



FINAL

Uniform Federal Policy- Quality Assurance Project Plan Addendum

USAEC Per- and Polyfluoroalkyl Substances Preliminary Assessment/Site Inspection Picatinny Arsenal, New Jersey

November 2019

Contract: W912DR-18-D-0004
Delivery Order: W912DR18F0685

Prepared For:

**U.S. ARMY CORPS OF ENGINEERS, BALTIMORE
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**Uniform Federal Policy-Quality
Assurance Project Plan
Addendum**

USAEC PFAS SI
Picatinny Arsenal, New Jersey

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List of Acronyms and Abbreviations

°F	degrees Fahrenheit
%	percent
AFFF	aqueous film-forming foam
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
B.S.	Bachelor of Science
CFR	Code of Federal Regulations
CP	Building 24 Chromium Plating
CPR	cardiopulmonary resuscitation
CSM	conceptual site model
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objective
EAB	Eastern Boundary
ELLE	Eurofins Lancaster Laboratories Environmental
EB	equipment blank
FB	field blank
FD	field duplicate
FH1	Building 169 – Firehouse 1
FH2	Building 3316 – Firehouse 2
ft bgs	feet below ground surface
GPB	Green Pond Brook
HAL	Health Advisory Level
HEL	NJARNG Helipad
GPS	global positioning system
GRG	Area 1222 Gorge
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigation-derived waste
installation	U.S. Army and Reserve installation
IRP	Installation Restoration Program
LAW	Lawn N of Building 3409/3410
LC/MS-MS	liquid chromatography / tandem mass spectrometry
LOD	limit of detection
LOQ	limit of quantitation
M.S.	Master of Science
MS	matrix spike
MSD	matrix spike duplicate
MW	monitoring well
MVU	mid-valley upgradient
N	normal (parent)
NJARNG	New Jersey Army National Guard
NJDEP	New Jersey Department of Environmental Protection
NAB	Northern Area Boundary

List of Acronyms and Abbreviations

N/A	not applicable
ng/g	nanogram per gram
ng/L	nanogram per liter
NS	no sample
OSHA	Occupational Safety and Health Administration
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFL	Post Farm Landfill
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PICA	Picatinny Arsenal
POC	point of contact
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
PSL	Former Pyrotechnic Area and Sanitary Landfill
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
SAB	Southern Area Boundary
SI	site inspection
SO	soil
SOP	standard operating procedure
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SW	surface water
TBD	to be determined
TGI	technical guidance instructions
TOC	total organic carbon
U.S.	United States
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
WTP	water treatment plant
WWTP	wastewater treatment plant

INTRODUCTION

A Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP; Arcadis U.S., Inc. [Arcadis] 2018b) was developed and submitted as final in October 2018. The PQAPP addresses the per- and polyfluoroalkyl substances (PFAS) preliminary assessment (PA) and site inspection (SI)-phase sampling at active United States (U.S.) Army (Army) installations (installations) within the U.S. Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are two of the most abundant PFAS and are recognized by the United States Environmental Protection Agency (USEPA) as contaminants of emerging concern that present potentially unacceptable human health and environmental impacts. The purpose of this site-specific Quality Assurance Project Plan (QAPP) Addendum is to supplement the PQAPP, detail the planning processes for collecting data, and describe the implementation of the quality assurance (QA) and quality control (QC) activities developed for the SI sampling proposed at Picatinny Arsenal (PICA) in Rockaway, New Jersey. The objectives of the PQAPP and this QAPP Addendum are to generate project data that are technically defensible and useful in meeting the Army's PFAS SI project goals. Project goals include identifying the presence or absence of PFAS (including PFOS and PFOA) at areas of potential interest (AOPs), identifying the presence or absence and the nature of other PFAS, and updating AOPI drinking water conceptual site models (CSMs), which will be detailed in an SI Report.

This QAPP Addendum addresses three primary elements:

- Project management
- General CSM description
- Site-specific investigation design and data acquisition.

The site-specific worksheets in this QAPP Addendum for PICA supplement the general programmatic information provided in the PQAPP. Site-specific details provided in this QAPP Addendum include sampling locations, media, methodologies, and procedures. Should site conditions warrant deviation from the prescribed procedures in this QAPP Addendum, the stakeholders will be consulted before changes to the sampling plan are made, and a revised QAPP Addendum will be issued, if necessary.

QAPP ADDENDUM WORKSHEET #1 & #2: TITLE AND APPROVAL PAGE

(Uniform Federal Policy-Quality Assurance Project Plan [UFP-QAPP] Manual Section 2.1)
(USEPA 2106-G-05 Section 2.2.1)

1. Project Identifying Information:
 - o Site name/project name: U.S. Army Environmental Command (USAEC) PFAS SI
 - o Site location/number: Picatinny Arsenal, Rockaway Township, New Jersey
 - o Contract/work assignment number: W912DR-18-D-0004/ W912DR18F0685
2. Lead Organizations: United States Army Corp of Engineers (USACE), USAEC, and PICA
 - o USACE Regional Point of Contact (POC), Baltimore District
Electronic approval provided via email 10/16/19 – see worksheet #4
Brant Crumbling Date
 - o PICA USAEC Environmental Support Manager
Electronic approval provided via email 10/15/19 – see worksheet #4
Mary Ellen Maly Date
 - o PICA Installation Restoration Program (IRP) Manager
Electronic approval provided via email 10/15/19 – see worksheet #4
Ted Gabel Date
3. List plans and reports from previous investigations relevant to this project:

Title	Date
Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, USAEC PFAS SI, Active Army Installations, Nationwide, USA	October 2018
Preliminary Assessment of Per- and Polyfluoroalkyl Substances, Picatinny Arsenal, NJ	February 2019

QAPP ADDENDUM WORKSHEET #4, #7, & #8: PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
 (USEPA 2106-G-05 Sections 2.2.1 and 2.2.7)

This worksheet is used to identify key site-specific personnel for each organization performing tasks defined in this QAPP Addendum.

LEAD ORGANIZATIONS: USACE, USAEC, and PICA

Name	Agency	Project Title/Role	Signature ¹ (check box)
Brant Crumbling	USACE	Regional POC	<input checked="" type="checkbox"/>
Mary Ellen Maly	USAEC	Environmental Support Manager	<input checked="" type="checkbox"/>
Ted Gabel	PICA	IRP Manager	<input checked="" type="checkbox"/>

ORGANIZATION: Arcadis

Name	Project Title/Role ¹	Education/Experience	Specialized Training/Certifications	Signature ² (check box)
Lisa Szegedi	PICA Project Manager	Bachelor of Science (B.S.) and Master of Science (M.S.) in Environmental Science, Project Manager with over 25 years of experience managing a diverse array of multi-million-dollar hazardous waste projects under various programs including Superfund and USACE contracts.		<input checked="" type="checkbox"/>
Jeff Burdick	Technical Lead	B.S. Geology, M.S. Hydrogeology 26 years of experience. Global lead for Site Evaluation and Restoration; site characterization, North American Technical PFAS Lead.		<input checked="" type="checkbox"/>
Eric Killenbeck	Hydrogeologist	B.S. Geology, 20 years of experience. Technical expert in site characterization for both federal and private sector clients.		<input checked="" type="checkbox"/>

Name	Project Title/Role ¹	Education/Experience	Specialized Training/Certifications	Signature ² (check box)
Chris Goldsmith	Field Team Leader / Site Safety and Health Officer (SSHO)	B.S. Geology, 13 years of experience. Experienced Field Team Leader responsible for implementation of tasks performed as part of a given field event for both federal and private sector clients. Provides oversight of all safety activities related to the field tasks.	<ul style="list-style-type: none"> • Occupational Safety and Health Administration (OSHA): Initial 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) • OSHA: HAZWOPER 8-Hour Refresher 29 Code of Federal Regulations (CFR) 1910.120(e)(8) • First Aid/Cardiopulmonary Resuscitation (CPR) • OSHA 30-Hour Construction Safety 	<input checked="" type="checkbox"/>
Veronica Bean	Field Sample Management	B.S. Environmental Science, 14 years of experience. Provided sample management support on numerous federal and private sector clients. Has extensive experience with sample management for high volume sample projects.	<ul style="list-style-type: none"> • OSHA: Initial 40-Hour HAZWOPER • OSHA: HAZWOPER 8-Hour Refresher 29 CFR 1910.120(e)(8) • First Aid/CPR • Department of Transportation 	<input checked="" type="checkbox"/>

¹ Field sampling personnel may be subject to change based on staff availability.

² Signature check boxes indicate personnel have read and agree to implement this QAPP Addendum as written.

QAPP ADDENDUM WORKSHEET #10: CONCEPTUAL SITE MODEL

(UFP-QAPP Manual Section 2.5.2)
(USEPA 2106-G-05 Section 2.2.5)

Preliminary drinking water CSMs for PICA AOPIs included in the SI sampling scope of work are presented below. Data collected during the completion of the SI sampling scope of work within this QAPP Addendum will be used to further develop drinking water CSMs for each AOPI in the SI Report for PICA.

Background Information

PICA, which covers approximately 5,801 acres, contains both improved and unimproved lands and is located in Rockaway Township, Morris County, New Jersey approximately 45 miles west of New York City. The installation is bordered by numerous major highways including State Route 15, Interstate 80, and U.S. Route 46 (**Figure 1**).

PICA was established in the late 1800s as a storage and powder depot. Production activities began several years before the Spanish-American War, which started in 1898. At the beginning of World War I, PICA was manufacturing smokeless powder and munitions of various sizes. By the end of the war, PICA had begun new operations including the melt-loading of projectiles, manufacture of pyrotechnic signals and flares, experimental manufacture of modern propellants, high explosives, fuzes, metal components, and the loading of trinitrotoluene and amatol into bombs and projectiles. During World War II, PICA produced thousands of pounds of smokeless powder, boosters, primers, and detonators. PICA also produced thousands of pounds of explosives for the Korean and Vietnam Conflicts.

In recent years, PICA's mission has shifted to become an integrated weapons and armaments specialty site for guns and ammunition. To help support this mission, PICA is the site of the Armaments Research, Development and Engineering Center, whose mission is conducting and managing research and development for all assigned weapons systems. PICA has also established several partnerships with academia and industry and has involved them in the research and development process.

Physical Setting

Topography and Climate

PICA is located in the New Jersey Highlands physiographic province between the Appalachian Piedmont physiographic province to the southeast and the Valley and Ridge province to the northwest. The New Jersey Highlands Region is part of the larger New York-New Jersey Highlands that encompasses 1.1 million acres of Appalachian ridges and valleys stretching from the Hudson to the Delaware River.

The majority of PICA appears on the Dover U.S. Geologic Survey topographic quadrangle. Elevations on PICA range from 685 feet above mean sea level in the valley to 1,287 feet above mean sea level along the ridgeline of Green Pond Mountain. In general, elevations are lower to the south and east and higher to the north and west. The majority of PICA occupies a central valley (Picatinny Valley) that is approximately seven miles long along with a narrower parallel intermontane valley (Green Pond Gorge) that is about two miles long. The width of PICA is approximately one mile with Green Pond Mountain to the northwest of PICA and Copperas Mountain to the east, and an unnamed hill to the southeast. Overall, the dominant

topographic gradient is from the northeast to the southwest with severe slopes present along the northwestern boundary of PICA along Green Pond Mountain.

PICA has a cool, humid continental climate. The average annual high temperature is 58.0 degrees Fahrenheit (°F) with an average annual low temperature of 37.8 °F. Daytime high temperatures average from 30 °F in January to 80 °F in July. Average humidity during the year is 79 percent (%) with highs observed up to 100% and lows of 49% (Weather Underground, Inc. 2013). Average annual precipitation is 52.39 inches with monthly averages between 0 and 6.6 inches.

Geology and Hydrogeology

PICA is located in the New Jersey Highlands physiographic province geographic region. The New Jersey Highlands are composed of Proterozoic to Devonian rocks as part of the Appalachian Mountains and formed when the continents collided. The region consists of a complex system of folded and faulted bedrock that forms northeast to southwest trending valleys and ridges. PICA occupies a main central valley with four bedrock formations that form the valley and the surrounding ridges: Precambrian gneiss and other metamorphic rocks, Cambrian Hardyston quartzite, Cambrian Leithsville dolomite, and Silurian Green Pond conglomerate. Unconsolidated deposits consists of Pleistocene glacial till and stratified drift that overlies much of the bedrock formations with the thickest deposits occurring within the central valley of PICA, which consists mainly of stratified drift with till along the ridges (Lucey 1972).

The soils at PICA are acidic and primarily derived from glacial deposits. The central portion of PICA has soils that consist of loamy, silty, and gravel clay pan soils along with swampy areas that consist of peat and muck. The southern end of PICA consists of poorly sorted sands, gravels, and boulders bordered by a terminal moraine. To the northwest is a mountain range (Green Pond Mountain) with rough, stony land that formed on jagged, rocky slopes. Glacial till blankets the western and eastern flanks of PICA. Up to 20 feet of glacial till consisting of sand, gravel, and boulders covers the western portion of PICA. The eastern portion of PICA consists of uniform glacial till with thicknesses ranging from 10 to 25 feet. The valley floor consists of till and drift from glacial lakes and streams with a thickness of up to 200 feet (Dames & Moore 1991).

Groundwater at PICA consists of four distinct aquifers; unconfined, upper semi-confined, lower semi-confined and bedrock aquifers. The uppermost aquifer is an unconfined aquifer consisting of stratified drift on top of fine sand and silt lake sediments and has a thickness of 20 to 35 feet (**Figure 2**). Groundwater in the unconfined aquifer generally flows toward surface water discharge areas, such as Green Pond Brook (GPB), Bear Swamp Brook, and Lake Picatinny. Two semi-confined glacial till aquifers (upper and lower) consisting primarily of sand and gravel underlie the upper most aquifer. The upper semi-confined aquifer is generally encountered in the southern half of the valley. The lower semi-confined aquifer occurs beneath the upper only in the central valley portion of this area. Groundwater flow direction in the semi-confined aquifers is generally down valley to the southwest and towards surface water discharge areas. Vertical flow is typically upward towards discharge areas except where affected by groundwater withdrawal wells. These three valley-fill aquifers (unconfined, upper semi-confined, and lower semi-confined) have a maximum thickness of approximately 175 feet. The bedrock aquifer consists of several formations dependent on location throughout PICA due to the folded and faulted nature of the New Jersey Highlands. The ridges consist of Green Pond Conglomerate along the western ridge of the installation and a suite of crystalline mesoproterozoic metamorphic rocks that makes up the eastern ridge. Valley areas of PICA consists of Green Pond Conglomerate and the crystalline bedrock north of Lake Picatinny, and the Leithsville Dolomite south of Lake Picatinny. In the southern portion of PICA the Leithsville Dolomite is separated from the semi-confined glacial till aquifer by weathered bedrock with a maximum thickness of 60 feet (Dames & Moore

1991). Groundwater flow in the bedrock is generally towards the central valley and surface water features; with local variation from the foliation and fractures faults that are present that can alter and control flow directions along fractures and fault planes.

Surface Water Hydrology

PICA lies within the recharge area of the New Jersey Watershed Management Area 6, the primary water supply for northern New Jersey. Surface water drains primarily from northeast to southwest with GPB serving as the primary drainage for PICA. GPB originates at a 500-acre spring-fed lake known as Green Pond, located adjacent to the northern border of PICA. All drainages at PICA empty into the Rockaway River, approximately one mile south and east of PICA. Rockaway River is the major tributary to the Boonton Reservoir, located approximately 17 miles downstream (southeast) of PICA, and used as the Jersey City water supply.

Main waterbodies within the installation include GPB, several unnamed small ponds, Bear Swamp Brook, Picatinny Lake and Lake Denmark. Approximately one mile south of PICA, GPB joins the Rockaway River. The Rockaway River flows east through the Boonton Reservoir before joining the Passaic River. Bear Swamp Brook joins GPB on the southern end of PICA. Ames Brook as well as the Hibernia Brook tributary flow off PICA exiting along the eastern boundary and join Lake Ames. Lake Denmark and Picatinny Lake are man-made features that collectively comprise 360 acres of open water. The lakes were constructed in the 1880s and are primarily used for industrial water supply and recreation.

Known or Suspected Contaminants and Sources

During the PA, 10 AOPs were identified following review of site documents, interviews with site personnel, and site reconnaissance visits (**Figure 3**). Groundwater samples were collected from five of these AOPs under a pre-SI investigation; refer to the Previous PFAS Investigations section. Additional information regarding each of the AOPs is listed in **Table 1**.

Table 1 - AOPi Descriptions

AOPi Name	Location on PICA	Description	Pre-SI Samples Collected?
Former Pyrotechnic Area	Southern Boundary	Prior to 1990, aqueous film-forming foam (AFFF) was utilized in this area once or twice a year by the PICA Fire Department to extinguish lingering fires on the peaty grounds associated with this area. In addition to confirmed AFFF use, historical landfilling activities at the sanitary landfill included dumping of sanitary waste, fly ash, ordnance, industrial wastes, and wastewater treatment plant (WWTP) sludge (refer to the Former WWTP Facility write-up). The Former Pyrotechnic Area consists of a marshy area that is relatively level, with a large pond located within the bounds of the site. There is a small building on site, as well as numerous MWs.	Yes; 3 monitoring well (MW) samples
Former Lower Burning Grounds	Southern Boundary	The PICA Fire Department used AFFF intermittently in this area to extinguish lingering fires due to difficulty associated with extinguishing fires on the peaty grounds in this area. The majority of these responses involving AFFF happened prior to the early 1990s. The Former Lower Burning Grounds consist of a flat, level field with peaty/organic materials present and marshy areas. Current use includes a solar farm.	Yes; 3 MW samples
Former Building 24	Southern	Chromium plating operations at Former Building 24 began in approximately 1942 and continued until about 1982. This was identified as an AOPi because certain mist suppressants used in chromium plating could contain PFAS. Former Building 24 and its associated lagoons have since been demolished and removed but were once the site of chromium plating operations and waste disposal at PICA. The Former Building 24 lot is now used as a parking lot. Building 25 still exists and borders the site. Bear Swamp Brook runs between where the associated lagoons were and the Former Building 24 lot. Where the lagoons were constructed is now a grassy/gravel surface that does not have a defined use.	Yes; 2 MW samples
Building 169 – Firehouse 1	Southern	Building 169 – Firehouse 1 is the most recently constructed firehouse currently utilized by the PICA Fire Department, built approximately 10 years ago. Over the past 10 years, an estimated 55 gallons of AFFF have been released during nozzle testing and hose cleanouts at this location. Firetrucks that stored AFFF were also washed and housed in the parking lots and internal bays at this firehouse. Current firehouse that includes a garage to house fire trucks as well as office/living space for Picatinny Fire Department personnel. Outside of Building 169 is an associated parking	Yes; 1 MW sample

AOPI Name	Location on PICA	Description	Pre-SI Samples Collected?
		lot for fire trucks and personnel vehicles. The site also includes a grassy lawn area.	
The Former WWTP Facility	Southern	This was identified as an AOPI due to the use of AFFF. Although the facility building was demolished in 2011, the Former WWTP Facility (former building 80) and the associated sludge beds could potentially be a secondary source of PFAS. The Former WWTP Facility consisted of the sewage treatment plant and its associated structures and sheds as well as the sludge drying bed and leach fields on the southern portion of the facility lot.	Yes; 2 MW samples
Post Farm Landfill	Southern Boundary	This was identified as an AOPI due to the relation to chromium plating wastes since drums found at the Post Farm Landfill came from Former Building 24, as well as other buildings. Beginning in the 1940s through 1979, the Post Farm Landfill received a variety of industrial waste generated at PICA, including fly ash, paint stripping wastes, phenols, and spent explosive laden hydraulic oils. In addition to the chromium plating-related wastes, spent hydraulic oils and paint sludges could potentially be a secondary source of PFAS. The Post Farm Landfill is surrounded by wooded vegetation and is located proximal to the southeastern installation boundary. The area is no longer an active landfill and does not have any current known uses.	No
Building 3316 – Firehouse 2	Eastern Boundary	Approximately 10 years ago, prior to the construction of Firehouse 1, Building 3316 – Firehouse 2 was historically used as the sole fire department at PICA. Building 3316 - Firehouse 2 still operates as an active firehouse and location of fire truck storage and fire department operations. Historical operations included fire truck storage and washing, AFFF handling and truck refilling operations, and nozzle testing. Building 3316 – Firehouse 2 consists of a stone/brick building used for office/living space for PICA Fire Department personnel. Also included in the building are multiple bays for firetruck and firefighting materials storage. There is a wraparound paved parking lot and an additional storage building behind the main firehouse. Small grassy areas and a longer lawn strip are east of the firehouse and its associated parking lots.	No
Lawn North of Building 3409/3410	Eastern Boundary	In the early 2010s, the Lawn to the North of Building 3409/3410 was used by the PICA Fire Department on multiple occasions as a location of AFFF training activities such as arc-training and nozzle testing. The area consists of a grassy lawn area to the north of Buildings 3409 and 3410. There is a gravel roadway that separates the lawn and a wooded area.	No

AOPI Name	Location on PICA	Description	Pre-SI Samples Collected?
		There are abandoned stormwater collection system structures within the grassy area.	
Building 3801 – NJARNG Helipad Area	Eastern Boundary	In 1988 or 1989, the PICA Fire Department utilized AFFF to respond to a fire that occurred on a concrete slab adjacent to Building 3801 at the New Jersey Army National Guard (NJARNG) Helipad area. The fire occurred due to a static electricity spark during a vehicle fueling operation. Approximately 20 gallons of AFFF were used to extinguish the fire. This site is operated by the NJARNG and consists of a building with office space and an attached garage to perform maintenance repairs. Other components of the site include a helipad south of the building, fuel aboveground storage tanks, large open storage lots, multiple stormwater drains in the parking lot and adjacent to the helipad, and grassy/lawn areas spread out between paved sections.	No
Area 1222 - Gorge	North-Central	Prior to 1988, the PICA Fire Department used AFFF periodically to extinguish fires that started due to the munitions testing activities that occurred in this area. AFFF was used due to the difficulty in extinguishing fires on the rocky topography associated with this area. The Area 1222 - Gorge is an operational range at PICA and contains training equipment/structures related to range missions. Within the Area 1222-Gorge there are sections of rocky topography, steep slopes, small streams, and wooded vegetation. There are some small ponded areas of water due to craters created from training activities.	No

Previous PFAS Investigations

In 2013, under the third Unregulated Contaminant Monitoring Regulation, PICA collected samples from the existing Building 1383 Water Treatment Plant (WTP). Samples were collected from the point of entry into the distribution system and were analyzed for various parameters, including PFOS and PFOA. Neither compound was detected; the limit of detection (LOD) was 40 and 20 nanograms per liter (ng/L) for PFOS and PFOA, respectively.

Because regulatory guidance levels for PFOS and PFOA decreased in May 2016, with the promulgation of USEPA’s health advisory level (HAL), and laboratories are able to achieve increasingly lower detection limits, in 2018 PICA performed proactive PFOS and PFOA sampling from the existing WTP at Building 1383, operated by American Water, as well as from the on-post potable wells PW-131 and PW-302D. Each sampling location has been shown to contain combined PFOS and PFOA concentrations in pre-treated water above the HAL (70 ng/L). Water from these wells is currently being treated with carbon to remove PFOS/PFOA. To date, all samples collected post-treatment have been non-detect for PFOS and PFOA; the laboratory LOD is 5 ng/L for each compound. The pre-treatment results from the most recent PICA potable well sampling, which was conducted in July and August of 2019 are as follows:

- PW-131 – 135.9 ng/L PFOS and 14.1 ng/L PFOA
- PW-302D - 82 ng/L PFOS and 8.7 ng/L PFOA

In September 2018, a pre-SI investigation was conducted at the following AOPIs; Former Pyrotechnic Area, Former Lower Burning Ground, Building 169 – Firehouse 1, Former Building 24, and the Former WWTP facility. Samples were also collected downgradient of the AOPIs at the southern boundary of the installation. Altogether, 25 samples were collected; 24 groundwater samples and one surface water sample. Refer to **Table 2** and **Figures 4 - 7**. Concentrations above the HAL were detected in one groundwater sample from the Former Pyrotechnic Area AOPI and two groundwater and one surface water sample from the southern boundary.

Table 2 - Pre-SI Sampling Results

Sample Location	No. of Samples (Groundwater / Surface Water)	Maximum PFOS / PFOA Concentrations (ng/L)	Comments
Former Pyrotechnic Area	3 / 0	7.4 / 70	One MW, 20/24MW-8, had concentrations > HAL; this is an unconfined aquifer
Former Lower Burning Grounds	3 / 0	Non-Detect / 26	All results < HAL
Former Building 24	2 / 0	50 / 13	All results < HAL
Building 169 – Firehouse 1	1 / 0	46 / 21	All results < HAL
The Former WWTP Facility	2 / 0	6.7 / 8	All results < HAL
Southern Boundary	13 / 1	Groundwater – 300 / 14 Surface Water – 130 / 13	Wells with concentrations > HAL included MW SB1-2; unconfined aquifer and MW SB3-2; lower semi-confined aquifer. The surface water sample was collected from GPB where it exits the installation

Potential Receptors and Contaminant Exposure Pathways

Potential receptors and contaminant exposure pathways for each of the installation's AOPIs are presented in the CSMs on **Figure 8 through Figure 17**. Based on the historical use of AFFF at the AOPIs, affected media are likely to consist of soil, groundwater, surface water, and/or sediment. Release and transport mechanisms include dissolution/desorption from soil to groundwater, runoff/dissolution/adsorption with surface water or stormwater, and adsorption/desorption between surface water and sediment. Human exposure pathways are shown as "potentially complete" or "incomplete" on the CSM figures; exposure pathways are only "complete" when the presence of PFAS in the exposure medium has been confirmed and there is no barrier to receptor exposure. Considering the Army's primary concern is for human exposure through direct ingestion of PFAS in drinking water, the remainder of this section focuses on the potential exposure pathways for only groundwater and surface water.

On-site drinking water wells with known PFOS/PFOA contamination in groundwater are currently being used to supply drinking water at the installation. These wells are being treated with carbon; after treatment PFOS/PFOA are not detected in the water. Other potential receptor pathways may include discharge to or recharge from groundwater to Lake Denmark, Picatinny Lake, or off-site via GPB. Note that Lake Denmark and Picatinny Lake are not used for drinking water.

As discussed under Previous PFAS Investigations, groundwater and surface water samples collected from monitoring wells at the southern boundary of PICA had concentrations above the HAL. Therefore, the following steps were conducted to determine if any potable wells, which are potential receptors, are located within 0.3 miles downgradient of the southern boundary of PICA.

1. A well search was conducted using New Jersey Department of Environmental Protection (NJDEP) well records.
2. Local water providers were contacted to determine what properties, if any, within the downgradient area are not known to be connected to public water.
3. Letters were sent to the owners of the properties identified as potentially having a private well. The letter included a questionnaire for the owners to complete and send back so the presence/absence of a private well could be determined.
4. If the questionnaire was not returned, a door-to-door survey was conducted and, if the owner was present, the presence/absence of a private well was confirmed.

Based on the well search results, one private well located within 0.3 mile downgradient of the southern boundary was sampled and PFOS/PFOA were detected. Therefore, the well search was expanded to an area 1-mile downgradient of PICA. Six additional properties known to have private wells and two properties potentially having a private well were identified within 1-mile downgradient of PICA. **Figure 18** shows the results of the well search, calling attention to those wells that are potentially potable and a possible source of exposure for human receptors. Note that this information will be continuously updated based on a review of records, ground truthing of the off-site wells and property owner correspondence responses. Details regarding these wells is given in **Attachment 1**. The well logs are given in **Attachment 2**. In addition, a community Wellhead Protection Area (**Figure 19**) is located on the southern portion of the installation.

Data Gaps

The following have not been determined and will be investigated as part of this SI:

Groundwater

- The presence/absence of PFAS at the following five AOPIs.
 - Building 3316 – Firehouse 2

- Area 1222 – Gorge
- Building 3801 – NJARNG Helipad Area
- Lawn North of Building 3409/3410
- Post Farm Landfill
- During the pre-SI limited groundwater sampling was conducted at the following AOPIs. Additional groundwater sampling is needed to confirm/refute the pre-SI results.
 - Former Lower Burning Grounds
 - Former WWTP Facility
- The NJDEP database has indicated the potential presence of private domestic wells located within 1 mile downgradient of the southern and eastern boundaries of PICA (i.e., downgradient of the AOPIs). Because the locations given in NJDEP's database are approximate, the exact locations of these wells are unknown and needed to be confirmed by other means. The well confirmation process included record review, township/borough potable well inquiries, potential well location ground truthing and potential well owner notification correspondence. The off-post potable water testing program is still underway and additional wells may be tested, if appropriate.
- While PFOS/PFOA was detected in groundwater at the downgradient southern boundary of the installation it is unknown if PFOS/PFOA has migrated off-site.
- Upgradient groundwater has not been sampled at PICA; therefore, it is not known if PFAS is coming onto PICA from off-post locations.

Soil

- Source strength of potential PFAS masses remaining in the soil beneath all AOPIs has not been documented.
- The purpose of sampling soil is to evaluate the potential for those media to be sources of PFAS to surface water and groundwater, as an influence to drinking water receptors, and not to evaluate direct contact with sediment or soil.

Surface Water

- Standing and/or running water is potentially present at the following AOPIs. Note that some streams at PICA are intermittent; the presence/absence of PFAS in surface water at these AOPIs is unknown.
 - Former Lower Burning Grounds
 - Former WWTP
 - Lawn to the North of Building 3409/3410
 - NJARNG Helipad Area
 - Area 1222 – Gorge
- Due to the distance to running water, the remaining AOPIs do not have a surface water pathway.
- PFOS/PFOA was detected in a surface water sample collected from the GPB at the installation's southern boundary.
- Upgradient surface water has not been sampled at PICA

For this sampling effort, CSM evaluations will focus on the elements applicable to the primary source and human receptors through an exposure pathway of direct ingestion of drinking water. Complete, potentially complete, and incomplete exposure pathways will be documented. While other potential exposure media will be sampled during this SI, the potential for human exposures to PFAS through non-drinking water pathways has not yet been established and may be evaluated at a future date if it is determined that those pathways warrant further consideration. **Figures 20 through 33** show the AOPIs; three AOPIs do not need additional sampling (Former Pyrotechnic Area, Former Building 24, and Building 169 – Firehouse 1) and will be addressed during the Remedial Investigation (RI). For the remaining AOPIs (Former Lower Burning Grounds, Former WWTP Facility, Post Farm Landfill, Building 3316 – Firehouse 2, Lawn North of Building 3409/3410, NJARNG Helipad, and Area 1222 – Gorge) the sample locations are shown on the figures. **Worksheet #17** of this QAPP Addendum provides the rationale and sampling design for the SI sampling scope of work to address the above data gaps. **Worksheets #18 and #20** of this QAPP Addendum list the proposed sample identifications and required QC samples for each media type.

QAPP ADDENDUM WORKSHEET #11: PROJECT/DATA QUALITY OBJECTIVES

(UFP-QAPP Manual Section 2.6.1)
(USEPA 2106-G-05 Section 2.2.6)

This worksheet states the problem, identifies the goal of the study, identifies information inputs, defines boundaries of the sampling, develops the analytical approach, specifies performance or acceptance criteria, and identifies the developed plan for obtaining data in accordance with USEPA's 7-step data quality objective (DQO) process, *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA 2006). This QAPP Addendum presents the selected investigation design and rationale in **Worksheet #17**, and the sampling summary in **Worksheets #18** and **#20**.

Step 1: State the Problem:

Known PFAS impacts to humans via drinking water exposure at PICA, which pose a potential risk to human health, may be related to suspected releases of PFAS on site. Initial findings of a PA have identified 10 AOPIs at the installation at which PFAS-impacted material may be primarily related to the use of AFFF in the area or the disposal of PFAS impacted material in the area, or the use of mist suppression potentially-containing AFFF during chromium plating operations. PFAS are resistant to degradation in the environment, and the zones of highest contaminant flux have not been identified. The location and extent of sources of PFAS in drinking water at PICA have not been determined. Because PFAS was reportedly used in fire fighting activities off-site, the potential contribution of off-installation sources of PFAS on the PICA property also needs to be determined.

Step 2: Identify the Goal of the Study:

PFOS and PFOA are two emerging contaminants in the class of PFAS that have drinking water HALs (USEPA 2016). The sampling activities as part of this SI for PICA will be conducted in conformance with Department of Defense (DoD) instructions 4715.07 (DoD 2013) and 4715.18 (DoD 2009) and the DoD Manual 4715.20 (DoD 2012); the DoD Instructions 4715.18 requires DoD components to respond to emerging contaminants like PFOS and PFOA.

On-site groundwater is pumped and used for drinking water purposes at PICA. Two on site potable wells were sampled and found to contain PFOS and PFOA above the HAL. Therefore, the primary goals of the sampling activities are to compile sufficient information to determine whether media associated with individual AOPIs on the installation contain detectable levels of PFAS, determine the residual source strength of those media, and refine the AOPI drinking water CSMs. For the purpose of this evaluation, any detections greater than the laboratory LOD will result in identification of PFAS presence. Complete vertical and horizontal delineation of PFAS contamination in soil and groundwater at PICA will not be completed in this project phase. Analytical samples collected for analysis of PFAS will be analyzed for select PFAS constituents (including PFOS/PFOA), as listed in the tables for each media type on **Worksheet #15** of this QAPP Addendum. The nature and extent of follow-up investigations will be determined at a later date in coordination with applicable guidance and regulator input.

Step 3: Identify Information Inputs:

The data needed to accomplish the goals of the sampling activities for this project are as follows:

- All information reviewed to date as part of the PA to identify the AOPIs, including historical use and personal accounts of historical activities, spill records, previous remedial actions completed, previous analytical data and validation packages
- Observations made during the site reconnaissance and conference calls after site visits, and during the investigation
- Condition of existing on-site monitoring wells proposed for sampling
- Locations of off-site private and public water supply wells
- Condition and use of off-site wells proposed for sampling
- New analytical data from sampled media applicable to each AOPI, which may include groundwater, soil, and surface water which may be accomplished through sampling of existing monitoring wells, temporary well installation, soil boring advancement, or grab sample collection
- Soil boring description logs that include detailed descriptions where soil borings are advanced.

Sampling will be limited to areas where AFFF (which likely contained PFAS, including PFOS/PFOA) use is documented, where chromium plating was conducted, or areas that may have received PFAS-contaminated material. Parameters and analytical methods are identified in Worksheets #19 and #30 of the PQAPP. Field sample collection methods are summarized in **Worksheet #17** of this QAPP Addendum and in Worksheet #21 of the PQAPP.

Step 4: Define the Boundaries of the Sampling:

Analytical sample collection at PICA will be completed within or near the AOPIs listed in **Worksheet #10 Table 1**.

The sampling design and rationale is further described in **Worksheet #17** for each AOPI. Tentative sample identifications for each medium and location to be sampled are listed on **Worksheet #18** of this QAPP Addendum and are shown on **Figures 21 through 33**. Geographic coordinates for the off-site sampling locations are listed in **Attachment 1**. Well construction details for the off-site wells to be sampled are included in **Attachment 2**, as available. Details for the on-site wells, where available, are included on the sampling figures.

Step 5: Develop the Analytic Approach:

Samples will be collected in accordance with the technical guidance instruction (TGI) and standard operating procedure (SOP) documents included as Appendix A to the PQAPP (Arcadis 2018b). The samples will be submitted for analysis to Eurofins Lancaster Laboratory Environmental (ELLE). Liquid chromatography/tandem mass spectrometry will be used to analyze samples for PFAS; **Worksheet #15** of this QAPP Addendum identifies the laboratory LODs for PFAS. The LOD is defined as “the lowest concentration for reliable reporting of a non-detect of a specific analyte in a specific medium with a specific method at 99 percent confidence” (DoD 2017) and will be used as the project screening levels for this SI. Project screening levels will only be used to identify presence or absence of PFAS (i.e., project screening levels are not utilized for risk-based comparisons which may relate to future remedial decisions) and will not be used to inform decisions for the site. Due to the changing regulatory environment for PFAS, decision screening levels will be determined at a later date.

- If PFAS concentrations are less than the project screening levels (i.e., the laboratory LODs), then PFAS are not considered to be present for the purposes of the SI.
- If PFAS concentrations are greater than the project screening levels, PFAS are present.

The final waste characterization and disposal plan for investigation-derived waste (IDW) will be conducted in accordance with Army guidance and state/local regulations. Disposition of IDW is discussed in **Worksheet #17** of this QAPP Addendum.

Step 6: Specify Performance or Acceptance Criteria:

Controls on precision, reporting, and accuracy are provided in Worksheets #12 and #28 of the PQAPP. Field monitoring and detection equipment will be routinely calibrated, as detailed in Worksheet #22 of the PQAPP, to confirm that equipment used is of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results.

Step 7: Develop the Plan for Obtaining Data:

The detailed sampling plan and rationale for this SI is presented in **Worksheet #17** of this QAPP Addendum. Sampling plans may be revised based on field conditions or site planning meetings.

QAPP ADDENDUM WORKSHEET #13: SECONDARY DATA USES AND LIMITATIONS

(UFP-QAPP Manual Section 2.7)

(USEPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

This worksheet identifies sources of secondary data not generated for the specific purpose of this project, or data generated under a separate QAPP, and summarizes their uses for this project. A full list of references reviewed to complete the SI at PICA will be provided in the SI Report.

Data Type	Source	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Aerial Imagery	ESRI, ArcGIS Online Aerial Imagery	Provided georeferenced aerial photos for figure backdrops.	Changes in land features may not be apparent on current or historical imagery.
Past Site Investigations	<p>Final Remedial Investigation Report MMRP RI (Weston Solutions 2014)</p> <p>Site-Specific Final Report MMRP Construction Support (PIKA 2014)</p> <p>UFP-QAPP Remedial Investigation for MMRP (Arcadis/Malcolm Pirnie and Weston Solutions 2012)</p> <p>Time Critical Removal Action Report Mount Hope Quarry (Malcolm Pirnie 2007)</p> <p>Preliminary Assessment for PFAS (Arcadis 2019)</p>	Provided regional site conditions, historical site usage, historical contaminant identification and concentrations, and remedial actions	<p>Site usage histories may omit records of AFFF procurement and use.</p> <p>There are limited PFAS data available <i>from previous investigations</i>. With the exception of the data collected during the pre-SI investigation conducted as part of the 2019 PA, it cannot be verified that historical sample collection or laboratory analysis for PFAS constituents was conducted in an acceptable manner for usable data.</p>
Installation Personnel Interviews	Various	Provided anecdotal histories of site use, AFFF use, and remedial actions completed.	Several installation personnel who would have worked on site during the peak of AFFF use are retired or out of contact.
NJDEP Well Records	NJDEP	Identify off-site wells	Database may not be complete; well locations are approximate.

QAPP ADDENDUM WORKSHEET #14 & #16: PROJECT TASKS & SCHEDULE

**(UFP-QAPP Manual Section 2.8.2)
(USEPA 2106-G-05 Section 2.2.4)**

The project schedule is presented below for sampling activities planned at PICA as part of the SI following completion of previous steps listed in Worksheet #14 & #16 of the PQAPP.

