Defense Fuel Support Point Verona
Supplemental Site Assessment Work Plan

Defense Logistics Agency Installation
Support for Energy

Prepared by:

TK&K SERVICES
ENVIRONMENTAL ENGINEERS AND CONSULTANTS

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SITE CHARACTERIZATION WORK PLAN
DEFENSE FUEL SUPPORT POINT VERONA
5449 WEST MAIN STREET
VERONA, NEW YORK

SIGNATURE PAGE

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Abbreviations/Acronyms

AFFF	Aqueous Film Forming Foam
AST	Aboveground Storage Tank
Bgs.	Below Ground Surface
CBS	Chemical Bulk Storage
COC	Chain of Custody
DFSP	Defense Fuel Support Point
DLA – Energy	Defense Logistics Agency – Energy
DPT	Direct Push Technology
EPA	Environmental Protection Agency
FID	Flame-Ionization Detector
Ft.	Foot
HAL	Health Advisory Level
HASP	Health and Safety Plan
Hcl	Hydrochloric Acid
Mcls	Maximum Contaminant Levels
Mg/L	Milligrams Per Liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
Mv	Millivolts
ND	None Detected
ng/l	Nanograms per liter
NTU	Nephelometric Turbidity Units
NYCRR	New York Codes, Rules and Regulations
NYLD	New York Leak Detection
NYSDEC	New York State Department of Environmental Conservation
ORP	Oxidation/Reduction Potential
PFAS	Perfluorinated Compounds
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PPE	Personal Protection Equipment
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Levels
SOP	Standard Operating Procedure
SSI	Supplemental Site Investigation
TK&K	TK&K Services
ug/kg	Micrograms per kilogram
UST	Underground Storage Tank

1 INTRODUCTION

This Site Characterization Work Plan has been prepared on behalf of the Defense Logistics Agency – Energy (DLA-E) by TK&K Services (TK&K) for the former Defense Fuel Support Point (DFSP) Verona, New York (the Site), (**Figure 1**). This Work Plan describes the proposed hydrogeologic investigation of per- and polyfluoroalkyl substances (PFAS) in groundwater at the Site and the surrounding areas (**Figure 2**). This document was prepared by TK&K for DLA-E under DS-FE Contract SPE0600-14-D-5424, Delivery Order SPE603-18-F-AOT7.

PFAS-containing aqueous film forming foam (AFFF) was previously stored at the Site for use in the bulk fuel storage and distribution firefighting system. The objective of the Supplemental Site Assessment is to identify the extent of impacts to groundwater at the site boundary and the adjacent groundwater and surface water offsite as recommended in a letter from New York State Department of Environmental Conservation (NYSDEC) dated September 4, 2019 . Four micro-wells will be installed and sampled onsite and five groundwater samples will be collected offsite on the adjacent property utilizing temporary wells. Additionally, three surface water and sediment samples will be collected within the nearby creek (see **Figure 2**) one upstream and two downstream. All samples will be analyzed via EPA Method 537.1 for perfluorooctanoic acid (PFOA) and perflurooctane sulfonate (PFOS). This investigation has been developed to meet the requirements of DER-10, (Technical Guidance for Site Investigation and Remediation) and NYSDEC's Guidelines for Sampling and Analysis of PFAS.

This Work Plan outlines the organization, planned activities, data review, and data reporting procedures associated with the hydrogeologic investigation at the Site. Protocols for sample collection, handling, storage, chain-of-custody, laboratory analyses, field analyses, data validation, and data reporting are provided. Field activities will be conducted in accordance with a site-specific Health and Safety Plan (HASP).

1.1 *Regulatory Framework*

DLA-E received a letter dated November 10, 2017 from NYSDEC requesting a full site investigation to determine the source of PFAS in groundwater and identify potential receptors. The letter indicated that, based upon review of the *Groundwater Sampling Report* by TK&K (September 2017), groundwater samples from on-site monitoring wells contained several PFAS, specifically PFOA and PFOS, at concentrations exceeding the USEPA Health Advisory Level (HAL) of 70 parts per trillion (ng/L). A complete history of PFAS sampling at DFSP Verona is provided in Section 2.1.

Currently, the NYSDEC does not have promogulated standards for PFAS in soil and

groundwater. Therefore, groundwater sample results will be compared to the HAL of 70 nanograms per liter (ng/L), or ng/L. Soil sample results will be used to assist with identifying possible source locations to groundwater and the evaluation of ecological resources.

1.2 *Project Management*

The following individuals will be responsible for the management and execution of the field efforts and report generation for this Supplemental Site Assessment.

Table 1. PROJECT MANAGEMENT PERSONNEL

Project Title	*Name*	*Contact Information*
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2 SITE LOCATION AND DESCRIPTION

DFSP Verona is located at 5449 West Main Street, Verona, Oneida County, New York. The facility is situated between New York State Route 31 and Interstate 90, and immediately West of State Route 365; one half-mile southwest of the junction of Main Street and Route 31. The facility is approximately 25 miles east of Syracuse, New York. The facility is owned by the United States Air Force (USAF). According to the USAF permit issued to DLA-E in 1983, the leased facility consists of 35.16 acres, approximately 13 acres comprise the fenced-in terminal with an additional 22 acres of field to the northeast and northwest.

DFSP Verona was constructed in 1959 as a fuel storage and transfer facility on previously undeveloped land. Historically, there have been four field constructed ASTs on site that covered a significant portion of the DFSP Verona service facility (Tanks 1, 2, 3, and 4). Each of the four ASTs were connected to an automated firefighting foam system. Fueling operations ceased at the facility as of September 2014 and DLA-E permanently closed the DFSP in August 2017. Decommissioning activities included the removal of all AFFF foam product material and residue from the facility (August 7 through August 14, 2017) as documented by *DFSP Verona Aqueous Fire Fighting Foam System Closure Report,* TK&K Services (November

2017).

