FINAL
Site Inspection Report
State Military Reservation
Concord, New Hampshire

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

August 2023

Prepared for:

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

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
%	Percent
µg/kg	Microgram(s) per kilogram
AASF	Army Aviation Support Facility
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
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
CSMS	Combined Support Maintenance Shop
DA	Department of the Army
DoD	Department of Defense
DPT	Direct-push technology
DQI	Data quality indicator
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EDR	Environmental Data Resources, Inc.
EIS	Extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
GAC	Granular activated carbon
GPR	Ground-penetrating radar
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
HQ	Hazard Quotient

IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	Liquid chromatography tandem mass spectrometry
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOQ	Limit of quantification
MCL	Maximum Contaminant Level
MIL-SPEC	military specification
MS	Matrix spike
MSD	Matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
NHDES	New Hampshire Department of Environmental Services
No.	Number
OSD	Office of the Secretary of Defense
OWS	Oil-water separator
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
ppt	parts per trillion
PVC	polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RI	Remedial investigation
RPD	Relative percent difference
SI	Site Inspection
SL	Screening level
SMR	State Military Reservation
SOP	Standard Operating Procedure
TCRA	Time Critical Removal Action

TOC	Total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USEPA	U.S. Environmental Protection Agency
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment & Infrastructure Inc.

EXECUTIVE SUMMARY

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

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for the relevant compounds. This SI was completed at the State Military Reservation (SMR) in Concord, New Hampshire and determined that further investigation is warranted for AOI 1: Former Army Aviation Support Facility (AASF). SMR will also be referred to as the "Facility" throughout this document.

The Facility, operated by New Hampshire ARNG (NHARNG), encompasses approximately 50 acres in Concord, New Hampshire. The SMR is located at 1 Minuteman Way, Concord, New Hampshire. The area surrounding the SMR includes residential and commercial properties to the north, the Concord Municipal Airport to the south, commercial and light industrial properties to the east, and additional residential neighborhoods to the west. Conservation/Public Lands are located approximately 0.8 miles to the southeast, adjoining the Soucook River. The SMR currently serves as the headquarters for the NHARNG.

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the two AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted in a Remedial Investigation (RI) for AOI 1, and no further action is warranted for AOI 2.

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

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

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

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Former AASF	●	●	●	Proceed to RI
2	Former Camp LaBonte	○	○	Not applicable	No further action

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

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum regarding Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (Assistant Secretary of Defense, 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum are referred to as "relevant compounds" throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA)[1]. The ARNG performed this SI at the State Military Reservation (SMR) in Concord, New Hampshire. The SMR is also referred to as the "Facility" throughout this report.

The SI project elements were performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. Environmental Protection Agency [EPA] 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 U.S. Department of Army (DA) requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at the SMR (AECOM Technical Services, Inc. [AECOM] 2019) that identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The SMR is located at 1 Minuteman Way in Concord, Merrimack County, New Hampshire, approximately 0.5 miles north-northwest from the Concord Municipal Airport terminal (**Figure 2-1**). The Facility property occupies approximately 50 acres on the east side of the Merrimack River, near the southeastern city limits, east of Interstate 93, and south of Interstate 393. The approximate center of the property is located at geographic coordinates 43°12'35.89"N; 71°30'43.74" W at 363 feet above mean sea level (amsl, AECOM, 2019).

The property was originally known in the late 1800s as the State Military Campground for the New Hampshire State Militia; additionally, it was known in 1886 as "Camp Langdon." In 1885, the State of New Hampshire entered into a 99-year lease with the City of Concord for use and development of the grounds on which the National Guard trained. Additional parcels of the property were deeded or leased to the City of Concord in 1911, 1937, 1942, and 1954, and the State of New Hampshire formally acquired the property in 1959 (The Louis Berger Group, Inc., 2006; AECOM, 2019). The property is currently owned by the State of New Hampshire and is used for state operations of the NHARNG. The SMR currently serves as the headquarters for the NHARNG. Facilities at the SMR include a warehouse, a maintenance shop, Joint Force Offices, the Concord Armory, and a Civil Support Teams building (Tighe & Bond, 2018; AECOM 2019).

An Army Aviation Support Facility (AASF) was located at the SMR in Building K from the 1960s to 2004. Typical activities conducted at the AASF included maintenance and repair of fixed-wing and rotary aircraft, storage and dispensing of fuel, and mechanical servicing and cleaning of helicopter interiors and exteriors (NHARNG, 1996; AECOM, 2019). The initial building for the AASF hangar (later known as the Ground Power Annex) was designed in 1959 and constructed between 1960 and 1961. Aerial photographs show that the initial building was present in 1960, 1967, and 1969. According to interviews with former AASF personnel, Bell helicopters and TH-55 helicopters were present at the SMR in the 1960s. In 1974, an addition to the original building was constructed to create Building K (The Louis Berger Group, Inc., 2006; AECOM, 2019). AASF operations continued at Building K until 2004, at which time operations were moved to a new AASF located at 26 Regional Drive, 0.5 mile to the east. The former Building K was incorporated into the current Joint Force Headquarters building.

The SMR is completely secured by a 6-foot fence, which consists of chain-link fence secured by a brick column and ornamental iron fencing barrier. Access to the Facility is through monitored gates at the perimeter of the Facility on Pembroke Road and on Minuteman Way via Regional Drive.

2.2 FACILITY ENVIRONMENTAL SETTING

The SMR is located within the Merrimack Valley in southern New Hampshire, within the Eastern New England Upland Physiographic Province of the Appalachian Highlands. The New England Upland consists of a maturely dissected plateau with narrow valleys, and the entire area was greatly modified by glaciation. The City of Concord developed along the Merrimack River and lies fully within the Merrimack River watershed (AECOM, 2019). The City of Concord has

a population of approximately 43,000 people, according to the 2017 US Census (US Census, 2018; AECOM, 2019).

The following sections include information on soil, hydrogeology, hydrology, climate, and current and future land use. The topography at the Facility is shown on **Figure 2-2**. The regional geology and groundwater features are shown on **Figure 2-3**. The regional surface water features are shown on **Figure 2-4**. Groundwater elevations and contours are presented on **Figure 2-5**.

2.2.1 Geology

Regional geology consists of unconsolidated glacial material overlying igneous and metamorphic rocks that were deposited during the Wisconsin stage of glaciation, of the Pleistocene Epoch during the Quaternary Period. The weight of the ice caused differential depressions of the land surface during the Pleistocene Epoch. The southeastward flow of glacial ice scoured the rock surface, and as the ice melted, it deposited a thick blanket of glacial till in many areas. Meltwater streams deposited a variety of ice-contact sands and gravels upon portions of the till sheet (U.S. Army Environmental Hygiene Agency [USAEHA], 1993). Geologic features near the Facility are shown on **Figure 2-3**.

The unconsolidated material, which is mainly ground moraine, was originally subglacial till, that was left scattered over the ground after the ice melted. A ground moraine consists of scattered boulders combined with cobbles, gravel, pebbles, sand, silt, and clay, with some areas of ice contact stratified drift. This stratified drift was derived from englacial and subglacial meltwater streams that also carried gravel, sand, silt, and clay (USAEHA, 1993; Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019).

Numerous environmental investigations have been conducted nearby the subject property for the Former Vishay Sprague Site, located at 70 Pembroke Road (approximately 0.4 miles east of the subject property). These investigations have indicated that the local geology is underlain by up to about five feet of fill overlying a relatively thick sequence (about 160 to 200 feet [ft]) of glacial deposits overlying granitic bedrock. Bedrock in the vicinity consists predominantly of moderately fractured, medium-grained, two-mica granite. The bedrock surface generally slopes downward from west to east (GZA GeoEnvironmental, Inc., 2010; AECOM, 2019).

In the immediate vicinity of the Facility, overlying bedrock is an approximately 25- to 50-foot-thick lacustrine deposit consisting of very dense, thinly interbedded silt, silt and clay, and fine sand. This stratum is overlain by an approximately 50- to 60-foot-thick section of glacial till consisting of very dense, fine to medium sand with clayey silt and gravel. Lacustrine sediments similar to those underlying the glacial till overlie the glacial till with thicknesses ranging from about 15 to 40 ft. Outwash deposits consisting predominantly of fine sand top the overburden stratigraphy with a thickness ranging from about 50 to 85 ft (GZA GeoEnvironmental, Inc., 2010; AECOM, 2019).

During the SI, borings were advanced between 5 and 60 ft below ground surface (bgs). The soil was classified predominately as sand with varying percentages of fines and gravel. Samples for grain size analyses were collected at the two AOIs at locations AOI01-04 and AOI02-02. The results indicate that the soil samples are comprised primarily of sand (65.4 percent [%] to 64.7%,

respectively) and fines (29.2% and 29.1 %, respectively) with some gravel (5.4% and 6.2%, respectively). These results and Facility observations are consistent with the reported depositional environment of the region. Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

The overburden hydrogeology in the area generally consists of a dual hydrogeologic unit system separated by the glacial till stratum. The upper unit consists of the saturated lacustrine and/or outwash deposits overlying glacial till, whereas the lower unit consists of the lacustrine deposits underlying the glacial till. Hydraulic communication between the upper and lower units is likely, with the glacial till forming only a partial aquitard. The upper overburden unit is unconfined, with the resultant groundwater surface at a pressure equal to atmospheric. The lower unit is partially confined by the glacial till, with the resultant groundwater surface at a pressure greater than atmospheric. Groundwater elevations within the upper unit are typically observed to be about 10 to 15 feet higher than those of the lower unit, indicating a loss in total head through the glacial till aquitard, and a vertically downward component of groundwater flow (GZA GeoEnvironmental, Inc., 2010; AECOM, 2019).

A site investigation was conducted in 1997 at the SMR to evaluate the presence or absence of metals and volatile organic compounds in soil and groundwater associated with several potential contamination areas (former Drywells A, B, and C; former UST and Pumphouse R; and Upgradient areas of concern). The site investigation report stated that all detected constituents were below applicable screening levels and recommended no further action. During the SI, groundwater was encountered from approximately 41 feet to 51 feet (Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019). Based on investigations at the nearby Former Vishay Sprague Site, groundwater in the vicinity is expected to be 30 to 50 feet below ground surface (bgs) (GZA GeoEnvironmental, Inc., 2018). Both investigations indicated that overburden groundwater flow was to the west-southwest, toward the Merrimack River, which is located 0.8 miles to the west/southwest. Groundwater features in the vicinity of the Facility are shown on **Figure 2-3**.

Static groundwater elevations measured in June 2022 during the SI ranged from 40.8 to 54.0 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-5** and indicate the groundwater flow direction at the SMR is primarily to the west/southwest.

The Environmental Data Resources, Inc. (EDR) Radius Map report did not identify any public supply wells at the SMR or within a 1-mile radius (EDR, 2019; AECOM, 2019). One domestic well and one commercial well were identified in the EDR Radius Map approximately 0.5 miles to the east, and side gradient of the Facility. Additionally, four wells were identified on the Facility and according to ARNG personnel, the wells were used for a geothermal system that is no longer in use, however, have not been officially decommissioned. Locations of the wells are shown on **Figure 2-3**.

Water at the SMR is supplied by municipal water from the City of Concord. Third Unregulated Contaminant Monitoring Rule data were reviewed as part of the PA. PFAS were non-detect for

the Concord Water Department treatment plant, which is located 4.3 miles northwest of the Facility, on the west side of the Merrimack River (USEPA, 2017; AECOM, 2019).
The primary water source for the Concord community is Penacook Lake, located 4 miles northwest of the Facility, on the west side of the Merrimack River. During dry periods, the lake is supplemented with water from Contoocook River Pump Station, which is located further northwest of Penacook Lake. Additionally, a groundwater well field adjacent to the Soucook River in Pembroke is maintained as an emergency water source (City of Concord, 2019c). The Pembroke well field is approximately 1.6 miles southeast of the Facility, on the opposite side of the Soucook River. None of these drinking water resources are anticipated to be hydraulically downgradient from the Facility.

2.2.3 Hydrology

The SMR is located within the central portion of the Merrimack River watershed, which stretches from central New Hampshire into Northeastern Massachusetts. The nearest major surface water bodies are the Merrimack River, located approximately 0.8 miles to the west of the Facility, and the Soucook River, located approximately 1 mile to the southeast. The Merrimack River is popular for recreational use, including boating, canoeing, rowing, and fishing (New Hampshire Department of Environmental Services [NHDES], 2017; AECOM, 2019). Based on the depth of the Merrimack River (5 to 40 ft or more; Concord Monitor, 2013; AECOM, 2019) and the depth to groundwater in the area (estimated to be 30 to 50 ft bgs), it is possible that groundwater to surface water discharge may occur at points along the river downgradient of the site. No wetlands exist within the vicinity of the Facility. Surface water features in the vicinity of the Facility are shown on **Figure 2-4**.

The topography of the Facility and in the surrounding area is relatively flat. Much of the Facility is paved with either asphalt or concrete, with unpaved grassy areas along the boundaries of the Facility. Surface water in the general vicinity flows westerly towards the Merrimack River. Stormwater at the SMR is currently managed utilizing a series of drainage basins and trenches for infiltration, which allow the majority of stormwater to infiltrate into the ground onsite. The Combined Support Maintenance Shop (CSMS) and unit vehicle parking area are outfitted with oil-water separator (OWS)-equipped catch basin drains that precede discharge to the Concord municipal storm drain system on Airport Road. The drainage within the storm drain system from Airport Road flows westward down Loudon Road and then to the Merrimack River, which is approximately 0.5 miles to the west of the SMR. Storm drains in the northeast corner of the SMR are also connected to the Concord municipal storm drainage system. In the northern portion of the Facility, stormwater runoff flows into scattered catch basins that discharge to the storm drain in Pembroke Road. This stormwater also flows westward into the storm drain system on Loudon Road and ultimately to the Merrimack River (VHB, 1993; Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019).

From the 1970s to approximately 2006, drywells were used to manage stormwater at the SMR. Historic reports for the SMR indicate that 14 drywells were present at the Facility. Seven of the drywells (DW-1 through DW-7) were located downgradient of the UH-60 helicopter pads and may have received drainage from these areas. According to Facility personnel, two of the drywells formerly received drainage from the refueling area (DW-9 and DW-10), and one received drainage downgradient of the Ground Power Annex (DW-8). Drywells DW-1 through

DW-10 were installed in the 1972 to 1974 timeframe (Jacques Whitford Company, Inc., 2003; AECOM, 2019). DW-A was located north-northwest from the blacktop driveway at the Airport Road gate, northeast of the boundary fence. DW-B was located 20 feet southeast from the southeast wall of the former AASF building (Building K). DW-C was located 160 feet southwest from the southeast corner of the former AASF building. An additional unnamed drywell was located on the northwest side of former Building K and southwest of DW-8 (labeled as DW-Z in the PA and in this document). Some of the drywells were removed or filled in the 1990s (Stone & Webster Environmental Technology & Services, 1998). According to interviews with NHARNG personnel, the remainder of the drywells were removed in 2006, with the exception of DW-1, which is still present at the Facility (shown on **Figure 2-5**).

2.2.4 Climate

The Facility lies within the humid continental climate zone, which is characterized by long, cold, snowy winters, very warm (and at times humid) summers, and relatively brief autumns and springs. The monthly daily average temperature ranges from a high of 31 degrees Fahrenheit (°F) in January to 82°F in July. In winter, successive storms deliver light to moderate snowfall amounts, which contribute to the relatively reliable snow cover. Summer can bring stretches of humid conditions as well as thunderstorms, and there is an annual average of 12 days of 90°F highs. Average annual precipitation is approximately 41 inches (US Climate Data, 2019; AECOM, 2019).

2.2.5 Current and Future Land Use

The Facility is zoned “industrial” by the City of Concord. The Facility is fenced with restricted access. Much of the Facility is paved with either asphalt or concrete. Approximately 15 acres of the SMR is a fully vegetated Pine Barrens Habitat area, which was created as mitigation to compensate for the habitat loss at the AASF currently located at 26 Regional Drive, Concord, New Hampshire. The SMR currently serves as the headquarters for the NHARNG. Facilities at the SMR include a warehouse, a maintenance shop, Joint Force Offices, the Concord Armory, and a Civil Support Teams building (Tighe & Bond, 2018; AECOM, 2019). Activities and land use within the Facility are not expected to change.

The area surrounding the SMR includes residential and commercial properties to the north, the Concord Municipal Airport to the south, commercial and light industrial properties to the east, and additional residential neighborhoods to the west. Conservation/Public Lands are located approximately 0.8 miles to the southeast, adjoining the Soucook River. Future land use of the surrounding area is not anticipated to change.

2.2.6 Sensitive Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the Facility; however, NHARNG is tracking locations of rare plants at the SMR. According to Facility personnel, the Grasshopper Sparrow, a State-threatened grassland bird, is often sighted in the vicinity of the SMR Facility. Additionally, the Pitch Pine woodland habitat on the SMR is permanently protected by the NHARNG in support of restoration efforts.