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Installation site visits	Arcadis	5/4/18	5/8/18	Field notes (included in PA Report)	Complete
Obtain off-site well information from NJDEP (NJDEP database and well logs)	Arcadis	11/1/18	5/30/19	Excel table listing well construction details, ownership, and distance from PICA	Complete
Identify off-site private wells for sampling	Arcadis	11/1/18	7/1/19	List of off-site wells to be sampled; including owner and lot/block	Complete
Ground truth on-site sample locations	Arcadis	2/5/19	2/7/19	Well inspection logs	Complete
Mobilization and set up for off-site sampling ¹	Arcadis	5/15/19	TBD	Field notes (included in SI report)	NA
Off-site sampling of private wells	Arcadis	5/15/19	TBD	Field notes and measurements (included in SI report)	Submitted in SI report
Sample Analysis of private wells	ELLE	5/16/19	TBD	Analytical data package and electronic data deliverable	Submitted in SI report
Data Validation of private wells	Arcadis	6/10/19	TBD	Data validation report	Submitted in SI report
Send results letter to off-site private well owners	Arcadis	7/1/19	TBD	Results letters	TBD
Draft Sampling Letter Report (if requested) of private wells	Arcadis	TBD	TBD	Sampling Letter Report (if requested)	(20 days after data validation)

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Draft Final QAPP Addendum and Site Safety and Health Plan (SSHP, included as Attachment 3 provided under separate cover)	Arcadis	9/19/19	9/30/19	Draft QAPP Addendum	9/30/19
Army review of Draft QAPP Addendum	Army	10/15/19	10/16/19	Comments on Draft QAPP Addendum	10/18/19
Regulator review of Draft Final QAPP Addendum	USEPA/NJDEP	10/21/19	10/31/19	Comments on Draft Final QAPP Addendum	10/31/19
Final QAPP Addendum and SSHP	Arcadis	10/31/19	11/4/19	Final QAPP Addendum and SSHP	11/4/19
Mobilization and set up for on-site sampling	Arcadis and subcontractors	11/4/19	TBD	Field notes (included in SI report)	Not Applicable (NA)
Sample collection of surface water and sediment	Arcadis	11/4/19	TBD	Field notes and measurements (included in SI Report)	Submitted in SI Report
Sample collection of groundwater from existing monitoring wells	Arcadis	11/4/19	TBD	Field notes and measurements (included in SI Report)	Submitted in SI Report
Soil boring/temporary well advancement, sample collection of soil and groundwater, and boring abandonment	Arcadis and subcontractors	11/4/19	TBD	Field notes and measurements (included in SI Report)	Submitted in SI Report
Sample Analysis for on-site sampling	ELLE	TBD	TBD	Analytical data package and electronic data deliverable	Submitted in SI Report
Preliminary Data Review Teleconference (if requested)	Arcadis	TBD	TBD	Draft data figures and tables (if requested)	TBD
Data Validation for onsite sampling	Arcadis	TBD	TBD	Data validation report	Submitted in SI Report
Draft Sampling Letter Report (if requested) of onsite sampling	Arcadis	TBD	TBD	Sampling Letter Report (if requested)	(20 days after data validation)
Draft SI Report	Arcadis	TBD	TBD	Draft SI Report	(90 days after data validation)

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Final SI Report	Arcadis	TBD	TBD	Final SI Report	TBD

1 – Two properties potentially having a private well have not yet responded to an inquiry regarding whether or not a private well is present. If these owners do respond, and a private well is present, another sampling event for off-site private domestic wells could occur.

QAPP ADDENDUM WORKSHEET #15: REFERENCE LIMITS AND EVALUATION TABLES

**(UFP-QAPP Manual Section 2.6.2.3)
(USEPA 2106-G-05 Section 2.2.6)**

This worksheet provides the laboratory-specific limits for the PFAS compounds that will be analyzed, including the typical limit of quantitation (LOQ) and LOD, as provided by the laboratory. The LOQ is “the smallest concentration that produces a quantitative result with known and recorded precision and bias,” and the LOD is “the lowest concentration for reliable reporting of a non-detect of a specific analyte in a specific medium with a specific method at 99 percent confidence” (DoD 2017). For the purposes of this SI, the project screening levels are defined as the LOD. Because project screening levels are equivalent to the LODs, project screening levels will vary slightly depending on batch- or sample-specific LODs reported by the laboratory for each analyte. If PFAS are detected greater than the project screening levels, PFAS are present. Concentrations detected between the LOD and LOQ are estimates, and therefore, will be qualified and indicated as such on laboratory analytical reports.

Media: Groundwater/Surface water		Analytical Group: PFASs (ELLE) per DoD Quality Systems Manual (QSM) 5.1.1 (or later version) Table B-15		
Analyte	CAS Number	Project Screening Level (ng/L)	Laboratory-Specific Limits	
			LOQ (ng/L)	LOD (ng/L)
Perfluorobutanoic acid (PFBA)	375-22-4	6	6	6
Perfluoropentanoic acid (PFPA)	2706-90-3	6	6	6
Perfluorohexanoic acid (PFHxA)	307-24-4	3	3	3
Perfluoroheptanoic acid (PFHpA)	375-85-9	1	1	1
Perfluorooctanoic acid (PFOA)	335-67-1	1	1	1
Perfluorononanoic acid (PFNA)	375-95-1	2	2	2
Perfluorodecanoic acid (PFDA)	335-76-2	3	3	3
Perfluoroundecanoic acid (PFUnA)	2058-94-8	2	2	2

Media: Groundwater/Surface water		Analytical Group: PFASs (ELLE) per DoD Quality Systems Manual (QSM) 5.1.1 (or later version) Table B-15		
Analyte	CAS Number	Project Screening Level (ng/L)	Laboratory-Specific Limits	
			LOQ (ng/L)	LOD (ng/L)
Perfluorododecanoic acid (PFDoA)	307-55-1	1	1	1
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	2	2	2
Perfluorotetradecanoic acid (PFTA)	376-06-7	2	2	2
Perfluorobutanesulfonic acid (PFBS)	375-73-5	1	1	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	2	2	2
Perfluorooctane sulfonate (PFOS)	1763-23-1	2	2	2
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	2991-50-6	3	3	3
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2355-31-9	3	3	3
6:2 Fluorotelomer sulfonate	27619-97-2	9	9	9
8:2 Fluorotelomer sulfonate	39108-34-4	6	6	6

Note:

CAS - Chemical Abstracts Service
ng/L – nanogram per liter

Media: Soil		Analytical Group: PFASs (ELLE) per DoD QSM 5.1.1 (or later version) Table B-15		
Analyte	CAS Number	Project Screening Level (ng/g)	Laboratory-Specific Limits	
			LOQ (ng/g)	LOD (ng/g)
Perfluorobutanoic acid (PFBA)	375-22-4	0.6	0.6	0.6
Perfluoropentanoic acid (PFPA)	2706-90-3	0.6	0.6	0.6
Perfluorohexanoic acid (PFHxA)	307-24-4	0.6	0.6	0.6
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.6	0.6	0.6
Perfluorooctanoic acid (PFOA)	335-67-1	0.6	0.6	0.6
Perfluorononanoic acid (PFNA)	375-95-1	0.6	0.6	0.6
Perfluorodecanoic acid (PFDA)	335-76-2	1	1	1
Perfluoroundecanoic acid (PFUnA)	2058-94-8	0.6	0.6	0.6
Perfluorododecanoic acid (PFDoA)	307-55-1	0.6	0.6	0.6
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.6	0.6	0.6
Perfluorotetradecanoic acid (PFTA)	376-06-7	0.6	0.6	0.6
Perfluorobutanesulfonic acid (PFBS)	375-73-5	0.6	0.6	0.6
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	0.6	0.6	0.6
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.6	0.6	0.6
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	2991-50-6	2	2	2
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2355-31-9	2	2	2

Media: Soil		Analytical Group: PFASs (ELLE) per DoD QSM 5.1.1 (or later version) Table B-15		
Analyte	CAS Number	Project Screening Level (ng/g)	Laboratory-Specific Limits	
			LOQ (ng/g)	LOD (ng/g)
6:2 Fluorotelomer sulfonate	27619-97-2	2	2	2
8:2 Fluorotelomer sulfonate	39108-34-4	2	2	2

Notes:
ng/g – nanogram per gram

Medium: Potable Water		Analytical Group: PFASs (ELLE) per DoD QSM 5.1.1 (or later version) EPA 537		
Analyte	CAS Number	Project Screening Level (ng/L)	Laboratory-Specific Limits	
			LOQ (ng/L)	LOD (ng/L)
Perfluorohexanoic acid (PFHxA)	307-24-4	1.5	2	1.5
Perfluoroheptanoic acid (PFHpA)	375-85-9	1.5	2	1.5
Perfluorooctanoic acid (PFOA)	335-67-1	1.5	2	1.5
Perfluorononanoic acid (PFNA)	375-95-1	1.5	2	1.5
Perfluorodecanoic acid (PFDA)	335-76-2	1.5	2	1.5
Perfluoroundecanoic acid (PFUnA)	2058-94-8	1.5	2	1.5
Perfluorododecanoic acid (PFDoA)	307-55-1	1.5	2	1.5
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	1.5	2	1.5
Perfluorotetradecanoic acid (PFTA)	376-06-7	1.5	2	1.5

Medium: Potable Water		Analytical Group: PFASs (ELLE) per DoD QSM 5.1.1 (or later version) EPA 537		
Analyte	CAS Number	Project Screening Level (ng/L)	Laboratory-Specific Limits	
			LOQ (ng/L)	LOD (ng/L)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	1.3	2	1.3
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	1.4	2	1.4
Perfluorooctane sulfonate (PFOS)	1763-23-1	1.4	2	1.4
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	2991-50-6	1.5	2	1.5
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2355-31-9	1.5	2	1.5

QAPP ADDENDUM WORKSHEET #17: SAMPLING DESIGN AND RATIONALE

UFP-QAPP, PFAS Sampling Activities

(UFP-QAPP Manual Section 3.1.1)
(USEPA 2106-G-05 Section 2.3.1)

The DQOs for the sampling are described in **Worksheet #11** of this QAPP Addendum. This worksheet provides the detailed rationale and approach for site-specific sampling at PICA. This QAPP Addendum has been developed to ensure the amount, type, and quality of data are sufficient to determine which areas and environmental media are impacted with detectable levels of PFAS.

Environmental data will be collected as presented within this QAPP Addendum and in accordance with the field SOPs provided in Appendix A to the PQAPP at the locations defined in **Worksheet #18** and on **Figures 20 to 33** of this QAPP Addendum, along with the QC sample requirements listed in **Worksheet #20** of this QAPP Addendum. Note that **Figures 20-22** show the Former Pyrotechnic Area, Former Building 24 and Building 169 – Firehouse 1; however, no samples are required from these AOPIs since concentrations above the HAL were detected in groundwater collected from this AOPI during the pre-SI sampling event. Therefore, these AOPIs will be further addressed in the RI. **Attachment 4** also contains an SOP specific to the collection of groundwater samples from off-site private wells. Components of some SOPs may require modification or be superseded by the PFAS TGI (P-10 in Appendix A to the PQAPP) and/or PFAS Sampling and Analysis White Paper (Appendix B to the PQAPP) to accommodate PFAS-specific sampling requirements (Arcadis 2018b). The sampling methods described in the SOPs establish equipment requirements; procedures for equipment and containers before sampling; sampling procedures under various conditions; equipment blank samples and field duplicate collection requirements; and requirements for storing samples to ensure that sample contamination does not occur during collection, transport, and analysis. All field activities will be conducted in accordance with the approved Programmatic Accident Prevention Plan (Arcadis 2018a) and SSHP.

The areas of focus for this SI were selected based on a review of historical documents and data and information obtained by conducting personal interviews during the PA; these information inputs were used to develop the preliminary drinking water CSMs provided in **Worksheet #10** and on **Figures 8 through 17** of this QAPP Addendum.

Surface water, and groundwater will be sampled to identify PFAS presence, type (of the selected constituents as listed in **Worksheet #15** of this QAPP Addendum, including PFOS/PFOA), and concentrations. Soil will be sampled to identify PFAS presence, type (of the 18 selected constituents as listed in **Worksheet #18** of the PQAPP, including PFOS/PFOA), and concentrations, as well as for total organic carbon (TOC), pH, and grain size (except where otherwise noted). These targeted sampling areas are believed to have the potential for the greatest PFAS concentrations closest to known releases of AFFF. PFAS has been detected in monitoring wells and drinking water wells near the southern boundary of the installation and in a private well located approximately 0.58 miles off-post during previous investigation activities.

Results of the sampling will be compiled and analyzed by Arcadis and presented in an SI Report. The report will summarize the field effort and present the validated sampling results, including QA/QC.

The planned project schedule to complete the SI for PICA is provided in **Worksheet #14 & 16** of this QAPP Addendum. The mobilization schedule will be determined upon the finalization of this QAPP Addendum. Prior to conducting any on-site sampling the locations will be field verified. Necessary permits, forms, or other project documentation, subcontracts, or project equipment will be procured before mobilization. Before conducting intrusive activities, the location of underground utilities will be determined. Utility companies and other responsible authorities will be contacted to locate and mark the locations. Installation-specific health and safety training will be completed by the field team prior to conducting any field work. In addition, an unexploded ordnance technician will clear the sampling areas. The investigation team will demobilize once field activities are complete. IDW (including soil cuttings, and water from decontamination of drill tooling), which may potentially contain PFAS, will be disposed of in accordance with NJDEP requirements, which allow the water and cuttings to be placed back where they came from. All non-IDW wastes will be removed from the site immediately upon completion of each day's field activities. A post-activity inspection will be conducted by the field team lead/regional lead and SSHO identified in the this QAPP Addendum and the attached SSHP (**Attachment 3**) to ensure the location is left clean.

Groundwater Sampling

Groundwater samples were previously collected from existing domestic wells. Refer to **Attachment 5** for a copy of the letters/questionnaires sent to the property owners. Groundwater samples will be collected from existing monitoring wells, existing domestic wells (if any additional wells are present downgradient of PICA), as well as temporary locations. At existing monitoring wells, the groundwater samples will be collected using low-flow sampling techniques; the type of pump used will depend on the depth of the well. The samples will be collected from approximately the center of the saturated screened interval. For existing domestic wells, the samples have been and, if required, will be collected in accordance with the SOP (**Attachment 4**). The temporary groundwater samples will be collected from screen point samplers targeting different depths. The exact depth of sample collection will be determined by the geologist/hydrogeologist using field observations during drilling and the equipment capabilities. Groundwater samples will be collected from 10 areas:

- Former Lower Burning Grounds
- Former WWTP Facility
- Post Farm Landfill
- Building 3316 – Firehouse 2
- Lawn N of Building 3409/3410 (temporary wells)
- NJARNG Helipad
- Area 1222 Gorge
- Eastern Boundary On-Site
- Northern Boundary On-Site (temporary wells)
- MidValley Upgradient onsite

Groundwater samples will be analyzed for select PFAS, and field parameters (temperature, pH, conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) will be measured during purging and allowed to stabilize (or purged for a maximum of 20 minutes, whichever is sooner) before groundwater sampling to ensure a representative sample is collected and, potentially, to inform the interpretation of analytical data. Groundwater samples will be collected to inform the interpretation of PFAS distribution and

migration and update the individual AOPI drinking water CSMs. Coordinates for each borehole's groundwater sampling location will be recorded using a handheld global positioning system (GPS).

Potable Water Source Sampling Off Site

The following additional steps have been conducted for sampling the off-site wells.

- Well records were obtained from NJDEP (database and well logs).
- The wells were record-truthed (e.g., review well logs, tax records).
- Local health departments and water departments were contacted for additional information about properties that potentially have potable wells.
- Property owners within 1 mile downgradient of the southern boundary of the installation were contacted.
- Once domestic wells within the downgradient area were identified as being present, and the owner agreed that the well could be sampled, samples were collected. Note that two owners have not yet responded to a letter asking if they have a property well, nor where they home during several door-to-door visits.
- Once the sampling data were obtained, the results were/will be reviewed to determine if an emergency action was required and if additional step-out sampling is required. To date, one private well owner was provided bottled water on an interim basis. NJDEP plans on connecting this property to the public water system.
- Once the data were validated, results letters were sent to the property owners.

Soil Sampling

Soil samples will be collected to inform the interpretation of PFAS distribution, determine residual source strength of potential PFAS release areas, evaluate the potential for those areas to be sources of PFAS to surface water and groundwater as an influence to drinking water, and update the individual AOPI CSMs. Soil samples will be analyzed for select PFAS, TOC, pH, and grain size; soil lithological descriptions will be continuously logged and will be documented on field forms. At locations accessible by drill rig, soil samples will be collected from the near surface (i.e., less than 6-inches below the top soil) and in the capillary zone immediately above the water table. If the drill rig cannot access the sample location, only a near surface sample will be collected. Soil samples will be collected from 6 areas:

- Former Lower Burning Grounds
- Former WWTP Facility
- Building 3316 – Firehouse 2
- Lawn N of Building 3409/3410 (temporary wells)
- NJARNG Helipad
- Area 1222 Gorge.

Direct push technology (DPT) boring and sampling will be completed using a dual-tube, top-down method. Coordinates for each soil sampling location will be recorded using a handheld GPS.

Surface Water Sampling

Surface water samples will be collected to inform the presence or absence of PFAS in possible secondary source areas. The surface water samples will be collected from on-site non-intermittent sources of surface water. Grab surface water samples will be collected from 7 areas (5 AOPIs as well as other upstream and downstream locations) (**Figure 33**):

- Former Lower Burning Grounds
- Former WWTP Facility

- Lawn N of Building 3409/3410
- NJARNG Helipad
- Area 1222 - Gorge
- Eastern Boundary On-Site
- Northern Boundary On-Site

Surface water samples will be collected from downstream to upstream to reduce siltation in sequential samples. All surface water samples will be analyzed for select PFAS, and field parameters (temperature, pH, conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) will be measured during surface water sampling to potentially inform the interpretation of analytical data. Coordinates for each surface water sampling location will be recorded using a handheld GPS.

Laboratories

ELLE will be used for this study. ELLE is a nationally accredited laboratory and has met the certification requirements of NJDEP. They hold laboratory certification identification number PA011, which expires June 30, 2020. PFAS analyses will be conducted in accordance with the DoD QSM 5.1.1 (or later version as the laboratory obtains updated certification), Table B-15 for the analytes listed in Worksheet #18 of the PQAPP. Arcadis will validate the data from the laboratory in accordance with Worksheets #34, #35, and #36 of the PQAPP. A Data Usability Summary Report will be prepared in accordance with the USACE Environmental Quality: Guidance for Evaluating Performance-Based Chemical Data, Engineer Manual 200-1-10 (USACE 2005) that will review precision, accuracy, completeness, representativeness, comparability, and sensitivity. This information will be included in an SI Report.

QAPP ADDENDUM WORKSHEET #18: SAMPLING LOCATIONS AND METHODS

(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(USEPA 2106-G-05 Section 2.3.1 and 2.3.2)

The tentative sampling locations, identifications, and associated analytes and parameters are summarized below; sampling locations well depths, and aquifer units are depicted on **Figures 24 through 33** for surface water, and soil. The group of PFAS constituents (including PFOS/PFOA) noted for analysis for groundwater, potable water, soil, and surface water samples in the table below is summarized for all media in **Worksheet #15** of this QAPP Addendum. **Worksheet #17** of this QAPP Addendum describes the rationale for the various sampling locations and media. Field activities and sampling procedures will be conducted in accordance with the TGI and SOP documents in Appendix A to the PQAPP (Arcadis 2018b). Additional information on PFAS sampling is available in the PFAS Sampling and Analysis White Paper (Appendix B to the PQAPP; Arcadis 2018b). The frequency requirements for QA/QC samples noted in Worksheet #20 of the PQAPP will be met. In addition to the requirements listed in Worksheet #20 of the PQAPP, a field reagent blank associated with potable water source sampling will be collected at a frequency of one per day as noted on **Worksheet #20** of this QAPP Addendum. **Worksheet #18** of this QAPP Addendum lists the number and type of QA/QC samples anticipated for each medium based on the sampling plan presented herein; however, the final number and identifications of QA/QC samples listed in the **Table 3** below are TBD based on progression of daily field activities. **Table 4** presents a summary of samples per media and location.

Table 3 - Sample Details

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
Former Pyrotechnic Area	Groundwater	PICA-PSL-1179-7	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-PSL-1179-4B					
		PICA-PSL-1179-3					
		PICA-PSL-TW-1					

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
Former Pyrotechnic Area	Surface Water	PICA-PSL-SW-1	Mid-Stream Depth	Grab	Normal, FD, MS/MSD	4	PFAS, TOC, grain size, pH
		PICA-PSL-SW-2			Normal	1	
	Soil	PICA-PSL-SO-01-0-0.5	0-0.5 feet	DPT	Normal	1	
		PICA-PSL-SO-01-DEPTH ²	Above water table		Normal	1	
Former WWTP Facility	Groundwater	PICA-WWTP-80-1	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-WWTP-80-2					
		PICA-WWTP-80-3					
		PICA-WWTP-MW-12E					
	Surface Water	PICA-WWTP-SW-3	Mid-Stream Depth	Grab	Normal	1	
		PICA-WWTP-SW-4					
Soil	PICA-WWTP-SO-02-0-0.5	0-0.5 feet	DPT	Normal	1	PFAS, TOC, grain size, pH	

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
		PICA-WWTP-SO-02-DEPTH ²	Above water table		Normal	1	
Post Farm Landfill	Groundwater	PICA-PFL-23MW-1	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-PFL-23MW-2					
		PICA-PFL-TW-2					
Building 3316 – Firehouse 2	Groundwater	PICA-FH2-3316-1	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-FH2-3316-3					
		PICA-FH2--TW-3					
	Soil	PICA-FH2--SO-03-0-0.5	0-0.5 feet	DPT	Normal	1	PFAS, TOC, grain size, pH
		PICA-FH2--SO-03-DEPTH ²	Above water table		Normal	1	
Lawn N of Building 3409/3410	Groundwater	PICA-LAW-TW-4	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-LAW-TW-5					

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
	Surface Water	PICA-LAW-SW-5	Mid-Stream Depth	Grab	Normal	1	
	Soil	PICA-LAW-SO-04-0-0.5	0-0.5 feet	DPT	Normal	1	PFAS, TOC, grain size, pH
		PICA-LAW-SO-04-DEPTH ²	Above water table		Normal	1	
NJARNG Helipad	Groundwater	PICA-HEL-175MW-1	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-HEL-175MW-2					
	Surface Water	PICA-HEL-SW-6	Mid-Stream Depth	Grab	Normal	1	
	Soil	PICA-HEL-SO-05-0-0.5	0-0.5 feet	DPT	Normal	1	PFAS, TOC, grain size, pH
		PICA-HEL-SO-05-DEPTH ²	Above water table		Normal	1	
Area 1222 Gorge	Groundwater	PICA-GRG-OD-3AR	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-GRG-OD-5A					
		PICA-GRG-OD-6A					

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
	Surface Water	PICA-GRG-TW-6					
		PICA-GRG-SW-7	Mid-Stream Depth	Grab	Normal	1	
		PICA-GRG-SW-8		Grab	Normal	1	
	Soil	PICA-GRG-SO-06-0-0.5	0-0.5 feet	DPT	Normal	1	PFAS, TOC, grain size, pH
		PICA-GRG-SO-06-DEPTH ²	Above water table		Normal	1	
Eastern Boundary On-Site	Groundwater	PICA-EAB-MW-26S	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-EAB-MW-27S					
		PICA-EAB-MW-28S					
		PICA-EAB-MW-29S					
	Surface Water	PICA-EAB-SW-9	Mid-Stream Depth	Grab	Normal	1	
		PICA-EAB-SW-10		Grab	Normal	1	

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
Northern Boundary On-Site	Groundwater	PICA-NAB-TW-7	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
		PICA-NAB-TW-8					
	Surface Water	PICA-NAB-SW-11	Mid-Stream Depth	Grab	Normal	1	
MidValley Upgradient On-Site	Groundwater	PICA-MVU-171MW-12	Mid-Saturated Screen	Grab	Normal	1	PFAS, field parameters ¹
Field Blank (1 per day)	Aqueous	PICA-FB-AQ-MMDDYY-1	NA	NA	FB	10	PFAS
Equipment Blank - Aqueous (1 per decon event or lot for disposable equipment)	EB	PICA-EB-AQ-MMDDYY-1	NA	NA	EB	TBD	
Field Duplicate - Aqueous (1 per 20 samples)	Aqueous	PICA-FD-AQ-MMDDYY-1	Duplicate	Grab	FD	2	
Equipment Blank - Soil (1 per decon event or lot for disposable equipment)	EB	PICA-EB-SO-MMDDYY-1	NA	NA	EB	TBD	PFAS, TOC
Field Duplicate - Soil (1 per 20 samples)	Soil	PICA-FD-SO-MMDDYY-1	Duplicate	Grab	FD	1	

Site Location	Medium	Sample ID	Depth Interval (Approximate)	Sample Method	Sample Type	Number of Samples	Analytes
MS/MSD - Soil/Aqueous (1 per 20 samples)	Soil/Aqueous	Same as parent sample	3x Volume	Grab	MS/MSD	3	

Notes:

- 1 – Field parameters include temperature, pH, conductivity, dissolved oxygen, turbidity, oxidation-reduction potential.
- 2 – Depth to be field determined and will be denoted as ## (below ground surface) in the sample name.
- 3 – Equipment Blank collected at a frequency of 1 per decon event or lot for disposable equipment. It is estimated 10 equipment blanks will be collected and locations will be determined by field staff.
- 4 – Field duplicates collected at a frequency of 1/20 samples. It is estimated 3 duplicates will be collected and locations will be determined by the field staff.
- 5 – Matrix spike and matrix spike duplicate (MS/MSD) samples to be collected at a frequency of 1/20 samples. It is estimated that 3 MS/MSD samples will be collected, and locations determined by the field staff.

Acronyms:

- AQ – aqueous
- DPT – direct push technology
- EB – equipment blank
- FB – field blank
- FD – field duplicate
- FH1 – Building 169 – Firehouse 1
- ft bgs – feet below ground surface
- LBG – Former Lower Burning Grounds
- MS – matrix spike
- MSD – matrix spike duplicate
- MW – monitoring well
- N – normal (parent)
- PICA – Picatinny Arsenal
- PSL – Pyrotechnic Area
- SAB – Southern Area Boundary
- SO - soil
- SW – surface water
- TW – temporary well
- TBD – To Be Determined
- WWTP – Wastewater Treatment Plant

Table 4 - Media by AOPI Details

AOPI	Existing Wells	Temporary Wells	SW Samples	Soil Samples
Former Lower Burning Grounds	1179-7	TW-1	SW-1	SO-1 (0-6)
	1179-4B		SW-2	SO-1 (capillary)
	1179-3			
Former WWTP	80-1	TW-2	SW-3	SO-2 (0-6)
	80-2		SW-4	
	80-3			
	MW-12E			
Post Farm Landfill	23MW-1	NS	NS	SO-2 (capillary)
	23MW-2			
Building 3316 - Firehouse 2	3316-1	TW-3	N/A	SO-3 (0-6)
	3316-3			SO-3 (capillary)
Lawn N of Building 3409/3410	NS	TW-4	SW-5	SO-4 (0-6)
		TW-5		SO-4 (capillary)
NJARNG Helipad	175MW-1	NS	SW-6	SO-5 (0-6)
	175MW-2			SO-5 (capillary)
Area 1222 - Gorge	OD-3AR	TW-6	SW-7	SO-6 (0-6)
	OD-5A		SW-8	SO-6 (capillary)
	OD-6A			
Eastern Boundary On-Site	MW-26S	NS	SW-9	NS
	MW-27S			
	MW-28S		SW-10	
	MW-29S			
Northern Boundary On-Site	NS	TW-7	SW-11	NS
		TW-8		
Mid-Valley Upgradient On-Site	171MW-12	NS	NS	NS

AOPI	Existing Wells	Temporary Wells	SW Samples	Soil Samples
Count	21	8	11	12

Acronyms:

TW – temporary well
SW – surface water
MW – monitoring well
NS – no sample

QAPP ADDENDUM WORKSHEET #20: FIELD QC SUMMARY

**(UFP-QAPP Section 3.1.1 and 3.1.2)
(USEPA 2106-G-05 Section 2.3.5)**

Primary and QA/QC samples will be collected during field activities as noted below at the frequencies prescribed in Worksheet #20 of the PQAPP (Arcadis 2018b). Field blanks will be collected at a frequency of 1 per 20 primary samples (not medium-specific, except potable water sources for which field reagent blanks will be collected at a frequency of one per day). Source blanks will be collected from each source of water used for the initial decontamination step. Equipment blanks, field blanks, and source blanks will be analyzed for PFAS only (same analyte list for groundwater/surface water and soil/sediment on **Worksheet #15**). The field reagent blank associated with drinking water sampling will be analyzed for PFAS only (same analyte list as provided for drinking water on **Worksheet #15**).

Matrix	Analyte/Analytical Group	Normal Samples	FD	MS	MSD	EB	Total # analyses
Groundwater	PFAS	29	2	2	2	1 per piece of relevant equipment per sampling event	TBD
Surface Water	PFAS	11	1	1	1	1 per piece of relevant equipment per sampling event	TBD
Potable Water	PFAS	10	0	0	0	0	10
Soil	PFAS	12	1	1	1	1 per piece of relevant equipment per sampling event	TBD
	TOC	12	1	1	1	N/A	15
	pH	12	N/A	N/A	N/A	N/A	12

Matrix	Analyte/Analytical Group	Normal Samples	FD	MS	MSD	EB	Total # analyses
	Grain size	12	N/A	N/A	N/A	N/A	12

Notes:

1. Estimated 10 days of sampling; however, the exact number of equipment blanks and field blanks will be determined by progress.
2. The potable water samples have already been collected.

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<http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KNJMARCE1&graphs=pan=custom&month=1&day=1&year=2003&monthend=1&dayend=1&yearend=2013>

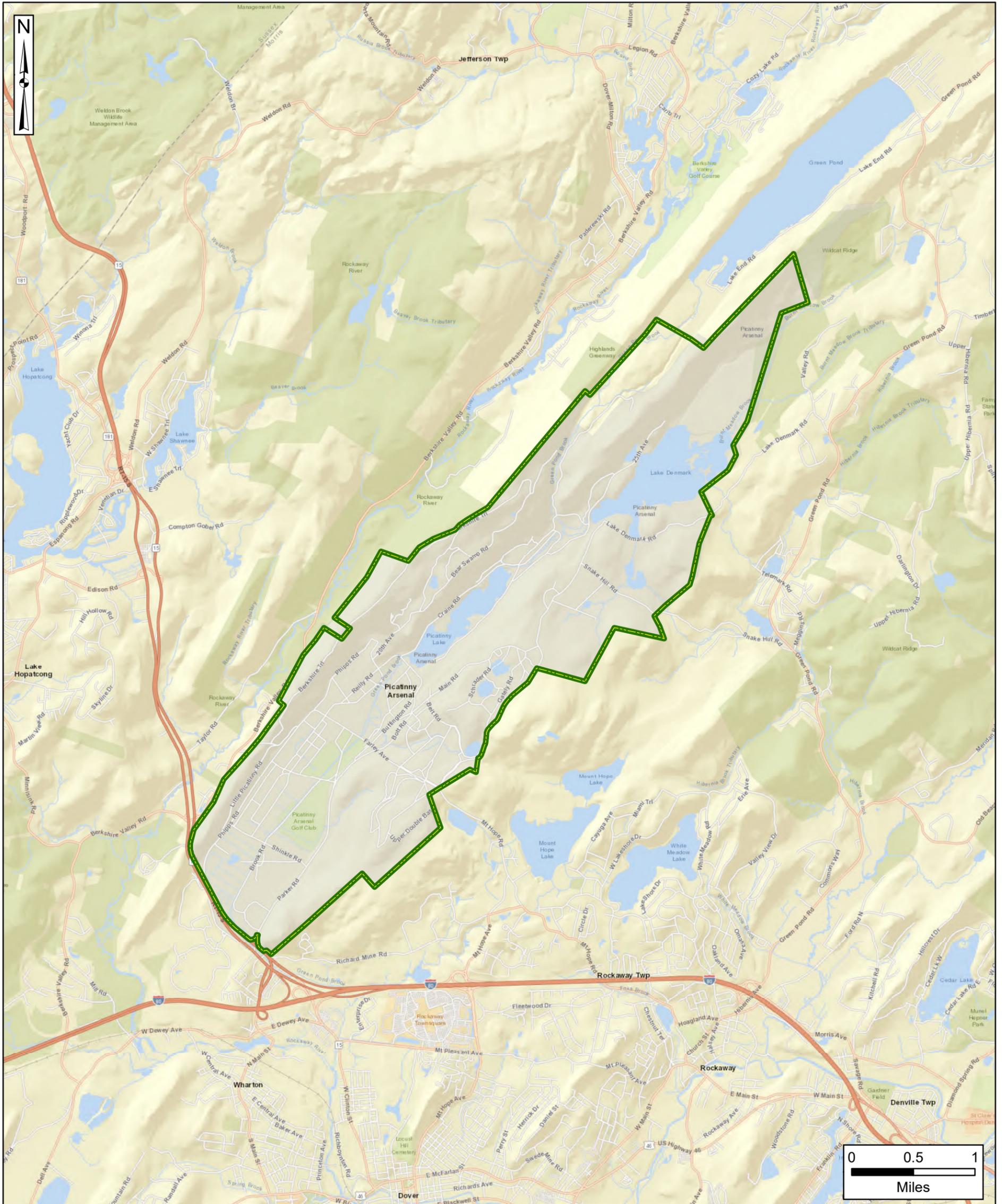
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Figures

Quality Assurance Project Plan Addendum
USAEC PFAS Site Inspection
Picatinny Arsenal, NJ



Figure 1
Picatinny Arsenal Location



 Installation Boundary

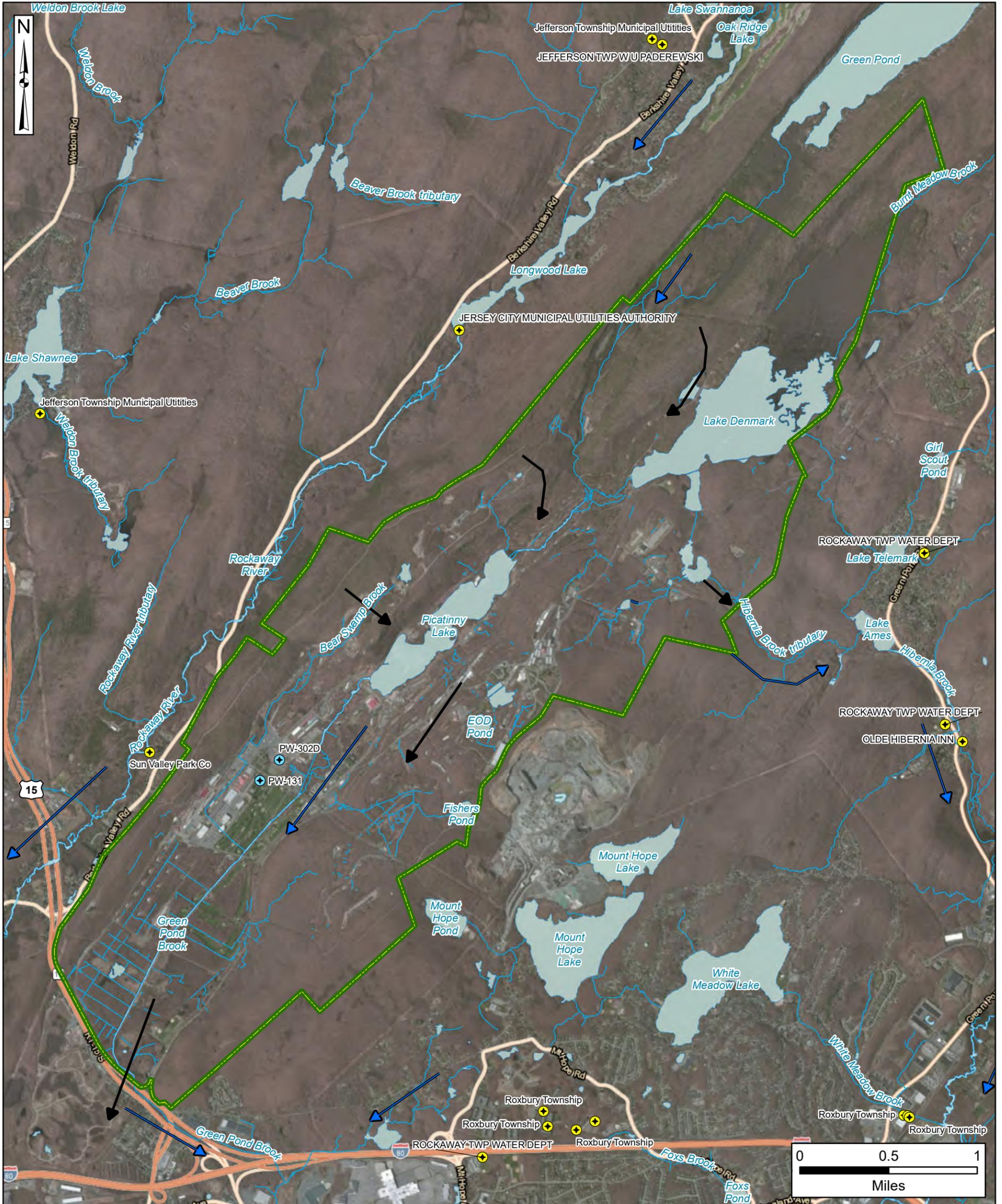
Data Sources:
Picatinny Arsenal, GIS Data, 2018
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 18 North

Quality Assurance Project Plan Addendum
 USAEC PFAS Site Inspection
 Picatinny Arsenal, NJ



Figure 2
Site Layout with Generalized Groundwater
and Surface Water Flow Directions



- Installation Boundary
- ~ River/Stream
- Water Body
- ➔ Groundwater Flow Direction
- ➔ Surface Water Flow Direction
- ⊕ Water Supply Well (On-Installation)
- ⊕ Water Supply Well (Off-Installation)

