SUPPLEMENTAL WORK PLAN
PHASE 2A REMEDIAL INVESTIGATION
TACONIC SITE

Prepared For:

Taconic, Inc.
136 Coonbrook Road
Petersburgh, New York 12138

NYSDEC Site No. 442047

Prepared By:

301 Plainfield Road, Suite 330
Syracuse, New York 13212

OCTOBER 2020

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

ACRONYM	Definition
CAMP	Community Air Monitoring Plan
COPC	Constituents of Potential Concern
CSM	Conceptual Site Model
DO	dissolved oxygen
EPA	United States Environmental Protection Agency
ERI	electrical resistivity imaging
FSAP	Field Sampling and Analysis Plan
FSP	Field Sampling Plan
ft bgs	fee below ground surface
FWIA	Fish and Wildlife Impact Analysis
HASP	Health and Safety Plan
IDM	investigation derived materials
IID	Interim Investigation Deliverable
IRM	Interim Remedial Measures
MASW	multichannel analysis of surface waves
MPR	monthly progress report
NTU	nephelometric turbidity units
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	oxidation reduction potential
PFAS	Per- and Poly-Fluoro Alkyl Substances
PFOA	Perfluorooctanoic Acid
PPE	personal protective equipment
PTFE	polytetrafluoroethylene
PVC	polyvinyl chloride
PW	production wells
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
SPLP	Synthetic Precipitation Leaching Procedure
TOC	total organic carbon

1.0 INTRODUCTION

Tonoga, Inc. d/b/a Taconic (Taconic) has prepared this Supplemental Phase 2a Remedial Investigation (RI) Work Plan for the Taconic Site (Site) located in the Town of Petersburgh (Town), Rensselaer County, New York. The Remedial Investigation/Feasibility Study (RI/FS) is being conducted in accordance with the requirements of the Administrative Settlement Agreement and Order on Consent (Index No. CO 4-20160519-01) (Settlement Agreement) executed between the New York State Department of Environmental Conservation (NYSDEC) and Taconic, with an effective date of November 20, 2016. The Site is listed on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site (Site No. 442047).

A phased investigation approach was established in the RI/FS Work Plan (OBG 2018) and approved by the NYSDEC. This supplemental Phase 2a RI Work Plan describes the activities of Phase 2a intended to identify the primary route(s) for off-site migration of constituents of potential concern (COPCs) and to perform Part 1 of the Fish and Wildlife Impact Analysis (FWIA). Taconic will prepare and submit supplemental work plans to the NYSDEC for review and approval as needed to complete the RI.

Phase 2a activities and analysis will be performed in accordance with the Field Sampling and Analysis Plan (FSAP) (Appendix A), Quality Assurance Project Plan (QAPP) (Appendix B), Health and Safety Plan (HASP) (Appendix C), and Community Air Monitoring Plan (CAMP) (Appendix D). These plans were previously submitted to and approved by NYSDEC. The FSAP and QAPP have been updated to include additional investigation activities proposed for Phase 2.

1.1 Site Description

Taconic owns a facility in Petersburgh, New York where it manufactures polytetrafluoroethylene (PTFE) coated fabrics. The Site is located in a rural area, at the northernmost intersection of Coonbrook Road and State Route 22 (Figure 1). The Site is a 23.54-acre area that features nine structures related to manufacturing and three parking lots (Figure 2). There is an unnamed stream that runs through the Site and another running south of the Site. The Site is currently an operating manufacturing facility. The surrounding parcels (some of which are owned by Taconic) are residential or undeveloped. The Little Hoosic River runs south to north on the opposite side of Route 22 from the Site.

1.2 Project Background

As described in the RI/FS Work Plan, Taconic has completed Phase 1 of the Remedial Investigation. The objectives of Phase 1 were to begin to define the nature of COPCs, evaluate the extent of COPC impacts in environmental media (e.g. groundwater, surface water, and soil), and develop a preliminary conceptual site model (CSM).

Phase 1a, conducted between April and September 2018, consisted primarily of sampling and analysis of various environmental media, such as surface soil, subsurface soil, surface water and sediment. Based on the results of the Phase 1a RI, Taconic implemented Phase 1b of the RI between April and October 2019, consisting primarily of the installation and testing of groundwater monitoring wells.

The results of the Phase 1a and 1b RI are summarized in the Interim Investigation Deliverable (IID), which was submitted to NYSDEC on February 28, 2020. The IID (Parsons, 2020) is provided in Appendix E. The Phase 1 results serve as the basis for the additional investigations for Phase 2 of the RI described in this supplemental RI Work Plan.

Phase 2 is intended to complete the requirements of an RI as described in *DER-10/Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010). The objective of the Phase 2 RI is to expand the sampling and analysis of environmental media within the site and adjacent off-site areas to better define the potential source areas, migration pathways, and the nature and extent of the compounds at or emanating from the Site.

Like Phase 1 of the RI, Phase 2 will also be completed in iterative phases, whereby data gathered in the initial phases will be used to plan and implement subsequent phases, as needed, to identify and design potential Interim Remedial Measures (IRMs) and to ultimately complete the RI.

This supplemental Phase 2a RI Work Plan describes the activities of Phase 2a intended to identify the primary route(s) for the off-site migration of COPCs and to perform Part 1 of the FWIA. Taconic will prepare and submit supplemental work plans to the NYSDEC for review and approval, as needed, to complete the RI, including Part 2 of the FWIA.

2.0 CONTACTS

Key contact information for NYSDEC, New York State Department of Health (NYSDOH), and Taconic is provided below:

NYSDEC

Barbara Firebaugh, P.G.
625 Broadway
Albany, NY 12233
Barbara.Firebaugh@dec.ny.gov

NYSDOH

Angela Martin
Bureau of Environmental Exposure Investigation
Corning Tower, Room 1787
Albany, NY 12237
Angela.martin@health.ny.gov

Taconic

A. Jeff Mirarchi, P.E.
Project Engineer
136 Coonbrook Road
Petersburgh, NY 12138
jeffm@4taconic.com

3.0 PRELIMINARY CONCEPTUAL SITE MODEL (CSM)

A preliminary CSM has been developed based on information from previous investigations and data obtained from Phase 1 of the RI. This preliminary CSM has been modified from that presented in Section 1.3.5 of the RI/FS Work Plan (OBG 2018) to incorporate data that has been obtained thus far in the RI. Additional information will be obtained about the geology and hydrogeology at the Site during Phase 2 of the RI, and the CSM will be refined after collection of additional data. This information will be compiled with regional information and presented in the Phase 2a Interim Investigation Deliverable, and ultimately in the RI Report. The preliminary CSM is described in the following subsections and illustrated in Figure 3,

3.1 Summary of Media

Based on Phase 1 results, potentially impacted media on and adjacent to the site include surface water, groundwater, surface soil, subsurface soil, and sediment. Additional sampling will be performed during Phase 2a to further assess impacts to environmental media.

3.2 Physiography and Geology

The Site is located in a northeast to southwest trending glacial valley. Topography moving across the Site consists of a steep valley wall to the west of the Site and relatively flat terrain toward the east, with a slight downward slope approaching the Little Hoosic River. The Little Hoosic follows the northeast-southwest trend of the valley and flows toward the northeast, generally consistent with the strike of foliation for the underlying phyllite bedrock. Surface water in the vicinity of the Site flows down from the hillside and follows a network of swales and storm sewers, which eventually discharge to the Little Hoosic River and its tributaries that flow into the river from the west. Two unnamed streams flow east through the Site, one south of the Site and the other through the middle of the Site, directly south of the Building 2/4/5 complex.

Bedrock at the Site is composed of phyllite and contains a weathered zone within the top few feet of rock. Depth to bedrock varies greatly throughout the Site, with very shallow bedrock in the north and west portions of the Site, increasing in depth moving to the south and east. Bedrock is encountered at approximately 4 feet below ground surface (ft bgs) on the northwest side of the Site (adjacent to building 1) and at approximately 63 ft bgs in the center of the Site, with deepest bedrock being encountered adjacent to the Little Hoosic River, at 75 ft bgs. Weathered bedrock is overlain by a discontinuous glacial outwash sand and gravel unit, which is overlain by a glaciolacustrine silt and clay that include some interspersed lenses of sand and gravel. In the absence of the lower sand and gravel unit, the glaciolacustrine silt and clay is in contact with the top of bedrock. The silt and clay unit varies in thickness, with the thickest portion being in the center of the Site beneath the Building 2/4/5 complex, pinching out at the bedrock valley walls. Surface deposits above the glaciolacustrine silt and clay are post-glacial sand and gravel, with a few pockets of surficial fill.

3.3 Hydrogeology

3.3.1 Hydrostratigraphy

The hydrostratigraphic framework at the Site consists of three distinct water-bearing zones and an aquitard. Water-bearing fractures are present within the phyllite bedrock. In places, the discontinuous lower sand and gravel unit is in contact with gravelly weathered bedrock collectively forming a hydraulic unit in which both materials contain water (Figure 3). A surficial water-bearing zone is present in the upper sand and gravel unit. Within the valley and the beneath the site, the surficial water-bearing zone and the deep water-bearing zone are separated by a glaciolacustrine aquitard, composed of the silt and clay unit. This aquitard restricts the flow of groundwater between the shallow and deeper units. However, the unconsolidated units pinch out at the western side of the valley and bedrock is observed, in places, as the topography rises out the valley. Therefore, the presence and competency of the aquitard is less substantiated along the western side of the site.

3.3.2 Hydraulic Boundary Conditions

This section summarizes the nature of groundwater flow, based on interpretation of potentiometric elevations, relative to boundary conditions: 1) Little Hoosic River and its tributaries; 2) physiography (valley orientation); 3) overburden aquitard; and 4) pumping influences.

Surficial Water-Bearing Zone (Upper Sand and Gravel)

The potentiometric surface of the shallow surficial water-bearing zone declines to the east, indicating groundwater flow toward and potential discharge to the Little Hoosic River. Tributary streams from the west are also expected to locally influence groundwater flow within the surficial water-bearing zone, consisting of groundwater discharge where streams are gaining and groundwater recharge where streams are losing.

Deeper Water-Bearing Zone (discontinuous Lower Sand and Gravel)

Beneath the facility, the potentiometric surface of the deeper water-bearing zone declines to the east in the direction of the Little Hoosic River. Farther from the facility along State Route 22, the potentiometric surface exhibits a northerly hydraulic gradient, oblique to the Little Hoosic River. The silt and clay aquitard is expected to inhibit discharge of groundwater from the deeper water-bearing zone to the shallow water bearing zone and surface water, and the alignment of the bedrock valley is expected to influence deeper groundwater flow to the northeast.

Water-Bearing Fractures in Bedrock

The orientation of bedrock fractures and foliation of the phyllite are expected to influence groundwater flow direction in bedrock beneath the weathered zone, by creating anisotropy in the hydraulic gradient field (i.e., increased hydraulic conductivity in the direction of foliation and facture orientation). The northeast trend of the valley suggests northeast-southwest structural orientation which is supported by borehole geophysical logging measurements. Specifically, there are a higher number of fractures with a prominent northeast-southwest strike.