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Merrimack County, New Hampshire (US Fish and Wildlife Services, 2022):

Insects: Karner Blue Butterfly *Lycaeides melissa samuelis* (endangered); Monarch Butterfly *Danaus plexippus* (candidate)

Mammals: Northern Long-eared Bat *Myotis septentrionalis* (threatened)

Flowering Plants: Northeastern Bulrush *Scirpus ancistrochaetus* (endangered); Small Whorled Pogonia *Isotria medeoloides* (threatened)

2.3 HISTORY OF PFAS USE

The PA identified two AOIs where PFAS were potentially released to soil and groundwater, within the boundary of the SMR. The former AASF and former Camp Labonte AOIs were identified based on preliminary data and inferred groundwater flow direction.

The former AASF was located at the SMR from the 1960s to 2004. Typical activities conducted at the AASF (Building K) included maintenance and repair of fixed-wing and rotary aircraft, storage and dispensing of fuel, and mechanical servicing and cleaning of helicopter interiors and exteriors (NHARNG, 1996; AECOM, 2019). AOI 1 is comprised of multiple sub-areas within the former AASF where PFAS may have been released; the former AASF hangar, the former fire truck parking area, the former washing platform (known as the "washrack"), former aircraft parking area, and the former Tri-Max™ training area. Additionally, drywells which were present throughout the Facility may act as a secondary source of PFAS to the environment where located proximate to a potential PFAS release.

One documented release of aqueous film forming foam (AFFF) from the former AASF hangar (Building K) fire suppression system occurred in 1999. Additionally, a second release of AFFF from the fire suppression system was recalled by one interviewee on an unknown date. After the releases, the foam was either washed into a trench drain inside the hangar or washed out of the hangar onto the apron to the east of the building, from there it would have entered the municipal sewer system; however, unintentional releases may have occurred to the nearby grassy areas (AECOM, 2019).

Former AASF personnel indicated that foam was used on two fire trucks at the SMR between the late 1960s and 1992. Both fire trucks were regularly parked in a crash/rescue bay on the north side of former Building K. Because the dates of use of the fire trucks overlap with the use of AFFF, there is the potential for the foam to have contained PFAS (AECOM, 2019). Unintended spills or releases of foam from the fire trucks may have occurred in the parking bay or to the asphalt outside the bay if the fire trucks were parked outside. Additionally, when the second fire truck was in use (pre- 1977 to 1992), foam was sprayed on the pavement at the former AASF (Building K) and then rinsed into the storm drains (AECOM, 2019). The location of the former fire truck parking bay is shown on **Figure 3-1**.

According to NHARNG personnel, aircraft maintenance was conducted inside the hangar at Building K but aircraft washing was conducted outside at the washing platform, also known as a washrack. There is the potential for unintended spills or releases of PFAS from the washing platform or the associated rinsate after washing aircraft or fire trucks.
Six Tri-Max™ mobile fire extinguishers were stored outside on the former AASF apron (one beside each helicopter) during the time that helicopters were stationed at the SMR. Given the long-term storage of the Tri-Max™ extinguishers in a non-climate-controlled environment, there is the potential for unintended spills or releases of PFAS from the extinguishers (AECOM, 2019). Additionally, the tanks would be periodically emptied as part of training exercises that occurred north of the former runway.

According to former AASF personnel, two fire trucks with foam capabilities were present at the SMR between the late 1960s and 1992. When the first fire truck was in use (late 1960s to pre-1977), foam was used for training on the grass and gravel to the north of the former Camp Labonte, at the SMR, at approximate geographic coordinates 43°12'38.9"N; 71°30'40.1"W (AECOM, 2019). However, no additional information was available on whether the foam contained AFFF. Because the first fire truck was potentially in use after the introduction of AFFF, a release of PFAS in the former Camp Labonte area is possible.

A description of each AOI is presented in **Section 3**.

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Insert Figure 2-1. Facility Location

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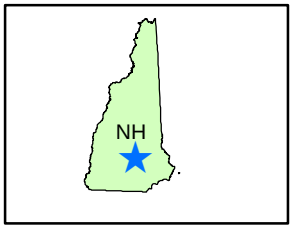
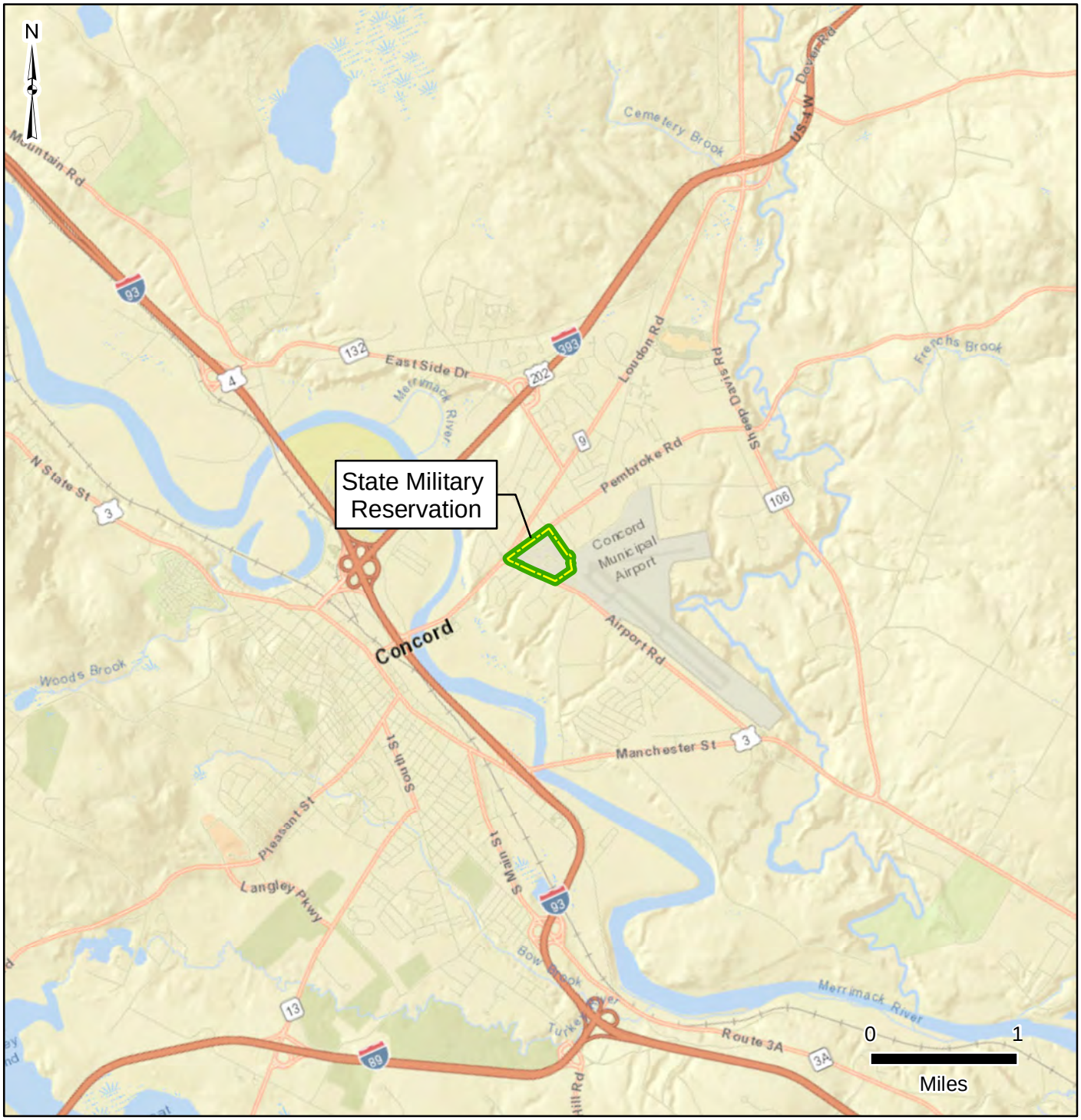
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 2-1
Facility Location





Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
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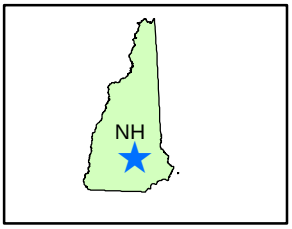
Figure 2-2
Facility Topography



Facility Data

Facility Boundary

Note:
Contour elevation recorded in ft. asml.

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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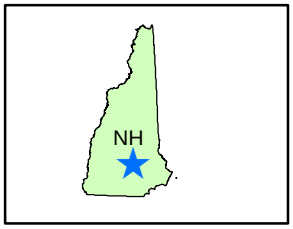
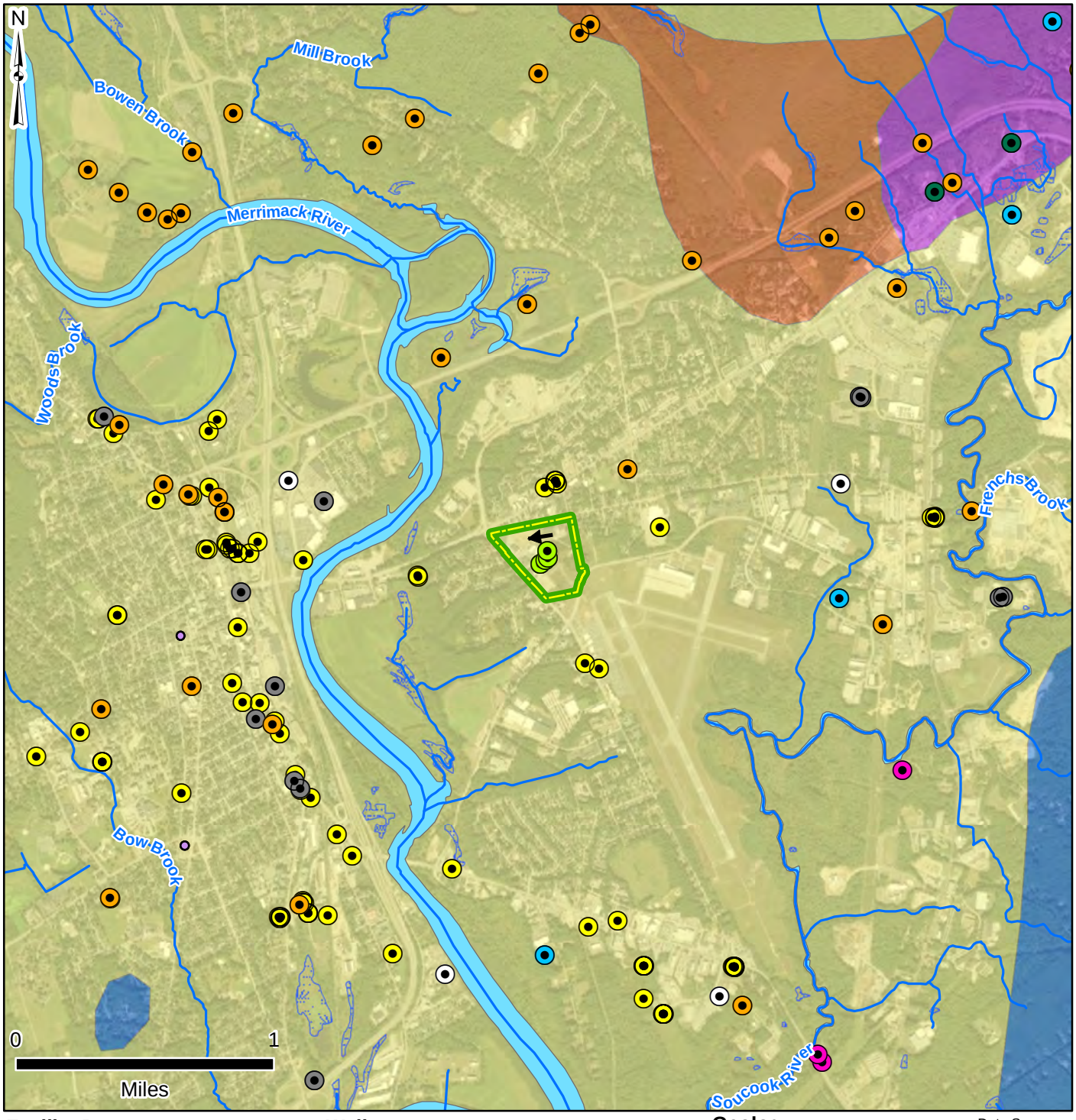
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 2-3
Groundwater Features





Facility Data
- Facility Boundary

Hydrology/ Hydrogeology
- Groundwater Flow Direction
- River/Stream
- Water Body
- Wetland

Wells
- Geothermal Well
- Other/Unkown Well
- Abandoned Well
- Agricultural Well
- Commercial Well
- Domestic Well
- Monitoring Well
- Public Water Supply Well

Geology
- Concord Granite
- Lower Rangley Formation
- Upper Rangley Formation
- Perry Mountain Formation

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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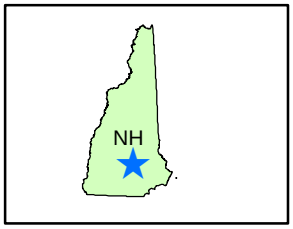
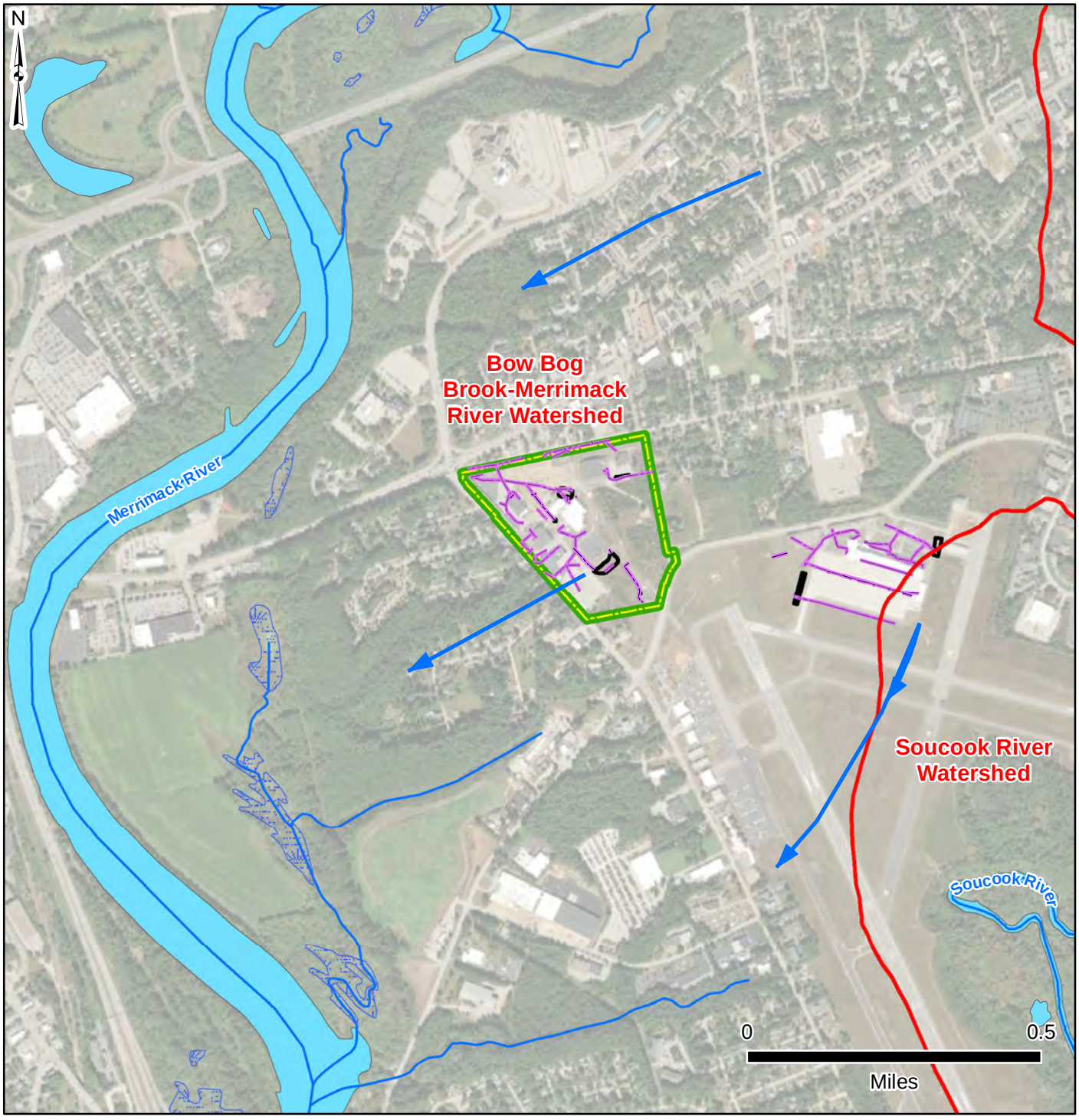
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 2-4
Surface Water Features





Facility Data
- Storm Sewer Line
- Facility Boundary
- Retention Basin

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Wetland
- Watershed
- River/Stream
- Water Body

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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3. SUMMARY OF AREAS OF INTEREST

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, six potential release areas were identified at SMR and grouped into two AOIs identified as: AOI 1 Former AASF and AOI 2 Former Camp LaBonte. These AOIs are described below and shown on **Figure 3-1**.

