soil boring CAOR-AOI01-02 was swapped with the location of soil boring/temporary well location CAOR-AOI01-03.

  In order to communicate these changes, and receive concurrence among WSP, EA, ARNG, USACE, and ORARNG, a Field Change Request was discussed with and submitted to ARNG, and ARNG notified ODEQ of the scope revisions, on 16 September 2021. The adjusted sampling locations are reflected on **Figure 5-1**.

- Although the UFP-QAPP Addendum indicated that two soil samples would be collected using a hand auger, from 0 to 1 ft bgs and 4 to 5 ft bgs, only one soil sample, from approximately 0 to 1 ft bgs, was collected using a hand auger at the following soil boring locations: CAOR-AOI01-01, CAOR-AOI01-02, CAOR-AOI01-03, CAOR-AOI01-04, and CAOR-AOI01-05. Midpoint subsurface samples (approximately 4 to 5 ft bgs) were not collected from a hand auger due to tight soil preventing the hand auger bit from penetrating greater than 1 ft bgs, but rather were collected from the dual-tube DPT sampler. This deviation does not affect data quality objectives for the SI, because soil samples were collected from planned depths.

- Temporary wells were installed at boring locations CAOR-AOI01-03, CAOR-AOI01-05, CAOR-AOI01-06, CAOR-AOI01-07, and CAOR-AOI01-08 as prescribed in the UFP-QAPP Addendum. However, no definitive groundwater table was encountered during drilling, and only wells CAOR-AOI01-06 and CAOR-AOI01-08 produced enough water to collect groundwater grab samples. These two wells were purged dry and allowed to recharge prior to sampling. The limited time for field work at the site due to Facility scheduling conflicts did not allow sufficient time to install a temporary well at an alternative location, nor to allow the other three temporary wells to sit longer and potentially produce enough volume to sample. Based on the nature of the release and the location of the two wells with sufficient water to sample, the two groundwater samples collected are considered be representative of the groundwater conditions downgradient of the AOI. Due to the limited amount of water encountered in temporary wells, shaker testing was not completed and a round of synoptic water levels was not collected.

- Due to time constraints caused by Facility scheduling, the field work needed to be completed in one day. Difficult drilling at CAOR-AOI01-05 resulted in more time than anticipated being spent at this location. All borings were completed within the time constraints, however there was insufficient time to extend borings deeper in an attempt to encounter and sample groundwater that may have been present at a depth below the proposed extent of the borings as documented in the UFP-QAPP Addendum (EA/Wood 2021a). As stated above, the groundwater samples collected are considered to be representative of the groundwater conditions downgradient of the AOI.

- As discussed in **Appendix A**, analysis of groundwater samples exceeded holding times for extraction provided in the UFP-QAPP Addendum. The detected concentrations were qualified as estimated and flagged with “J.” Because those concentrations were two orders of magnitude below the screening level and because J-qualified results are valid for use, these results are considered usable in meeting the objectives of the SI.

- The UFP-QAPP Addendum specified 5-foot screens be used when installing monitoring wells for groundwater sampling. At locations where temporary monitoring wells were installed, one section of 10-foot screen was used to ensure the highest likelihood of sample recovery since depth to groundwater was unknown.

In addition, the UFP-QAPP Addendum contained an error with regard to the soil extraction holding time. The PFAS extraction holding time for soil should have been identified as 28 days, consistent with the Programmatic UFP-QAPP. Holding times for soil (as corrected) were met.

Table 5-1. Site Inspection Samples by Medium
Camp Adair, Corvallis, Oregon
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
CAOR-AOI01-1-1	09/21/2021	1.0	X				
CAOR-AOI01-1-5	09/21/2021	5.0	X				Parent Sample of CAOR-AOI01-FD01
CAOR-AOI01-FD01	09/21/2021	5.0	X				FD
CAOR-AOI01-1-14	09/21/2021	14.0	X				MS/MSD Collected
CAOR-AOI01-2-1	09/21/2021	1.0	X				
CAOR-AOI01-2-5	09/21/2021	5.0	X				
CAOR-AOI01-2-14	09/21/2021	14.0	X				
CAOR-AOI01-3-1	09/21/2021	1.0	X				
CAOR-AOI01-3-5	09/21/2021	5.0	X				
CAOR-AOI01-3-14	09/21/2021	14.0	X				
CAOR-AOI01-4-1	09/21/2021	1.0	X	X	X	X	
CAOR-AOI01-4-5	09/21/2021	5.0	X				Parent Sample of CAOR-AOI01-FD02
CAOR-AOI01-FD02	09/21/2021	5.0	X				FD
CAOR-AOI01-4-14	09/21/2021	14.0	X				
CAOR-AOI01-5-1	09/21/2021	1.0	X				
CAOR-AOI01-5-5	09/21/2021	5.0	X				
CAOR-AOI01-5-14	09/21/2021	14.0	X				
Groundwater Samples							
CAOR-AOI01-6-GW-20	09/21/2021	20.0	X				
CAOR-AOI01-8-GW-20	09/21/2021	20.0	X				MS/MSD Collected Parent Sample of CAOR-AOI01-FD03
CAOR-AOI01-FD03	09/21/2021	20.0	X				FD
Blank Samples							
CAOR-FB-01	09/21/2021	-	X				Field Blank
CAOR-EB-01	09/21/2021	-	X				Equipment Blank Collected from DPT Probe Shoe

Notes:
- = Not applicable
ASTM = ASTM International
bgs = below ground surface
EB = equipment blank
ft = feet
FD = field duplicate
FB = field blank
LC/MS/MS = liquid chromatography tandem mass spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
PFAS = per- and polyfluoroalkyl substances
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

**Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Camp Adair, Corvallis, Oregon
Site Inspection Report**

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	CAOR-AOI01-1	15.0	-
	CAOR-AOI01-2	14.5	-
	CAOR-AOI01-3	20.0	10.0 – 20.0
	CAOR-AOI01-4	15.0	-
	CAOR-AOI01-5	18.0	8.0 – 18.0
	CAOR-AOI01-6	20.0	10.0 – 20.0
	CAOR-AOI01-7	20.0	10.0 – 20.0
	CAOR-AOI01-8	20.0	10.0 – 20.0

Notes:
- = Not applicable
bgs = below ground surface
ft = feet

**Table 5-3. Groundwater Elevations
Camp Adair, Corvallis, Oregon
Site Inspection Report**

Monitoring Well ID	Top of Casing Elevation (ft NAVD88)	Depth to Water (ft btoc)	Groundwater Elevation (ft NAVD 88)
CAOR-AOI01-03	329.065	-	-
CAOR-AOI01-05	268.038	-	-
CAOR-AOI01-06	300.860	18.31	282.55
CAOR-AOI01-07	320.407	-	-
CAOR-AOI01-08	296.522	17.60	278.92

Notes:
- = Not Applicable
btoc = below top of casing
ft = feet
NAVD88 = North American Vertical Datum 1988

Army National Guard Site Inspections
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Camp Adair, Oregon