2.1 *Site Background*

In November 2016, the Department of Defense initiated an evaluation of the Site's drinking water for PFOA and PFOS due to prior storage and use of AFFF on site. Sampling drinking water at locations with AFFF storage has become standard practice at DoD facilities in recent years to identify possible receptors of PFAS contamination. DFSP Verona groundwater is not a source of potable water or irrigation at the Site. The source of municipal water is Glenmore Reservoir on Florence Creek, located twenty miles from the facility. A drinking water sample was obtained by TK&K from the first spigot after the municipal supply line enters DFSP Verona's administrative building and analyzed via EPA Method 537.1. All results were below detectable laboratory limits for PFOA and PFOS at 9 and 15 ng/L, respectively. The drinking water results were provided in a report entitled *Analytical Report for Perfluorinated Compounds Sampling in Drinking Water DFSP Verona*, TK&K Services (December 2016).

In June and July 2017, DLA-E collected groundwater samples from several site monitoring wells and one soil sample near the former SPDES discharge point for the oil/water separator for laboratory analysis of PFAS. Laboratory results indicated groundwater from monitoring wells at the facility are impacted by PFAS. The highest concentrations of PFAS in groundwater were detected in monitoring wells MW-10R (1,300 ng/L of PFOS and 62 ng/L of PFOA) and MW-27 (670 ng/L PFOS and 16 ng/L PFOA). Both wells are located downgradient of the loading rack. PFAS concentrations were detected further downgradient in wells MW-5 (6.2 ng/L of PFOS and 92 ng/L of PFOA) and MW-9 (190 ng/L of PFOS and 18 ng/L of PFOA), located near the western fence line. PFAS concentrations diminished upgradient of the loading rack at well MW-24 (61 ng/L of PFOS and 1.8 ng/L of PFOA), but increased significantly in the furthest upgradient well, MW-13 (1,000 ng/L PFOS and 15 ng/L of PFOA). The soil sample collected to evaluate the potential for the facility's storm water to contact and transport PFAS (VER-SED-01) contained 6.2 ug/Kg of PFOS, indicating that the storm water system was not a significant transport mechanism. Sampling locations are depicted on Figure 2. The results of groundwater and soil testing was provided in a report entitled DFSP Verona PFAS Groundwater Sampling Report, TK&K Services, (September 2017).

The NYDSEC was notified by DLA-E of their findings. NYSDEC opened Spill Number 17-08575 in response and conducted State-led private well sampling in the surrounding community for PFAS in groundwater. NYSDEC provided DLA-DM with laboratory results of the sampling event but no narrative report of the NYSDEC private well sampling results. Using online imaging, TK&K mapped locations of the samples collected using addresses provided on the laboratory chain of custody. Laboratory results indicated there were no impacts of PFOS or PFOA detected above the HAL of 70 ng/L. Of the eight private wells sampled, only one sample,

(approximately 2,400 feet to the northwest of the Site and across Stoney Creek), had a detection of PFOA at 5.8 ng/L. All other private well results were Not Detected (ND) for PFAS. All other private well results were Not Detected (ND) for PFAS. According to the NYSDEC Spill Incidents Database, Spill Number 17-08575 was closed on 02/22/2019.

A Site Characterization Work Plan for the investigation of PFAS was submitted to the NYSDEC and was approved via a call with TK&K personnel on December 3, 2018. During that call, the NYSDEC requested that monitoring well (MW-10R) be re-sampled during the site characterization field work to confirm the concentration from the summer 2017 sampling event. Field work for the Site Characterization was performed in December 2018 and January 2019. As detailed in the DFSP Verona Site Characterization Work Plan dated November 2018, from December 10 to 12, 2018, TK&K and its subcontractor, Drilex Environmental, advanced nine soil borings that were completed as monitoring wells utilizing hollow-stem auger drilling techniques and a track-mounted drilling rig. Soil borings were advanced to a depth of 15 to 20 feet below ground surface (bgs.) or to refusal if the refusal depth was less than 15 feet bgs. Split-spoon samples were collected from the 0-2-foot interval below grade and at the groundwater interface from each boring for laboratory analysis. Two soil surface samples (SSPFAS -38 & SSPFAS-39) were collected to investigate shallow soils near the west wall of the AFFF pump house and to determine whether soil contamination could be a potential source to groundwater.

Source areas and the extent of PFAS in soil was evaluated at DFSP Verona through the collection and laboratory analysis of 16 soil samples collected from nine soil borings and two surface sample locations. Currently, there is not a regulatory requirement for PFAS in soil. The screening guidance for PFOA or PFOS in soil was calculated as 126 ug/kg using the USEPA Regional Screening Level (RSL) calculator and a hazard quotient of 0.1 for a residential exposure. This RSL was exceeded at surface soil sample locations SSPFAS-33 (0-2 ft) at 185 ug/kg and SSPFAS-38 (0-6 in) at 184 ug/kg. Fourteen of sixteen soil samples contained PFAS with the highest concentrations in soil sample SSPFAS-33 (0-2 ft) and surface sample SSPFAS-38 (0-6 in).

On January 8, 2019 TK&K mobilized to DFSP Verona to collect groundwater samples from fourteen groundwater monitoring wells to further assess PFAS distribution in groundwater utilizing the newly installed and existing groundwater monitoring wells on site. Laboratory results confirmed the presence of PFAS above the project screening level of USEPA's HAL criteria of 70 ng/l at DFSP Verona. It should be noted that the USEPA HAL criteria is a drinking water health advisory and the groundwater at Verona is not a source of drinking water.

The results of soil and groundwater sampling and analysis for the Site Characterization was

provided in a report titled Final Site Characterization Report, TK&K Services, (July 2019). As detailed in the Final Site Characterization Report, two of the highest PFAS results were observed in wells MW- 33 (PFOA + PFOS 5,985 ng/l) and MW-37 (PFOA + PFOS 2,680 ng/l). The elevated PFAS detections in groundwater from these wells may be related to the PFAS releases in soil near the AFFF pump house where the soil may be acting as a continuing source of PFAS contamination to groundwater. Elevated PFAS concentrations in groundwater are present downgradient of the loading rack, as indicated by the results from wells MW-36 (PFOA + PFOS 2,055.5 ng/l) and MW-10R (PFOA + PFOS 1,148.6 ng/l). The historic release of AFFF onto the concrete pad at the loading rack may have been another source of PFAS to groundwater.