3.1 AOI 1 – FORMER ARMY AVIATION SUPPORT FACILITY

AOI 1 is the Former AASF, including the former main AASF hangar (former Building K) fire suppression system releases, the former fire truck parking area, the former washing platform, the former aircraft parking apron, the dry wells, and the Tri-Max™ training area. Potential PFAS release mechanisms within this AOI are described below.

The former AASF was located at the SMR from the 1960s to 2004. Typical activities conducted at the AASF (Building K) included maintenance and repair of fixed-wing and rotary aircraft, storage and dispensing of fuel, and mechanical servicing and cleaning of helicopter interiors and exteriors (NHARNG, 1996; AECOM, 2019). AOI 1 is comprised of multiple sub-areas within the former AASF where PFAS may have been released; the former AASF hangar, the former fire truck parking area, the former washing platform (known as the "washrack"), former aircraft parking area, and the former Tri-Max™ training area. Additionally, drywells, which were present throughout the AASF, may act as a secondary source of PFAS to the environment, where located proximate to a potential PFAS release.

Former AASF Hangar
The first building for the AASF hangar was constructed between 1960 and 1961, and helicopters were present at the SMR in the 1960s. In 1974, an addition to the original building was constructed to create Building K (The Louis Berger Group, Inc., 2006; AECOM, 2019). The Aircraft Maintenance Hangar was located in the center of former Building K, at approximate geographic coordinates 43°12'37.4"N; 71°30'46.6"W (AECOM, 2019).

According to interviews with former personnel, a fire suppression system was installed in the hangar in 1994. No fire suppression system was present prior to this time, despite aircraft operations beginning in the 1960s. The system was charged with 3% AFFF from 1994 to 2004. No additional information on the type of AFFF, frequency of testing, or system maintenance was available. The system was removed in 2004, when operations were moved to the new AASF at 26 Regional Drive, located 0.5 miles to the east of the Facility. The majority of former Building K was demolished at that time, except for the main hangar. The current Building 1 was constructed by November 2007, around the former hangar. The former hangar is now used as a large drill and assembly hall for the Joint Force Headquarters.

One documented release of AFFF from the fire suppression system occurred on 23 July 1999. According to interviewees, a fire was triggered using a lighter to ignite accelerants located in the Communications Room of Building K. The amount of AFFF released is unknown. After the release, the foam was either washed into a floor drain trench inside the hangar or washed out of the hangar onto the apron to the east of the building. The trench drain inside the hangar led to a 1,000-gallon OWS located outside the building, and then to the municipal sewer system, per the

terms and conditions of City of Concord Industrial Discharge Permit No. H-37 (VHB, 1993; NHARNG, 1996; AECOM, 2019). The location of the 1,000-gallon OWS is presumed to be on the southwest side of former Building K, based on historic figures from the 1998 SI Report (Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019). Foam washed onto the apron would have entered a catch basin that discharged to the municipal sewer system. The location of the former AASF (Building K) fire suppression system release is shown on **Figure 3-1**.

A second release of AFFF from the fire suppression system was recalled by one interviewee, during the PA, who stated the hangar quickly filled up with foam. However, the date of this incident and the quantity of AFFF released was unknown. The foam from this release is presumed to have been managed in the same manner as the first release.

Former Fire Truck Parking Area
Former AASF personnel indicated that two fire trucks were used at the SMR during AASF operations. The first was a former 1940s vintage LaFrance fire truck, which moved to the SMR from Manchester Airport in the 1960s. The vintage LaFrance fire truck was removed from the Facility sometime prior to 1977 (the exact date is unknown). The second fire truck was tank-mounted on a deuce and a half truck, which was introduced to the SMR sometime prior to 1977 and was removed from the site in 1992. Both fire trucks were regularly parked in a crash/rescue bay on the north side of former Building K, at approximate geographic coordinates 43°12'38.2"N; 71°30'47.0"W (AECOM, 2019).

Interviewees indicated that foam was used by both fire trucks. Although interviewees recalled that two types of foam were used, no additional information was available on the dates of foam use, the type of foam used, or whether the foam contained AFFF. Because the dates of use of the fire trucks overlap with the use of AFFF, there is the potential for the foam to have contained PFAS. Unintended spills or releases of foam from the fire trucks may have occurred in the parking bay or to the asphalt outside the bay if the fire trucks were parked outside. Additionally, former AASF personnel indicated that when the second fire truck was in use (pre- 1977 to 1992), foam was sprayed on the pavement at the former AASF (Building K) and then rinsed into the storm drains. The location of the former fire truck parking bay is shown on **Figure 3-1**.

Former Washing Platform ("Washrack")
During the former AASF operations, aircraft maintenance and washing was conducted outside at the washing platform (known as the "washrack"). The washrack was located at approximate geographic coordinates 43°12'39.1"N; 71°30'45.3"W (AECOM, 2019). Rinsate generated in the washrack was collected in a blocked sump at that location and pumped into a mobile holding tank. The holding tank was then wheeled into the hangar's maintenance area and pumped into the same floor drain trench at the front of the hangar, which led to a 1,000-gallon OWS located outside the building, and then to the municipal sewer system (VHB, 1993; NHARNG, 1996). However, there is the potential for unintended spills or releases of PFAS from the washrack after washing aircraft or fire trucks. No documentation or information were available on the type, quantity, and concentration of AFFF, which may have been released from the washrack. The location of the former washrack is shown on **Figure 3-1.**

Former Aircraft Parking Area

According to interviews with former AASF personnel, six Tri-Max™ mobile fire extinguishers were stored outside on the former AASF (Building K) apron (one beside each helicopter) during the time that helicopters were stationed at the SMR (from the 1960s to 2004). The center of the parking apron was approximately located at geographic coordinates 43°12'37.8"N; 71°30'43.1"W (AECOM, 2019). No spills or releases were reported from the Tri-Max™ extinguishers, and interviewees could not confirm if routine inspections were performed on the tanks. Given the long-term storage of the Tri- Max™ extinguishers in a non-climate-controlled environment, there is the potential for unintended spills or releases of PFAS from the extinguishers. No additional documentation or information were available on the type, quantity, and concentration of AFFF stored in the Tri-Max™ extinguishers. All Tri-Max™ mobile fire extinguishers were removed from the Facility and sent for disposal in approximately 2004. The area is now a parking lot. The former aircraft parking area is shown on **Figure 3-1**.

Former Tri-Max™ Training Area

The Tri-Max™ mobile fire extinguishers used at the former aircraft parking area would be periodically discharged as part of training exercises that occurred in an area south of the aircraft parking area and north of the former runway. No information on the frequency of training or discharge volumes was available. The approximate location of the former Tri-Max™ training area is shown on **Figure 3-1**.

Former and Current Drywells

From the 1970s to approximately 2006, drywells were used to drain stormwater at the SMR. According to historic records (as noted below), there were 14 drywells at the SMR. There is potential for AFFF from the hangar fire suppression system release in 1999, or from unintended spills or releases in the other identified areas, to have entered the drywells. Thus, the drywells may be secondary sources of PFAS. Some of the drywells were removed or filled in the 1990s (Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019). According to interviews with NHARNG personnel, the remainder of the drywells were removed shortly before construction began on Building 1 (Joint Force Headquarters) in 2007, with the exception of DW-1, which is still present at the Facility.

- DW-1 through DW-10 - Seven of the drywells (DW-1 through DW-7) were located downgradient of the former UH-60 helicopter pads and may have received drainage from these areas. According to Facility personnel, two of the drywells formerly received drainage from the refueling area (DW-9 and DW-10), and one received drainage downgradient of the Ground Power Annex (DW-8). Drywells DW-1 through DW-10 were installed in the 1972 to 1974 timeframe (AECOM, 2019). The base of DW-8 was approximately 14 feet in diameter and 17 feet in depth. The remaining dry wells ranged from 10 to 15 feet deep and from 7 to 10 feet in diameter (Jacques Whitford Company, Inc., 2003; AECOM, 2019). Downgradient impacts to soil and groundwater from DW-1 through DW-10 were evaluated in a 2003 Limited Site Investigation (Jacques Whitford Company, Inc., 2003), and a monitoring well (MW-1) was installed adjacent to DW-8 to investigate a known release of No. 2 Fuel Oil. Petroleum-contaminated soils were subsequently removed from DW-8 and transported to Loudon, NH as non-hazardous waste in September 2004. A Certificate

of No Further Action for the drywells was issued on 17 December 2004 (NHDES, 2004). However, PFAS were not evaluated as part of the drywell investigation.

- DW-A was located 18 feet north-northwest from the blacktop driveway at the Airport Road gate, and 8.5 feet northeast from the boundary fence (Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019). DW-A was two-ft in diameter and was constructed of brick and concrete. DW-A was constructed subsurface (2 ft bgs) and had a two-foot square steel cover to keep the soil out (Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019). A catch basin that was located adjacent to and south of Building Q connected to DW-A. Past releases of liquid hazardous wastes reportedly occurred, draining into an OWS. Some waste from the OWS was routed to a former waste oil underground storage tank (Tank No. 8). The potentially contaminated water from the OWS was allowed to drain into the catch basin and then flowed through a 4-inch pipe into DW-A. DW-A was excavated and removed in June 1994, and the New Hampshire Department of Environmental Services recommended no further action at this location (USAEHA, 1994; AECOM, 2019).

- DW-B was located 20 feet southeast of the southeast wall of the former AASF building (Building K). Before 1992, wash water from the service bay floor, which contained oils and greases from airplane repair and maintenance, was collected in a sump, discharged into a catch basin, and then discharged into DW-B. After 1992, the drains inside the former AASF maintenance bays were blocked off, and the wash water was pumped into wheeled holding tanks, which were transported to the CSMS, where they emptied into the OWS. This OWS is connected to the Concord publicly owned treatment works. DW-B was located directly below the catch basin, which also received drainage from the roof of the former AASF (Building K). According to a site plan, DW-B drained into a storm drain pipeline, which flowed to a combination storm drain and sanitary sewer main on Airport Road. A portion of the water in DW-B possibly drained into the soil (USAEHA, 1993; USAEHA, 1994; Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019).

- DW-C was located 160 feet southwest of the southeast corner of the former AASF building (Building K) and 170 feet northwest from Building R, the JP-8 (formerly JP-4) pumphouse. Formerly, the catch basin leading to DW-C reportedly had water ponded on the ground surface within a diameter of approximately 40 feet. DW-C was plugged and then could not drain or drained very slowly. In the fall of 1993, DW-C was filled, and a solid, pre-cast concrete catch basin was installed on top of it. This catch basin currently flows into a new pipeline, which was constructed in early 1994, and is connected to the Airport Road storm drain. Since this change occurred, water ponding at the surface of the catch basin has not been observed (USAEHA, 1994; Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019).

- An additional unnamed drywell (labeled as DW-Z in the PA and this document) was identified on figures from the 1998 SI Report, located on the northwest side of former

Building K (southwest of DW-8) and extends from a former septic system (Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019).

3.2 AOI 2 – FORMER CAMP LABONTE

AOI 2 is the Former Camp Labonte. The Former Camp Labonte was used by the NHARNG as a Weekend Training Site for many years and originally served as the New Hampshire Military Academy for Officer Candidate School prior to the State of New Hampshire's acquisition of the current New Hampshire National Guard Training Site property in Center Strafford in 1985.

According to former AASF personnel, two fire trucks were used at the SMR during AASF operations. The first fire truck was a former 1940s vintage LaFrance fire truck, which was moved to the SMR from Manchester Airport in the 1960s. The vintage LaFrance fire truck was removed from the Facility sometime prior to 1977 (the exact date is unknown). The second fire truck was tank-mounted on a deuce and a half truck, which was introduced to the SMR sometime prior to 1977 and was removed from the Facility in 1992.

Interviewees indicated that foam was used by both fire trucks. When the first fire truck was in use (late 1960s to pre-1977), foam was used for training on the grass and gravel to the north of the former Camp Labonte on the SMR, at approximate geographic coordinates 43°12'38.9"N; 71°30'40.1"W (**Figure 5-1**, AECOM, 2019). As stated in the AOI 1 discussion above, when the second fire truck was in use (pre-1977 to 1992), foam was sprayed on the pavement at the former AASF (Building K), but not in the Camp LaBonte area.

According to former AASF personnel, two types of foam were used on the fire trucks. The older of the two foams contained animal-based ingredients (potentially blood or fat). The second type of foam was referred to as a "civilian foam" that came in 5-gallon containers from a local Fire Department (either the Concord Fire Department or the Franklin Fire Department). No additional information was available on the dates of foam use, the type of foam used, or whether the foam contained AFFF. Because the first fire truck was potentially in use after the introduction of AFFF in firefighting foams, a release of PFAS-containing AFFF at the former Camp Labonte area is possible.

The former Camp Labonte was located to the south of the parking lot that is behind the Concord Readiness Center and previously had five small training huts and seven larger training huts. All the five small training huts and some of the larger training huts were demolished sometime in the mid-to-late 1990s. In 2008, two of the remaining larger training huts were combined into one building and the other remaining huts were demolished. That building now serves as a Karner Blue Butterfly Captive Rearing Building, which is leased to the New Hampshire Fish and Game Department. The area is also part of the 15 acres of fully vegetated Pine Barrens Habitat, which was created as mitigation to compensate for the habitat loss at the AASF currently located at 26 Regional Drive, Concord, New Hampshire.

3.3 ADJACENT SOURCES

Two potential off-Facility sources of PFAS are adjacent to the Facility and are not under the control of the NHARNG. A description of each off-Facility source is presented below and shown on **Figure 3-1**.

3.3.1 Electropac Worldwide Inc. Site (former Vishay Sprague Facility)

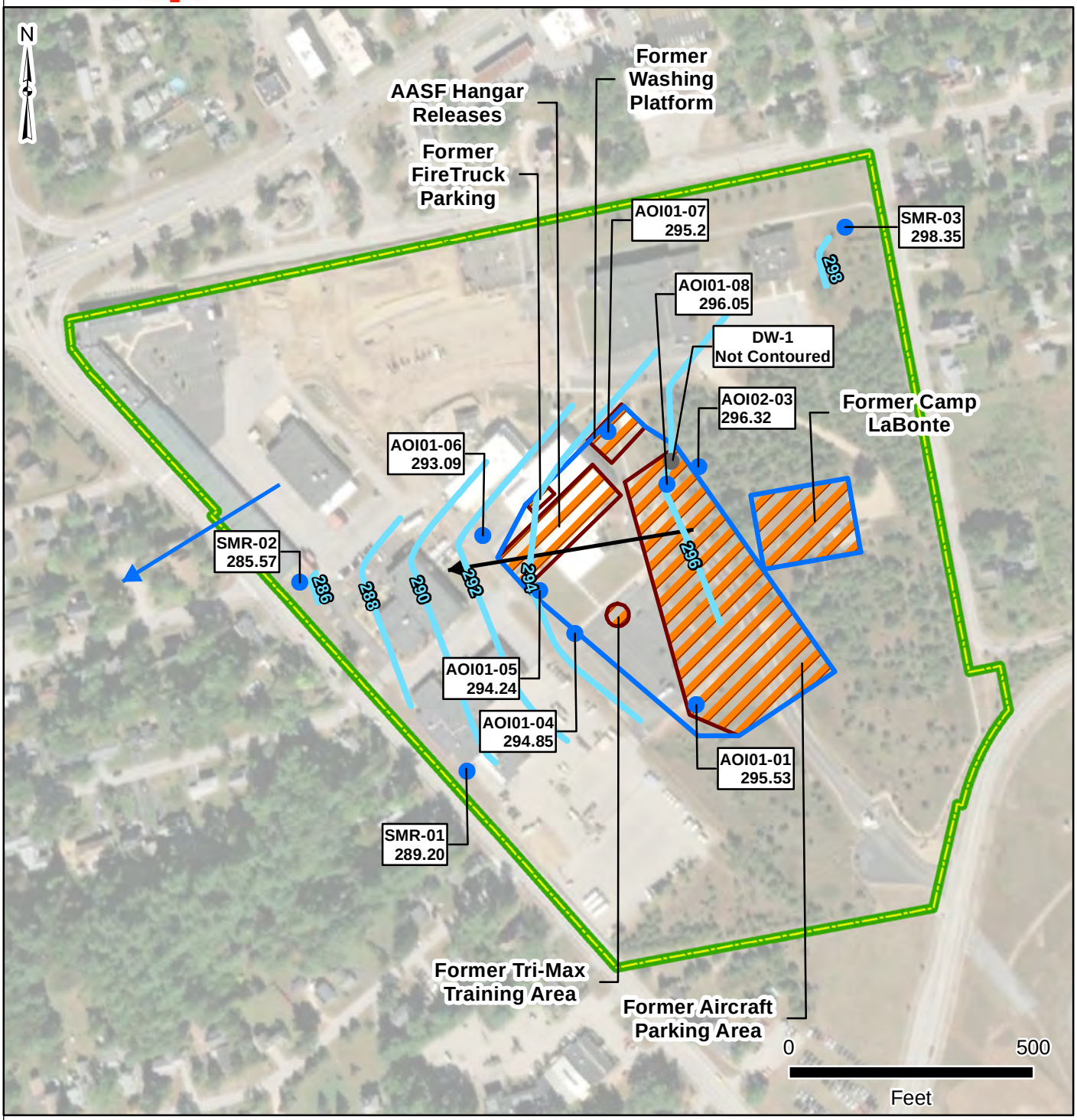
The Electropac Worldwide Inc. site (former Vishay Sprague site) at 70 Pembroke Road is located approximately 1/3-mile east, cross gradient, of the SMR. This Facility is included on the NHDES PFAS Sampling Map as a site with a positive PFAS detection; however, the type and concentrations of PFAS were not identified.