Pumping Influences

Groundwater flow within overburden water-bearing zones appears to be influenced by water extraction from the Taconic production wells (PWs) and potentially from nearby residential wells. Groundwater elevation data indicate a downward hydraulic gradient between surficial and deep overburden water-bearing zones in the center of the site, which is potentially induced by pumping at nearby wells. Though a downward gradient is observed, the glaciolacustrine aquitard likely inhibits vertical migration based on the vertical head difference of approximately 10 feet observed between the surficial and deep overburden water-bearing units.

3.3.3 Hydraulic Properties

Hydraulic conductivity test results indicate similar average hydraulic conductivities among wells screened in the three different water bearing zones. The mean hydraulic conductivity from wells screened within bedrock was 7.78E-04 cm/sec, which is consistent within the expected range of hydraulic conductivity for fractured metamorphic rock (Heath 1983). Mean hydraulic conductivities of the deeper water-bearing unit and surficial water-bearing unit were 1.41E-03 cm/sec and 2.18E-03 cm/sec, respectively, both of which fall within range of hydraulic conductivities for sand (Heath 1983). The surficial water-bearing unit has a slightly higher hydraulic conductivity than the deeper and bedrock fracture units, and hydraulic conductivity within bedrock is slightly lower than the other two water-bearing units.

4.0 SCOPE OF WORK

4.1 Objectives

The objectives for Phase 2a of the RI are as follows:

1. Expand the extents of surface and shallow unsaturated subsurface soil samples in off-site areas proximal to the Site to assess the potential impacts related to deposition of PFAS from historic air emissions, including the assessment of potential impacts related to leaching and migration to groundwater;
2. Expand the sampling of surface water and stormwater runoff within the Site and in adjacent upstream and downstream areas to better define the distribution of PFAS concentration;
3. Install, test, and sample additional overburden monitoring wells within the Site and in adjacent off-site areas to refine the conceptual site model, improve the definition of shallow groundwater gradients and flow/discharge areas, evaluate the hydraulic connection between shallow groundwater and surface water, and evaluate the off-site migration of PFAS;
4. Install, test, and sample additional bedrock groundwater monitoring wells within the Site and in adjacent off-site areas to refine the conceptual site model, improve the definition of bedrock groundwater gradients and flow, and evaluate the off-site migration of PFAS; and,
5. Perform Part 1 of a FWIA to identify actual or potential impacts to fish and wildlife resources.

4.2 Investigation Approach and Media

The objectives listed in Section 4.1 will be achieved in Phase 2a through additional sampling and analysis of impacted environmental media, including unsaturated soil, surface water / stormwater, overburden groundwater, and bedrock groundwater. Testing will also be performed to improve understanding of potential off-site transport mechanisms, including historic air emissions, surface water and groundwater interactions, and groundwater pathways in overburden and bedrock. Proposed investigation activities are detailed in the following subsections.

4.2.1 Unsaturated Soil

Impacts to unsaturated subsurface soil have been observed on-site. At most locations, highest concentrations occurred in shallower intervals, from 0.5 to 8 ft bgs. Impacts to surface soil have been observed both on- and off-site, particularly north of the site. Although the Phase 1 data indicates the concentration of Perfluorooctanoic Acid (PFOA) in all samples of surface soil were well below the United States Environmental Protections Agency's (EPA's) site-specific action level for soil (1 ppm) established for the Hoosick Falls sites, additional soil sampling is proposed for Phase 2a to assess potential impacts to groundwater from leaching from impacted soil. Additional soil sampling in Phase 2a will focus on off-site soil to assess potential impacts from historic air emission deposition and define the vertical concentration profile. In order to acquire this data, soil samples will be collected from 24 locations (Figure 4) as described in the following subsections. A summary of proposed unsaturated soil sampling is provided in Table 1.

4.2.1.1 Location Selection

Twenty-four sampling areas were selected in the vicinity of the Site. Specific sample locations will be selected in these areas with NYSDEC concurrence based on the following criteria:

- Land appears undisturbed (not cultivated, farmed, filled, or manicured) for the past 60 years;
- No indication or evidence of dumping or other potential sources of contamination nearby;
- Outside of the floodplain;
- Not within a wetland;
- Sufficient soil thickness available (avoiding bedrock outcrops and areas of shallow bedrock); and
- Access agreement with the property owner.

4.2.1.2 Sampling and Analysis

At each location, surface (0-2 inches bgs), near surface (2-12 inches bgs) and subsurface (12-24 inches bgs) grab soil samples will be collected using a stainless-steel hand auger. A composite sample of 0-24 inches will also be collected. Boulders and cobbles may be encountered, especially in collection of 12 to 24 inch bgs samples. If refusal is encountered, the sampling location will be offset by approximately 3 feet up to two times. If refusal is encountered at all offsets for a given location, the sampling interval in which refusal was reached will not be collected. Each sampling location will be documented by a recognizable landmark, with a handheld GPS unit, and marked in the field using survey flagging

Surface (0-2 inches bgs) and near surface (2-12 inches bgs) grab soil samples will be analyzed for Per- and Poly-Fluoro Alkyl Substances[1] (PFAS), and up to five samples will also be analyzed for PFOA substitutes consisting of 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA. Subsurface (12-24 inches bgs) grab soil samples, as well the composite sample, will be sent to the lab placed on-hold. Based on the results of surface and near surface samples, the subsurface sample and the composite soil sample from one-third of locations will be selected for analysis, with DEC concurrence. The selected subsurface soil samples will be analyzed for PFAS. The selected composite samples will be analyzed for TOC and the Synthetic Precipitation Leaching Procedure (SPLP) will be performed and the extract will be analyzed for PFAS. All sample collection, handling, and analysis will be performed in accordance with the FSAP and QAPP.

4.2.1.3 Monitoring Well Installation Soil Sampling

In order to gain a more detailed understanding of the connection between soil, leachate, and groundwater PFAS concentrations, soil samples will be collected during overburden monitoring well installation at a subset of locations (MW-17, MW-19, and MW-23). Locations have been selected based on the Phase 1 surface and subsurface soil sampling results. Samples will be collected in the following intervals: 0-2, 2-12, and 12-24 inches

[1] All PFAS analyses will be performed for the 21 PFAS analytes as specified in QAPP.

bgs as well as the 12-inch interval directly above the water table, as estimated during soil logging. In addition, samples will be collected from the following subsurface zones (if encountered): mottled zones (encompassing the total thickness of the observed mottling) and subjectively impacted soils (based on visual, olfactory, or other field screening observations). All samples will be analyzed for PFAS, SPLP PFAS, and TOC. Sample collection, handling, and analysis will be performed in accordance with the FSAP, QAPP.

4.2.2 Surface Water and Stormwater

Surface water and stormwater samples have been collected during six sampling events as part of Pre-RI and RI Phase 1 activities. A total of 15 locations have been sampled from natural streams and ponds, including the Little Hoosic River, as well as from storm water infrastructure (ponds, drainage ditches, outfalls, etc.) throughout the site.

During Pre-RI and Phase 1 activities, concentrations of PFOA in samples from natural surface water and stormwater infrastructure sampling locations were greater than 10 ng/L, indicating that further assessment may be warranted according to NYSDEC's PFAS guidance document (NYSDEC 2020).

In order to better define concentrations of PFAS, additional sampling of surface water and storm water runoff within the site and in adjacent upstream and downstream areas will be performed during Phase 2a.

4.2.2.1 Baseflow Natural Surface Water Sampling Locations

Natural surface water sampling will occur at 24 locations in streams and rivers throughout the vicinity of the Site, including multiple locations in the Little Hoosic River (Figure 5) and associated tributaries. Two rounds of samples will be collected at each location during baseflow conditions approximately four months apart. Proposed natural surface water sampling is summarized in Table 2.

4.2.2.2 Storm Flow Stormwater and Natural Surface Water Sampling Locations

Samples will be collected from stormwater features (catch basins and drainage swales) at five locations on and near the site (Figure 6). Two rounds of samples will be collected from stormwater features, both during storm flow conditions. Additionally, a subset of natural surface water locations (SW-16, SW-17, SW-21, SW-22, SW-24, SW-31, SW-32, and SW-33) will also be sampled during storm flow conditions. Therefore, these surface water locations will be sampled a total of four times and provide data regarding both baseflow and storm flow. Because sampling events are based on flow conditions, evaluation of high and low stream flows will be used to determine the sampling schedule, rather than a rigid schedule. Proposed stormwater sampling is summarized in Table 2.

4.2.2.3 Surface Water and Stormwater Sampling and Analysis

Prior to sampling during base flow conditions, field parameters (temperature, pH, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity) will be measured. Measurement of field parameters is not proposed for stormflow sampling so that samples can be collected more quickly during consistent flow regimes. Each sampling location will be documented by a recognizable landmark, with a handheld global positioning system (GPS) unit, and marked in the field using survey flagging, so that the same location may be sampled during subsequent events. Samples will be collected from the middle of the water column, with care being taken to not sample near the air-water interface nor near the mudline.

All surface water and storm water samples will be analyzed for PFAS. Up to five samples during one round of baseflow and one round of storm flow will also be analyzed for PFOA substitutes, consisting of 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA. Sample collection, handling, and analysis will be performed in accordance with the FSAP and QAPP.

4.2.3 Stream Elevation Gauging

The free water surface elevations of natural surface water drainages will be measured and used to supplement groundwater potentiometric elevation monitoring to provide a more cohesive potentiometric surface. Three survey points or staff gauges will be installed, one in the unnamed stream on the facility property (near buildings 4 and 5) and two in the Little Hoosic River (one upstream and one downstream of the facility) (Figure 6). The Little Hoosic upstream location is anticipated to be installed near Brimmer Bridge Road and the downstream location on the Taconic-owned “campground property” east of NYS Route 22. Specific locations will be determined based on field reconnaissance.

Staff gauges will be mechanically driven into the stream bottom by hand methods and surveyed for elevation at the top of the staff gauge. Each staff gauge will be photographed for future reference to assess any movement or disturbance, and re-leveled for elevation, as necessary. Stream elevation will be measured from the top of the staff gauge using a water level indicator, tape measure, or folding ruler.

4.2.4 Surface Geophysical Profiling

Surface geophysical profiling will be performed to gain a better understanding of subsurface conditions, including stratification, top of bedrock surface, and features that may serve as preferential groundwater pathways. Surface geophysics transects will be conducted along the north-northeast perimeter of the Taconic property, generally corresponding to a traverse that includes proposed monitoring wells MW-21, MW-22, and MW-23 (Figure 7). This transect is oriented transverse to the orientation of the valley and to the northeast strike of fractures and foliation within the phyllite bedrock, which corresponds to the inferred groundwater flow direction in bedrock. Surface geophysical methods to be implemented include seismic and electrical methods: 1) multichannel analysis of surface waves (MASW) and 2) electrical resistivity imaging (ERI). The findings of the surveys will be used to inform the targeted placement of monitoring wells and enhance the conceptual site model.

