FINAL
Site Inspection Report
Camp Ethan Allen Training Site, Vermont

Perfluorooctanesulfonic Acid (PFOS) and
Perfluorooctanoic Acid (PFOA) Impacted Sites
ARNG Installations, Nationwide

August 2021

Army National Guard Bureau
111 S. George Mason Drive
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UNCLASSIFIED

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Acronyms and Abbreviations

6:2 FTS	6:2 Fluorotelomer sulfonate
8:2 FTS	8:2 Fluorotelomer sulfonate
µg/kg	micrograms per kilogram
°C	degrees Celsius
°F	degrees Fahrenheit
%	percent
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film forming foam
amsl	above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
bgs	below ground surface
CEATS	Camp Ethan Allen Training Site
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
DO	dissolved oxygen
DPT	direct-push technology
DQI	data quality indicator
DQO	data quality objective
DUA	data usability assessment
DVR	data validation report
EDR™	Environmental Data Resources, Inc.
EIS	extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineering Manual
FedEx	Federal Express
ERB	equipment rinsate blank
FRB	Field Reagent Blank
foot/day	foot per day
GPR	ground-penetrating radar
GPS	global positioning system
HDPE	high-density polyethylene
HA	Health Advisory
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOD	limit of detection
LOQ	limit of quantitation

MCL	maximum contaminant level
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
ng/L	nanograms per liter
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
NOAA	National Oceanic and Atmospheric Administration
ORP	oxidation-reduction potential
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutyrate
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUdA	perfluoroundecanoic acid
PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
PVC	poly-vinyl chloride
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	relative percent differences
SDWA	Safe Drinking Water Act
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System

USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VHWMR	Vermont Hazardous Waste Management Regulations
VSI	visual site inspection
VTARNG	Vermont Army National Guard
VTDEC	Vermont Department of Environmental Conservation
VTUL	Vermont Underground Locators

Executive Summary

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at per- and polyfluoroalkyl substances (PFAS)-impacted sites at ARNG facilities nationwide. The objective of the SI at each facility is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutanesulfonic acid (PFBS) at or above screening levels (SLs). An SI was completed at Camp Ethan Allen Training Site (CEATS) in Jericho, Vermont. CEATS will be referred to as the "facility" throughout this document.

CEATS occupies approximately 11,000 acres in eastern Chittenden County, Vermont, on the western side of the Green Mountains and is operated by the Vermont ARNG (VTARNG). The majority of the facility's footprint is undeveloped and forested. Indoor facilities are located along the western portion of CEATS, including a few offices, barracks, and equipment maintenance buildings. The remaining portions of the facility are occupied by fields with trails, firing ranges, and other indoor and outdoor facilities. A network of trails and paved and unpaved roads is distributed throughout the facility. Additionally, CEATS hosts one of the premier cross-country ski and biathlon courses in North America. During the PA for PFAS, four potential PFAS release areas associated with the biathlon facility were identified: the Waxing Areas, Biathlon Course, Walker Building, and Snowmaking Pond (AECOM, 2019a). Remnants of ski wax potentially containing PFAS may have been released in these areas. The release areas were grouped into one Area of Interest (AOI), AOI 1, which was investigated during the SI. The SI field activities were conducted from 2 to 8 August 2019 and included the collection of soil, groundwater, surface water, and sediment samples.

To fulfill the project Data Quality Objectives set forth in the approved SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2019b), samples were collected and analyzed for a subset of 18 PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.1 Table B-15. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.6** of this Report.

The Department of Defense (DoD) has adopted a policy to retain facilities in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 October 2019 (Assistant Secretary of Defense, 2019). The ARNG PFAS SIs follow this DoD policy and, should the maximum site concentration for sampled media exceed the SLs, the AOI will proceed to a Remedial Investigation (RI), the next phase under CERCLA. The SLs apply to three compounds, PFOA, PFOS, and PFBS, for both soil and groundwater, as presented in **Table ES-1**. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil, groundwater, sediment, and surface water contain or do not contain the 18 PFAS analyzed within the boundaries of the facility.

Sample chemical analytical concentrations were compared against the project SLs as described in **Table ES-1**. A summary of the results of the SI data relative to the SLs is as follows:

- While detected concentrations indicate a release of PFAS materials, the detected concentrations of PFOA, PFOS, and PFBS in soil samples from AOI 1 were orders of magnitude below the SLs.

- PFOS was not detected in groundwater. PFOA and PFBS were detected in groundwater at AOI 1 at maximum concentrations of 10.9 nanograms per liter (ng/L) and 2.33 J[1] ng/L, respectively, below the SLs of 40 ng/L and 40,000 ng/L, respectively.

Drinking water sources at the facility include a potable well (#40293, located south of the Walker Building) used to supply the biathlon facilities located within CEATS. As a state action in accordance with the Safe Drinking Water Act (SDWA), the Vermont ARNG (VTARNG) has sampled well #40293 nine times between March 2017 and December 2020. The well #40293 sampling was completed separately from the SI described in this report. Since the initial sampling event, PFAS have consistently been detected in well #40293 above the Vermont Drinking Water Maximum Contaminant Level (MCL), with a maximum detection of PFOS at 40.8 ng/L in December 2020. The Vermont MCL is 20 nanograms per liter (ng/L) for PFOA, PFOS, perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), and perfluorononanoic acid (PFNA), individually or combined (Vermont Department of Environmental Conservation [VTDEC], 2020). Due to the detections of PFAS in well #40293 above the Vermont MCL, units are currently responsible for providing their own water when using the facility.

Table ES-2 summarizes the SI results for soil and groundwater. **Table ES-3** summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, no further evaluation under CERCLA is warranted at this time. However, in light of the detections of PFAS in drinking water samples from well #40293 above the Vermont MCL of 20 ng/L, which were collected under a separate action in accordance with the SDWA, there is a potentially complete pathway to drinking water receptors, which include DoD and civilian users of the biathlon facility. Samples of soil and groundwater collected as part of the CERCLA SI show detections of PFOA, PFOS, and PFBS, but they were detected at levels below the OSD SLs. Therefore, additional action will be taken under the SDWA.

Table ES-1 Screening Levels (Soil and Groundwater)

Analyte	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	130,000	1,600,000	40,000

Notes:
a.) Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard quotient (HQ) = 0.1. 15 October 2019.

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[1] Positive field sample results associated with percent recoveries less than the lower quality control limits are qualified "J."

Table ES-2 Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Walker Building	◐	◐	NA
	Waxing Sheds	◐	◐	NA
	Snowmaking Pond	NA	NA	NA
	Biathlon Course	◐	◐	◐

Legend:

NA = not applicable

● = detected; exceedance of SLs

◐ = detected; no exceedance of SLs

○ = not detected

Table ES-3 Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Walker Building	Detections in soil and groundwater were below SLs.	No further action under CERCLA
	Waxing Sheds		
	Snowmaking Pond		
	Biathlon Course		

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1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites, ARNG Installations, Nationwide. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor, AECOM Technical Services, Inc. (AECOM), under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017. The ARNG performed this SI at Camp Ethan Allen Training Site (CEATS) in Jericho, Vermont. CEATS will be referred to as the “facility” throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; US Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as per- and polyfluoroalkyl substances (PFAS). The term PFAS is used throughout this report to encompass all PFAS chemicals being evaluated, including PFOA, PFOS, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the task order.

1.2 SI Purpose

A PA was performed at CEATS (AECOM, 2019a) that identified four potential PFAS release areas, which were grouped into one Areas of Interest (AOI). The objective of the SI is to identify whether there has been a release to the environment from the AOI and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

As stated in the *Federal Facilities Remedial Site Inspection Summary Guide* (USEPA, 2005), an SI has five goals:

1. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment;
2. Determine the potential need for a removal action;
3. Collect or develop data to evaluate potential release;
4. Collect data to better characterize the release for more effective and rapid initiation of a Remedial Investigation (RI), if determined necessary; and
5. Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD).

In addition to the USEPA-identified goals of an SI, the ARNG SI also identifies whether there are potential off-facility PFAS sources.

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2. Facility Background

2.1 Facility Location and Description

CEATS occupies approximately 11,000 acres in eastern Chittenden County, Vermont, on the western side of the Green Mountains. The town of Jericho, Vermont is approximately 1.5 miles to the northeast. The southern boundary of the facility runs adjacent to Mill Brook, a tributary of the Winooski River. The eastern boundary abuts drainage divide formed by the main ridgeline of the Green Mountains. Mt. Mansfield State Forest is located directly east of the facility, on the eastern side of the Green Mountains. Land to the north, south, and west of the facility consists of privately-owned farmland, residences, and undeveloped forests (**Figure 2-1**).

The majority of the facility's footprint is undeveloped and forested. Indoor facilities are located along the western portion of CEATS, by the main entrance. Approximately 600 acres of fields with trails, firing ranges, and other indoor and outdoor facilities occupy the central, south-central, and eastern portions of CEATS. A network of trails and paved and unpaved roads is distributed throughout CEATS. The current and former uses of CEATS (including separately operated portions within the facility boundary) are discussed below.

CEATS is operated by the Vermont ARNG (VTARNG) and hosts the Army Mountain Warfare School and Armory. There are several other entities that also use the facilities and ranges for training, including other VTARNG units, state and local police forces, and out of state units. The facility is sparsely populated; a few offices, barracks, and equipment maintenance buildings are primarily located along Ethan Allen Road, in the Lee River Valley. The barracks are occasionally used to house a few hundred individuals during training exercises throughout the year. Prior to the establishment of CEATS, the area was used for farming and pasture.

In 1926, the War Department established CEATS as a small arms range, and the area has since been used for small arms, medium caliber, and large caliber training. Beginning in 1952, the General Dynamics Armament Systems, Inc. (formerly the Armament Systems Department of General Electric) began research, design, testing, and evaluation of munitions systems within CEATS, including the use of depleted uranium ammunition. Affected soils were subsequently removed and shipped off-site (Clark et al., 2005). The DA granted license to the state of Vermont for ARNG use beginning 17 December 1976. Since that time, several supplemental agreements have been issued to add additional acreage and extend the license until 16 December 2027.

In addition, CEATS hosts one of the premier cross-country ski and biathlon courses in North America and features one of three internationally licensed biathlon courses in the US (GlobalSecurity.org, 2011). Vermont became the pinnacle of the US Military Biathlon Program in 1972; the National Guard Bureau's first biathlon championships were held at CEATS in 1975. Since then, CEATS has been used for both military and civilian biathlon training and held national and international competitions. Civilian use includes the Ethan Allen Biathlon Club, Mansfield Nordic Club, and local high schools. The 5-kilometer Biathlon Course is operated year-round, and during winter months, the course is supplemented with artificially made snow.

2.2 Facility Environmental Setting

CEATS is located in the Green Mountains of Vermont, within the New England Physiographic Province. Surface topography of the facility is rugged, hilly, and mountainous, with a maximum elevation of approximately 3,573 feet above mean sea level (amsl) and a minimum elevation of approximately 604 feet amsl. The easternmost edge of the property trends north-south along western side the main ridge of the Green Mountains. The westward-flowing Lee River originates near the eastern boundary, flows westward through the center of the facility, and exits at the western boundary. This main drainage and drainages to the north and south are fed by several tributaries located within the facility boundary, some of which form small ponds at low-lying interior locations. The area surrounding the facility is rural and supports a variety of wildlife. The topography of CEATS is shown on **Figure 2-2**. The facility geology and groundwater features are presented on **Figure 2-3**, and surface water features are presented on **Figure 2-4.**

2.2.1 Geology

CEATS is on the western side of the Green Mountains, within a region generally characterized by north-south-trending hills, ranges, and intervening valley that are cut by east-west-trending drainages. The eastern boundary of the facility corresponds to the drainage divide formed by the linear, north-south-trending, main ridge of the Green Mountains.

CEATS is underlain by the western limb of the north-south-trending Green Mountain Anticlinorium, an antiformal duplex that is approximately 10 miles wide and consists of Ordovician, Cambrian, and Neoproterozoic rock units separated by depositional contacts and thrust faults. The area is underlain by lithologically diverse, predominantly metasedimentary rocks of the West Bridgewater Formation, Fairfield Pond Formation, Underhill Formation, Hazens Notch Formation, Fayston Formation, and Pinnacle Formation. These rocks include schist, phyllite, marble, amphibolite, gneiss, quartzite, and greenstone. Depositional contacts, bedding, and thrust faults generally dip to the west and strike to the south (Ratcliffe et al., 2011). The bedrock geology for the area is presented in **Figure 2-3**.

Surface materials at CEATS consist predominantly of glacial till mantling bedrock and reflect the topography of the underlying bedrock surface, bedrock, and pluvial deposits consisting of swamp, peat, and/or muck. Modern, unconsolidated fluvial and glacial outwash deposits are also present in areas adjacent to the Lee River in the western half of the facility (Stewart and MacClintock, 1970).

Northwestern Vermont is an area of greater earthquake hazard potential relative to elsewhere in Vermont and the northeast US based on probabilistic seismic hazard analysis performed by the US Geological Survey (USGS). The probable intensity of ground shaking in northwestern Vermont is less than that in more recognized seismic hazard risk areas of the US; however, northwestern Vermont has the fifth highest probable intensity in the continental US. The earthquake shaking hazard in northwestern Vermont derives from its proximity to areas of significant seismic activity in the northern portion of New York State and the St. Lawrence River Valley in Canada (Lens et al., 2013).

The geological data collected as part of the SI is consistent with the regional geology of the surrounding area. Observations from shallow borings advanced across AOI 1 indicate that a thin layer of glacial till exists overlying weathered bedrock. The glacial till consisted of a heterogeneous sand, silt, and clay matrix with small, subangular gravel. The till thickness varied widely from a few feet thick to upwards of 20 feet depending on the location within the valley and presence of surficial bedrock.

2.2.2 Hydrogeology

As a result of glacial retreat, stratified drift sediments form a confined aquifer in places overlain by an unconfined aquifer that make up the stratified-drift aquifers in the Mill Brook and Lee River Valleys at the facility. The Pinnacle and Underhill Formations are the major bedrock formations at CEATS. These formations contain varied textural and compositional differences; the differences are enough to define mappable rock units shown on **Figure 2-3** but are not great enough to create regional variations in groundwater flow in the bedrock aquifer.

The overall direction of groundwater flow in the Lee River and Mill Brook Valleys is from east to west, while localized flow is from the valley walls to the Lee River or Mill Brook. The regional bedrock hydraulic conductivity at the facility is approximated to be 1 foot per day (foot/day) or less. Groundwater flow velocity in the center of the Lee River Valley is estimated to be 0.7 to 2 feet/day due to the steep gradient of the Valley and relatively coarse stratified drift. The Mill Brook Valley has a relatively shallow gradient and fine-grained streambed sediments resulting in an estimated velocity of 0.7 foot/day or less (Clark et al., 2005).

Static depth to groundwater in the bedrock aquifer is commonly 10 to 20 feet below ground surface (bgs). Depths to groundwater greater than 20 feet bgs usually occur at higher altitudes and ridges, whereas shallow groundwater is typically found in topographic low points or near surface water bodies. The water table generally follows the land surface. Streams in the center of valleys containing stratified-drift deposits typically drain the aquifer, whereas streams that cross from upland till into stratified-drift deposits generally lose water to the aquifer (Clark et al., 2005). Depth to groundwater in the upper till was observed to range from 5.33 to 14.32 feet bgs in August 2019 during the SI field event, at temporary monitoring well locations where groundwater was encountered. It is suspected that the groundwater present in the till above bedrock is not a continuous aquifer.

The primary drinking water source for the facility has been the Champlain Water District system since 1999 (Clark et al., 2005). Prior to this period, CEATS was served by three onsite bedrock wells. Two bedrock wells, with depths to approximately 300 feet bgs, formerly supplied water to the training facilities, and a bedrock well, with a depth of 140 feet bgs, formerly provided water to the Cantonment. The Cantonment occasionally uses its well to fill portable drinking water supply tanks (Clark et al., 2005). Additional drinking water sources at the facility include a potable well (#40293, located south of the Walker Building) used to supply the biathlon facilities located within CEATS, with a depth of 225 feet bgs. Within the Walker Building, drinking water is treated using a clean water filtration, Point-of-Entry Treatment system manufactured by Kinetico Water Systems. However, due to detections of PFAS in well #40293 above the Vermont drinking water Maximum Contaminant Level (MCL), units are responsible for providing their own water when using the facility. The Vermont MCL is 20 nanograms per liter (ng/L) for PFOA, PFOS, perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), and perfluorononanoic acid (PFNA), individually or combined (Vermont Department of Environmental Conservation [VTDEC], 202018). The drinking water sampling results for PFAS are discussed in **Section 2.4** of this report.