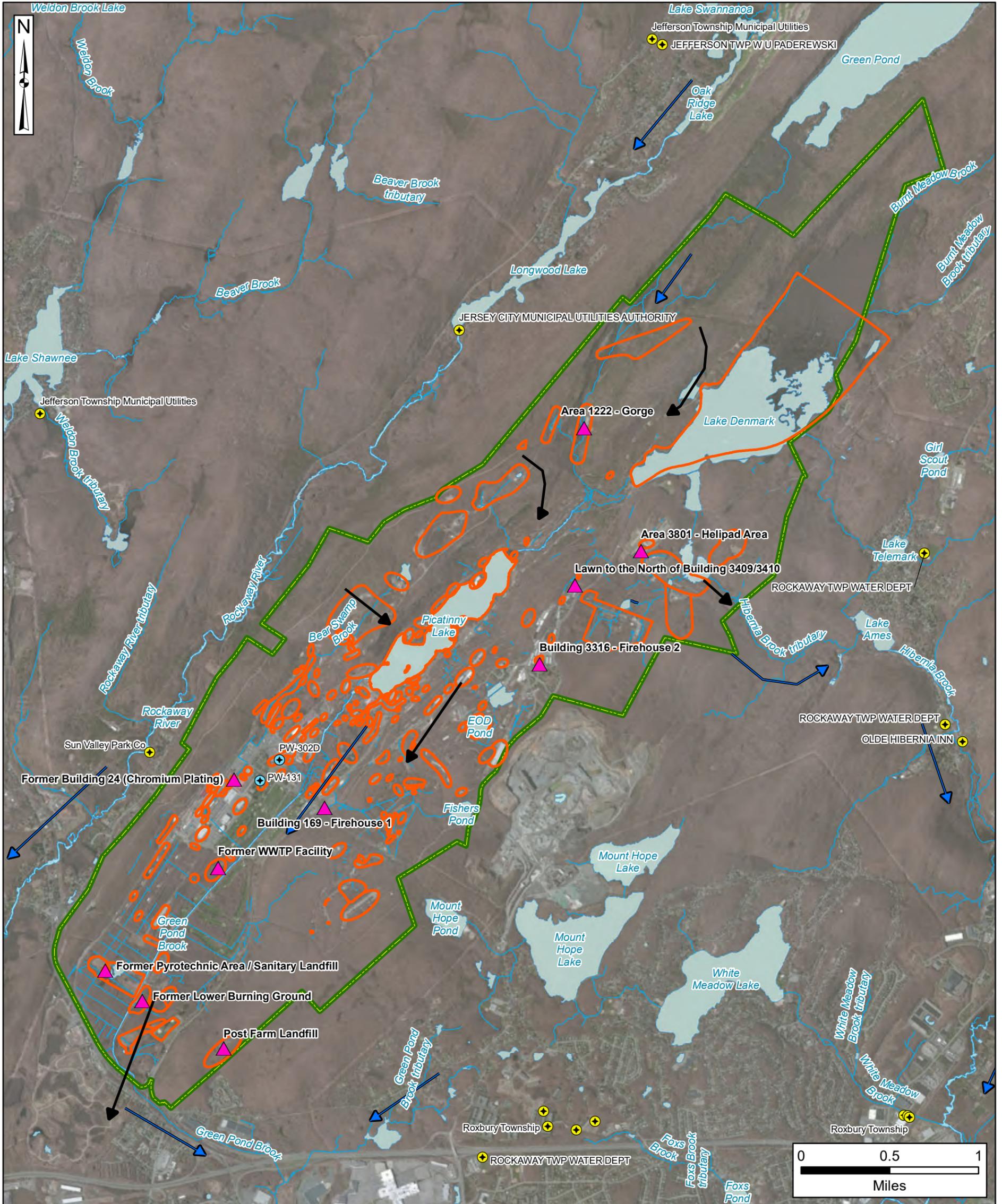
Data Sources:
 Picatinny Arsenal, GIS Data, 2018
 CEA, Well Data, 2018
 EDR, Well Data, 2018
 ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
 WGS 1984, UTM Zone 18 North

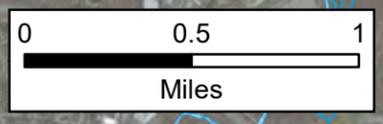
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 USAEC PFAS Site Inspection
 Picatinny Arsenal, NJ



Figure 3
 AOPI Locations



- Installation Boundary
- River/Stream
- Water Body
- Groundwater Flow Direction
- Surface Water Flow Direction
- AOPI Location
- Water Supply Well (On-Installation)
- Water Supply Well (Off-Installation)
- Installation Restoration Program Site Area (Shaw, 2008)



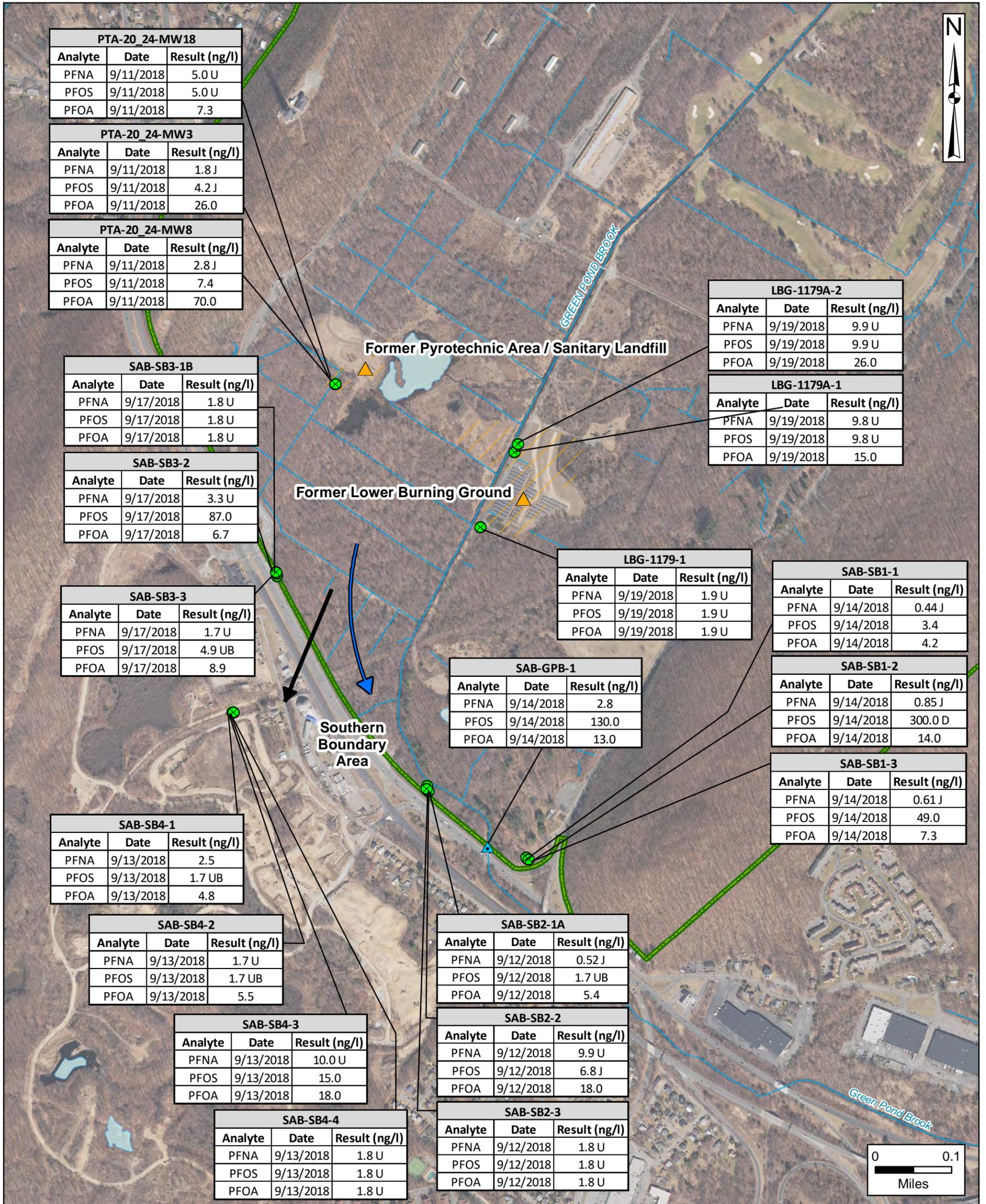
Data Sources:
 Picatinny Arsenal, GIS Data, 2018
 EDR, Well Data, 2018
 CEA, Well Data, 2018
 ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
 WGS 1984, UTM Zone 18 North

Quality Assurance Project Plan Addendum
 USAEC PFAS Site Inspection
 Picatinny Arsenal, NJ



Figure 4
Pre-SI Sampling Former Pyrotechnic Area and Sanitary Landfill, Former Burning Grounds, and Southern Boundary



PTA-20_24-MW18		
Analyte	Date	Result (ng/l)
PFNA	9/11/2018	5.0 U
PFOS	9/11/2018	5.0 U
PFOA	9/11/2018	7.3

PTA-20_24-MW3		
Analyte	Date	Result (ng/l)
PFNA	9/11/2018	1.8 J
PFOS	9/11/2018	4.2 J
PFOA	9/11/2018	26.0

PTA-20_24-MW8		
Analyte	Date	Result (ng/l)
PFNA	9/11/2018	2.8 J
PFOS	9/11/2018	7.4
PFOA	9/11/2018	70.0

LBG-1179A-2		
Analyte	Date	Result (ng/l)
PFNA	9/19/2018	9.9 U
PFOS	9/19/2018	9.9 U
PFOA	9/19/2018	26.0

LBG-1179A-1		
Analyte	Date	Result (ng/l)
PFNA	9/19/2018	9.8 U
PFOS	9/19/2018	9.8 U
PFOA	9/19/2018	15.0

SAB-SB3-1B		
Analyte	Date	Result (ng/l)
PFNA	9/17/2018	1.8 U
PFOS	9/17/2018	1.8 U
PFOA	9/17/2018	1.8 U

SAB-SB3-2		
Analyte	Date	Result (ng/l)
PFNA	9/17/2018	3.3 U
PFOS	9/17/2018	87.0
PFOA	9/17/2018	6.7

SAB-SB3-3		
Analyte	Date	Result (ng/l)
PFNA	9/17/2018	1.7 U
PFOS	9/17/2018	4.9 UB
PFOA	9/17/2018	8.9

LBG-1179-1		
Analyte	Date	Result (ng/l)
PFNA	9/19/2018	1.9 U
PFOS	9/19/2018	1.9 U
PFOA	9/19/2018	1.9 U

SAB-SB1-1		
Analyte	Date	Result (ng/l)
PFNA	9/14/2018	0.44 J
PFOS	9/14/2018	3.4
PFOA	9/14/2018	4.2

SAB-GPB-1		
Analyte	Date	Result (ng/l)
PFNA	9/14/2018	2.8
PFOS	9/14/2018	130.0
PFOA	9/14/2018	13.0

SAB-SB1-2		
Analyte	Date	Result (ng/l)
PFNA	9/14/2018	0.85 J
PFOS	9/14/2018	300.0 D
PFOA	9/14/2018	14.0

SAB-SB4-1		
Analyte	Date	Result (ng/l)
PFNA	9/13/2018	2.5
PFOS	9/13/2018	1.7 UB
PFOA	9/13/2018	4.8

SAB-SB1-3		
Analyte	Date	Result (ng/l)
PFNA	9/14/2018	0.61 J
PFOS	9/14/2018	49.0
PFOA	9/14/2018	7.3

SAB-SB4-2		
Analyte	Date	Result (ng/l)
PFNA	9/13/2018	1.7 U
PFOS	9/13/2018	1.7 UB
PFOA	9/13/2018	5.5

SAB-SB2-1A		
Analyte	Date	Result (ng/l)
PFNA	9/12/2018	0.52 J
PFOS	9/12/2018	1.7 UB
PFOA	9/12/2018	5.4

SAB-SB4-3		
Analyte	Date	Result (ng/l)
PFNA	9/13/2018	10.0 U
PFOS	9/13/2018	15.0
PFOA	9/13/2018	18.0

SAB-SB2-2		
Analyte	Date	Result (ng/l)
PFNA	9/12/2018	9.9 U
PFOS	9/12/2018	6.8 J
PFOA	9/12/2018	18.0

SAB-SB4-4		
Analyte	Date	Result (ng/l)
PFNA	9/13/2018	1.8 U
PFOS	9/13/2018	1.8 U
PFOA	9/13/2018	1.8 U

SAB-SB2-3		
Analyte	Date	Result (ng/l)
PFNA	9/12/2018	1.8 U
PFOS	9/12/2018	1.8 U
PFOA	9/12/2018	1.8 U

Installation Boundary

Surface Water Flow Direction

Note:
 ng/l = nanograms per liter

AOPI Location

Assumed Groundwater Flow Direction

AFFF Use Area

Groundwater Sampling Location

Surface Water Sampling Location

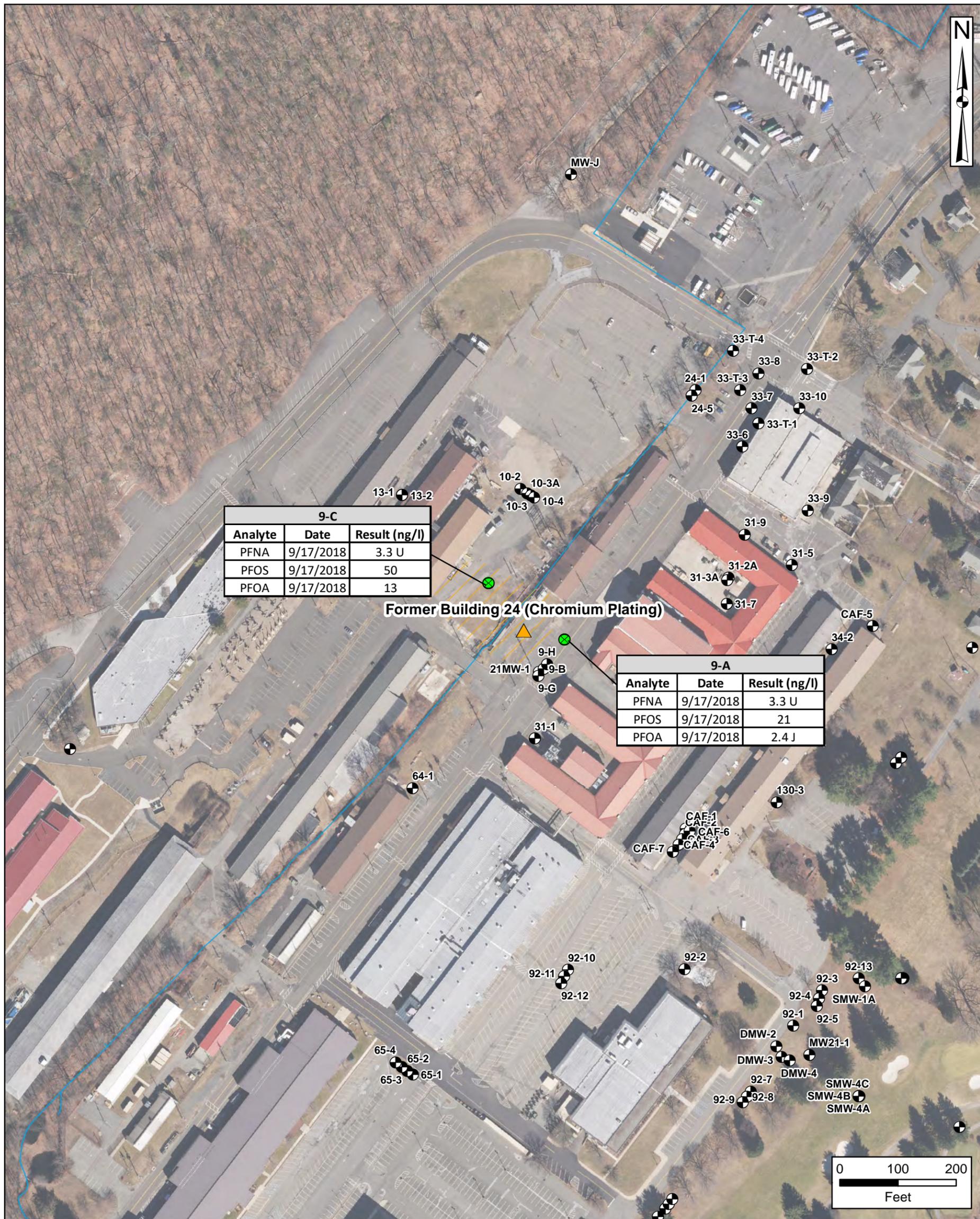
Coordinate System:
 WGS 1984, UTM Zone 18 North

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 Picatinny Arsenal, NJ



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Figure 5
 Pre-SI Sampling Former Building 24



- ▲ AOPI Location
- ⊕ Monitoring Well
- Groundwater Sampling Location

Note:
 ng/l = nanograms per liter

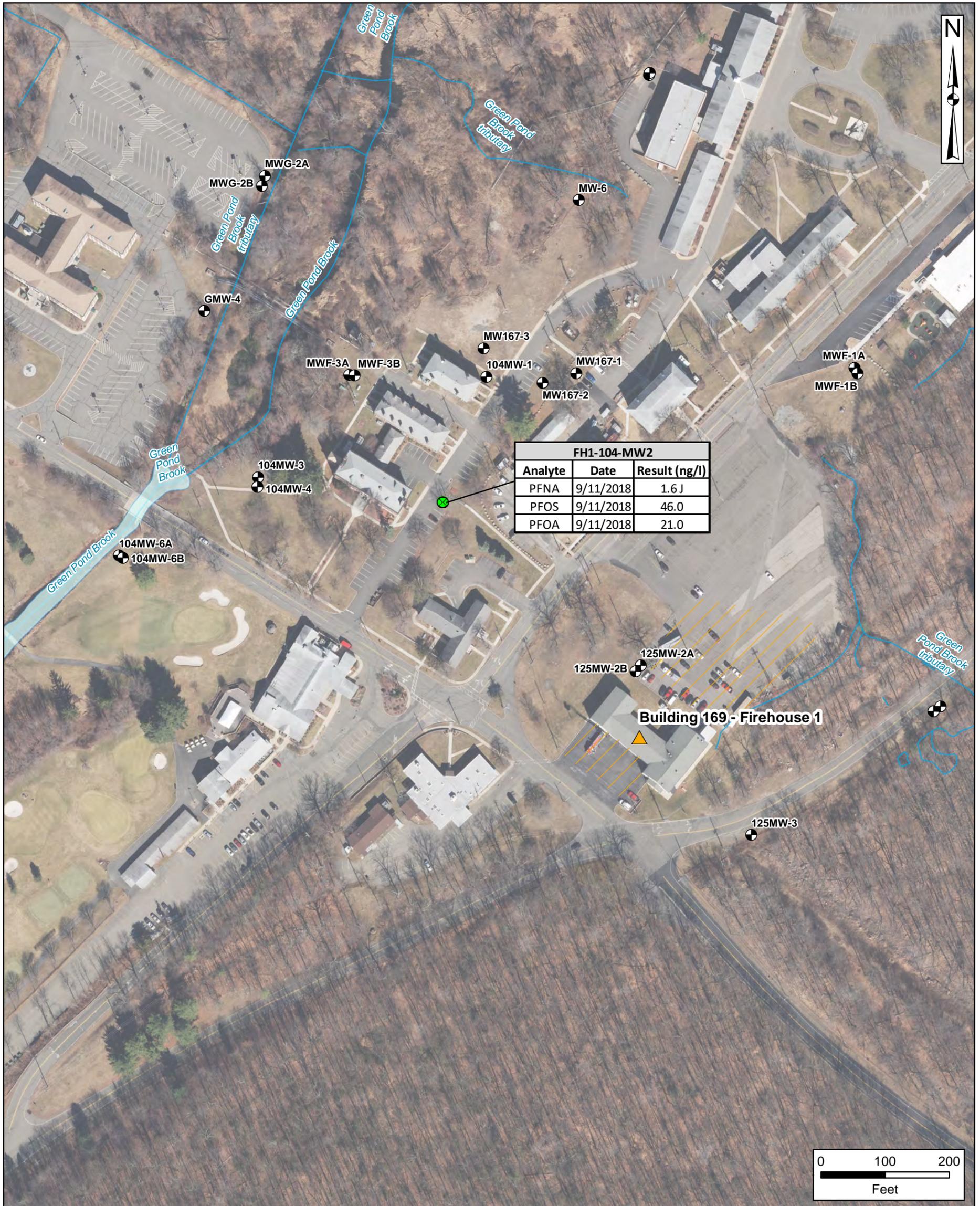
Coordinate System:
 WGS 1984, UTM Zone 18 North

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 USAEC PFAS Site Inspection
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ARCADIS

Figure 6
 Pre-SI Sampling Building 169
 Firehouse 1



- AOPI Location
- AFFF Use Area
- Monitoring Well
- Groundwater Sampling Location

Note:
 ng/l = nanograms per liter

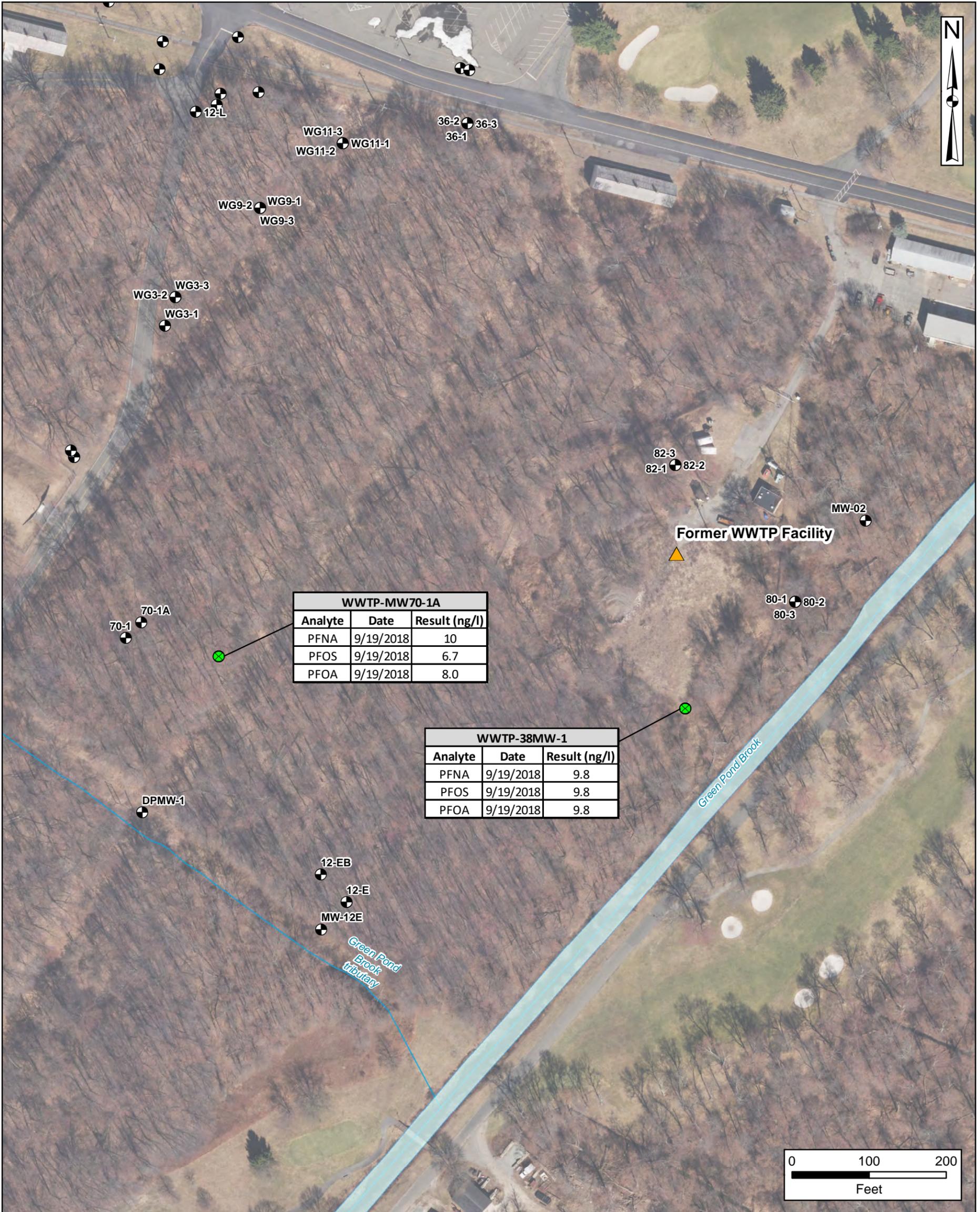
Coordinate System:
 WGS 1984, UTM Zone 18 North

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ARCADIS

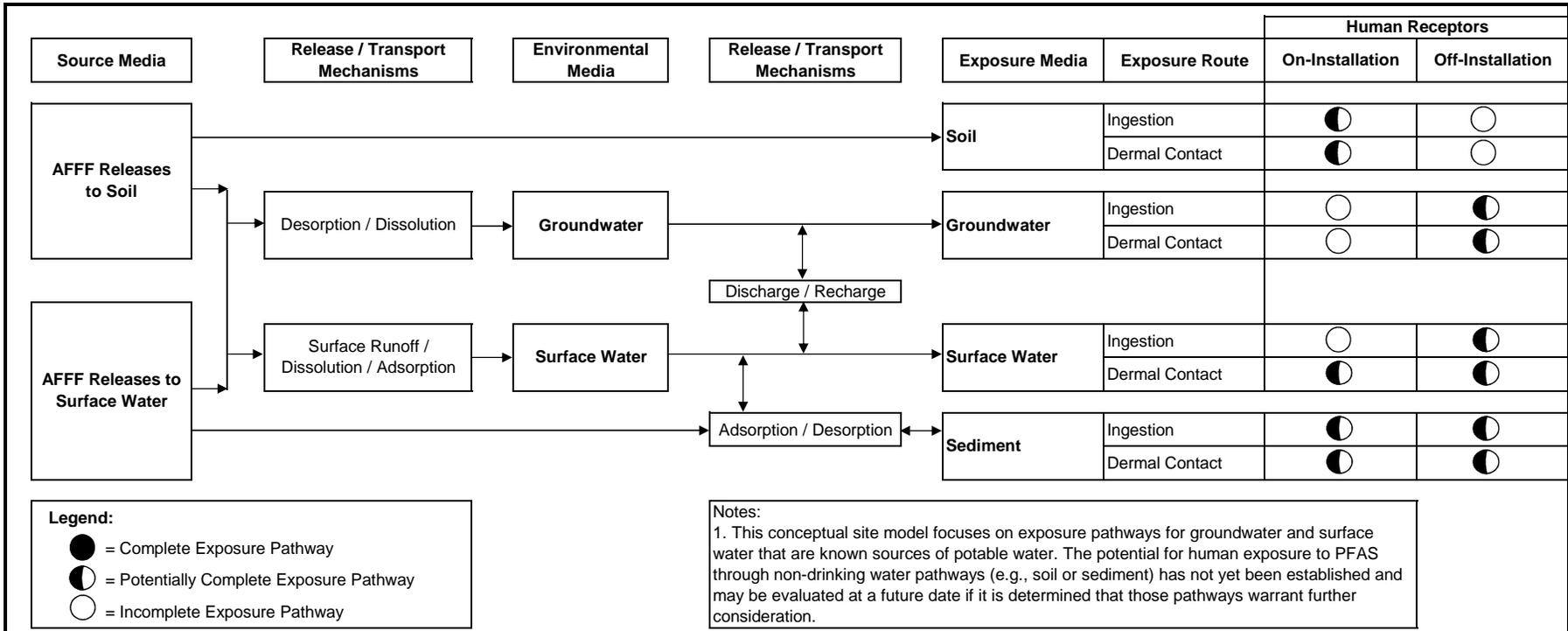
Figure 7
Pre-SI Sampling Former WWTP



- AOPI Location
- Monitoring Well
- Groundwater Sampling Location

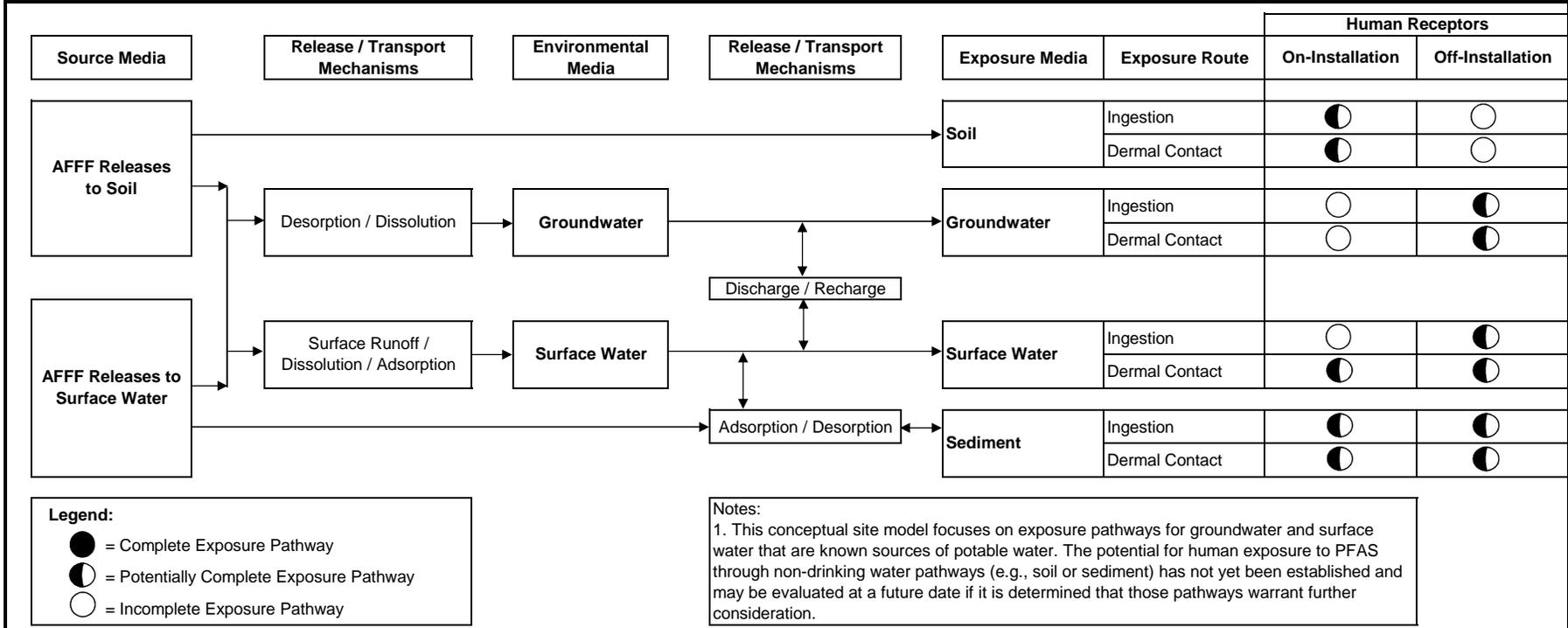
Note:
 ng/l = nanograms per liter

Coordinate System:
 WGS 1984, UTM Zone 18 North



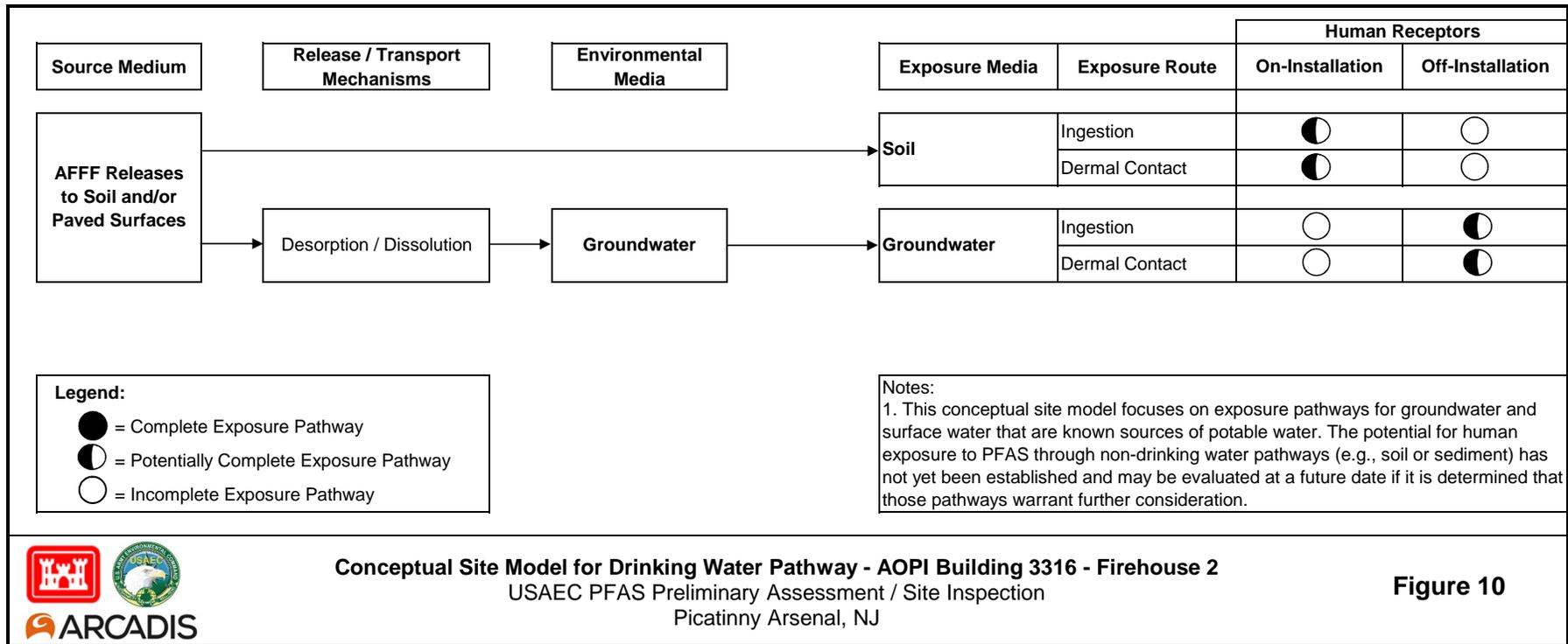
Conceptual Site Model for Drinking Water Pathway - AOPI Former Pyrotechnic Area and Sanitary Landfill
 USAEC PFAS Preliminary Assessment / Site Inspection
 Picatinny Arsenal, NJ

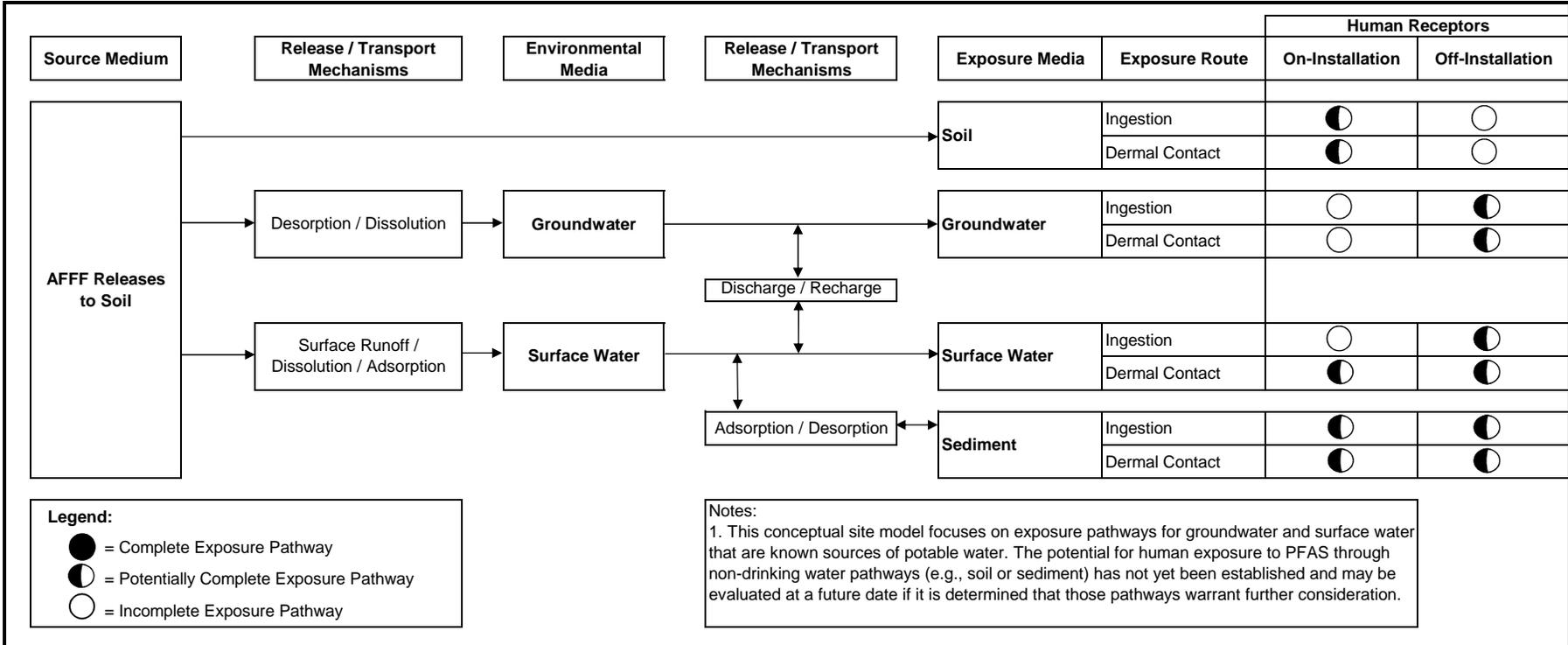
Figure 8



Conceptual Site Model for Drinking Water Pathway - AOPF Former Lower Burning Grounds
 USAEC PFAS Preliminary Assessment / Site Inspection
 Picatinny Arsenal, NJ