3.3.2 The Richard M. Flynn Fire Academy

The Richard M. Flynn Fire Academy (Fire Academy) is located 1.5 miles due east, cross gradient, of the SMR. Class B foam has been used on the Fire Academy site through approximately 175 training courses dating back to 1994. In June and August 2018, environmental samples were collected at the Academy at the request of NHDES. PFOS was detected in groundwater at concentrations ranging from 190 parts per trillion (ppt) to 18,000 ppt and PFOA was detected at concentrations ranging from 120 ppt to 2,200 ppt, with a maximum total of 20,200 ppt for combined PFOA/PFOS. Elevated concentrations of PFAS compounds were also detected in soil samples and adjacent surface water samples from the Soucook River; however, there were no standards for PFAS in soil or surface water in New Hampshire in 2018 (Nobis Group, 2018; AECOM, 2019). On July 23, 2020, the NH Legislature signed NH House Bill 1264 into law establishing Maximum Contaminant Levels (MCLs) and Ambient Groundwater Quality Standards for PFOA (12 ppt and 12 nanograms per liter (ng/L), PFOS (15ppt and 15 ng/L), PFHxS (18ppt and 18 ng/L) and PFNA(11 ppt and 11 ng/L).

The types and quantities of AFFF used or stored at the Fire Academy currently or historically are not known. However, because the Fire Academy has confirmed releases of PFAS and is located outside the boundary of the SMR, it is considered an adjacent off-Facility source of PFAS (AECOM, 2019).

Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire
Figure 2-5
Groundwater Elevations
June 2022



Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Sample Type
- Drywell
- Temporary Monitoring Well (No Soil Samples)

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction
- Groundwater Elevation Contour (2-Foot Interval)

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the Data Quality Objective (DQO) process and outlined in the SI Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum (EA/Wood, 2022), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for the presence or absence of relevant compounds at each of the sampled AOIs.

4.1 PROBLEM STATEMENT

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

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for SMR (AECOM, 2019)
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP –QAPP Addendum (Wood/EA, 2022)
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figures 2-1** and **2-2**). The scope of the SI was bounded vertically by the depth of temporary monitoring wells installed within groundwater, where encountered (maximum depth of 60 feet bgs). Off-Facility sampling was not included in the scope of this SI. If future off-Facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 1.01) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 021). Data were compared to applicable SLs within this document and decision rules as defined in the UFP-QAPP Addendum (EA/Wood, 2022).

4.5 DATA USABILITY ASSESSMENT

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

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the UFP-QAPP (EA/Wood, 2022).

5. SITE INSPECTION ACTIVITIES

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

- *Final Preliminary Assessment Report, SMR, New Hampshire,* dated November 2019 (AECOM, 2019)
- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide,* dated December 2020 (EA, 2020)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, SMR, New Hampshire* dated May 2022 (EA/Wood, 2022)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2021 (EA, 2020)
- *Final Accident Prevention Plan/Site Safety and Health Plan, SMR, New Hampshire,* dated November 2021 (EA/Wood, 2021).

The SI field activities were conducted from 24 May to 13 June 2022 and consisted of utility clearance, direct-push technology (DPT) boring and soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2022), except as noted in **Section 5.9**.

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

- Twenty-five (25) soil samples from 9 boring locations;
- Ten (10) grab groundwater samples from 10 temporary well locations;
- Twenty-six (26) quality assurance (QA)/QC samples.

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

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 22 April 2022, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI included ARNG, USACE, NHARNG, NHDES, and 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 UFP-QAPP Addendum (EA/Wood, 2022).

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

5.1.2 Utility Clearance

WSP USA Environment & Infrastructure Inc. (WSP), previously doing business as Wood Environment & Infrastructure Solutions, Inc. (Wood), contacted the Utility Notification Center to notify them of intrusive work at the Facility. WSP contracted Advanced Technologies Utility Locating Corp., a private utility location service, to perform utility clearance at the Facility. Utility clearance was performed at each of the proposed boring locations on 23 May 2022 with input from the WSP field team. 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 by WSP's drilling subcontractor, Parratt Wolff, Inc., 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 meet acceptability criteria, as defined in the UFP-QAPP Addendum, prior to the start of field activities. A sample from a potable water source at the SMR, was collected on 6 May 2022, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 (DoD, 2020). The results of the sample of the potable water source used for decontamination of

drilling equipment during the SI are provided in **Appendix F**. A discussion of the results is presented in the Data Usability Assessment (**Appendix A**).

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 Programmatic UFP-QAPP (EA, 2020).

5.2 HAND AUGER SOIL SAMPLING

Soil samples were collected from two locations for chemical analysis from 0 to 2 ft below ground surface (bgs) and 3 to 5 ft bgs using a hand auger. All soil sample locations are shown on **Figure 5-1**. The hand auger locations were selected based on the AOI information provided in the PA (AECOM, 2019) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA/Wood, 2022). Non-dedicated sampling equipment (i.e., hand auger) was decontaminated between sampling locations.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain-of-custody (COC) procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15) in accordance with the UFP-QAPP Addendum. QC samples and analysis were performed as described in the UFP-QAPP Addendum (EA/Wood, 2022).

5.3 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with SOP 047 *Direct-Push Technology Sampling* (EA/Wood, 2022*).* 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 5 ft of the boring in compliance with utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. Several boring locations were adjusted within a 50-feet offset for reasons including drill rig access, utility avoidance and bias toward sampling within observed drainage features.

Three discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was collected approximately 1 ft above the groundwater table, and one collected at the mid-point between the surface and the groundwater table (not to exceed 15 ft bgs). Groundwater was encountered at depths ranging from 41 to 56 ft bgs during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 44 to 60 bgs.

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

moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix E**.

Each sample was collected into a laboratory-supplied PFAS-free HDPE bottle 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 (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic carbon (TOC, EPA Method 9060A), pH (EPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

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

DPT borings were converted to temporary wells, which were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA/Wood, 2022). After removal of the casings, boreholes were abandoned using bentonite chips. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.4 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using a GeoProbe® DT7822 dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 5-ft section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected, after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. After the recharge period, groundwater samples were collected using a bladder 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, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected in a separate container. 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 in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant

with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSD samples were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field blank (FB) was collected in accordance with the UFP-QAPP Addendum (EA/Wood, 2022). In instances when non-dedicated sampling equipment was used, such as a bladder pump, one EB was collected a day and analyzed for the same parameters as the groundwater samples. A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.7**), temporary wells were abandoned in accordance with the SI UFP-QAPP Addendum (EA/Wood, 2022) by removing the PVC and backfilling the hole with bentonite chips.

5.5 SYNOPTIC WATER LEVEL MEASUREMENTS

Synoptic water level elevation measurements were collected from the newly installed temporary monitoring wells prior to sampling. Water level measurements were taken from the survey mark on the northern side of the well casing. Groundwater elevation data is provided in **Table 5-3**. A groundwater flow contour map is provided as **Figure 2-5**.

5.6 SURVEYING

The northern side of each new temporary well casing was surveyed following guidelines provided in the SOPs provided in the SI QAPP Addendum (EA/Wood, 2022). Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected on 13 June 2022 and are provided in **Appendix B3**.

5.7 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS IDW is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the UFP-QAPP Addendum (EA/Wood, 2022).

Soil IDW (i.e., soil cuttings) generated during the SI activities were returned to the borehole from which they originated. The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location.

Liquid IDW generated during SI activities (purge water, decontamination fluids) were treated using granular activated carbon (GAC) and contained in two labeled, 55-gallon Department of Transportation approved steel drums and left onsite as directed by Facility personnel. The liquid IDW was sampled following the SI fieldwork and is awaiting disposal.

Geographic coordinates were collected using a Global positioning system (GPS) around each location where IDW was placed. The IDW placement locations are displayed on the figure in **Appendix B6**.

The IDW disposal is being managed under a separate contract (EA Engineering, Science, and Technology, Inc., 2021). Specifics on the disposal of liquid IDW and the GAC will be addressed in an IDW Technical Memorandum.

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 off-site at a licensed solid waste landfill

5.8 LABORATORY ANALYTICAL METHODS

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

Soil samples were also analyzed for TOC using EPA Method 9060A, pH by EPA Method 9045D, and grain size using ASTM Method D-422.

5.9 Deviations from SI UFP-QAPP Addendum

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

- Multiple sample locations were moved into grassy areas to avoid disturbing the rare plants and paved/concrete areas that are located at the SMR as directed by NHARNG. Some of these changes placed the sample locations within the historic release locations.

- Borings were advanced via DPT instead of Hollow Stem Auger (HSA) drilling methods at all locations designated for soil and groundwater sample collection. An HSA was deployed to the SMR, but soil conditions did not warrant the use of HSA drilling methods.

Table 5-1. Site Inspection Samples by Medium
State Military Reservation, Concord, New Hampshire
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (EPA Method 9060A)	pH (EPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
AOI01-01-SB-(0-2)	5/24/22	0-2	X				
AOI01-01-SB-(13-15)	5/24/22	13-15	X				
AOI01-01-SB-(40)	5/24/22	40	X				
AOI01-02-SB-(0-2)	6/8/22	0-2	X				
AOI01-02-SB-(13-15)	6/8/22	13-15	X				
AOI01-02-SB-(40-42)	6/8/22	40-42	X				
AOI01-03-SB-(0-2)	6/8/22	0-2	X				
AOI01-03-SB-(13-15)	6/8/22	13-15	X				
AOI01-03-SB-(40-42)	6/8/22	40-42	X				
AOI01-04-SB-(0-2)	6/7/22	0-2	X				
AOI01-04-SB-(13-15)	6/7/22	13-15	X				
AOI01-04-SB-(42-44)	6/7/22	42-44	X				
AOI01-05-SB-(0-2)	6/6/22	0-2	X	X	X	X	Parent Sample of (SMR)-DUP04
AOI01-05-SB-(13-15)	6/6/22	13-15	X				
AOI01-05-SB-(39-41)	6/6/22	39-41	X				
AOI01-06-SB-(0-2)	6/2/22	0-2	X				
AOI01-06-SB-(13-15)	6/2/22	13-15	X				
AOI01-06-SB-(44-46)	6/2/22	44-46	X				
AOI01-07-SB-(0-2)	6/2/22	0-2	X				
AOI01-07-SB-(13-15)	6/2/22	13-15	X				
AOI01-07-SB-(42-44)	6/2/22	42-44	X				
AOI02-01-SB-(0-2)	6/1/22	0-2	X	X	X	X	Parent Sample of (SMR)-DUP02
AOI02-01-SB-(2-5)	6/1/22	3-5	X				
AOI02-02-SB-(0-2)	6/1/22	0-2	X				
AOI02-02-SB-(2-5)	6/1/22	3-5	X				Parent Sample of (SMR)-DUP03; MS/MSD Collected
(SMR)-DUP02	6/1/22	-	X				
(SMR)-DUP03	6/1/22	-	X				
(SMR)-DUP04	6/6/22	-	X				
Groundwater Samples							
AOI01-01-GW-(45)	6/7/22	45	X				
AOI01-04-GW-(45)	6/9/22	45	X				
AOI01-05-GW-(47)	6/10/22	47	X				
AOI01-06-GW-(49)	6/8/22	49	X				
AOI01-07-GW-(45)	6/10/22	45	X				

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (EPA Method 9060A)	pH (EPA Method 9045D)	Grain Size (ASTM D422)	Comments
AOI01-08-GW-(45)	6/9/22	45	X				
AOI02-03-GW-(44)	6/8/22	44	X				
SMR-01-GW-(54)	5/31/22	54	X				Parent sample of (SMR)-DUP01; MS/MSD Collected
SMR-02-GW-(57)	6/8/22	57	X				
SMR-03-GW-(45)	6/8/22	45	X				
(SMR)-DUP01	5/31/22	-	X				
Blank Samples							
(SMR)-EB-01	5/24/22	-	X				Equipment Blank Collected from Stainless Steel Trowel
(SMR)-FB-01	5/24/22	-	X				
(SMR)-EB-02	5/31/22	-	X				Equipment Blank Collected from Water Level Meter
(SMR)-FB-02	5/31/22	-	X				
(SMR)-EB-03	6/1/22	-	X				Equipment Blank Collected from Hand Auger
(SMR)-FB-03	6/1/22	-	X				
(SMR)-EB-04	6/2/22	-	X				Equipment Blank Collected from Stainless Steel Spoon
(SMR)-FB-04	6/2/22	-	X				
(SMR)-EB-05	6/6/22	-	X				Equipment Blank Collected from Stainless Steel Trowel
(SMR)-FB-05	6/6/22	-	X				
(SMR)-EB-06	6/7/22	-	X				Equipment Blank Collected from Water Level Meter
(SMR)-FB-06	6/7/22	-	X				
(SMR)-EB-07	6/7/22	-	X				Equipment Blank Collected from Stainless Steel Spoon
(SMR)-FB-07	6/8/22	-	X				
(SMR)-EB-08	6/8/22	-	X				Equipment Blank Collected from Stainless Steel Trowel
(SMR)-FB-08	6/9/22	-	X				
(SMR)-EB-09	6/8/22	-	X				Equipment Blank Collected from Bladder Pump
(SMR)-FB-09	6/10/22	-	X				
(SMR)-EB-10	6/9/22	-	X				Equipment Blank Collected from Water Level Meter
(SMR)-EB-11	6/10/22	-	X				Equipment Blank Collected from Water Level Meter

Notes:
SMR = State Military Reservation
ASTM = American Society for Testing and Materials
bgs = below ground surface
EB = equipment blank
FD = field duplicate
FB = field blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
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
State Military Reservation, Concord, New Hampshire
Site Inspection Report

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AOI01-01	44.0	39.0-44.0
	AOI01-02	44.0	-
	AOI01-03	44.0	-
	AOI01-04	48.0	43.0-48.0
	AOI01-05	48.0	43.0-48.0
	AOI01-06	52.0	47.0-52.0
	AOI01-07	48.0	44.0-48.0
	AOI01-08	48.0	43.0-48.0
2	AOI02-01	5.0	-
	AOI02-02	5.0	-
	AOI02-03[1]	48.0	42.0-47.0
Facility Boundary	SMR-01	56.0	51.0-56.0
	SMR-02	60.0	55.0-60.0
	SMR-03	48.0	43.0-48.0

Notes:
[1] Temporary well screen set above total depth to capture groundwater interface
bgs = below ground surface

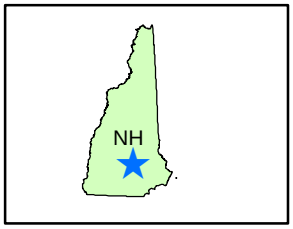
Table 5-3. Groundwater Elevation
State Military Reservation, Concord, New Hampshire
Site Inspection Report