In addition to potable well #40293, there are eight other wells at CEATS which supply potable water sources (Tetra Tech, 2017). These potable water sources are located within classroom and bathroom sinks located within training buildings used intermittently by various entities. The well locations are shown on **Figure 2-3**. General Dynamics Armament Systems, Inc. is still supplied by onsite water from a bedrock well. One of the firing ranges is also supplied by a bedrock well with a total depth of 226 feet bgs that is infrequently used. An artificial pond, used by CEATS to supply snowmaking machines, is fed by 2 wells: one deep well, drilled to a depth of 625 feet bgs, and one shallow well, approximately 4 feet bgs, that is fed by a spring. The West Bolton Public Water Source Protection area includes land areas within the facility boundaries; however, the water system is upgradient of CEATS watershed and not likely to be affected by activities within the facility boundary.

An Environmental Data Resources, Inc. (EDR)™ Report for CEATS, which was included as an appendix to the PA Report, included a well search for a 1-mile radius surrounding the facility (AECOM, 2019a). Using additional online resources, such as state and local GIS databases, wells were researched to a 4-mile radius of the facility. Numerous domestic wells are located immediately outside of the northern, western, and southern boundaries of the facility. The identified wells are shown on **Figure 2-3**. Domestic wells are commonly drilled into bedrock in the communities surrounding CEATS. Median well depth is approximately 300 feet bgs; hydraulic properties and aquifer characteristics vary widely across relatively short distances (Clark et al., 2005).

Based on the USEPA's Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, no PFAS were detected in a public water system above the USEPA Health Advisory (HA) level within 20 miles of the facility (USEPA, 2017a). The USEPA HA is 70 ng/L for PFOS and PFOA, individually or combined (USEPA, 2016a; USEPA, 2016b). PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

2.2.3 Hydrology

CEATS is located within three separate sub-watersheds. The majority of the facility lies within the Browns River Watershed, which runs through the center of the facility, from east to west, and encompasses approximately 6,548 acres of CEATS. The second largest drainage area, covering around 3,830 acres, is the Snipe Island Brook-Winooski River Watershed, which drains the southern area of the facility to Mill Brook. Lastly, approximately 840 acres of the far northeastern portion of the facility lies within Headwaters Browns River Watershed. Watersheds within the facility boundary lie within hilly, mountainous terrain and include drainage areas that are mostly forested and undeveloped. Watersheds, surface water features, and their associated drainages at CEATS are presented in **Figure 2-4**.

Numerous unnamed tributaries, natural and artificial ponds, springs, and wetlands are located within CEATS. These freshwater features predominantly drain into two major waterbodies: the Lee River, which subsequently discharges to the Browns River to the northwest, and Mill Brook, which drains to the Winooski River to the southwest. The drainage divide between the watersheds runs east-west across the southcentral half of the facility. Both systems drain into Lake Champlain, a large freshwater lake that forms the western border between New York and Vermont and comprises the main freshwater supply for adjacent regions.

The major hydrologic feature of CEATS is the Lee River, which runs through the central portion of the facility, flowing generally east to west. Several small, unnamed tributaries flow into the Lee River along its length. Data from 2003 showed that the average streamflow that year was 25.4 cubic feet per second. A comparative analysis of the Lee River to other similar rivers in Vermont indicated that groundwater likely contributes largely to streamflow during periods of low rainfall. The watershed contains a large area of relatively permeable stratified-drift deposits that may act as a storage reservoir for groundwater (Clark et al., 2005).

The southern third of the facility is drained by several southward- and/or southwestward-flowing tributaries that feed into Mill Brook. Mill Brook runs along the southern boundary of the facility and flows westward towards its confluence with the Winooski River, approximately 4 miles west of CEATS.

At low-lying locations within the north-central, central, and south-central portions of CEATS, surface water flows into several freshwater surface ponds, forested/shrub wetlands, and emergent wetlands. In total, ponds cover approximately 60 acres, forested/shrub wetland cover approximately 330 acres, and emergent wetlands cover approximately 15 acres of CEATS (US Fish and Wildlife Service [USFWS], 2018).

2.2.4 Climate

CEATS is located in the western half of the Green Mountains physiographic region of Vermont. Local rainfall and temperature ranges in this region are strongly affected by factors such as slope, elevation, aspect, and urbanization, and they can vary considerably over short distances. Temperatures are moderated year-round by the proximity of Lake Champlain to the west. Cool breezes blow inland off the lake in the summer, and in the winter, the Lake acts as a heat reservoir that moderates local land temperature. Air temperature highs in July and lows in January average

80 degrees Fahrenheit (°F) and 18°F, respectively (National Oceanic and Atmospheric Administration [NOAA], 2019). Rainfall data indicate that CEATS is located in an area that averages approximately 38 inches of precipitation per year. Precipitation is well distributed throughout the year but typically heavier in the summer than in the winter. Strong thunderstorms in the summer produce the heaviest local rainfall intensities (NOAA, 2019). Precipitation remains largely locked in snowpack during winter months prior to melt.

2.2.5 Current and Future Land Use

CEATS is used by the VTARNG for weapons-testing and training and is home to the Army Mountain Warfare School. There are several other entities that also use the facilities and ranges for training, including other VTARNG units, state and local police forces, and out of state units. The majority of the facility's footprint is undeveloped and forested. The few offices, barracks, and equipment maintenance buildings are primarily located along Ethan Allen Road, in the Lee River Valley. The facility is sparsely populated; however, the barracks occasionally host a few hundred individuals during training exercises throughout the year.

The facility is used for both military and civilian biathlon training and holds national and international competitions. Civilian use includes the Ethan Allen Biathlon Club, Mansfield Nordic Club, and local high schools. Biathlon training and competitions occur throughout the year; traditional snow skis are used for training and competitions during winter months, while roller skis are used during the warmer months of the year. During the visual site inspection (VSI), facility staff mentioned that people have used Snowmaking Pond for recreational swimming.

Land to the north, south, and west of the facility is primarily rural, consisting of privately-owned farmland, residences, and undeveloped forests. The eastern border of the facility abuts the western slope of the Green Mountains and Mount Mansfield State Forest.

Reasonably anticipated future land use is not expected to change from the current land use described above.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The majority of CEATS is forested and supports a variety of wildlife. Additionally, there are several small ponds and wetlands within the facility that provide habitat for aquatic species. Wildlife noted during the SI field event or reported by CEATS employees include black bear, bobcat, whitetail deer, wild turkey, otter, beaver, fisher, mink, squirrel, chipmunk, frogs, and numerous songbird and raptor species, including Osprey.

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Chittenden County, Vermont (USFWS, 2019):

- **Mammal**: Northern Long-Eared bat, *Myotis septentrionalis* (threatened)
- **Mammal**: Indiana bat, *Myotis sodalist* (endangered)

2.3 History of PFAS Use

As described above, CEATS hosts a premier cross-country ski and biathlon course. High-grade commercial ski and snowboard waxes have been found to contain high concentrations of PFAS (Kotthoff et al., 2015). Surface water and snowmelt have been shown to have measurable PFAS impacts downgradient of ski areas (Kwok et. al., 2013). Remnants of ski wax potentially containing PFAS, left in and swept from the Wax Sheds and Walker Building by patrons of the biathlon facility, are a potential PFAS source at CEATS. Additionally, residual wax left on the snow surface along the 5-kilometer Biathlon Course is a potential source of PFAS. Interviewees noted that high grade waxes are almost exclusively used for competition, and that lower grade waxes (reportedly not PFAS-containing) are used the majority of the time at the facility.

2.4 Other PFAS Investigations

As a state action in accordance with the Safe Drinking Water Act (SDWA), VTARNG began sampling drinking water at well #40293, located approximately 50 feet south of the Walker Building within the biathlon facilities at CEATS, in March 2017. The well is an open bedrock borehole with a total depth of 225 feet bgs, which has been cased from the ground surface to 20 feet bgs. In addition to potable well #40293, the March 2017 sampling and analysis report included the eight other wells at CEATS which supply potable water (Tetra Tech, 2017). These potable water sources are classroom and bathroom sinks located within training buildings used intermittently by various entities. **Table 2-1** summarizes the potable well locations sampled in the March 2017 and the detected compounds in groundwater. Well locations are shown on **Figure 2-3**.

Of the nine potable wells sampled in the March 2017 sampling event, PFAS were detected in six wells. Of those detections, the maximum detection was PFOA at 19.5 ng/L at well #40293 (Walker Building well). VTARNG has sampled well #40293 eight additional times between the initial sampling event in March 2017 and December 2020, with a maximum detection of PFOA at 40.8 ng/L in December 2020. The well #40293 sampling is being completed separately from the SI described in this report. **Table 2-2** summarizes the results for PFOA, PFOS, PFHpA, PFHxS, and PFNA, the five compounds applicable to the Vermont MCL, for each round of sampling. Since the initial sampling event, PFAS have consistently been detected in well #40293 above the Vermont MCL of 20 ng/L but below the USEPA HA of 70 ng/L (VTDEC, 2020; USEPA, 2016a; USEPA, 2016b). Currently, units are responsible for providing their own water when using the biathlon facility.

Table 2-1: PFAS Detections in Potable Wells at CEATS (March 2017)

Well Number	Location	PFOA	PFOS	PFHpA	PFBA	PFTeDA	PFTrDA	PFHxA	PFPeA
40293	Walker Building	19.5	--	12.2	--	--	--	--	--
40030	Range	--	--	--	1.4 J	0.645 J	--	--	--
WAT21	Firing Point Classroom	--	--	--	--	--	--	--	--
40163	Range	--	--	--	--	0.456 J	--	--	--
WAT19	Range	--	--	--	--	--	--	--	--
40167	Range Classroom	0.724 J	--	--	--	--	0.572 J	--	
40107	Range	--	--	--	--	--	--	--	--
40081	Range	1.24 J	--	--	1.59 J	--	--	0.96 J	1.13 J
40054	Pump House #2	8.19	1.54 J	--	--	--	--	--	--

Notes:

1.) Detected concentrations are shown in ng/L.

J = estimated concentration
ng/L = nanograms per liter
PFBA = perfluorobutyrate
PFHpA = perfluoroheptanoic acid
PFHxA = perfluorohexanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
PFPeA = perfluoropentanoic acid
PFTeDA = perfluorotetradecanoic acid
PFTrDA = perfluorotridecanoic acid

Table 2-2: Well #40293 (Walker Building Well) Sampling Results

	Result (ng/L)								
Analyte	March 2017	August 2017	November 2017	February 2018	July 2018	September 2018	January 2019	May 2019	December 2020
Perfluorooctanoic acid (PFOA)	19.5	29	31	34	30	32	31	24	40.8
Perfluorooctanesulfonic acid (PFOS)	--	1.48 J	0.721 J	--	--	--	--	--	--
Perfluoroheptanoic acid (PFHpA)	12.2	19.5	18	21.5	19	17	22	15	26.6
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	--	--	--	--	--	--
Perfluorononanoic acid (PFNA)	--	1.96 J	1.93 J	1.76 J	--	--	2	--	2.53
Total Vermont 5 PFAS[1]	32	52	52	57	49	49	55	39	70

Notes:

1.) The Vermont MCL 20 ng/L for PFOA, PFOS, PFHpA, PFHxS, and PFNA, individually or combined (VTDEC, 2020)

-- = not detected
J = estimated concentration
ng/L = nanograms per liter

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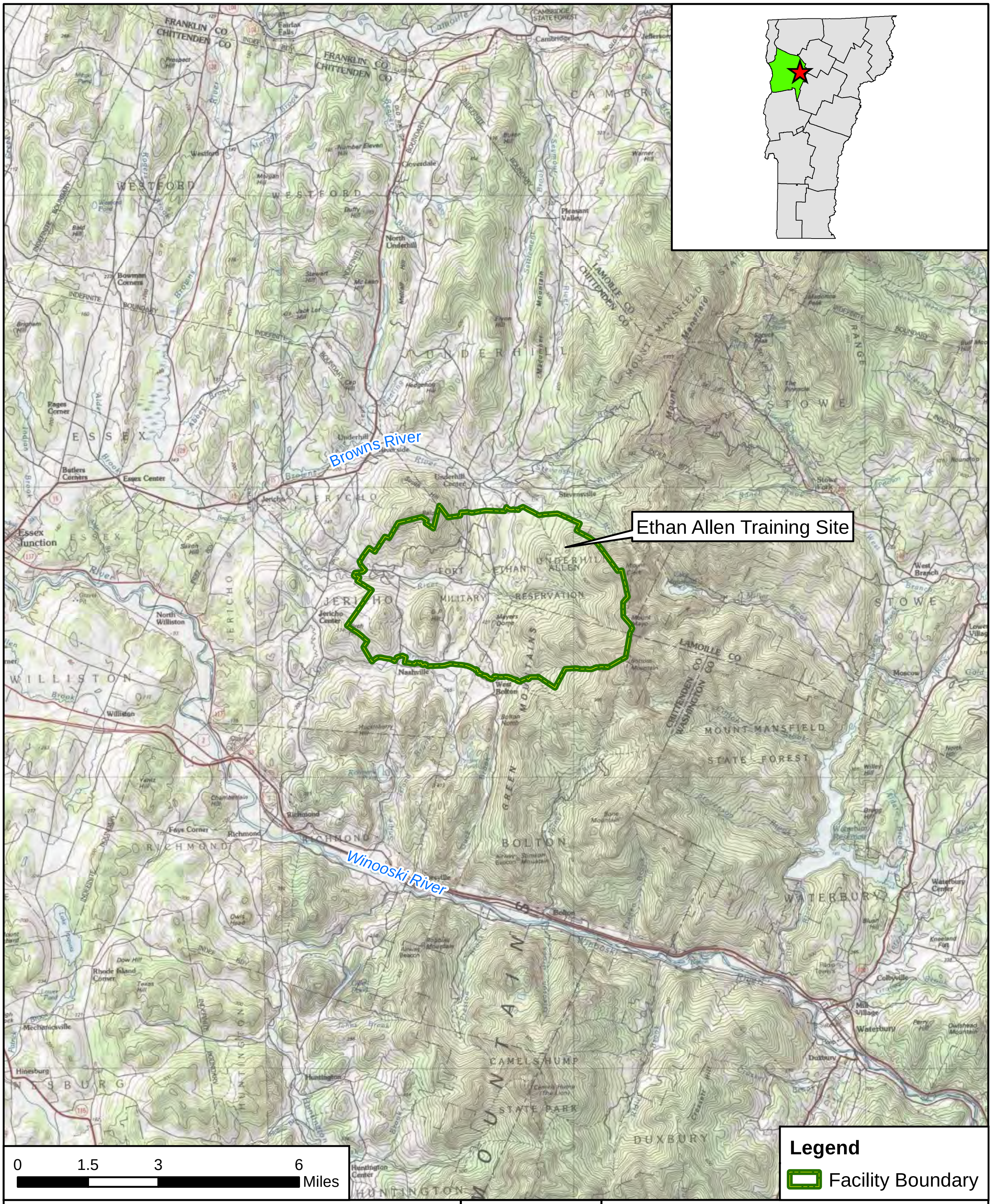

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NOTES Site Inspection UFP-QAPP Addendum at Ethan Allen Training Site, VT				
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SCALE	1:190,080	CHK BY	AM	12/17/2019
Base Map: Copyright:© 2013 National Geographic Society, i-cubed		PM	RG	12/17/2019

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1

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CLIENT	ARNG			
NOTES	Site Inspection UFP-QAPP Addendum at Ethan Allen Training Site, VT			
REVISED	12/17/2019	GIS BY	MS	12/17/2019
SCALE	1:63,360	CHK BY	AM	12/17/2019
Base Map: Copyright:© 2013 National Geographic Society, i-cubed		PM	RG	12/17/2019

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Facility Topography

AECOM
12420 Milestone Center Drive
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Figure 2-2