4.2.4.1 Multichannel Analysis of Surface Waves

The MASW survey is expected to identify stratigraphic surfaces and discontinuities that may inform the conceptual site model and affect fluid flow and plume migration, including the potential for a weathered bedrock transition zone, paleochannels, and other fractures or weathering-induced weaknesses in the top of bedrock. MASW measures shear wave velocity of seismic surface waves generated from an energy source, such as a sledgehammer or weight drop. Shear-wave velocity is a direct indicator of the ground strength or stiffness, which helps distinguish between different types of strata or weaknesses in that strata. The procedure will produce a two-dimensional cross section based on collecting multichannel seismic records at multiple locations.

4.2.4.2 Electrical Resistivity Imaging

The ERI survey will be conducted using an earth resistivity meter, which measures the apparent conductivity of the subsurface employing an artificial source which is introduced through point electrodes. Electrodes will be driven into the ground by hand or with hand tools if refusal is met by hand. The ERI survey is intended to identify zones of saturation (e.g., saturated fracture in bedrock, or saturated sand channel), distinguishable due to the presence of ionic water in contrast with unsaturated or less saturated geologic materials (e.g., dry, solid bedrock). These features are expected to potentially influence the occurrence and migration of fluid flow in the off-site groundwater migration direction. The procedure will produce a two-dimensional cross section based on contrast between electrically conductive (saturated media) and electrically resistive earth (e.g., dry, unfractured bedrock). An electrode spacing of 10 feet will typically yield a depth of penetration of 100 ft bgs, which can be adjusted based on electrode spacing.

4.2.5 Overburden Groundwater

During Pre-RI and Phase 1 activities, a total of 24 overburden wells were installed and sampled. Of the sampled wells, 14 were shallow and were generally screened within the surficial water-bearing layer, comprised of the upper sand and gravel unit. The remaining 10 wells were screened in the deep overburden (lower sand and gravel and upper weathered bedrock). PFOA was detected in samples from both the shallow and deep overburden monitoring wells at concentrations greater than 10 ng/L, indicating that further assessment may be warranted according to NYSDEC's PFAS guidance document (NYSDEC 2020).

Additional overburden groundwater monitoring wells will be installed at five locations (Table 3 and Figure 8) to provide perimeter and downgradient characterization of PFOA concentrations, and to improve the definition of the shallow groundwater potentiometric surface, including hydraulic gradients and groundwater flow/discharge areas.

4.2.5.1 Location Selection

Overburden monitoring wells are proposed to provide perimeter characterization around the facility and to better define the potentiometric surface and groundwater flow direction (Figure 8). Locations of proposed monitoring wells are subject to change based on the results of surface geophysics, if specific zones of saturation in overburden or other subsurface groundwater features are identified. It is anticipated that up to two wells will be installed at each location, with one well being screened in each sand and gravel water-bearing unit encountered with sufficient thickness for monitoring well construction.

4.2.5.2 Well Installation and Development

Overburden drilling and monitoring well installation will be accomplished using hollow-stem auger and/or sonic drilling techniques. During installation, soil cores will be collected continuously and logged in accordance with the procedures presented in the FSAP. Soil samples will be collected as described in Section 4.2.1.3. Given the variable thickness of overburden material across the site, well depths will vary. It is anticipated that one well at each location will be screened in surficial sand and gravel and the other will be screened in deep sand and gravel (where these units are encountered), which are separated by the glaciolacustrine aquitard. Wells will be installed with 5 to 10 feet of slotted polyvinyl chloride (PVC) screen with a slot size of 0.010- or 0.020-inch, based on the grain size of screened material. The screen will be followed by PVC riser to approximately 3 ft above ground or just below ground surface, depending on the finishing specifications of each well. The annular space will be filled with filter sand (#00 or equivalent) to approximately 2 feet above the top of the screen, followed by bentonite, and grout to the surface. Wells will be finished with either a 3-foot stick-up protective casing or a minimum 8-inch diameter flush-mount protective casing. Stick-ups and flush-mount completions will be set in an approximately 2-foot diameter concrete pad. A locking J-plug will be installed on top of the well.

Monitoring wells will be developed in accordance with the FSAP to remove the fine material which may have settled within the wells, to remove introduced drilling fluids, and to provide better hydraulic communication with the surrounding formation. After allowing the grout to set for a minimum of 24 hours, well development can begin. Development will consist of surging and purging the well until water is clear, when field measured turbidity values are below 5 NTUs and/or turbidity values have stabilized, or when ten volumes are removed. In the event of low yielding wells, development of those wells will consist of purging dry three times over three consecutive days or less. During well development, pH, temperature, DO, oxidation-reduction potential (ORP), turbidity and specific conductance will be measured and recorded after each well volume. After allowing 72 hours for the aquifer and the well to re-equilibrate groundwater sampling can begin.

4.2.5.3 Sampling and Gauging

Following well development and the subsequent equilibration period, newly installed overburden monitoring wells will be sampled using techniques as described in the FSAP. Water quality parameters will be measured using a flow-through cell during the low-flow sampling. Measurements of DO, ORP, temperature, pH, specific conductivity and turbidity will be obtained. Groundwater samples will be collected for PFAS analysis, and managed and analyzed in accordance with the QAPP. A subset of samples (up to ten total between overburden and bedrock groundwater) will also be analyzed for PFOA substitutes consisting of 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA.

Prior to installation of new groundwater monitoring wells, one round of manual water-level measurements will be collected from all previously installed monitoring wells. After well installation, manual water-level measurements will be collected from the newly installed monitoring wells as well as old wells. The resulting data will be used to estimate horizontal and vertical hydraulic gradients, assist in assessing compound fate and transport, and to help refine the CSM.

4.2.6 Bedrock Groundwater

Prior to Phase 1, the three production wells at the site, two of which are open-hole bedrock wells (PW-1 and PW-2), were sampled and analyzed for PFAS. Results from both bedrock wells indicate PFOA concentrations greater than 10 ng/L indicating that further assessment may be warranted according to NYSDEC's PFAS guidance document (NYSDEC 2020). During Phase 1, two exploratory boreholes were drilled to a depth of 25 ft into bedrock to assess overburden and bedrock conditions, and samples of bedrock groundwater were collected from each of these open-hole wells. Data from EXB-1, located in the center of the site (Figure 8), indicate PFOA concentrations greater than the 10 ng/L guidance value. PFOA concentrations from EXB-2, located off-site, adjacent to the Little Hoosic River (Figure 8), were less than the guidance value. During Phase 1, two unused supply wells (RW-185CBR and RW-Camp) were also sampled and samples from both yielded PFOA concentrations above 10 ng/L. Concentrations above the guidance value indicate that further assessment of PFAS in bedrock groundwater is necessary.

To further asses bedrock groundwater quality and improve definition of groundwater flow within bedrock, up to six bedrock monitoring wells are planned for installation (Figure 8). Initially, three bedrock monitoring wells along a potential migration pathway from the facility to the north and northeast will be installed, developed, tested, and sampled as described in the following subsections. Data from testing and sampling of these wells will inform the final placement and construction of additional bedrock groundwater monitoring wells, if needed.

4.2.6.1 Location Selection

Bedrock monitoring wells are proposed to provide perimeter characterization around the facility, and along a potential migration pathway to the northeast (Figure 8). Potential migration to the northeast is based on measurements of fractures and foliation with a predominant northeast strike direction (N42°E) measured by borehole geophysics conducted in PW-1, PW-4, and RW-159 (Figure 8). Transverse surface geophysical profiling (MASW and electrical resistivity imaging) will be used to more optimally locate proposed monitoring wells along this transect (Figure 7), based on evidence of subsurface features such as depressions in the bedrock surface, zones of bedrock weakness, and zones of saturation, which may influence groundwater flow direction and migration.

4.2.6.2 Installation Sequence

Proposed bedrock monitoring wells MW-20BR, MW-22BR, and MW-23BR will be drilled and installed followed by borehole geophysical logging and discrete interval packer sampling. In consultation with DEC, these data well be used to determine the final location, construction, and testing of the remaining perimeter bedrock monitoring wells to be installed.

4.2.6.3 Depth and Construction

Proposed bedrock monitoring wells MW-20BR, MW-22BR, and MW-23BR (Figure 8) will be installed to target depths as follows:

- MW-20BR (160 feet bgs)
- MW-22BR (240 feet bgs)
- MW-23BR (260 feet bgs)

The proposed target depth of MW-20BR is based on proximity to a potential shallow/surface release location and includes the upper transmissive zone identified in PW-1 (based on borehole geophysical logging [heat pulse flow meter and televiewer]) and the difference in overburden thickness between PW-1 and the proposed MW-20BR location.

The proposed target depths for MW-22BR and MW-23BR are adjusted from a depth of 300 feet bgs, based on PFOA concentrations above this depth in PW-1 and PW-4. Target depths for MW-22BR and MW-23BR are based on lesser overburden thickness moving toward the edge of the valley and up slope. Overburden thickness at MW-8D (proximate to PW-1) is 62 feet; bedrock is near ground surface at the proposed MW-22BR location; overburden thickness at MW-7D (representative of MW-23BR) is 18 feet. Target monitoring well depths may be adjusted based on surface geophysics and acquired borehole data related to fracture depth, orientation, yield, concentration and the elevation of the proposed well location, as well as conditions encountered during drilling. Initial bedrock monitoring well construction will consist of a 6-inch diameter steel casing, installed and grouted 5feet into the top of competent bedrock, and a 6-inch diameter (nominal) open borehole to the target depth. Final bedrock monitoring well construction will entail installation of a multi-level sampler, targeted interval well screen(s), packers, or modifications to the target depth. The final configuration and construction will be determined in consultation with DEC, based on 1) depth, aperture, and frequency of fractures; 2) borehole hydraulic conditions; and 3) magnitude and vertical distribution of COPCs. These data will be acquired by borehole geophysics and packer sampling described below.

4.2.6.4 Drilling, Installation, Completion, and Development

Bedrock monitoring wells will be drilled using air rotary or air hammer methods. The borehole will be advanced 5 feet into competent bedrock, and a 6-inch diameter steel casing will be grouted in place to keep the borehole open and to prevent migration of overburden groundwater into the borehole. The grout will be allowed at least 24 hours to cure prior to advancing further into bedrock. Once grout has set, a nominal 6-inch diameter borehole will be advanced by air hammer drilling to the target depth by drilling through the casing. As drilling advances, rock cuttings will be collected with a baking sieve, washed, and jarred for subsequent description of lithology. The depth of significant changes in drilling rate or water yield will be noted on the boring log. At each drilling location, up to three grab samples of formation water, returned to the surface via air circulation, will be obtained for analysis of PFOA, dependent on water yield and availability for sampling. This will provide a general concentration profile of the formation as drilling proceeds, especially for first encountered groundwater in shallow bedrock. These are screening level samples that will not be subject to data validation.