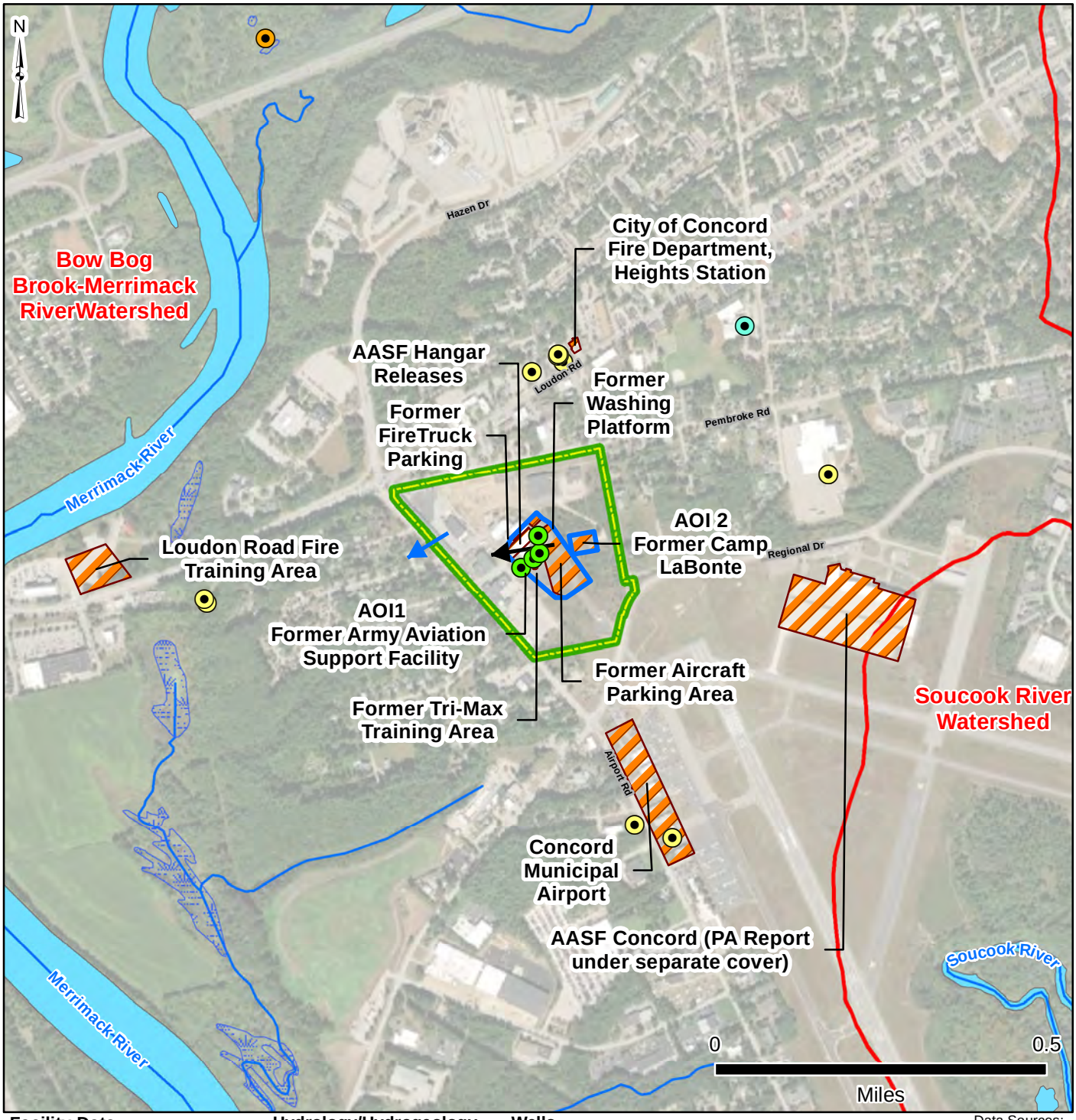
Monitoring Well ID	Top of Casing Elevation (ft NAVD88)	Depth to Water (ft btoc)	Groundwater Elevation (ft NAVD 88)
AOI01-01	339.17	43.64	295.53
AOI01-04	340.68	45.83	294.85
AOI01-05	340.67	46.43	294.24
AOI01-06	341.45	48.36	293.09
AOI01-07	341.55	46.35	295.20
AOI01-08	338.53	42.48	296.05
AOI02-03	340.96	44.64	296.32
SMR-01	340.65	51.45	289.20
SMR-02	341.20	55.63	285.57
SMR-03	342.77	44.42	298.35

Notes:
[1] Temporary well screen set above total depth to capture groundwater interface
btoc = below top of casing
NAVD88 = North American Vertical Datum 1988

Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 3-1
Areas of Interest





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Watershed
- Water Body
- Wetland
- River/Stream

Wells
- Monitoring Well
- Geothermal Well
- Domestic Well
- Domestic Drinking Water Well
- Other/Unknown Well
- Test/Exploration

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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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 each AOI is provided in **Sections 6.3 and 6.4**. SLs for relevant compounds, for both soil and groundwater, are presented in **Table 6-1**. **Tables 6-2** through **6-6** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 SCREENING LEVELS

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

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

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

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

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

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental

ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the Facility: the residential scenario is applied to surface soil results (0 to 2 feet bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 feet bgs). The SLs are not applied to deep subsurface soil results (>15 feet bgs) because 15 feet is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

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

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

6.3 AOI 1

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

6.3.1 AOI 1 Soil Analytical Results

Soil samples were collected from seven boring locations associated with AOI 1 during the SI. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Tables 6-2** through **Table 6-4** summarize the soil results.

Surface soil (0 to 2 ft bgs) was sampled from boring locations AOI01-01 through AOI01-07. Shallow subsurface soil (2 to 15 ft bgs) was sampled from boring locations AOI01-01 through AOI01-07. Deep subsurface soil (39 to 46 ft bgs) was sampled from boring locations AOI01-01 through AOI01-07.

PFOS was detected in surface soil at concentrations exceeding the SL. PFHxS, PFNA, and PFOA were also detected in surface soil but at concentrations below their respective SLs. PFOS was detected at all seven locations at concentrations that ranged from 1.1 microgram per kilogram (µg/kg) to 210 µg/kg and exceeded the SL at three locations (AOI01-01, AOI01-02, and AOI01-03). PFHxS was detected at two of seven locations at concentrations of 0.39 J µg/kg

and 0.58 J µg/kg. PFNA was detected at one location at a concentration of 0.28 J µg/kg. PFOA was detected at three of seven locations at concentrations that ranged from 0.22 µg/kg to 0.72 µg/kg. PFBS was not detected in any of the surface soil samples.
PFHxS, PFOA, and PFOS were detected in shallow subsurface soil at concentrations below their respective SLs. PFHxS was detected at two of seven locations at concentrations that ranged from 0.31 µg/kg to 0.39 J µg/kg. PFOA was detected at two of seven locations at concentrations that ranged from 0.25 J µg/kg to 0.30 J µg/kg. PFOS was detected at one location at a concentration of 6.0 µg/kg. PFBS and PFNA were not detected in any of the shallow subsurface soil samples.

PFHxS, PFOA, PFOS, PFBS, and PFNA were not detected in any of the deep subsurface soil samples.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater samples were collected from nine temporary wells associated with AOI 1 during the SI. **Figure 6-6 and Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring well locations AOI01-01, AOI01-04 through AOI01-08, and SMR-01 through SMR-03. SMR-03 was located upgradient of AOI 1 and SMR-01 and SMR-02 were located downgradient of AOI 1. PFHxS, PFOA, and PFOS were detected in groundwater at concentrations exceeding their respective SLs. PFBS, and PFNA were detected at concentrations below their respective SLs. PFHxS was detected at seven of nine locations at concentrations that ranged from 1.3 J ng/L to 160 ng/L and exceeded the SL at three locations (AOI01-04, AOI01-6, and SMR-02). PFHxS was detected in the upgradient sample (SMR-03) below its SL. PFOA was detected at seven of nine locations at concentrations that ranged from 1.7 J ng/L to 34 ng/L and exceeded the SL at five locations (AOI01-04, AOI01-05, AOI01-06, SMR-01 [and its duplicate], and SMR-02). PFOA was detected in the upgradient sample (SMR-03) below its SL. PFOS was detected in six of nine locations at concentrations that ranged from 13 ng/L to 280 ng/L and exceeded its SL at six locations (AOI01-01, AOI01-04, AOI01-05, AOI01-06, SMR-01 [and its duplicate], and SMR-02). PFBS was detected in eight of nine locations at concentrations that ranged from 0.6 J ng/L to 20 ng/L and was detected in the upgradient sample (SMR-03). PFNA was detected in three of nine locations at concentrations that ranged from 0.82 J ng/L to 1.4 J ng/L.

6.3.3 Conclusions

Based on the results of the SI, PFOS was detected in surface soil at concentrations above the SL. PFHxS, PFOA, and PFOS were detected in groundwater at concentrations above their respective SLs. Based on the exceedances of the SLs in soil and groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2: Former Camp LaBonte. The soil and groundwater results are summarized in **Table 6-2**

through **Table 6-5**. Soil and groundwater results are presented on **Figures 6-1** through **Figure 6-7**.

6.4.1 AOI 2 Soil Analytical Results

Soil samples were collected from two boring locations associated with AOI 2 during the SI. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Tables 6-2** through **Table 6-4** summarize the soil results.

Surface soil (0 to 2 ft bgs) was sampled from boring locations AOI02-01 and AOI02-02. Soil was sampled from shallow subsurface soil (2 to 5 ft bgs) from boring locations AOI02-01 and AOI02-02. Soil was not sampled from deep subsurface soil intervals for boring locations AOI02-01 and AOI02-02.

PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in the surface soil samples.

PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in the shallow subsurface soil samples.

6.4.2 AOI 2 Groundwater Analytical Results

A groundwater sample was collected from one temporary well associated with AOI 2 during the SI. **Figure 6-6 and Figure 6-7** presents the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in the groundwater sample.

6.4.3 Conclusions

Based on the results of the SI, PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in soil or groundwater and further evaluation at AOI 2 is not warranted.

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report
Concord SMR

Area of Interest		AOI01															
Location ID		AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-05, Duplicate		AOI01-06		AOI01-07	
Sample ID		AOI01-01-SB-(0-2)		AOI01-02-SB-(0-2)		AOI01-03-SB-(0-2)		AOI01-04-SB-(0-2)		AOI01-05-SB-(0-2)		(SMR)-DUP04		AOI01-06-SB-(0-2)		AOI01-07-SB-(0-2)	
Sample Date		5/24/2022		6/8/2022		6/8/2022		6/7/2022		6/6/2022		6/6/2022		6/2/2022		6/2/2022	
Depth		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																	
PFBS	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	ND	U	0.39	J	0.58	J	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	19	ND	U	ND	U	0.28	J	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	19	ND	U	0.23	J	0.72		ND	U	ND	U	ND	U	0.22		ND	U
PFOS	13	16		210		27		2.0	J	1.4		1.1		4.4		1.1	J+

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

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

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Interpreted Qualifiers

J = Estimated concentration.
J+ = The result is an estimated quantity, but the result may be biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted DL.
UJ = The analyte was not detected and was reported as less than the limit of detection. However, the associated numerical value is approximate.

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report
Concord SMR

Area of Interest		AOI02					
Location ID		AOI02-01		AOI02-01-SB-(0-2), Duplicate		AOI02-02	
Sample ID		AOI02-01-SB-(0-2)		(SMR)DUP02		AOI02-02-SB-(0-2)	
Sample Date		6/1/2022		6/1/2022		6/1/2022	
Depth		0 - 2 ft		0 - 2 ft		0 - 2 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	1900	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U
PFNA	19	ND	U	ND	U	ND	U
PFOA	19	ND	U	ND	U	ND	U
PFOS	13	ND	U	ND	U	ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

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

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Interpreted Qualifiers

J = Estimated concentration.
J+ = The result is an estimated quantity, but the result may be biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted DL.
UJ = The analyte was not detected and was reported as less than the limit of detection. However, the associated numerical value is approximate.

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report
Concord SMR

Area of Interest		AOI01													
Location ID		AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06		AOI01-07	
Sample ID		AOI01-01-SB-(13-15)		AOI01-02-SB-(13-15)		AOI01-03-SB-(13-15)		AOI01-04-SB-(13-15)		AOI01-05-SB-(13-15)		AOI01-06-SB-(13-15)		AOI01-07-SB-(13-15)	
Sample Date		5/24/2022		6/8/2022		6/8/2022		6/7/2022		6/6/2022		6/2/2022		6/2/2022	
Depth		13 - 15 ft		13 - 15 ft		13 - 15 ft		13 - 15 ft		13 - 15 ft		13 - 15 ft		13 - 15 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)															
PFBS	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	0.39	J	0.31		ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	0.25	J	0.3	J	ND		ND	U	ND	U	ND	U	ND	U
PFOS	160	6.0		ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense, July 2022. *Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022.* The screening levels for soil are based on Industrial/Commercial Composite Worker scenario for incidental ingestion of contaminated soil.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Interpreted Qualifiers

J = The result is an estimated quantity.
U = The analyte was not detected at a level greater than or equal to the adjusted DL.
UJ = The analyte was not detected and was reported as less than the limit of detection. However, the associated numerical value is approximate.

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report
Concord SMR

	Area of Interest	AOI02					
	Location ID	AOI02-01		AOI02-02		AOI02-02-SB-(2-5), Duplicate	
	Sample ID	AOI02-01-SB-(2-5)		AOI02-02-SB-(2-5)		(SMR)DUP03	
	Sample Date	6/1/2022		6/1/2022		6/1/2022	
	Depth	2 - 5 ft		2 - 5 ft		13 - 15 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	25000	ND	U	ND	UJ	ND	UJ
PFHxS	1600	ND	U	ND	UJ	ND	UJ
PFNA	250	ND	U	ND	UJ	ND	UJ
PFOA	250	ND	U	ND	UJ	ND	UJ
PFOS	160	ND	U	ND	UJ	ND	UJ

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense, July 2022. *Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022.* The screening levels for soil are based on Industrial/Commercial Composite Worker scenario for incidental ingestion of contaminated soil.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Interpreted Qualifiers

J = The result is an estimated quantity.
U = The analyte was not detected at a level greater than or equal to the adjusted DL.
UJ = The analyte was not detected and was reported as less than the limit of detection. However, the associated numerical value is approximate.

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report
Concord SMR

Area of Interest		AOI01													
Location ID		AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06		AOI01-07	
Sample ID		AOI01-01-SB-(40)		AOI01-02-SB-(40-42)		AOI01-03-SB-(40-42)		AOI01-04-SB-(42-44)		AOI01-05-SB-(39-41)		AOI01-06-SB-(44-46)		AOI01-07-SB-(42-44)	
Sample Date		5/24/2022		6/8/2022		6/8/2022		6/7/2022		6/6/2022		6/2/2022		6/2/2022	
Depth		40 ft		40 - 42 ft		40 - 42 ft		42 - 44 ft		39 - 41 ft		44 - 46 ft		42 - 44 ft	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)															
PFBS	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense, July 2022. *Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. May 2022.* The screening levels for soil are based on Industrial/Commercial Composite Worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

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

UJ = The analyte was not detected and was reported as less than the limit of detection. However, the associated numerical value is approximate.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

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Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report
Concord SMR

	Area of Interest	AOI01											
	Location ID	AOI01-01		AOI01-04		AOI01-05		AOI01-06		AOI01-07		AOI01-08	
	Sample ID	AOI01-01-GW-(45)		AOI01-04-GW-(45)		AOI01-05-GW-(47)		AOI01-06-GW-(49)		AOI01-07-GW-(45)		AOI01-08-GW-(45)	
	Sample Date	6/7/2022		6/9/2022		6/10/2011		6/8/2022		6/10/2022		6/9/2022	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)													
PFBS	601	0.91	J	7.3		9.3		20		0.6	J	ND	U
PFHxS	39	3.6		76		32		120		ND	U	ND	U
PFNA	6	0.82	J	1.4	J	1.2	J	ND	U	ND	U	ND	U
PFOA	6	4.0		20		13		18		ND	U	ND	U
PFOS	4	69		51		13		26		ND	U	ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

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

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Interpreted Qualifiers

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

Acronyms and Abbreviations

AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
ng/L	nanogram(s) per liter
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report
Concord SMR

	Area of Interest	AOI02		SMR							
	Location ID	AOI02-03		SMR-01		SMR-01, Duplicate		SMR-02		SMR-03	
	Sample ID	AOI02-03-GW-(44)		SMR-01-GW-(54)		(SMR)-DUP01		SMR-02-GW-(57)		SMR-03-GW-(45)	
	Sample Date	6/8/2022		5/31/2022		5/31/2022		6/8/2022		6/8/2022	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)											
PFBS	601	ND	U	5.9		5.7		19		5.5	
PFHxS	39	ND	U	31		28		160		1.3	J
PFNA	6	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	6	ND	U	15		16		34		1.7	J
PFOS	4	ND	U	19		18		280		ND	U

Notes

Gray Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

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

Chemical Abbreviations

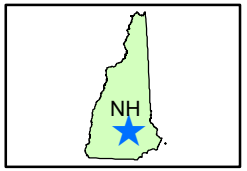
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