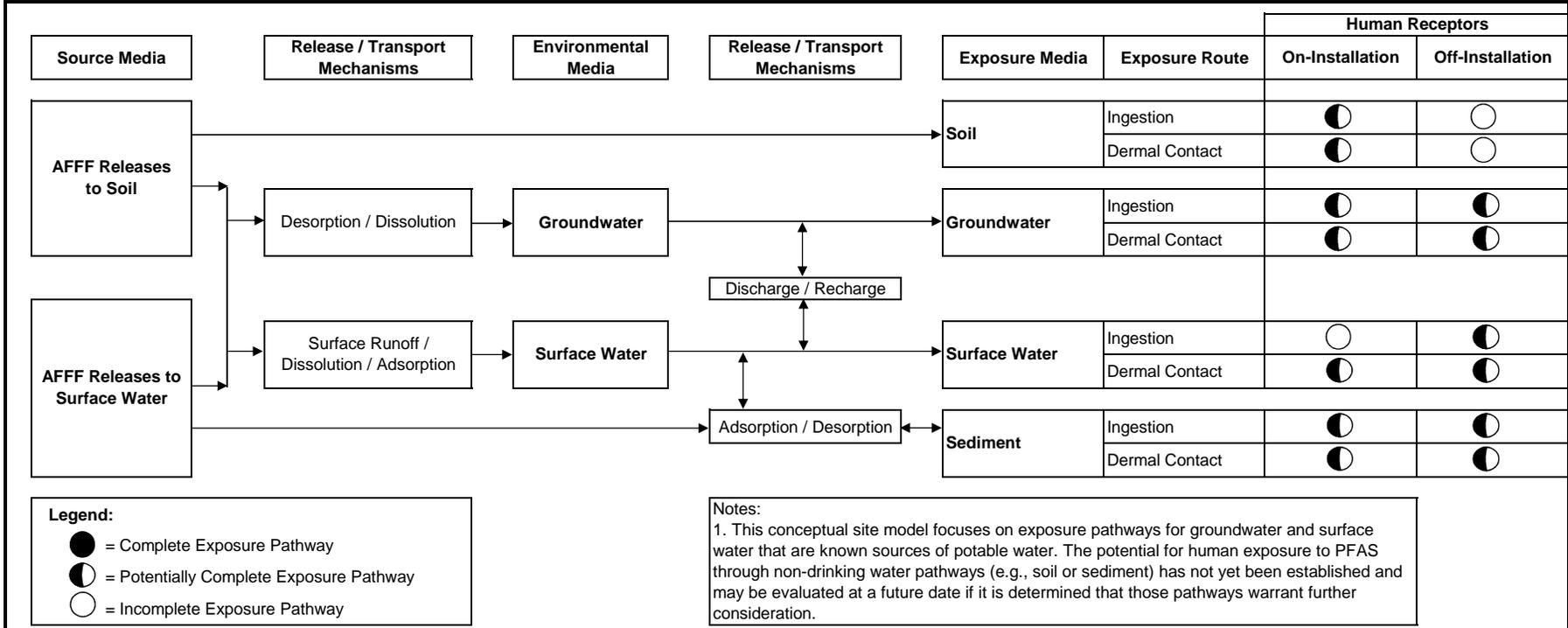
Figure 9





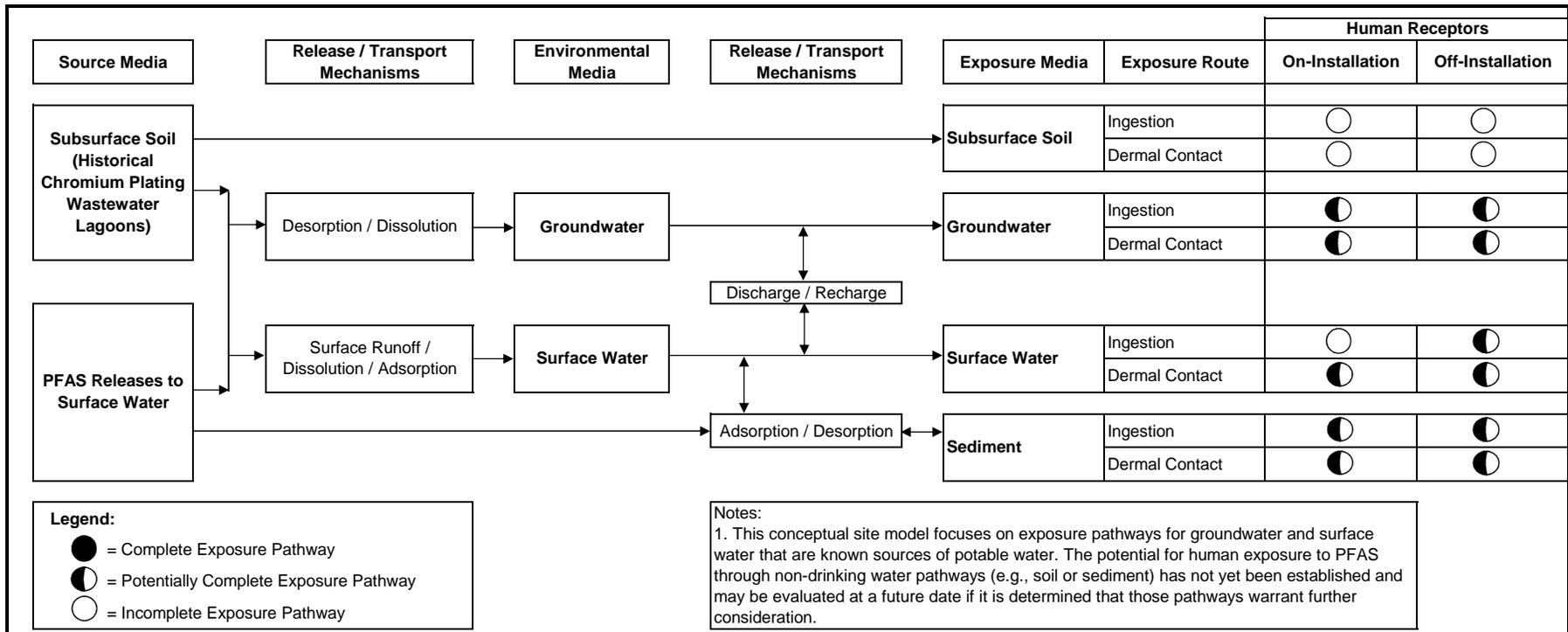
Conceptual Site Model for Drinking Water Pathway - AOPI Lawn to the North of Building 3409/3410
 USAEC PFAS Preliminary Assessment / Site Inspection
 Picatinny Arsenal, NJ

Figure 11



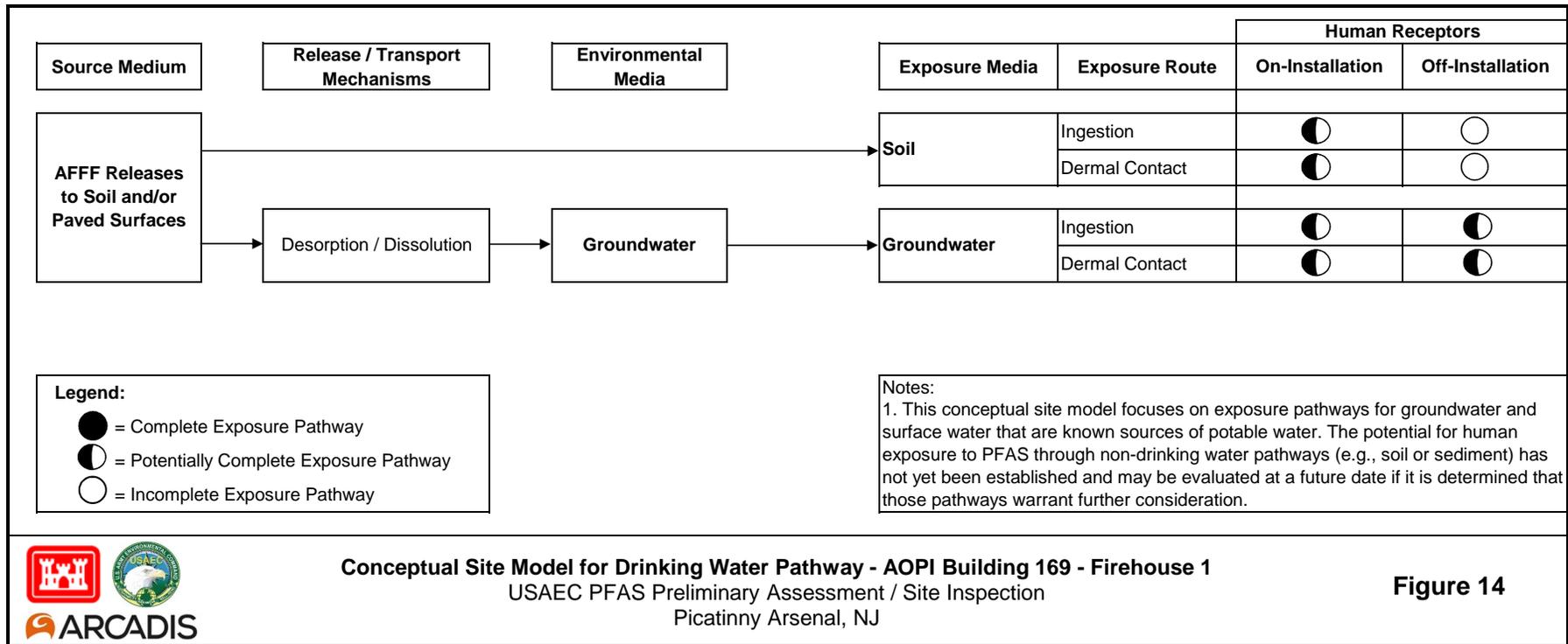
Conceptual Site Model for Drinking Water Pathway - AOP1 Area 1222 - Gorge
 USAEC PFAS Preliminary Assessment
 Picatinny Arsenal, NJ

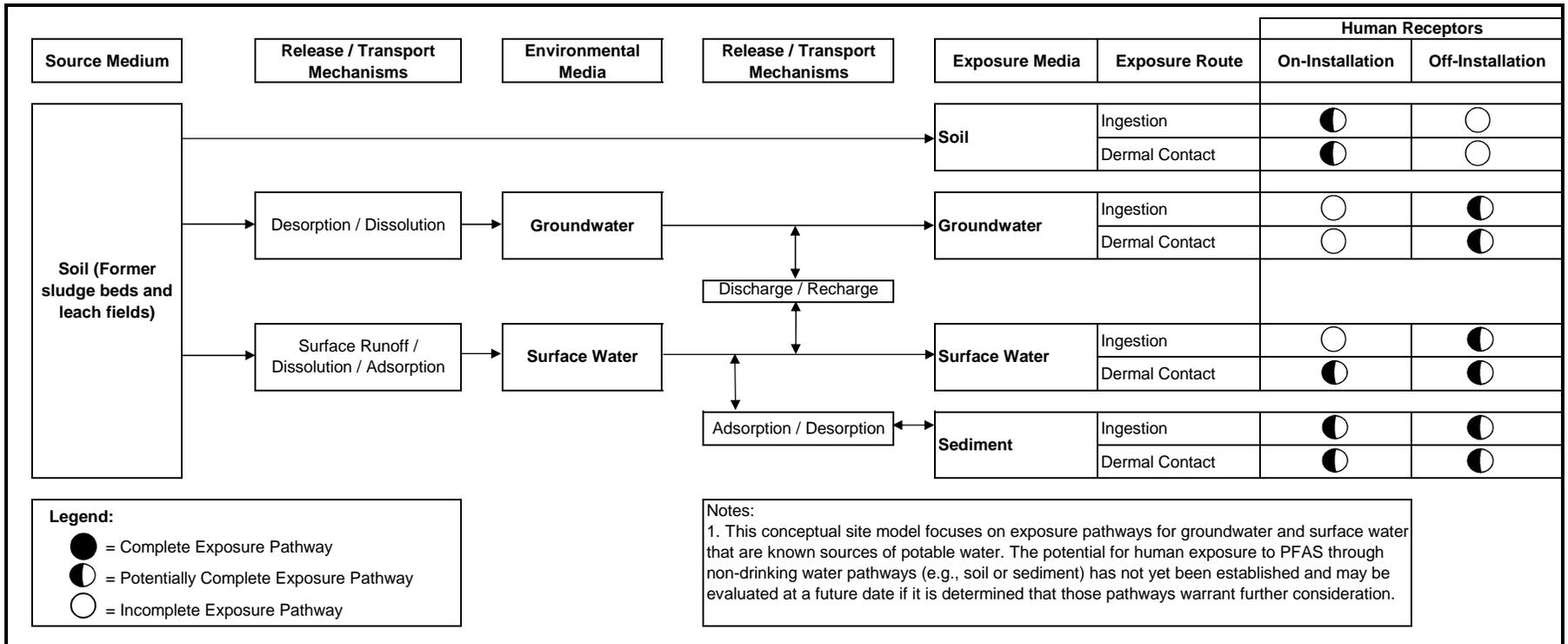
Figure 12



Conceptual Site Model for Drinking Water Pathway - AOPF Former Building 24
 USAEC PFAS Preliminary Assessment
 Picatinny Arsenal, NJ

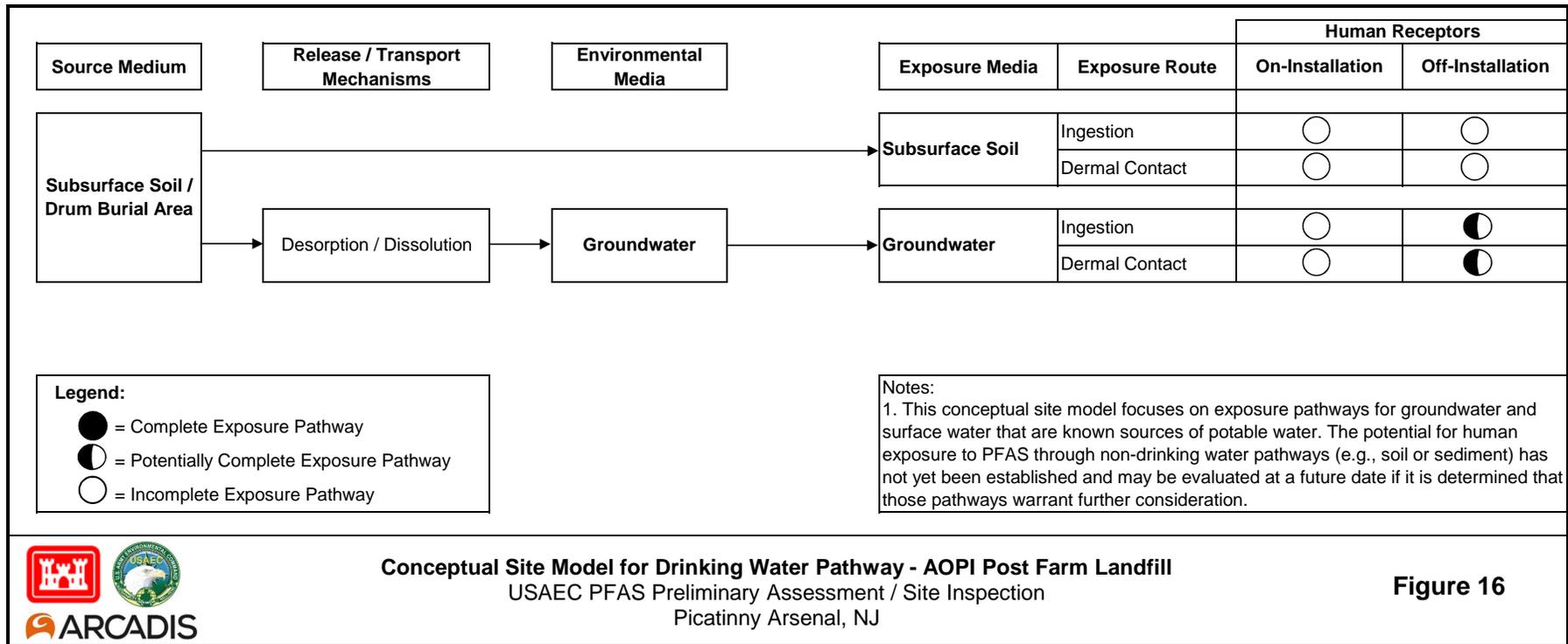
Figure 13

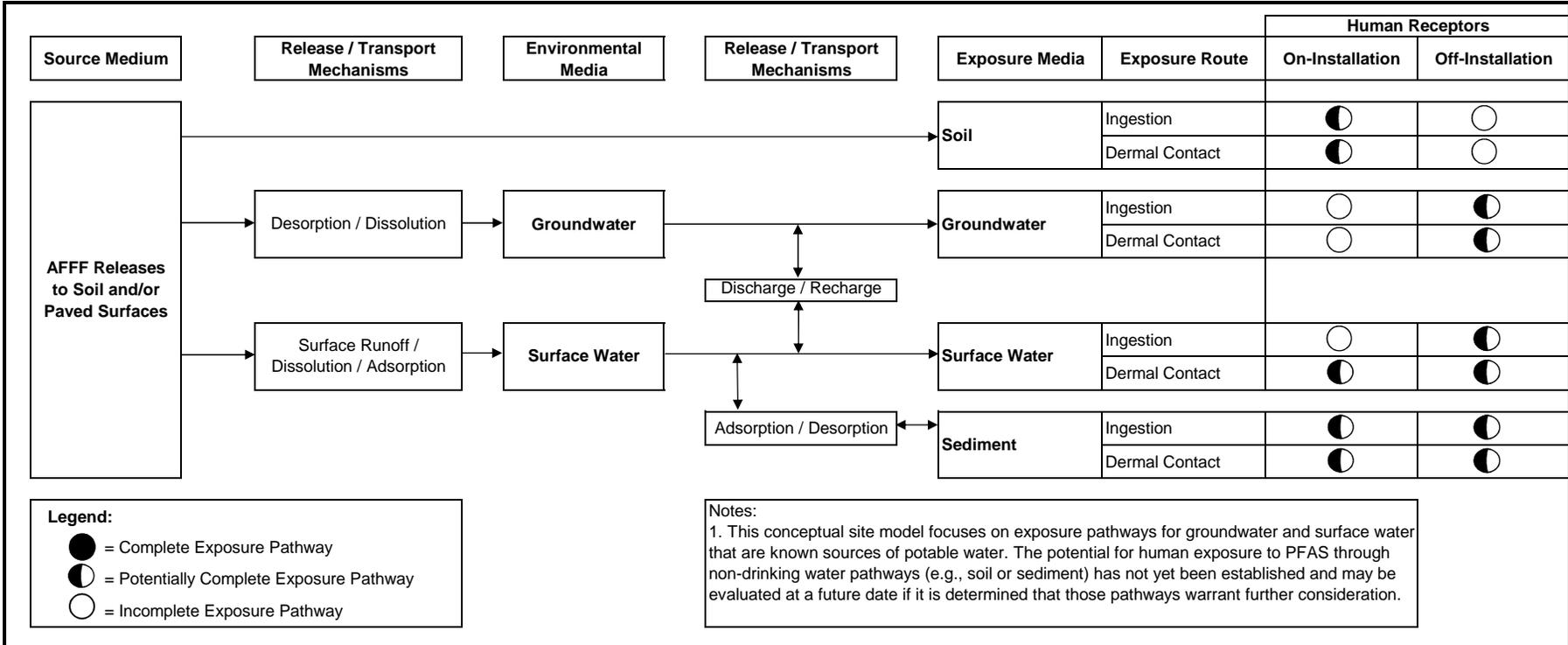




Conceptual Site Model for Drinking Water Pathway - AOPI Former WWTP Facility
 USAEC PFAS Preliminary Assessment / Site Inspection
 Picatinny Arsenal, NJ

Figure 15





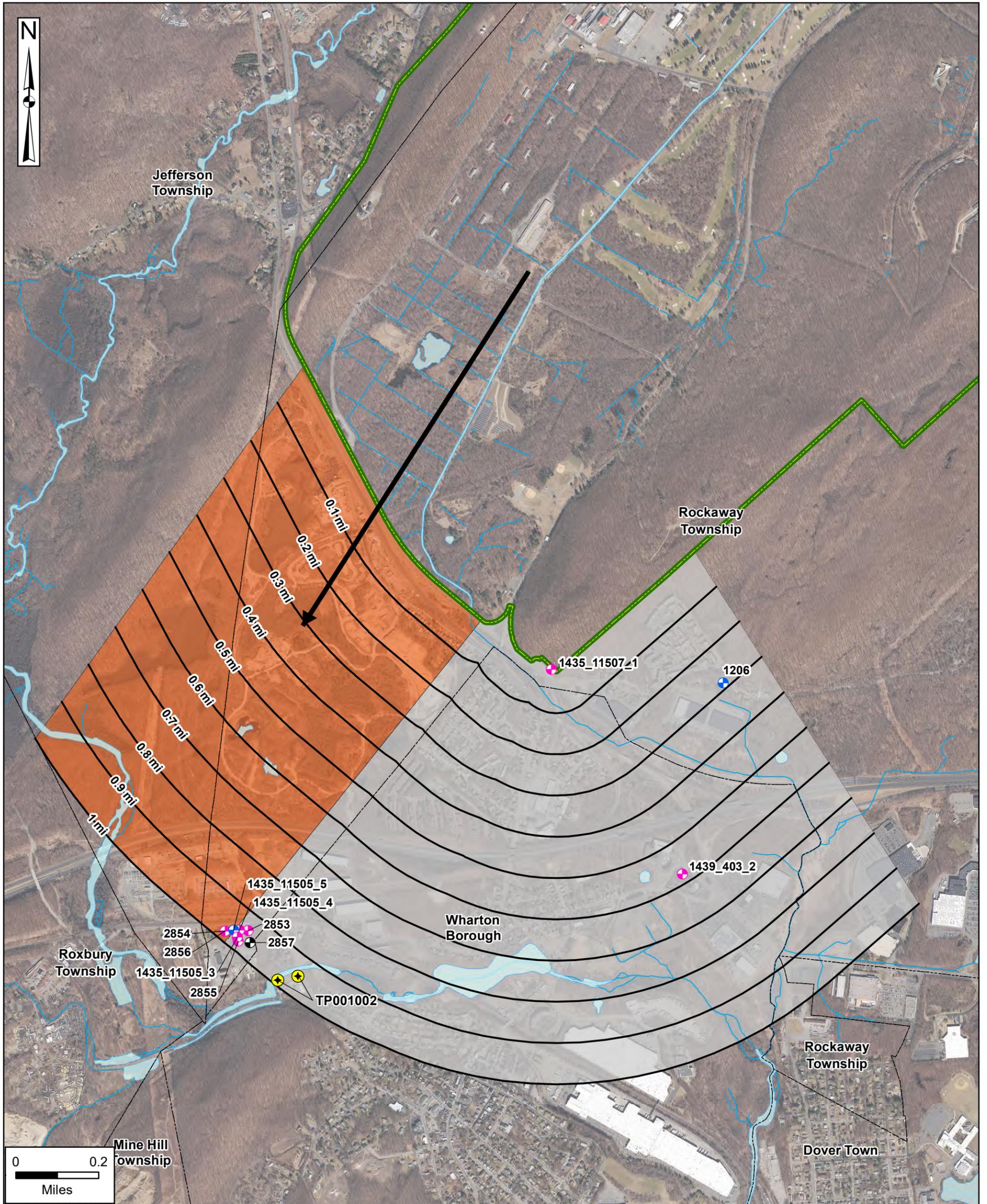
Conceptual Site Model for Drinking Water Pathway - AOPI Building 3801 - NJARNG Helipad Area
 USAEC PFAS Preliminary Assessment / Site Inspection
 Picatinny Arsenal, NJ

Figure 17

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 Picatinny Arsenal, NJ



Figure 18
Off-Site Well Locations



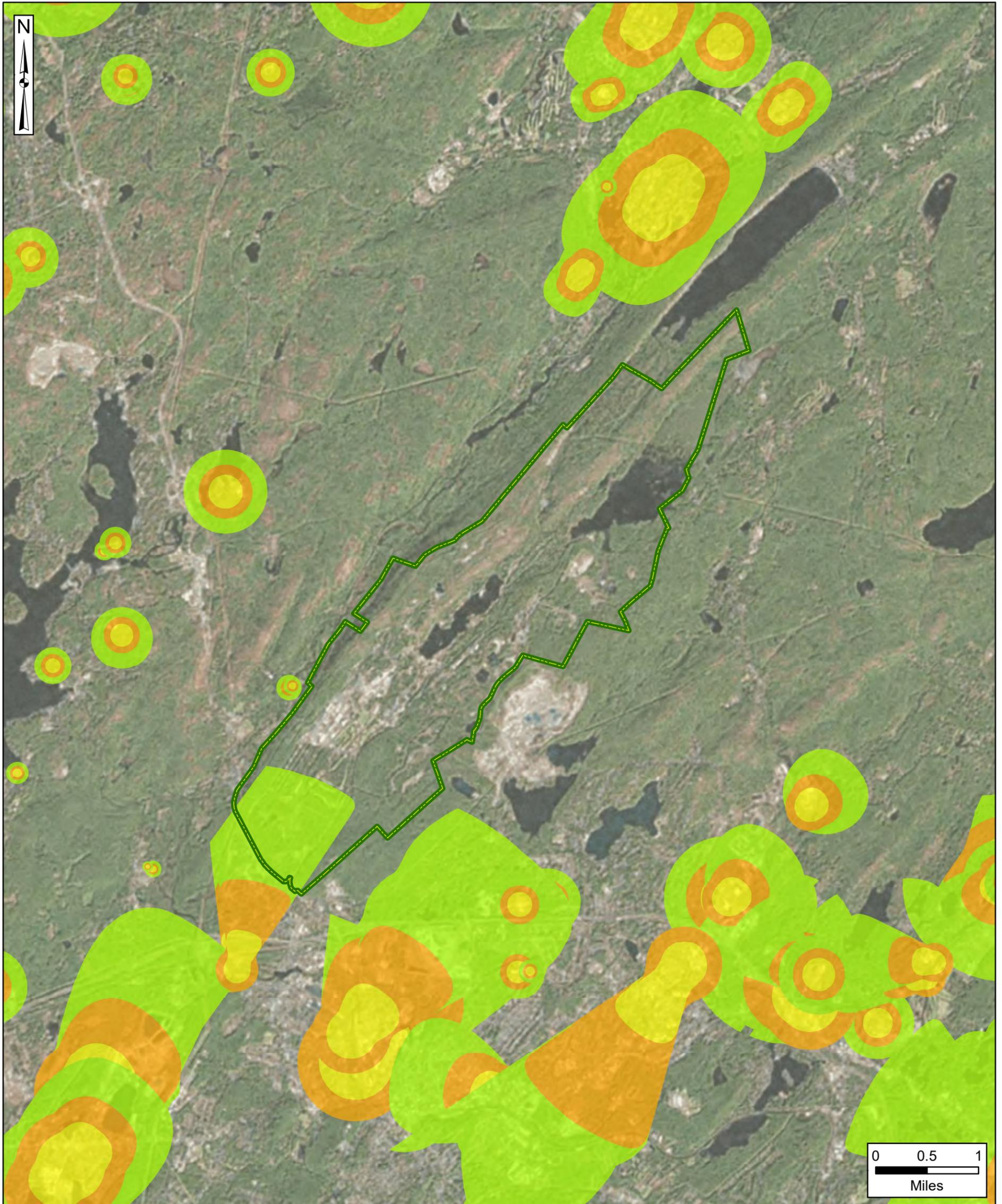
- Installation Boundary
- Southern Downgradient Area
- Southeast Downgradient Area
- Groundwater Flow Direction
- Municipal Boundary
- ★ Potable Well - Sampled
- ★ Potable Well - Identified
- Possible Well Identified. Owner has been provided questionnaire
- ★ Public Supply Well - Sampled

Note: Wharton Public Supply Well (TP001002) sampled by Wharton Borough. The TP001002 represents two well locations. The wells are connected to a single air stripping tower, so they are combined under one designation.

* wells identified within 1 mile radius hydraulically downgradient of Picatinny Arsenal



Figure 19
Community Well Head Protection Areas



 Installation Boundary

Time of Travel*

-  2 Year
-  5 Year
-  12 Year

* Indicates the area a well draws water from within a specified time frame.

Data Sources:
Picatinny Arsenal, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

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 Picatinny Arsenal, NJ



Figure 20
AOPI Former Pyrotechnic Area



- AOPI Location
- AFFF Use Area
- Potential PFAS Release/Spray Field
- Well
- Well (Abandoned / Not Located)
- River/Stream
- Water Body
- Assumed Groundwater Flow Direction

Note:
 Pre-SI sampling indicated PFOS/PFOA concentrations found above Health Advisory Level (HAL).



Figure 22
AOPI Building 169 - Firehouse 1

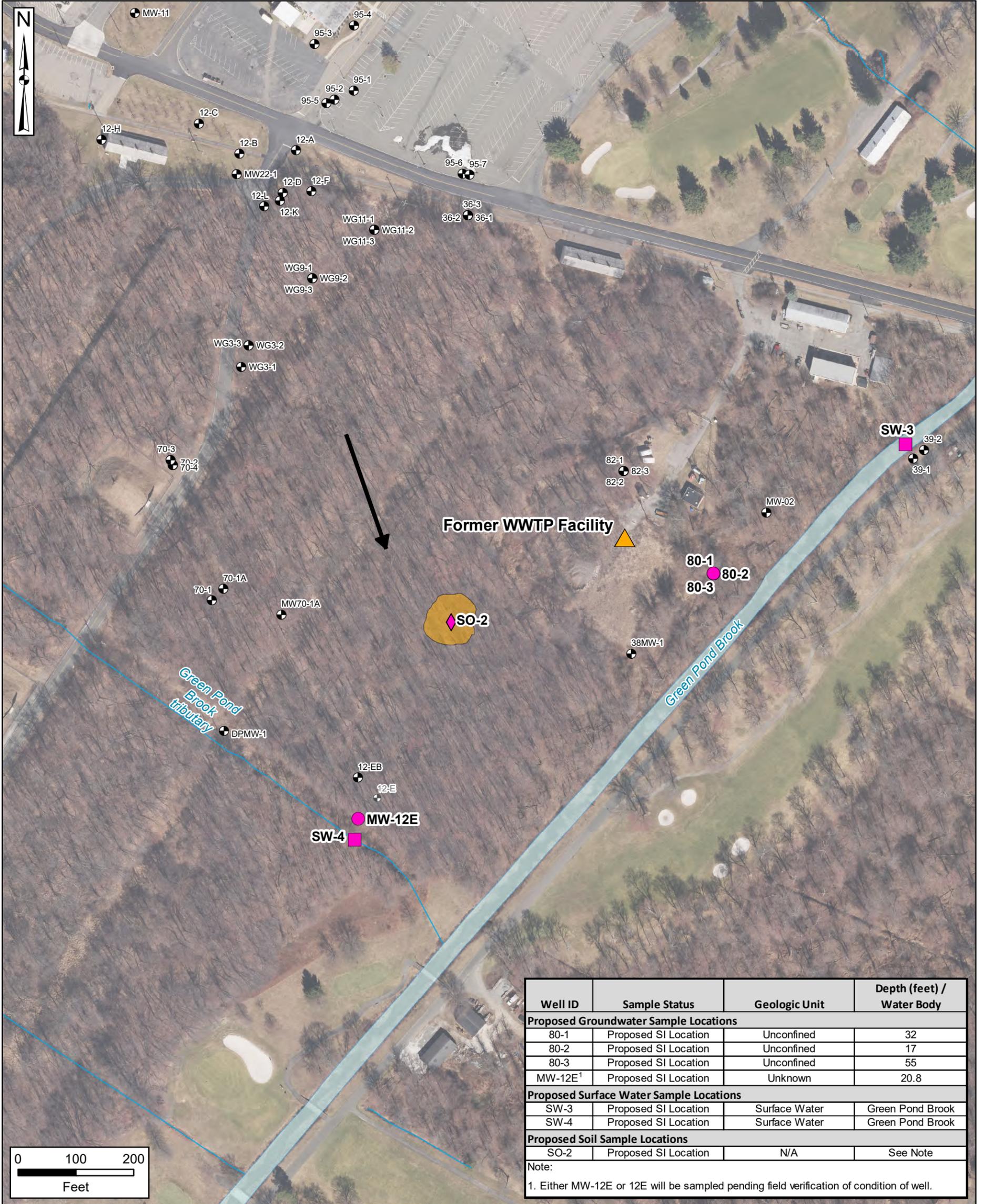


- AOPI Location
- AFFF Use Area
- Well
- Well (Abandoned / Not Located)
- River/Stream
- Assumed Groundwater Flow Direction

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Figure 24
AOPI Former WWTP Facility
Proposed Sampling Locations



Well ID	Sample Status	Geologic Unit	Depth (feet) / Water Body
Proposed Groundwater Sample Locations			
80-1	Proposed SI Location	Unconfined	32
80-2	Proposed SI Location	Unconfined	17
80-3	Proposed SI Location	Unconfined	55
MW-12E ¹	Proposed SI Location	Unknown	20.8
Proposed Surface Water Sample Locations			
SW-3	Proposed SI Location	Surface Water	Green Pond Brook
SW-4	Proposed SI Location	Surface Water	Green Pond Brook
Proposed Soil Sample Locations			
SO-2	Proposed SI Location	N/A	See Note

Note:
 1. Either MW-12E or 12E will be sampled pending field verification of condition of well.

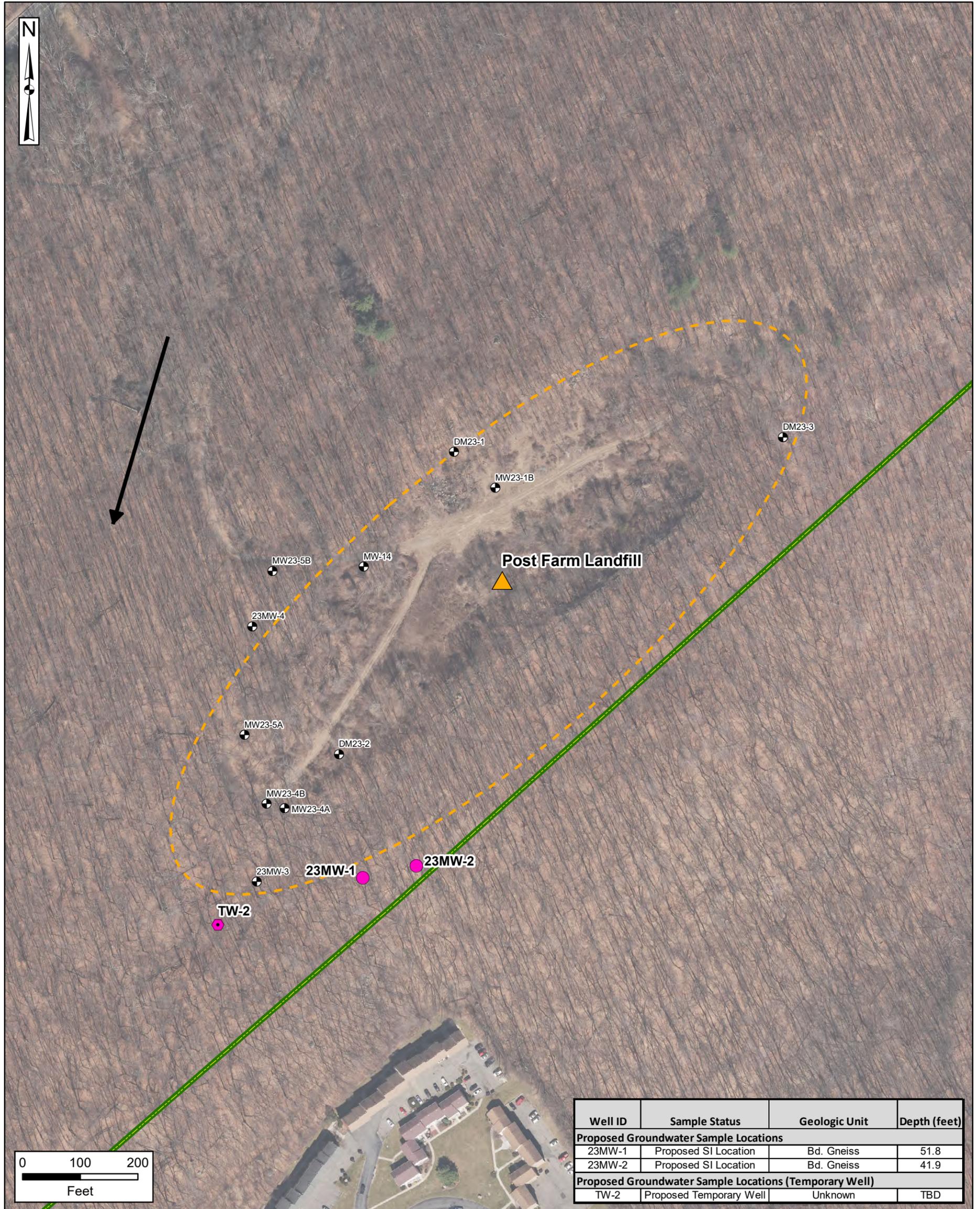
- AOPI Location
- Approximate Location of Leach Fields
- Well
- Well (Abandoned / Not Located)
- Assumed Groundwater Flow Direction
- River/Stream
- Water Body
- Groundwater Sampling Locations**
- Proposed Sample Location for SI
- Surface Water Sampling Locations**
- Proposed Sample Location for SI
- Soil Boring Sampling Locations**
- Proposed Sample Location for SI

Note:
 Soil samples will be collected near surface and within the capillary zone (just above water table). The drill rig may not be able to access the soil sample location. If the location cannot be accessed only a surface soil sample will be collected. A SW sample will be collected if stream is flowing during the sampling event.



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Figure 25
AOPI Post Farm Landfill
Proposed Sampling Locations



Well ID	Sample Status	Geologic Unit	Depth (feet)
Proposed Groundwater Sample Locations			
23MW-1	Proposed SI Location	Bd. Gneiss	51.8
23MW-2	Proposed SI Location	Bd. Gneiss	41.9
Proposed Groundwater Sample Locations (Temporary Well)			
TW-2	Proposed Temporary Well	Unknown	TBD

- Installation Boundary
- AOPI Location
- Approx. Historical Dumping Area
- Well
- Assumed Groundwater Flow Direction

- Groundwater Sampling Locations**
- Proposed Sample Location for SI
 - Proposed Sample Location for SI (Temporary Well)



Figure 26
AOPI Building 3316 - Firehouse 2
Proposed Sampling Locations



Well ID	Sample Status	Geologic Unit	Depth (feet)
Proposed Groundwater Sample Locations			
3316-1	Proposed SI Location	Unknown	70.1
3316-3	Proposed SI Location	Unknown	20.7
Proposed Groundwater Sample Locations (Temporary Well)¹			
TW-3	Proposed Temporary Well	Unknown	TBD
Proposed Soil Sample Locations			
SO-3	Proposed SI Location	N/A	See Note

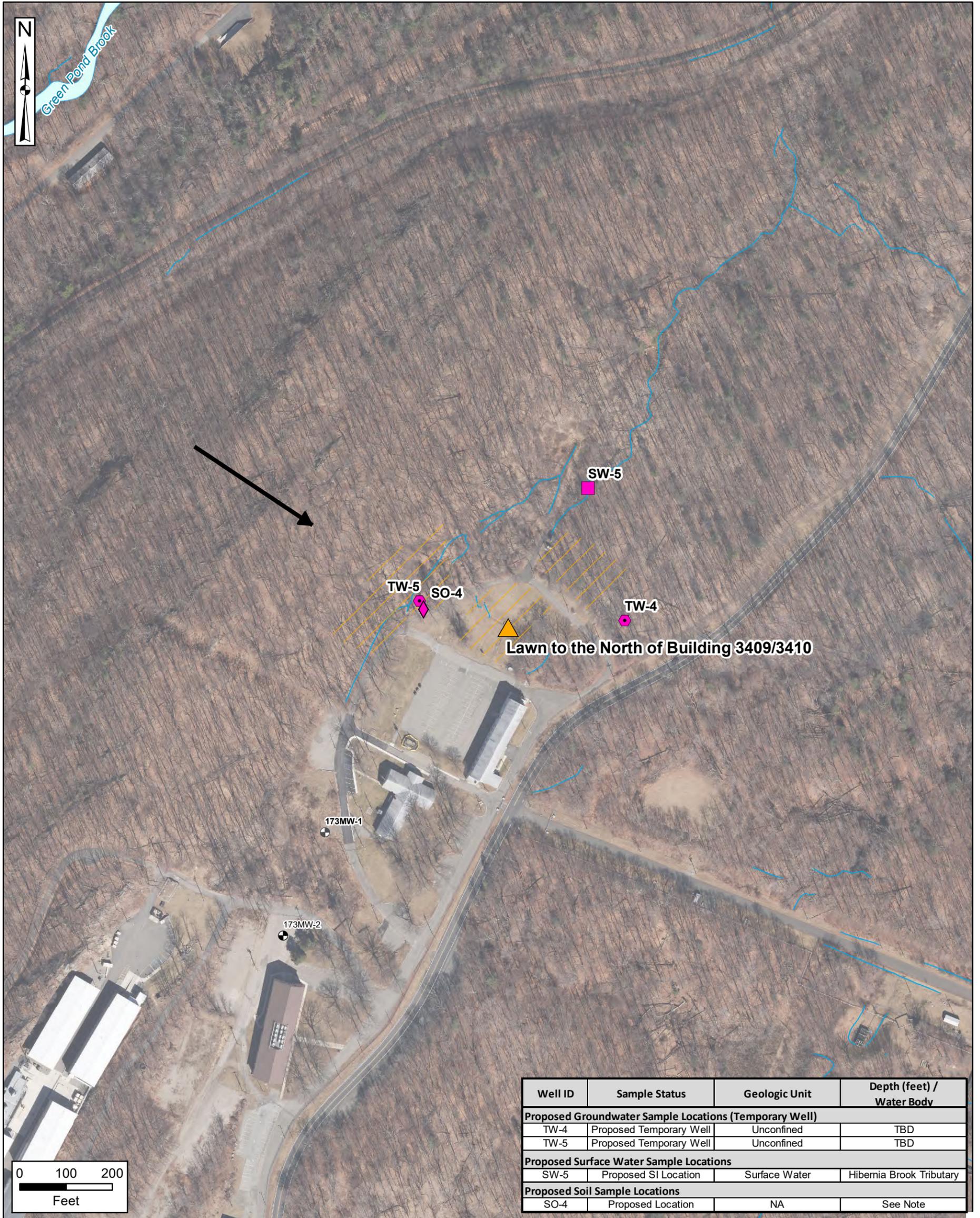
- AOPI Location
- AFFF Use Area
- Well
- Well (Abandoned / Not Located)
- Assumed Groundwater Flow Direction

- Groundwater Sampling Locations**
- Proposed Sample Location for SI
 - Proposed Sample Location for SI (Temporary Well)
- Soil Boring Sampling Locations**
- Proposed Sample Location for SI

Note:
 Soil samples will be collected near surface and within the capillary zone (just above water table). Areas where AFFF use was confirmed and a temporary well (TW) is proposed, a soil sample will be co-located. Soil sample location will be downgradient from the identified AFFF use area and co-located with TW-3. Field verification of sheet flow from the identified AFFF use area will determine final location.