From October 7 to October 8, 2019, TK&K and its subcontractor, Drilex Environmental, advanced 17 soil borings utilizing hollow-stem auger techniques and a truck-mounted drilling rig. On October 16 and 17, 2019 TK&K and its subcontractor, Cascade Environmental, advanced 20 soil borings of which six soil borings were completed as micro-wells utilizing direct-push technology (DPT) and a track-mounted Geoprobe drill rig. On December 19, 2019 TK&K and its subcontractor, Cascade Environmental, advanced 22 soil borings of which 10 soil borings were completed as micro-wells utilizing a track-mounted Geoprobe drill rig.

Between October 7 - 8 and October 16 -17, split-spoon and macro-core samples were collected from the 0-2 ft. interval below grade and at the groundwater interface at 11 soil boring locations to delineate PFAS soil contamination around soil borings SSPFAS-33 and SSPFAS-38 from TK&K's Site Characterization Report dated July 2019. Separately between October 7 - 8 and October 16 -17 split-spoon and macro-core samples were collected every 50 feet along the 1000 feet of underground AFFF pipeline at the interval below the pipeline, estimated to be between 4 to 5 feet bgs.

On December 19, 2019, four additional soil borings were advanced around past soil borings SSPFAS-33 and SSPFAS-38 from TK&K's Site Characterization Report dated July 2019, to further delineate the area. At the request of NYSDEC, eight soil borings were advanced in the area surrounding the loading rack and nearby MW-36 which was previously found to have elevated PFAS concentrations in groundwater. Macro-core samples were collected from the 0-2 ft. interval bgs and at the groundwater interface for these 12 aforementioned boring locations. Each macro-core sample was screened in the field via visual and olfactory observations. All soil samples were collected and shipped under chain of custody to SGS (Orlando, Florida) for laboratory analysis of PFAS, UCMR List by EPA Method 537.1 Modified.

Fifty-nine of seventy-one soil samples contained PFAS above the detection level, however, only four samples, as mentioned above, contained PFOS above the RSL. SSPFAS-17 was

collected within the sump near the pump house floor drain discharge pipe. This area could have been exposed to AFFF runoff after testing, cleaning or refilling activities inside the AFFF Pump House. The highest concentrations in soil are in this area and the area downgradient of the sump. The remainder of the PFAS detections were below the RSL in soil and are not indicative of a source area but rather a generalized impact from historic site releases.

On November 5, 2019 TK&K mobilized to DFSP Verona to collect groundwater samples from groundwater monitoring wells (MW-2R, MW-4, MW-5, MW-7R, MW-8R, MW-9, MW-10R, MW-13, MW-16R, MW-22, MW-23R, MW-24, MW-25, MW-27, MW-29, MW-30, MW-31, MW-32, MW-33, MW-34, MW-35, MW-36, MW-37, MW-38, MW-39, MW-40, MW-41, MW-42, MW-43) to assess PFAS distribution in groundwater utilizing the newly installed and existing groundwater monitoring wells on site. On January 7, 2020 TK&K mobilized to DFSP Verona to collect groundwater samples from ten newly installed groundwater monitoring wells (MW-44, MW-45, MW-46, MW-47, MW-48, MW-49, MW-50, MW-51, MW-52 and MW-53) to further assess PFAS distribution in groundwater utilizing the newly installed groundwater monitoring wells on site.

The November 2019 and January 2020 groundwater sampling events confirmed the presence of PFAS above the project screening level of USEPA's HAL criteria of 70 ng/l at DFSP Verona. It should be noted that the USEPA HAL criteria is a drinking water health advisory and the groundwater at Verona is not a source of drinking water. The two highest PFAS results were observed in wells MW-46 (PFOA + PFOS 13,766 ng/l) and MW-37 (PFOA + PFOS 7,775 ng/l). The elevated PFAS detections in groundwater from these wells may be related to the PFAS releases in soil near the AFFF pump house where the soil may be acting as a continuing source of PFAS contamination to groundwater downgradient.

Elevated PFAS concentrations in groundwater are present downgradient of the loading rack, as indicated by the results from wells MW-36 (PFOA + PFOS 6,147 ng/l), MW-27 (PFOA + PFOS 275.6 ng/l. The historic release of AFFF onto the concrete pad at the loading rack may have been another source of PFAS to groundwater.

2.2 *Geology & Hydrogeology*

According to the *Remedial Investigation Report* by Engineering-Science, Inc. (January 1995), soil borings and well logs for DFSP Verona indicate there are three glacially-derived unconsolidated units of variable composition, thickness, and extent. The first unit occurs across the majority of the site and consists of silt and clay with a trace of sand and gravel (glacial till). The second unit occurs predominantly in the southern half of the site and consists of silt, clay, sand, and trace amounts of gravel. The third unit is highly variable in extent and consists of sand and gravel (glacial outwash).

Underlying the unconsolidated glacial deposits is gray shale (bedrock) of the Clinton Group.

Bedrock is highly weathered for the upper few feet; below the weathered zone is massive shale with minimal fracturing. Bedrock was encountered at 20 feet bgs in the southern part of the site and within a few feet of the surface within the wetlands of Stony Creek. In 1995, three bedrock monitoring wells (MW-20D, MW-21D, and MW-22D) were to be installed to determine if facility-related contaminants were infiltrating the shallow bedrock. However, during the installation of MW-21D, no groundwater was encountered in bedrock at 90 feet below grade (70 feet into bedrock). Due to the lack of groundwater, no samples were available for analysis and bedrock wells MW-20D and MW-21D were abandoned by grouting with a bentonite and cement mixture. Bedrock is apparently not capable of yielding sufficient groundwater to be considered a productive aquifer and the potential for transport of PFAS via groundwater at the Site is limited to the unconsolidated glacial deposits that comprise the overburden aquifer.