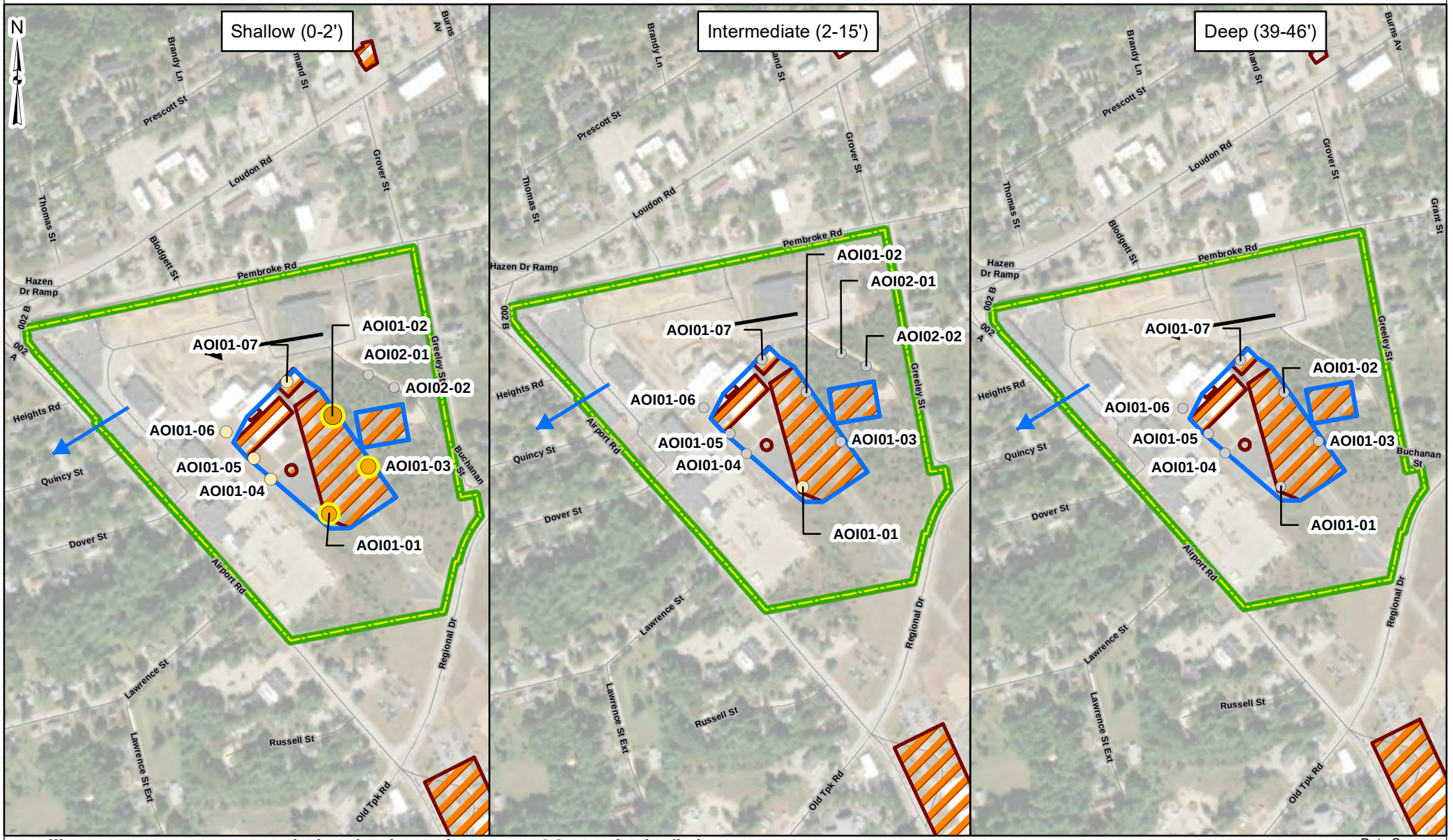
Acronyms and Abbreviations

AOI	Area of Interest
DUP	duplicate
HQ	Hazard Quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
ND	analyte not detected above the LOD (LOD values are presented in Appendix F)
ng/L	nanogram(s) per liter
OSD	Office of the Secretary of the Defense
QSM	Quality Systems Manual
PFAS	per- and polyfluoroalkyl substances
SB	soil boring
SMR	State Military Reservation
USEPA	United States Environmental Protection Agency
Qual	interpreted qualifier

Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 6-1
PFOS Detections in Soil





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

PFOS Results (µg/kg)
- ND (Non-Detect)
- >ND - 13
- >13 -160
- >160 - 1,600
- >1,600

NOTES:
PFOS = perfluorooctanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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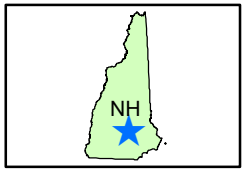
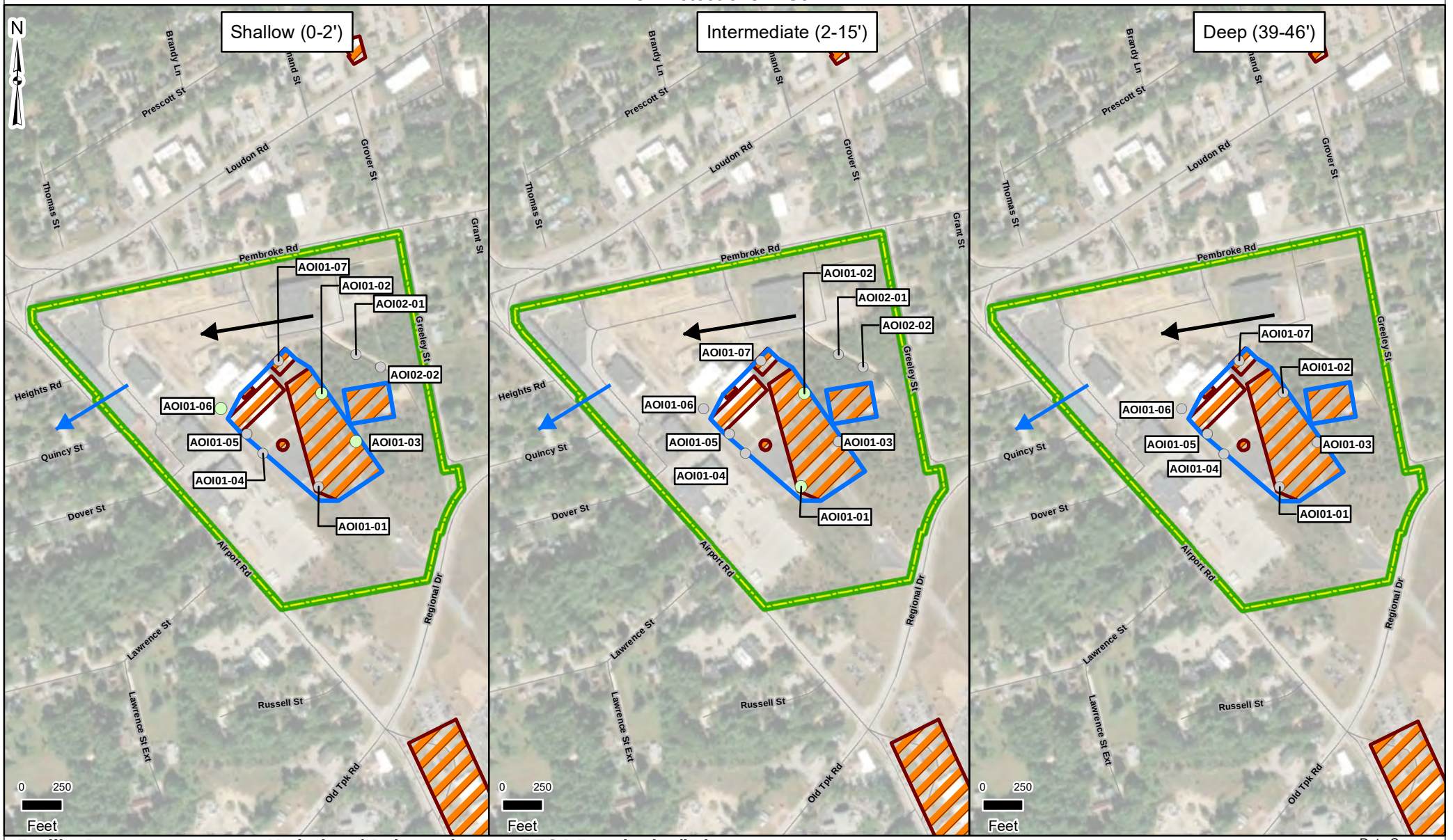
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 6-2
PFOA Detections in Soil





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

PFOA Results (µg/kg)
- ND (Non-Detect)
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFOA = perfluorooctanoic acid
ND = Non-Detect
(µ g/Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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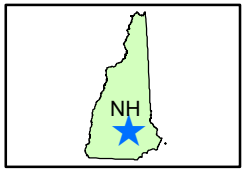
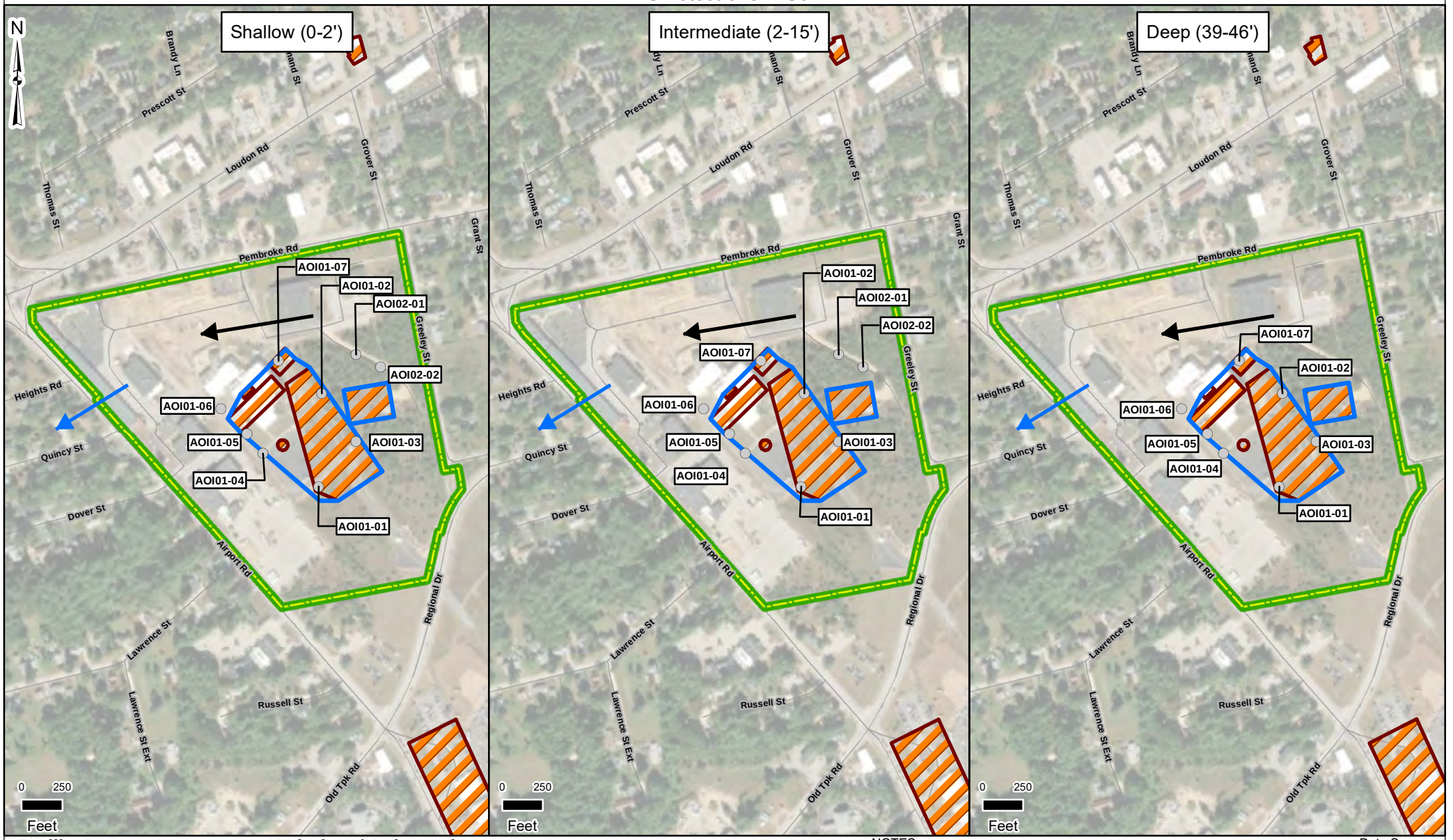
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 6-3
PFBS Detections in Soil





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

PFBS Results (µg/kg)
- ND (Non-Detect)
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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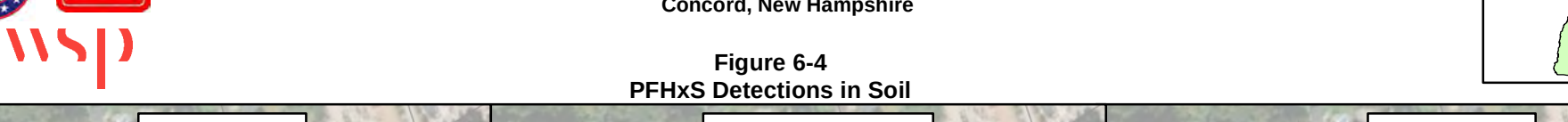
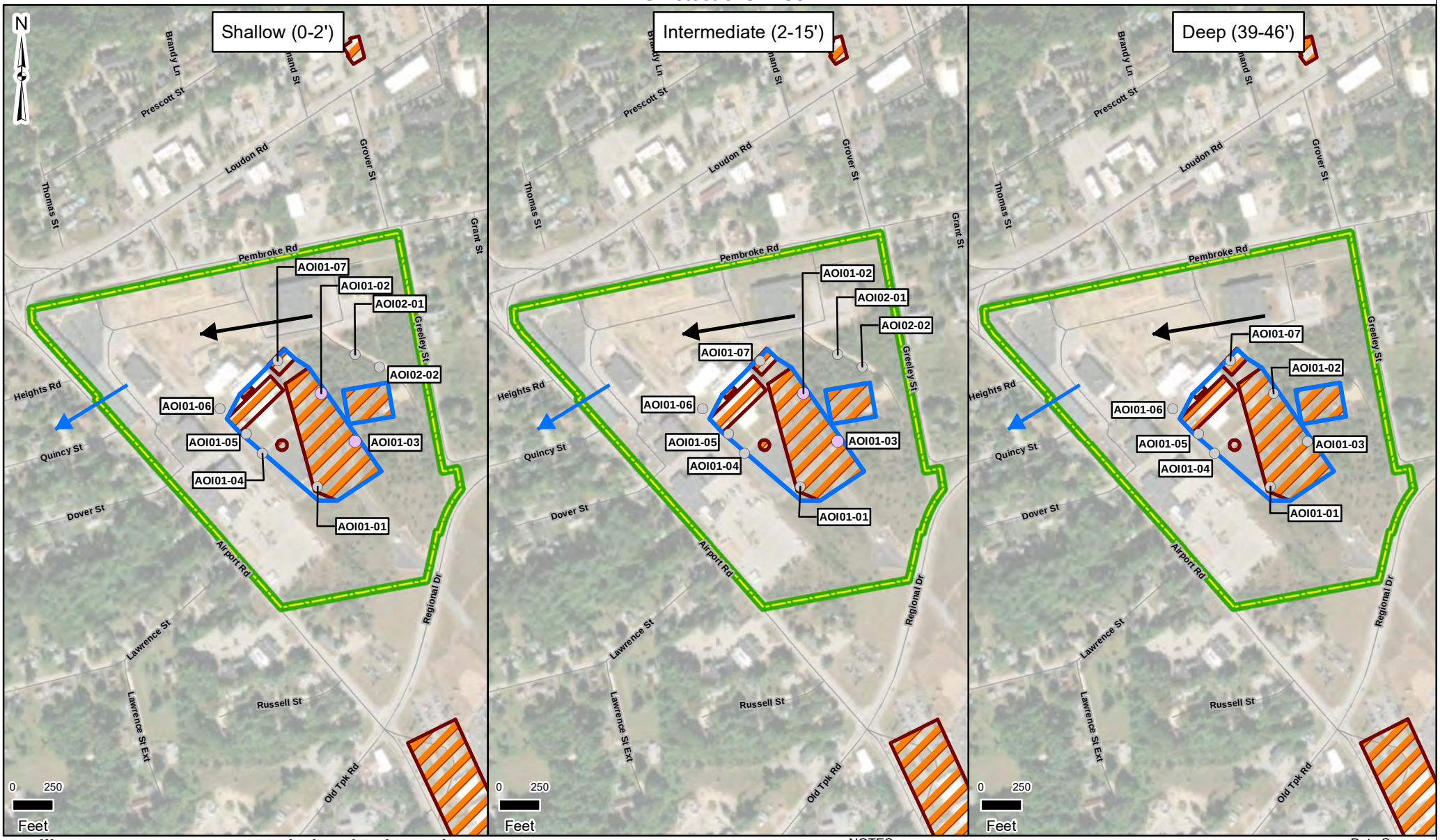
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 6-4
PFHxS Detections in Soil