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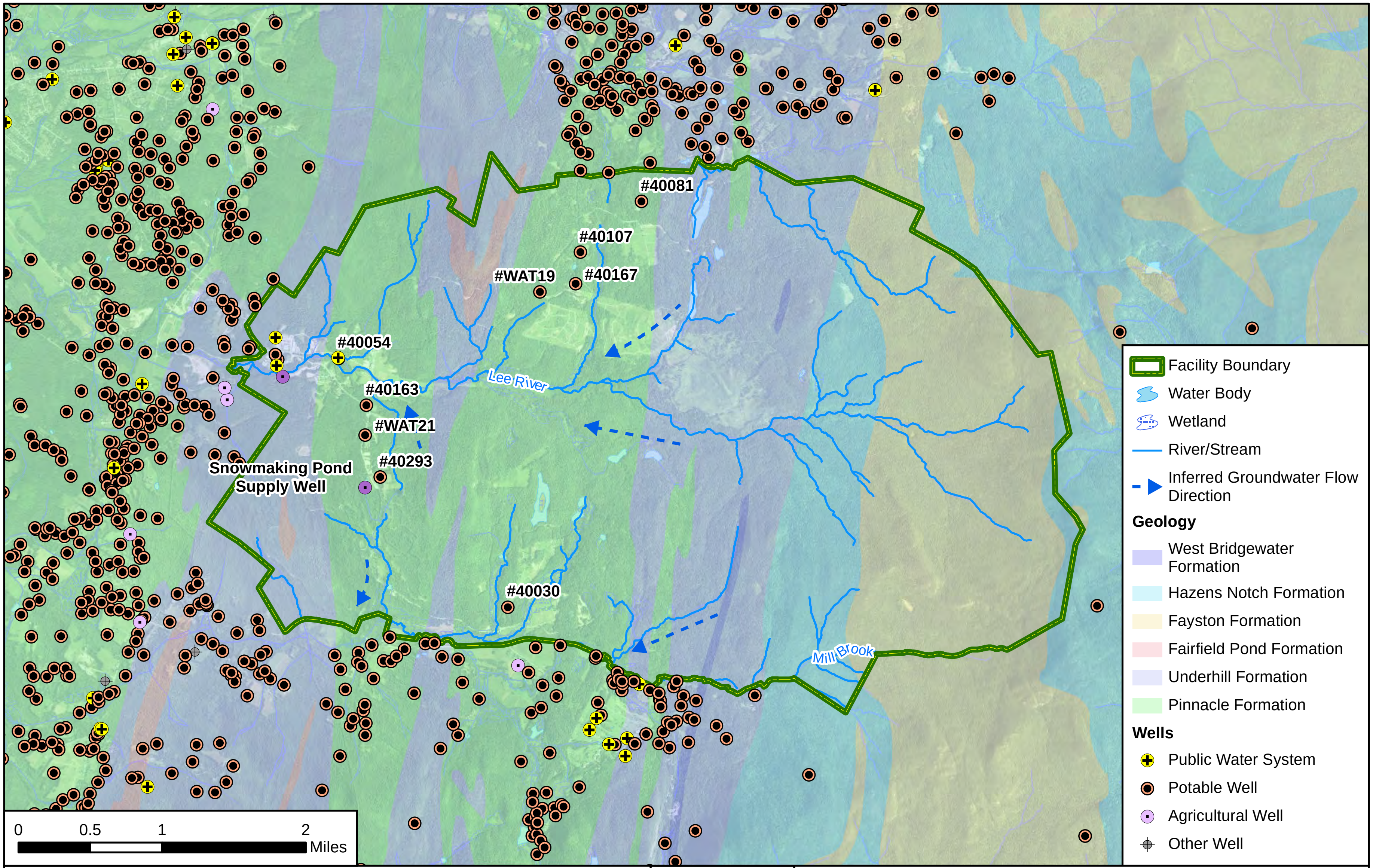

CLIENT	ARNG			
PROJECT	Site Inspection UFP-QAPP at Ethan Allen Training Site, VT			
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SCALE	1:63,360	CHK BY	AM	12/17/2019
Base Map: National Agricultural Imagery Program, 2016 Well Data: VT Dept of Envionrmental Conservation, Water Resource Section; ARNG		PM	RG	12/17/2019

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TITLE

Groundwater Features

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Germantown, MD 20876

Figure 2-3

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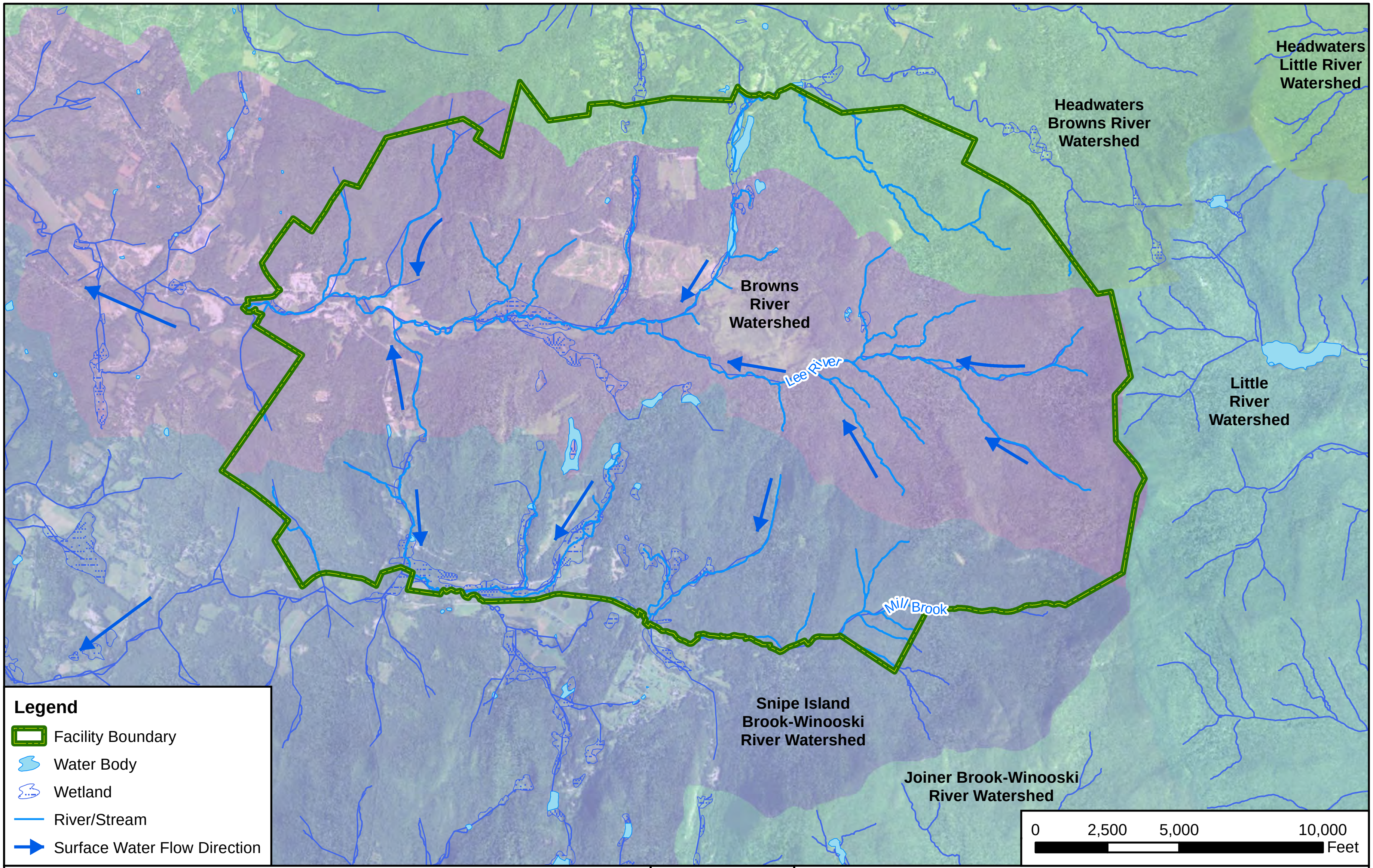

CLIENT	ARNG			
PROJECT	Site Inspection UFP-QAPP at Ethan Allen Training Site, VT			
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SCALE	1:60,000	CHK BY	AM	12/17/2019
Base Map: National Agricultural Imagery Program, 2016		PM	RG	12/17/2019

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TITLE

Surface Water Features

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12420 Milestone Center Drive
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Figure 2-4

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3. Summary of Areas of Interest

Based on the PA findings, one AOI was identified at CEATS: AOI 1 Biathlon Facility, which includes the Walker Building, Waxing Sheds, Snowmaking Pond, and Biathlon Course (**Figure 3-1**). A summary of the AOI is presented below.

3.1 AOI 1 – Biathlon Course

AOI 1 includes four potential release areas associated with the Biathlon Course at CEATS: the Waxing Areas, Biathlon Course, Walker Building, and Snowmaking Pond. Remnants of ski wax potentially containing PFAS at the potential release areas are a potential PFAS source.

3.1.1 Waxing Areas (Walker Building and Waxing Sheds)

As part of the biathlon facility, 20 Wax Sheds (two rows of ten [10] huts) used by biathletes during training and competitions for ski maintenance and ski waxing are located on the western side of the Walker Building, at geographic coordinates 44°28'3.07"N; 72°56'12.84"W. Each shed stands above grade, is approximately 15 feet long by 10 feet wide, and is constructed with a wooden (plywood) floor and work benches, an exhaust fan, and a window. Multiple entities use these facilities, inclusive of the National Guard (see **Section 2.2.5**).

During the VSI, hardened wax was observed on the floor and work benches of the sheds. Discarded wax shavings were also observed in plastic waste bins within the sheds. Interviewees were not sure where the bins were emptied but speculated they were likely emptied in facility trash bins for municipal waste disposal. An empty waste bin with wax remnants was observed during the VSI lying on its side in the strip of grass between the two rows of sheds. Interviewees also noted that wax shavings from the floors of the warming huts have typically been swept out of the sheds onto the grassy area, between the two rows of sheds.

Additionally, inside the Walker Building are rooms for applying ski wax and a wax storage room. A French drain surrounds the Walker Building and is connected to the facility's storm water drainage network. Wax may have been swept from inside the building and entered the drainage system. Remnants of ski wax left in and swept from the Waxing Sheds and Walker Building by patrons of the biathlon facility are potential PFAS sources.

3.1.2 Snowmaking Pond

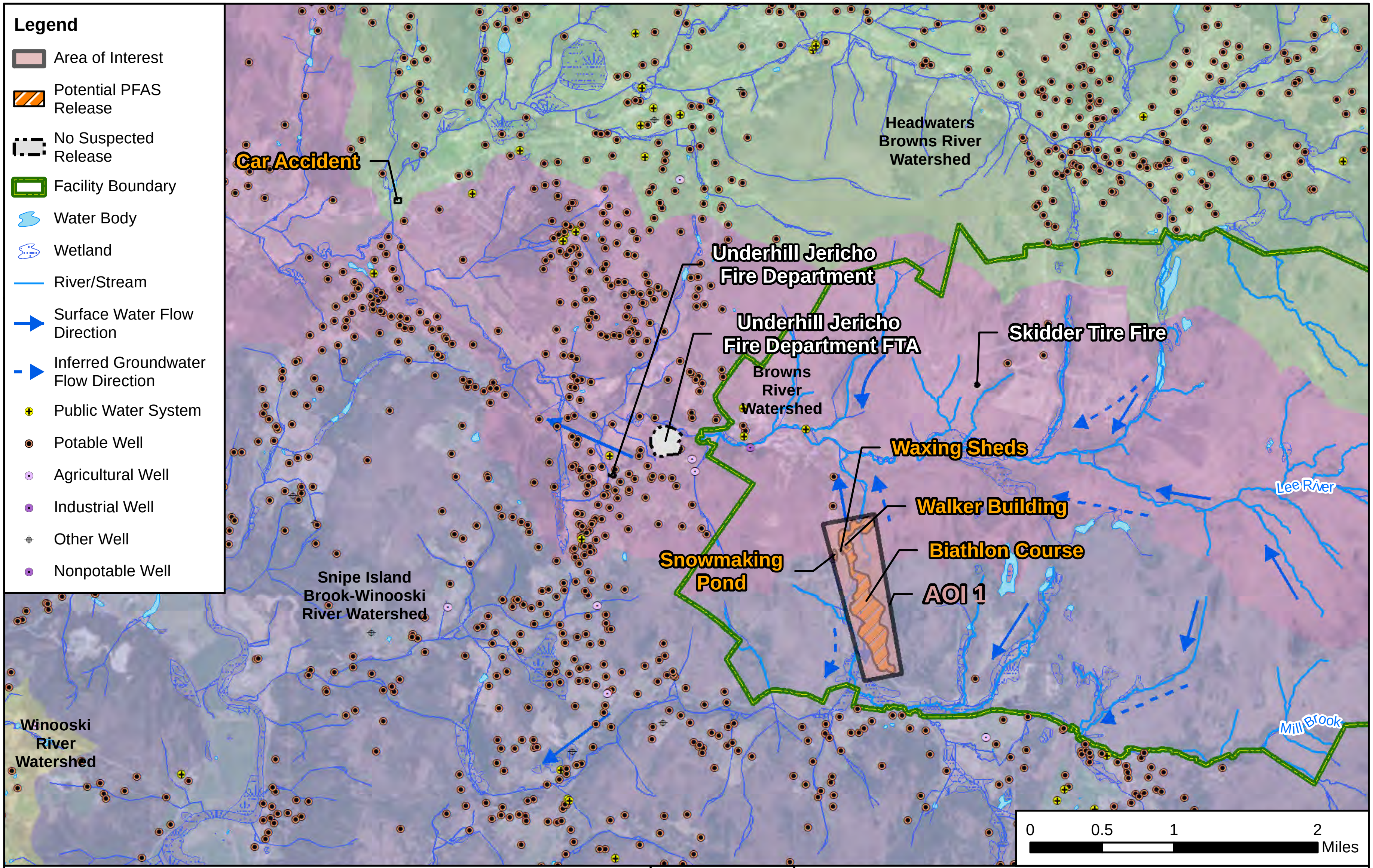
Located approximately 130 feet to the west and upgradient of the Wax Sheds is an artificial pond used to supply snowmaking machines with water. The approximate geographic coordinates are 44°28'1.80"N; 72°56'15.93"W. Historical aerials provided in the EDR^{TM} report show that the pond was built between 1986 and 1999. Portions of the biathlon track are supplemented with artificial snow during the winter, as needed. The pond is fed by two wells: one deep well, drilled to a depth of 625 feet bgs, and one shallow well, approximately 4 feet bgs, that is spring-fed. Based on interviews with facility staff during the VSI, approximately 3.3 kilometers of the 5-kilometer track can be covered by the artificial snow. The Snowmaking Pond may be a secondary source of PFAS because the pond is fed by groundwater wells.

3.1.3 Biathlon Course

The Biathlon Course is a 5-kilometer asphalt-paved track averaging about 20 feet in width that starts at a newly constructed building located immediately to the south of the Walker Building. The course is situated to both the north/northwest and south of the Walker Building. Biathlon training and competitions occur at the course throughout the year. Traditional snow skis are used for training and competitions during winter months, while roller skis are used during the warmer months of the year. At select locations along the course, snow is supplemented with water from the Snowmaking Pond (a potential secondary source of PFAS). Normal use of the Biathlon Course during winter months results in wax from skis, incidentally, transferring from the ski to snow. This residual wax left on the snow surface may be a potential source of PFAS in snowmelt along the 5-kilometer track.

Off-Site Snow for the Biathlon Course

During the 2017 ski course season, a combination of low snow and snowmaking machine failure required off-site snow to be transported to the facility for use at the Biathlon Course. Interviews with facility staff have indicated that about 120 to 160 tons of snow were trucked in from South Burlington Airport, down-gradient of CEATS, declination station, and Hyde Park (approximately 30 to 40 tons from each location). The PFAS concentrations (if any) in the off-site snow are unknown and may have contributed to the detected levels of PFAS in groundwater from infiltration due to snow melt.



CLIENT	ARNG			
PROJECT	Site Inspection UFP-QAPP at Ethan Allen Training Site, VT			
REVISED	12/17/2019	GIS BY	MS	12/17/2019
SCALE	1:63,360	CHK BY	AM	12/17/2019
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	12/17/2019

N

TITLE

Area of Interest

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

Project Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support project decision-making process. The specific DQOs established for this facility are described below. These DQOs were developed in accordance with the USEPA's seven-step iterative process (USEPA, 2006).

4.1 Problem Statement

The following problem statement was developed during project planning:

The presence of PFAS, which may pose a risk to human health or the environment, in environmental media at the facility is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve.

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 Office of the Secretary of Defense (OSD) dated 15 October 2019 (Assistant Secretary of Defense, 2019). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site 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 three compounds: PFOS, PFOA, and PFBS. The SLs are presented in **Section 6.1** of this Report.

The following quotes from the DA policy documents form the basis for this project (DA, 2016a; DA, 2018):

- "The Army will research and identify locations where PFOS- and/or PFOA-containing products, such as aqueous film forming foam (AFFF), are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider fire training areas, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas."
- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination."
- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA HA levels" (USEPA, 2016a; USEPA, 2016b).

4.2 Goals of the Study

The following goals were established for this SI:

1. Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.
2. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.