Figure 27
AOPI Lawn to the North of Building 3409/3410
Proposed Sampling Locations



Well ID	Sample Status	Geologic Unit	Depth (feet) / Water Body
Proposed Groundwater Sample Locations (Temporary Well)			
TW-4	Proposed Temporary Well	Unconfined	TBD
TW-5	Proposed Temporary Well	Unconfined	TBD
Proposed Surface Water Sample Locations			
SW-5	Proposed SI Location	Surface Water	Hibernia Brook Tributary
Proposed Soil Sample Locations			
SO-4	Proposed Location	NA	See Note

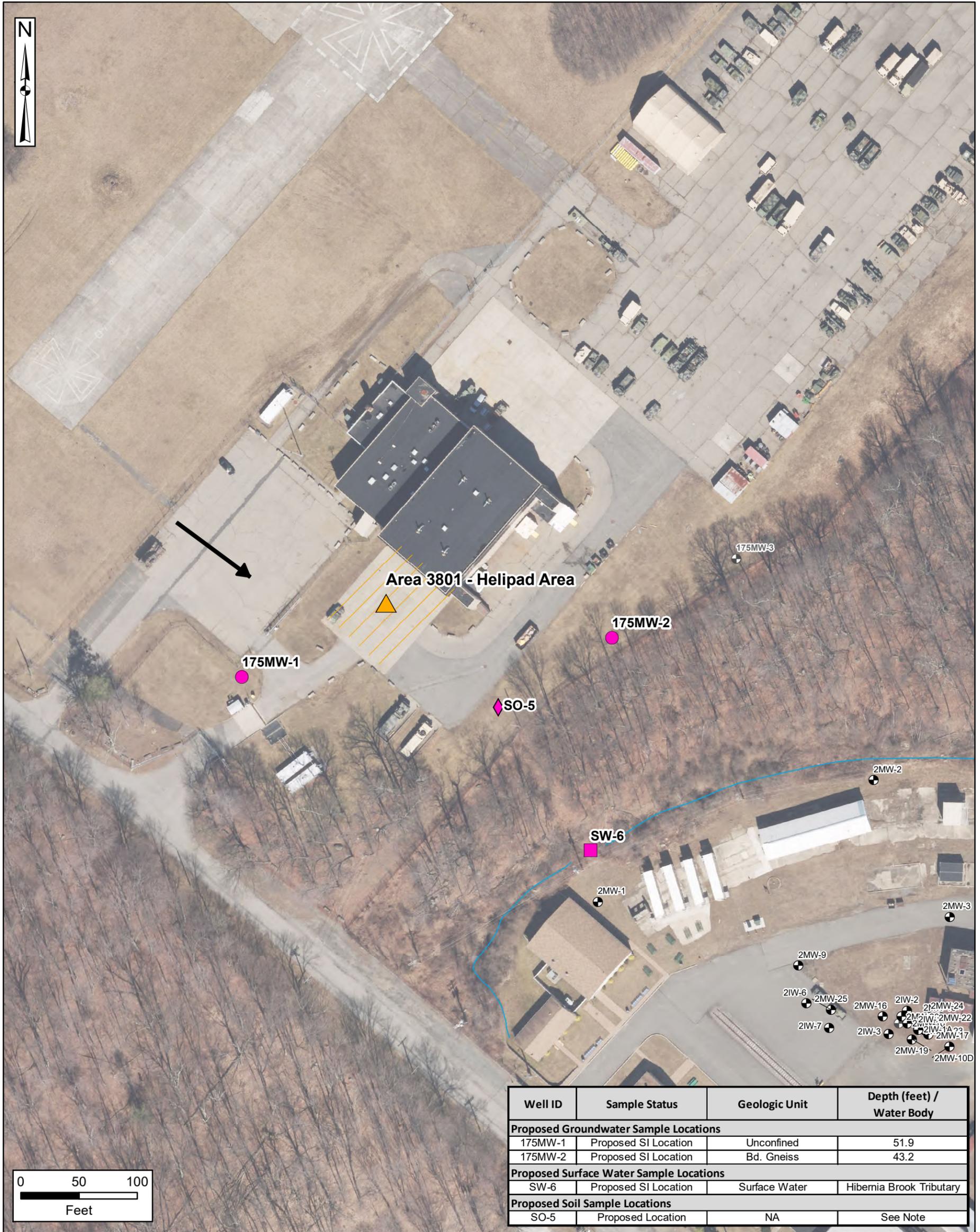
- AOPI Location
- AFFF Use Area
- River/Stream
- Well
- Well (Abandoned / Not Located)
- Assumed Groundwater Flow Direction

- Groundwater Sampling Locations**
- Proposed Sample location for SI (Temporary Well)
- Surface Water Sampling Locations**
- Proposed Sample Location for SI
- Soil Boring Sampling Locations**
- Proposed Sample Location for SI

Note:
 Soil samples will be collected near surface and within the capillary zone (just above water table). Areas where AFFF use was confirmed and a temporary well (TW) is proposed, a soil sample will be co-located. Soil sample SO-4 will be co-located with TW-5. A SW sample will be collected if stream is flowing during the sampling event.



Figure 28
AOPI Building 3801 – NJARNG Helipad Area
Proposed Sampling Locations



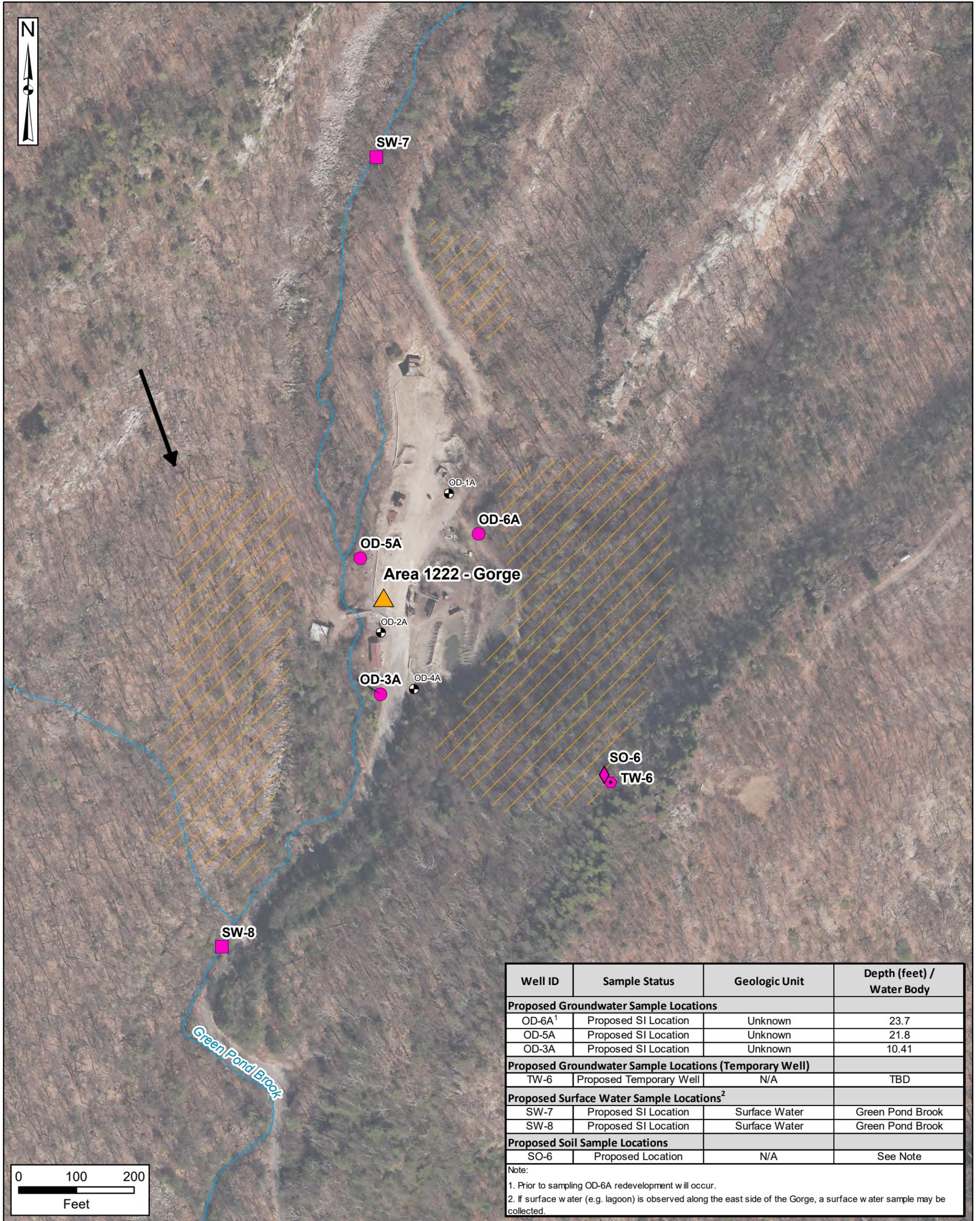
- AOPI Location
- AFFF Use Area
- River/Stream
- Well
- Well (Abandoned / Not Located)
- Assumed Groundwater Flow Direction

- Groundwater Sampling Locations**
- Proposed Sample Location for SI
- Surface Water Sampling Locations**
- Proposed Sample Location for SI
- Soil Boring Sampling Locations**
- Proposed Sample Location for SI

Note:
 Soil samples will be collected near surface and within the capillary zone (just above water table). Soil sample location will be downgradient from the identified AFFF use area, field verification of sheet flow from the identified AFFF use area will determine final location. A SW sample will be collected if stream is flowing during the sampling event



Figure 29
AOPI Area 1222 - Gorge
Proposed Sampling Locations



Well ID	Sample Status	Geologic Unit	Depth (feet) / Water Body
Proposed Groundwater Sample Locations			
OD-6A ¹	Proposed SI Location	Unknown	23.7
OD-5A	Proposed SI Location	Unknown	21.8
OD-3A	Proposed SI Location	Unknown	10.41
Proposed Groundwater Sample Locations (Temporary Well)			
TW-6	Proposed Temporary Well	N/A	TBD
Proposed Surface Water Sample Locations²			
SW-7	Proposed SI Location	Surface Water	Green Pond Brook
SW-8	Proposed SI Location	Surface Water	Green Pond Brook
Proposed Soil Sample Locations			
SO-6	Proposed Location	N/A	See Note

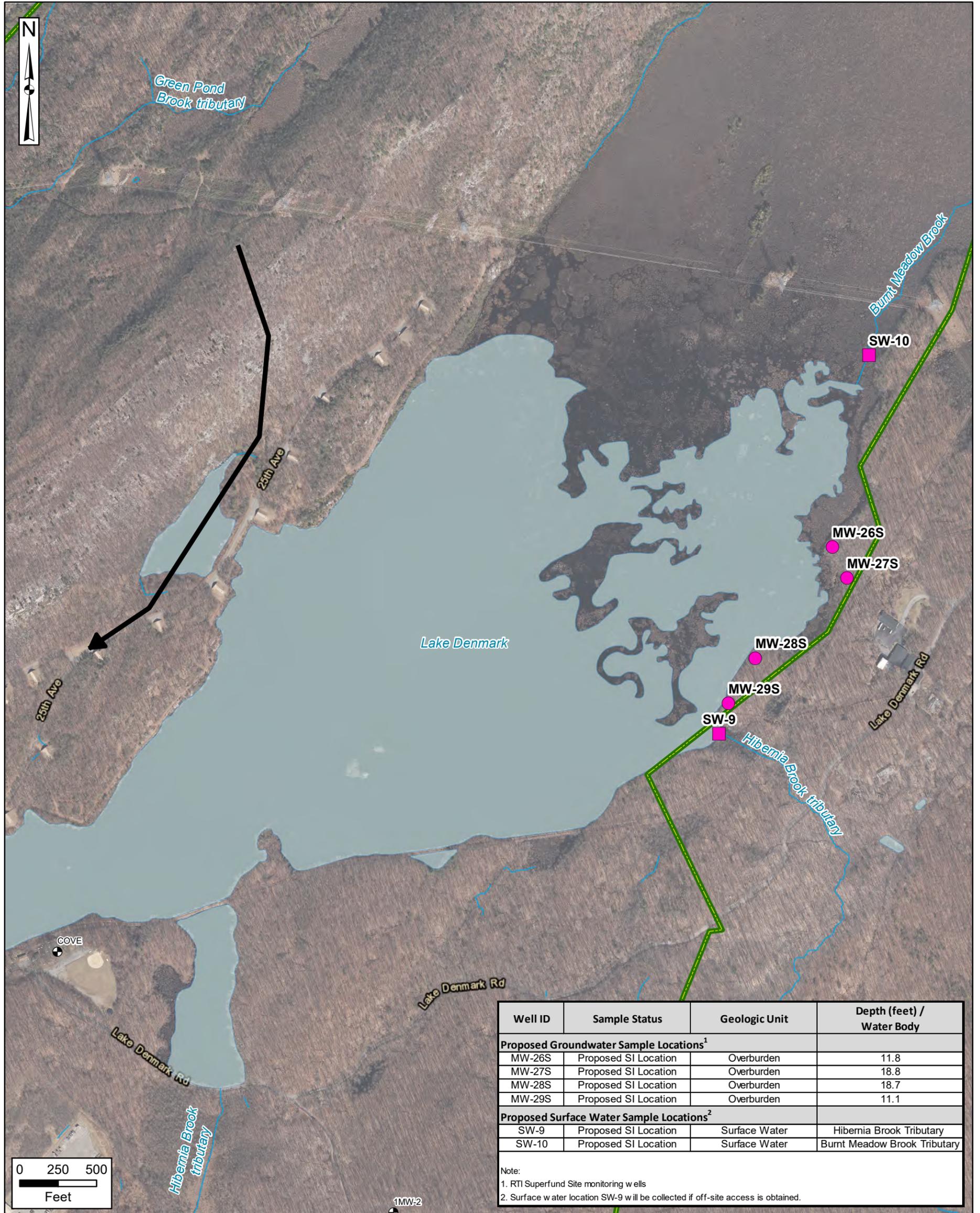
Note:
 1. Prior to sampling OD-6A redevelopment will occur.
 2. If surface water (e.g. lagoon) is observed along the east side of the Gorge, a surface water sample may be collected.

- AOPI Location
- AFFF Use Area
- Well
- River/Stream
- Assumed Groundwater Flow Direction
- Proposed Sample Location for SI
- Proposed Sample location for SI
- Proposed Sample Location for SI (Temporary Well)
- Proposed Sample Location for SI

Note:
 Soil samples will be collected near surface and within the capillary zone (just above water table). Areas where AFFF use was confirmed and a temporary well (TW) is proposed, a soil sample will be co-located. A SW sample will be collected if stream is flowing during the sampling event.



Figure 30
Eastern Boundary - On-Site
Proposed Sample Locations



Well ID	Sample Status	Geologic Unit	Depth (feet) / Water Body
Proposed Groundwater Sample Locations¹			
MW-26S	Proposed SI Location	Overburden	11.8
MW-27S	Proposed SI Location	Overburden	18.8
MW-28S	Proposed SI Location	Overburden	18.7
MW-29S	Proposed SI Location	Overburden	11.1
Proposed Surface Water Sample Locations²			
SW-9	Proposed SI Location	Surface Water	Hibernia Brook Tributary
SW-10	Proposed SI Location	Surface Water	Burnt Meadow Brook Tributary

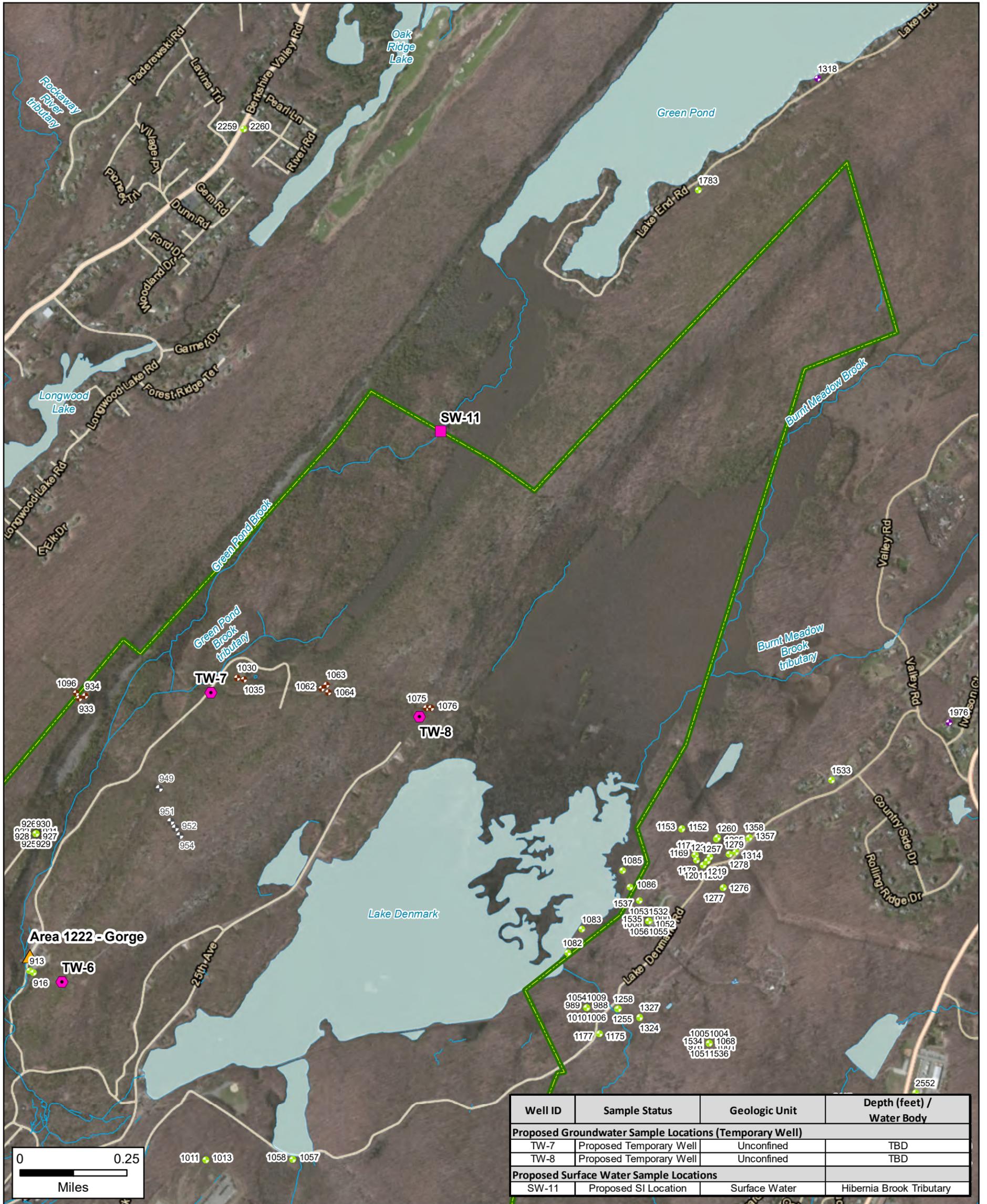
Note:
 1. RTI Superfund Site monitoring wells
 2. Surface water location SW-9 will be collected if off-site access is obtained.

- Installation Boundary
- River/Stream
- Water Body
- Groundwater Flow Direction
- Well
- Groundwater Sampling Locations**
 - Proposed Sample Location for SI
- Surface Water Sampling Locations**
 - Proposed Sample Location for SI

Note:
 A SW sample will be collected if stream is flowing during the sampling event.



Figure 31
Northern Boundary
Proposed Sampling Locations



- Installation Boundary
- AOPI Location
- Water Body
- River/Stream
- Environmental Well - Not Potentially Potable
- Geothermal Well - Not Potentially Potable
- Industrial Well - Not Potentially Potable
- Well (Abandoned)

- Groundwater Sampling Locations**
- Proposed Sample Location for SI (Temporary Well)
- Surface Water Sampling Locations**
- Proposed Sample Location for SI

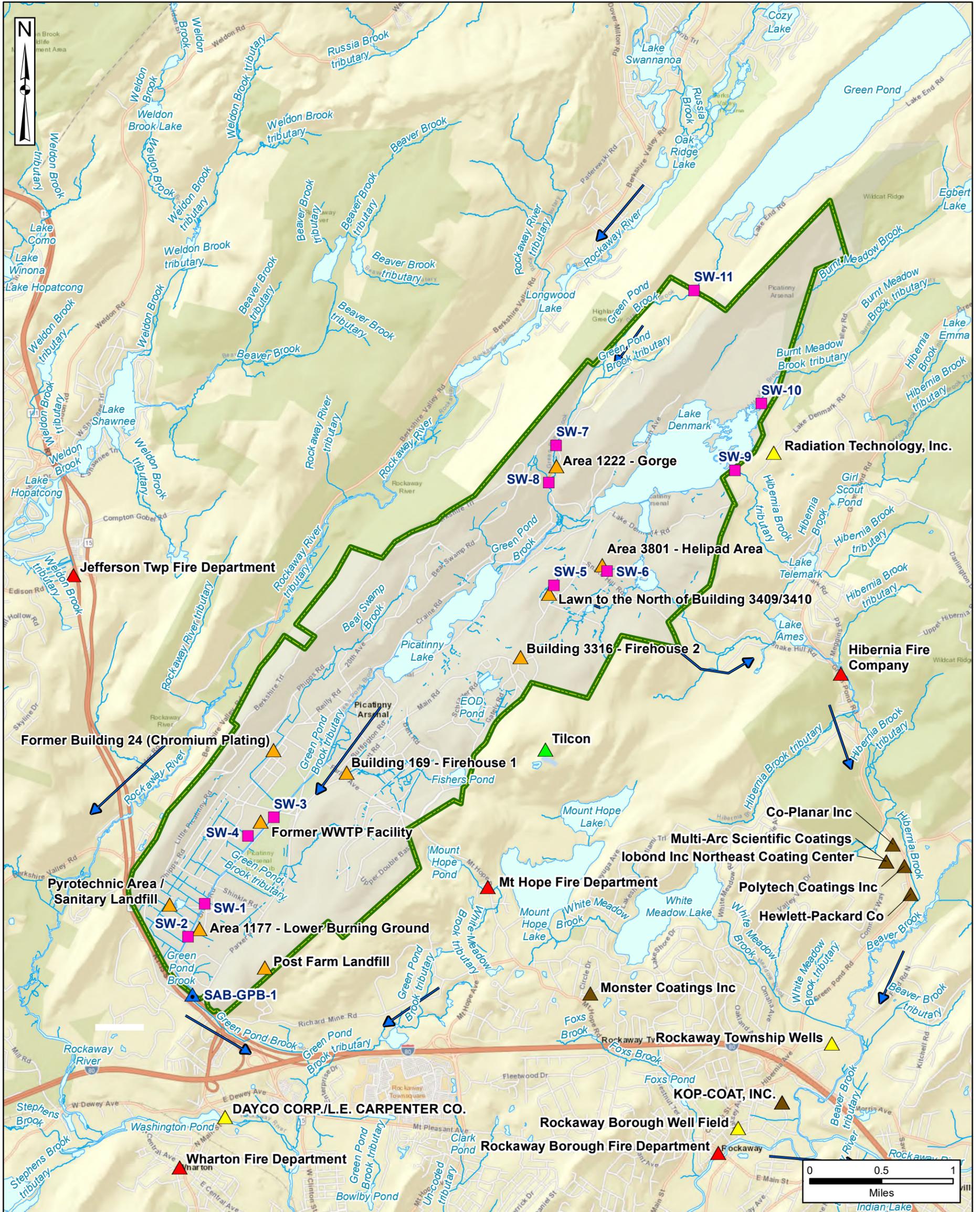
Note:
 A SW sample will be collected if stream is flowing during the sampling event.

Coordinate System:
 WGS 1984, UTM Zone 18 North

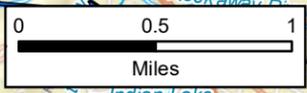
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Figure 33
Proposed Site-Wide
Surface Water Sample Locations



- Installation Boundary
- ▲ AOPi Location
- ▬▬▬ AFFF Use Area
- ➔ Surface Water Flow Direction
- ▲ Pre-SI Surface Water Sample Location
- Proposed Surface Water Sampling Location
- ▲ Fire Department
- ▲ Industry
- ▲ NPL Site
- ▲ Quarry



Coordinate System:
 WGS 1984, UTM Zone 18 North

Attachment 1

Off-Site Well Details

Attachment 1
Picatinny SI QAPP Addendum
Off-Site Well Details

Well Figure ID	Well Permit No	Block	Lot	Municipality	Easting	Northing	Distance from southern boundary (miles)	Total Depth (feet)	Diameter Top of Well (inches)	Diameter Bottom of Well (inches)	Casing material	Boring Log Information	Well Status
1435_11507_1	NA (Rockaway Township identified well; well record not reviewed)	11507	1	Rockaway Township	470469.2948	758021.1604	0.01	NA	NA	NA	NA	NA	Well identified and sampled (sampled 8/14/19)
1206	2500003681	11508	4	Rockaway Township	472664.4065	757841.234	0.29	71	6	6	Steel	log recorded on permit is illegible	Well identified; Owner mailed/property visited - no questionnaire/access response
1439_403_2	NA (Wharton Borough identified well; well record not reviewed)	403	2	Wharton Borough	472129.4688	755394.131	0.58	NA	NA	NA	NA	NA	Well identified and sampled (sampled 5/15/19 & 7/3/19)
2853	2500016185	11506	2	Rockaway Township	466576.727	754703.1018	0.94	134	NA	NA	Steel	0 - 46' Sand, gravel; 46' - 134' Clay	Well identified and sampled (sampled 8/13/19)
1435_11505_4	NA (Wharton Borough identified well; well record not reviewed)	11505	4	Rockaway Township	466465.4696	754712.9867	0.95	NA	NA	NA	NA	NA	Well identified and sampled (sampled 8/13/19)
2857	2500029370	11506	5	Rockaway Township	466601.0737	754544.6368	0.96	280	10	6	Steel	0 - 45' Gravel; 45' - 174' Sand, 174' - 280' Granite	Possible well identified; Owner received letter/property visited - no questionnaire/access response
1435_11505_5	NA (Rockaway Township identified well; well record not reviewed)	11505	5	Rockaway Township	466390.4407	754706.03	0.96	NA	NA	NA	NA	NA	Well identified by Township; Owner mailed/owner's residence visited - no questionnaire/access response
1435_11505_3	NA (Owner identified well; well record not reviewed)	11505	3	Rockaway Township	466435.9958	754616.0487	0.97	NA	NA	NA	NA	NA	Well identified and sampled (sampled 8/13/19)
2855	2500018916	11505	2	Rockaway Township	466447.5079	754566.0114	0.98	120	6	6	Steel	Sand & gravel overburden	Well identified and sampled (sampled 8/13/19)
2854	2500016470 (Year 1972)	11505	6	Rockaway Township	466280.5904	754698.8348	0.98	100	6	NA	Steel	0 - 15' Clay & Gravel; 46' - 100' Sand & Gray Clay	Well identified and sampled (sampled 8/14/19)
2856	2500021618 (Year 1980)							30	6	6	17# drive	Hand dug well to 15', sand & gravel with large stones to water bearing sand & gravel to bottom at 30'.	Well identified and sampled (sampled 8/14/19)

NA - Information not available or not recorded

Attachment 2

Off-Site Well Logs

This PDF Package contains multiple files grouped together within a single container PDF file.

Kofax Power PDF can be used to view, create and manage the files within this container.

To get started, click any file in the PDF Portfolio to view it.

- PDF Packages group multiple files and file types together to make them easier to distribute or share.
- PDF Packages allow you to organize related files for easier viewing and printing
- PDF Packages maintain the original security settings of the files or folders included in the container

Note: In older viewers/editors the files are stored as attachments to this page.

Attachment 3

Site Safety and Health Plan (provided under separate cover)



United States Army Corps of Engineers – Baltimore District

SITE SAFETY AND HEALTH PLAN

PICATINNY ARSENAL

Morris County, New Jersey

Contract Number: W912DR-13-D-0019
Delivery Order: W912DR17F0396

September 2018

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 PICATINNY ARSENAL, MORRIS COUNTY, NEW JERSEY
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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AFFF	aqueous film-forming foam
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
AOPI	area of potential interest
APP	Accident Prevention Plan
Arcadis	Arcadis U.S., Inc.
BBP	Bloodborne Pathogens
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
DEET	N, N-diethyl-m-toluamide
DOT	Department of Transportation
eV	electron volts
HazMat	hazardous material
HAZWOPER	Hazardous Waste Operations and Emergency Response
mg/m ³	milligrams per meter cubed
mmHg	millimeter of mercury
NIOSH	National Institute of Occupational Safety and Health
NJARNG	New Jersey Army National Guard
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PFAS	per- and polyfluoroalkyl substance
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
ppt	parts per trillion
PQAPP	Programmatic Quality Assurance Project Plan
PTA	Picatinny Arsenal
QAPP	Quality Assurance Project Plan

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REL	recommended exposure limit
SHM	Safety and Health Manager
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TLV	threshold limit value
TM	Task Manager
TWA	time weighted average
USAEC	United States Army Environmental Command
WWI	World War I
WWII	World War II
WWTP	Wastewater Treatment Plant

Picatinny Arsenal
Site Safety and Health Plan
Site Inspection
Morris County, New Jersey

Contract Number: W912DR-13-D-0019 / W912DR17F0396

Plan preparer (Competent Person in Health and Safety). Relevant Health and Safety qualifications listed on Worksheet #4, 7, and 8 in the Quality Assurance Project Plan (QAPP) Addendum for Picatinny Arsenal (Arcadis 2018¹).

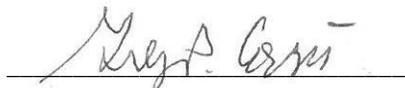


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Plan approved, by company/corporate officer authorized to obligate the company's Corporate Industrial Hygienist. This Site Safety and Health Plan (SSHP) has been prepared under the supervision of and has been reviewed and approved by a Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene. Demonstration of competency is included in Attachment 4 of the Accident Prevention Plan (APP).



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¹ Arcadis. 2018. Uniform Federal Policy-Quality Assurance Project Plan Addendum, United States Army Corps of Engineers Per- and Polyfluoroalkyl Substances Preliminary Assessment/Site Inspection, Picatinny Arsenal, New Jersey. August.

1 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

This SSHP was prepared as an appendix to the APP to address the potential health and safety hazards associated with sampling at Picatinny Arsenal (PTA). Planned activities are identified in **Table 1-1** below.

Table 1-1: Summary of Sites and Activities

Area	Planned Activities
Southern Area Boundary	<ul style="list-style-type: none">• Groundwater Sampling• Surface Water
Pyrotechnic Area and Sanitary Landfill	<ul style="list-style-type: none">• Groundwater Sampling
Area 1177 – Lower Burning Ground	<ul style="list-style-type: none">• Groundwater Sampling
Building 169 – Firehouse 1	<ul style="list-style-type: none">• Groundwater Sampling
Former Building 24	<ul style="list-style-type: none">• Groundwater Sampling
Former WWTP Facility	<ul style="list-style-type: none">• Groundwater Sampling

This SSHP is an appendix to, and must be used in conjunction with, the APP, not as a stand-alone document. Required information contained in the APP will be referenced as needed in the SSHP.

1.1 Site Description

PTA is a government-operated munitions research and development facility located in Morris County, New Jersey, approximately 40 miles west of New York City and four miles northeast of Dover, New Jersey. The arsenal sits in the Highlands of New Jersey (**Figure 1**).

PTA was established in 1880 by the United States (U.S.) War Department as a storage and powder depot. Later it was expanded to assemble powder charges for cannons and to fill projectiles with maximite (a propellant). During World War I (WWI), PTA produced all sizes of projectiles. In the years following WWI, PTA began projectile melt-loading operations and began to manufacture pyrotechnic signals and flares on a production basis. During World War II (WWII), PTA produced artillery ammunition, bombs, high explosives, pyrotechnics, and other ordnance. After WWII, PTA's primary role became the research and engineering of new ordnance; however, during the Korean and Vietnam conflicts, PTA resumed the production and development of explosives, ammunition and mine systems.

In recent years, PTA's mission has shifted to conducting and managing research development, life cycle engineering, and support of other military weapons and weapon systems. The facility has responsibility for the research and development of armament items. The PTA has also entered into an enhanced usage leasing program for certain acreage at the southern part of the arsenal as well as the leasing of buildings to third parties in the 350 area of Picatinny. Congress has agreed with the Department of Defense through the Base Realignment and Closure process that Picatinny not be closed but remain open and

take in more missions. Seven other Department of Defense sites are now being realigned at Picatinny including parts of Adelphi Laboratory Center and laboratories associated with the Naval Surface Warfare Center Division Crane.

Nine areas of potential interest (AOPIs) were identified by the Army during the per- and polyfluoroalkyl substance (PFAS) Preliminary Assessment site visit conducted in May 2018. Those AOPIs include Building 169 – Firehouse 1, Building 3316 – Firehouse 2, Building 3801 – New Jersey Army National Guard (NJARNG) Helipad Area, Area 1177 – Lower Burning Ground, Lawn to the North of Building 3409/3410, Pyrotechnic Area and Sanitary Landfill, Area 1222 – Gorge, Former Building 24, and the Former Wastewater Treatment Plant (WWTP) Facility. The current sampling scope of work will focus on five of these AOPIs where PFAS release is known or suspected, i.e., where fire training activities occurred (Building 169 – Firehouse 1, Area 1177 – Lower Burning Ground, Pyrotechnic Area and Sanitary Landfill), chromium plating activities occurred (Former Building 24) and secondary sources (Former WWTP Facility). **Figure 1** depicts the Installation boundary and location of the five AOPIs. The sampling locations associated with these AOPIs are presented in the PTA QAPP Addendum (Arcadis 2018).

There are currently two firehouses on PTA utilized by the Picatinny Fire Department. Building 169, also referred to as Firehouse 1, was built approximately 10 years ago and is the main location of current fire department operations. Building 3316, also referred to as Firehouse 2, is located further North on the installation and was utilized as the sole location of fire department operations prior to the construction of Firehouse 1, but currently still has some fire-related activity. Fire truck storage, aqueous film-forming foam (AFFF) fueling operations, and nozzle testing occurred at both firehouse locations.

Although there are no formally dedicated fire training areas on post, fire training involving AFFF occurred at the lawn North of Building 3409/3410 (arc testing).

Firefighting activities involving AFFF were confirmed at various locations, including the Pyrotechnic Area and Sanitary Landfill, the lower burning ground (Area 1177), the Gorge (Area 1222) and the NJARNG Helipad Area (Building 3801). The Picatinny Fire Department used AFFF at the Pyrotechnic Area and Sanitary Landfill, lower burning ground and the Gorge to better extinguish fires in the bog/peaty material in these areas. In 1988 or 1989, the Picatinny Fire Department utilized AFFF to respond to a fire in front of Building 3801 at the NJARNG Helipad area caused during a vehicle fueling operation.

Chromium plating activities occurred at Former Building 24. The Former WWTP Facility was identified as a secondary source that may have PFASs in its influent from the floor drains associated with the firehouses.

This sampling will seek to determine the presence or absence of PFAS constituents in groundwater at these AOPIs, as well as PFASs migration offsite in groundwater and surface water.

1.2 Contamination Characterization

Based on historical site uses and previous inspection results available, it is possible to encounter the chemicals listed in **Table 1-2** below during sampling activities. PFASs; including perfluorooctane sulfonate and perfluorooctanoic acid, are also suspected to be hazards at PTA.