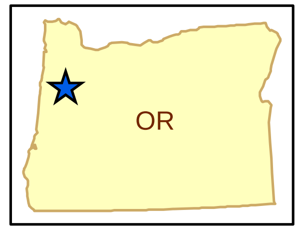
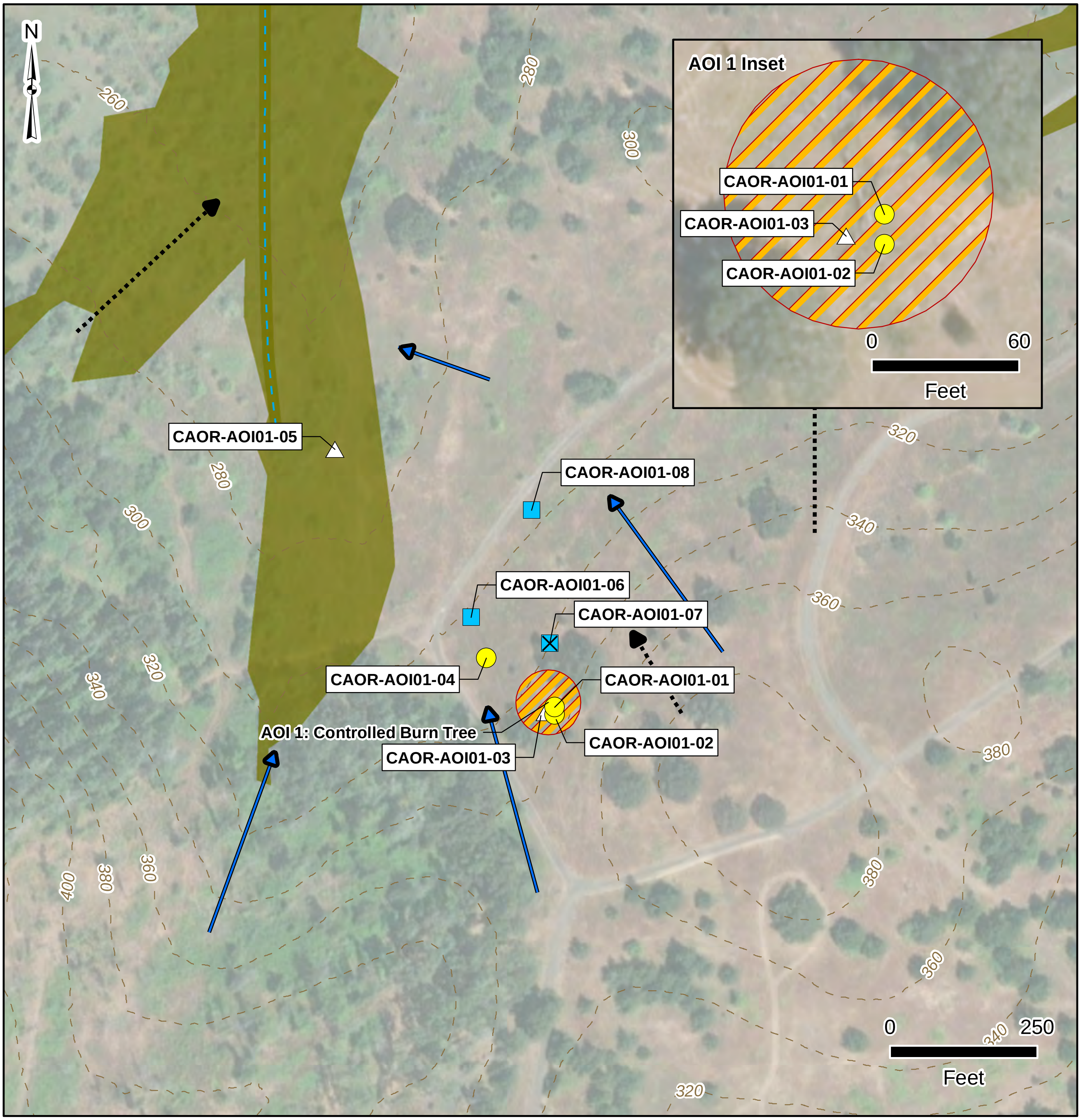


Figure 5-1
Site Inspection Sample Locations



Facility Data

Potential PFAS Release

Topography

Elevation Contour (20 ft. interval, NAVD88 datum)

NOTE: Facility boundary extends beyond the limits of this figure.

Sample Location

Soil Boring Location

Soil Boring & Temporary Groundwater Well Location (groundwater not encountered)

Temporary Groundwater Well Location

Temporary Groundwater Well Location (groundwater not encountered)

Hydrology

Surface Water Flow Direction

Inferred Shallow Groundwater Flow Direction

Intermittent Creek/Stream

Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:...........................WSP
Prepared For:.....................USACE
Projection:...........NAD 83 UTM 10N

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6. SITE INSPECTION RESULTS

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for the AOI is provided in **Section 6.3**. SLs for relevant compounds, for both soil and groundwater, are presented in **Table 6-1**. **Table 6-2** through **Table 6-4** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 SCREENING LEVELS

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD (Assistant Secretary of Defense 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented in **Table 6-1**.

Table 6-1. Screening Levels (Soil and Groundwater)

Analyte[2]	Residential (Soil) (µg/kg)[1] 0-2 ft bgs	Industrial / Commercial Composite Worker (Soil) (µg /kg)[1] 2-15 ft bgs	Tap Water (Groundwater) (ng/L)[1]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
1. Assistant Secretary of Defense. July 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. May 2022.
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Abbreviations:
µg/kg = microgram(s) per kilogram
bgs = below ground surface
ft = feet
ng/L = nanogram(s) per liter

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the Facility: the residential scenario is applied to surface soil results (0 to 2 ft bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 ft bgs). The SLs are not applied to deep subsurface soil results (>15 ft bgs) because 15 ft is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

To provide basic soil parameter information, soil samples were analyzed for TOC, pH, and grain size, which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC, pH, and grain size sampling.

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important PFAS partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions, and are therefore relatively mobile in groundwater (Xiao et al., 2015), but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy 2006; Guelfo and Higgins 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients (K_{oc} values) can help in evaluating transport potential, though other geochemical factors (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC, 2018).

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Controlled Burn Tree. The soil and groundwater results are summarized in **Table 6-2** through **Table 6-4**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Soil samples were collected from five boring locations associated with AOI 1 during the SI. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** and **Table 6-3** summarize the soil results.

Surface soil (0 to 2 ft bgs) was sampled from boring locations AOI01-01 through AOI01-05. Soil was also sampled from shallow subsurface soil (2 to 6 ft bgs) and deep subsurface soil (6 to 15 ft bgs) from boring locations AOI01-01 through AOI01-05. PFOA was detected in surface soil at one location, CAOR-AOI01-05, at 0.23 J µg/kg, which is below its SL. The other relevant compounds were not detected in surface soil. No relevant compounds were detected in the shallow or deep subsurface soil collected during the SI.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater samples were collected from two temporary wells associated with AOI 1 during the SI. **Figure 6-6** and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring well locations AOI01-06 and AOI01-08. PFOS and PFOA were detected at concentrations below their respective SLs in one of the two wells (AOI01-06). PFOS was detected at a concentration of 0.63 J ng/L, and PFOA was detected at a concentration of 0.53 J ng/L. Groundwater from AOI01-08 (and its duplicate) did not have any detections of the relevant compounds.

6.3.3 Conclusions

Based on the results of the SI, PFOA was detected in soil below its SL. PFOA and PFOS were detected in groundwater at concentrations below their respective SLs. Based on these results, further evaluation at AOI 1 is not warranted.

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Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Surface Soil
Site Inspection Report, Camp Adair, Oregon

	Area of Interest	AOI 1																			
	Location ID	CAOR-AOI01-01				CAOR-AOI01-02				CAOR-AOI01-03				CAOR-AOI01-04				CAOR-AOI01-05			
	Sample Name	CAOR-AOI01-1-1				CAOR-AOI01-2-1				CAOR-AOI01-3-1				CAOR-AOI01-4-1				CAOR-AOI01-5-1			
	Parent Sample ID																				
	Depth	1 ft				1 ft				1 ft				1 ft				1 ft			
	Sample Date	9/21/2021				9/21/2021				9/21/2021				9/21/2021				9/21/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																					
Perfluorobutanesulfonic acid (PFBS)	1,900	<	1.9	2.3	U	<	2.0	2.4	U	<	1.8	2.3	U	<	2.0	2.4	U	<	1.9	2.3	U
Perfluorohexanesulfonic acid (PFHxS)	130	<	0.46	0.70	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.49	0.73	U	<	0.47	0.70	U
Perfluorononanoic acid (PFNA)	19	<	0.46	0.70	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.49	0.73	U	<	0.47	0.70	U
Perfluorooctanesulfonic acid (PFOS)	13	<	0.46	0.70	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.49	0.73	U	<	0.47	0.70	U
Perfluorooctanoic acid (PFOA)	19	<	0.46	0.70	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.49	0.73	U	0.23	0.47	0.70	J

Grey Fill	Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022. Soil Screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL.