Wells will be finished with either a 3-foot stick-up protective casing or a minimum 8-inch diameter flush-mount protective casing. Flush-mount curb boxes will be fitted over the well head and will be set in an approximate 2-foot diameter concrete pad. A locking J-plug will be installed on top of the well and/or a locking lid will be installed on the protective casing

Bedrock monitoring wells will be developed as described in the FSAP to remove the fine material, to remove introduced drilling fluids, and to provide better hydraulic communication with the surrounding formation. Development will consist of purging by air lift methods or surging and purging with a submersible pump until water is clear, when field measured turbidity values are below 5 nephelometric turbidity units (NTUs) and/or turbidity values have stabilized. During well development, pH, temperature, turbidity and specific conductance will be measured and recorded periodically.

4.2.6.5 Testing

Borehole geophysical logging will be conducted in proposed bedrock monitoring wells MW-20BR, MW-22BR, and MW-23BR, consisting of the following:

- Optical televiewer
- Acoustic televiewer (amplitude, travel time, and caliper)
- Fluid temperature
- Fluid conductivity
- Heat pulse flow meter (five depths based on drilling observations)

These data will be used to select approximately three to five depths for discrete interval packer sampling for PFAS, based on indications of open fractures with fluid flow (e.g., deflection in fluid temperature, fluid conductivity, and/or heat pulse flow meter).

Packer sampling will consist of the deployment of inflatable rubber packers to isolate a 10-foot or 20-foot interval across the target fracture or fracture zone. The packer interval will be determined in consultation with NYSDEC. The interval will be purged of three interval volumes by submersible pump, measuring field parameters (pH, temperature, specific conductivity) initially and after each volume. After purging, the well will be sampled for PFOA. For low yielding intervals, sampling will be conducted following recovery after removal of one packer interval volume. If a test interval does not recover sufficiently within 60 minutes, that interval will not be sampled. These are screening level samples for vertical profiling and will not be subject to data validation. The packer assembly will be equipped with pressure transducers to monitor above and below the packer assembly as an indication of packer seal integrity or short-circuiting. The purge rate and volume will also be measured and recorded.

Should the data indicate a downward gradient, discrete zone of impact, or discretely impacted open and flowing fractures, alternative construction will be evaluated (e.g., targeted well screen or multi-level sampler). These testing data may be used to determine the target depths of surrounding bedrock monitoring wells in consultation with NYSDEC.

4.2.6.6 Bedrock Water Level Monitoring

Prior to installation of additional wells, water levels will be manually collected from all bedrock wells, including usable/accessible Taconic-owned supply wells. After installation of new bedrock monitoring wells, water levels will be collected again from all old and newly installed bedrock wells. The resulting data will be used to further improve understanding of groundwater flow within bedrock.

4.2.7 Fish and Wildlife Impact Analysis

A FWIA will be conducted to meet the requirements of DER-10, Section 3.10.1. During RI Phase 2a, Part 1 (Resource Characterization) will be completed. This involves a qualitative evaluation of actual or potential impacts to fish and wildlife resources from Site-related constituents. The evaluation will include the identification and description of the ecological resources located on and within 0.5-miles of the Site. Available information and the resource descriptions developed from the office review and Site evaluation will be used to characterize the exposure setting, identify the constituents of potential ecological concern, constituent migration pathways, and evaluate potential Site-related effects to local fish and wildlife resources. The findings of the Part 1 FWIA will be presented within the Phase 2a Interim Investigation Deliverable and used to evaluate the need to advance to Part 2 (Ecological Impact Assessment).

5.0 PROJECT PLANNING AND IMPLEMENTATION

5.1 Applicable Guidance Documents

Work will be performed in accordance with the Field Sampling Plan (FSP) developed for this site, which includes the field methods and procedures to be used during all RI field activities. The FSP has been revised from the originally approved version to include additional investigation activities proposed in Phase 2 and to comply with *Guidelines for Sampling and Analysis of PFAS* (NYSDEC 2020). All sample handling and analysis will be performed in accordance with the QAPP, which includes data quality objectives and criteria, data acquisition, management, and analytical procedures, quality control measures, data validation and usability elements, and assessment and oversight details. The QAPP has been revised from the originally approved version to reflect the proposed analytical scope of Phase 2 and to comply with *Guidelines for Sampling and Analysis of PFAS* (NYSDEC 2020). Work will also be performed in accordance with the CAMP and HASP. The FSAP, QAPP, and HASP/CAMP were prepared in accordance with *DER-10, Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010) and have been previously approved by NYSDEC.

5.2 Notifications and Communications

In accordance with DER-10, NYSDEC will be notified of the start of any field activities associated with Phase 2 seven calendar days prior to the actual start of field activities. Notification will be provided in writing and will include a schedule of the work. Subsequent seven-day notices and work schedules will be provided where the work is to proceed in phases not subject to the initial schedule provided.

5.3 Management of Investigation Derived Materials

Investigation Derived Materials (IDM) produced during this project include soil, decontamination water, groundwater (from drilling, well development, purging associated with sampling, geophysical testing [e.g., vertical flow meter profiling under pumping conditions] and potential other testing), personal protective equipment (PPE), disposable sampling equipment and other debris. IDM will be handled and disposed of in accordance with applicable state and federal regulations. Detailed procedures for handling and disposal of each type of IDM are included in the FSAP.

5.4 Documentation

All field activities will be documented and described in a field log. Stratigraphic logs from soil borings and well construction logs from monitoring well installation will be prepared. Other types of documentation will include surface soil, surface water, and groundwater sampling logs. All field documentation will be digitized and included in the Remedial Investigation Report. Logs will be completed in accordance with the procedures described in the FSAP.

6.0 REPORTING

6.1 Monthly Progress Reports

As required under the Settlement Agreement, Monthly Progress Reports (MPRs) will be prepared and submitted to NYSDEC throughout implementation of the RI/FS. MPRs will cover the following:

- Actions taken during the month
- Analytical and other results obtained during the month
- Deliverables submitted or approved during the month
- Actions planned for the following month
- Anticipated delays and mitigative measures
- Proposed or approved modifications
- Citizen participation activities.

6.2 Phase 2a Interim Deliverable Report

Upon completion of Phase 2a of the RI, an interim submittal that includes summary tables and figures will be prepared and submitted to NYSDEC. The deliverable will also summarize the findings of Part 1 of the FWIA. The interim investigation deliverable and any potential data gaps will be discussed with NYSDEC. If there are no data gaps, then the RI Report will be prepared and submitted to NYSDEC within 90 days of the determination that no additional investigation activities are needed to complete the RI. If data gaps are identified, a scope for contingent subsequent activities will be developed and submitted to NYSDEC within 45 days of reaching concurrence on the additional activities needed to complete the RI. In concurrence with NYSDEC, Phase 2a data will also be evaluated to determine if the FWIA will be advanced to Part 2 (Ecological Impact Assessment).

6.3 Remedial Investigation Report

As described in the RI/FS Work Plan (OBG 2018), the RI Report will be prepared and submitted to NYSDEC within 90 days of receiving the final analytical data package. The RI Report will be completed in accordance with Section 3.14 of NYSDEC's DER-10 guidance. The report will summarize the data collected during the RI, as well as other relevant data collected prior to and during the RI for the Site.

The RI Report will include comparison of the soil, groundwater, surface water and sediment analytical data to relevant SCGs. Analytical data presented in the report text, tables and figures will include values for constituents reported by the lab, including those below the reporting limit but above the method detection limit, with appropriate qualifiers.

The content of the RI Report will include the following:

- Facility history including an overview of the products manufactured, chemicals used and relevant waste management practices through time
- An updated Site description, if necessary
- Site maps
- Hydrogeologic interpretation
- Summary of prior investigations/sampling performed by Taconic and others
- A presentation of the available analytical data for PFAS
- Investigation approach (including any phasing, and the sequence within each phase), sampling locations, and analyses performed
- Field investigation observations
- Chemical analyses results
- Nature and extent characterization
- Presentation of the QHHEA and FWIA, prepared during the RI
- A refined CSM (see Section 3 for a preliminary CSM)
- Assessment of existing data to evaluate whether there is the need for supplemental data collection
- Summary of the RI results, conclusions and any recommendations.

Based on the Settlement Agreement, NYSDEC's comments on the RI Report are expected within 60 days.

NYSDEC's comments on the RI Report will be addressed in accordance with the standard provisions included in Appendix A of the Settlement Agreement. Upon approval of the RI Report by NYSDEC, the report will be placed in the local document repository.

7.0 SCHEDULE

A draft schedule for completion of the RI/FS is provided below. Proposed dates and/or durations for investigation activities and report preparation are presented. The start date of these activities is dependent upon approval of this work plan by NYSDEC.

Milestone Activity	Estimated Schedule
NYSDEC approval of Phase 2a Work Plan	TBD
Implementation of Phase 2a field activities	Late Summer through end of 2020
Interim investigation deliverable (with Phase 2a results) submittal to NYSDEC for review	90 days following receipt of the final analytical data for Phase 2a
Implementation of additional Phase 2 (i.e. Phase 2b) field activities (if necessary)	TBD
RI Report submittal to NYSDEC for review	90 days following receipt of final analytical data for additional Phase 2 activities (i.e. Phase 2b); if additional Phase 2 activities are determined to not be necessary, then 90 days following that determination

8.0 REFERENCES

Heath, 1983. Basic ground-water hydrology. U.S. Geological Survey Water-Supply Paper 2220, 86p.

NYSDEC 2010. *DER-10/Technical Guidance for Site Investigation and Remediation*. May 3.

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

OBG 2018. *Remedial Investigation/Feasibility Study Work Plan, Taconic Site, NYSDEC Site No. 442047*. April.

Parsons 2020. *Interim Investigation Deliverable, Taconic Site, NYSDEC Site No. 442047*. February.

TABLES

TABLE 1 – UNSATURATED SOIL PROPOSED SAMPLING SUMMARY

Location	Matrix	Number of Samples	Sample Depths[1]	Analysis[2]
SS-32	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-33	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-34	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-35	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; PFAS; SPLP PFAS and TOC[1] PFAS, TOC, and pH[1]
SS-36	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-37	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-38	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-39	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-40	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-41	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-42	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-43	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-44	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-45	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-46	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-47	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-47	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-47	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-48	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-49	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-50	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-51	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-52	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
SS-53	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]

Location	Matrix	Number of Samples	Sample Depths[1]	Analysis[2]
SS-54	Soil	4	0-2”; 2-12”; 12-24”; 0-24" (composite)	PFAS; SPLP PFAS and TOC[1]
MW-17	Soil	4 estimated) [3]	0-2”; 2-12”; 12-24”; TBD[3]	PFAS, SPLP PFAS and TOC
MW-19	Soil	4 (estimated) [3]	0-2”; 2-12”; 12-24”; TBD[3]	PFAS, SPLP PFAS and TOC
MW-23	Soil	4 (estimated) [2]	0-2”; 2-12”; 12-24”; TBD[3]	PFAS, SPLP PFAS and TOC

Notes:

1. Samples will be collected from all of the listed depth intervals. Samples from 0-2 ft and 2-12 inches intervals will be analyzed immediately, while samples from 12-24 inches and 0-24 inches (composite) are placed “on-hold” at the lab. Based on the results of initial samples, a subset of locations will be selected for analysis of PFAS in the 12-24 inches interval as well as SPLP PFAS, TOC, and pH analysis of the composite sample.
2. Up to five samples will also be analyzed for PFOA substitutes including 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA.
3. Samples will be collected from select monitoring well locations in the listed intervals, as well as in the 12 inches interval directly above the water table, and from the following unsaturated subsurface zones (if encountered): mottled zones (encompassing the total thickness of the observed mottling), and subjectively impacted soils (based on visual, olfactory, or other field screening observations).