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

PFHxS Results (µg/kg)
- ND (Non-Detect)
- >ND - 13
- >13 -160
- >160 - 1,600
- >1,600

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFHxS = perfluorohexanesulfonic acid
ND = Non-Detect
(µg /Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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Army National Guard Site Inspections
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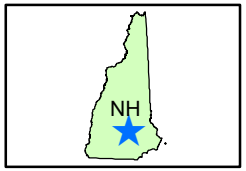
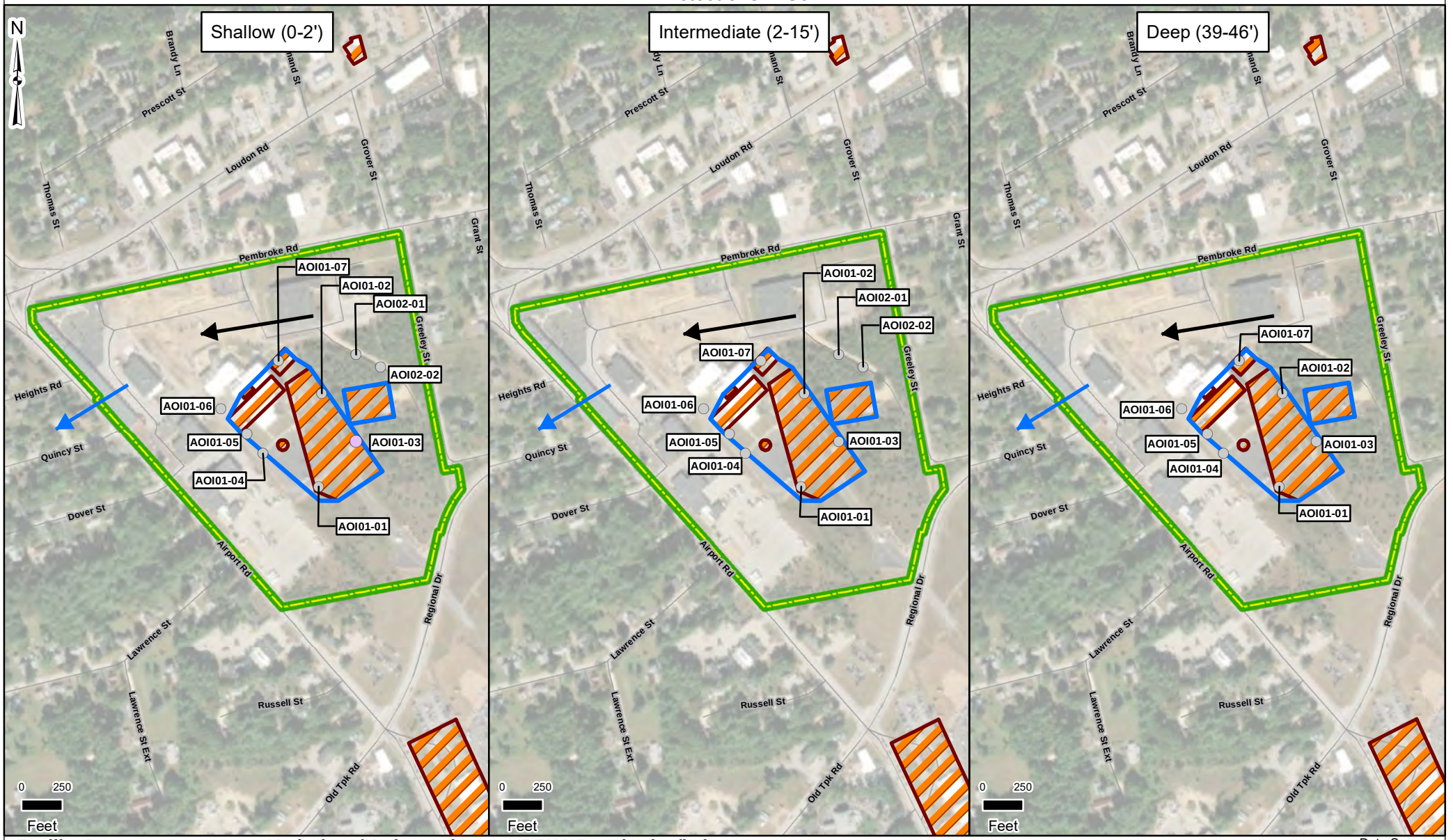
Figure 6-5
PFNA Detections in Soil





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

PFNA Results (µg/kg)
- ND (Non-Detect)
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFNA = perfluorononanoic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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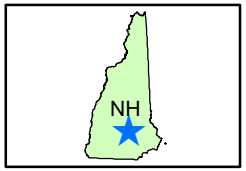
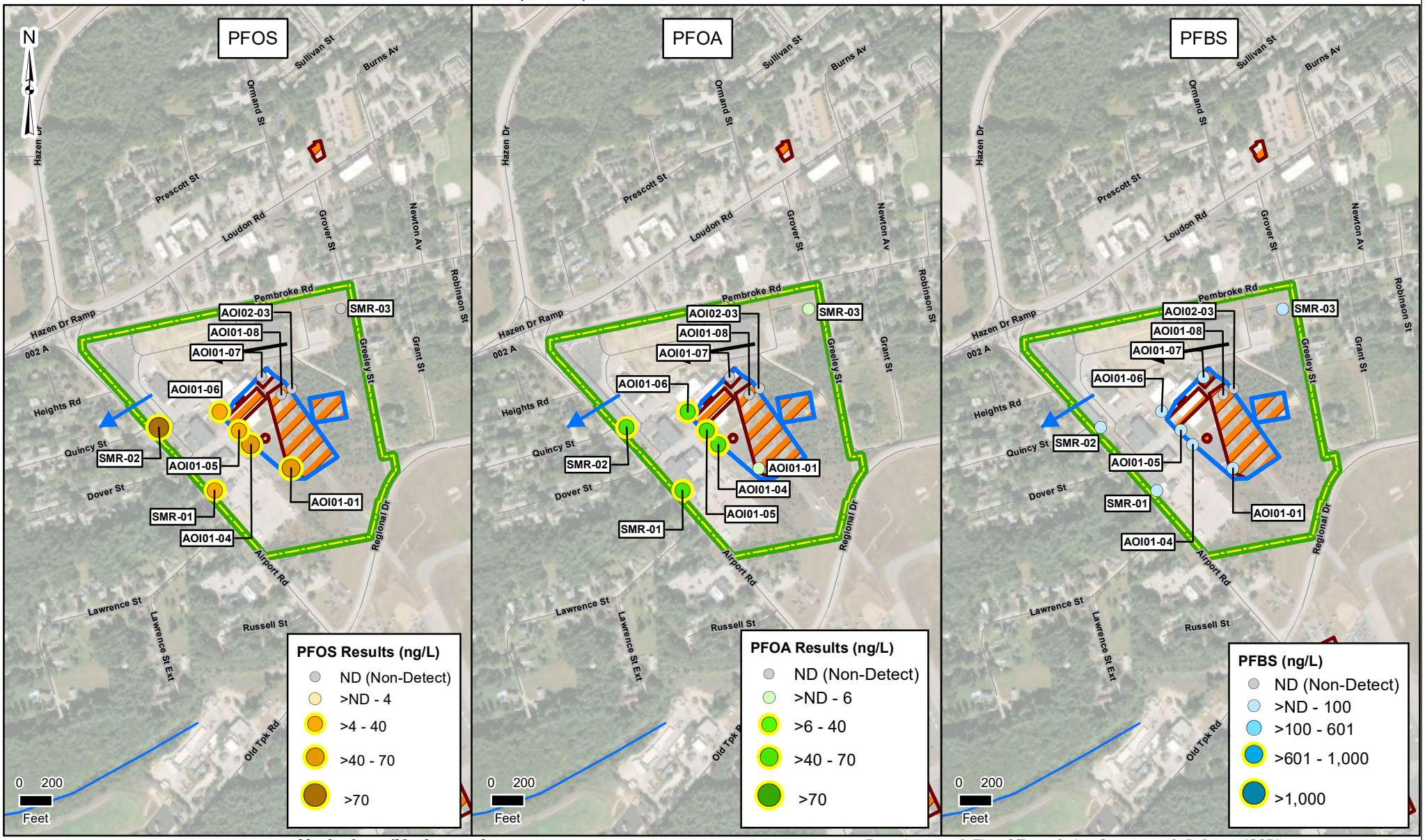
Site Inspection Report
State Military Reservation
Concord, New Hampshire

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





Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction
- River/Stream

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFOS = perfluorooctanesulfonic acid
PFOA = perfluorooctanoic acid
PFBS = perfluorobutanesulfonic acid
ND = Non-Detect
ng/L = nanogram(s) per liter

Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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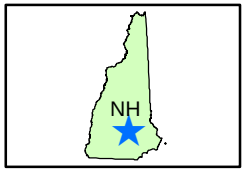
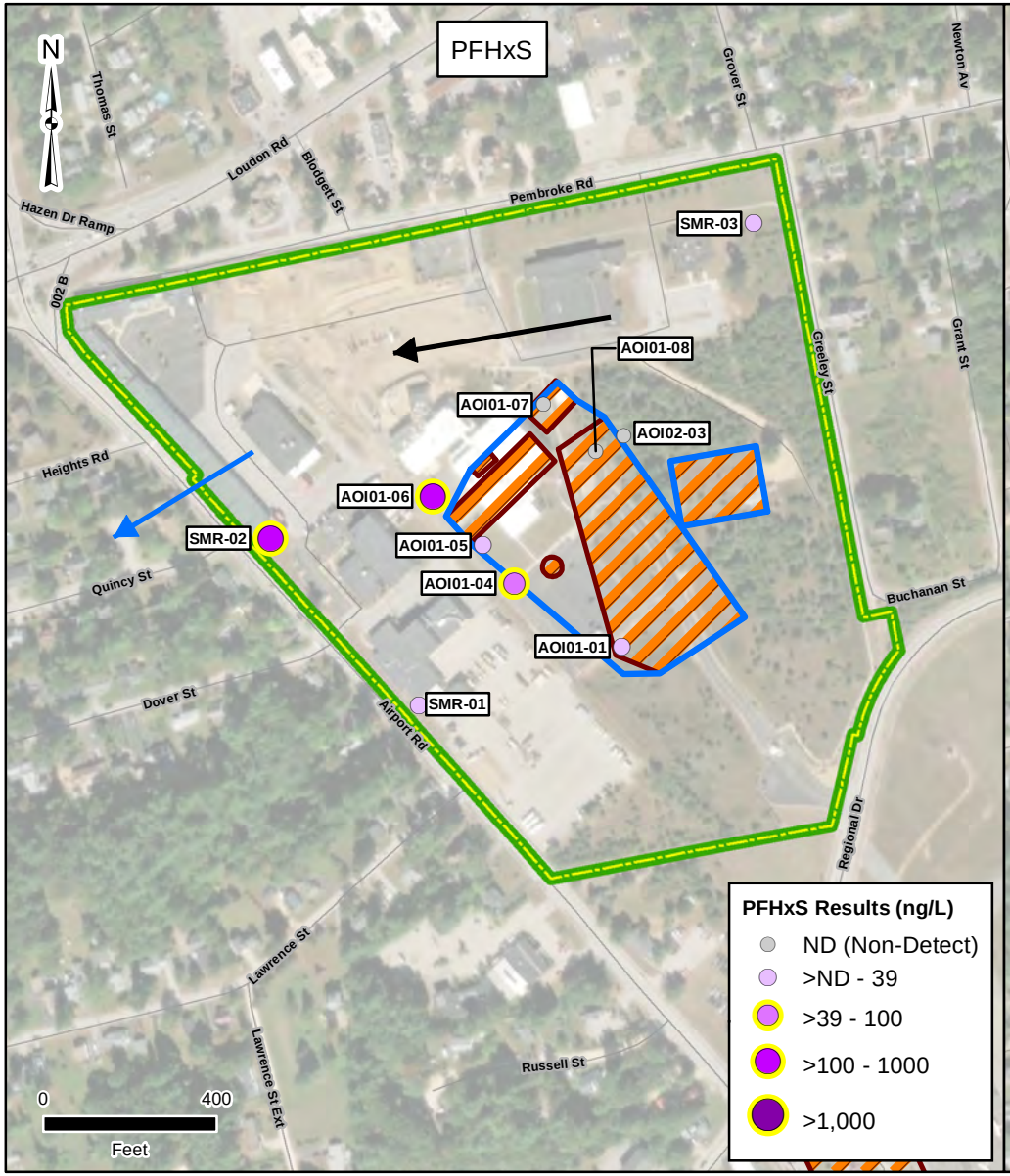
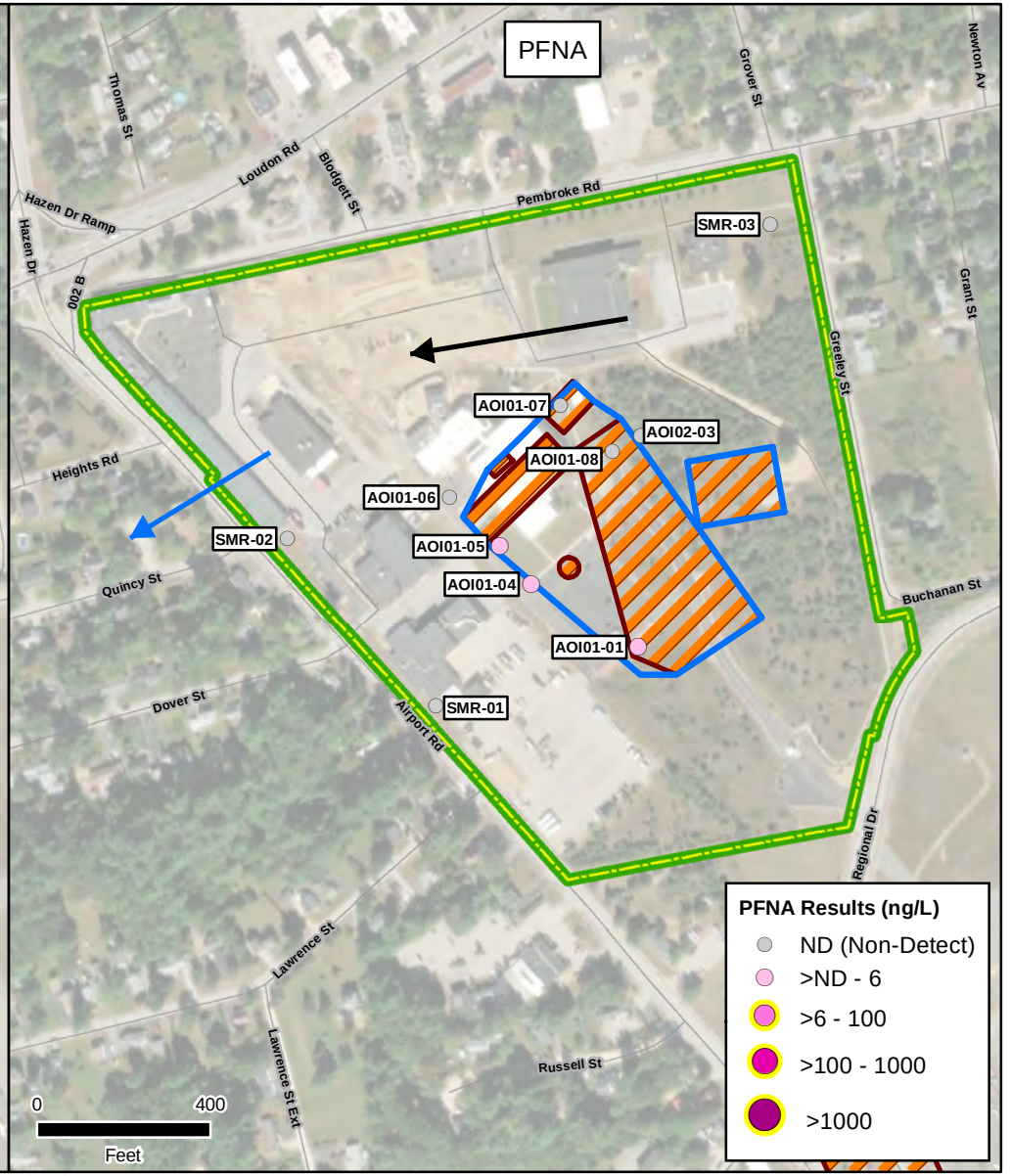
Army National Guard Site Inspections
Site Inspection Report
State Military Reservation
Concord, New Hampshire

Figure 6-7
PFHxS and PFNA Detections in Groundwater







Facility Data
- Area of Interest (AOI)
- Potential PFAS Release
- Facility Boundary

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
ND = Non-Detect
ng/L = nanogram(s) per liter
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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7. EXPOSURE PATHWAYS

The Conceptual Site Model (CSM) for each AOI, revised based on the SI findings, is presented on **Figure 7-1** and **Figure 7-2**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the Facility conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present. SLs are presented in **Section 6.1** of this report.