3. Determine the potential need for a removal action.
4. Collect data to better characterize the release areas for more effective and rapid initiation of an RI.
5. Identify within 4 miles of the installation other potential PFAS sources (fire stations, major manufacturers, other DoD facilities) and receptors, including both groundwater and surface water receptors, to determine whether the ARNG is the likely source of PFAS, or whether there is an off-facility source of PFAS responsible for installation detections of PFAS (USEPA, 2005).
6. Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.

4.3 Information Inputs:

Primary information inputs included:

- The PA for CEATS (AECOM, 2019a);
- Analytical data collected as part of VTARNG drinking water sampling efforts at the Site;
- Analytical data from groundwater, surface water, sediment, and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2019b); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.4 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-site sampling was not included in the scope of this SI. If future off-site sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s).

4.5 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs and decision rules as defined in the SI QAPP Addendum (AECOM, 2019b). These rules governed response actions based on the results of the SI sampling effort.

The decision rules described in the **Worksheet #11** of the SI QAPP Addendum identify actions based on the following:

Groundwater:

- Is there a human receptor within 4 miles of the facility?
- What is the concentration of PFOA, PFOS, and PFBS at the potential release areas?
- What is the concentration of PFOA, PFOS, and PFBS at the facility boundary upgradient and downgradient of the potential release areas?
- What does the conceptual site model (CSM) suggest in terms of source, pathway and receptor?

Soil:

- What is the concentration of PFOA, PFOS, and PFBS in shallow surface soil (0 to 2 feet bgs)?
- What is the concentration of PFOA, PFOS, and PFBS in deep soil (i.e., capillary fringe)?
- What does the CSM suggest in terms of source, pathway, and receptor?

Soil, groundwater, surface water, and sediment samples were collected from each of the potential PFAS release areas within AOI 1. Depth to groundwater in the upper till was observed to range from 5.33 to 14.32 feet bgs in August 2019.

4.6 Data Usability Assessment

The Data Usability Assessment (DUA) 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, 2018a; DoD, 2018b; USEPA, 2017b).

Data Quality Indicators (DQIs) (Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity) are important components in assessing data usability. These DQIs were evaluated in the subsequent sections and demonstrate that the data presented in this SI report are of high quality. Although the SI data are considered reliable, some degree of uncertainty can be associated with the data collected. Specific factors that may contribute to the uncertainty of the data evaluation are described below. The Data Validation Report (DVR) (**Appendix A**) presents explanations for all qualified data in greater detail.

4.6.1 Precision

4.6.2 Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate relative percent differences (RPD); laboratory precision is measured with calibration verification, internal standard recoveries, laboratory control spike (LCS) and matrix spike (MS) duplicate RPD.

Extraction internal standards (EIS) were added by the laboratory during sample extraction to measure relative responses of target analytes and used to correct for bias associated with matrix interferences and sample preparation efficiencies, injection volume variances, mass spectrometry ionization efficiencies, and other associated preparation and analytical anomalies. Several field samples displayed EIS area counts less than the outside the quality control (QC) limits of 50-150%. The field sample results associated with EIS area counts greater than the upper QC limit were non-detect and were qualified “UJ”. The qualified results should be considered usable as estimated values with a positive bias. The positive field sample results associated with EIS area counts less than the QC limit, but greater than 20 percent (%), were qualified “J+”, while non-detects were qualified “UJ”. The qualified results should be considered usable as estimated values with a positive bias. The field sample results associated with area counts less than 20% were qualified “X” for positive field sample results and “UX” for non-detect field sample results. The qualified field sample results associated with EIS area counts less than 20%, but greater than 10%, are recommended for use as estimated values with a positive bias and are reported with interpreted qualifiers of “J+” for the positive associated field sample results and “UJ” for the associated non-detect field sample results.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. All calibration verifications were within the project established precision limits presented in the QAPP Addendum (AECOM, 2019b).

LCS/LCS duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2019b).

MS/MS duplicate (MSD) samples were prepared, analyzed, and reported for all preparation batches. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. MS/MSD samples were submitted to the laboratory for analysis at a rate of 5%. The MS/MSD performed on parent sample AOI1-SW06 displayed a RPD greater than the upper QC limit of 30% for perfluorotridecanoic acid (PFTrDA). The parent sample result associated with this positive bias was non-detect; therefore, no data qualifying action was required.

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for PFAS and general chemistry parameters. The field duplicate samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2019b).

4.6.3 Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in the LCS/LCSD, MS/MSD, and surrogates.

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis, with one exception. The LCS/LCSD pairs prepared in batch 665135 displayed a percent recovery greater than the upper QC limit of 130% for PFTrDA. The associated field sample results were non-detect; therefore, no data qualifying action was required.

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested, with a limited number of exceptions. Two MS/MSD pairs displayed percent recoveries outside the QC limits. The MS/MSD performed on parent sample AOI1-GW05 displayed a percent recovery less than the lower QC limit of 70% for perfluorobutyrate (PFBA). The parent sample result associated with this negative bias was positive and was qualified “J-”. The qualified result should be considered usable as an estimated value with a negative bias. The MS/MSD performed on re-extracted parent sample AOI1-SW06 displayed a percent recovery greater than the upper QC limit of 170% for PFTrDA. The parent sample result associated with this positive bias was non-detect; therefore, no data qualifying action was required.

4.6.4 Representativeness

Representativeness qualitatively expresses the degree to which data accurately reflect site conditions. Factors that affect the representativeness of analytical data include appropriate sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences.

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by liquid chromatography tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.1 Table B-15, including the specific preparation requirements (i.e. ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in Table B-15 were monitored, standards that contained both branched and linear isomers when available were used, and isotopically labeled standards were used for quantitation.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. All preservation techniques were followed by the field staff, and all technical and analytical holding times were met by the laboratory. The laboratory used approved standard methods in accordance with the QAPP Addendum (AECOM, 2019b) for all analyses.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. Several PFAS instrument blanks and method blanks displayed detections greater than the detection limit for multiple target analytes. In total, 277 field sample results for various analytes were qualified “U” during data validation due to associated detections in instrument and/or method blanks. The reported field sample result values were adjusted to be equal to the limit of detection (LOD); the LOD was elevated to the concentration of the blank detection in instances where the blank concentration was greater than the LOD. The results are usable as qualified but should be considered false positives and treated as non-detect.

One field reagent blank (FRB) was collected during the event. Equipment rinsate blanks (ERBs) were also collected for groundwater, soil, and sediment samples. The ERBs and the FRB were non-detect for target analytes.

A sample of the water used for decontamination of the drill rig was collected in advance of the field effort. The decontamination sample, CEATS-PW-01, displayed a detection for PFOS greater than the detection limit, at 4.06 ng/L. The positive associated field sample results were greater than five times the concentration found in the decontamination sample; therefore, no data qualifying action was required. Based on the sample results, the potable water source was deemed acceptable for use during the investigation for decontamination of drilling equipment and during well installation.

Overall, the data are usable for evaluating the presence or absence of PFAS at the facility. Sufficient usable data were obtained to meet the objectives of the SI.

4.6.5 Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures help ensure comparability. Standard field sampling and typical laboratory protocols were used during the SI and are considered comparable to ongoing investigations.

4.6.6 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per parameter is as follows:

- PFAS in groundwater by LC/MS/MS compliant with QSM 5.1 Table B-15 at 100%
- PFAS in soil by LC/MS/MS compliant with QSM 5.1 Table B-15 at 100%
- PFAS in surface water by LC/MS/MS compliant with QSM 5.1 Table B-15 at 100%
- PFAS in sediment by LC/MS/MS compliant with QSM 5.1 Table B-15 at 100%
- pH in soil by USEPA Method 9045D at 100%
- Total organic carbon (TOC) by USEPA Method 9060 at 100%

4.6.7 Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a method detection limit (MDL) study, and calibration standards at the limit of quantitation (LOQ). In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the QAPP Addendum (AECOM, 2019b). The laboratory provided the requested MDL studies and provided applicable calibration standards at the LOQ. In order to achieve the DQOs for sensitivity outlined in the QAPP Addendum (AECOM, 2019b), the laboratory reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the MDL were reported and qualified “J” as estimated values by the laboratory.

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 implemented in accordance with the following approved documents:

- *Final Preliminary Assessment Report, Camp Ethan Allen Training Site, Jericho, Vermont* dated April 2019 (AECOM, 2019a);
- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan* dated March 2018 (AECOM, 2018a);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Camp Ethan Allen Training Site, Jericho, Vermont* dated July 2019 (AECOM, 2019b);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b); and
- *Final Site Safety and Health Plan, Camp Ethan Allen Training Site, Jericho, Vermont* dated July 2019 (AECOM, 2019c).

The SI field activities were conducted from 2 to 8 August 2019 and consisted of direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and surface water and sediment sample collection. Field activities were conducted in accordance with the QAPP Addendum (AECOM, 2019b), except as noted in **Section 5.7.**

The following samples were collected during the SI and analyzed for a subset of 18 PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15 to fulfill the project DQOs:

- 21 soil samples from 10 locations (soil borings or hand auger locations);
- Four grab groundwater samples from four of the five temporary well locations;
- Six sediment samples; and
- Eight surface water samples, six of which were co-located with sediment samples, and two of which were located downgradient from soil borings where groundwater was unavailable

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. 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**. A Nonconformance and Corrective Action Report is provided in **Appendix B2**. 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 for each of these activities are presented below.

5.1.1 Technical Project Planning

The USACE TPP Process, Engineering Manual (EM) 200-1-2 (DA, 2016b) 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 quantitative and qualitative DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 25 June 2019, prior to SI field activities. Meeting minutes are provided in **Appendix D**. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2.

The stakeholders for this SI include ARNG, VTARNG, USACE, and VTDEC representatives familiar with the facility, the regulations, 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 SI QAPP Addendum (AECOM, 2019b). Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM contacted the “Dig Safe®” one-call utility clearance contractor to notify them of intrusive work at CEATS. However, because CEATS is a private facility, Dig Safe® contractors do not enter the facility. Therefore, AECOM contracted Vermont Underground Locators (VTUL), a private utility location service, to perform utility clearance. VTUL performed utility clearance of the proposed boring locations on 2 August 2019 with input from the AECOM field team and CEATS Biathlon Facility staff. General locating services and ground-penetrating radar (GPR) were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be PFAS-free prior to the start of field activities. Because the potable water source at CEATS is known to contain PFAS, an offsite source of potable water was identified. A sample from a potable water source at the office of AECOM’s drilling subcontractor, Cascade Technical Services, LLC, was collected on 26 June 2019, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15. The results of the potable well sample are provided in **Appendix F**. A discussion of the results is presented in **Section 4.6.4**.

Materials that were 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 (SOPs) appendix to the SI QAPP Addendum (AECOM, 2019b). Prior to the start of field work each day, a PFAS Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Soil samples were collected via direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2019b). 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 soil from the top five feet of the boring, in accordance with AECOM utility clearance procedures.

Three discrete soil samples were collected for chemical analysis from each soil boring, with the exception of location AOI1-SB03, which had only two soil samples collected due to shallow refusal. Refer to **Section 5.7** for additional details on deviations from the SI QAPP Addendum. At locations other than AOI1-SB03, one surface soil sample (0 to 1 feet bgs) and two subsurface soil samples (one approximately 1 foot above the groundwater table and one at the mid-point between the surface and the groundwater table) were collected from each boring. At AOI1-SB03, bedrock refusal was encountered at 5.8 feet bgs. Two offset locations (approximately 25 feet downgradient from original location) were attempted, but bedrock refusal was encountered at 3 feet bgs at both locations. Therefore, only two soil samples were collected from AOI1-SB03.

Additionally, four surface soil locations (AOI1-SB07 through AOI1-SB10) were completed to 1 feet bgs using a hand auger. AOI1-SB10 was added during the field effort to replace the third sample from AOI1-SB03 via the Nonconformance and Corrective Action Report process (**Section 5.7**). The soil boring locations are shown on **Figure 5-1**, and boring and sample depths are provided **Table 5-1**. The soil boring locations were selected based on the available information for the AOI and were agreed upon through the TPP process and SI QAPP Addendum review.

The soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System (USCS). A photoionization detector (PID) was used to screen the breathing zone during boring activities as part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B3**) and in a non-treated field logbook (i.e., composition notebook). Depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) were recorded. The boring logs are provided in **Appendix E**.

Each sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles 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 by LC/MS/MS compliant with QSM 5.1 Table B-15, TOC (USEPA Method 9060A), and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2019b).

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. In instances when non-dedicated sampling equipment was used, such as a hand auger for the 0 to 1 feet bgs soil samples, ERBs were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2019b) using bentonite chips at completion of sampling activities. Borings were installed in grass 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. Temporary wells were installed at five of the six boring locations (AOI1-SB01, AOI1-SB02, AOI1-SB04, AOI1-SB05, and AOI1-SB06). A temporary well was not installed at location AOI1-SB03 due to shallow refusal at 5.8 feet bgs before groundwater was encountered in the boring (refer to **Section 5.7** for additional details on deviations from the QAPP Addendum). Once the borehole was advanced to the desired depth, a temporary well was constructed of a 10-foot section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. The screen intervals for the temporary wells are provided on **Table 5-2**. New PVC pipe and screen were used at each location to avoid cross contamination between locations.

The temporary wells were allowed to recharge for a minimum of 24 hours after installation before collection of groundwater samples. After the recharge period, one of the five temporary wells (location AOI1-SB02) was dry; therefore, a groundwater sample could not be collected at this location. Surface water samples were collected downgradient of locations AOI1-SB02 and AOI1-

SB03 since groundwater could not be obtained at these locations. Refer to **Section 5.4** for additional details on surface water sampling.

Groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen [DO], oxidation-reduction potential [ORP], and turbidity) were measured using a water quality meter and recorded on the field sampling form (**Appendix B3**) after each grab sample was collected. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into 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 5.1 Table B-15 in accordance with the QAPP Addendum (AECOM, 2019b).

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 FRB was collected, in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Temporary wells were abandoned in accordance with the QAPP Addendum (AECOM, 2019b) by removing the PVC and backfilling the hole with bentonite chips. Temporary wells were installed in grass areas to avoid disturbing concrete or asphalt.

5.4 Surface Water and Sediment Sampling

Co-located surface water and sediment samples were collected from tributaries flowing to Mill Brook and Lee River, downgradient of AOI1. Additionally, two stand-alone surface water samples (AOI1-SW07 and AOI1-SW08) were collected as replacement samples downgradient of soil boring locations where groundwater could not be obtained. AOI1-SW07 was collected from a natural spring emergence point as replacement sample for groundwater at AOI1-SB02. AOI1-SW08 was collected from a pond as a replacement sample for groundwater at AOI1-SB03.

Sediment samples were co-located with surface water samples and were collected in accordance with the SI QAPP Addendum (AECOM, 2019b). Surface water samples were collected from a single point in the waterbody by dipping the laboratory-supplied bottle into the water, approximately two-thirds up from the bottom of the water body. For the co-located surface water and sediment samples, the surface water sample was collected before the co-located sediment sample. Sampling was performed in a manner to minimize disturbance of bottom sediments and as quickly as possible to ensure a representative sample was collected. Additionally, a subsample of each surface water sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the surface water samples.

After collection of the surface water sample, a sediment coring device (hand auger) was used to collect the sediment sample from the first 1 foot of sediment. The sediment was transferred to a Ziploc bag, where the sample was homogenized, and stones in excess of 1 centimeter were removed. After collection of the surface water and sediment samples from each location, general water quality parameters (i.e., temperature, pH, conductivity, DO, ORP, and turbidity) were collected with a water quality meter and recorded on the field sampling form (**Appendix B3**). The surface water and sediment sample locations are shown on **Figure 5-1**, and sample depths are provided **Table 5-1**.

Each sample was collected into 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 for analysis of PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15. Sediment samples were also analyzed for TOC (USEPA Method 9060A) and pH (USEPA Method 9045D), in accordance with the SI QAPP Addendum (AECOM, 2019b).

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. In instances when non-dedicated sampling equipment was used, ERB samples were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

5.5 Investigation-Derived Waste

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2019b) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were left in place at the point of the source. The soil cuttings were distributed on the ground surface on the downgradient side of the boring. The soil IDW was not sampled and assumed the PFAS characteristics of the associated soil samples collected from that source location. Geographic coordinates were collected using a Global positioning system (GPS) around each location where IDW was placed (i.e., an IDW polygon). The IDW polygons are displayed on the figure in **Appendix F**.

Liquid IDW generated during the SI activities (i.e., purge water and decontamination fluids) were containerized in one properly-labeled 55-gallon drum. Approximately 10 gallons of liquid IDW were generated over the course of the event. One sample of the liquid IDW was collected and submitted to the laboratory for analysis of PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15. While pending analytical results, the drum was staged on the North side of the Snowmaking Building, at approximate geographic coordinates 44°28'06.9"N, 72°56'15.0"W, as designated by the VTARNG.