TABLE 2 – SURFACE WATER AND STORMWATER PROPOSED SAMPLING SUMMARY

Location	Matrix	Number of Samples	Depth(s)[1]	Analysis[2]	Rationale
Surface Water					
SW-15	Surface water	2	TBD	PFAS	Upstream in stream that flows towards site.
SW-16	Surface water	4	TBD	PFAS	Upstream at site boundary. Will be sampled during baseflow and storm flow conditions.
SW-17	Surface water	4	TBD	PFAS	Downstream at site boundary. Will be sampled during baseflow and storm flow conditions.
SW-18	Surface water	2	TBD	PFAS	Upstream in stream that flows towards site.
SW-19	Surface water	2	TBD	PFAS	Upstream in stream that flows towards site.
SW-20	Surface water	2	TBD	PFAS	Upstream in stream that flows towards site.
SW-21	Surface water	4	TBD	PFAS	Upstream at site boundary. Will be sampled during baseflow and storm flow conditions.
SW-22	Surface water	4	TBD	PFAS	Downstream at site boundary. Will be sampled during baseflow and storm flow conditions.
SW-23	Surface water	2	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility
SW-24	Surface water	4	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility. Will be sampled during baseflow and storm flow conditions.
SW-25	Surface water	2	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility.
SW-26	Surface water	2	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility.
SW-27	Surface water	2	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility.
SW-28	Surface water	2	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility.
SW-29	Surface water	2	TBD	PFAS	Tributary that enters Little Hoosic River downstream of facility.

Location	Matrix	Number of Samples	Depth(s)[1]	Analysis[2]	Rationale
SW-30	Surface water	4	TBD	PFAS	In Little Hoosic River, upstream of the site. Will be sampled during baseflow and storm flow conditions.
SW-31	Surface water	2	TBD	PFAS	In Little Hoosic River, upstream of the site.
SW-32	Surface water	4	TBD	PFAS	In Little Hoosic, downgradient of natural tributary that flows through the site. Will be sampled during baseflow and storm flow conditions.
SW-33	Surface water	4	TBD	PFAS	In Little Hoosic, downgradient of tributary that is fed by site stormwater. Will be sampled during baseflow and storm flow conditions.
SW-34	Surface water	2	TBD	PFAS	In Little Hoosic, downgradient of the site.
SW-35	Surface water	2	TBD	PFAS	In Little Hoosic, downgradient of the site.
SW-36	Surface water	2	TBD	PFAS	In Little Hoosic, downgradient of the site and many tributaries unrelated to the site.
SW-37	Surface water	2	TBD	PFAS	In Little Hoosic, downgradient of the site and the greater Petersburgh area.
Stormwater					
STW-01	Stormwater	2	TBD	PFAS	Storm ditch that receives overland flow south of the Building 6, 9, 10, and 11 complex and discharges to the Little Hoosic River.
STW-02	Stormwater	2	TBD	PFAS	On-site storm ditch downstream of the discharge of the storm sewer system around the Building 2, 4, and 5 complex.
STW-03	Stormwater	2	TBD	PFAS	Storm ditch receiving overland flow from Building 2/4/5 area and stormwater from the storm sewer system around the Building 2, 4, and 5 complex.

Location	Matrix	Number of Samples	Depth(s)[1]	Analysis[2]	Rationale
STW-04	Stormwater	2	TBD	PFAS	Culvert inlet receiving water from the storm ditch behind Building 1.
STW-05	Stormwater	2	TBD	PFAS	Culvert inlet draining an unnamed pond toward the Little Hoosic River; Most stormwater from the central and northern portions of the site drains here.

Notes:

1. Sample depth will be dependent on the depth of the water body; Sample will be collected mid-depth within the water body (sufficiently beneath the surface but above sediment).
2. A subset of up to five samples will also be analyzed for PFOA substitutes including 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA.

TABLE 3 – OVERBURDEN GROUNDWATER PROPOSED SAMPLING SUMMARY

Location[1]	Matrix	Number of Samples[1]	Depth(s)[1]	Analysis[2]	Rationale
MW-17S/D	Overburden groundwater	2	TBD	PFAS	Off-site, potential upgradient well for perimeter characterization south of the site. Adjacent to Phase 1 direct-push groundwater sample.
MW-18S/D	Overburden groundwater	2	TBD	PFAS	Off-site, potential upgradient well for perimeter characterization southeast of the site.
MW-19S/D	Overburden groundwater	2	TBD	PFAS	Off-site, downgradient well for characterization east of the southern portion of the site, towards Little Hoosic River.
MW-21S/D	Overburden groundwater	2	TBD	PFAS	Off-site, downgradient well for characterization east of the northern portion of the site towards the Little Hoosic River.
MW-23S/D	Overburden groundwater	2	TBD	PFAS	Off-site, potential side gradient well for perimeter characterization north of the site.

Notes:

1. It is anticipated that well pairs will be installed, with one screened in surficial sand and gravel and the other screened in deeper sand and gravel, corresponding to well labels S and D. Actual number of wells installed at each location and screen depths will be based on the hydrostratigraphic conditions encountered.
2. A subset of samples (up to ten total between overburden and bedrock groundwater) will also be analyzed for PFOA substitutes including 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA.

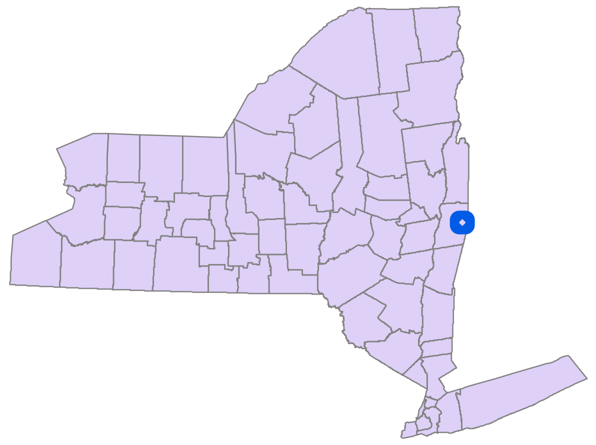
TABLE 4 – BEDROCK GROUNDWATER PROPOSED SAMPLING SUMMARY

Location[1]	Matrix	Number of Samples[2]	Depth(s)[2]	Analysis[3]	Rationale
MW-17BR	Bedrock groundwater	TBD	TBD	PFAS	Off-site, potential upgradient well for perimeter characterization south of the site
MW-19BR	Bedrock groundwater	TBD	TBD	PFAS	Off-site, potential downgradient well for characterization east of the southern portion of the site towards the Little Hoosic River.
MW-20BR	Bedrock groundwater	TBD	TBD	PFAS	On-site, potential source area characterization just downgradient of Building 1.
MW-21BR	Bedrock groundwater	TBD	TBD	PFAS	Off-site, down-gradient well for characterization of potential a migration route to the east.
MW-22BR	Bedrock groundwater	TBD	TBD	PFAS	Off-site, down-gradient well for characterization of a potential migration route to the north.
MW-23BR	Bedrock groundwater	TBD	TBD	PFAS	Off-site, down-gradient well for characterization of a potential migration route to the northeast.

Notes:

1. Bedrock wells will be installed in phases, with MW-20BR, MW-22BR, and MW-23BR being installed first. Preliminary testing at these wells will guide location and construction details of subsequent wells.
2. Wells will be sampled using rubber packers to isolate specific fractures within the formation. Samples will be collected prior to, during, and after purging to understand potential PFAS concentration changes as sampled water changes from mixed borehole groundwater to groundwater direct from fractures. Number of packer intervals and sample depths will be determined based on borehole testing and surface geophysical results.
3. A subset of samples (up to ten total between overburden and bedrock groundwater) will also be analyzed for PFOA substitutes including 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA.

FIGURES



Elevation Contours (20 foot intervals)