Regionally, the principal supply of groundwater in Oneida County occurs in glacial outwash deposits. Only about one third of county residents rely on groundwater; those residents are primarily in the western part of the County. According to the October 2018 Environmental Baseline Survey (TK&K), ten water supply wells were identified in the EDR report within one mile of DFSP Verona including one public water supply well. There are no water supply wells on DFSP Verona, and the property is supplied with potable water from the Verona Water Authority.

Groundwater contour maps have been prepared from data collected from on-site monitoring wells. **Figure 3** is from Supplemental Site Characterization Report, TK&K Services (January 2020) and indicates that the direction of groundwater flow in the overburden aquifer to be generally northwest, toward Stony Creek. The same groundwater flow direction was determined by Engineering-Science in 1995. Stoney Creek is classified as Class C by the NYSDEC, with best uses listed as fishing and is considered suitable for propagation and primary and secondary contact recreation. There are also two distinct wetlands located on the property along the northwest property line and adjacent to the CSX railroad tracks. These wetlands are considered a 0.245-acre Freshwater Emergent Wetland and a 0.545-acre Freshwater Forested/Shrub Wetland. The DFSP terminal is located within a State Regulated Wetland Check Zone.

2.3 *Documented Releases*

TK&K recently prepared an Environmental Baseline Survey (EBS) (October 2018) for the Site. The EBS included review of available Site information pertaining to surrounding receptors and a Site reconnaissance and interviews with DFSP Verona personnel to determine historical usage and releases of PFAS containing AFFF used for fire suppression. PFAS containing aqueous film forming foam (AFFF) was stored in the AFFF house in 55-gallon drums that were used to fill the two 200-gallon bladder tanks of the fire suppression system for firefighting purposes.

The AFFF fire suppression system was decommissioned in August 2017. All AFFF foam product on Site was removed and flushed from the system, and properly disposed off-Site. According to the Site Maintenance Supervisor, AFFF releases at the Site include:

- Between 1988 and 1993, a lightning strike tripped a photonic eye sensor, releasing AFFF into Tank 1. Water containing AFFF was subsequently drained from Tank 1 into Berm 1. Residual dike water and AFFF liquid was recovered by a vacuum truck for off-site disposal.
- In 2003, another lightning strike caused an AFFF release onto the concrete pad of the loading rack. The AFFF was not recovered and the liquid reportedly evaporated on the pad.

3 Soil Boring and Monitoring Well Installation

3.1 *Site Reconnaissance & Utility Clearance*

TK&K proposes to advance soil borings and install monitoring wells for the collection of soil and groundwater samples, as previously discussed. Soil boring locations will be pre-marked in the field. DIG-SAFELY will be contacted at least three working days prior to the initiation of the drilling operations to mark locations of subsurface utilities within and around the proposed work area. Additionally, a utility locating contractor will be retained to identify previously unknown or private utilities on the Site. A general reconnaissance of site conditions for potential hazards, obstructions, debris, restrictions to equipment/personnel access, and overall condition of the ground surface will also be performed at the time of the soil boring location field mark-out. Proposed soil boring/monitoring well locations are illustrated on **Figure 2**. Actual soil boring locations may require adjustment in the field if access restrictions or underground obstructions are encountered.

3.2 *Groundwater and Surface Water/Sediment Characterization Activities*

The PFAS investigation will focus on the shallow groundwater, surface water and sediment at locations downgradient of the Site along the property boundary and on the adjacent property. Proposed surface water and sediment samples will be collected from Stoney Creek.

Proposed groundwater, surface water and sediment locations are shown on **Figure 2** and include:

- Groundwater samples will be collected downgradient of monitoring wells MW-44, MW-45 and MW-46 which had elevated PFOS concentrations (3,110 ng/l, 98.3 ng/l and 13,600 ng/l respectively) at the northwest property boundary.
- Groundwater samples will be collected from micro-wells and temporary wells on the

adjacent downgradient property, northwest of the DFSP and across the railroad tracks to assess the extent of PFAS contamination in groundwater.

- Surface water and sediment samples will be collected from Stoney Creek on the adjacent property northwest of the DFSP in order to evaluate if PFAS in groundwater is actively discharging to and impacting Stoney Creek.

The location of monitoring wells, surface water and sediment samples and rationale for sample collection during the investigation is provided in **Table 2**.

Upon DLA-E approval of micro-well and temporary well installation locations, TK&K will advance soil borings utilizing direct-push technology (DPT) and a track-mounted Geoprobe drill rig. Soil borings will be advanced to a depth of 15 feet bgs or to refusal if the refusal depth is less than 15 feet bgs. If areas designated for temporary well installation are inaccessible to a track-mounted drilling rig, TK&K will mobilize to the locations on foot and advance soil borings using a hand-auger and install temporary wells to the maximum depth achievable before refusal which is anticipated to be approximately 5 feet bgs.

A field geologist will oversee the drilling activities under the supervision of a Professional Geologist and in accordance with State Regulations. The site "rig" geologist will have multiple duties including Health and Safety for drilling operations, quality control, and technical oversight of all drilling activities. Following completion of each borehole, soil cuttings depicting no Flame Ionizing Detector readings will be spread in the area of the borehole. Contaminated soils will be segregated into drums, sampled, and labeled appropriately.

Permanent micro-wells will be constructed of 1-inch diameter prepacked schedule 40 polyvinyl chloride (PVC) factory-slotted screen and riser installed to intersect the top of the groundwater table. A clean sand pack will be placed in the annular space between the well screen and borehole. This sand pack will extend 1' ft. above the well screen to account for any settling that may occur. A bentonite pellet seal will be placed immediately above the sand pack and the remainder of the boring will be sealed with a cement/bentonite slurry to prevent the downward migration of surface water. Temporary wells will be constructed of 1-inch diameter schedule 40 PVC factory-slotted screen and riser installed in the hand augered boring to intersect the top of the groundwater table. A clean sand pack will be placed around the well screen and a one-foot bentonite pellet seal will be placed to the land surface.