Analytical results for the IDW sample indicated that PFOS was not detected and PFOA was detected at 2.46 J. The laboratory report for the IDW sample is included in **Appendix G**. In accordance with the QAPP Addendum (AECOM, 2019b), because the combined PFOA+PFOA concentration was less than the 20 ng/L combined value established in the Vermont Hazardous Waste Management Regulations (VHWMR), the liquid IDW was discharged the ground surface downgradient of one of the investigation borings, in accordance with the SI QAPP Addendum (AECOM, 2019b). Discharge of the liquid IDW was completed by Cascade Technical Services on 18 October 2019.

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

5.6 Laboratory Analytical Methods

Samples were analyzed for a subset of 18 PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD-ELAP and NELAP certified laboratory. The 18 PFAS analyzed as part of the ARNG SI program include the following:

- 6:2 fluorotelomer sulfonate (6:2 FTS)
- Perfluorohexanoic acid (PFHxA)

- 8:2 fluorotelomer sulfonate (8:2 FTS)
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- Perfluorobutyrate (PFBA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluoropentanoic acid (PFPeA)
- Perfluorotetradecanoic acid (PFTeDA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluoroundecanoic acid (PFUdA)

Soil and sediment samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.7 Deviations from SI QAPP Addendum

Derivations from the SI QAPP Addendum occurred due to field conditions and discussion between AECOM, ARNG, and USACE. Deviations from the SI QAPP Addendum are noted below and are documented in the Nonconformance and Corrective Action Report (**Appendix B2**):

- A soil boring adjacent to the Walker Building at CEATS (AOI1-SB03) was proposed in the SI QAPP Addendum, with collection of three samples in the boring. However, refusal was encountered at 5.8 feet bgs. Two offset locations (approximately 25 feet downgradient from original location) were attempted, but bedrock refusal was encountered at 3 feet bgs at both locations. Therefore, only two soil samples were collected from the original location due to the shallow depth of refusal. To replace the third sample from AOI1-SB03, an additional surface soil sample (AOI1-SB10) was collected via hand auger in the vicinity of the Walker Building. The location was placed in a low-lying spot alongside one of the main thoroughfares of the course, between the Walker Building and firing range.
- Additionally, the following field decisions were made in accordance with the procedures established in the SI QAPP Addendum (AECOM, 2019b):
    - A temporary well was not installed at location AOI1-SB03 due to shallow refusal at 5.8 feet bgs; therefore, a groundwater sample could not be collected at this location. Surface water sample AOI1-SW08 was collected from a downgradient pond as a replacement sample.
    - A temporary well was installed at location AOI-SB02. The temporary well was allowed to recharge for 24 hours after installation but was dry after the recharge period; therefore, a groundwater sample could not be collected. Surface water sample AOI1-SW07 was collected from a nearby natural spring emergence point as replacement sample.

Table 5-1
Samples by Medium
Site Inspection Report
Camp Ethan Allen Training Site, Jericho, Vermont

Sample Identification	Sample Collection Date/Time	Sample Depth (ft bgs) 1	PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI1-SB01-00-01	8/6/2019 8:45	0 - 1	x	x	x	
AOI1-SB01-05-06	8/6/2019 10:30	5 - 6	x	x	x	
AOI1-SB01-14-15	8/6/2019 10:40	14 - 15	x	x	x	
AOI1-SB02-00-01	8/5/2019 15:30	0 - 1	x	x	x	
AOI1-SB02-04-05	8/5/2019 15:45	4 - 5	x	x	x	
AOI1-SB02-13-14	8/5/2019 15:55	13 - 14	x	x	x	
AOI1-SB03-00-01	8/5/2019 11:20	0 - 1	x	x	x	
AOI1-SB03-00-01-D	8/5/2019 11:20	0 - 1	x	x	x	FD
AOI1-SB03-05-06	8/5/2019 11:55	5 - 6	x	x	x	
AOI1-SB04-00-01	8/5/2019 9:40	0 - 1	x	x	x	
AOI1-SB04-00-01-MS	8/5/2019 9:40	0 - 1	x	x	x	MS
AOI1-SB04-00-01-MSD	8/5/2019 9:40	0 - 1	x	x	x	MSD
AOI1-SB04-03-04	8/5/2019 10:20	3 - 4	x	x	x	
AOI1-SB04-07-08	8/5/2019 10:30	7 - 8	x	x	x	
AOI1-SB04-07-08-D	8/5/2019 10:30	7 - 8	x	x	x	FD
AOI1-SB05-00-01	8/6/2019 14:15	0 - 1	x	x	x	
AOI1-SB05-04-05	8/6/2019 14:55	4 - 5	x	x	x	
AOI1-SB05-08-09	8/6/2019 15:05	8 - 9	x	x	x	
AOI1-SB06-00-01	8/6/2019 13:05	0 - 1	x	x	x	
AOI1-SB06-08-09	8/6/2019 13:10	8 - 9	x	x	x	
AOI1-SB06-13-14	8/6/2019 13:20	13 - 14	x	x	x	
AOI1-SB07-00-01	8/5/2019 17:05	0 - 1	x	x	x	
AOI1-SB08-00-01	8/8/2019 8:50	0 - 1	x	x	x	
AOI1-SB09-00-01	8/8/2019 9:05	0 - 1	x	x	x	
AOI1-SB10-00-01	8/7/2019 16:00	0 - 1	x	x	x	
Groundwater Samples						
AOI1-GW01	8/7/2019 14:15	5 - 15	x			
AOI1-GW04	8/7/2019 10:00	6 - 11	x			
AOI1-GW04-D	8/7/2019 10:00	6 - 11	x			FD
AOI1-GW05	8/7/2019 15:20	4 - 9	x			
AOI1-GW05-MS	8/7/2019 15:20	4 - 9	x			MS
AOI1-GW05-MSD	8/7/2019 15:20	4 - 9	x			MSD
AOI1-GW06	8/7/2019 14:55	4 - 14	x			
Surface Water Samples						
AOI1-SW01	8/7/2019 13:40	2 in	x			
AOI1-SW02	8/2/2019 15:15	4 in	x			
AOI1-SW02-D	8/2/2019 15:15	4 in	x			FD
AOI1-SW03	8/2/2019 16:30	4 in	x			
AOI1-SW04	8/7/2019 11:30	5 in	x			
AOI1-SW05	8/7/2019 10:40	4.5 in	x			
AOI1-SW06	8/2/2019 17:10	2.5 in	x			
AOI1-SW06-MS	8/2/2019 17:10	2.5 in	x			MS
AOI1-SW06-MSD	8/2/2019 17:10	2.5 in	x			MSD
AOI1-SW07	8/7/2019 9:25	1.5 in	x			
AOI1-SW08	8/7/2019 15:45	5 in	x			
Sediment Samples						
AOI1-SD01-00-01	8/7/2019 13:50	0 - 1	x			
AOI1-SD02-00-01	8/2/2019 15:20	0 - 1	x			

Table 5-1
Samples by Medium
Site Inspection Report
Camp Ethan Allen Training Site, Jericho, Vermont

Sample Identification	Sample Collection Date/Time	Sample Depth (ft bgs) [1]	PFAS by LC/MS/MS compliant with QSM 5.1 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Sediment Samples (continued)						
AOI1-SD02-00-01-D	8/2/2019 15:20	0 - 1	x			FD
AOI1-SD03-00-01	8/2/2019 16:40	0 - 1	x			
AOI1-SD04-00-01	8/7/2019 11:40	0 - 1	x			
AOI1-SD05-00-01	8/7/2019 10:50	0 - 1	x			
AOI1-SD06-00-01	8/2/2019 17:20	0 - 1	x			
AOI1-SD06-00-01-MS	8/2/2019 17:20	0 - 1	x			MS
AOI1-SD06-00-01-MSD	8/2/2019 17:20	0 - 1	x			MSD
Quality Control Samples						
CEATS-EB01	8/2/2019 15:45	NA	x			EB on ziploc bag
CEATS-EB02	8/2/2019 15:55	NA	x			EB on hand auger
CEATS-EB03	8/6/2019 10:20	NA	x			EB on shoe of drill rig
CEATS-FRB01	8/2/2019 15:50	NA	x			FRB
IDW Sample						
CEATS-IDW01	8/8/2019 12:20	NA	x			

Notes:

[1] Sample depths for surface water samples are inches (in) below water surface

Acronyms and Abbreviations:
bgs = below ground surface
EB = equipment blank
FD = field duplicate
FRB = field reagent blank
ft = feet
IDW = invetigation-derived waste
in = inches
LCMSMS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
PFAS = per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths and Temporary Well Screen Intervals
Site Inspection Report
Camp Ethan Allen Training Site, Jericho, Vermont

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AOI1-SB01	19	5 - 15 [1]
	AOI1-SB02	14	1 - 11 [1,2]
	AOI1-SB03	5.8	NA
	AOI1-SB04	11	6 - 11
	AOI1-SB05	10	4 - 9
	AOI1-SB06	14.5	4 - 14 [1]
	AOI1-SB07	1	NA
	AOI1-SB08	1	NA
	AOI1-SB09	1	NA
	AOI1-SB10	1	NA

Notes:

[1] Temporary well screens set above total depth to capture intervals of highest moisture content

[2] Temporary well was dry after a minimum of 24 hours allotted for recharge

Acronyms and Abbreviations:
bgs = below ground surface
ft = feet
NA = not applicable

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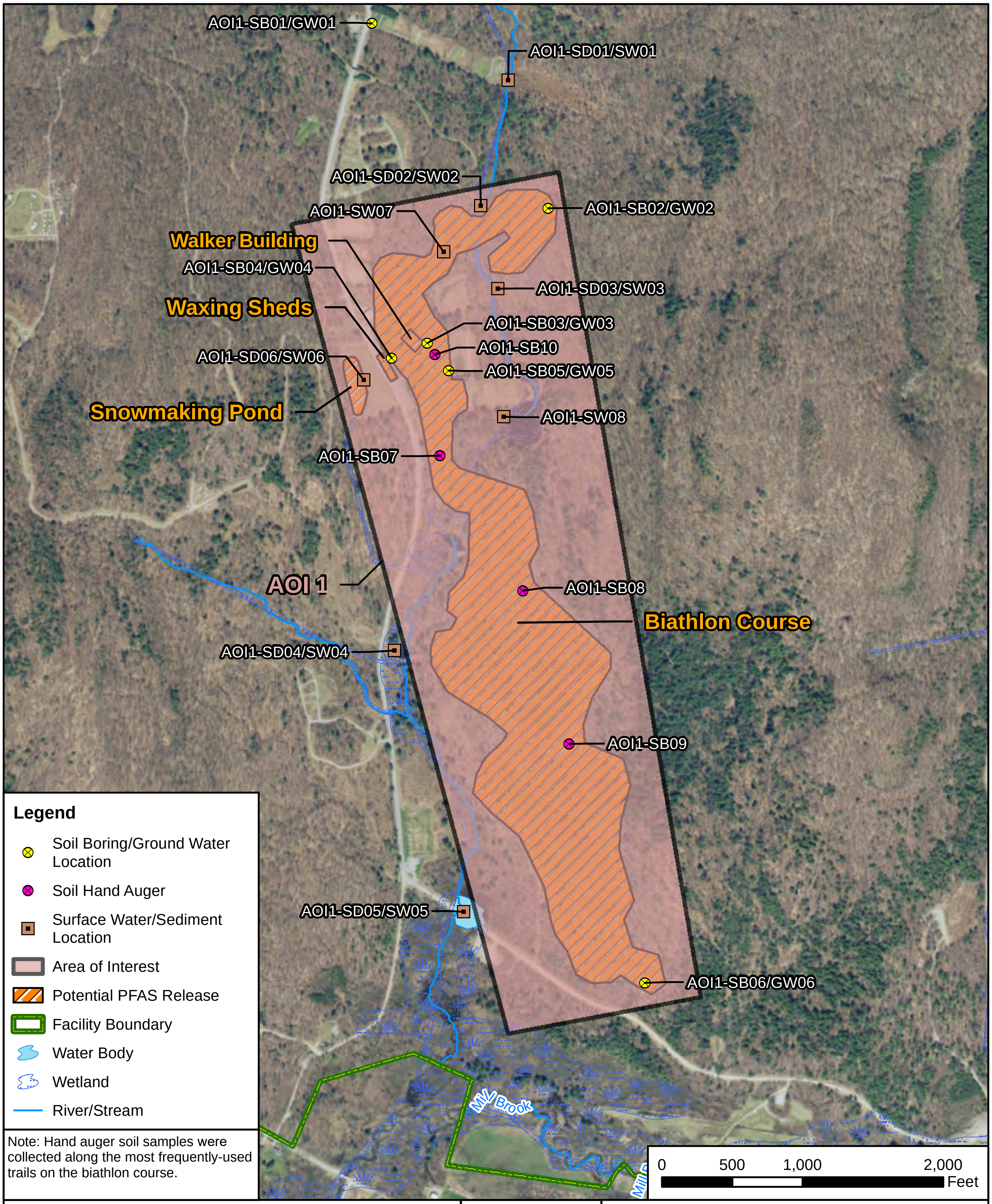

Note: Hand auger soil samples were collected along the most frequently-used trails on the biathlon course.

Site Inspection Sample Locations

CLIENT	ARNG			
NOTES	Site Inspection UFP-QAPP at Ethan Allen Training Site, VT			
REVISED	12/17/2019	GIS BY	MS	12/17/2019
SCALE	1:12,000	CHK BY	AM	12/17/2019
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	12/17/2019

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

Q:\Projects\ENV\GEARS\GEO\ARNG PFAS\900-CAD-GIS\920-GIS or Graphics\MXD\VT\TS_Ethan_Allen\TS_Ethan_Allen_SI\TS_Ethan_Allen_SI_Report\Fig_5-1_TS-Ethan_Allen_SI.mxd

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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 AOI 1 is provided in **Section 6.3**. **Table 6-2** through **Table 6-6** present PFAS results for samples with detections in soil, groundwater, surface water, and sediment; only constituents detected in one or more samples are included. 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 dated 15 October 2019 (Assistant Secretary of Defense, 2019). 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 an RI, the next phase under CERCLA. The SLs apply to three compounds, PFOA, PFOS, and PFBS, for both soil and groundwater, as presented in **Table 6-1**.

All other results presented in this report are considered informational in nature and serve as an indication as to whether soil, groundwater, sediment, and surface water contain or do not contain PFAS within the boundaries of the facility.

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

Analyte	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	130,000	1,600,000	40,000

Notes:

a.) Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard quotient (HQ) = 0.1. 15 October 2019.

6.2 Soil Physicochemical Analyses

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport of PFAS contaminants. 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, which includes four potential PFAS release areas: the Waxing Areas, Biathlon Course, Walker Building, and Snowmaking Pond. The detected compounds in soil, groundwater, surface water, and sediment are summarized on **Table 6-2** through **Table 6-6**. The detections of PFOS and PFOA in soil, groundwater, surface water, and sediment are presented on **Figure 6-1** through **Figure 6-5**.

6.3.1 AOI 1 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the four potential PFAS release areas: the Waxing Areas, Biathlon Course, Walker Building, and Snowmaking Pond. **Figure 6-1** and **Figure 6-2** present detections in soil for PFOS and PFOA, respectively. The detected compounds in surface soil and shallow subsurface soil are summarized on **Table 6-2** and **Table 6-3**, respectively.

Soil was sampled from surface soil (0 to 1 feet bgs) and shallow subsurface soil (3 to 15 feet bgs) from boring locations AOI1-SB01 through AOI01-SB09. Up to three soil samples were collected from each boring: one surface soil sample and two subsurface soil samples (one approximately 1 foot above the groundwater table and one at the mid-point between the surface and the groundwater table). PFOA, PFOS, and PFBS were detected in soil at concentrations several orders of magnitude lower than the SLs. In surface soil, PFOA was detected at five locations, with concentrations ranging from 0.012 J micrograms per kilogram (µg/kg) to 0.193 J µg/kg. PFOS was detected at seven locations, with concentrations ranging from 0.026 J µg/kg to 0.123 J µg/kg. PFBS was detected at seven locations, with concentrations ranging from 0.00168 J µg/kg to 0.019 J µg/kg.

In shallow subsurface soil, PFOA, PFOS, and PFBS were also detected in soil at concentrations several orders of magnitude lower than the SLs. PFOA was detected at three locations, with concentrations ranging from 0.012 J µg/kg to 0.018 J µg/kg. PFOS was detected at two locations, with concentrations ranging from 0.048 J µg/kg to 0.279 J µg/kg. PFBS was detected at two locations, with concentrations ranging from 0.00237 J µg/kg to 0.00277 J µg/kg.