0 1,500 3,000 6,000 Feet

FIGURE 1

TACONIC
Finding a better way

SITE LOCATION

PHASE 2 REMEDIAL INVESTIGATION

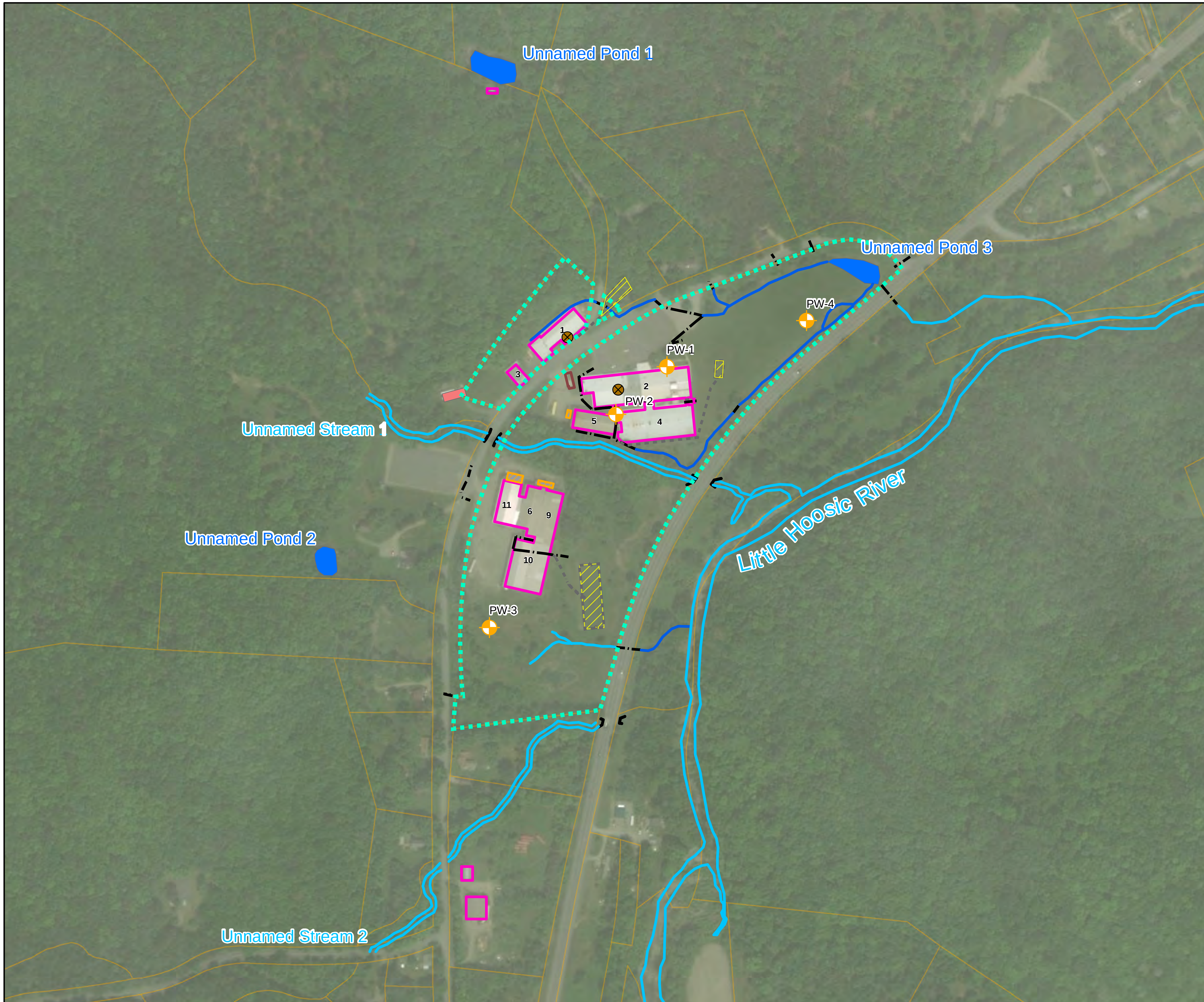
PARSONS

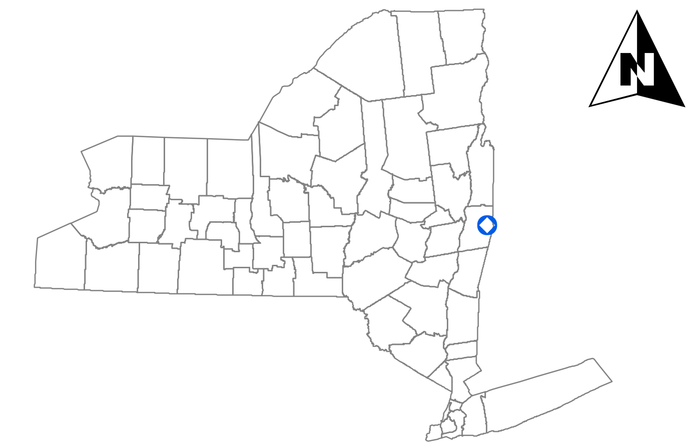
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plotted By: Sisson, Evan

Plot Date: 7/9/2020

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Site Location.mxd





Production Well Location
Inactive Drywell
Site Boundary
Tax Parcel Boundaries
Building Footprint

Utilities

Sanitary Sewer
Storm Ditch
Storm Sewer
Culvert
River Boundaries
Natural Gas Tank
Pond
Leach Field
Fume Eliminators
Sludge Roll-off Storage

0 265 530 1,060 Feet

TACONIC
Finding a better way

SITE PLAN, SITE FEATURES

PHASE 2 REMEDIAL INVESTIGATION

PARSONS

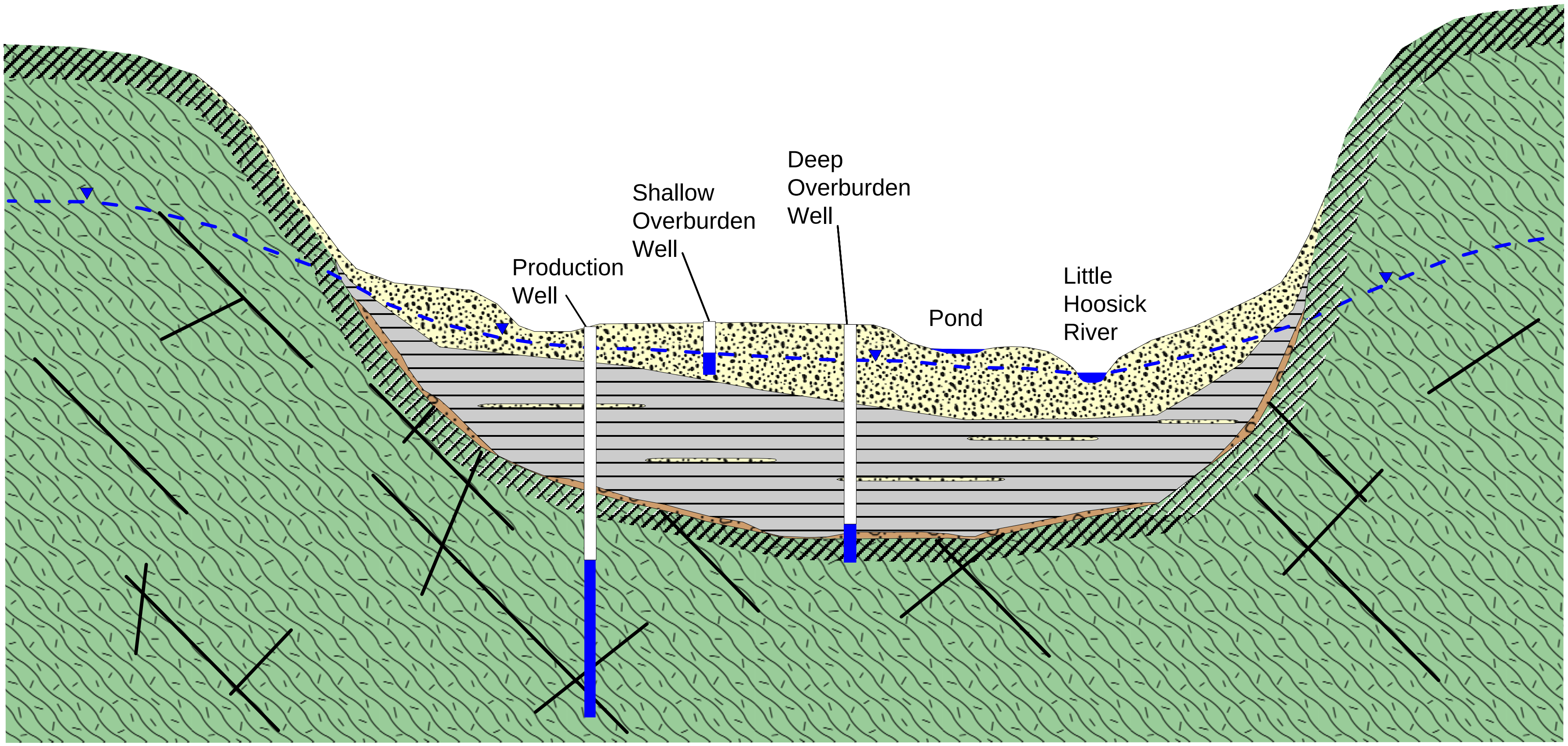
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plotted By: Sisson, Evan

Plot Date: 7/9/2020

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Site Plan.mxd

Preliminary Cross-Sectional Conceptual Site Model



	Geologic Legend	Hydrostratigraphic Unit
	Upper Sand & Gravel	Surficial Water-Bearing Zone
	Silt & Clay with Sand & Gravel Lenses	Glaciolacustrine Aquitard
	Lower Sand & Gravel	Deeper Water-Bearing Zone
	Weathered Bedrock	
	Bedrock (Phyllite)	Water-Bearing Fractures

Water Table

Bedrock Water-Bearing Fracture

Notes:
1) Diagram is thematic and not to scale.

FIGURE 3

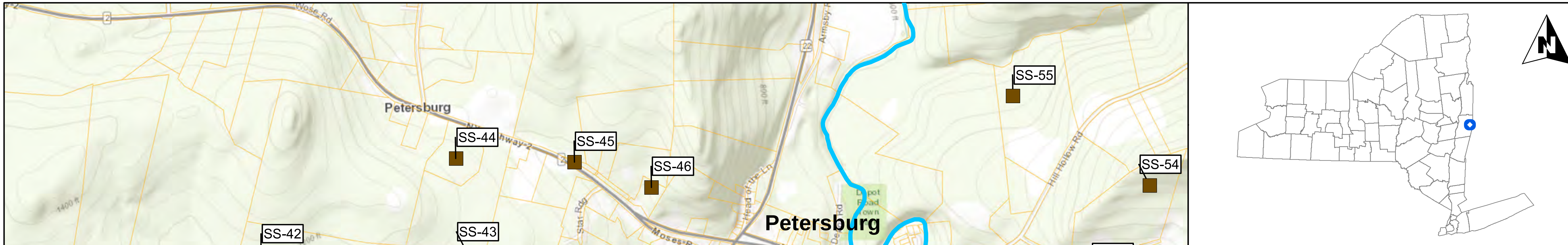
TACONIC
Finding a better way

Preliminary Conceptual Site Model

PHASE 2 REMEDIAL INVESTIGATION

PARSONS

301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560



- Proposed Unsaturated Soil Sample Locations
- Previous Surface Soil Sample Locations
- Site Boundary
- Tax Parcel Boundaries

Notes:

1) Soil grab samples will be collected at 0-2, 2-12, and 12-24 inches below ground surface (bgs) intervals and a composite sample will be collected from 0-24 inches bgs.

2) Samples from 0-2” and 2-12” intervals will be analyzed immediately for PFAS, while samples from 12-24” and 0-24” (composite) are placed “on-hold” at the lab. Based on the results of initial samples, 1/3 of locations will be selected for analysis of PFAS in the 12-24” interval and 1/3 of locations will be selected for SPLP PFAS and TOC analysis of the composite sample.