Chemical Abbreviations

PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

<	analyte not detected above the LOD
AOI	Area of Interest
DL	detection limit
ft	feet
HQ	hazard quotient
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
OSD	Office of the Secretary of Defense
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Shallow Subsurface Soil
Site Inspection Report, Camp Adair, Oregon

	Area of Interest	AOI 1															
	Location ID	CAOR-AOI01-01				CAOR-AOI01-01				CAOR-AOI01-01				CAOR-AOI01-02			
	Sample Name	CAOR-AOI01-1-5				CAOR-AOI01-FD01				CAOR-AOI01-1-14				CAOR-AOI01-2-5			
	Parent Sample ID					CAOR-AOI01-1-5											
	Depth	5 ft				5 ft				14 ft				5 ft			
	Sample Date	9/21/2021				9/21/2021				9/21/2021				9/21/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorobutanesulfonic acid (PFBS)	25,000	<	1.9	2.4	U	<	2.1	2.6	U	<	2.0	2.5	U	<	2.0	2.6	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	<	0.48	0.71	U	<	0.52	0.78	U	<	0.50	0.75	U	<	0.51	0.77	U
Perfluorononanoic acid (PFNA)	250	<	0.48	0.71	U	<	0.52	0.78	U	<	0.50	0.75	U	<	0.51	0.77	U
Perfluorooctanesulfonic acid (PFOS)	160	<	0.48	0.71	U	<	0.52	0.78	U	<	0.50	0.75	U	<	0.51	0.77	U
Perfluorooctanoic acid (PFOA)	250	<	0.48	0.71	U	<	0.52	0.78	U	<	0.50	0.75	U	<	0.51	0.77	U

Grey Fill = Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022. Soil Screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
U = The analyte was not detected at a level greater than or equal to the adjusted DL.

Chemical Abbreviations
PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations
< analyte not detected above the LOD
AOI Area of Interest
DL detection limit
ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Shallow Subsurface Soil
Site Inspection Report, Camp Adair, Oregon

	Area of Interest	AOI 1															
	Location ID	CAOR-AOI01-02				CAOR-AOI01-03				CAOR-AOI01-03				CAOR-AOI01-04			
	Sample Name	CAOR-AOI01-2-14				CAOR-AOI01-3-5				CAOR-AOI01-3-14				CAOR-AOI01-4-5			
	Parent Sample ID																
	Depth	14 ft				5 ft				14 ft				5 ft			
	Sample Date	9/21/2021				9/21/2021				9/21/2021				9/21/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorobutanesulfonic acid (PFBS)	25,000	<	2.0	2.5	U	<	2.3	2.8	U	<	2.5	3.1	U	<	2.2	2.8	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	<	0.50	0.74	U	<	0.57	0.85	U	<	0.61	0.92	U	<	0.56	0.84	U
Perfluorononanoic acid (PFNA)	250	<	0.50	0.74	U	<	0.57	0.85	U	<	0.61	0.92	U	<	0.56	0.84	U
Perfluorooctanesulfonic acid (PFOS)	160	<	0.50	0.74	U	<	0.57	0.85	U	<	0.61	0.92	U	<	0.56	0.84	U
Perfluorooctanoic acid (PFOA)	250	<	0.50	0.74	U	<	0.57	0.85	U	<	0.61	0.92	U	<	0.56	0.84	U

Grey Fill = Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022. Soil Screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
U = The analyte was not detected at a level greater than or equal to the adjusted DL.

Chemical Abbreviations
PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations
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ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Shallow Subsurface Soil
Site Inspection Report, Camp Adair, Oregon

	Area of Interest	AOI 1															
	Location ID	CAOR-AOI01-04				CAOR-AOI01-04				CAOR-AOI01-05				CAOR-AOI01-05			
	Sample Name	CAOR-AOI01-FD02				CAOR-AOI01-4-14				CAOR-AOI01-5-5				CAOR-AOI01-5-14			
	Parent Sample ID	CAOR-AOI01-4-5															
	Depth	5 ft				14 ft				5 ft				14			
	Sample Date	9/21/2021				9/21/2021				9/21/2021				9/21/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorobutanesulfonic acid (PFBS)	25,000	<	2.1	2.7	U	<	1.9	2.4	U	<	1.8	2.3	U	<	1.8	2.3	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	<	0.53	0.80	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.46	0.69	U
Perfluorononanoic acid (PFNA)	250	<	0.53	0.80	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.46	0.69	U
Perfluorooctanesulfonic acid (PFOS)	160	<	0.53	0.80	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.46	0.69	U
Perfluorooctanoic acid (PFOA)	250	<	0.53	0.80	U	<	0.49	0.73	U	<	0.46	0.69	U	<	0.46	0.69	U

Grey Fill = Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022. Soil Screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
U = The analyte was not detected at a level greater than or equal to the adjusted DL.

Chemical Abbreviations
PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations
< analyte not detected above the LOD
AOI Area of Interest
DL detection limit
ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg micrograms per kilogram

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Camp Adair, Oregon

	Location ID	CAOR-AOI01-06				CAOR-AOI01-08				CAOR-AOI01-08			
	Sample Name	CAOR-AOI01-6-GW-20				CAOR-AOI01-8-GW-20				CAOR-AOI01-FD03			
	Parent Sample ID									CAOR-AOI01-8-GW-20			
	Sample Date	9/21/2021				9/21/2021				9/21/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Water, PFAS (LC/MS/MS) (ng/L) compliant with QSM Version 5.3 Table B-15													
Perfluorobutanesulfonic acid (PFBS)	600	<	0.81	1.6	UJ	<	0.84	1.7	UJ	<	0.99	2.0	UJ
Perfluorohexanesulfonic acid (PFHxS)	39	<	0.81	1.6	UJ	<	0.84	1.7	UJ	<	0.99	2.0	UJ
Perfluorononanoic acid (PFNA)	6	<	0.81	1.6	UJ	<	0.84	1.7	UJ	<	0.99	2.0	UJ
Perfluorooctanesulfonic acid (PFOS)	4	0.63	0.81	1.6	J	<	0.84	1.7	UJ	<	0.99	2.0	UJ
Perfluorooctanoic acid (PFOA)	6	0.53	0.81	1.6	J	<	0.84	1.7	UJ	<	0.99	2.0	UJ

Grey Fill	Detected concentration exceeded OSD Screening Levels

References
(1) Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ = 0.1. May 2022. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers
J = Estimated concentration
UJ = The analyte was not detected at a level greater than or equal to the adjusted DL.
However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations
PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations

<	analyte not detected above the LOD
DL	detection limit
HQ	hazard quotient
LOD	limit of detection
OSD	Office of the Secretary of Defense
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
ng/L	nanograms per liter