Wells installed in unpaved areas (with the exception of temporary wells) will be provided with standpipes and locking caps, and with sealed curb boxes in paved areas. The rig geologist will prepare a standard well construction diagram to include the well details and collect representative groundwater samples from monitoring wells.

Soil classification will be recorded in the field on soil boring logs. Also, photographs will be recorded for all soil borings. Newly installed temporary and micro-wells will be developed to restore the natural permeability of the surrounding formation adjacent to the borehole prior to sampling.

Development will be performed using either surge block and pumping or over-pumping, using the drill rig pump or a peristaltic pump. Development water will be discharged to the ground surface local to the well. Wells will be developed for 30 minutes or until the development water is clear, whichever comes first.

The proposed micro-well and temporary well locations are illustrated on **Figure 2**. Field survey equipment (Leica Viva GS15 GPS unit) will be used to collect horizontal and vertical GPS field date for each sample location to be transferred to TK&K's GIS database for the site and included in the Report.

4 GROUNDWATER SAMPLING PLAN

Previous hydrogeologic investigations performed at the Site have indicated that the bedrock underlying the Site consists of shale that is not significantly fractured and not capable of producing groundwater samples for analysis. Therefore, groundwater sampling will be limited to the overburden aquifer.

Groundwater monitoring wells to be sampled are indicated on **Table 2**. Groundwater purging and sampling will be conducted utilizing low flow sampling methodology per the USEPA Region 1 Low Stress (low flow) Purging and Sampling for the Collection of Groundwater Samples from Monitoring Wells (EPASOP-GW 001). Monitoring well depths and screen lengths are included on **Table 2**.

Groundwater monitoring well samples submitted for laboratory analysis will be analyzed for:

- PFAS, UCMR List by EPA Method 537.1 (Modified).

Results of groundwater sampling will be compared to the HAL of 70 ng/L. See **Figure 2** for the groundwater sampling well locations.

4.1 *Groundwater Sampling Methodology*

Groundwater sampling will be conducted via low flow sampling techniques utilizing the following equipment:

- Adjustable rate peristaltic or submersible pumps.

- Water level measuring device (i.e. water level meter or oil/water interface probe).
- Groundwater multi-meter (YSI 560/650 or similar) with flow cell to measure temperature, specific conductance, pH, oxidation/reduction potential (ORP), dissolved oxygen (DO) for determination of well stabilization.
- Turbidity meter.
- Flow rate measurement supplies.
- Personal protective equipment (PPE) as defined in the Site HASP.
- Appropriate pre-preserved sample containers.
- Sample cooler with ice.

Depth to groundwater measurements will be collected from the wells prior to sampling. The following steps will be followed when purging monitoring wells and collecting and preserving groundwater and QA/QC samples:

- The previously decontaminated pump, multi-meter, and associated equipment will be assembled for operation with new HDPE and silicone tubing.
- The monitoring well will be purged at a rate no greater than 0.2 liters per minute (L/min) and no less than 0.05 L/min. Groundwater drawdown should be measured and kept to less than 0.3 feet wherever possible.
- Groundwater field parameters (specific conductance, pH, OPR, and DO) will be monitored incrementally after a minimum of one flow through cell volume of groundwater has been purged through the flow through cell (typically every 3 to 5 minutes).
- The purging of the monitoring well will be considered stable after three consecutive readings of all parameters stabilize per the specifications in the USEPA Region 1 Guidance. More specifically, stabilization will be achieved when turbidity variance is within 10% for values greater than 5 Nephelometric turbidity units (NTU), DO variance is within 10% for values greater than 0.5 milligrams per liter (mg/L), specific conductance variance is within 3%, temperature variance is within 3%, pH variance is within 0.1 units, and ORP variance is within 10 millivolts (mV). If stabilization criteria are not met, wells will be purged a maximum of 1 hour prior to sampling.
- Following stabilization of groundwater parameters sample containers shall be filled. Containers used for this sampling event will require two 250 ml HDPE containers for water.
- All sample containers will be labeled and stored in accordance with the sample management specifications defined in Section 4.

4.2 *Field Precautions*

The following Field Precautions will be taken during the sampling process to avoid sample cross-contamination during PFOS and PFOA sample collection:

Unacceptable Items

- No Teflon®, Gore-Tex™, Tyvek®, Blue ice, or Post-it ® products
- No waterproof or water-resistant log books, filed books, pens, or other products
- No plastic clipboards, binders, spiral-bound, or other plastic-containing record-keeping products
- No waterproof, water-resistant, or stain-resistant clothing or rain gear
- No cosmetics, moisturizers, creams, or other cleaning and showering products
- No glass or LDPE sample containers
- No Decon 90® decontamination fluid
- No food or drinks (other than as specified below)
- No new clothing (less than 6 washings)

Acceptable Items

- HDPE materials (other than sample containers)
- Acetate liners, silicon tubing, Sharpie® pens, non-waterproof paper
- Water-based ice (not Blue ice)
- PVC boots
- Cotton clothing (more than 6 washings old)
- Sunscreens, insect repellents (other than Skin-so-Soft®)
- Alconox® and Liquinox® decontamination fluid
- Bottled water, bottled Gatorade®, bottled PowerAde®, and similar bottled hydration drinks.

5 SURFACE WATER AND SEDIMENT SAMPLING

Surface water samples will be collected for PFAS analysis in a manner consistent with NYSDEC's Guidelines for Sampling and Analysis of PFAS. Due to a lack of regulatory criteria, results of surface water sampling will be compared to the HAL of 70 ng/L. See **Figure 2** for the proposed surface water and sediment sampling locations.

Surface water and sediment samples submitted for laboratory analysis will be analyzed for:

- PFAS, UCMR List by EPA Method 537.1.