3) Up to 5 samples will also be analyzed for PFOA substitutes consisting of 11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA

4) Sample locations subject to approval by NYSDEC

0 1,000 2,000 4,000 Feet

FIGURE 4

TACONIC
Finding a better way

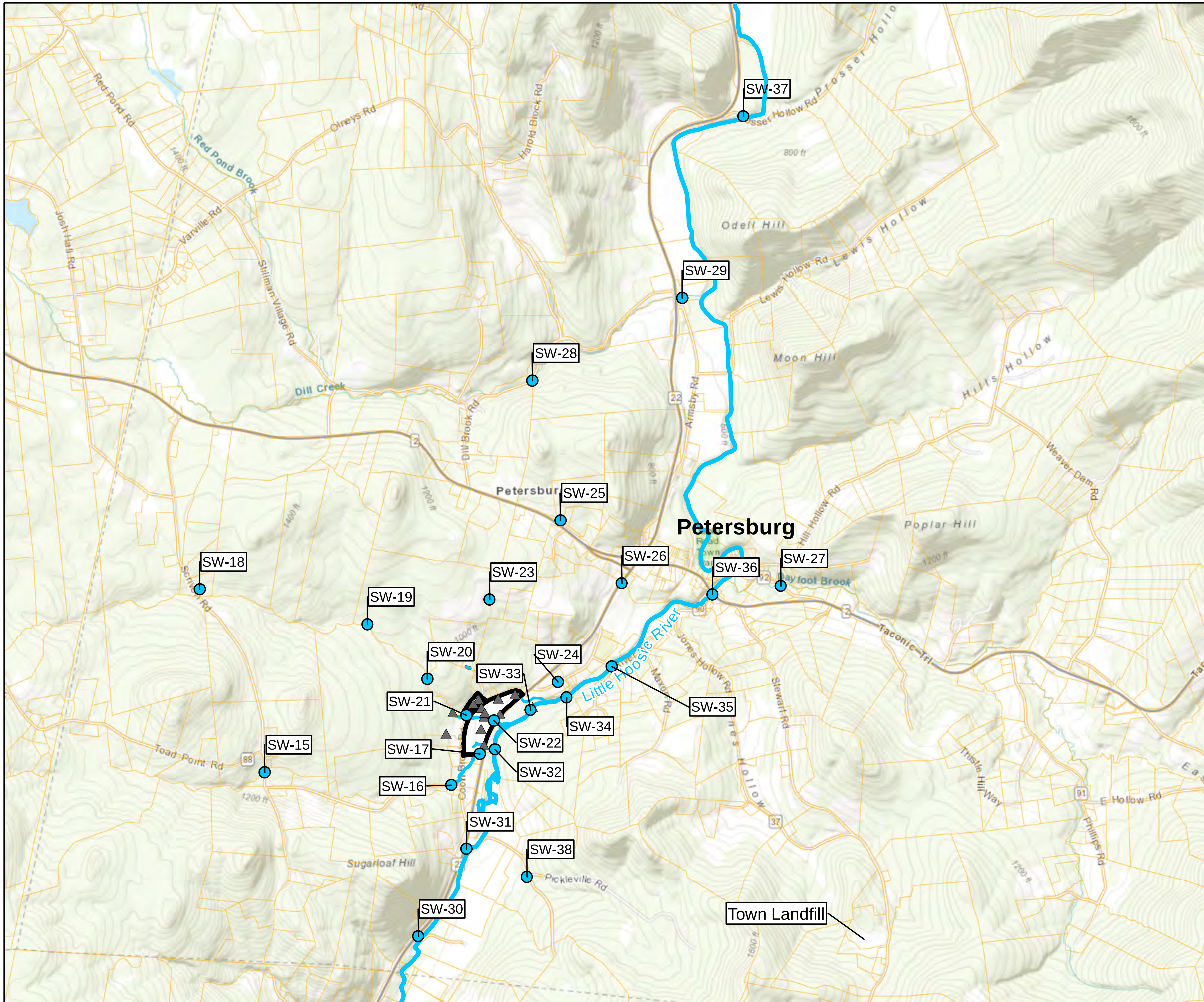
PROPOSED UNSATURATED SOIL SAMPLING LOCATIONS

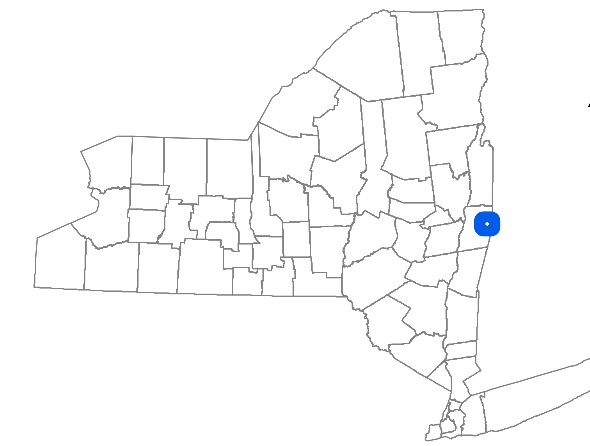
PHASE 2 REMEDIAL INVESTIGATION

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plot Date: 7/9/2020 Plotted By: Sisson, Evan

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Proposed Unsaturated Soil Sampling Locations.mxd





Proposed Surface Water Sample Locations

Previous Surface Water Sample Locations

Site Boundary

Tax Parcel Boundaries

Notes:

1) Two rounds of samples to be collected at each location during baseflow conditions approximately 4 months apart.

2) All samples to be analyzed for PFAS (NYSDEC 21 list).

3) Up to 5 samples total (including surface water and stormwater) to be analyzed for four PFOA substitutes (11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA).

4) Sample locations subject to approval by NYSDEC.

0 1,500 3,000 6,000 Feet

FIGURE 5

TACONIC
Finding a better way

PROPOSED SURFACE WATER SAMPLING LOCATIONS

PHASE 2 REMEDIAL INVESTIGATION

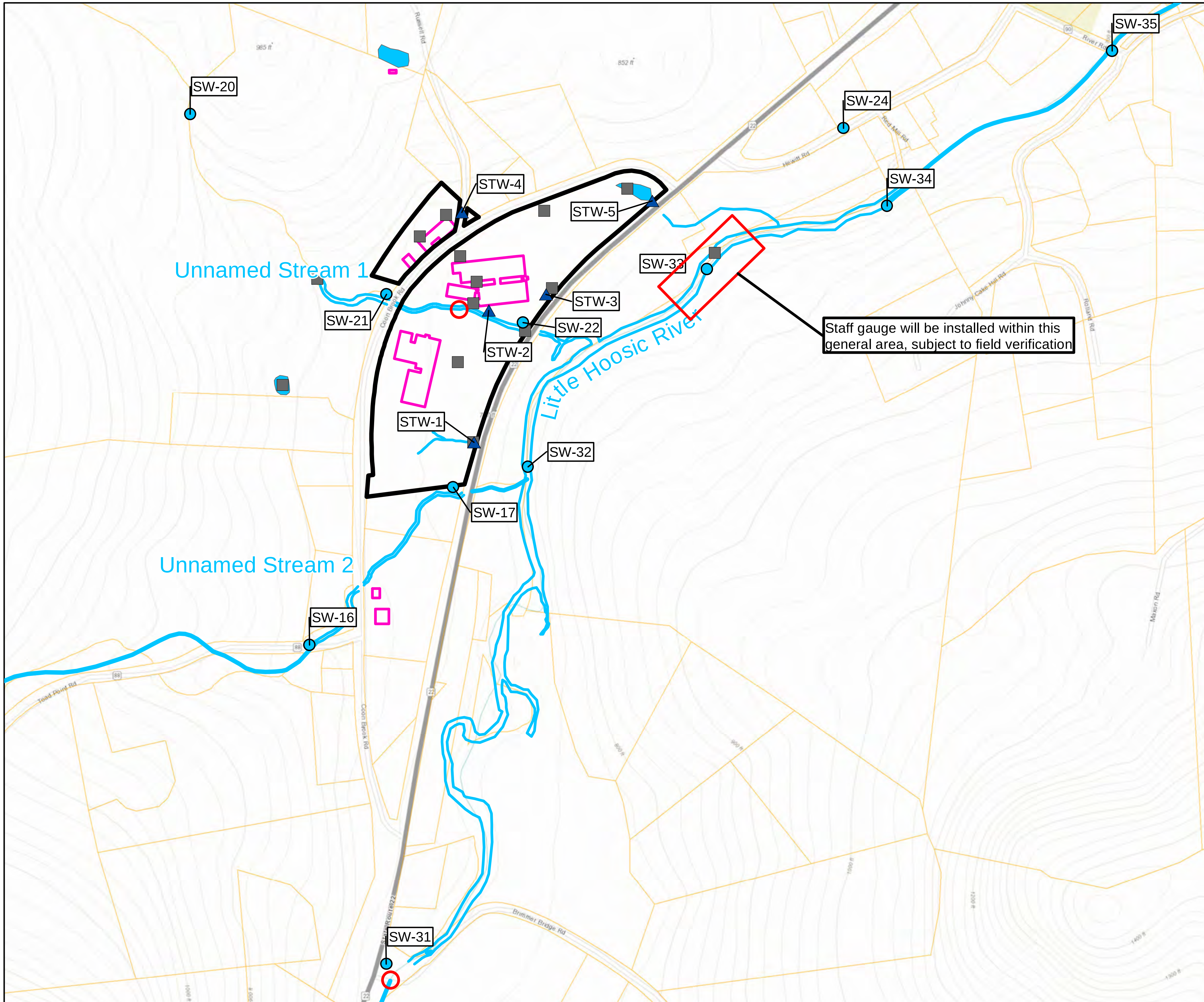
PARSONS

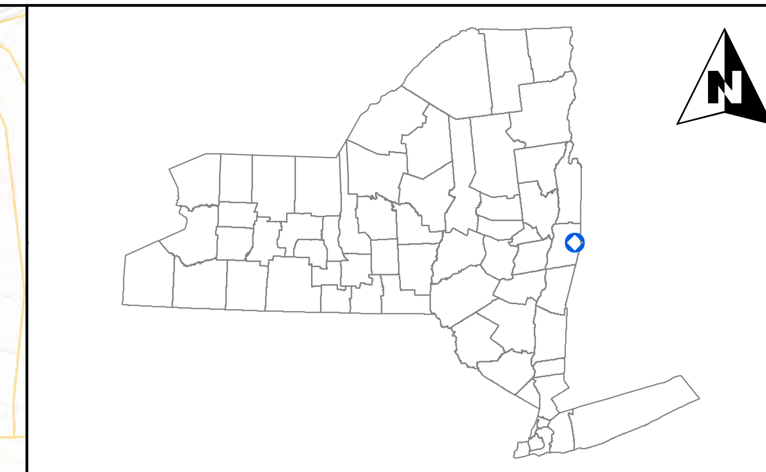
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plotted By: Sisson, Evan

Plot Date: 7/9/2020

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Proposed Surface Water Sampling Locations.mxd





- Proposed Storm Water Sample Locations
- Proposed Staff Gauge Locations
- Proposed Surface Water Sample Locations
- Previous Surface Water Sample Locations
- Proposed Staff Gauge Area
- Site Boundary
- Building Footprint
- Tax Parcel Boundaries

Notes:

1) "SW"=Surface Water location in natural water bodies. "STW"=Storm Water location in man-made drainage systems.

2) Two rounds of samples to be collected at each location during storm flow conditions approximately 4-months apart.

3) Up to 5 samples total (including surface water and stormwater) to be analyzed for four PFOA substitutes (11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA).

4) All samples to be analyzed for PFAS (NYSDEC 21 list).

5) Sample and staff gauge locations subject to approval by NYSDEC.