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Table 1-2: Site Chemical Information

Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
Southern Area Boundary Wells						
Arsenic	0.01 mg/m ³	0.01 mg/m ³	--	--	--	Inhalation, Ingestion, Contact In animals: irritation skin, possible dermatitis; respiratory distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage
Lead	0.05 mg/m ³	0.05 mg/m ³	--	--	--	Inhalation, Ingestion, Contact Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy ; kidney disease;

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						irritation eyes; hypertension
Vinyl Chloride	1 ppm	1 ppm	2,530	2.12	9.99	Inhalation, Contact Lassitude; abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]
Area 1177-Lower Burning Ground						
Benzo(a)anthracene	--	--	--	--	--	Inhalation, Contact, Ingestion Irritation of skin and eye; gastrointestinal irritation or distress; dermatitis, acne; phototoxic skin reaction and blisters; nose and throat irritation
Benzo(a)pyrene	0.2 mg/m ³	--	--	--	--	Inhalation, Contact Dermatitis, bronchitis, [potential occupational carcinogen]
Benzo(b)fluoranthene	--	--	--	--	--	Inhalation, Contact, Ingestion

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						Respiratory irritation, dizziness, weakness, fatigue, nausea, headache; skin irritation, defatting, dermatitis; eye irritation, tearing, reddening; may cause systemic poisoning
Dibenzo(a,h)anthracene	--	--	--	--	--	Inhalation, Contact, Ingestion Irritation of skin, eyes, digestive tract, and respiratory track; [potential occupational carcinogen]
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	Inhalation, Contact, Ingestion Irritation of skin, eyes, digestive tract, and respiratory track; [potential occupational carcinogen]
Arsenic	0.01 mg/m ³	0.01 mg/m ³	--	--	--	Inhalation, Ingestion, Contact In animals: irritation skin, possible dermatitis; respiratory

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage
Cadmium	TWA 0.005 mg/m ³	0.01 mg/m ³	0	--	--	Inhalation, Ingestion Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Copper	0.1 mg/m ³	0.2 mg/m ³	0	--	--	Inhalation, Ingestion, Contact Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung,

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						liver, kidney damage; anemia
Lead	0.05 mg/m ³	0.05 mg/m ³	--	--	--	Inhalation, Ingestion, Contact Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy ; kidney disease; irritation eyes; hypertension
Arochlor 1260	--	0.001 mg/m ³ (National Institute of Occupational Safety and Health [NIOSH] recommended exposure limit [REL])	0.000075	1.5	--	Inhalation, Absorption, Ingestion, Contact Irritates eyes and skin; dermatitis; aspiration hazard; [potential occupational carcinogen]
Former Building 24						
1,1-Dichloroethene	--	20 mg/m ³	500	3.25	10.00	Inhalation, Absorption, Ingestion, Contact

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]
cis-1,2-Dichloroethene	790 mg/m ³ 200 ppm	200 ppm	180 - 265	3.34	9.66	Inhalation, Ingestion, Contact Irritation eyes, respiratory system; central nervous system depression; [potential occupational carcinogen]
Tetrachloroethene (PCE)	200 ppm	25 ppm	14	5.8	9.32	Inhalation, Absorption, Ingestion, Contact Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						occupational carcinogen]
Trichloroethylene (TCE)	200 ppm	10 ppm	58	4.5	9.45	Inhalation, Absorption, Ingestion, Contact Irritation eyes, skin; headache, visual disturbance, lassitude, dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Vinyl Chloride	1 ppm	1 ppm	2,530	2.12	9.99	Inhalation, Contact Lassitude; abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
Former WWTP Facility						
Arsenic	0.01 mg/m ³	0.01 mg/m ³	--	--	--	Inhalation, Ingestion, Contact In animals: irritation skin, possible dermatitis; respiratory distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage
Barium	0.5 mg/m ³	0.5 mg/m ³	0.000665	--	--	Inhalation, Ingestion, Contact Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia; benign pneumoconiosis (baritosis)
Chromium	0.5 mg/m ³	0.5 mg/m ³	--	--	--	Inhalation, Ingestion, Contact Irritation eyes, skin; lung

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						fibrosis (histologic)
Lead	0.05 mg/ m ³	0.05 mg/ m ³	--	--	--	Inhalation, Ingestion, Contact Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy ; kidney disease; irritation eyes; hypertension
P,P'-DDE	1.0 mg/m ³	1.0 mg/m ³	0.00000649	--	--	Inhalation, Absorption, Ingestion, Contact Nausea, vomiting, diarrhea, stomach pain, and headache
P,P"-DDT	1.0 mg/m ³	1.0 mg/m ³	--	1.6	--	Inhalation, Absorption, Ingestion, Contact Nausea, vomiting, diarrhea, stomach pain, and headache
Arochlor 1260	--	0.001 mg/m ³ (NIOSH REL)	0.000075	1.5	--	Inhalation, Absorption,

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Constituent	OSHA PEL	ACGIH TLV	Vapor Pressure (mmHg)	Vapor Density (Air=1)	Ionization Potential	Routes of Entry / Exposure Symptoms
						Ingestion, Contact Irritates eyes and skin; dermatitis; aspiration hazard; [potential occupational carcinogen]
Suspected Constituents of Concern						
PFAS	U.S. Environmental Protection Agency Lifetime Health Advisory: 70 ppt	--	--	--	--	Associations between exposure and adverse reproductive, developmental, and systemic effects; reasonably anticipated to be carcinogenic. Refer to Attachment 1.

Notes:

ACGIH – American Conference of Governmental Industrial Hygienists

eV – electron volts

mg/m³ – milligrams per meter cubed

mmHg – millimeter of mercury

OSHA – Occupational Safety and Health Administration

PEL – Permissible Exposure Limit

ppm – parts per million

ppt – parts per trillion

TLV – Threshold Limit Value

TWA – Time Weighted Average

Ionizing radiation hazards are not expected to be significant at PTA. Hazards from biological agents or other disease-causing agent hazards are not known to be present.

2 HAZARD AND RISK ANALYSIS

Activity Hazard Analyses (AHAs) list and evaluate the health and safety hazards known to be associated with the planned activities for onsite workers. AHAs list each task or step, describe some of the evident safety hazards associated with that task or step, and then recommend various controls, personal protective equipment (PPE), and operating procedures to control the hazards. An AHA has been developed for each task/operation to be performed; AHAs are included as Attachment 1 in the APP.

The Site Safety and Health Officer (SSHO) will manage the AHAs, and with the help of the field staff, improve upon or add to existing analyses as new potential hazards are identified. If additional tasks are necessary due to scope changes or changes in field conditions, or other circumstances, additional AHAs may be required. The AHAs will be reviewed daily or prior to each phase of work with the field team.

General field activities to be completed at PTA include:

- Site mobilization/preparation and demobilization; and
- Groundwater sampling of existing monitoring wells.
- Surface water sampling.

The field sampling plan for these activities is described in detail in the PTA QAPP Addendum. The sections below further describe hazards likely to be encountered while performing the field sampling.

2.1 Chemical Hazards

As noted in Section 1.2, additional chemicals beyond the constituent of concern (PFAS) may be encountered during sampling activities. **Table 1-2** summarizes the historically known chemical constituents of concern. Field personnel should be alert to this possibility; evidence of free product, stained or colored soil, and odors are indicators for such contamination. The SHM and PM or Task Manager (TM) should be contacted immediately regarding evidence or the suspicion of chemical contamination.

Groundwater and surface water samples will be collected for the analysis of PFAS. Due to the nature of the constituents of concern, local features, and type of site activities planned, risk of chemical exposures to site workers through inhalation, ingestion, or dermal contact is anticipated to be low. Site personnel can reduce their potential exposure to constituents of concern by: practicing contaminant avoidance and following proper decontamination procedures, observing good personal hygiene, implementing engineering controls during soil disturbance (i.e., soil wetting, equipment selection and use), and properly using specified PPE. Appropriate PPE, as discussed in Section 5, will be worn to cover exposed skin, and hygiene practices will be sufficient to preclude ingestion and dermal contact as exposure pathways.

2.2 Physical Hazards

The physical hazards listed below are anticipated at PTA. Plans, programs, and procedures to address each hazard are described in Attachment 1 of the APP; actions to eliminate or minimize each hazard are described in the AHAs. Relevant checklists are also included in the APP.

- Heat/cold stress;
- Noise;
- Slips, trips and falls;
- Ergonomic (lifting, pushing/pulling, pinch points);
- Equipment operation (e.g., lacerations, flying objects);
- Utility strikes;
- Overhead and falling objects;
- Inclement weather; and
- Dust.

2.3 Biological Hazards

Personnel working at PTA should be aware of the possible biological hazards described below, including bloodborne pathogens (BBPs) and the presence of hazardous wildlife, insects, and plants and associated illnesses they may cause. Site workers will receive instruction in recognition/identification and avoidance of hazardous wildlife, insects, and plants and their common habitats. **Attachment 2** includes more detailed descriptions and photos of each biological hazard.

2.3.1 Bloodborne Pathogens

Workers onsite, including those who have been designated as first aid responders, have the potential for occupational exposure to BBPs and will have completed training in exposure control including universal precautions. The BBP and Exposure Control Program is detailed in Section 9.5 of the APP.

2.3.2 Snakes

Several species of snakes may be present at PTA, including two species of venomous snakes. With the exception of some rare species of venomous snakes, snakes will typically not attack unless feeling threatened or provoked. All snakes encountered should be avoided. If a snake is discovered, the SSHO should be immediately informed of the snake's location, size and type, if known. In most cases, only a brief interruption of work will be necessary to allow the snake to vacate the work area on its own. Species of venomous snakes which may be present at PTA, their identifying characteristics, and typical habitats, along with a photo of each species, are included in **Attachment 2**. Snake chaps may be added to the required PPE list in **Section 5.2** if snakes are observed in or near work zones during work.

Site personnel should avoid rocks, timber and leaf piles, and animal burrows (including those vacated by other animals) as snakes typically use these habitats for shelter or hibernating.

Even if the snake identification is known to be non-venomous, any snake bite should be treated immediately. Bites from venomous snakes can be painful and can result in severe illness or death, but most bites can be effectively treated in emergency rooms and rarely result in death. Symptoms of venomous snake bites may include difficulty breathing, numbness/tingling, nausea and vomiting, shock,

skin color changes or swelling, thirst, tiredness or weakness, and blurred vision. In route to an emergency room, or while waiting on site for first responders, first aid for a venomous snake bite can include:

- Keep the person calm
- Wash the bite with soap and water.
- Restrict movement of the affected area and keep it below the heart level to reduce the flow of venom in the blood stream
- Depending on the location of the bite, wrap the limb from the further point down to the bite area
- Remove rings or constricting items from the affected area as the area may swell
- Observe the affected area for swelling and/or color change
- Monitor the victim's vital signs if possible (temperature, pulse, rate of breathing, and blood pressure)
- If shock occurs, lay the victim flat, raise the feet, and cover the person with a blanket

2.3.3 Arachnids and Insects

Hazardous insects which may be encountered at PTA during site activities include venomous spiders, disease-causing ticks and mosquitos, and stinging wasps and bees. **Attachment 2** includes further descriptions and photo identifications of the more hazardous spiders and ticks.

To mitigate potential exposure to arachnid or insect bites/stings, the following safety precautions are required:

- Use insect repellent containing N, N-diethyl-m-toluamide (DEET) on skin
- Tuck pants into socks and secure with duct tape
- Wear long sleeves
- Use buddy system to check for ticks
- Perform self-check when removing clothing after being in tick-infested areas

Spiders

In New Jersey venomous spiders are very rare; however, there is the potential that brown recluse and northern black widow may be present, as described and pictured in **Attachment 2**.

The brown recluse bite is not usually felt and may not be immediately painful, the bite can become painful and blistered within two to eight hours, and pain and other local effects worsen 12 to 36 hours after the bite. The venom of the brown recluse can cause skin damage, including tissue loss and necrosis. Other symptoms may include postulating lesions, rash, joint pains, chills, fever, nausea, and vomiting.

Even less common is the northern black widow spider. While more widely known and more easily identifiable, the black widow spider's presence in New Jersey is limited. The black widow's bite can be deadly to humans and the bite is sharp and painful. Acute pain occurs with the bite with more symptoms following 20 minutes to an hour later, including profuse sweating, rigid abdomen muscles, muscle spasms, difficulty breathing, slurred speech, poor coordination, dilated pupils, and swelling of the face and extremities.

Victims of brown recluse or black widow spider bites should seek immediate medical attention.

Ticks

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite personnel. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including anaplasmosis, babesiosis, ehrlichiosis, Lyme disease, Powassan, and Rocky Mountain spotted fever. Various ticks that may be present at PTA are described and pictured in **Attachment 2**.

Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission. Covering exposed areas of the body and the use of insect repellent containing DEET help prevent tick bites. Permethrin should be applied to clothing and not to skin; permethrin treated clothing is available commercially. Mesh netting worn over legs and torso can be purchased that offer some physical barrier protection. Periodically during the workday, personnel should inspect themselves for the presence of ticks. Notify fellow personnel if you see a tick on yourself or on a team member. Brush the tick off, if it is crawling on you. Often a tick will flatten itself against the skin, so it may have to be scraped off. If a tick is discovered and has attached itself to the skin, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite areas with soap and water. Then apply an antiseptic to the bite area.
- Save the tick in a small container with the date and note the location of the bite on your body and where you think the tick came from.
- Notify the SHM and WorkCare of any tick bites as soon as possible. An accident report should be filed within 24-hours of a tick bite that occurs while working.

All personnel sustaining a tick bite should immediately call Work Care as antibiotic treatment is most effective at this time.

Other Biting or Stinging Insects

Mosquitos, wasps, and bees pose a significant hazard to field staff as their bites/stings may cause allergic reactions as well as transmit diseases. Diseases that are transmitted via mosquitos can be serious, and include, but are not limited to Lyme disease, West Nile Virus, and Zika Virus. Insect repellent is recommended to reduce the potential for mosquito bites.

Being inflicted with multiple bee/wasp stings is likely if a site worker accidentally disturbs a nest. Any known nests around the work area should be flagged off to notify personnel of their presence. Bee/wasp stings may result in slight discomfort to life-threatening symptoms of an allergic reaction (i.e., anaphylactic shock). Site personnel should use extreme caution to avoid encountering stinging insects, particularly those with known bee/wasp allergies. Site workers with known bee/wasp allergies are encouraged to inform the SSHO of this condition prior to participation in site activities and keep required emergency

medication on or near their person at all times. It is also encouraged for such site workers to let the SSHO and co-workers know where the medication is located and how to administer it.

2.3.4 Bears

There are black bears present at Picatinny. If you are hiking through an area, make your presence known, especially where the terrain or vegetation makes it hard to see. If possible, travel with a group.

If you see a bear, avoid it if you can. Give the bear every opportunity to avoid you. If you do encounter a bear at close distance, remain calm. Attacks are rare. Chances are, you are not in danger. Most bears are interested only in protecting food, cubs, or their "personal space." Once the threat is removed, they will move on. Remember the following:

- **Identify Yourself** • Let the bear know you are human. Talk to the bear in a normal voice. Wave your arms. Help the bear recognize you. If a bear cannot tell what you are, it may come closer or stand on its hind legs to get a better look or smell. A standing bear is usually curious, not threatening. You may try to back away slowly diagonally, but if the bear follows, stop and hold your ground.
- **Don't Run** • You can't outrun a bear. They have been clocked at speeds up to 35 mph, and like dogs, they will chase fleeing animals. Bears often make bluff charges, sometimes to within 10 feet of their adversary, without making contact. Continue waving your arms and talking to the bear. If the bear gets too close, raise your voice and be more aggressive. Bang pots and pans. Use noisemakers such as a bear horn. Never imitate bear sounds or make a high-pitched squeal.
- **If Attacked** • If a bear actually makes contact, you have two choices: play dead or fight back. The best choice depends on whether the bear is reacting defensively or is seeking food. Play dead if you are attacked by a bear you have surprised, encountered on a carcass, or any female bear that seems to be protecting cubs. Lie flat on your stomach or curl up in a ball with your hands behind your neck. Typically, a bear will break off its attack once it feels the threat has been eliminated. Remain motionless for as long as possible. If you move, and the bear sees or hears you, it may return and renew its attack. Rarely, lone black bears or grizzlies may perceive a person as potential food. Fight any bear that follows you or breaks into a tent or building.

Defensive aerosol sprays which contain capsicum (red pepper extract) have been used with some success for protection against bears. These sprays may be effective at a range of 6-8 yards. If discharged upwind or in a vehicle, they can disable the user. Take appropriate precautions. If you carry a spray can, keep it handy and know how to use it.

2.3.5 Other Wildlife

Other hazardous wildlife encounters may occur with rats and mice, raccoons, or stray dogs and cats. Do not approach or aggravate wildlife, especially animals which are behaving strangely or foaming at the mouth.

2.3.6 Plants

Poison ivy is a rooted or climbing plant with ternate leaves (arranged in threes) and white berries. Poison oak is usually a shrub though it sometimes becomes a vine several inches in diameter, climbing up high

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into oak trees, attached by air-roots. Poison sumac can grow as a shrub or small tree, but never as a vine. The leaves of these poisonous plants produce irritating oil that causes an intensely itchy skin rash and characteristic bullous lesions. All personnel should inform each other if these plants are observed on a property; these plants are to be avoided. Further description and photographs of poison ivy and poison oak are included in **Attachment 2**.

3 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

Staff organization, qualifications, and responsibilities are provided in Section 4 and Attachment 3 of the APP.

1 4 TRAINING

2 Arcadis will only permit trained employees with current valid certificates of training onto job sites. The
3 SSHO will verify compliance with all training requirements, maintain a copy of training records on-site, and
4 track when employees may need to become recertified in a particular training. Training records will be
5 maintained at field locations for the specific work activities and workers at that location.

6 4.1 General Training

7 General training requirements are addressed in Section 6 of the APP.

8 4.2 Project-Specific Training

9 Site-specific training will be given and documented to verify training prior to the start of any field work per
10 the APP. This training will include, but should not be limited to, general site hazards, PPE usage, and
11 recognition of physical and biological hazards.

12 Safety meetings will be conducted daily by the SSHO for all site personnel, subcontractors, and visiting
13 personnel and documented on the Daily Tailgate Safety Meeting Attendance Record form provided in
14 Attachment 2 of the APP or in the daily quality control field logbook. The information and data obtained
15 from applicable site characterization and analysis will be addressed in the safety meetings and used to
16 update the APP and SSHP, as necessary.

17 4.3 Department of Transportation Hazardous Materials 18 Transportation

19 All samples being shipped by air or ground transport will be evaluated using a Shipping Determination
20 provided in **Attachment 4** to determine if the material or equipment being shipped is hazardous for
21 transport. This Shipping Determination will be retained on file.

22 All materials identified as hazardous (HazMat) will be shipped according to the applicable Department of
23 Transportation (DOT) and International Air Transport Association regulations and requirements as
24 prescribed by Arcadis' DOT Program; however, no shipment of hazardous materials is anticipated.

25 All employees preparing HazMat packages or offering HazMat to a 3rd party carrier (such as FedEx), will
26 have current HazMat training as prescribed by Arcadis' DOT Program.

5 PERSONAL PROTECTIVE EQUIPMENT

5.1 General Protection Levels and Training

As described in the APP, Level D/Modified Level D PPE will be worn by all on-site workers for adequate protection against known or anticipated hazards for all tasks included in the sampling scope of work. The level of protection worn by site personnel will be enforced by the SSHO and may be upgraded or downgraded at the discretion of the SHM or the SSHO, based on real-time site experience. Any recommended changes in the level of protection will be documented, and a revised hazard assessment will be prepared by the SHM and provided to the SSHO for use in the field. The AHAs will be updated and approved by the SSHO to reflect any changes in the level of protection.

In addition to the PPE training received during the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and associated 8-hour HAZWOPER refresher training, the SSHO will ensure that all field personnel have the proper PPE training by reviewing proper PPE use/adjustment, limitations of the PPE, proper care and inspection of PPE, and disposal of PPE during the Daily Tailgate Meeting. If the SSHO determines during the Daily Tailgate Meeting and inspection that an employee needs to be retrained, the SSHO will not allow the employee to perform the work activities until this retraining has occurred.

PPE will be inspected regularly and maintained in serviceable and sanitary condition and before being reissued to another person or returned to storage, will be cleaned, disinfected, inspected, and repaired.

5.2 Required Level of Protection

The minimum level of protection (Level D/Modified Level D) that is required of the Arcadis and subcontractor personnel at PTA includes:

- Protective headgear which meets the requirements of the American National Standards Institute (ANSI) Z89.1, Class A or ANSI Z89.2, Class B.
- High visibility safety/reflective vests;
- Clothing suitable for the weather and work conditions. The minimum will be a long-sleeve shirt and long pants.
- Safety toe boots meeting American Society for Testing and Materials 2413 standards;
- Safety glasses ANSI Z87;
- Persons requiring corrective lenses in eyeglasses will be protected by one of the following:
 - Eyeglasses with protective lenses that provide optical correction.
 - Goggles that can be worn over corrective lenses without disturbing the adjustment of the spectacles; or goggles that incorporate corrective lenses mounted behind the protective lenses.

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- Cut-Resistant Level 2 gloves or leather gloves for work not involving the handling of decontamination equipment (cut-resistant if handling potential sharp items);
- Nitrile gloves (when handling samples or preserved bottle ware; may be worn over cut-resistant gloves), and
- Rubber chest or hip waders when working in swampy or marshy areas, as necessary, or during stream sampling. Lighter weight, water-proof waders may be a source of PFAS.

6 MEDICAL SURVEILLANCE

All on-site Arcadis personnel who may have potential exposure to hazardous materials will have an initial employment, an annual, and a termination medical examination. Medical evaluations will be performed by an approved occupational physician in accordance with Arcadis's Medical Surveillance Program. All Arcadis personnel working at PTA will be enrolled in Arcadis's Medical Surveillance Program.

The SSHO will obtain a copy of documentation verifying participation in a medical surveillance program. Documentation will be maintained at field locations for the specific workers at that location. This documentation will be made available upon the request of the Government Designated Authority. Records will be kept in accordance with OSHA requirements.

The purposes of the medical evaluation are to: 1) determine fitness for duty; and 2) establish baseline data for future reference. Such an evaluation is based upon the individual's occupational and medical history, a comprehensive physical examination, and an evaluation of the ability to work while wearing protective equipment. It is not anticipated that respiratory protection will be required at PTA; however, if field conditions change such that a respirator is necessary, all personnel must undergo an OSHA-type evaluation of the individual's ability to use respiratory protective equipment, including a pulmonary function test.

Supplemental examinations may be performed whenever there is an actual or suspected excessive exposure to chemical constituents of concern or upon experience of exposure symptoms or following injuries or temperature stress.

7 EXPOSURE MONITORING AND AIR SAMPLING

Particulate or chemical hazard exposure above TLVs are not expected at PTA; however, based upon known groundwater contaminants, volatile organic compounds may be present in the breathing zone during groundwater sampling activities. A photo-ionization detector equipped with a 10.2/10.6 eV lamp will be utilized to monitor the air over each monitoring well once the well cap is removed to ensure protection of site workers. Allow well to vent, if possible.

The photo-ionization detector will be calibrated/documentated to isobutylene each day prior to beginning work. All readings will be recorded including non-detects.

Action levels for air monitoring for possible volatile organic compounds in the breathing zone during sampling activities are as follows:

- <1 ppm PID– no action, continue work-PEL for VC = 1.0 ppm for 8 hours TWA
- >1 ppm for five minutes on PID, pull detector tube for VC
- > 1.0 ppm VC on detector tube, stop work, allow to vent, assess possible engineering controls (fan)
- < 1.0 ppm VC detector tube, continue monitoring with PID and follow protocol
- > 5 ppm for > 5 minutes on PID – STOP WORK TLV for 1,1 DCE

If any unusual conditions are encountered (e.g., odors, suspect liquids, excessive noise) during any work activities or if personnel experience any symptoms associated with potential exposure, work will be stopped. Site conditions and the need for additional PPE, site controls, or monitoring programs will be re-evaluated prior to resuming work.

8 HEAT AND COLD STRESS MONITORING

Heat and cold stress monitoring are addressed in Section 9 the APP. Field work is tentatively scheduled for late summer, when heat stress monitoring will be most applicable.

9 STANDARD OPERATING SAFETY PROCEDURES

A range of chemical, physical, and biological hazards exist at PTA that must be understood by all personnel conducting sampling activities. At a minimum, the safe work practices to be followed will include:

- Sampling activities will be performed in accordance with the standard operating procedures included in **Appendix A** of the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP²).
- Required work permits will be obtained prior to the start of sampling activities.
- All personnel have the obligation to correct or report unsafe work conditions and to utilize “Stop Work Authority” when necessary to protect workers or the public. The PM should be notified if any subcontractor personnel are observed not to be able to perform to their capacity, as needed for the subcontracted work.
- The number of personnel and equipment on a property will be minimized, consistent with effective site operations. Personnel will use the buddy system (i.e., within earshot or visual contact with other personnel) on all properties as stated in the APP. At least one person will be required to carry a cellular telephone.
- Any protective equipment and clothing must be worn by personnel as outlined in this SSHP.
- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, the need for decontamination and cross-contamination.
- Eating, drinking, chewing gum, tobacco smoking, or any other practice that increases the probability of hand-to-mouth transfer of contaminated material, or hand-to-equipment transfer of possible PFAS-containing material is prohibited in the work area. These practices should be conducted in field vehicles, trailers or offsite.
- During activities (e.g., well installation, purging, sampling) potentially involving contaminated material, materials will be collected and containerized in DOT-approved 55-gallon drums for characterization and disposal. Containers and drums will be properly labeled and inspected prior to being moved. Operations onsite will be organized to minimize the amount of drum or container movement.
- Work will be conducted during daylight hours only.
- Medicine and alcohol can potentiate the effects of exposure to toxic chemicals. Due to possible contraindications, use of prescribed drugs should be reviewed with the occupational medical physician. Alcoholic beverage and illegal drug intake are forbidden during sampling activities. The Arcadis Drug and Alcohol Policy is included as Attachment 4 of the APP.

² Arcadis. 2018. Draft Final Programmatic Uniform Federal Policy Quality Assurance Project Plan, USAEC PFAS PA/SI, Active Army Installations, Nationwide, USA. June.

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- When it is necessary for an authorized visitor to observe the sampling activities, that person will be issued appropriate PPE, briefed on potential hazards, safety practices, decontamination procedures and site communications, and sign the SSHP indicating that they have been briefed and had an opportunity to read the SSHP.

10 SITE CONTROL MEASURES

A daily log containing the names of personnel, site entry and exit times, and their expected work tasks will be maintained. Controls to preclude cross contamination will be in place, including the following:

- Work Zone delineation, including a support zone, contamination reduction zone, and exclusion zone as determined by the SSHO;
- Properly using specified PPE, including nitrile gloves;
- Practicing contamination avoidance, by avoiding or minimizing contact with constituents of concern;
- Washing tools and equipment that have been in contact with potentially affected media (e.g., groundwater and/or surface water); and
- Observing good personal hygiene, washing hands after work tasks and before/after eating.

11 PERSONAL HYGIENE AND DECONTAMINATION

To the extent practicable, dedicated or disposable field equipment that does not require decontamination will be used during these sampling efforts. The Site sanitation and housekeeping plan is described in Section 9 of the APP. Field crews will be mobile, using restrooms at nearby buildings.

12 EQUIPMENT DECONTAMINATION AND DISPOSAL

All equipment will be decontaminated prior to the start of each work day, in between all sample locations, and at the end of each work day. Decontamination procedures are presented in standard operating procedures included in **Appendix A** of the PQAPP.

All discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on a property. All potentially contaminated materials, (e.g., clothing, gloves, PPE) will be bagged or drummed as necessary and segregated for disposal. All contaminated waste materials will be containerized onsite until characterized for proper disposal. All non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic wastes.

13 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

Emergency equipment will be readily accessible and distinctly marked. Arcadis and subcontractor personnel will be familiar with the location and trained in the use of emergency equipment. Emergency equipment that will be available includes:

Fire Extinguishers

- Arcadis and subcontractors will provide fire extinguishers.
- Fire extinguishers will be inspected, serviced, and maintained in accordance with the manufacturer's instructions. At a minimum, all extinguishers will be checked monthly and recertified annually.
- Immediately after each use, fire extinguishers will be either recharged or replaced.
- Fire extinguishers will be carried in all mechanical equipment or construction vehicles, distinctly marked, and readily accessible.
- Fire extinguishers will be carried in the field vehicles, distinctly marked, and readily accessible. Field staff will have completed applicable fire extinguisher training.

First Aid Kits

- First aid kits will conform to the American Red Cross and requirements of 29 Code of Federal Regulations 1910.151. At a minimum, first aid kits will be equipped with provisions necessary for the anticipated hazards at a property. Examples are: ANSI Z308.1-2015 "Minimum Requirements for Workplace First-aid Kits," and American Red Cross "Anatomy of a First Aid Kit."
- First aid kits will consist of a weatherproof container with individually sealed packages containing each type of item.
- First aid kits will be fully equipped before being sent to a property and will be checked monthly by the SHM or SSHO; expended items will be immediately replaced.
- First aid kits will be carried in the field vehicles, distinctly marked, and readily accessible.

Eye Wash Stations

Portable eyewash bottles will be available with the first aid kit. The water in the unit will be maintained at a temperature between 60 and 100 degrees Fahrenheit. Personal eyewash fluids will be visually inspected daily by the SSHO to verify they remain sanitary with no visible sediments. In an eye emergency, the eye will be immediately flushed with large amounts of sterile water while lifting the lower and upper lids.

Professional medical attention should be sought immediately. Emergency eyewash containers will be distinctly marked and located in areas known to all field personnel.

Other Equipment

Bear horns will also be carried in field vehicles and on field personnel during field work.

14 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

This section supplements the emergency response plans and contingency procedures addressed in Section 9 of the APP.

14.1 Pre-Emergency Planning

The SHM or SSHO will implement this emergency response plan whenever conditions at PTA warrant such action. The SHM or SSHO will be responsible for assuring the evacuation, emergency treatment, and emergency transport of personnel as necessary, and notification of emergency response units and the appropriate staff.

The SHM or SSHO will inform the local fire department about the nature and duration of sampling activities expected on a property and the type of chemicals of concern and possible health or safety effects of emergencies involving these chemicals.

14.2 Personnel Roles, Lines of Authority and Communication

The SHM is the primary authority for directing operations at a property under emergency conditions. All communications both on and off the property will be directed through the SHM, or in the absence of the SHM, the PM, or TM. Section 4 of the APP outlines the roles and responsibilities of safety and managerial personnel for the project.

Telephones and hand signals will be used for communications. Cellular phones will be used during emergency situations. Working order of the cellular phones should be verified before field tasks begin. Site workers will establish hand signals to communicate with each other during sampling field activities when verbal communication is not possible.

14.3 Emergency Recognition and Prevention

As part of the Site Orientation Training, the SHM and PM will address emergency recognition and prevention. Topics will include hazard recognition regarding tasks to be performed, in addition to hazards associated with property constituents of concern. Personnel should also read this SSHP to become familiar with other topics related to emergency recognition and prevention.

14.3.1 Adverse Weather Conditions

The contingency plan for severe weather is described in Section 9 of the APP.

Additionally, special care should be taken when rain is falling at the project site. Because of the nature of constituents of concern being investigated and the prohibition of rain gear (which may contain PFAS) at the project site, field sampling should not be performed when rain fall is persistent at a rate that saturates the ground (i.e., forms puddles).

14.3.2 Fire or Explosion

Vapors at concentrations exceeding the lower explosive limits values are not anticipated in the work zone. However, if a gas odor is observed, vent and evacuate the area, and notify the local fire and police departments and other appropriate emergency response groups.

Other fire hazards may include brush fires from operation of heavy equipment over or near dry vegetation. Prior to operating heavy equipment, the area should be cleared to minimize potential for brush fires. Notify local fire and police departments and other appropriate emergency response groups by calling 911 if an actual fire or explosion has taken place. Allow the responding agencies to be responsible for public safety and notifying the public.

14.4 Emergency Response Plan

A detailed Emergency Response Plan is provided in Section 9 of the APP. Site-specific medical support details are provided below.

14.4.1 Emergency Telephone Numbers

Emergency phone numbers will be made available in the field vehicles (as housed in this SSHP) and saved to cell phones.

14.4.2 Medical Support

14.4.2.1 On-Site First Aid Support

First aid kits as described in Section 13 will be available in each field vehicle, in areas most accessible to employees and in the proximity of those areas where accidents are most likely to occur. The SSHO will be responsible for keeping the first aid kits adequately supplied. First aid kits will be provided at a ratio of one for every 25 employees. The presence of fewer than 25 employees onsite still warrants a first aid kit to be onsite. The SSHO will inspect the first aid equipment at each location on a daily basis as part of the daily health and safety and occupational health inspections. Only those trained in rendering first aid, including cardiopulmonary resuscitation (CPR), will do so.

ANSI –approved eyewash meeting Z 358.1-2014 will be used when field conditions are consistent with its use as it is the preferred method to drench eyes. Portable eyewash bottles may be used in lieu of the former and, on this site, will be available with the first aid kit. The water in the unit will be maintained at a temperature between 60 and 100 degrees Fahrenheit. Personal eyewash fluids will be visually inspected daily by the SSHO to verify they remain sanitary with no visible sediments.

This is a developed area and emergency medical response is available from local responders. However, Arcadis has designated that at least two people (one being the SSHO) onsite to be trained in first aid/CPR as offsite medical may not be able to respond in a prompt manner (within a few minutes). The emergency medical facilities will be notified of the nature of the work to be performed, the injuries/illnesses prevalent during onsite field activities, and the anticipated dates and locations for which the work will be performed.

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This notification will be completed via telephone and notes taken to document the notification will be provided to the PM, Technical Lead, TM, and SHM via e-mail. The emergency services providers will be offered an onsite orientation of the project and the associated hazards. Access procedures to the site will be determined and provided to the emergency responders for efficient access to the site in the event of an emergency.

In addition, a verbal agreement will be established between Arcadis, local emergency responders, and the servicing emergency medical facility that specifies the responsibilities of onsite personnel, emergency response personnel, and the emergency medical facility in the event of an onsite emergency. In the event that a field employee is involved in an accident that requires medical treatment beyond first aid, field personnel will contact 911 using a cellular phone. After contacting 911, the SSHO will contact Work Care at (800) 455-6155 to inform them of the emergency. Additionally, the SSHO will notify the PM, Technical Lead, or TM and SHM.

In case of non-emergency related injury-illness, field personnel will contact Work Care at (800) 455-6155. Work Care will provide instructions to the field personnel and inform them if the injured employee must receive additional medical attention. The PM, Technical Lead, TM, or SHM and SSHO will be notified after calling Work Care.

Emergency responders will be contacted first for transporting an injured employee to an appropriate medical support facility. In rare events, it may be necessary for a member of the project team to drive the employee to the emergency room. If this situation arises, the designated first aid responder(s) will transport the injured party.

The St. Clare's Dover Hospital (Dover, New Jersey) is the local hospital and urgent care provider for PTA; the total drive time from the site is approximately 11 minutes. **Figure 2** provides a map of the recommended route from PTA to St. Clare's Dover Hospital.

Directions to St. Clare's Dover Hospital in Dover from PTA are as follows:

- Head southwest on Parker Road
- Continue onto State NJ-15 South
- Keep left at fork and follow signs for I-80 E/New York
- Merge onto I-80 E
- Take exit 35 toward Mt. Hope/Dover
- Turn right at Mt. Hope Avenue
- Turn right at US-46 W/E McFarlan Street
- Destination (400 W. Blackwell Street) will be on the left

The SSHO will coordinate with the emergency responders to gain an understanding of what needs to be done in the event of an emergency and to ensure emergency medical service information is accurate. Emergency phone numbers are included in **Table 14-1**, below.

Table 14-1: Emergency Contact List

Emergency Contact	Phone
Police/Ambulance/Fire (For Emergencies)	911
New Jersey State Police (For Emergencies)	911
Police (Non-Emergency)	(973) 724-7273
Fire (Non-Emergency)	(973) 724-3097
Local Hospital: St Clare's Dover Hospital 400 W. Blackwell Street, Dover, New Jersey 07801	(973) 989-3000
WorkCare	(888) 449-7787
Poison Control	(800) 222-1222
National Response Center (all spills in reportable quantities)	(800) 424-8802
PM: Rhonda Stone	(610) 563-6122 (M)
Regional Lead: Ankit Gupta	(818) 219-9475 (M)
Task Manager: Lisa Szegedi	(201) 797-7400 (M)
SHM/CIH: Grey Coppi	(732) 661-3851 (O) (908) 917-6948 (M)
SSHO: Chris Goldsmith (Qualifications provided as Attachment 3)	(201) 378-8032 (M)
PTA Environmental Restoration PM: Ted Gabel	(973) 724-6748 (O)

M – mobile; O – office.

14.5 Evacuation Procedures/Safe Distances

Evacuation procedures and anticipated conditions that may require these responses are described below. If property evacuation is required, all Arcadis personnel will be notified by cellular telephone.

- Withdrawal Upwind:** Withdrawing upwind (100 feet or more, if practical) will be required when gas odor is detected (call 911 immediately, when at a safe distance). Personnel conducting sampling activities will observe general wind directions. The CIH, PM, and the U.S. Army Corps of Engineers PM will be notified of conditions and actions taken. When access to the property is restricted and escape is thereby hindered, personnel may be instructed to evacuate the property rather than move upwind, especially if withdrawal upwind moves personnel away from escape routes.
- Property Evacuation:** Property evacuation will be required when a fire or major collapse occurs; or when explosion is imminent or has occurred. After determining that evacuation is warranted, the field team will proceed upwind of the work area and call 911, then notify the SHM or SSHO of Site conditions. The SHM or SSHO and the field team will remain at the designated location given on the 911 call, so they may assist the first responders to the situation. The SHM or SSHO will remain with the 911 responders until told to leave. The field team will proceed to their field vehicles and document their knowledge of the situation.

The evacuation route and an upwind gathering point will be determined by the SHM or SSHO each day and communicated to all personnel prior to beginning work. Any modifications to the evacuation route or gathering point will be discussed at the Daily Tailgate Safety Meetings.

- Surrounding Area Evacuation:** The area surrounding a property will be evacuated when persistent, insuppressible toxic or explosive vapors from borings are released, or air quality monitored at several

points downwind indicates danger to the surrounding area. When the SHM or SSHO determines that conditions warrant evacuation of downwind residences and commercial operations, they will call 911, and then the local agencies will be notified, and assistance requested, if necessary.

14.6 Spill Containment Plan

Reportable spills are not expected; however, potential accidental releases of fuels or hydraulic fluids could occur at the site. The spill containment plan is described in Section 9 of the APP.