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Army National Guard Site Inspections
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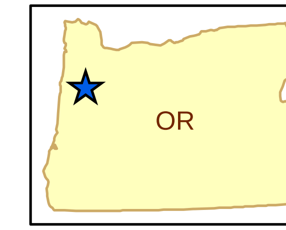
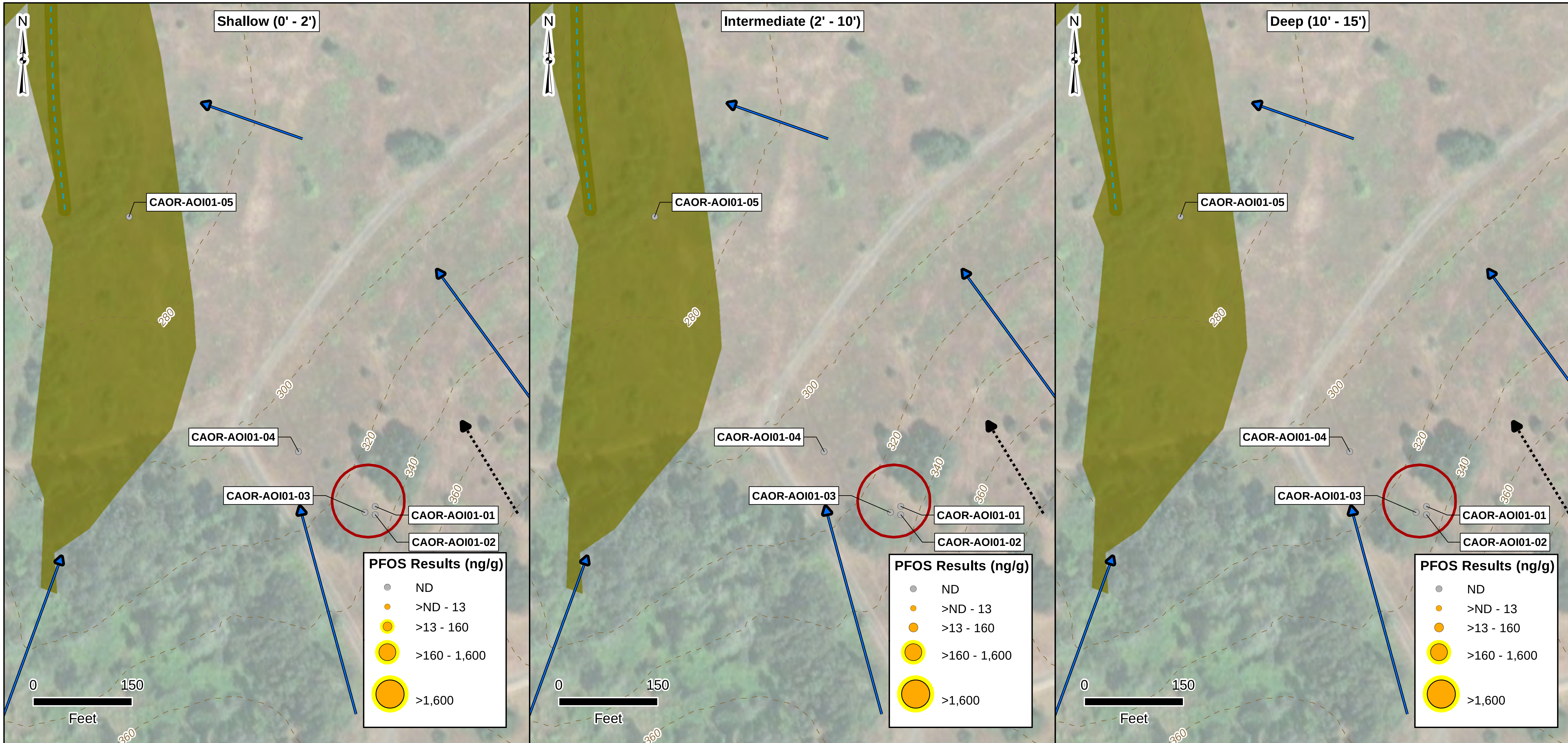
Figure 6-1
PFOS Detections in Soil





Facility Data

Potential PFAS Release

Hydrology

Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Topography

Elevation Contour
(20 ft. interval, NAVD88 datum)

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:...........................WSP
Prepared For:.....................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-1 PFOS Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:55:25 PM

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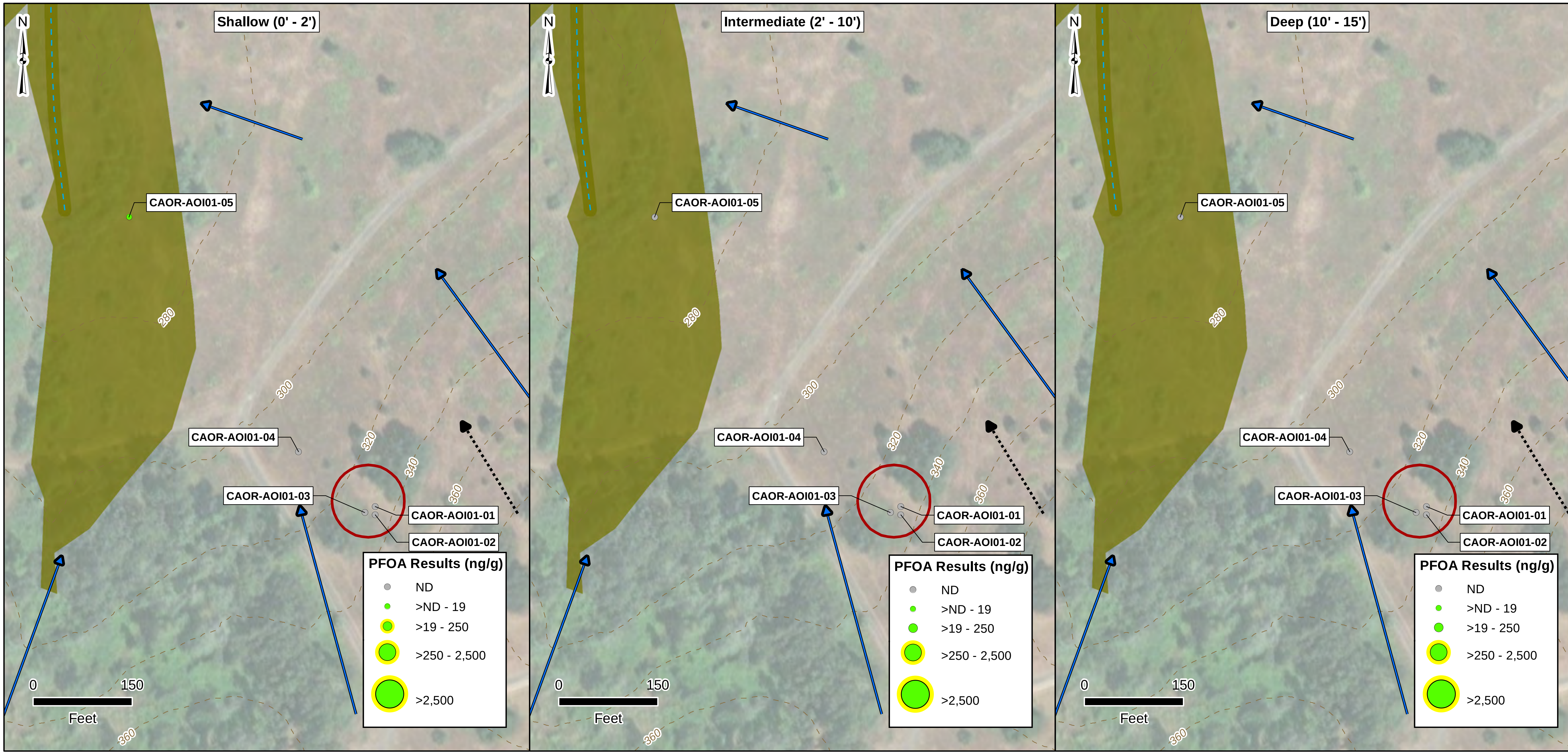
Site Inspection Report
Camp Adair, Oregon