5.1 *Surface Water and Sediment Sampling Methodology*

Surface water and sediment sampling will be collected utilizing the following equipment:

- Personal protective equipment (PPE) as defined in the Site HASP.
- Appropriate pre-preserved sample containers.
- Sample cooler with ice.
- PFAS-free water
- Alconox® and Liquinox® decontamination fluid

The following step will be followed when collecting and preserving surface water and QA/QC samples:

- Where conditions permit, previously decontaminated sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

Sediment samples will be collected from the bottom of Stoney Creek from the side of the creek that is closest to DFSP Verona. Samples will be collected using a steel hand auger or shovel without any coatings and a stainless steel spoon and bowl.

The following steps will be followed when collecting and preserving sediment and QA/QC samples:

- Standard two step decontamination using detergent (Alconox) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.
- When the sample is collected it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized.

5.2 *Field precautions*

Field precautions will follow guidelines discussed in Section 4.2 to avoid sample cross-contamination during PFOS and PFOA sample collection.

6 SAMPLE MANAGEMENT

The sample identification system to be used during this investigation will assign a unique

sample identifier to each sample collected. Data management will be consistent with this sample identification system. The protocols for assigning field sample numbers are described below. Each sample collected will have its own identifier, which will apply for the duration of the project. The sample identifier will consist of an alphanumeric code that will identify the site designation, sample type, sample number, and quality control (QC) sample designation (if applicable). The QC sample identifier will also consist of an alphanumeric code that will identify the QC sample designation, sampling date, and sample number (if applicable).

Location	Identifier	Location ID	Sample Depth (ft.)	Example	DESCRIPTION
DFSP Verona	GW Sample	MW-28	N/A	Verona MW-28	Groundwater sample collected from MW-28
	Duplicate GW Sample	MW-28(D)	N/A	Verona MW-28(D)	Duplicate of Sample MW-28
	Equipment QC Sample	(Date Code) E/MW-28 (GW)	N/A	12-16-2018 E/MW-28 (GW)	Sampling Equipment QC Sample
	SD Sample	SD-01	N/A	SD-01	Sediment sample collected from SD-01
	SW Sample	SW-01	N/A	SW-01	Surface water sample collected from SW-01

Field personnel will complete sample labels using indelible ink. Labels will include the project identification, sample identification, date and time of collection, sampler's initials, sample matrix, type of sample (grab or composite), analyses to be performed, and preservative used (if applicable).

6.1 *Sample Packing and Shipping*

Samples for off-site laboratory analysis will be shipped via Federal Express or by a courier provided by the laboratory for overnight delivery in waterproof coolers using the procedures outlined below. The samples taken for this project shall be considered low-level or environmental samples for packaging and shipping purposes. The sample packing procedures are as follows:

- Fill out the pertinent information on the sample label and ensure agreement with the chain of custody (COC).
- Place about 3 inches of cushioning material, such as vermiculite or bubble pack, in the bottom of the cooler.
- Wrap the sample containers in bubble pack. Place containers in the cooler in such as way that they will not touch during shipment.
- Put in additional vermiculite or bubble pack packing material to partially cover sample containers (more than halfway).
- Place ice, sealed in plastic bags, around and on top of the containers. The temperature of the samples should be maintained at 4°C +/- 2°C during shipment to the laboratory.
- Fill cooler with cushioning material.
- Close cooler and place signed custody seals on both ends of the cooler.

If a laboratory courier will pick up the cooler, the cooler may be closed and transferred to the courier. The courier will sign the COC as a record of receipt, returning one signed copy to the sampler. If samples are to be shipped via Federal Express or other delivery service, the following steps will be taken:

- Put COC record in a waterproof plastic bag and tape it to the inside lid of the cooler.
- Tape the drain shut.
- Secure the lid by wrapping the cooler completely with nylon strapping tape or duct tape at a minimum of two locations.
- Attach completed shipping label to top of the cooler and place signed custody seals on both ends of the cooler.
- Cover custody seals with clear nylon strapping tape to prevent tampering or undue breakage.

From the time of sample collection, samples for off-site analysis will be stored on ice. The laboratory will record the temperature of the samples upon arrival at the facility.

6.2 *Sample Chain of Custody*

To maintain and document sample possession, COC records will be kept. These procedures are necessary to ensure sample integrity from the collection time through data reporting. The COC protocol provides the ability to trace sample possession and handling. A sample is considered under custody if it is/was:

- In a person's possession;
- In a person's view after being in possession;
- In a person's possession and locked up; or

- In a designated secure area.

Personnel collecting samples are responsible for sample care and integrity until the samples are properly transferred or dispatched. The number of people handling a sample will be kept to a minimum.

The sampler(s) will initially complete the COC records, which shall accompany the samples at all times. The following information shall be indicated on the COC record:

- Project identification;
- Signature of samplers;
- Sample identification, sample matrix, date and time of collection, grab or composite sample designation, number of containers corresponding to that sample identification, analyses required, remarks or sample location (if applicable), and preservation method(s);
- Signature of the individual relinquishing the samples; and
- Name of the individual(s) receiving the samples and air bill number, if applicable.

The COC preparer will check the sample label and COC record for accuracy and completeness.

6.3 *Sample Quality Assurance/Quality Control (QA/QC)*

Appropriate QA/QC procedures will be implemented throughout the sampling and analyses programs. All laboratory certifications are required to remain current throughout the duration of the project. All QA/QC samples will be indicated as such on the COC. TK&K will perform a QA/QC screening on laboratory data to ensure against bias and error.

For groundwater, surface water and sediment samples, TK&K will collect one duplicate sample for every 20 sample locations. Matrix Spike and Matrix Spike Duplicate samples will be run by the laboratory for every batch of 20 samples. One equipment blank and one field blank will be collected during the groundwater sampling event, and a field blank will be prepared during the sediment sampling event. All QA/QC samples will be analyzed for PFAS via EPA Modified Method 537.1.

6.4 *Data Review*

The laboratory will provide results within ten business days of sample receipt. The data elements that will be evaluated during data review include:

- Data completeness

- Preservation and holding times
- Blanks
- Laboratory control
- Sample and sample duplicate
- Spike sample
- Quantitation limits

Final sampling data and laboratory analytical reports will be included in a completion report.