14.7 Post-Emergency Response Actions

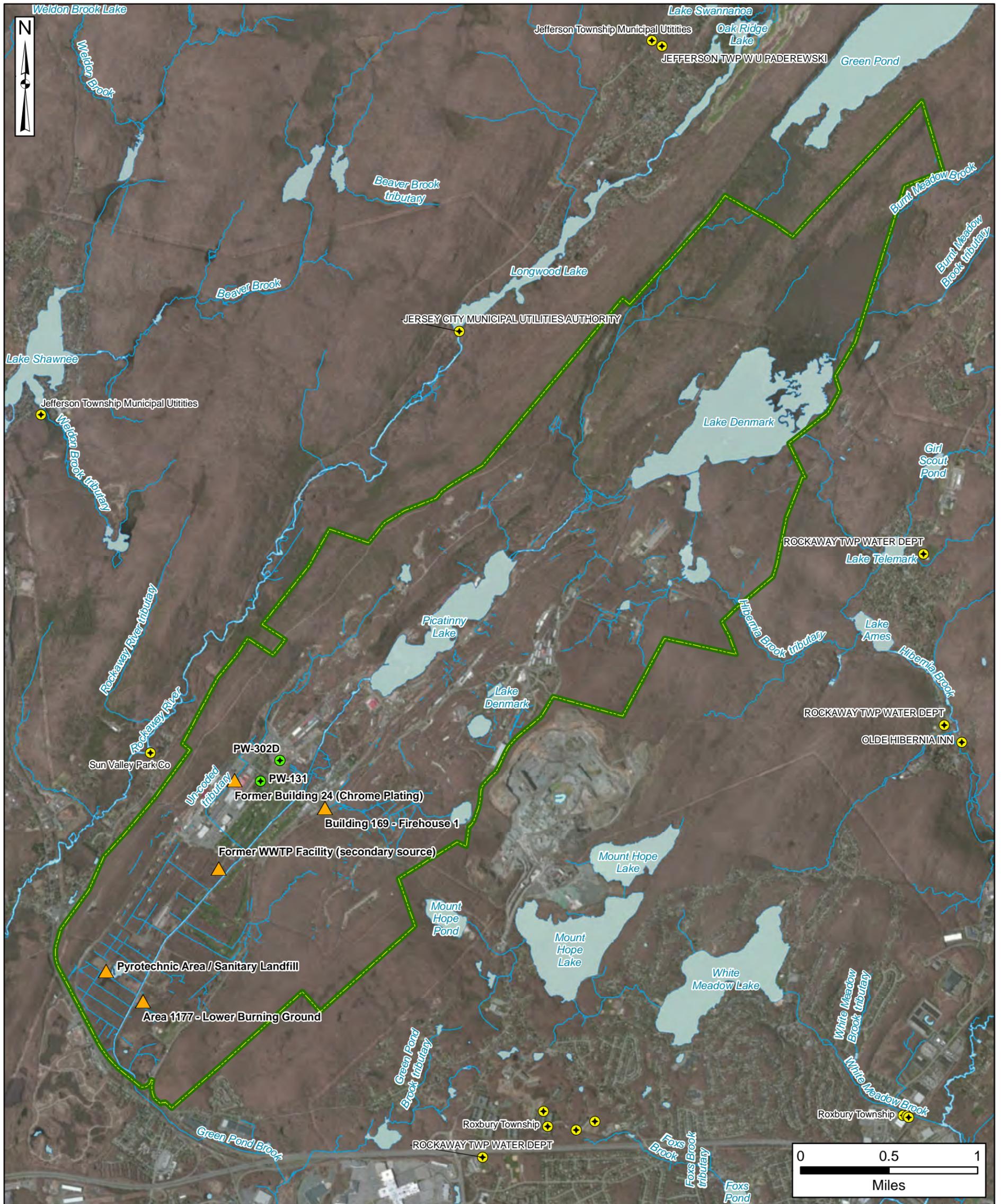
Before sampling activities are resumed, personnel will be fully prepared and equipped to handle another similar emergency. The SSHO will be responsible for re-stocking emergency supplies and replacing or repairing damaged equipment and reviewing or revising the emergency response plan as appropriate.

FIGURES

Site Safety and Health Plan
 USAEC PFAS Preliminary Assessments
 Picatinny Arsenal, NJ

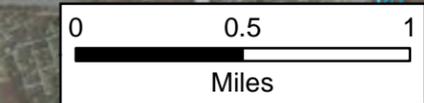


Figure 1
 Picatinny Arsenal Installation Layout

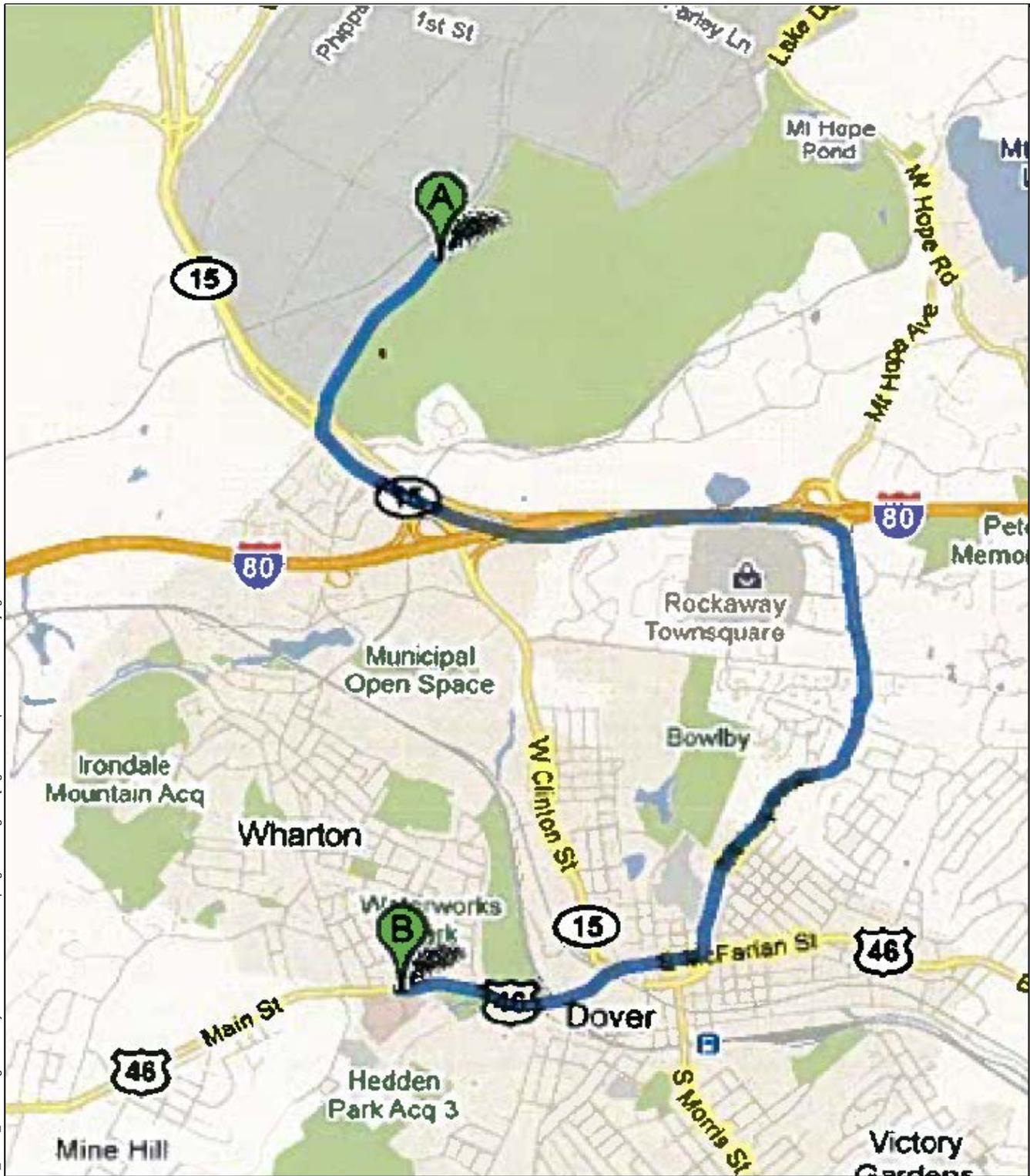


- Installation Boundary
- AOPI Location
- Drinking Water Well (On-Installation)
- Water Supply Well (Off-Installation)

- River/Stream
- Water Body



Coordinate System:
 WGS 1984, UTM Zone 18 North



Notes:

1. Image obtained from Google Maps.
2. Telephone number for St. Clare's Dover Hospital: (973) 989-3000

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 PICATINNY ARSENAL
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**ROUTE TO ST CLARE'S DOVER HOSPITAL -
 DOVER, NJ**



FIGURE
2

ATTACHMENT 1
PFAS Fact Sheet

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

Frequently Asked Questions

What are PFAS?

Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a large group of man-made chemicals that have been used in industry and consumer products worldwide since the 1950s.

- PFAS do not occur naturally, but are widespread in the environment.
- PFAS are found in people, wildlife and fish all over the world.
- Some PFAS can stay in people's bodies a long time.
- Some PFAS do not break down easily in the environment.



How can I be exposed to PFAS?

PFAS contamination may be in drinking water, food, indoor dust, some consumer products, and workplaces. Most non worker exposures occur through drinking contaminated water or eating food that contains PFAS.

Although some types of PFAS are no longer used, some products may still contain PFAS:

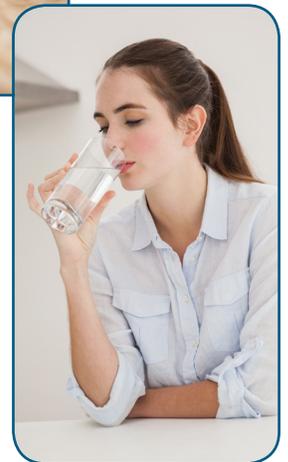
- Food packaging materials
- Nonstick cookware
- Stain resistant carpet treatments
- Water resistant clothing
- Cleaning products
- Paints, varnishes and sealants
- Firefighting foam
- Some cosmetics



How can I reduce my exposure to PFAS?

PFAS are present at low levels in some food products and in the environment (air, water, soil etc.), so you probably cannot prevent PFAS exposure altogether. However, if you live near known sources of PFAS contamination, you can take steps to reduce your risk of exposure.

- If your drinking water contains PFAS above the EPA Lifetime Health Advisory, consider using an alternative or treated water source for any activity in which you might swallow water:
 - » drinking
 - » food preparation
 - » cooking
 - » brushing teeth, and
 - » preparing infant formula
- Check for fish advisories for water bodies where you fish.
 - » Follow fish advisories that tell people to stop or limit eating fish from waters contaminated with PFAS or other compounds.
 - » Research has shown the benefits of eating fish, so continue to eat fish from safe sources as part of your healthy diet.
- Read consumer product labels and avoid using those with PFAS.



How can PFAS affect people's health?

Some scientific studies suggest that certain PFAS may affect different systems in the body. NCEH/ATSDR is working with various partners to better understand how exposure to PFAS might affect people's health—especially how exposure to PFAS in water and food may be harmful. Although more research is needed, some studies in people have shown that certain PFAS may:

- affect growth, learning, and behavior of infants and older children
- lower a woman's chance of getting pregnant
- interfere with the body's natural hormones
- increase cholesterol levels
- affect the immune system and
- increase the risk of cancer

At this time, scientists are still learning about the health effects of exposures to mixtures of PFAS.

How can I learn more?

You can visit the following websites for more information:

- **CDC/ATSDR:**
 - » CDC Info: <https://www.cdc.gov/cdc-info/>, or **(800) 232-4636**.
 - » www.atsdr.cdc.gov/pfc/index.html
 - » <https://www.cdc.gov/exposurereport/index.html>
- **Environmental Protection Agency (EPA):**
<https://www.epa.gov/chemical-research/research-and-polyfluoroalkyl-substances-pfas>
- **Food and Drug Administration:**
<https://www.fda.gov/food/newevents/constituentupdates/ucm479465.htm>
- **National Toxicology Program:**
<https://ntp.niehs.nih.gov/pubhealth/hat/noms/pfoa/index.html>

If you have questions about the products you use in your home, please contact the **Consumer Product Safety Commission (CPSC)** at **(800) 638-2772**.

List of Common PFAS and Their Abbreviations:

Abbreviation	Chemical name
PFOS	Perfluorooctane sulfonic acid
PFOA (or C8)	Perfluorooctanoic acid
PFNA	Perfluorononanoic acid
PFDA	Perfluorodecanoic acid
PFOSA (or FOSA)	Perfluorooctane sulfonamide
MeFOSAA (aka Me-PFOSA-AcOH)	2-(N-Methyl-perfluorooctane sulfonamido) acetic acid
Et-FOSAA (aka Et-PFOSA-AcOH)	2-(N-Ethyl-perfluorooctane sulfonamido) acetic acid
PFHxS	Perfluorohexane sulfonic acid

ATTACHMENT 2
Biological Hazards Descriptions and Photos

Attachment 2
Biological Hazards Descriptions and Photos
Site Safety and Health Plan
Picatinny Arsenal, Morris County, New Jersey

Timber Rattlesnake
(Crotalus horridus)



Timber rattlesnakes are generally tan or yellowish-tan, with markings along the back that are dark brown and change from blotches on the neck to bands near the tail. Often, a dark line extends from the eye along the angle of the jaw, and there is a rust-colored stripe down the back. It has a large rattle at the end of its tail. Timber rattlesnakes have a hole between the nostril and the eye, and cat-like, vertical pupils. Mature timber rattlesnakes reach 36-60 inches in length.

This rattlesnake lives on rocky, wooded hillsides and mature forests in southwestern and western Wisconsin. Timber rattlesnakes are usually active from April into early October. They bask on sunny rocks in spring and autumn. In summer they are mostly nocturnal.

Northern copperhead
(Agkistrodon contortrix mokasen)



Like most members of the pit viper family, the Copperhead is a heavy-bodied snake. When alarmed, it may violently vibrate its tail. When the vibrating tail strikes vegetation, it may sound like a rattle, but this species does not have a rattle on its tail. The copperhead is two shades of copper or reddish-brown. Its head is a solid copper color. The darker shade forms an hourglass shape over the lighter background, with the wider portion of the hourglass on the side of the snake while the narrow portion is on the snake's back. The snake's coloration is excellent camouflage when it lies in leaf litter. Young copperheads, known as

Attachment 2
Biological Hazards Descriptions and Photos
Site Safety and Health Plan
Picatinny Arsenal, Morris County, New Jersey

“neonates” are paler in color than the adults. Neonates also have a yellow-tipped tail that acts as a lure for prey. Mature northern copperheads reach 25-53 inches in length.

Copperheads may inhabit rocky wooded hillsides, rocky fields, berry thickets, wooded wetlands, farmlands, and even old mulch piles.

Brown Recluse Spider
(Loxosceles reclusa)



Brown recluse spiders range in color from yellowish tan to dark brown and become darker as they age. They are most commonly identified by a violin-shaped marking on the part of their body attached to their legs. They have three pairs of eyes arranged in a U-shape. These spiders usually range in body length of between 0.25-0.75 inches but may grow larger.

Brown recluse spiders are very rare in Wisconsin.

Northern Black Widow Spider
(Latrodectus variolus)



The black widow is so named because the female of the species has a distinctive black body with a red hourglass shape on the bottom of her abdomen. The hourglass of the northern black widow is often

Attachment 2
Biological Hazards Descriptions and Photos
Site Safety and Health Plan
Picatinny Arsenal, Morris County, New Jersey

incomplete. Mature females have approximately 0.50-inch bodies with 1.5 to 2.0-inch leg spans; mature males are approximately one third this size. Only the females are considered dangerous.

Black widows' presence in Wisconsin is very limited as Wisconsin is the northern portion of the spider's range. These spiders are active mostly at night, and can be found in out buildings, sheds, car ports or other structures.

Deer Tick
(Ixodes scapularis)



Deer ticks or black-legged ticks are present throughout forested areas and can transmit Lyme disease. Females reach about 0.25 inches in length and are black and brick red in color, while males are much smaller and completely black.

Dog Tick or Wood Tick
(Dermacentor)



American dog ticks (*Dermacentor variabilis*, pictured left) are widely distributed east of the Rocky Mountains and also occur in limited areas on the Pacific Coast. Dogs and medium-sized mammals are the preferred hosts of adult dog ticks, although they feeds readily on other large mammals, including humans. Rocky Mountain wood ticks (*Dermacentor andersoni*, pictured right) are found in the Rocky Mountain states and in southwestern Canada. Adult ticks feed primarily on large mammals; larvae and nymphs feed on small rodents.

Attachment 2
Biological Hazards Descriptions and Photos
Site Safety and Health Plan
Picatinny Arsenal, Morris County, New Jersey

Lone Star Tick
(*Amblyomma americanum*)



Lone star ticks are larger and chestnut brown in color. These ticks are most common in wooded areas, particularly in forests with thick underbrush.

Poison Ivy
(*Toxicodendron radicans*)



Poison Ivy is present throughout the forested areas and may occur as a climbing vine or a rooted, singular plant. It can be identified by three shiny leaves that grow outward from a thick woody vine or thin pale stem. Urushiol, an oil that causes rash on human skin, is present on the entire plant. Proper identification and avoidance are the best options when conducting field work.

Attachment 2
Biological Hazards Descriptions and Photos
Site Safety and Health Plan
Picatinny Arsenal, Morris County, New Jersey

Poison Oak
(*Toxicodendron diversilobum*)



Poison-oak is usually a shrub, though it sometimes becomes a vine several inches in diameter that grows high into the oak trees attached by air-roots. The leaves do come in threes. They are shiny, without prickles, and the middle leaf has a distinct stalk. It is harder to identify Poison Oak in the winter, when it loses its leaves and looks like erect bare sticks coming from the ground. Poison Oak is highly variable. It varies from shrub to vine. The leaves vary from red to green. It has erect stems, leaves in threes, small greenish flowers, and smooth seeds that are about 1/4 inch across. It is deciduous, and often loses its leaves in late summer, leaving it hard to recognize.

Poison Sumac
(*Toxicodendron vernix*)



Poison sumac can grow as a shrub or small tree, but never as a vine. It ranges in height from 5 to 25 feet. The berries are greenish-white, similar to poison ivy berries. The leaves are green in the summer and turn orange/red in the fall. Leaves are smooth edged and the stems are red.

ATTACHMENT 3
Site Safety and Health Officer Certifications

SSHO
Christopher Goldsmith



Education

BA 2005 (Geology)

Registration/Certifications

New York State professional Geologist (PG), TWIC Certification, E-Rail Certification, CSX Training certification

Training

40-hr HAZWOPER; 8-hr HAZWOPER Refresher; 10-hr OSHA Construction; 30-hr OSHA Construction; 8—hr OSHA Supervisor training; DOT Hazardous Material shipping training; First Aid/Blood Borne Pathogens/ Adult CPR, DOT HAZMAT Transportation Certification, Fire Extinguisher

Mr. Goldsmith has more than 13 years of experience providing consulting services for various environmental projects focused on groundwater investigations, site characterization, and remediation. Mr. Goldsmith has served as the SSHO for many Private, State and Federal projects for groundwater task/field team leader and for various excavation activities which enabled him to oversee the overall safety for activities related to construction management oversight, and environmental investigations. Mr. Goldsmith has the appropriate certifications and training (40-hr HAZWOPER and OSHA 30-hour Construction trained) and has experience with industry safety and implementing safety and occupational health procedures at cleanup operations, and is competent to be the SSHO for this project. Mr. Goldsmith is trained and experienced in exposure monitoring and selecting and adjusting levels of PPE.

Relevant Experience

January 2015 – Present: IBM/Global Foundries: MLC Project and DCAP Project / East Fishkill, NY.

Mr. Goldsmith was SSHO for contractor oversight of demolition/decommissioning facility activities that included decontamination of solid waste management unit (SWMU) piping and tanks, industrial chemical tooling, transfer piping and tanks. During these activities he conducted inspection and documentation of removed decontaminated environmental apparatus (tooling, piping, tanks) as neutral and debris free conditions to go out for disposal/recycle. Oversaw that the contractor was using proper PPE for task being completed according JSAs, that included chemical gloves, chemical suits, safety glasses and face shield. When concentrated levels of chemicals were detected during monitoring, the contractor was advised to stop work and upgrade PPE to full face respirator. Also, implemented exclusion zones, so unauthorized personnel did not enter work area. He was involved with preparing health and safety documents and planning/coordinating contractor activities. Also, enforcement of ARCADIS health and safety policies and standards. Specific responsibilities included:

- Implement the Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures

- Specific health and safety concerns addressed by Mr. Goldsmith included mitigating potential property damage and personal injury associated with being struck by falling objects or objects under force (projectiles) during demolition activities, exposure of site workers to elevated noise conditions, exposure of site workers to residual chemical contamination, and hazards associated with working in proximity to construction equipment and vehicles.
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 40% of time for 42 months = 1.4 years

October 2010 – March 2017: SSHO, Kansas City District, USACE: CDE: OU3 Groundwater Dover

Municipal Well No. 4 Superfund Site / Dover, NJ. Mr. Goldsmith served as SSHO oversight of drillers decommissioning monitoring wells within the monitoring well network. Assured that drillers were wearing proper PPE during well abandonment activities such as jackhammering (hearing protection, face shield, safety glasses, proper gloves) to remove well pads and grouting wells with pressurized tremie pipe and hoses (face shield, safety glasses, proper gloves). Also, enforcement of ARCADIS/Malcolm Pirnie health and safety policies and standards. Specific responsibilities included:

- Implement the APP and Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 10% of time for 60 months = 0.5 years

November 2013 – March 2014, March 2018 – November 2018: SSHO, New York and Baltimore District, USACE / Joint Base McGuire Dix Lakehurst, NJ.

Mr. Goldsmith was Site Health and Safety officer for monitoring well abandonment. Assured that drillers were wearing proper PPE during well abandonment activities such as jackhammering (hearing protection, face shield, safety glasses, proper gloves) to remove well pads and grouting wells with pressurized tremie pipe and hoses (face shield, safety glasses, proper gloves). Also, served as SSHO for excavation and demolition of out of service oil water separators. During excavating, mitigated hazards associated with trenching by assuring proper sloping was done for safe access to grout pipe that was abandoned in place. An exclusion zone was implemented to prevent unauthorized personnel from approaching open excavation or swing radius of

backhoe. Also, enforcement of ARCADIS health and safety policies and standards. Specific responsibilities included:

- Implement the APP and Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 15% of time for 13 months = 0.2 years

March 2012-September 2014: Field Team Lead/SSHO, Picatinny Arsenal GRiP Program,

Rockaway, N.J. (GP06PICA) Mr. Goldsmith served SSHO for oversight of test pit excavation. As SSHO Mr. Goldsmith mitigated potential injuries associated with trenching by assuring proper sloping was done for safe access for sampling and setting up exclusion zones. Also, served as SSHO for oversight of drillers decommissioning large network of monitoring wells that have been taken out of site sampling plan. Monitored that drillers were wearing proper PPE during well abandonment activities such jackhammering (hearing protection, face shield, safety glasses, proper gloves) to remove well pads and grouting wells with pressurized tremie pipe and hoses (face shield, safety glasses, proper gloves). Also, enforcement of ARCADIS health and safety policies and standards. Specific responsibilities included:

- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 20% of time for 24 months = 0.40 years

November 2012 – May 2013: SSHO, Con Edison/Orange and Rockland Utilities: Former MGP Site/ Port

Jervis, NY. Mr. Goldsmith Served as the SSHO for a large excavation at former MGP site. As SSHO, assisted in construction oversight of excavation activities to make sure contractor was following Arcadis design specifications. Potential hazards included personal injury and property damage associated with construction equipment and machinery. Hazards were mitigated by clearly marking and strictly enforcing access to the exclusion zone and use of spotters. Also, enforcement of ARCADIS health and safety policies and standards (duration 100% of time for 6 months = 0.5 year).

Duration 100% of time for 6 months = 0.50 years

January 2007 – June 2010: GTE-Verizon: GTE OSI-Hicksville / Hicksville NY (04563001.0000). Served as the SSHO for oversight of drillers decommissioning large network of monitoring wells that have been taken out of site sampling plan. Mitigated task-specific hazards (noise exposure, energy release due to pressurized equipment) by implementing engineering and administrative controls (maintain distance from potential hazards, deploy barriers to block flying debris/projectiles), and Monitoring that contractors were wearing proper PPE during well abandonment activities such jackhammering (hearing protection, face shield, safety glasses, proper gloves) to remove well pads and grouting wells with pressurized tremie pipe and hoses (face shield, safety glasses, proper gloves). Also, enforcement of ARCADIS/Malcolm Pirnie health and safety policies and standards. Specific responsibilities included:

- Implement the APP and Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 45% of time for 41 months = 1.5 years

October 2006-June 2011: SSHO, Rentokil Initial Environmental Services, Inc.: Consolidated Laundry / Newark NJ. Served as SSHO for excavation of former UST to remediate released product. As SSHO mitigated potential hazards associated with deep excavation (25 feet) through use of shoring, and potential personal injuries associated with demolition and removal of former building foundation through implementation of administrative and engineering controls (strict enforcement of exclusion zone - maintain distance), and proper use of PPE. Specific responsibilities included:

- Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 40% of time for 36 months = 1.2 years

June 2011-Present: SSHO, GTE-Verizon: GTE OSI-Florham Park / Florham Park, NJ. Mr. Goldsmith acted as SSHO for monitoring well network decommissioning. Monitored that drillers were wearing proper PPE during well abandonment activities such jackhammering (hearing protection, face shield, safety glasses, proper gloves) to remove well pads and grouting wells with pressurized tremie pipe and

hoses (face shield, safety glasses, proper gloves). Also, enforcement of ARCADIS/Malcolm Pirnie health and safety policies and standards. Specific responsibilities included:

- Implement the Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 10% of time for 26 months = 0.2 years

July 2012 – October 2014: SSHO, Baltimore District, USACE: Picatinny Arsenal: Area C Groundwater Long Term Monitoring / Picatinny NJ. Mr. Goldsmith served as SSHO oversight of monitoring well abandonment. Mitigated potential personal injury risks associated with pressurized equipment, power tools (jackhammer) by maintaining exclusion zone, deployment of physical barriers and proper use of PPE while removing well pads and grouting wells with pressurized tremie pipe and hoses (face shield, safety glasses, proper gloves). Also, enforcement of ARCADIS/Malcolm Pirnie health and safety policies and standards. Specific responsibilities included:

- Implement the APP and Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures
- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 5% of time for 27 months = 0.1 years

July 2010-July 2012: SSHO, Jersey City, Jersey City Municipal Service Center – Linden Ave Redevelopment / Jersey City, NJ. Mr. Goldsmith was SSHO for oversight of test pit excavation to determine extent of on-site contamination. Also, involved in test pit/excavation oversight of Cr⁶ delineation and removal. As SSHO made sure proper sloping was done for safe access for sampling and setting up exclusion zones. Also, enforcement of ARCADIS/Malcolm Pirnie health and safety policies and standards. Specific responsibilities included:

- Implement the APP and Site Safety and Health Plan
- Prepare and present daily health and safety briefings that include chemical, physical, and/or biological hazards, H&S deficiencies and corrective measures

SSHO

Christopher Goldsmith



- Direct the use of PPE for personnel
- Perform initial and daily site H&S inspections
- Investigate and report accidents

Duration 30% of time for 24 months = 0.60 years

Total demonstrated SSHO experience duration is 6.6 years

Compliance Solutions Occupational Trainers, Inc.

Certificate of Completion

Student Name: Christopher Goldsmith

Company: Malcolm Pirnie, Inc.

Certify that the above named student has completed the

40 Hour HAZWOPER

29 CFR 1910.120(e)

Date of Issue: 9/2/2005

By:  President

200534578

Compliance Solutions

"Today's Training... Tomorrow's Solution"

Student Affiliation:

Malcolm Pirnie, Inc.

3601

10515 E 40th Ave, Suite 116, Denver Colorado 80239 800-711-2706

Certificate of Completion

This is to certify that

Christopher Goldsmith

has successfully completed the classroom requirements for

40 Hour HAZWOPER

29 CFR 1910.120(e)

Presented

Friday, September 02, 2005

Compliance Solutions Occupational Trainers, Inc.

Certificate Number: 71686



Neval Gupta
Vice President



Jeffrey Kline
President/CEO

Arcadis Online Institute

Certificate of Completion

Christopher Goldsmith

has met the online course completion requirements for
HAZWOPER Annual Refresher (ARCADIS)

in accordance with 29 CFR 1910.120 and 1926.65

Certificate ID 1494156-11293
Continuing Education Units 0.8
AdvanceOnline Solutions, Inc. is
authorized by IACET to offer 0.8
CEUs for this program.

*AdvanceOnline Solutions, Inc. is accredited by the International
Association for Continuing Education and Training (IACET) and is
authorized to issue the IACET CEU.*

Date 2/5/2018 11:19:00 AM
Time Online 09:12:49
AdvanceOnline Solutions, Inc.
2400 Augusta Drive, Suite 465
Houston, Texas 77057
www.advanceonline.com
Phone: (713) 621-1100



AdvanceOnline Solutions Online Institute

Certificate of Completion**Christopher Goldsmith**

has met the online course completion requirements for

OSHA 30-Hour Construction Safety (2012)

This student has completed the formal instruction for AdvanceOnline Solution's OSHA-authorized 30-Hour Construction Safety Outreach Program, earning a DOL-OSHA completion card. Topics covered in this program include Introduction to OSHA, Managing Safety and Health, Struck and Caught Hazards, Personal Protective Equipment, Hearing Conservation, Respiratory Protection, Lead and Crystalline Silica, Asbestos, Hazard Communication, Electrical Safety, Hand and Power Tools, Fall Protection, Ladder Safety, Excavations, Scaffolds, Crane Safety, Heavy Equipment, Forklift Safety, Materials Handling, Permit-Required Confined Spaces, Fire Safety, Welding and Cutting, Concrete and Masonry, Steel Erection, and Ergonomics.

Certificate ID: 3353_734776**Instructor:** Rick Gleason**Continuing Education Units:** 3.0**Date:** 5/21/2013 7:36:00 PM**Time Online:** 34:57:43

AdvanceOnline Solutions Inc. has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102; (703) 506-3275.

AdvanceOnline Solutions, Inc.
2400 Augusta Drive, Suite 465
Houston, Texas 77057
www.advanceonline.com
Phone: (713) 621-1100



Certificate of Training

Christopher Goldsmith

Has successfully completed
training in Blood Borne Pathogens
in accordance with OSHA standard 1910.1030

Course Completion Date: April 20, 2018

Brittany Westerkamp
Instructor Name

CINTAS.



JKO

JOINT KNOWLEDGE ONLINE



Christopher Goldsmith
has successfully completed
Level I Antiterrorism Awareness Training
08/13/2018

A handwritten signature in black ink, reading "H.W. Thorp, Jr.", written over a horizontal line.

H.W. Thorp, Jr., GS-15
Chief, Joint Knowledge Online Division
Deputy Director Joint Training
Joint Staff, J7

This is an official course completion certificate from a JKO Standalone course.
Standalone course completions are not tracked or recorded with Joint Knowledge Online.



Certificate of Completion

Christopher Goldsmith

Has been trained and tested on the

Arcadis Complete DOT/IATA Hazardous Materials Shipping and Transportation Training (HazMat #1)

- | | |
|--|---|
| <input checked="" type="checkbox"/> DOT/IATA Regulatory Overview | <input checked="" type="checkbox"/> Labeling |
| <input checked="" type="checkbox"/> Arcadis Policies/Procedures | <input checked="" type="checkbox"/> Shipping Papers |
| <input checked="" type="checkbox"/> Classification | <input checked="" type="checkbox"/> Recordkeeping |
| <input checked="" type="checkbox"/> Identification | <input checked="" type="checkbox"/> Placarding/ID Numbers |
| <input checked="" type="checkbox"/> Packaging Selection | <input checked="" type="checkbox"/> Health and Safety |
| <input checked="" type="checkbox"/> Package Preparation | <input checked="" type="checkbox"/> Emergency Response |
| <input checked="" type="checkbox"/> Marking | <input checked="" type="checkbox"/> HazMat Security |

As required by 49 CFR 172.704(a)(1) through (5) and IATA section 1.5

8 PDH/ .8 CEU

12 Dec 2016

Sam Moyers, CDGP
Arcadis Director of Transportation Safety
630 Plaza Drive, Suite 100
Highlands Ranch, Colorado 80129



HEARTSAVER FIRST AID CPR AED

Heartsaver®
First Aid CPR AED



American
Heart
Association

Christopher Goldsmith

The above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver First Aid CPR AED Program. Optional completed modules are those **NOT** marked out:

Child CPR AED
4.20.2018
Issue Date

infant CPR ~~Exam~~
4.2020
Recommended Renewal Date

HEARTSAVER FIRST AID CPR AED

Training Center Name Cintas First Aid OH20246#

TC Info 6800 Cintas Blvd.

Course Location Mason, Ohio 45040

Instructor Name Brittany Westerkamp ID# 10150372260

Holder's Signature Christopher Goldsmith



**Medical Examiner's
Certificate**

I certify that I have examined

Christopher Goldsmith

In recognition of having received:

- Medical Clearance Respirator Clearance
In compliance with 29CFR 1910.120 and 1910.134

A completed examination for this person is on file at my office. For further information please contact me at (800) 455-6155.

9/22/17
Exam Date

[Signature]
Physician's Signature

Medical Restrictions

This medical certificate is valid for 1 year(s) from the date of examination as shown on the other side of this certificate.

Medical Restrictions:

None

(800) 455-6155
www.workcare.com

CENTER FOR DEVELOPMENT OF SECURITY EXCELLENCE

Certificate of Training

Security Awareness Hub

Christopher Goldsmith

has successfully completed

OPSEC Awareness for Military
Members, DoD Employees and
Contractors



Awarded on: 08/13/2018

A handwritten signature in black ink, appearing to read "Kevin J. Jones".

KEVIN J. JONES
Director of Center for Development
of Security Excellence



Compliance Solutions
"Today's Training... Tomorrow's Solution"

3980 Quebec St., 2nd Floor, Denver CO 80207-1633 800-711-2706

Student Affiliation:

ARCADIS-US

99002120

Certificate of Completion

This is to certify that

Christopher Goldsmith

has been tested and successfully meets the training requirements for

OSHA Site Supervisor
as per 29 CFR 1910.120

Presented

Monday, February 08, 2016

Compliance Solutions Occupational Trainers, Inc.

Neval Gupta
Vice President

Jeffrey E. Kline
President/CEO

Certificate Number: 754915418

Christopher Goldsmith

Has completed: UXO General Awareness (Online)

on 25 Apr 2018

Patricia A. Vollertsen

Patricia A Vollertsen
Director, H&S Administration

ATTACHMENT 4
Shipping Determination



SHIPPING/TRANSPORTATION DETERMINATION FORM
 Non-Regulated Shipping Determination

Revision 10

Date:	8/29/2018
Project Name:	USAEC PFAS PA- Picatinny Arsenal, Rockaway, NJ
Project Number:	2118216.1000

1) Check the following to certify the sample media being transported/shipped meet non-regulated or not restricted status:

- Samples will not be collected on this project

OR

- The following samples have been reviewed and do not meet criteria of a regulated shipment under DOT or IATA:

Check applicable media that will be sampled on the project:

- | | | |
|--|---|--|
| <input type="checkbox"/> Soil | <input checked="" type="checkbox"/> Groundwater | <input type="checkbox"/> Air samples |
| <input type="checkbox"/> Sediment | <input checked="" type="checkbox"/> Surface water | <input type="checkbox"/> Tissue, body part, or body fluid (1) |
| <input type="checkbox"/> Sludge | <input type="checkbox"/> Process water | <input type="checkbox"/> Plant tissue, part or fluid |
| <input type="checkbox"/> Bldg. materials | <input type="checkbox"/> Waste water | <input type="checkbox"/> Mold |
| <input type="checkbox"/> Articles | <input type="checkbox"/> Potable water | <input type="checkbox"/> Investigation derived waste (all media types) |
| | <input type="checkbox"/> Product | <input type="checkbox"/> Other: _____ |

- The following location(s) and media are not covered by above, are considered HazMat for shipping/transportation, and are subject to an additional shipping determination:

1a

2) For sample preservatives, the following checkboxes must be checked confirming a non-regulated/not restricted determination:

- Sample containers will be filled and preserved in accordance with EPA SW-846 protocols (2)
- Sample containers will not be field preserved with acids or bases by Arcadis staff
- Empty but preserved sample containers will not be return shipped to the laboratory or office
- EPA Method 5035 (TerraCore) samples will not be collected (3)

Supplemental information used to confirm section 1 and 2 conclusions:

3) Certify the following by checking the applicable categories that will be shipped or transported on this project (at least one category must be checked):

- Equipment and supplies will not be transported or shipped on this project.

OR

- Rental equipment being transported/shipped will not contain materials subject to DOT/IATA regulation (4)
- Field test kits, fire extinguishers and first aid kits will not be shipped
- Remediation chemicals transported in quantities >440 pounds gross weight per vehicle are not DOT regulated
- Other equipment and supplies used on this project are:
 - Not regulated for transport; and/or
 - Eligible for materials of trade exception

- The following equipment/supplies are not covered by above, are considered HazMat for

shipping/transportation, and are subject to an additional shipping determination:

3a

Supplemental information used to confirm this conclusion:

Completion of the "Determination" worksheet is not required. Issue this worksheet to field staff.

3) Certification:

I certify that I am current in HazMat #1 or approved equivalent and the above determination is true and correct to the best of my knowledge.

Name :

Signature:

Reviewed By:

May be signed by any currently trained HazMat #1 employee

Notes:

- 1) This category applies to mammals, reptiles, birds, fish, insects, arachnids and all other vertebrate and invertebrate organisms.
- 2) This category is limited to containers preserved with ≤ 4 ml of preservatives and excludes containers used to preserve human or animal tissue described in footnote 1.
- 3) Unhide and review the generic Quick Form for TerraCores for details
- 4) Unhide and attach the generic Quick Form for rental equipment.
- 5) Unhide and attach the generic Quick Form for MOT transport.



SHIPPING/TRANSPORTATION DETERMINATION FORM
Regulated Material Shipping Determination

Revision 10

Date:	8/29/2018
Project Name:	USAEC PFAS PA- Picatinny Arsenal, Rockaway, NJ
Project Number:	2118216.1
Supplemental Information:	Safety data sheet (see file)

1) Description of the Material to be Transported or Shipped

1a Select a description category ==> Samples

1b *Water with ppb or low ppm concentrations of volatile, semivolatile and/or inorganic constituents with no sheens or odors*

1c PFAS and PFOA compounds in groundwater and surface water

- This material is mixed with water, soil or other inert material
- This material will be shipped on wet or blue ice
- Consignment contains dry ice
- Consignment contains containers with acid/base preservatives prepared by an analytical laboratory.
- Leave this box unchecked

2) Classification and Identification

2a This material is: Not Restricted/Not Regulated
Do not complete sections 2b or 2c below

Complete for Hazardous Materials ONLY:

2b UN/NA/ID#: NA 2c PG: NA Primary Hazard Class: NA

Subsidiary Hazard Class: NA NA

PSN: NA

Add the word "mixture" or "solution" in cell G30 above if not already included in the PSN.

- See Section 7a

2d This material is a: No additional criteria applies to this material

3) Packaging, Exceptions and Shipping Information

3a Packaging Type: Combination Package - Non-Bulk

3b Inner Container Category: Plastic receptacles

3c Number and Quantity:

	Number	Container type		Net Qty. Each Container		
Container type #1	26	250 ml	Plastic	250	ml	<= Select units here TIP: Do not place units in the white column. Place the largest container in bottle set in row #1.
Container type #2	0	None	None		None	
Container type #3	0	None	None		None	
Container type #4	0	None	None		None	
Container type #5	0	None	None		None	
Container type #6	0	None	None		None	

3d Intermediate Packaging: Plastic bag/liner

3e Outer Packaging: Non-specification box- plastic (sample cooler)

3f Other: None Type: None

- Overnight AIR shipping for next day delivery is required

Your suggested shipping configuration (excluding MOT option): Not available for this shipping configuration.