Figure 6-2
PFOA Detections in Soil



Facility Data
Potential PFAS Release

Hydrology
Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Topography
Elevation Contour
(20 ft. interval, NAVD88 datum)

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:...........................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-2 PFOA Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:53:58 PM

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Camp Adair, Oregon

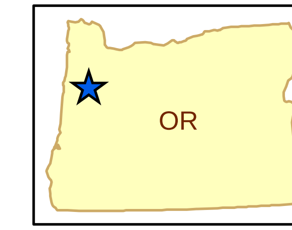
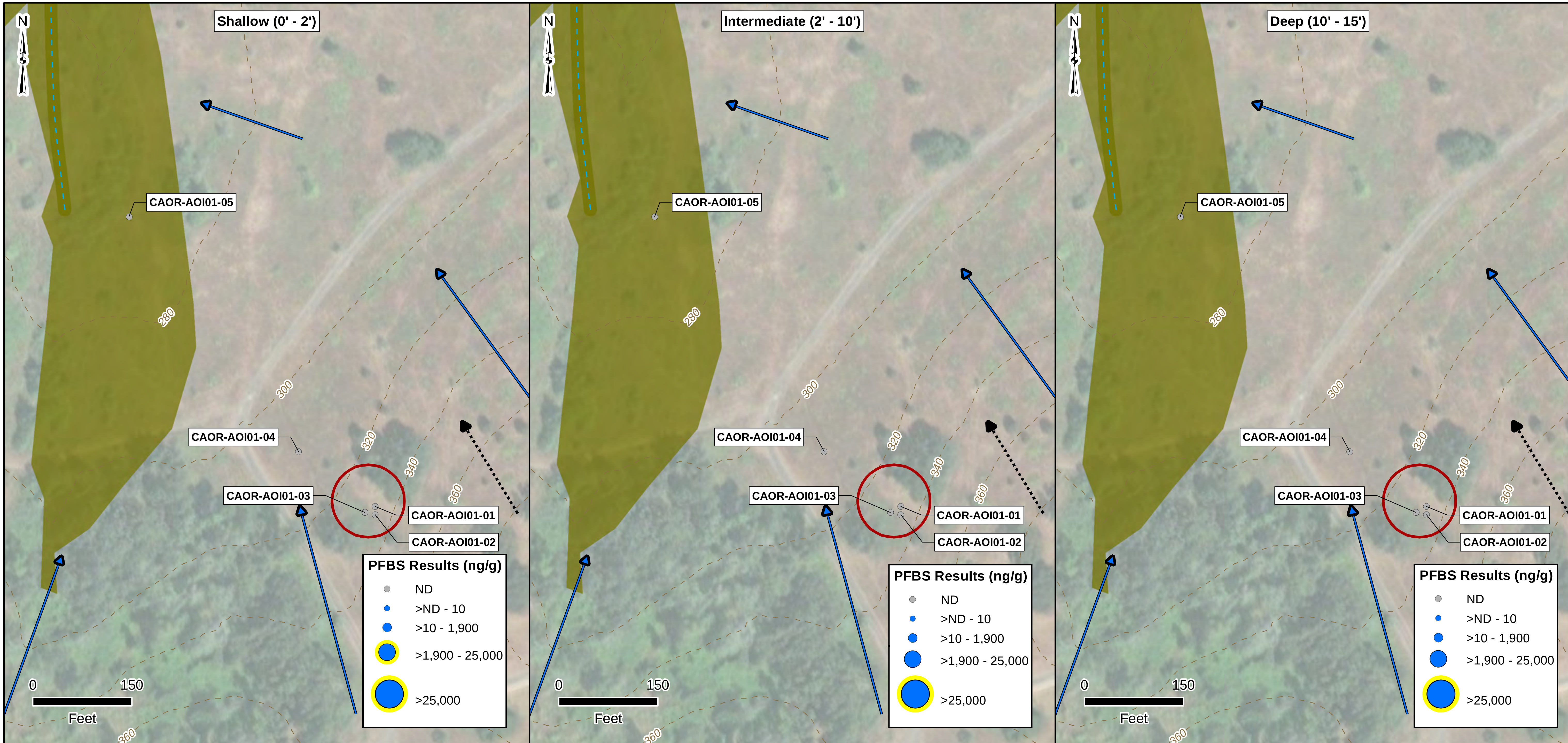


Figure 6-3
PFBS Detections in Soil



Facility Data

Potential PFAS Release

Hydrology

Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Topography

Elevation Contour
(20 ft. interval, NAVD88 datum)

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.................................May 2023
Prepared By:...........................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-3 PFBS Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:54:28 PM

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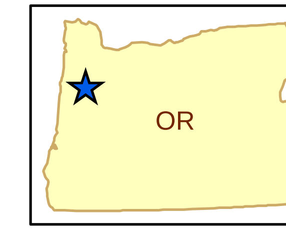
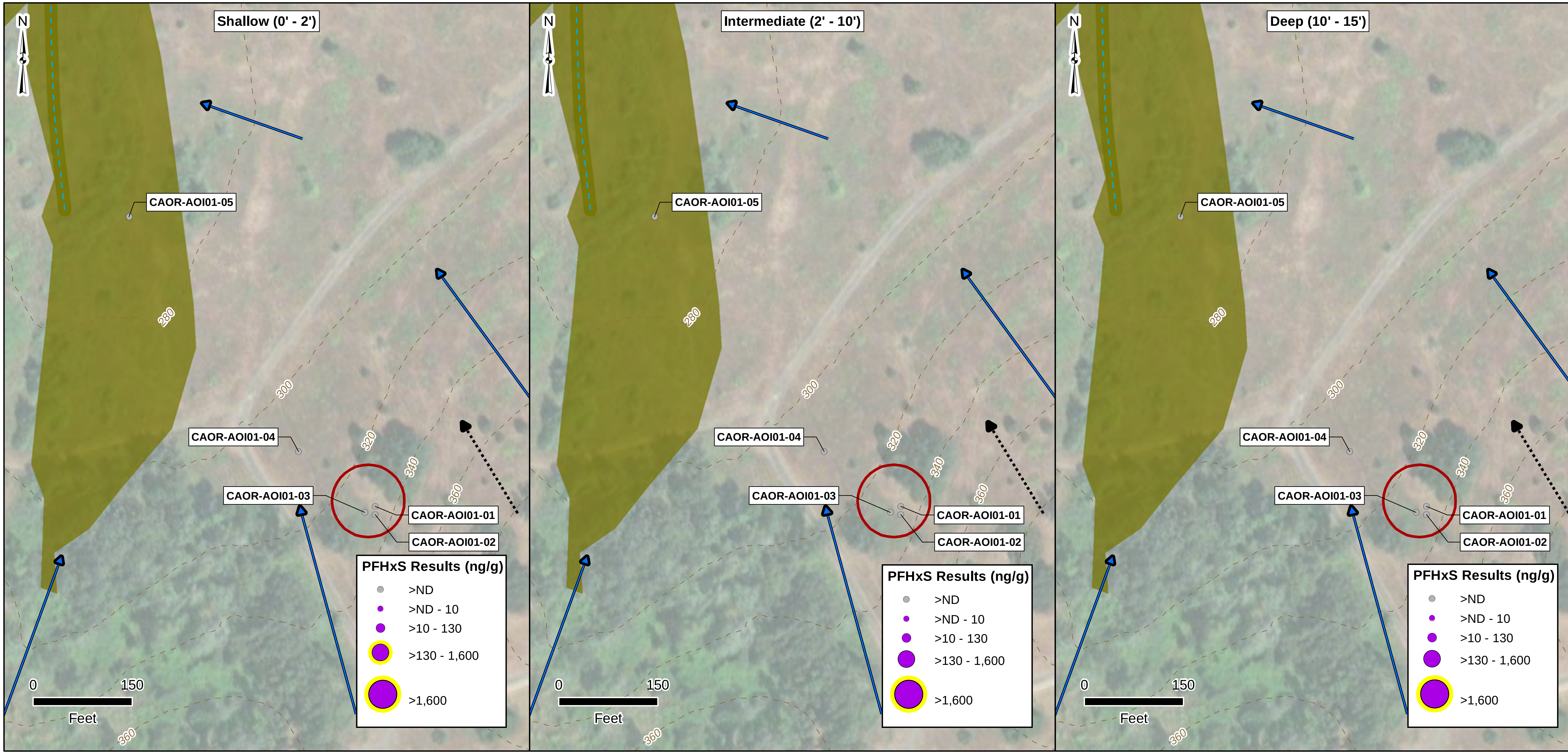
Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