0 375 750 1,500 Feet

FIGURE 6

TACONIC
Finding a better way

PROPOSED STORM WATER SAMPLING AND STAFF GAUGE LOCATIONS

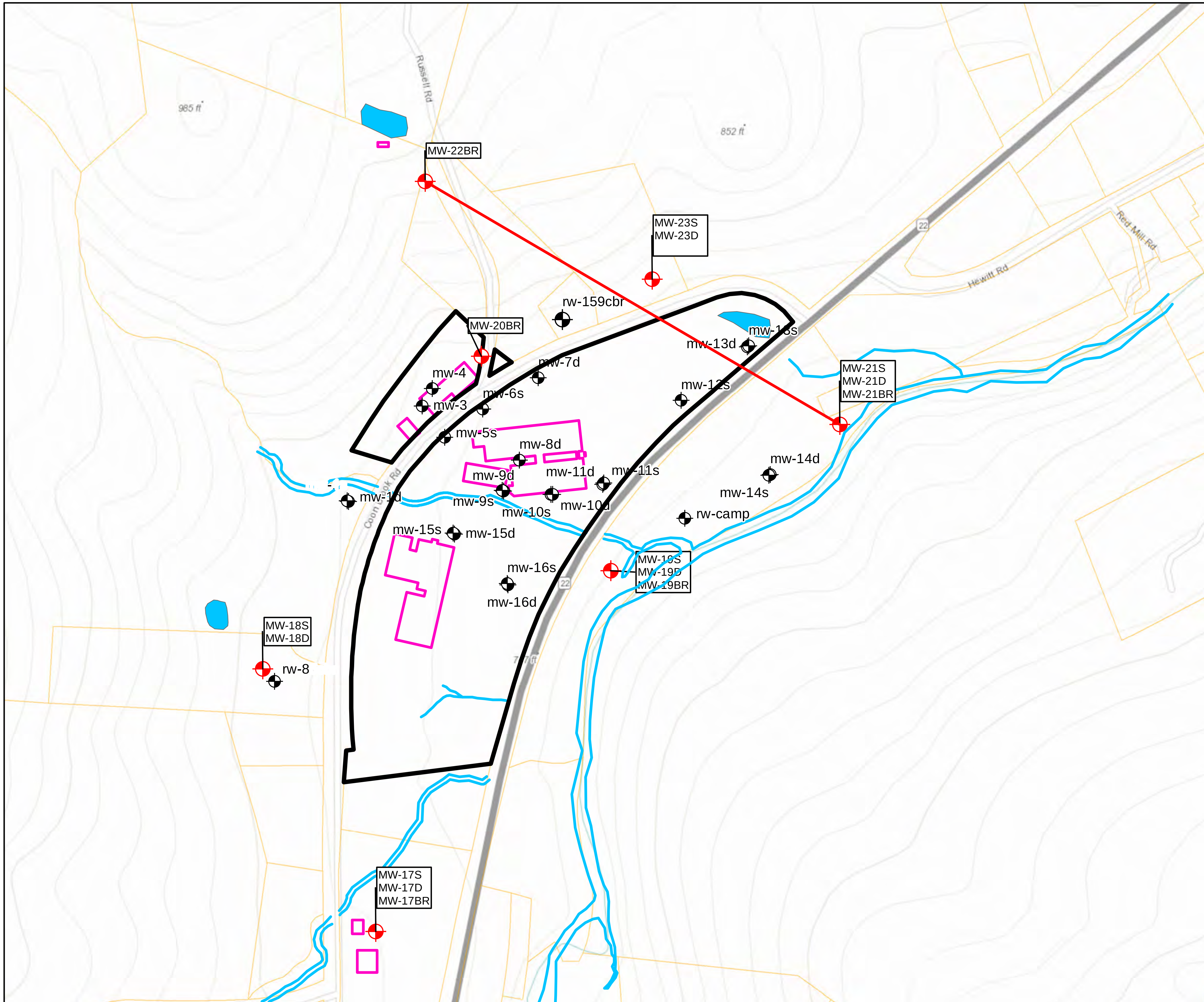
PHASE 2 REMEDIAL INVESTIGATION

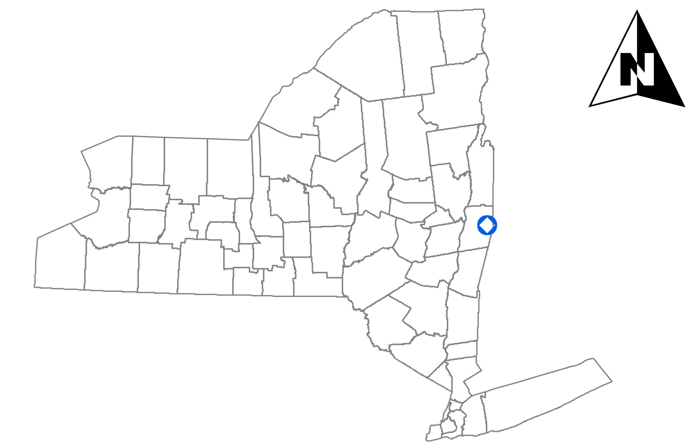
PARSONS

301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plot Date: 7/9/2020 Plotted By: Sisson, Evan

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Proposed Storm Water Sampling Locations.mxd





Proposed Monitoring Well Location
Existing Monitoring Well Location
Proposed Surface Geophysics Transect
Site Boundary
Building Footprint
Tax Parcel Boundaries

Notes:
1) Proposed surface geophysics methods include multichannel analysis of surface waves (MASW) and electrical resistivity imaging.

0 250 500 1,000 Feet

FIGURE 7

TACONIC *Finding a better way*

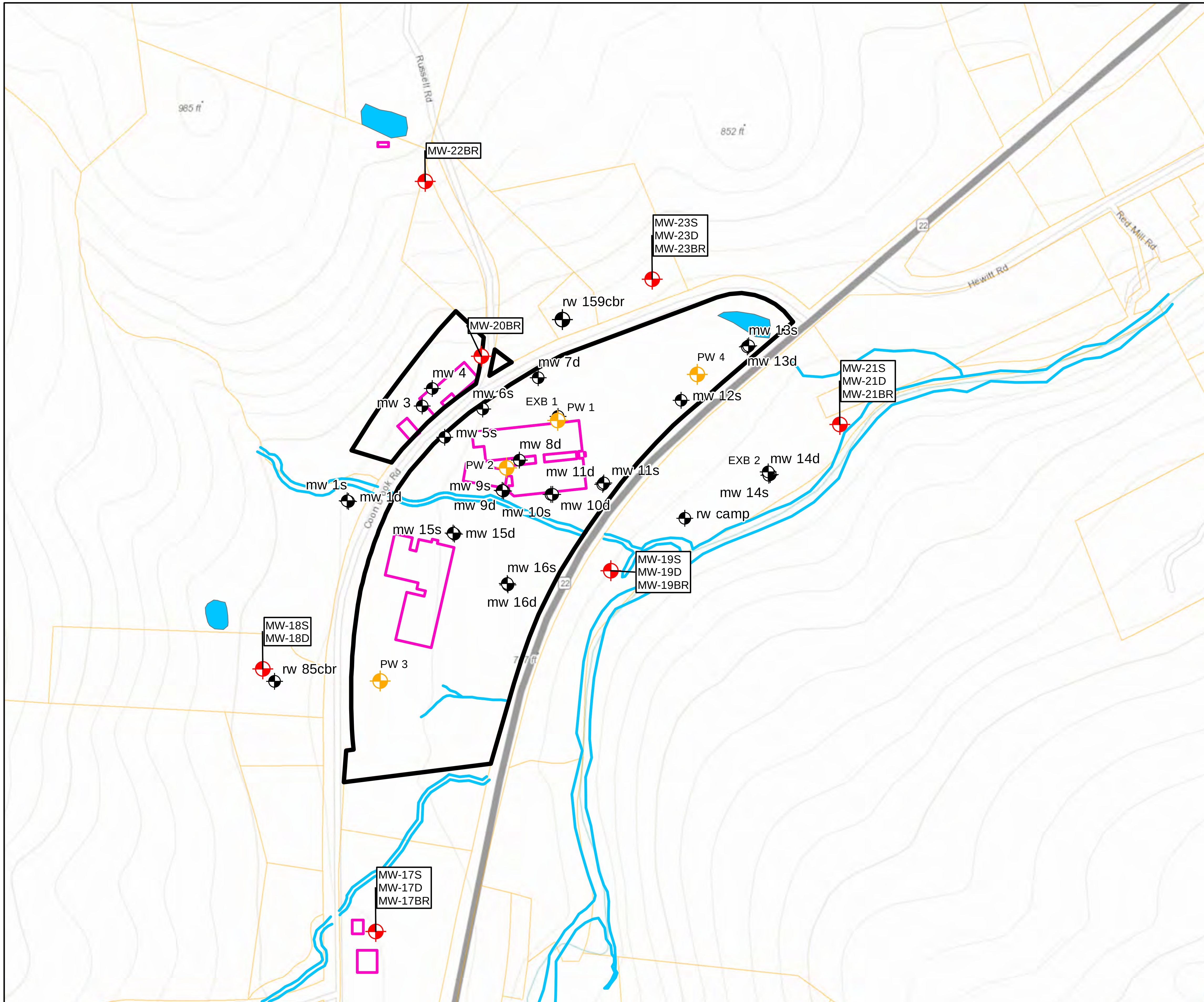
PROPOSED SURFACE GEOPHYSICS TRANSECT

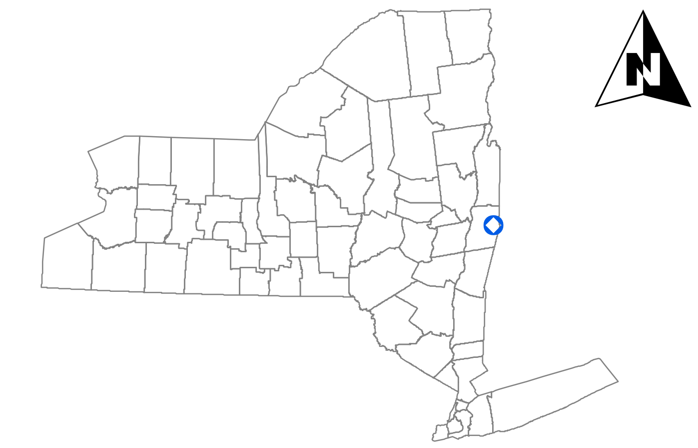
PHASE 2 REMEDIAL INVESTIGATION

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plot Date: 10/23/2020 Plotted By: Sisson, Evan

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Proposed Surface Geophysics Transect Locations.mxd





Proposed Monitoring Well Location

Production Well Locations

Existing Monitoring Well Location

Site Boundary

Building Footprint

Tax Parcel Boundaries

Notes:

1) Wells labeled BR are bedrock wells. Borehole geophysics and discrete interval inflatable packer sampling will be conducted in bedrock wells, beginning with MW-20BR, MW-22BR, and MW-23BR. Results from these initial wells will inform the location and tests to be performed at additional bedrock wells.

2) Wells labeled S and D indicate screens in surficial sand & gravel and deep sand & gravel, respectively. Both are overburden wells. Actual number of overburden wells installed will depend on the number of sand and gravel units.

3) All samples to be analyzed for PFAS (NYSDEC 21 list).

4) Up to 10 samples to be analyzed for four PFOA substitutes (11Cl-PF3OUdS, 9Cl-PF3ONS, DONA, and HFPODA).

5) Well locations subject to approval by NYSDEC.

0 250 500 1,000 Feet

FIGURE 8

TACONIC *Finding a better way*

PROPOSED MONITORING WELL LOCATIONS

PHASE 2 REMEDIAL INVESTIGATION

PARSONS

301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

Plot Date: 10/23/2020 Plotted By: Sisson, Evan

Document Path: E:\C Drive\p005664b\Taconic\MXDs\Taconic Proposed MW Locations Rev1.mxd