6.3.2 AOI 1 Groundwater Analytical Results

PFOA and PFBS were detected in groundwater at AOI 1 at concentrations below SLs. PFOS was not detected in groundwater at AOI 1. **Figure 6-3** present the ranges of detections for PFOA and PFOS in groundwater. The detected compounds in groundwater are summarized on **Table 6-4**.

Groundwater samples were collected from temporary monitoring well locations AOI1-GW01, AOI1-GW04, AOI1-GW05, and AOI1-GW06. PFOS was not detected in any of the four locations sampled. PFOA and PFBS were detected but were below the SLs of 40 ng/L and 40,000 ng/L, respectively. PFOA was detected in all four temporary monitoring wells samples, with concentrations ranging from 3.03 J ng/L to 10.9 ng/L. PFBS was detected in two temporary monitoring wells, with concentrations ranging from 1.77 J ng/L to 2.33 J ng/L.

6.3.3 AOI 1 Surface Water Analytical Results

Surface water samples were collected from tributaries flowing to Lee River to the north and Mill Brook to the south, both downgradient of AOI 1. Additionally, AOI1-SW07 was collected from a natural spring emergence point along the Biathlon Course and AOI1-SW08 was collected from a pond near the rifle range along the Biathlon Course. **Table 6-5** summarizes the detected compounds in surface water. **Figure 6-4** presents the ranges of detections for PFOA and PFOS in surface water.

PFOA was detected at two locations in surface water with concentrations ranging from 1.59 J ng/L to 1.72 J ng/L. PFOS and PFBS were not detected in surface water. There were no detections of PFOA, PFOS, or PFBS in surface water at locations AOI1-SW01 (representing surface water flowing away from AOI 1 to the north), AOI1-SW05 (representing surface water flowing away from AOI 1 to the south), and AOI1-SW06 (the snowmaking pond).

6.3.4 AOI 1 Sediment Analytical Results

Sediment samples were collected from tributaries flowing to Lee River to the north and Mill Brook to the south, which are both considered downgradient of AOI 1 due to a surface water divide near the Walker Building. **Table 6-6** summarizes the detected compounds in sediment. **Figure 6-5** presents the ranges of detections for PFOA and PFOS in sediment.

PFOA, PFOS, and PFBS were detected in sediment. PFOA was deected at two locations, with concentrations ranging from 0.121 J µg/kg to 0.144 J µg/kg. PFOS was detected at three locations with concentrations ranging from 0.032 J µg/kg to 0.082 J µg/kg. PFBS was detected at two locations with concentrations ranging from 0.0029 J µg/kg to 0.0057 J µg/kg.

There were no detections of PFOA, PFOS, or PRBS in sediment at locations AOI1-SW04 and AOI1-SW05 (representing surface water flowing away from AOI 1 to the south).

6.3.5 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil at AOI 1. The detected concentrations indicate there was likely a release of PFAS-containing materials, with highest concentrations found in surface soils nearest the Waxing Areas (Walker Building and Waxing Sheds); however, the results in soil were orders of magnitude lower than the SLs. PFOA and PFBS were detected in groundwater at concentrations below SLs; PFOS was not detected in groundwater. Based on these results, no further evaluation at AOI 1 is warranted under CERCLA at this time.

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Camp Ethan Allen Training Site

Area of Interest		AOI1																			
Sample ID		AOI1-SB01-00-01		AOI1-SB02-00-01		AOI1-SB03-00-01		AOI1-SB03-00-01-D		AOI1-SB04-00-01		AOI1-SB05-00-01		AOI1-SB06-00-01		AOI1-SB07-00-01		AOI1-SB08-00-01		AOI1-SB09-00-01	
Sample Date		08/06/2019		08/05/2019		08/05/2019		08/05/2019		08/05/2019		08/06/2019		08/06/2019		08/05/2019		08/08/2019		08/08/2019	
Depth		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																					
6:2 FTS	-	ND		ND		ND		0.019	J	0.025	J	ND		ND		ND		ND		ND	
8:2 FTS	-	0.017	J	0.012	J	0.015	J	ND		0.013	J	ND		0.013	J	ND		ND		ND	
NEtFOSAA	-	0.00653	J	ND		ND		ND		0.014	J	ND		ND		ND		ND		ND	
NMeFOSAA	-	0.00929	J	ND		ND		ND		ND		ND		ND		0.00613	J	0.00749	J	ND	
PFBA	-	0.014	J	ND		ND		ND		0.028	J	0.00792	J	ND		ND		0.012	J	ND	
PFBS	130000	0.019	J	0.00209	J	0.00376	J	0.00482	J	0.00427	J	0.00330	J	0.00168	J	0.00777	J	ND		ND	
PFDA	-	ND		ND		ND		ND		0.118	J	ND		ND		0.120	J	ND		ND	
PFDoA	-	0.015	J	ND		ND		ND		0.065	J	0.00972	J	0.410	J	0.033	J	ND		0.028	J
PFHpA	-	0.023	J	ND		ND		ND		0.077	J	0.016	J	ND		ND		ND		ND	
PFHxS	-	ND		0.00444	J	0.00294	J	0.013	J	0.00681	J	ND		0.00366	J	0.00747	J	ND		ND	
PFNA	-	ND		0.016	J	0.013	J	0.017	J	0.066	J	ND		0.014	J	0.053	J	ND		ND	
PFOA	130	0.079	J	0.012	J	0.039	J	0.048	J	0.193	J	ND		ND		0.044	J	ND		ND	
PFOS	130	0.123	J	0.077	J	0.026	J	0.034	J	0.046	J	0.058	J	ND		0.112	J	0.041	J	ND	
PFPeA	-	ND		0.00542	J	0.00509	J	0.00365	J	0.044	J	ND		0.00635	J	0.013	J	ND		ND	
PFTrDA	-	ND		0.031	J	0.00515	J	0.00832	J	0.032	J	ND		0.00340	J	0.037	J	ND		ND	
PFUnDA	-	0.023	J	0.055	J	ND		ND		0.054	J	0.011	J	ND		0.047	J	ND		0.035	J

Grey Fill	Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
ND	Analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable

Table 6-3
PFAS Detections in Shallow Subsurface Soil
Site Inspection Report, Camp Ethan Allen Training Site

	Area of Interest	AOI1																			
	Sample ID	AOI1-SB01-05-06		AOI1-SB01-14-15		AOI1-SB02-04-05		AOI1-SB02-13-14		AOI1-SB03-05-06		AOI1-SB04-03-04		AOI1-SB04-07-08		AOI1-SB04-07-08-D		AOI1-SB05-04-05		AOI1-SB05-08-09	
	Sample Date	08/06/2019		08/06/2019		08/05/2019		08/05/2019		08/05/2019		08/05/2019		08/05/2019		08/05/2019		08/06/2019		08/06/2019	
	Depth	5 - 6 ft		14 - 15 ft		4 - 5 ft		13 - 14 ft		5 - 6 ft		3 - 4 ft		7 - 8 ft		7 - 8 ft		4 - 5 ft		8 - 9 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																					
6:2 FTS	-	0.015	J	ND		0.014	J	0.031	J	0.016	J	0.030	J	0.015	J	ND		ND		ND	
8:2 FTS	-	ND		0.010	J	ND		0.020	J	ND		ND		ND		ND		ND		ND	
NEtFOSAA	-	ND		ND		ND		ND		ND		0.010	J	ND		ND		ND		ND	
NMeFOSAA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFBA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFBS	1600000	0.00277	J	ND		ND		ND		0.00237	J	ND		ND		ND		ND		ND	
PFDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFDoA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFHpA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFHxA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFHxS	-	0.00358	J	0.00266	J	0.00904	J	0.013	J	0.010	J	0.00779	J	0.00194	J	0.00170	J	0.00202	J	0.00215	J
PFNA	-	0.00456	J	0.00254	J	0.00769	J	0.00812	J	0.00910	J	0.041	J	0.00333	J	0.00779	J	0.00312	J	0.014	J
PFOA	1600	ND		ND		0.012	J	ND		ND		0.018	J	0.013	J	0.012	J	ND		ND	
PFOS	1600	ND		ND		ND		0.279	J	ND		0.048	J	ND		ND		ND		ND	
PFPeA	-	0.00967	J	0.00332	J	0.014	J	ND		0.016	J	0.020	J	0.00892	J	0.00718	J	0.00722	J	0.014	J
PFTeDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFTrDA	-	0.00362	J	0.00545	J	0.00329	J	0.00377	J	0.00704	J	0.012	J	0.00303	J	0.00695	J	0.00869	J	0.00591	J
PFUnDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

▨ Grey Fill	Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
ND	Analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable

Table 6-4
PFAS Detections in Groundwater
Site Inspection Report, Camp Ethan Allen Training Site

	Area of Interest	AOI1									
	Sample ID	AOI1-GW01		AOI1-GW04		AOI1-GW04-D		AOI1-GW05		AOI1-GW06	
	Sample Date	08/07/2019		08/07/2019		08/07/2019		08/07/2019		08/07/2019	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS via PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)											
6:2 FTS	-	9.05		3.58	J	ND		1.68	J	ND	
PFBA	-	4.55	J	3.47	J	3.45	J	3.09	J-	1.93	J
PFBS	40000	1.77	J	ND		ND		2.33	J	ND	
PFHpA	-	2.11	J	5.63	J	5.64	J	5.65	J	ND	
PFHxA	-	5.94	J	9.24		9.59		7.55	J	4.02	J
PFNA	-	1.54	J	ND		ND		ND		1.68	J
PFOA	40	6.82	J	6.75	J	6.97	J	10.9		3.03	J
PFPeA	-	2.69	J	5.32	J	8.77	J	5.25	J	4.14	J

Grey Fill	Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	Duplicate
GW	Groundwater
HQ	Hazard quotient
LOD	Limit of Detection
ND	Analyte not detected above the LOD
OSD	Office of the Secretary of Defense
Qual	Interpreted Qualifier
USEPA	United States Environmental Protection Agency
ng/L	nanogram per liter
-	Not applicable

Table 6-5
PFAS Detections in Surface Water
Site Inspection Report, Camp Ethan Allen Training Site

Area of Interest	AOI1																	
Sample ID	AOI1-SW01		AOI1-SW02		AOI1-SW02-D		AOI1-SW03		AOI1-SW04		AOI1-SW05		AOI1-SW06		AOI1-SW07		AOI1-SW08	
Sample Date	08/07/2019		08/02/2019		08/02/2019		08/02/2019		08/07/2019		08/07/2019		08/02/2019		08/07/2019		08/07/2019	
Analyte	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS via PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																		
PFBA	ND		ND		ND		2.14	J	2.91	J	ND		ND		1.84	J	2.83	J
PFOA	ND		1.59	J	1.70	J	ND		ND		ND		ND		1.72	J	ND	

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

PFBA	perfluorobutanoic acid
PFOA	perfluorooctanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
LOD	Limit of Detection
ND	Analyte not detected above the LOD
Qual	Interpreted Qualifier
SW	Surface water
ng/L	nanogram per liter

Table 6-6
PFAS Detections in Sediment
Site Inspection Report, Camp Ethan Allen Training Site

Area of Interest	AOI1													
Sample ID	AOI1-SD01-00-01		AOI1-SD02-00-01		AOI1-SD02-00-01-D		AOI1-SD03-00-01		AOI1-SD04-00-01		AOI1-SD05-00-01		AOI1-SD06-00-01	
Sample Date	08/07/2019		08/02/2019		08/02/2019		08/02/2019		08/07/2019		08/07/2019		08/02/2019	
Depth	0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Sediment, PFAS via PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)														
PFBA	0.063	J	0.052	J	0.072	J	0.010	J	ND		ND		0.00411	J
PFBS	ND		0.00570	J	0.00615	J	0.00290	J	ND		ND		ND	
PFDA	0.063	J	ND		0.042	J	ND		ND		ND		ND	
PFDoA	0.024	J	0.012	J	0.013	J	0.012	J	ND		ND		0.00587	J
PFHpA	0.074	J	0.055	J	0.073	J	ND		ND		ND		ND	
PFHxA	ND		0.095	J	0.124	J	ND		ND		ND		ND	
PFHxS	ND		ND		0.015	J	ND		ND		ND		ND	
PFNA	0.078	J	ND		ND		ND		ND		ND		ND	
PFOA	0.144	J	0.121	J	0.125	J	ND		ND		ND		ND	
PFOS	0.065	J	0.032	J	0.082	J	0.034	J	ND		ND		ND	
PFPeA	0.089	J	0.081	J	0.091	J	ND		ND		ND		ND	
PFUnDA	ND		0.022	J	0.022	J	0.021	J	ND		ND		0.00661	J

Interpreted Qualifiers

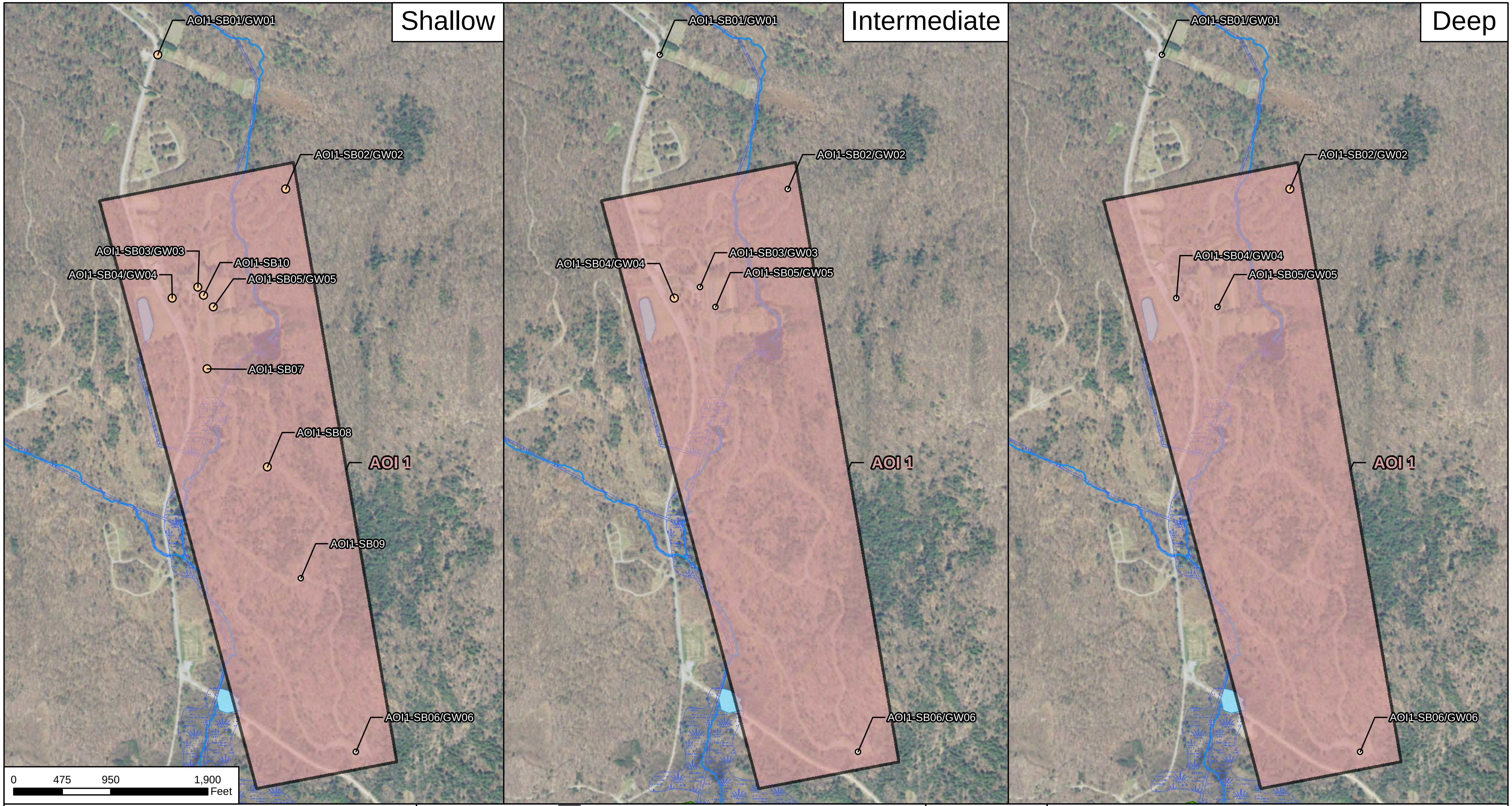
J = Estimated concentration

Chemical Abbreviations

PFBA	perfluorobutyrate
PFBS	perfluorobutane sulfonate
PFDA	perfluorodecanoate
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	Duplicate
ft	feet
LOD	Limit of Detection
ND	Analyte not detected above the LOD
Qual	Interpreted Qualifier
SD	Sediment
ug/Kg	micrograms per Kilogram