6.5 *Investigation Derived Waste Management*

Investigation Derived Waste consisting of groundwater from well development and sampling activities, and soil cuttings from drilling activities will be generated during this investigation. Well development and purge water will be returned to the ground surface local to the sampling point, and soil cuttings with no Flame Ionizing Detector readings will be spread at the location of drilling. Soil cuttings with Flame Ionizing Detector readings above zero will be containerized in 55-gallon drums and disposed off-site at an approved waste disposal facility.

6.6 *Reporting*

Following data collection, analysis and validation, a summary of results will be prepared and included in the completion report. The results will be used to address the stated objectives. The laboratory detection limit for sediment will be 0.2 micrograms per Kilogram (ug/Kg) and water will be 1.9 ng/L for PFOS and PFOA.

7 HEALTH AND SAFETY

All soil sampling, groundwater sampling, and related work performed on the Site will be conducted in accordance with the site-specific *Health & Safety Plan* (HASP) and USEPA Environmental Response Team (ERT) *Standard Operating Procedures: Soil Sampling* (ERT SOP 2012). Level D Personal Protection will be appropriate for the proposed soil sampling work on the Site. Topics of the HASP include:

- Key Personnel and Management
- Job Safety Analyses
- Work and Support Areas
- Personal Protective Equipment
- Air Monitoring
- Emergency Response
- Training Requirements and

- Medical Surveillance Program

8 REFERENCES

NYSDEC. Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program. March 1991.

Engineering-Science, Inc. Remedial Investigation (RI) for Defense Fuel Support Point Verona, New York. January 1995.

TK&K Services. Analytical Report for Perfluorinated Compounds Sampling in Drinking Water DFSP Verona, New York. December 2016.

TK&K Services. DFSP Verona PFC Groundwater Sampling Report. September 2017.

TK&K Services. DFSP Verona Aqueous Firefighting Foam System Closure Report. November 2017.

TK&K Services. Environmental Baseline Survey. Defense Fuel Support Point Verona, New York. October 2018.

TK&K Services. Supplemental Site Characterization Report. Defense Fuel Support Point Verona, New York. January 2020.

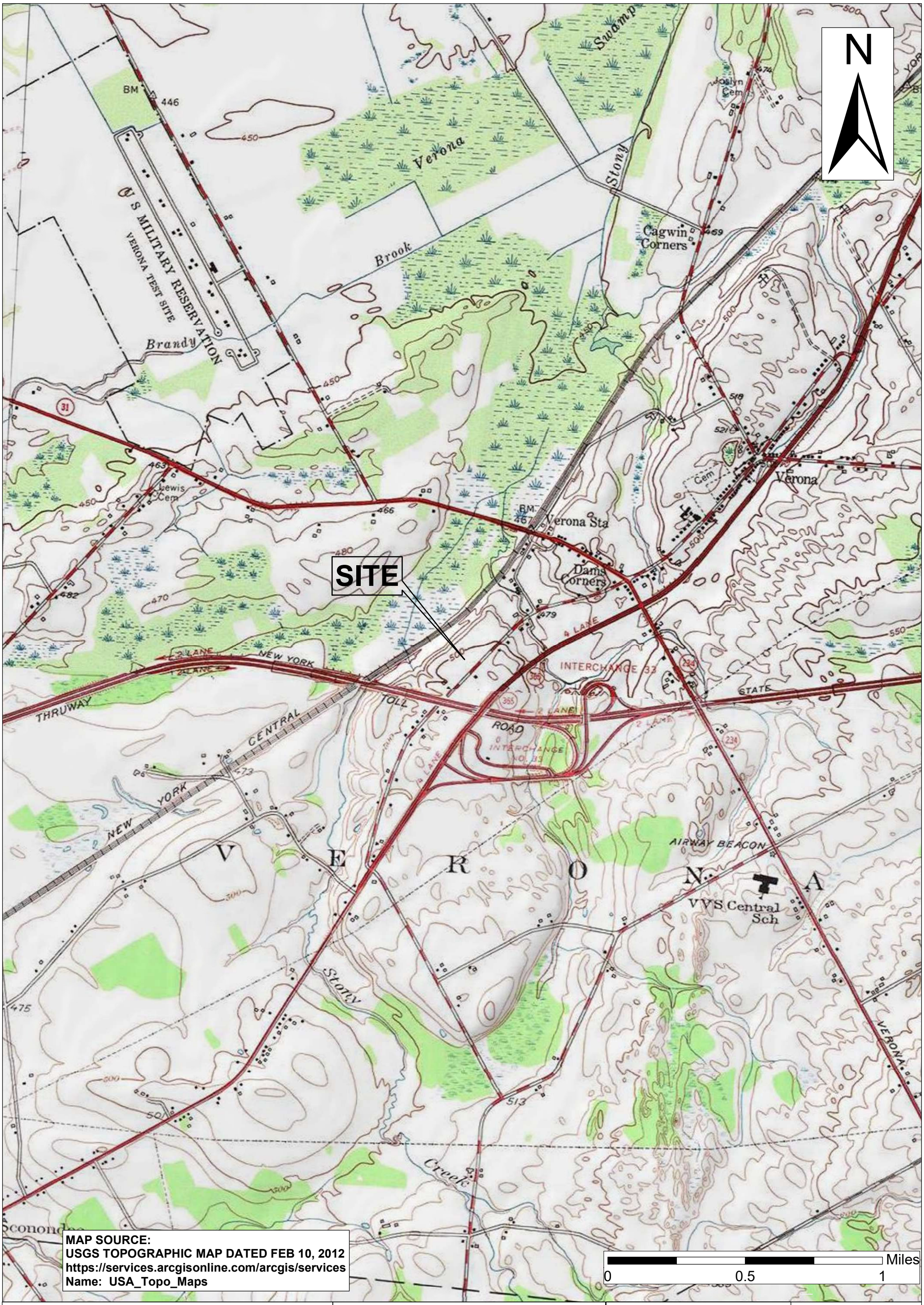
NYSDEC. Guidelines for Sampling and Analysis of PFAS. January 2020.