This material will be shipped (mode of transport and type of shipment):

3g Road as a non-regulated/restricted consignment

If using an exception/exemption, list the exception/exemption below

3h None

Carrier/Transporter information:

3i Arcadis or Lab Courier Transport

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	NA	NA
Metal	NA	NA
Plastic	26	250 mL

Plastic Bag	NA	NA
Paper Bag	NA	NA
Fibre	NA	NA

Outer Package Limit

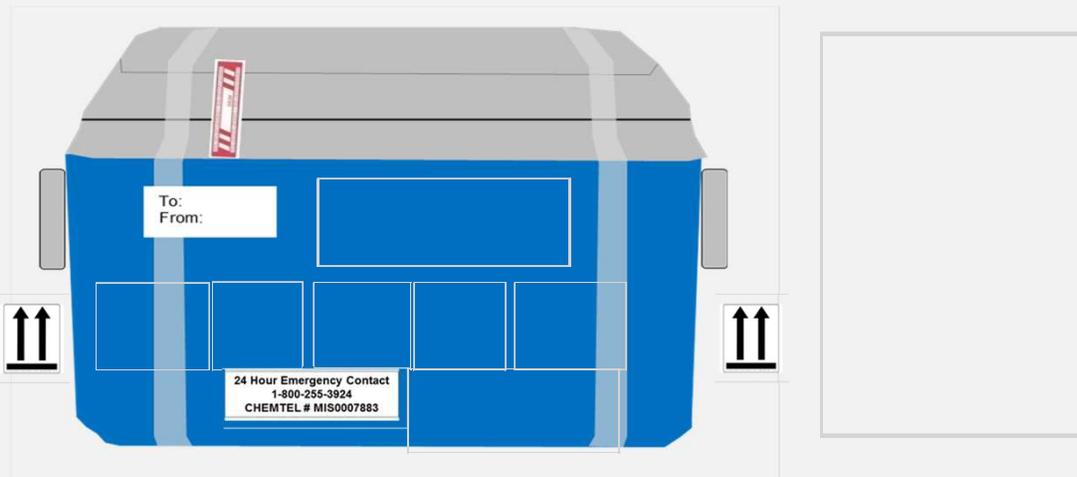
NA	NA
6.5	L/Kg

Total net volume/mass:

- Arcadis Shipping Guide US-001 attached
- Specific package closure instructions are attached
- Arcadis Shipping Guide or HSSP is available for this shipment: NA

4) Marks and Labels for Non-Bulk Packages

Orientation arrows, if shown, may be red or black in color.



Place all marks and labels checked in this section on same side of package (excludes orientation arrows, if shown).

5) Documentation

- No special documentation required
- Requires a Shipper's Declaration (air) prepared using : None
- Requires HazMat ground shipping papers prepared using: None
- Requires a Bill of Lading or Manifest (>MOT, Freight, Trucking Co., Waste Hauler, etc.)
- Requires Special Permit DOT-Special Permit #:
- Other:

6) Emergency Response

- Use ChemTel 24/7 Emergency Phone and Contract Number or approved equivalent (authorized client or vendor) for this shipment:
 1-800-255-3924 (ChemTel #MIS0007883) Register this shipment with ChemTel:
 Have carrier tracking number available. <http://Arcadis.chemtel.net/>
- Ensure current edition of Emergency Response Guidebook in vehicle (this applies to Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in 7a)

7a

8) References and Rationale for the Determination (add additional sheets, if required).

8a

		NA
	DOT Special Provisions:	NA
	This sampling event is part of a larger site characterization scope of work. These samples represent the 1st round of sampling and thus detections are unknown but are suspected to be PPB or low PPM range concentrations. The SigmaAldrich SDS for PFOA and PFAS have been consulted and are available on file.	
305	Rationale must be at least 200 characters (including spaces)	



QUICK VIEW SHIPPING DETERMINATION FORM

Revision 10

For Use by Field Staff

Date: 8/29/2018
 Project Name: USAEC PFAS PA- Picatinny Arsenal, Rockaway, NJ
 Project Number: 2118216.1

This Determination applies to: Not applicable.

The material you will be shipping includes the following:

Water with ppb or low ppm concentrations of volatile, semivolatile and/or inorganic constituents with no sheens or odors: PFAS and PFOA compounds in groundwater and surface water

If this is not what you are shipping or if you need help, contact Veronica Bean at 973-919-5372 for assistance and guidance.

The material in your shipment has been classified as a: Not Restricted/Not Regulated

This material has been identified as:

PROPER SHIPPING NAME (including applicable modifiers and technical names):

An ID Number, Proper Shipping Name, Hazard Class, and Packing Group are not required for this shipment.

ID NUMBER: NA Hazard Class NA (NA) Packing Group NA

The above information in RED is required on the outer package of your shipment as illustrated in the picture

Follow Shipping Guide US-001 to prepare this shipment Follow Shipping Guide US-015 for dry ice

Refer to the referenced HSSP to right for more information: NA

Package preparation configuration per package shipped (not to exceed):

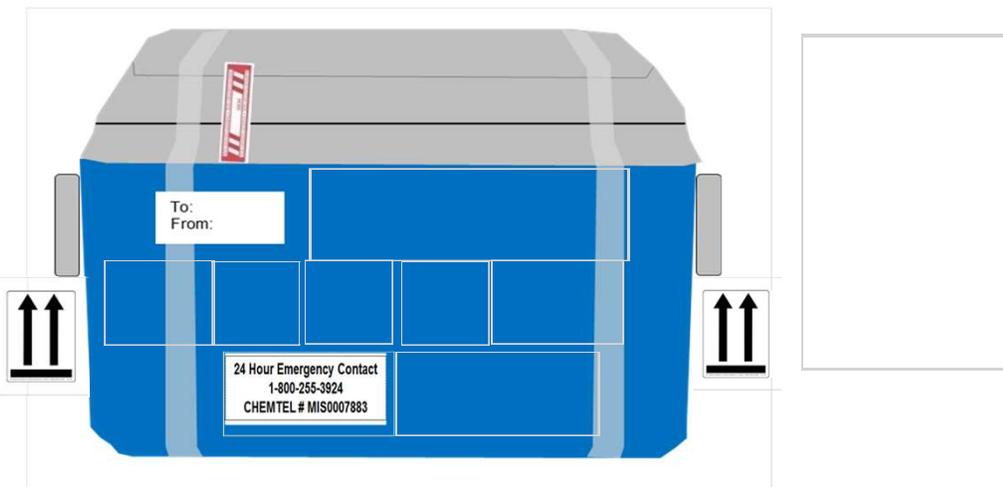
Inner container sizes and quantity:

# of containers	Size	Type	Net Qty Each
26	250 ml	Plastic	250 ml
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None

Intermediate packaging: Plastic bag/liner

Outer packaging: Non-specification box- plastic (sample cooler)

Place marks and labels on same side of package, except orientation arrows should be placed on each end of package.



If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for assistance.

Your supervisor (PM, TM, or Field supervisor) must register this shipment with ChemTel (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: Arcadis or Lab Courier Transport



ARCADIS SHIPPING GUIDE NO. US-001

Environmental Sample Cooler Preparation for Hazardous Materials Shipping Do Not Use After 12/31/2018

1) Fill bottles <90% Full



2) Tape lids secure



3) Place bottles in protective bubble wrap bags or wrap in cushioning material



4) Place protected bottles inside of a self-sealing bag (Ziploc® bag)



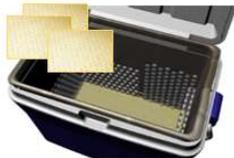
5) Select a clean, like new ice chest ≤52 quart capacity. Avoid ice chests with drain plugs



6) Line ice chest with plastic bag (heavy duty trash bag)



7) Place absorbent pads, vermiculite, or other compatible absorbent in ice chest (enough to absorb contents of ice chest) and additional cushioning material (like bubble wrap)



8) Place all bottles in ice chest in upright position (including temperature blank if required by your work plan)



9) Fill remaining void with compatible absorbent, cushioning materials or ice in self-sealing plastic bags (if using cooling preservation). Don't overfill the bag liner.



10) Twist and tie off top of plastic bag



11) Place chain-of-custody in self-sealing plastic bag and tape to inside lid of ice chest



12) Close lid and secure with strapping/packing tape all the way around the ice chest. Apply chain-of-custody seals (one on each side or as directed in your work plan)



1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Perfluorooctanoic acid

Product Number : 171468

Brand : Aldrich

CAS-No. : 335-67-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheetCompany : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 4), H302

Acute toxicity, Inhalation (Category 4), H332

Serious eye damage (Category 1), H318

Carcinogenicity (Category 2), H351

Reproductive toxicity (Category 1B), H360

Effects on or via lactation, H362

Specific target organ toxicity - repeated exposure (Category 1), Liver, H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302 + H332

Harmful if swallowed or if inhaled.

H318

Causes serious eye damage.

H351

Suspected of causing cancer.

H360

May damage fertility or the unborn child.

H362

May cause harm to breast-fed children.

H372

Causes damage to organs (Liver) through prolonged or repeated exposure.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Pentadecafluorooctanoic acid
Perfluorocaprylic acid
Perfluorooctanoic acid

Formula : $C_8HF_{15}O_2$
Molecular weight : 414.07 g/mol
CAS-No. : 335-67-1
EC-No. : 206-397-9

Hazardous components

Component	Classification	Concentration
Pentadecafluorooctanoic acid	Acute Tox. 4; Eye Dam. 1; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302 + H332, H318, H351, H360, H362, H372	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Continue rinsing eyes during transport to hospital. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: > 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: > 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------------------|---|
| a) Appearance | Form: flakes
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | 2.6 at 1 g/l |
| e) Melting point/freezing | Melting point/range: 55 - 56 °C (131 - 133 °F) - lit. |

point

- | | |
|---|--|
| f) Initial boiling point and boiling range | 189 °C (372 °F) at 981 hPa (736 mmHg) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 0.69 hPa (0.52 mmHg) at 25 °C (77 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.900 g/cm ³ |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Bases, Oxidizing agents, Reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Rat - 189 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

DNA damage

Rat

DNA damage

Carcinogenicity

Suspected human carcinogens

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Pentadecafluorooctanoic acid)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Effects on or via lactation

Presumed human reproductive toxicant

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard

No data available

Additional Information

RTECS: RH0781000

Cough, Shortness of breath, Headache, Nausea, Vomiting

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3261 Class: 8 Packing group: III
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Pentadecafluorooctanoic acid)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG

IATA

UN number: 3261 Class: 8 Packing group: III
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Pentadecafluorooctanoic acid)

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Pentadecafluorooctanoic acid	335-67-1	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Pentadecafluorooctanoic acid	335-67-1	

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled.

H318 Causes serious eye damage.
H332 Harmful if inhaled.
H351 Suspected of causing cancer.
H360 May damage fertility or the unborn child.
H362 May cause harm to breast-fed children.
H372 Causes damage to organs through prolonged or repeated exposure.

HMIS Rating

Health hazard: 3
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 0

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.10

Revision Date: 03/29/2018

Print Date: 07/14/2018

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Heptadecafluorooctanesulfonic acid solution

Product Number : 77283

Brand : Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302 Harmful if swallowed.
H314 Causes severe skin burns and eye damage.
H331 Toxic if inhaled.
H351 Suspected of causing cancer.
H360 May damage fertility or the unborn child.
H362 May cause harm to breast-fed children.
H372 Causes damage to organs through prolonged or repeated exposure.

H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P321	Specific treatment (see supplemental first aid instructions on this label).
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula	:	C ₈ HF ₁₇ O ₃ S
Molecular Weight	:	500.13 g/mol

Hazardous components

Component	Classification	Concentration
Heptadecafluorooctane-1-sulphonic acid		
CAS-No.	1763-23-1	30 - 60 %
EC-No.	217-179-8	
Index-No.	607-624-00-8	
		Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; Aquatic Acute 2; Aquatic Chronic 2; H302 + H332, H314, H351, H360, H362, H372, H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sulphur oxides, Hydrogen fluoride

5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information

no data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: clear, liquid
Colour: light red |
| b) Odour | no data available |
| c) Odour Threshold | no data available |
| d) pH | no data available |
| e) Melting point/freezing point | no data available |
| f) Initial boiling point and boiling range | no data available |
| g) Flash point | no data available |
| h) Evaporation rate | no data available |
| i) Flammability (solid, gas) | no data available |
| j) Upper/lower flammability or explosive limits | no data available |
| k) Vapour pressure | no data available |
| l) Vapour density | no data available |
| m) Relative density | 1.250 g/cm ³ |
| n) Water solubility | no data available |
| o) Partition coefficient: n-octanol/water | no data available |
| p) Auto-ignition temperature | no data available |

- q) Decomposition temperature no data available
- r) Viscosity no data available
- s) Explosive properties no data available
- t) Oxidizing properties no data available

9.2 Other safety information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

no data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

no data available

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

no data available

Inhalation: no data available

Dermal: no data available

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available
no data available

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

no data available

12.2 Persistence and degradability

no data available

12.3 Bioaccumulative potential

no data available

12.4 Mobility in soil

no data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3265 Class: 8 Packing group: II
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Heptadecafluorooctane-1-sulphonic acid)
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 3265 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Heptadecafluorooctane-1-sulphonic acid)
Marine pollutant: No

IATA

UN number: 3265

Class: 8

Packing group: II

Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Heptadecafluorooctane-1-sulphonic acid)

15. REGULATORY INFORMATION**SARA 302 Components**

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Heptadecafluorooctane-1-sulphonic acid	1763-23-1	2009-07-17

New Jersey Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Heptadecafluorooctane-1-sulphonic acid	1763-23-1	2009-07-17

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
Lact.	Effects on or via lactation

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0

Reactivity Hazard: 0

Further information

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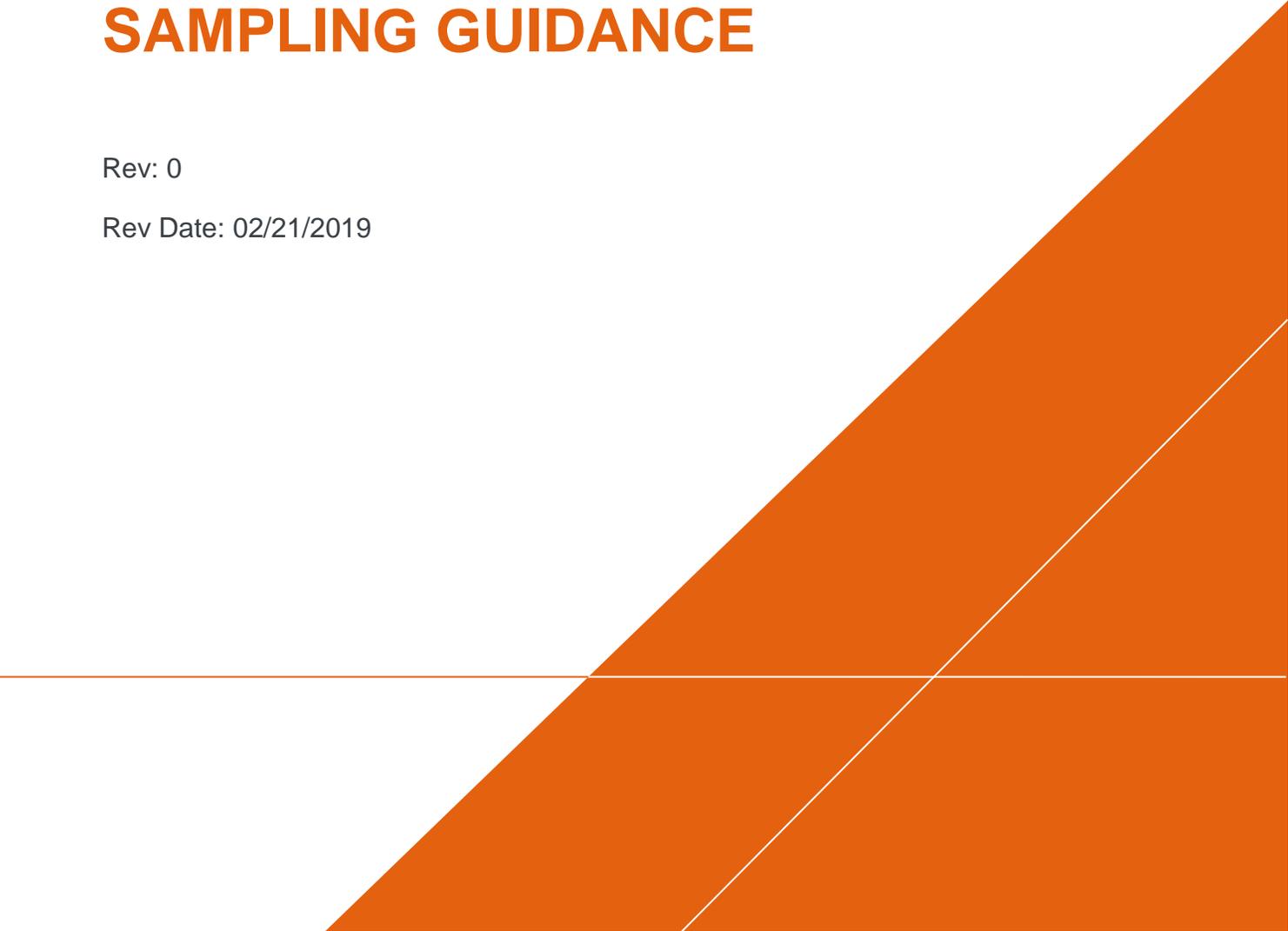
Attachment 4

Off-Site Well Sampling SOP

TGI - DOMESTIC WELL SAMPLING POLY- AND PERFLUORINATED ALKYL SUBSTANCES (PFAS) FIELD SAMPLING GUIDANCE

Rev: 0

Rev Date: 02/21/2019



VERSION CONTROL

Revision No	Revision Date	Page No(s)	Description	Reviewed by
0	02, 21, 2019			Technical Expert Name Procedure Librarian Name

APPROVAL SIGNATURES

Prepared by:	<u>Insert signature here</u>	<u>02/19/2019</u>
	Eric Killenbeck	Date:

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	Lisa Szegedi	Date:

1 INTRODUCTION

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

2 SCOPE AND APPLICATION

The purpose of this Technical Guidance Instructions (TGI) is to provide guidance on domestic well sampling for poly-and perfluorinated alkyl substances (PFAS) in private wells.

Given the extremely low detection limits associated with PFAS analysis and the many potential sources of trace levels of PFAS, field personnel are advised to err on the side of caution by strictly following these protocols, frequently replacing nitrile gloves, and rinsing field equipment to help mitigate the potential for false detections of PFAS. Other specific items related to field sampling for PFAS are discussed in the sections below.

This document does not address water quality parameter measurements (e.g., specific conductivity, temperature, pH, ORP), sample preservation/packaging, chain-of-custody forms, or laboratory analysis. SOPs for these are included in the Programmatic QAPP and the site-specific Health and Safety Plan (HASP), as appropriate.

3 PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have completed and will have current health and safety training as required by Arcadis, the client, or regulations, such as 40-hour HAZWOPER training and/or OSHA HAZWOPER site supervisor training. Arcadis personnel will also have current training as identified in the site-specific HASP which may include first aid, cardiopulmonary resuscitation (CPR), Blood Borne Pathogens (BBP) as needed. The HASP will also identify any access control requirements.

Prior to mobilizing to the field, the sampling team will review and be thoroughly familiar with relevant site-specific documents including but not limited to the QAPP, HASP, historical information, and other relevant site documents.

Arcadis field sampling personnel will be knowledgeable in the relevant processes, procedures, and TGIs and possess the demonstrated required skills and experience necessary to successfully complete the desired field work. Additionally, the groundwater sampling team will review and be thoroughly familiar with documentation provided by equipment manufacturers and become familiar with the operation of (i.e., hands-on experience) all equipment that will be used in the field prior to mobilization.

Ideally, Arcadis personnel directing, supervising, or leading groundwater sample collection activities will have a minimum of one (1) year of previous groundwater sampling experience. Field employees with less than six (6) months of experience will be accompanied by a supervisor (as described above) to ensure that proper sample collection techniques are employed.

4 EQUIPMENT LIST

The following equipment and materials must be available for sampling:

- Site plan of sampling locations, relevant work plan (or equivalent), and this TGI;
- Appropriate health and safety equipment, as specified in the site HASP;
- Dedicated plastic sheeting (preferably high-density polyethylene [HDPE]) or other clean surface to prevent sample contact with the surfaces;
- Conductivity/temperature/pH meter;
- Dissolved oxygen meter, oxidation reduction potential meter, and turbidity meter;
- Brushes for scrubbing sampling equipment;
- Pens and pencils for writing;
- Clipboards, field binders, and field note pages that are not waterproof;
- Labeled sample bottles:
 - Water: HDPE bottles fitted with polypropylene screw cap only; some types of PFAS samples (primarily drinking water) may require preservative, which will be indicated by the laboratory conducting the analysis. The laboratory will specify the sample bottle volume.
- Ziploc® bags to hold ice and samples;

- Appropriate blanks (field reagent blanks supplied by the laboratory);
- Appropriate transport bottles (coolers) with ice and appropriate labeling, no blue ice;
- Deionized water for initial decontamination rinsing;
- “PFAS-free” water provided by the laboratory for final decontamination rinsing;
- Packing and shipping materials;
- Groundwater Sampling Log; and
- Chain-of-Custody (COC) Forms.

5 CAUTIONS

5.1 Food Packaging

Some food packaging may be treated with PFAS-containing chemicals to prevent permeation of oil and water in the food outside of the packaging. To avoid potential food packaging-related PFAS contact:

- Do not bring any food outside of the field vehicles onsite and eat snacks and meals offsite.
- Wash hands after eating.
- Remove any field garments or outer layers prior to eating. Do not put them back on until done eating and hands are washed.

5.2 Field Gear

5.2.1 Clothing

Many types of clothing are treated with PFAS for stain and water resistance, in particular outdoor performance wear under brand names such as Gore-Tex®. To avoid potential clothing-related PFAS contact:

- Do not wear any outdoor performance wear that is water or stain resistant, or appears to be. Err on the side of caution.
- Wear pre-laundered (multiple washings, i.e. 6+) clothing that is not stain resistant or water proof.
- Natural fabrics such as cotton are preferred. Synthetic fabrics may also be acceptable if there is no indication on the label that the fabric is water and stain resistant.
- Most importantly, avoid contacting your clothing with sampling equipment, bottles, and samples.

5.2.2 Personal Protective Equipment

5.2.2.1 Safety Footwear

Some safety footwear has been treated to provide a degree of waterproofing and increased durability, and may represent a source of trace PFAS. For the health and safety of field personnel, footwear must be protected at all times to avoid potential PFAS contamination. To do this:

- Do not touch your safety footwear in the immediate vicinity of the sampling port (i.e., within 10 meters [m]).
- Do not allow gloves used for sampling to come in contact with safety footwear.

5.2.2.2 Nitrile Gloves

- Wear disposable nitrile gloves at all times. Don a new pair of nitrile gloves **before** the following activities at each sample location:
- Decontamination of re-usable sampling equipment;
- Contact with sample bottles or “PFAS-free” water bottles;
- Insertion of anything into the sample ports (e.g., HDPE tubing); and
- Handling of any quality assurance/quality control (QA/QC) samples including field blanks and equipment blanks.

Don a new pair of nitrile gloves after the following activities:

- Handling of any non-dedicated sampling equipment;
- Contact with contaminated surfaces; or
- When judged necessary by field personnel

5.3 Personal Hygiene

- Shower at night.
- Do not use personal care products after showering such as lotions, makeup, and perfumes, UNLESS medically necessary.
- Use sunscreen and insect repellent ONLY if necessary for health and safety. If they are necessary, apply sunscreen and repellent prior to initiating field sampling. If sunscreen and/or repellent need to be reapplied, ensure a safe distance away from the sampling locations and equipment (i.e., more than 10 m away). Wash hands after application.

5.4 Visitors

Visitors to the site are asked to remain at least 10 m from sampling areas.

6 HEALTH AND SAFETY CONSIDERATIONS

- Field activities must be performed in accordance with the site HASP, a copy of which will be present onsite during such activities.
- Work will be conducted on private properties, not under the control of Arcadis. Prior to conducting any work, the field crew shall develop a property-specific job hazard analysis that identifies any property-specific hazards (e.g., toys throughout lawn, unsafe stairs into property).

7 PROCEDURE

Arcadis staff will coordinate a sample date and time to sample the private well with the owner of the well. Unless otherwise specified, in writing, by the owner, all contact will be directly with the owner and not a property tenant. Upon arrival, Arcadis will provide introductions and let the resident/property owner know the purpose is to collect a potable well sample for PFAS analysis in accordance with previous correspondence provided to them regarding the sampling. Arcadis will request information from the property owner regarding the water system at each property. Information that will be recorded includes presence of water softeners, sediment traps, filters, etc., and the location of these items.

Additional activities to be performed and procedures to be followed by the sampling team prior to potable well sample collection include:

- Don a new set of nitrile gloves immediately prior to sampling.
- Do not use gloved hands to subsequently handle papers, pens, clothes, etc., before collecting samples.
- Use the 2-250 mL HDPE bottles that are supplied by the laboratory for each sample location.
- Samples bottle caps must remain on the bottle until immediately prior to sample collection, and the bottle must be sealed immediately after sample collection.
- Drinking Water Sampling Protocol: At each sampling location, the sampling team will wash and dry hands thoroughly with a clean towel prior to donning new non-powdered disposable nitrile gloves and then proceed to collect samples per the Army Guidance (A1 and A2) as below:
- The team will first remove any aerator, diffuser, tubing, splash guard, or any other fittings from the faucet to be sampled.
- The team will then flush the faucet at fast full flow for approximately 5 minutes, after which, they will reduce the tap water flow to a pencil-width stream.
- If the faucet or water source access point is for an infrequently used water source, the field team will ensure continuous purging of water for at least 15 minutes before reducing the flow to a pencil-width stream for sample collection.

- For sample collection, the field team will first check to make sure that each of the three 250-mL polypropylene sample containers include the preservative powder (Trizma). If a FTB is required to be collected at the location per the UFP-QAPP, the field team will also check that an FTB container filled with laboratory-prepared reagent water and an empty FTB bottle without any preservative are also available for that sample.
- The field team will then fill each sample container carefully to the bottom of the neck to avoid any overfilling and spillage of the preservative. The field team will make sure to not touch the inside of the polypropylene bottle caps or around the edge of the bottle during sample collection or allow them to encounter the faucet. The sample container will then be recapped, and inverted several times until the preservative is thoroughly mixed with the sample water. The same steps will be repeated to fill the other two field sample containers for the same sample location.
- The tap will be shut off after the sample collection.
- If a FTB is required, the field team will then proceed with opening the FTB container filled with laboratory-prepared reagent water and the empty FTB bottle, and pour the contents of the full FTB container into the empty FTB container.
- After sample collection, the team will label each sample container (including FTB, if applicable) using a pen or pencil with the sample ID, date and time of sample collection, installation name, sampler's name and other pertinent information.
- The field team will then place all sample containers from one sample location grouped together in a polyethylene bag in the sample cooler packed with double-bagged wet ice.
- The field team will then fill out the required forms provided in the field sampling documentation kit including sample collection forms and sample location notation forms.
- The field team will also note the relevant details associated with sample collection in their dedicated non-waterproof log books. At a minimum, they will note the names of sampling personnel, location where sample was collected, sample identification number or name, date and time when the sample was collected, descriptions of components removed prior to purging the tap, and any issues that occurred.

During Sample Collection

Potable water outfalls and taps are likely to vary. If possible, the team will avoid sampling from any taps fitted with Teflon tape or other PFAS-containing materials. Stainless steel and polyvinyl chloride materials are acceptable. The sampling team will collect unfiltered samples from a tap or port, as follows:

- Initiate flow from the water source and allow the system to flush for at least 3 minutes.
- Collect the sample into the HDPE bottle until the sample bottle is full (leaving slight headspace in the bottle is acceptable).
- Tightly screw on the polypropylene or HDPE cap.

After Sample Collection

Upon collection, the sample bottles will be placed in a sealed Ziploc® bag. Sample collection information will be recorded including the sample identification (ID) and time of sampling on the sample bottle label, in the field notes, and on the chain-of-custody (COC) form. The COC form will be explicitly marked for expedited analysis with a standard turnaround time (approximately 3 weeks). Samples will be placed in durable coolers, with enough ice to keep the sample temperature between 0 and 4°C until delivered to the laboratory. Only “wet” ice will be used, with no use of “blue ice” or similar cold storage packets. PFAS sample coolers will be either delivered by Arcadis or laboratory courier to or shipped via FedEx Priority Overnight delivery to:

Sample Receiving
Eurofins Lancaster Laboratory Environmental
2425 New Holland Pike
Lancaster, Pennsylvania 17601

Samples will be analyzed for PFAS by U.S. EPA Method 537.1.

All disposable sampling materials will be treated as single use, and disposed appropriately after sampling at each location. Samples from each residence will be kept in their own dedicated cooler with the appropriate quality assurance samples.

8 WASTE MANAGEMENT

Typically, the tap water will be allowed to drain through the sink drain where the faucet is installed. If no sink drain below the tap water is available, the tap water will be collected in a disposable cup, and disposed via the closest drain.

9 DATA RECORDING AND MANAGEMENT

Following sample collection and shipping, the field team will demobilize back to the Arcadis local field office. The RTL and PM will organize a demobilization lessons-learned teleconference with the field team to capture any lessons that can be shared across the project with other field teams via a team SharePoint site. This will ensure continuous programmatic enhancement of field execution delivery to USAEC and USACE. The field team will draft a letter trip report to capture a summary of their field activities and any issues that they faced and will include a copy of their field forms as an appendix. The trip report will undergo internal review by RTL and PM, and will be submitted to Installation POC and USAEC.

Results letters will be provided to the well owners/users within approximately five weeks of sample collection, barring unforeseen delays in receipt of laboratory analytical results. If the combined PFOA/PFOS values at a well were below the HAL for past sampling events, but are above the HAL for future sampling events, then a phone call will be placed to the well owner/user within two days of completing the preliminary data quality review for the laboratory results for that sample.

10 QUALITY ASSURANCE

Avoiding cross-contamination from PFAS-containing materials during this sampling will be of utmost importance given the very low detection limits for the analyses that will be conducted for these compounds. As such, materials with the potential to contain PFAS will not be used during the sampling (including PTFE pipe tape, pipe thread pastes that contain PTFE, PTFE sample tubing, food wrappers, water resistant/proof clothing, waterproof field books, etc.)

Sample information, including sample ID and date/time collected, will be recorded on the provided bottle labels and attached to the sample bottles immediately after sealing the bottles. This information also will be recorded on the COC form provided by the laboratory, in a Potable Water Supply Sample Log, and in the sampling team's field notes. A signed copy of the COC form will be provided to the laboratory whenever a sample cooler is delivered to the laboratory. A copy of each COC form will be kept with the field notes and sample logs.

After receipt from the laboratory, Arcadis will conduct a preliminary data quality review (Level 2 data validation). The sample results will be communicated to well owners/users after completion of the preliminary data quality review, as outlined in the "Project Communication" section below. After completion of the preliminary data quality review, Arcadis will conduct a more comprehensive validation of the data (Level 4 data validation). The timeframe for the Level 4 validation may vary based on the amount of time required for the laboratory to send additional Quality Assurance/Quality Control information to Arcadis, and the number of samples under review. The anticipated timeframe for completion of Level 4 validation is approximately 8 weeks after sample collection, assuming timely delivery of results from the laboratory. If any changes to the reported sampling results become necessary after completion of the Level 4 validation, the well owners/users, PICA, USACE, USAEC, NJDEP, and EPA will be notified of those changes.

11 REFERENCES

U.S. Army Corps of Engineers – Omaha District. 2016. Chemistry Requirements – PFAS.

U.S. Environmental Protection Agency. 2009. USEPA Method 537: Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), version 1.1, September. National Exposure Research Laboratory, Office of Research and Development.

Transport Canada. February 2016, Per- and Polyfluorinated Alkyl Substances (PFAS) Field Sampling Guidance.

United States Environmental Protection Agency (USEPA). 2013. Operating Procedure: Potable Water Supply Sampling. USEPA Region 4 Science and Ecosystem Support Division, Athens, Georgia (May 30, 2013) SESDPROC-3050R3.

12 ATTACHMENTS

Attachment A - Example Right-of-Entry (Missing)

Attachment B – Private Well Sampling Log

Attachment C - Example Private Well Questionnaire

ATTACHMENT A

Example Right-of-Entry

ATTACHMENT B

Private Well Sampling Log



Private Well Sampling Log

Sampling Personnel: _____ Date: _____

Purge Time: Begin: _____ End: _____ Weather: _____

Sampling Location Address: _____

Sampling Location (i.e., before/after treatment system. Inside tap, outside tap, etc. _____

Sketch of Sample Location and Specific Site Features

Is there a water softener upstream of the sampling location? _____

Are there any other wells on the property? _____

Approximate Flow Rate During Sampling: _____

How was the Flow Rate Measured? _____

Gallons Purged (Estimate): _____

Purge water Observations (Color, Odor, etc.): _____

Constituents, No of Containers, Container Type, and Preservative: _____

Sample ID: _____

QA/QC or Duplicate Sample Collected at this Location? _____

Other Observations On-Property (basement, septic tank, work shop, signs of spills or disposal area, etc.)

Other Observations Off-Property (locations and names of the following within close proximity to property; gas stations, automobile repair shops, car washes and any industrial property)

Sample Team Lead Signature: _____

ATTACHMENT C

Example Private Well Questionnaire

<p>PRIVATE WELL QUESTIONNAIRE</p> <p>United States Army Corps of Engineers, New York District</p> <p>Picatinny Arsenal</p>	
Property Owner Name(s):	
Street Address:	
City/State/Zip:	
Mailing Address: (leave blank if the same as above)	
Phone:	Email:
Is this rental a unit? (Please circle) YES NO If rental, please provide the following:	
Owner Name: _____	
Owner Phone: _____	
Tenant Name: _____	
Tenant Phone: _____	
Number of Occupants:	
Depth of Well (in feet):	
Do you use your well for drinking water? (Please circle) YES NO	
Do you treat your water? (Please circle) YES NO If YES: (Please circle) Water Softener Carbon Filtration Unit Reverse Osmosis Other (Please specify): _____	
If YES, can the treatment unit be bypassed to collect an untreated sample? (Please circle) YES NO	
Does your property have a septic tank? (Please circle) YES NO If YES, please indicate where the septic tank is located on the property.	

Has your well been previously tested for PFAS? (Please circle) YES NO

(If YES, please provide a copy of the test results.

To help expedite scheduling, please indicate if we may use an outdoor spigot to collect a water sample during business hours. (Please circle) YES NO

Thank you for taking the time to fill out this form. Kindly return it to our office in the enclosed self-addressed stamped envelope at your earliest convenience.

Please use the back of this form for any additional contact information or details about your well.



Attachment 5

Example Off-Site Property Owner Letters



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON
PICATINNY ARSENAL, NEW JERSEY 07806-5000

Month, XX, 2019

Mr./Mrs. John Doe
123 Main Street
Nowhere, NJ 12345

RE: Property Address (Block # Lot #)

Dear Property Owner or Current Resident:

The purpose of this letter is to confirm that you use a private water supply well to provide your drinking water to the above referenced property in Rockaway Township New Jersey and to ask you to complete the enclosed Private Well Questionnaire. Representatives from our Army contractor, Arcadis, may have, or will soon be contacting you to either schedule a sampling event or to follow through if you have not completed or sent the questionnaire.

In February 2018, Picatinny Arsenal discovered the combined levels of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) above the U.S. Environmental Protection Agency (USEPA) lifetime health advisory level (HAL) level of 70 parts-per-trillion in our drinking water.

For a more detailed background, please see the enclosed Picatinny PFOA/PFOS Assessment Fact Sheet.

PFOS and PFOA are part of a class of manmade chemicals known as perfluorinated compounds. PFOS and PFOA are found in many consumer and industrial products. For more information on PFOS/PFOA, please see the enclosed fact sheet from the USEPA.

As part of the Army's effort to determine whether these compounds may have migrated to water wells outside of Picatinny, monitoring wells near Picatinny Arsenal's southern boundary were sampled. Three wells were found to have PFOS/PFOA levels above the USEPA HAL.

We now need to determine if drinking water from wells that are immediately down stream of Picatinny have PFOS/PFOA above the HAL.

To accomplish this task, we ask for your assistance in completing the enclosed "Private Well Questionnaire." Please fill it out to the best of your ability and return it in the self-addressed stamped envelope provided. This information will greatly assist us in developing an organized sampling strategy for the area.

You will not be responsible for any costs associated with the collection and analysis of water samples at your property. When laboratory analysis is complete, we will furnish you the PFOS and PFOA results. The results will also be provided to your local health department, USEPA and the New Jersey Department of Environmental Protection.

If you should have any questions regarding any of the above, including the enclosed Fact Sheet, please contact either Ted Gabel, 973-724-6748 (ted.b.gabel.civ@mail.mil) or Timothy Rider, 973-724-6364 (timothy.l.rider3.civ@mail.mil).

If you have specific questions, regarding the questionnaire or sampling, you can contact Lisa Szegedi from Arcadis at 201-398-4328 (Lisa.Szegedi@arcadis.com).

Your cooperation and assistance is greatly appreciated.

Sincerely,

Ted Gabel
Project Manager for Environmental
Restoration
Picatinny Arsenal

PRIVATE WELL QUESTIONNAIRE
Picatinny Arsenal

Property Owner Name(s):

Street Address:

City/State/Zip:

Mailing Address:
(leave blank if the same as above)

Phone:

Email:

1. Please confirm that you have a drinking water well on your Property:

2. Does the Army have your permission to sample your drinking water supply well?

Is this rental a unit? (Please circle) YES NO
If rental, please provide the following:

Owner Name:

Owner Phone:

Tenant Name:

Tenant Phone:

Number of Occupants:

Depth of Well (in feet):

Do you use your well for drinking water? (Please circle) YES NO

Do you treat your water? (Please circle) YES NO

If YES: (Please circle) Water Softener
Carbon Filtration Unit
Reverse Osmosis
Other (Please specify):

If YES, can the treatment unit be bypassed to collect an untreated sample? (Please circle) YES NO

Does your property have a septic tank? (Please circle) YES NO

If YES, please indicate where the septic tank is located on the property.

Has your well been previously tested for PFAS? (Please circle) YES NO
(If YES, please provide a copy of the test results.)

To help expedite scheduling, please indicate if we may use an outdoor spigot to collect a water sample during business hours. (Please circle) YES NO

Sample Permission: by signing below you authorize the Army and its contractor, Arcadis, to sample your drinking water well. You will be contacted within 10 business days to make arrangements for the sampling. Please note, on average, sampling your well should take **less than 30-minutes** depending on storage tank capacity and/or connected water treatment unit, and the sampling will be performed at no cost to you.

Signature/Date (owner/resident)

Signature/Date (resident, if different than owner)

Thank you for taking the time to fill out this form. Kindly return it to our office in the enclosed self-addressed stamped envelope as soon as you can. Representatives from our Army contractor, Arcadis, will soon be contacting you to either schedule a sampling event or to follow through if you have not completed or sent the questionnaire.

Please use the back of this form for any additional contact information or details about your well.