▨ Area of Interest
🟩 Facility Boundary
Water Body
Wetland
River/Stream

PFOS Results (µg/Kg)
- ○ ND
- ● >ND - 10
- ● >10 - 130
- ● >130 - 1,600
- ● >1,600

CLIENT	ARNG			
Site Inspection UFP-QAPP at Ethan Allen Training Site, VT				
REVISED	12/21/2020	GIS BY	MS	12/21/2020
SCALE	1:11,400	CHK BY	AM	12/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	12/21/2020

PFOS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-1

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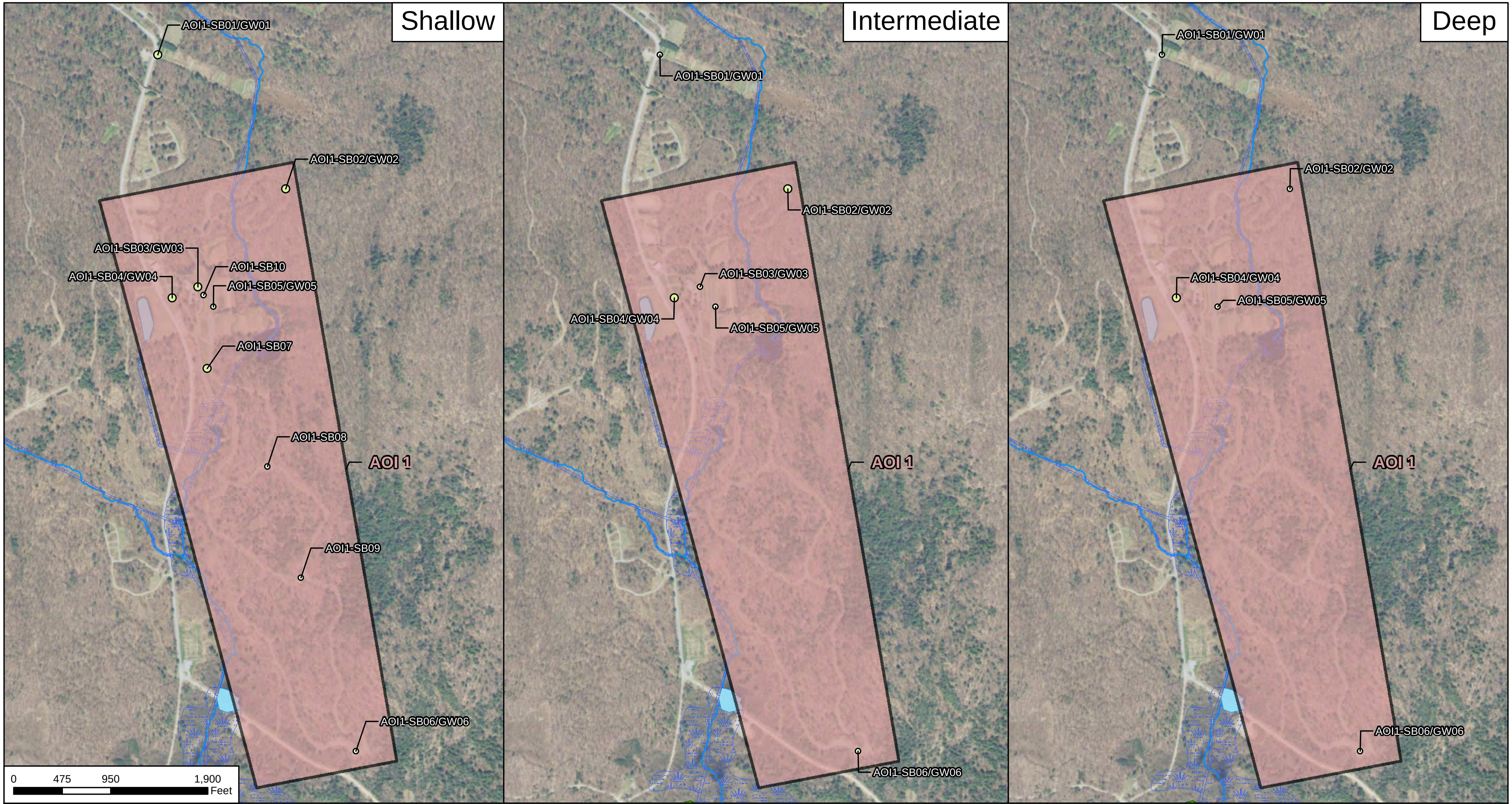


CLIENT ARNG				
Site Inspection UFP-QAPP at Ethan Allen Training Site, VT				
REVISED 12/21/2020	GIS BY	MS	12/21/2020
SCALE 1:11,400	CHK BY	AM	12/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community	PM	RG	12/21/2020

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\VT\TS_Ethan_Allen\TS_Ethan_Allen_SI\TS_Ethan_Allen_SI_Report\Fig_6-2_TS_Ethan_Allen_Soil_PFOA_Results.mxd

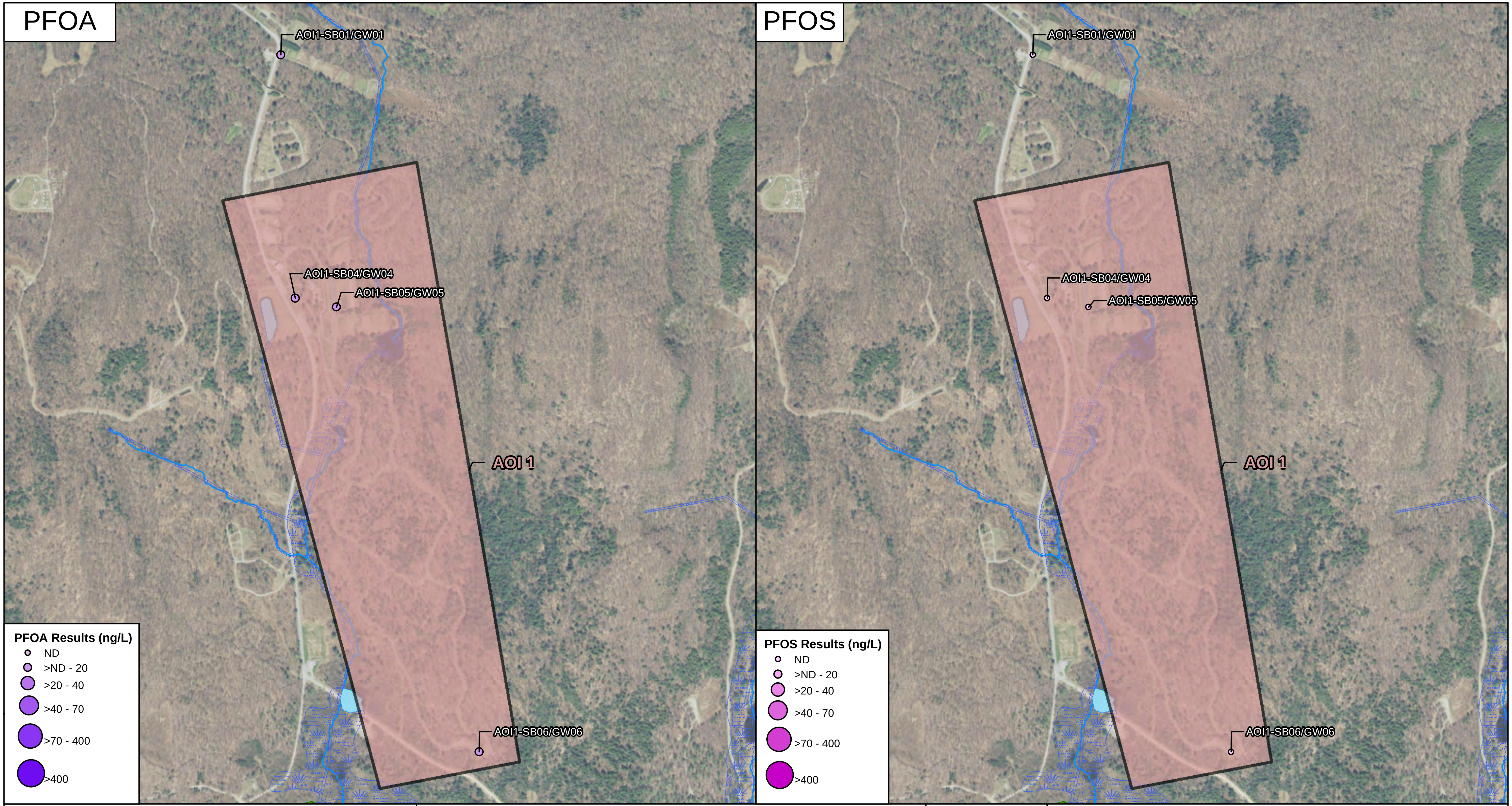
🟥 Area of Interest
🟩 Facility Boundary
Water Body
Wetland
River/Stream

PFOA Results (µg/Kg)
● ND
● >ND - 10
● >10 - 130
● >130 - 1,600
● >1,600

PFOA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-2



CLIENT	ARNG			
Site Inspection UFP-QAPP at Ethan Allen Training Site, VT				
REVISED	12/21/2020	GIS BY	MS	12/21/2020
SCALE		CHK BY	AM	12/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	12/21/2020

Legend

- ▨ Area of Interest
- 🟩 Facility Boundary
- ▨ Water Body
- ▨ Wetland
- — River/Stream

0 475 950 1,900 Feet

PFOA & PFOS Detections in Groundwater

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Germantown, MD 20876

Figure 6-3

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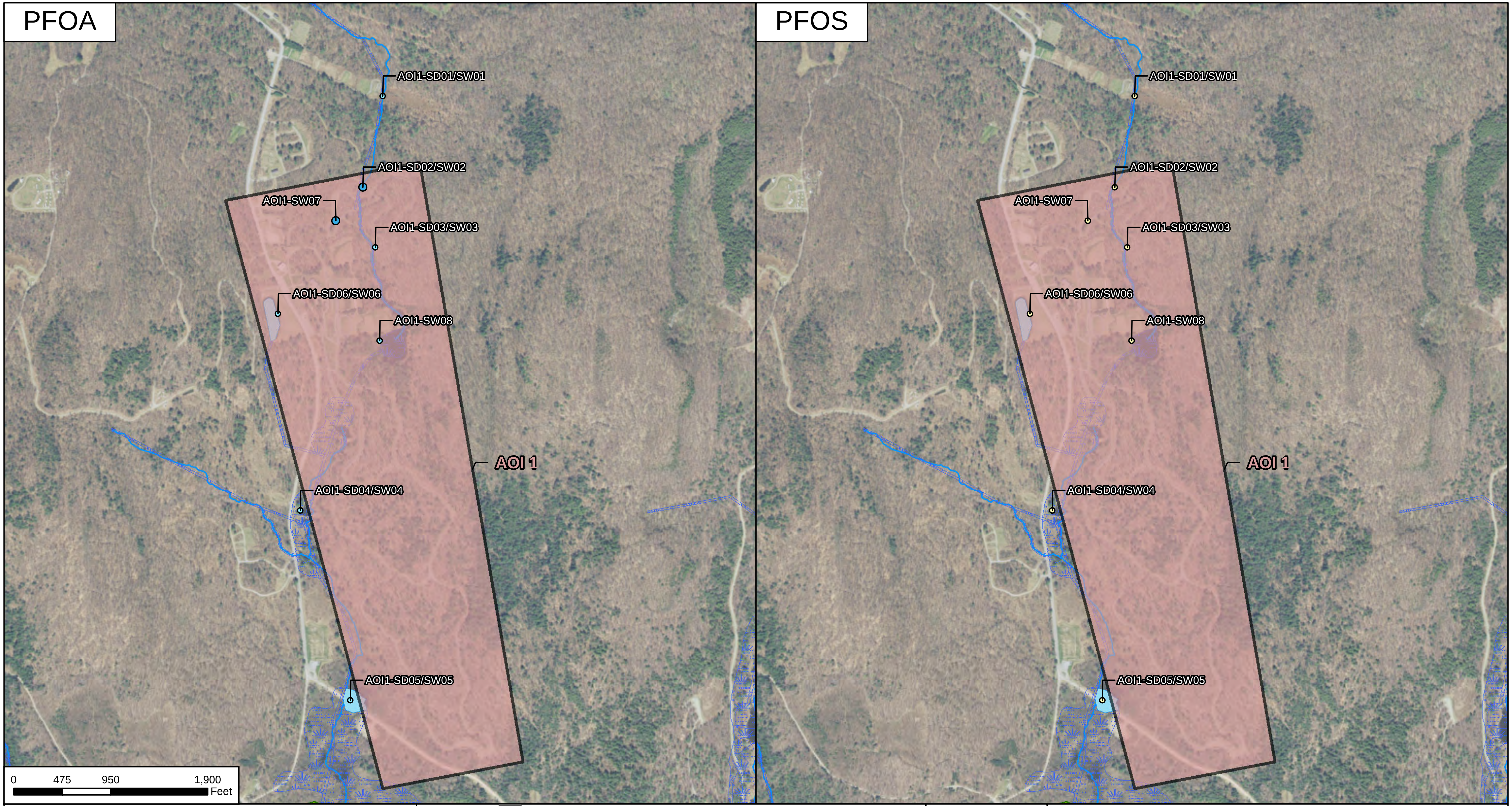

CLIENT	ARNG

Site Inspection UFP-QAPP at Ethan Allen Training Site, VT

REVISED	12/21/2020	GIS BY	MS	12/21/2020
SCALE	1:11,400	CHK BY	AM	12/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	12/21/2020

▨ Area of Interest
▭ Facility Boundary
Water Body
Wetland
River/Stream

PFOA Results (ng/L)
- ○ ND
- ● >ND - 10
- ● >10 -100
- ● >100 - 1,000
- ● >1,000

PFOS Results (ng/L)
- ○ ND
- ● >ND - 10
- ● >10 - 100
- ● >100 - 1,000
- ● >1,000

N

PFOA & PFOS Detections in Surface Water

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Germantown, MD 20876

Figure 6-4

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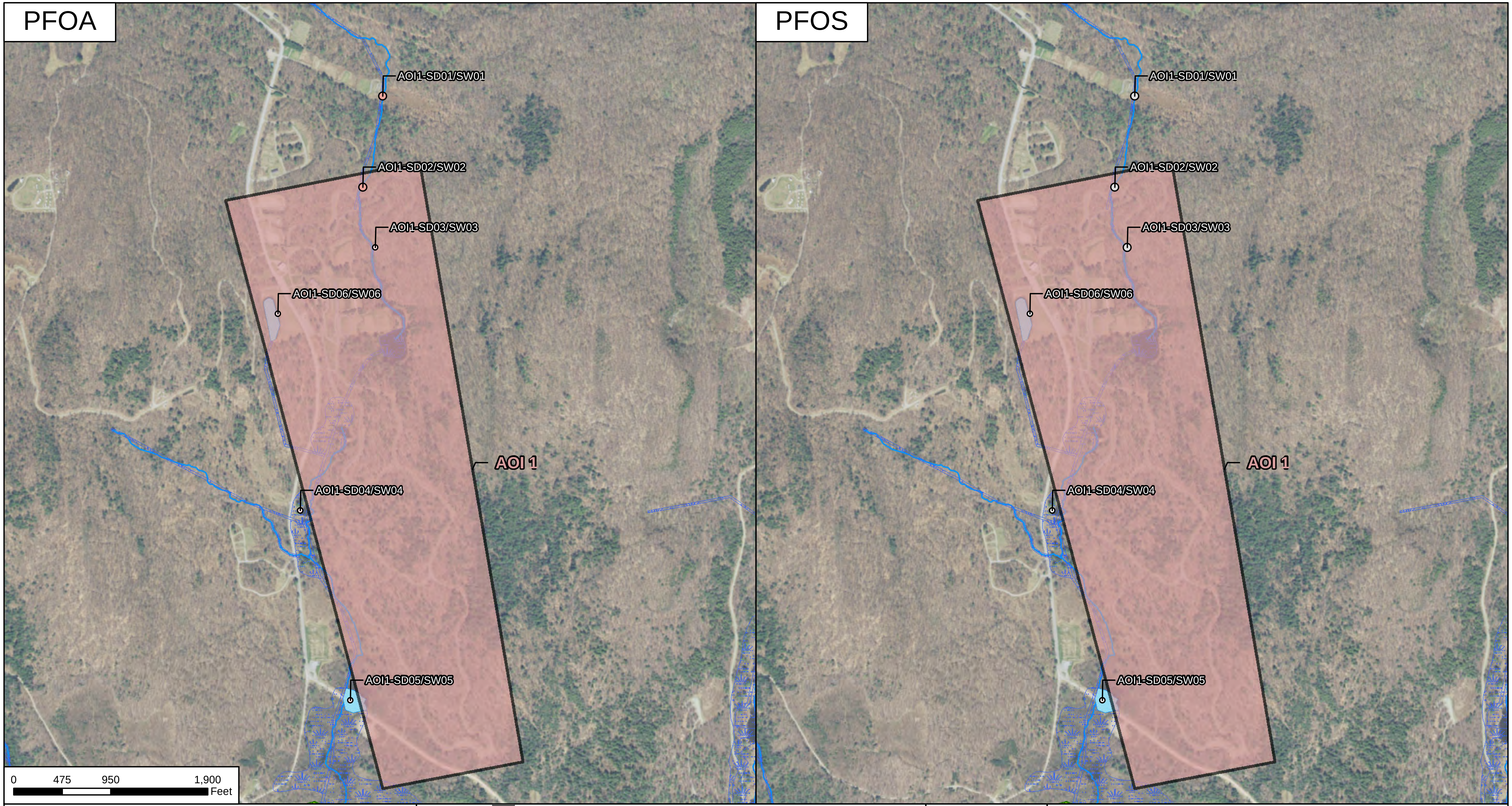