Tables

Table 2: Soil and Groundwater Sampling Plan
DFSP Verona
Verona, NY

Sample Designation	Location	Rationale	Well Depth (ft)	Screen Length (ft)
MW-44	Downgradient along railroad	Requested by NYSDEC	10	5
MW-45	Downgradient along railroad, immediately west of stone outfall	Requested by NYSDEC	10	5
MW-46	Downgradient along railroad, northwest	Requested by NYSDEC	10	5
SB/MW-54	North of MW-47	Cross Gradient Groundwater Delineation	15	10
SB/MW-55	Northeast of MW-46	Downgradient Groundwater Delineation	15	10
SB/MW-56	Southwest of MW-44 along railroad tracks	Downgradient Groundwater Delineation	15	10
SB/MW-57	Near the western Property boundary, along railroad tracks	Downgradient Groundwater Delineation	15	10
5 Temporary Monitoring Wells	Adjacent property	Determine extent (if any) impacts to adjacent property's groundwater	15	10
3 sediment grab samples	Canal on adjacent property, on the bank closest to the DFSP	Determine extent (if any) impacts to adjacent property's surface water and associated sediment		
3 surface water grab samples	Canal on adjacent property, upstream and downstream	Determine extent (if any) impacts to adjacent property's surface water		

Figures



MAP SOURCE:
USGS TOPOGRAPHIC MAP DATED FEB 10, 2012
https://services.arcgisonline.com/arcgis/services
Name: USA_Topo_Maps

TK&K SERVICES

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DEFENSE LOGISTICS AGENCY
SUPPORT FOR ENERGY
VERONA, NY

FIGURE 1
LOCUS MAP

SUPPLEMENTAL
SITE CHARACTERIZATION
WORK PLAN

DESIGNED BY: SC
CHECKED BY: EK
APPROVED BY: EK
DRAWN BY: SC
SCALE: AS SHOWN
DATE: 03/23/2020

PROJECT No.:
8006-0014

N

298.002-1-9.2

298.002-1-10

298.002-1-1.1

Existing Monitoring Wells to be Sampled

MW55
MW54
MW46
MW47
MW45
MW41
MW48
MW44
MW42
MW40
MW43
MW32
MW39
MW49
MW56
MW30
MW9
MW37
MW38
MW57
MW5
MW10R
MW33
MW2R
MW50
MW31
MW27
MW51
MW34
MW36
MW35
MW52
MW4
MW29
MW53
MW24
MW16R
MW13
MW23R
MW7R
MW25
MW3R
MW8R

BUCKEYE PIPELINE
APPROXIMATE LOCATION
NOT FIELD VERIFIED

Legend

- Proposed SW/SD Sample Location
- Proposed GW Grab Sample Location
- Proposed Micro-well Location
- Monitoring Wells
- Oneida Parcels
- Fence Line

0 40 80 160 240 320 400 Feet

AFFF SYSTEM SOURCE: US ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS OMAHA DISTRICT JUNE 2012 (NOT FIELD VERIFIED)

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DEFENSE LOGISTICS AGENCY
SUPPORT FOR ENERGY
VERONA, NY

FIGURE 2
PROPOSED SAMPLING LOCATIONS

SUPPLEMENTAL
SITE CHARACTERIZATION
WORK PLAN

DESIGNED BY: SC
CHECKED BY: EB
APPROVED BY: EB
DRAWN BY: SC
SCALE: AS SHOWN
DATE: 03/12/20

PROJECT No.:
8006-0014

STONEY CREEK
(NOT PICTURED)

N

MW46
469.51'

MW47
478.12'

MW45
467.95'

MW41
474.85'

MW48
492.48'

MW44
467.08'

470'

MW42
474.85'

MW40
492.68'

475'

MW43
472.78'

MW32
494.54'

MW39
498.47'

MW49

MW30
492.92'

MW38
497.45'

BUCKEYE PIPELINE
APPROXIMATE LOCATION
NOT FIELD VERIFIED

MW9
475.12'

MW37
497.53'

MW5
474.40'

MW10R
491.20'

MW33
498.35'

FIRE SUPPRESSION
WATER TOWER

MW2R
495.02'

AFFF
PUMP HOUSE

LOADING RACK

MW50
500.57'

MW51
500.37'

MW35
501.57'

MW34
501.64'

480'

MW31
484.36'

MW27
499.72'

485'

FORMER
TANK 4
(DEMOLSHED)

MW36
497.39'

MW52
500.44'

ADMINISTRATION
LAB BUILDING

MW4
484.78'

MW29
489.98'

MW53
500.18'

MW24
501.28'

490'

MW16R
489.20'

MW13
503.04'

TANK 1

TANK 3

495'

MW23R
497.45'

MW7R
503.63'

MW25
499.60'

TANK 2

500'

MW3R
501.26'

MW8R
503.11'

Legend

- Monitoring Wells
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Existing Aboveground AFFF Lines
- Existing Underground AFFF Lines
- Former Aboveground AFFF Lines (Removed)
- Low Sump Point
- Surface Sample
- Fence Line
- 489.99' Groundwater Elevation

NOTE: Groundwater level for MW-49 was not obtained due to obstruction (frozen condition).

0 20 40 80 120 160 200 Feet

ELEVATION BENCHMARK WAS FINISHED FLOOR OF THE ADMINISTRATION LAB BUILDING (506.81)

AFFF SYSTEM SOURCE: US ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT JUNE 2012 (NOT FIELD VERIFIED)

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DEFENSE LOGISTICS AGENCY
SUPPORT FOR ENERGY
VERONA, NY

FIGURE 3
GROUNDWATER CONTOUR

SUPPLEMENTAL
SITE CHARACTERIZATION
WORK PLAN

DESIGNED BY: SC
CHECKED BY: EK
APPROVED BY: EK
DRAWN BY: SC
SCALE: AS SHOWN
DATE: 03/23/2020

PROJECT No.:
8006-0014