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

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

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

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1

AOI 1 is the Former AASF, including the former main AASF hangar (former Building K) fire suppression system releases, the former fire truck parking area, the former washing platform, the former aircraft parking apron, the dry wells, and the Tri-Max™ training area.

PFOS was detected in surface soil at AOI 1 at concentrations above the SL. Additionally, PFHxS, PFNA, and PFOA were detected in surface soil below the SL at AOI 1. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for Facility workers and construction workers are potentially complete. PFHxS, PFOA, and PFOS were detected in shallow subsurface soil at AOI 1 below the SL. Construction workers could contact constituents in shallow subsurface soil via incidental ingestion and inhalation of dust; therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is the Former Camp Labonte. According to former AASF personnel, two fire trucks with foam capabilities were present at the SMR between the late 1960s and 1992. When the first fire truck was in use (late 1960s to pre-1977), foam was used for training on the grass and gravel to the north of the former Camp Labonte. The first fire truck was potentially in use after the introduction of AFFF.

PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in surface or subsurface soil at AOI 2; therefore, the soil exposure pathway for Facility workers and construction workers is incomplete. The CSM is presented in **Figure 7-2**.

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1 – Former AASF

PFHxS, PFOA, and PFOS were detected at concentrations exceeding their respective SLs and PFBS, and PFNA were detected at concentrations below their respective SLs. Due to the depth of groundwater at the Facility, the groundwater ingestion exposure pathway for construction workers is considered incomplete. Relevant compounds were detected above their respective SLs in groundwater at the downgradient boundary of the Facility; ho; therefore, the pathway for ingestion of shallow groundwater by off-Facility residents is potentially complete. The exposure concentration for downgradient, off-Facility residents is unknown. Groundwater interaction may be possible for the Merrimack River located approximately 0.8 miles to the west/southwest (downgradient), therefore, the ingestion exposure pathway for offsite surface water and sediment is considered potentially complete for recreational users. Human consumption of fish potentially affected by PFAS from the river is also possible. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2 – Former Camp LaBonte

PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in the groundwater sample from AOI 2, therefore ingestion exposure for construction workers, nearby residents, and recreational users is incomplete. The CSM is presented in **Figure 7-2**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

There is no surface water located at the SMR, however, stormwater does discharge to the Concord municipal storm drain system on Airport Road. The drainage within the storm drain system from Airport Road flows westward down Loudon Road and then to the Merrimack River, which is approximately 0.5 miles to the west of the SMR. Storm drains in the northeast corner of the SMR are also connected to the Concord municipal storm drainage system. In the northern portion of the site, stormwater runoff drains into scattered catch basins that discharge to the storm drain in Pembroke Road. This stormwater also flows westward into the storm drain system on Loudon Road and ultimately to the Merrimack River (VHB, 1993; Stone & Webster Environmental Technology & Services, 1998; AECOM, 2019). Stormwater has the potential to transport AFFF or PFAS-impacted soils to water bodies. No surface water or sediment samples were collected as part of the SI.

7.3.1 AOI 1 – Former AASF

PFHxS, PFNA, PFOA, and PFOS were detected in surface soil at AOI 1. Due to the presence of PFAS in soil, there is the potential for stormwater to transport PFAS-impacted soil particles to the Merrimack River and expose the potential recreational user by ingestion of surface water. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.1 AOI 2 – Former Camp LaBonte

PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in any of the surface soil samples at AOI 2, therefore ingestion exposure for the recreational user is incomplete. The CSM is presented in **Figure 7-2**.

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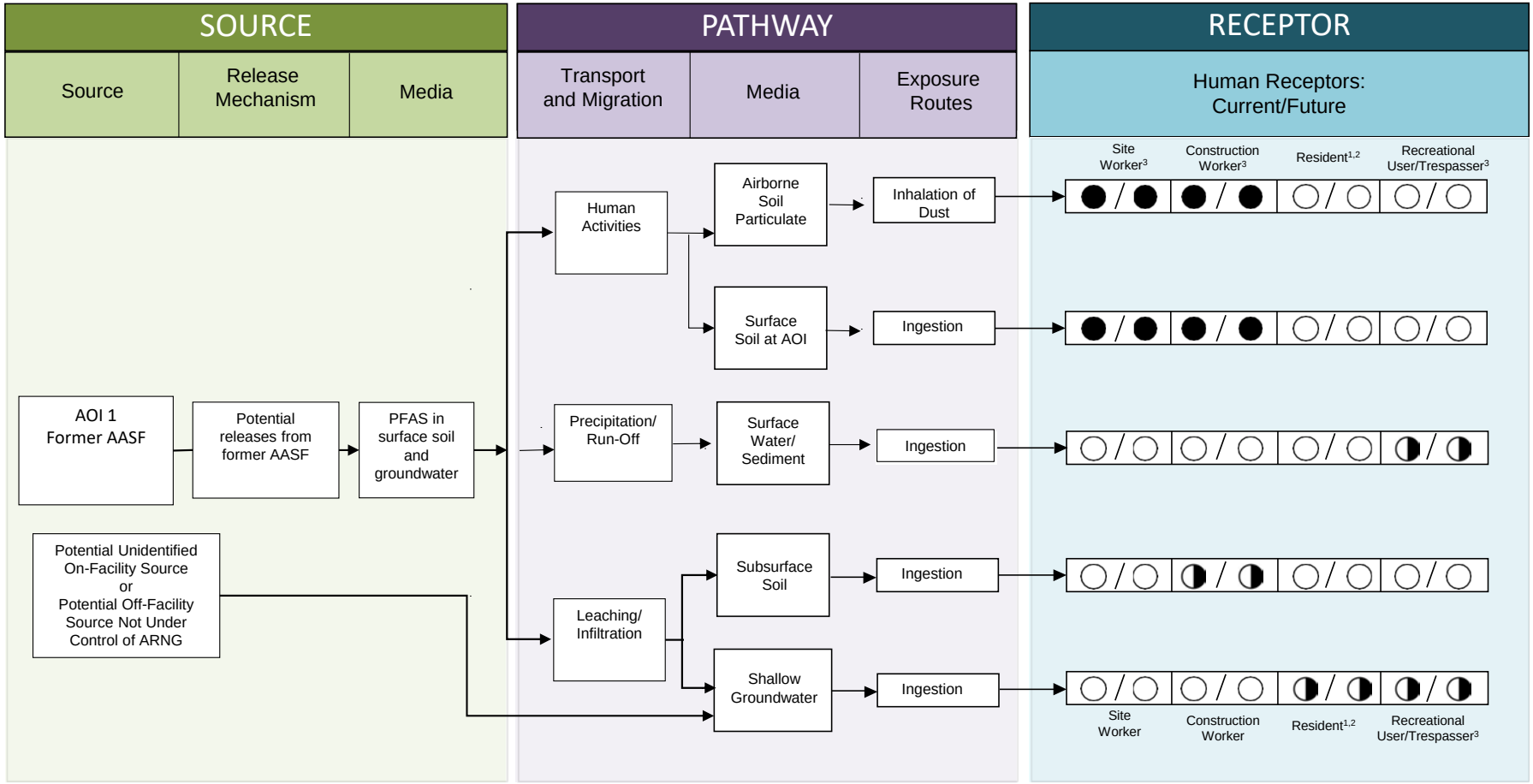

LEGEND

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

Notes:

1. The resident refers to off-site receptors
2. Inhalation of dust for off-site receptors is likely insignificant
3. Dermal contact exposure pathway is incomplete for PFAS
4. No current active construction at the Facility

Figure 7-1
Conceptual Site Model, AOI 1
SMR

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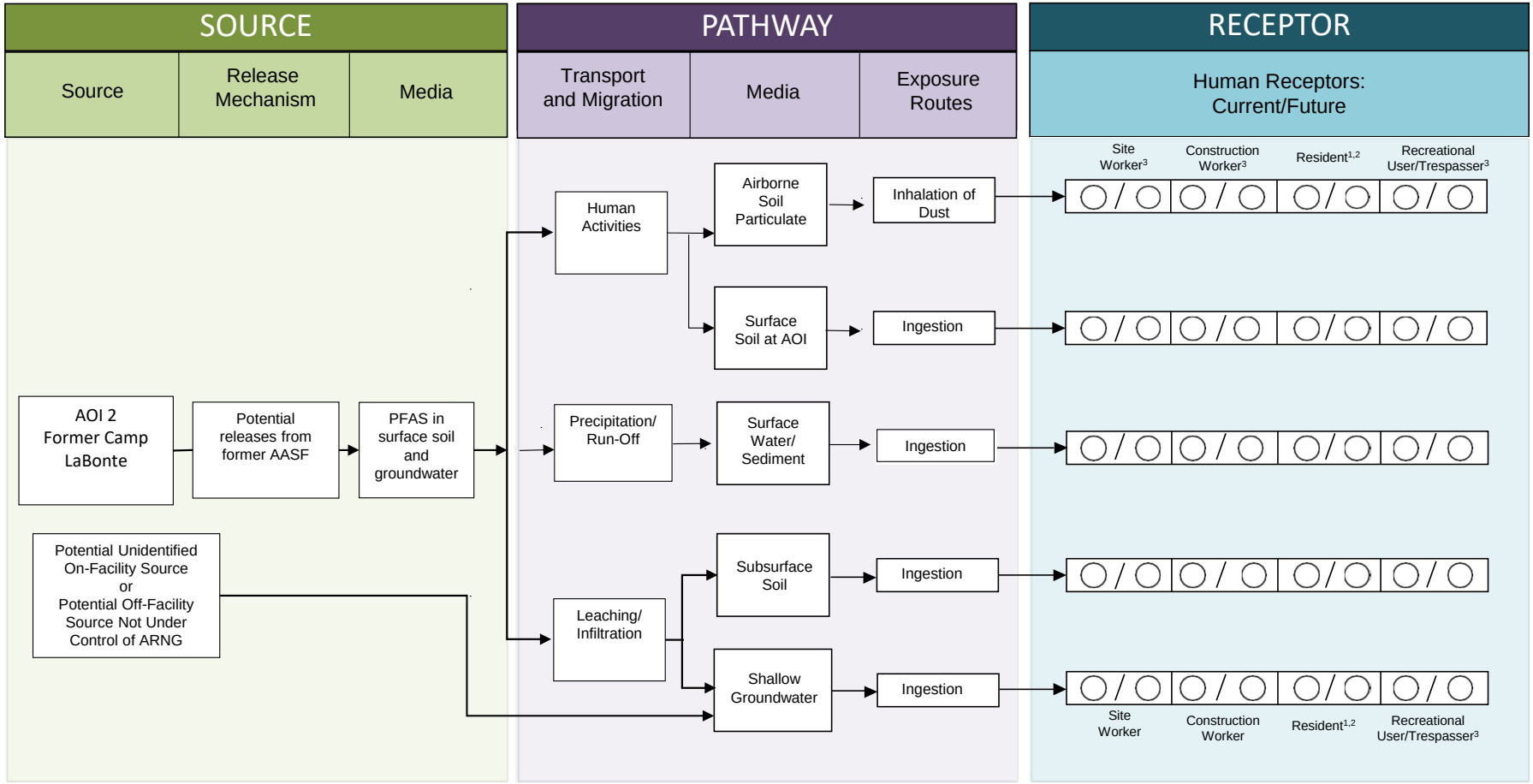

LEGEND

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

Notes:

1. The resident refers to off-site receptors
2. Inhalation of dust for off-site receptors is likely insignificant
3. Dermal contact exposure pathway is incomplete for PFAS
4. No current active construction at the Facility

Figure 7-2
Conceptual Site Model, AOI 2
SMR

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8. SUMMARY AND OUTCOME

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

8.1 SI ACTIVITIES

The SI field activities at the Facility were conducted from 24 May to 13 June 2022. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2022), except as previously noted in **Section 5.9**.

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

- Twenty-five (25) soil grab samples from 9 boring locations
- Ten (10) grab groundwater samples from 10 temporary well locations
- Twenty-six (26) QA/QC samples.

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

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA in the form of a RI is warranted for AOI 1, but further evaluation is not warranted for AOI 2 (see **Table 8-1**). Based on the CSMs developed and revised based on the SI findings, there is potential for exposure to receptors from AOI 1 from sources on the Facility resulting from historical DoD activities.

Sample chemical analytical concentrations collected during the SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to SLs is as follows:

At AOI 1:

- PFOS was detected in surface soil at concentrations exceeding the SL. PFHxS, PFNA, and PFOA were detected in surface soil at concentrations below their respective SLs. PFOS was detected in all seven locations with a maximum concentration of 210 µg/kg. PFHxS, PFOA, and PFOS were detected in shallow subsurface soil at concentrations below their respective

SLs. PFHxS, PFOA, PFOS, PFBS, and PFNA were not detected in any of the deep subsurface soil samples.

- PFHxS, PFOA, and PFOS were detected in groundwater at concentrations exceeding their respective SLs. PFBS and PFNA were detected at concentrations below their respective SLs. PFHxS was detected in seven of nine locations at concentrations that ranged from 1.30 ng/L to 160 ng/L. PFOA was detected in seven of nine locations at concentrations that ranged from 1.70 ng/L to 34.0 ng/L. PFOS was detected in six of nine locations at concentrations that ranged from 13 ng/L to 280 ng/L.

- Relevant compounds were detected in upgradient monitoring well SMR-03 at concentrations below their respective SLs. PFOS and PFOA were detected in the downgradient Facility boundary wells (SMR-02, SMR-01) at concentrations above their respective SLs. PFHxS was detected in downgradient Facility boundary well SMR-02 at a concentration above the SL.

Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.

At AOI 2:

- PFHxS, PFNA, PFBS, PFOA, and PFOS were not detected in any of the soil or groundwater samples from AOI 2.

Based on the results of the SI, further evaluation at AOI 2 is not warranted.

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

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

Table 8-1. Summary of Site Inspection Findings and Recommendations

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Former AASF	●	●	●	Proceed to RI
2	Former Camp LaBonte	○	○	Not applicable	No further action

Legend:

● = Detected; exceedance of screening levels

◐ = Detected; no exceedance of screening levels

○ = Not detected

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9. REFERENCES

AECOM. 2019. *Final Preliminary Assessment Report, State Military Reservation Concord, New Hampshire*. November.

Assistant Secretary of Defense. 2022. Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. United States Department of Defense. 6 July.

Department of the Army (DA). 2016a. *EM-200-1-2, Environmental Quality, Technical Project Planning Process*. 29 February.

———. 2016b. *Army Guidance to Address Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) Contamination*. August.

———. 2018. *Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances*. September.

DoD. 2019a. *Department of Defense (DoD), Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3*. May.

———. 2019b. *General Data Validation Guidelines*. November.

———. 2020. *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15*. May.

EA, Engineering, Science, and Technology, PBC (EA). 2020. *Final Programmatic Uniform Federal Policy Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide*. December.

EA Engineering, Science, and Technology, PBC and Wood Environment & Infrastructure Solutions, Inc. (EA/Wood). 2021. *Accident Prevention Plan/Site Safety and Health Plan Addendum, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide, State Military Reservation Concord, New Hampshire*. November.

———. 2022. *Final Site Inspection Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) Addendum, State Military Reservation, Concord, New Hampshire, Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide*. May.

Guelfo, J.L. and C.P. Higgins. 2013. *Subsurface transport potential of perfluoroalkyl acids and aqueous film-forming foam (AFFF)-impacted sites*. Environmental Science and Technology 47(9):4164-71.

Higgins, C.P., and R.G. Luthy. 2006. *Sorption of perfluorinated surfactants on sediments*. Environmental Science and Technology 40 (23): 7251-7256.

ITRC. 2018. *Environmental Fate and Transport for Per- and Polyfluoroalkyl Substances*. March.

U.S. Environmental Protection Agency (EPA). 1980. *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*. 11 December.

———. 1994. *National Oil and Hazardous Substances Pollution Contingency Plan (Final Rule).* 40 Code of Federal Regulations Part 300; 59 Federal Register 47384. September.

———. 2001. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation* Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). December.

———. 2005. *Federal Facilities Remedial Site Inspection Summary Guide.* 21 July.

———. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process* USEPA/240/B-06/001. February.

———. 2017. *National Functional Guidelines for Organic Superfund Data Review*. OLEM 9355.0-136, EPA-540-R-2017-002. Office of Superfund Remediation and Technology Innovation. January.

US Fish and Wildlife Service (USFWS). 2022. *Endangered Species.* http://ecos.fws.gov/ipac/. Accessed 19 October.

Xiao, F., M. F. Simcik, T.R. Halbach, and J.S Gulliver. 2015, *Perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) in soils and groundwater of a U.S. metropolitan area: Migration and implications for human exposure*. Water Research 72:64-74.