Figure 6-4
PFHxS Detections in Soil





Facility Data
Potential PFAS Release

Hydrology
Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Topography
Elevation Contour
(20 ft. interval, NAVD88 datum)

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.................................May 2023
Prepared By:............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-4 PFHxS Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:54:13 PM

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Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

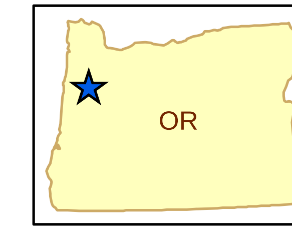
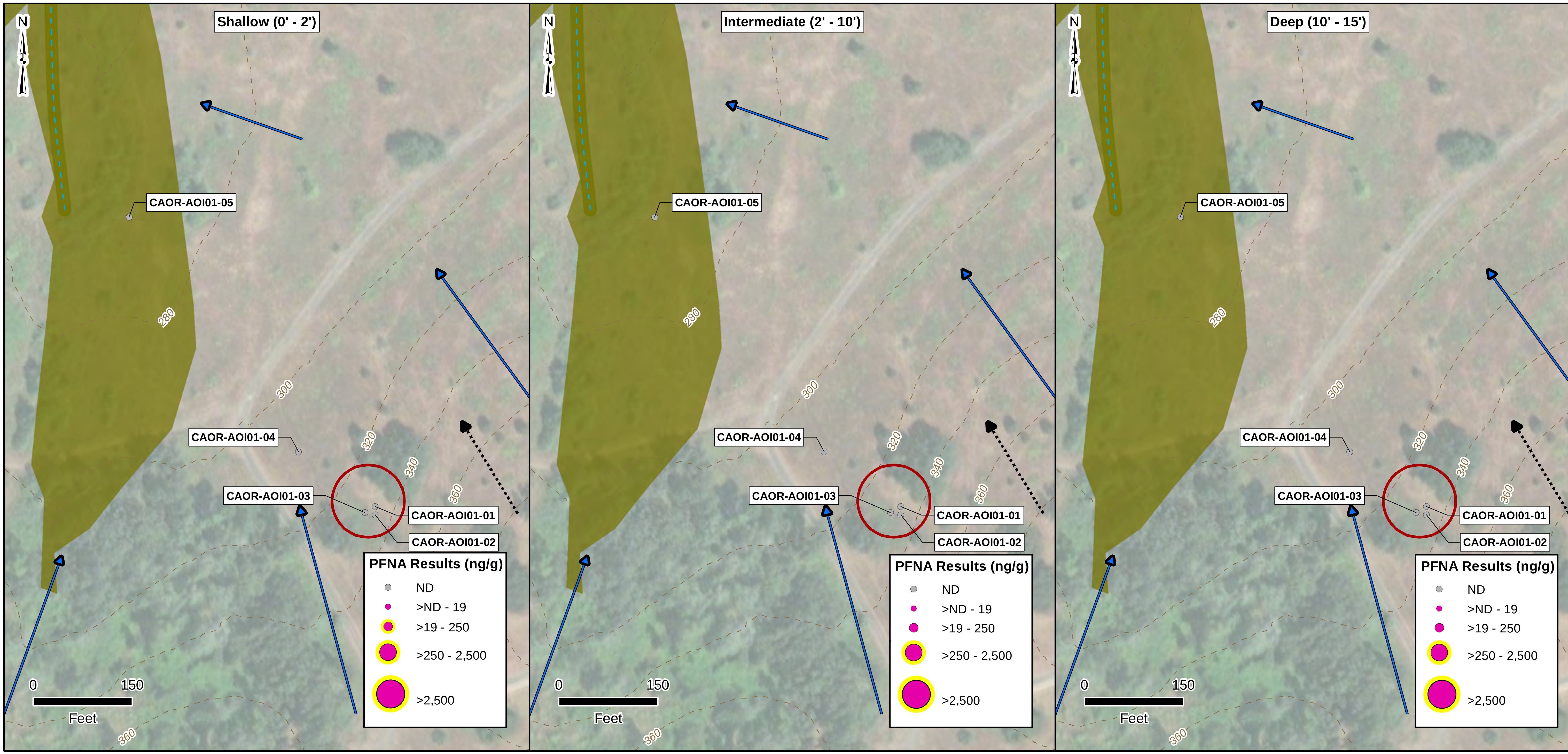


Figure 6-5
PFNA Detections in Soil



Facility Data

Potential PFAS Release

Hydrology

Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Topography

Elevation Contour
(20 ft. interval, NAVD88 datum)

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:...........................WSP
Prepared For:.......................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-5 PFNA Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:54:49 PM

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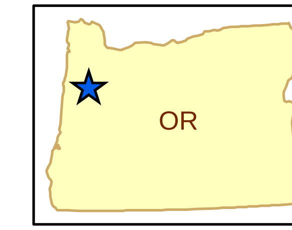
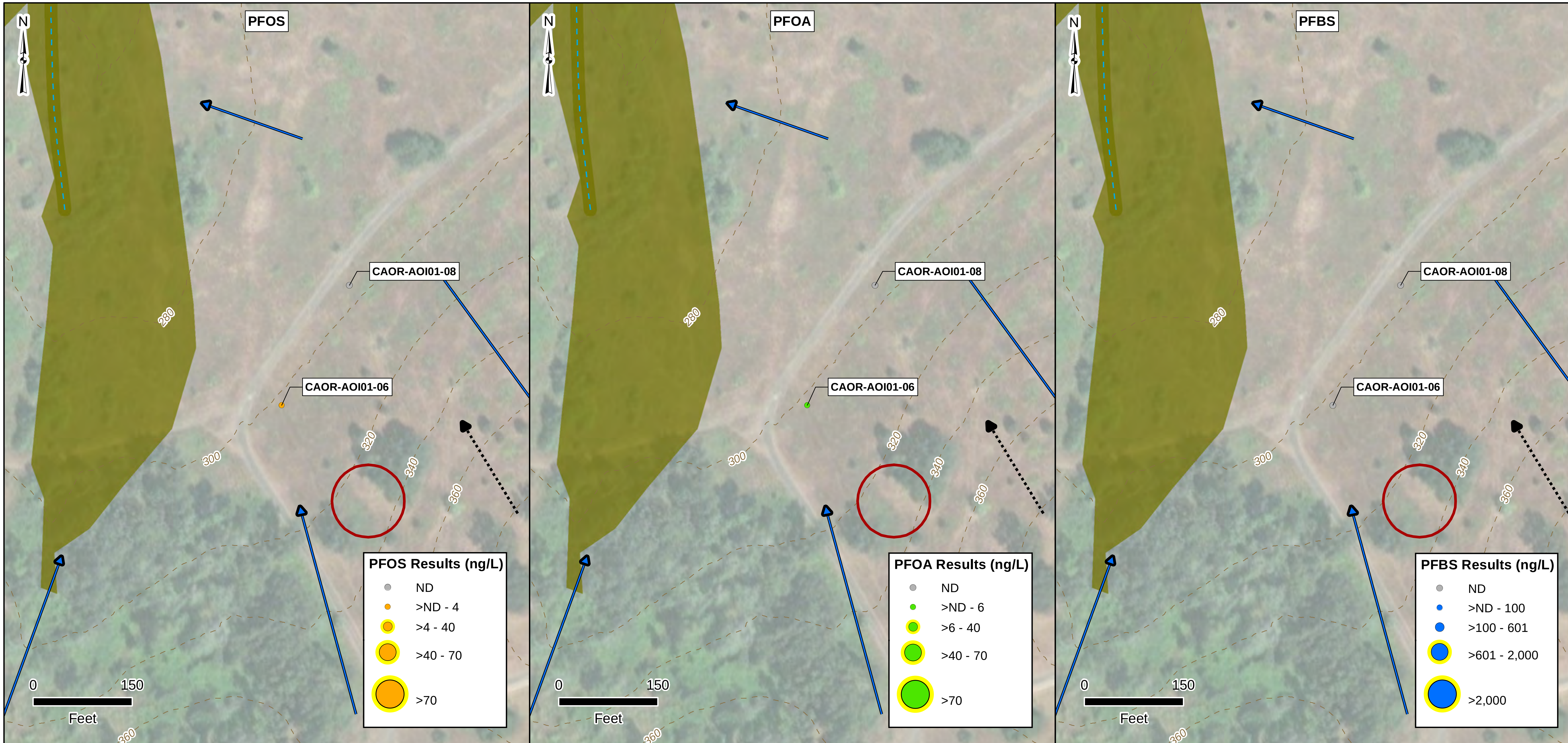


Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

Figure 6-6
PFOS, PFOA, and PFBS Detections in Groundwater



Facility Data
Potential PFAS Release

Hydrology
Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Topography
Elevation Contour
(20 ft. interval, NAVD88 datum)

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:................................May 2023
Prepared By:..........................WSP
Prepared For:.....................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-6 PFOS-PFOA-PFBS Detections in Groundwater.mxd - stephane.descombes - 5/1/2023 - 12:55:05 PM

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Army National Guard Site Inspections
Site Inspection Report
Camp Adair, Oregon

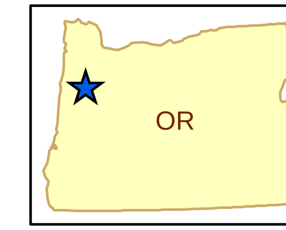
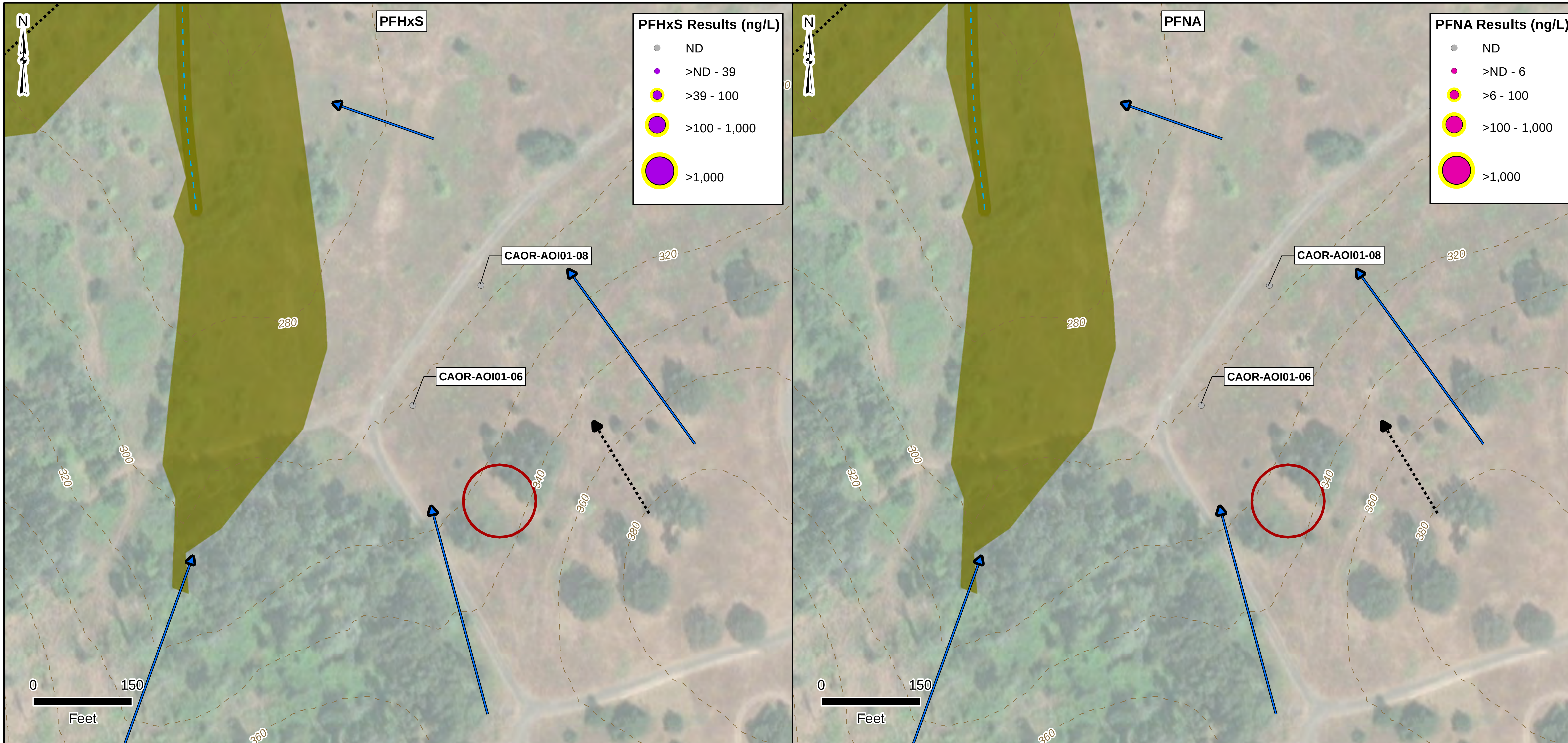


Figure 6-7
PFHxS & PFNA Detections in Groundwater



Facility Data

Potential PFAS Release

Topography

Elevation Contour
(20 ft. interval, NAVD88 datum)

Hydrology

Surface Water Flow Direction
Inferred Shallow Groundwater Flow Direction
Perennial Creek/Stream
Intermittent Creek/Stream
Waterbody
Wetlands

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020

Date:.................................May 2023
Prepared By:............................WSP
Prepared For:......................USACE
Projection:...........NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\Camp Adair\13.0 GIS_SI\Figure 6-7 PFHxS & PFNA Detections in Groundwater.mxd - stephane.descombes - 5/1/2023 - 12:56:36 PM

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7. EXPOSURE PATHWAYS

The Conceptual Site Model (CSM) for the AOI, revised based on the SI findings, is presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to remedial investigation (RI) or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the Facility conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

1. Contaminant source;
2. Environmental fate and transport;
3. Exposure point;
4. Exposure route; and
5. Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of the relevant compounds above the SLs. Areas with an identified potentially complete pathway and a complete pathway may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in a RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA 2001). Receptors at the Facility include site workers (e.g., facility staff and visiting soldiers), construction workers, off-site residents, and potential trespassers.