CLIENT	ARNG			
Site Inspection UFP-QAPP at Ethan Allen Training Site, VT				
REVISED	12/21/2020	GIS BY	MS	12/21/2020
SCALE	1:17,155	CHK BY	AM	12/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	12/21/2020

▨ Area of Interest
🟩 Facility Boundary
Water Body
Wetland
River/Stream

PFOA Results (µg/Kg)
○ ND
● >ND - 10
● >10 - 100
● >100 - 1,000
● >1,000

PFOS Results (µg/Kg)
○ ND
● >ND - 10
● >10 - 100
● >100 - 1,000
● >1,000

N

PFOA & PFOS Detections in Sediment

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Germantown, MD 20876

Figure 6-5

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7. Exposure Pathways

The CSM for AOI 1, revised based on the SI findings, is presented on **Figure 7-1**. A CSM presents the current understanding of the site 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 figure uses an empty circle symbol to represent an incomplete exposure pathway. Areas with an incomplete pathway generally warrant no further action. However, the pathway is considered potentially complete if PFOA, PFOS, or PFBS 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 PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway may warrant further investigation or action.

In general, the potential routes of exposure to PFAS 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 PFAS 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, trespassers, residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results for PFOA, PFOS, and PFBS 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

From approximately 1972 to present, PFAS may have been released to soil at four potential release areas associated with the biathlon facility at CEATS: the Waxing Areas, Biathlon Course, Walker Building, and Snowmaking Pond. Remnants of ski wax swept from the Wax Sheds and Walker Building by patrons of the biathlon facility are a potential PFAS source, as is the residual wax left on the snow surface along the 5-kilometer Biathlon Course.

PFOA, PFOS, and PFBS were detected in soil in three source areas (the Waxing Areas, Biathlon Course, and Walker Building). Based on the results of the SI, ground-disturbing activities to surface soil could result in site worker, construction worker, recreational user, and trespasser exposure to PFOA, PFOS, and PFBS via inhalation of dust and ingestion. Ground-disturbing activities to subsurface soil could result in construction worker exposure to PFOA, PFOS, and

PFBS via ingestion. Therefore, the exposure pathways for inhalation and ingestion are potentially complete for these receptors. The CSM is presented in **Figure 7-1**.

7.2 Groundwater Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in groundwater, in addition to the results of drinking water samples collected under the SDWA, 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

The overall direction of deep, bedrock groundwater flow in the Lee River and Mill Brook Valleys is east to west, while localized flow is from the valley walls to the Lee River or Mill Brook. The primary drinking water source for CEATS since 1999 has been the Champlain Water District system; however, bedrock wells are still occasionally used at the facility. Additionally, numerous domestic wells are located off-facility in both Lee River and Mill Brook Valleys. The domestic wells are commonly drilled into bedrock with median well depths of approximately 300 feet bgs. Hydraulic properties and aquifer characteristics vary widely across relatively short distances (Clark et al., 2005).

Drinking water sources at the facility include a potable well (#40293, located south of the Walker Building) used to supply the biathlon facilities located within CEATS. As a state action in accordance with the SDWA, the VTARNG has sampled well #40293 nine times between March 2017 and December 2020. The well #40293 sampling was completed separately from the SI described in this report. Since the initial sampling event, PFAS have consistently been detected in well #40293 above the Vermont MCL, with a maximum detection of PFOS at 40.8 ng/L in December 2020.

The SI groundwater sampling program at CEATS focused on groundwater present in the till above bedrock. Depth to groundwater in the till was observed from 5.33 to 14.32 feet bgs in August 2019. It is suspected that the groundwater present in the till above bedrock is not a continuous aquifer, and that the majority of shallow groundwater flows toward and discharges into nearby surface water drainage features. Among the four groundwater samples collected from temporary wells during the SI, PFOS was not detected. PFOA and PFBS were detected but were below the SLs of 40 ng/L and 40,000 ng/L, respectively.

Based on the results of the SI, in addition to the detections of PFAS in drinking water samples from well #40293 above the Vermont MCL of 20 ng/L (VTDEC, 2020), the groundwater ingestion exposure pathway is considered potentially complete for site workers, recreational users, trespassers, and nearby off-site residents. Additionally, the ingestion exposure pathway is considered potentially complete for construction workers during trenching activities deep enough to encounter shallow groundwater. The CSM is presented in **Figure 7-1**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in surface water and sediment were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.3.1 AOI 1

PFOS, PFOA, and PFBS were detected in surface water and sediment samples collected from tributaries flowing to Lee River to the north and Mill Brook to the south, both downgradient of AOI 1. Therefore, the ingestion exposure pathway for surface water and sediment is considered potentially complete for site workers, construction workers, and trespassers/recreational users. No PFOS, PFOA, or PFBS were detected in surface water or sediment at location AOI1-SW05 (representing surface water flowing off the facility to the south). Therefore, the ingestion exposure pathways in surface water and sediment are considered incomplete for nearby offsite residents. The CSM is presented on **Figure 7-1**.

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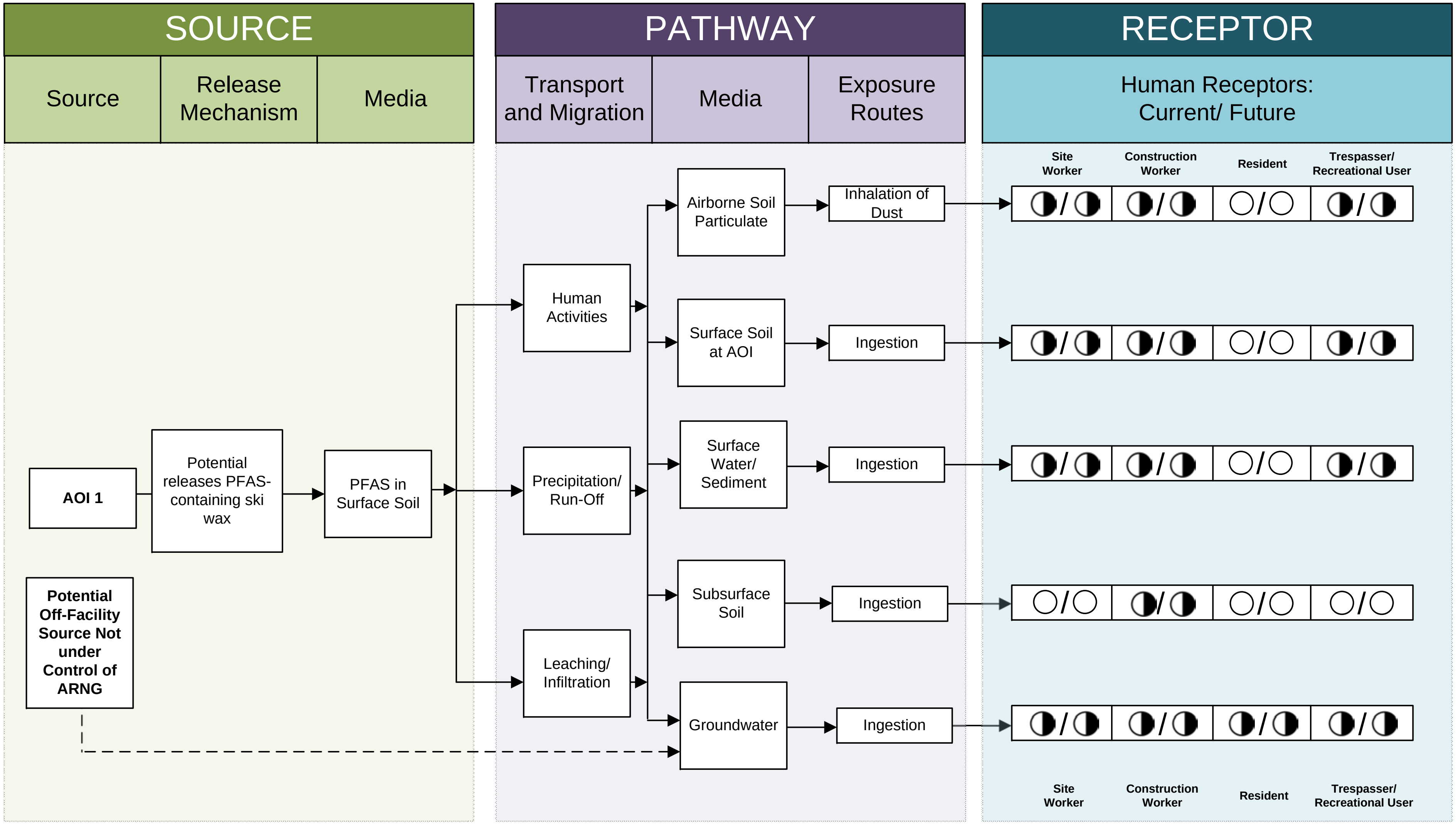

LEGEND

- ——□ Flow-Chart Stops
- ——▶ Flow-Chart Continues
- - - -▶ Partial / Possible Flow
- ○ Incomplete Pathway
- ◐ Potentially Complete Pathway
- ● Potentially Complete Pathway with Exceedance of SL

NOTES

1. The resident and recreational user receptors refer to an off-site resident or recreational user.

2. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-1
Conceptual Site Model
AOI 1 – Biathlon Facility

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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 CEATS were conducted from 2 to 8 August 2019. The SI field activities included soil, groundwater, surface water, and sediment sampling. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2019b), except as previously noted in **Section 5.7**.

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2019b), samples were collected and analyzed for a subset of PFAS by LC/MS/MS compliant with QSM Table B-15 as follows. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.6** of this Report.

- 21 soil samples from 10 locations (soil borings or hand auger locations);
- Four grab groundwater samples from four of the five temporary well locations;
- Six sediment samples; and
- Eight surface water samples, six of which were co-located with sediment samples, and two of which were located downgradient from soil borings where groundwater was unavailable.

The information gathered during this investigation was used to determine if PFOA, PFOS, and/or PFBS were present at or above SLs. Additionally, the CSM was refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure to PFOA, PFOS, and PFBS, as described in **Section 7**.

8.2 SI Goals Evaluation

As described in **Section 4.2**, the SI activities were designed to achieve six main goals or DQOs. This section describes the SI goals and the conclusions that can be made for each based on the data collected during this investigation.

1. *Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.*

   PFOA, PFOS, and PFBS were detected at the facility in soil, groundwater, surface water, and sediment. PFOA, PFOS, and PFBS were detected in the potential PFAS release areas, as well as near the facility boundary between source areas and potential drinking water receptors. However, the detections of PFOA, PFOS, or PFBS in soil or groundwater did not exceed the SLs.

2. *Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.*

   All potential PFAS release areas (the Waxing Areas, Biathlon Course, Walker Building, and Snowmaking Pond) were removed from further consideration under CERCLA based on the soil and groundwater data collected during the SI. PFOA, PFOS, and PFBS were not detected in soil or groundwater above the SLs at AOI 1.

   However, in light of the detections of PFAS in drinking water samples from well #40293 above the Vermont MCL of 20 ng/L, which were collected under a separate action in accordance with the SDWA, there is a potentially complete pathway to drinking water receptors, which include DoD and civilian users of the biathlon facility. Therefore, additional action will be considered under the SDWA. At the time of this report, units are responsible for providing their own water when using the facility.

3. *Determine the potential need for a removal action.*

   Based on the data collected during this SI, no need for a removal action was identified.

4. *Collect data to better characterize the release areas for more effective and rapid initiation of an RI.*

   The geological data collected as part of the SI are consistent with the regional geology of the surrounding area. Observations from shallow borings advanced across AOI 1 indicate a thin layer of glacial till exists overlying weathered bedrock. The glacial till consisted of a heterogeneous sand, silt, and clay matrix with small, subangular gravel. The till thickness varied widely from a few feet thick to upwards of 20 feet depending on the location within the valley and presence of surficial bedrock.

   Depth to water measured from the temporary monitoring wells installed in August 2019 ranged from 5.33 to 14.32 below top of casing; however, it is unlikely the till unit represents a continuous aquifer across AOI 1 given the surficial geology of the area. These geologic and hydrogeologic observations inform development of technical approach for any further investigation.

5. *Identify within 4 miles of the installation other potential PFAS sources (fire stations, major manufacturers, other DoD facilities) and receptors, including both groundwater and surface water receptors, and sample accordingly, in order to determine whether the ARNG is the likely source of PFAS or whether there is an off-facility source of PFAS responsible for installation detections of PFAS (USEPA, 2005).*

   Based upon the evaluation of groundwater and soil results in comparison to SLs, in combination with the groundwater flow direction analysis, the results of the SI indicate that the source of detected concentrations of PFOA, PFOS, and PFBS in soil and shallow groundwater at the facility is likely attributable to ARNG activities at the Biathlon Course; however, the hydrogeological connection and potential migration pathways between the overburden (soil and shallow groundwater) and deep bedrock groundwater are not fully understood and, as a result, it is not understood whether these detections are the source of the PFAS detections in well #40293 (Walker Building well), which has a depth of 225 feet bgs.

6. *Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.*

   Detections of PFOA, PFOS, and PFBS in soil and groundwater at the potential PFAS release areas indicate there was likely a release of PFAS-containing materials, with highest concentrations found in surface soils nearest the Waxing Areas (Walker Building and Waxing Sheds). These detections, in addition to the detections PFAS in drinking water samples from well #40293 above the Vermont MCL of 20 ng/L, indicate there is a potentially complete pathway between source and receptor.

8.3 Outcome

Based on the CSM developed and revised in light of the SI findings, in addition to the results of drinking water samples collected under the SDWA, there is potential for exposure to drinking water receptors from AOI 1 from sources on facility resulting from historical DoD activities.

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

- While detected concentrations indicated a release of PFAS materials, the detected concentrations of PFOA, PFOS, and PFBS in soil samples from AOI 1 were orders of magnitude below the SLs.
- PFOS was not detected in groundwater. PFOA and PFBS were detected in groundwater at AOI 1 at maximum concentrations of 10.9 ng/L and 2.33 J ng/L, respectively, below the SLs of 40 ng/L and 40,000 ng/L, respectively.

Table 8-1 summarizes the SI results for soil and groundwater. **Table 8-2** summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, no further evaluation under CERCLA is warranted at this time.

However, in light of the detections of PFAS in drinking water samples from well #40293 above the Vermont MCL of 20 ng/L, which were collected under a separate action in accordance with the SDWA, there is a potentially complete pathway to drinking water receptors, which include DoD and civilian users of the biathlon facility. Samples of soil and groundwater collected as part of the CERCLA SI show detections of PFOA, PFOS, and PFBS, but they were detected at levels below the OSD SLs. Therefore, additional action will be taken under the SDWA.

Table 8-1 Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Soil – Near Facility Boundary	Groundwater – Source Area	Groundwater – Facility Boundary
1	Walker Building	◐	NA	◐	NA
	Waxing Sheds	◐	NA	◐	NA
	Snowmaking Pond	NA	NA	NA	NA
	Biathlon Course	◐	◐	◐	◐

Legend:

NA = not applicable

● = detected; exceedance of SLs

◐ = detected; no exceedance of SLs

○ = not detected

Table 8-2 Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Walker Building	Detections in soil and groundwater were below SLs.	No further action under CERCLA
	Waxing Sheds		
	Snowmaking Pond		
	Biathlon Course		

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