7.1 SOIL EXPOSURE PATHWAY

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.1.1 AOI 1

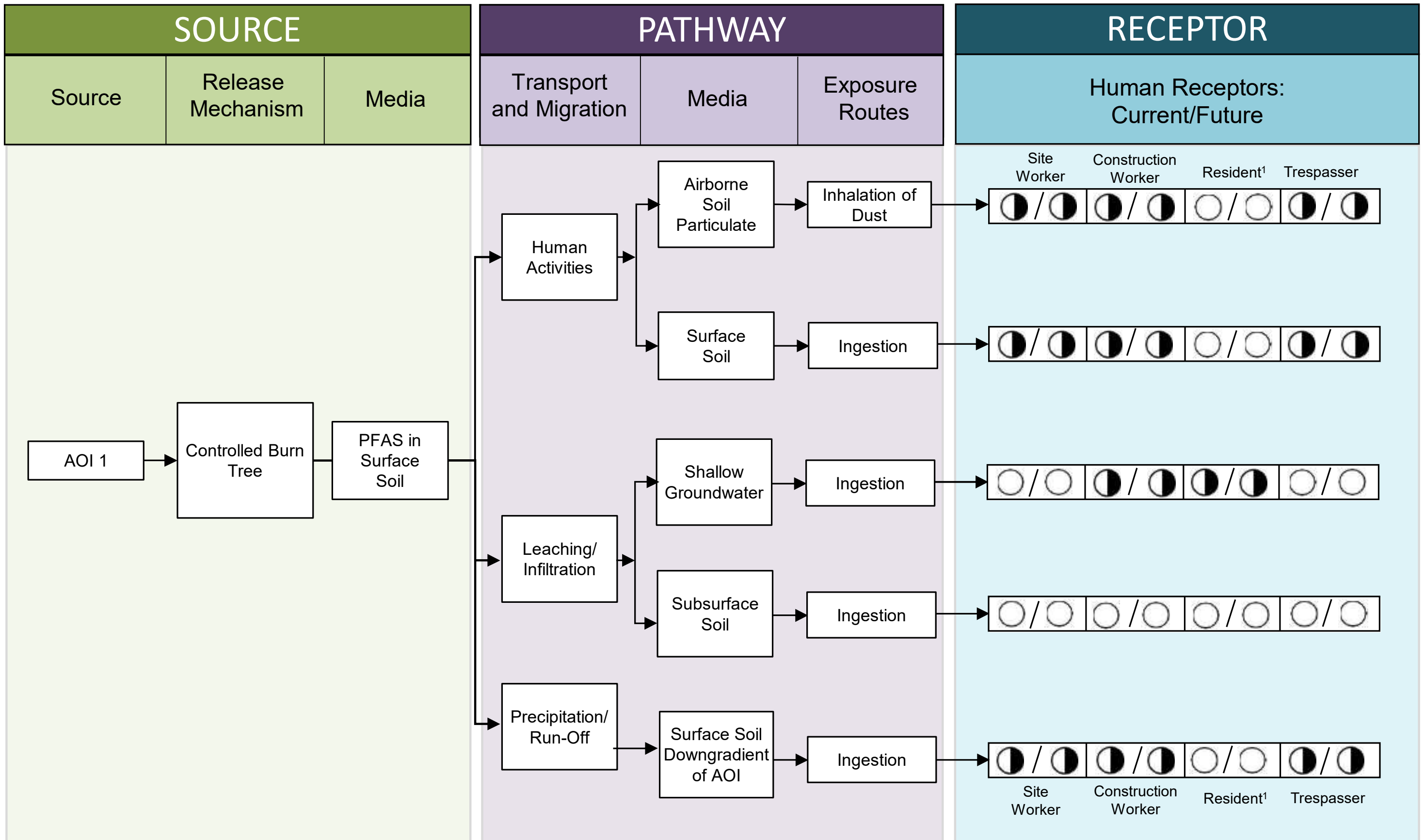
AOI 1 is the Controlled Burn Tree and its immediate surrounding area (**Figure 3-1**). A one-time release of AFFF to vegetation and the ground surface by the OMD occurred at AOI 1 in 2011. PFOA was detected in soil at a concentration below the SL at one boring location completed downgradient of AOI 1. Relevant compounds were not detected in subsurface soil; therefore, the pathway for incidental ingestion of subsurface soil by construction workers during ground-disturbing activities is incomplete. Based on the results of the SI at AOI 1, direct contact with surface soil could result in facility worker, construction worker, and/or trespasser exposure to PFOA via inhalation of dust or incidental ingestion of soil particles. Therefore, the exposure pathways for inhalation and ingestion are potentially complete for these receptors. The CSM is presented on **Figure 7-1**.

7.2 GROUNDWATER EXPOSURE PATHWAY

The SI results in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.2.1 AOI 1

AOI 1 is the Controlled Burn Tree and its immediate surrounding area (**Figure 3-1**). A one-time release of AFFF to vegetation and the ground surface by the OMD occurred at AOI 1 in 2011. PFOA and PFOS were detected in one groundwater sample collected from a temporary well downhill, and presumed downgradient, from the release area at concentrations below the SLs. Based on the results of the SI at AOI 1, ground-disturbing activities that extend to the water table could result in construction worker exposure to PFOA and PFOS via incidental ingestion. The Luckiamute River Water System supplies potable water to the Facility; therefore, the pathway for ingestion of shallow groundwater by facility workers and trespassers is incomplete. Resident receptors downgradient of the AOI could be exposed by ingestion of shallow groundwater; therefore, the exposure pathway for ingestion is potentially complete for these receptors. The CSM is presented on **Figure 7-1**.



LEGEND

- Flow-Chart Continues
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

NOTES

1. The resident users refer to off-site receptors.
2. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-1
Conceptual Site Model
Camp Adair

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8. SUMMARY AND OUTCOME

This section summarizes SI activities and findings. The most significant findings are summarized in this section and are reproduced directly or abstracted from information contained in this report. The outcome provides general and comparative interpretations of the findings relative to the SLs.

8.1 SI ACTIVITIES

The SI field activities at the Facility were conducted on 21 September 2021. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (Wood/EA 2021a), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI UFP-QAPP Addendum (EA/Wood 2021), samples were collected and analyzed for a subset of PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

- 15 soil grab samples from five boring locations
- 2 grab groundwater samples from two temporary well locations
- 5 QA/QC samples.

An SI is conducted when the PA determines an AOI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at the AOI to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOI, which are described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, no further evaluation under CERCLA is warranted for AOI 1 at this time (see **Table 8-1**). Based on the CSM developed and revised based on the SI findings, there is potential for exposure to receptors from AOI 1 from sources on the Facility resulting from historical DoD activities. As described in Section 2.2.2, groundwater wells may be present downgradient of the source area but exact location and use information is not publicly available. The SI groundwater samples were collected from locations a minimum of approximately 1,000 feet from the downgradient (northern and eastern) boundaries of the Najaf Training Center Facility. Groundwater is not used for drinking water on the Najaf Training Center Facility.

Sample chemical analytical concentrations collected during the SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. The following bullets summarize the SI results relative to the SLs:

- At AOI 1:
  - PFOS and PFOA, were detected in groundwater at AOI 1. Neither PFOS nor PFOA exceeded the SLs.
  - PFOA was detected in shallow surface soil at AOI 1 at a concentration several orders of magnitude below the SL.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table 8-1 summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

Table 8-1. Summary of Site Inspection Findings and Recommendations, Camp Adair, Corvallis, Oregon Site Inspection Report

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Controlled Burn Tree	◐	◐	No further action

Legend:

● = Detected; exceedance of screening levels

◐ = Detected; no exceedance of screening levels

○ = Not detected

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