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03 September 2021

Via email

Ms. Erica Bergman
Case Manager
Bureau of Case Management
New Jersey Department of Environmental Protection
401 East State Street
Trenton, NJ 08625-0420

RE: Solvay Specialty Polymers USA, LLC West Deptford Site
PI #015010 RPC 140002

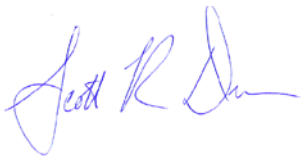
Dear Ms. Bergman:

Attached for your review, please find the document *Remedial Action Investigation Workplan – Soil*, prepared by Integral Consulting, Inc. of behalf of Solvay Specialty Polymers USA, LLC (Solvay), and dated 03 September 2021. I have also attached the Traditional Oversight Form prepared for this document.

As you know, the Department, through the Site Remediation Program, has developed a technical consultation process for LSRPs and remediating parties to consult with experienced DEP staff to ask site specific technical questions (https:/www.nj.gov/dep/srra/technical_consultation/). As noted in the attached Work Plan, Solvay and I, as the LSRP for this Site, have technical questions and require such a consultation to complete the work described in the attached Work Plan, including consultation on the soil to groundwater migration pathway. We will be reaching out next week to both William Carp and Kevin Schick in the Site Remediation Program, who are identified as willing and able to assist in addressing technical questions related to the Migration to Ground Water (MGW) Exposure Pathway Fate & Transport Models and Soil contamination and other technical issues respectively, to set up that meeting or meetings.

If you have any questions or comments, I can be reached at any time at sdrew@geosyntec.com or by my cell (609) 865-1167.

Sincerely,



Scott R. Drew, L.S.R.P
Senior Principal

Copy: Mitchell Gertz, Solvay

New Jersey Department of Environmental Protection
Site Remediation and Waste Management Program

TRADITIONAL/DIRECT OVERSIGHT REPORT CERTIFICATION FORM

Date Stamp
(For Department use only)

SECTION A. SITE NAME AND LOCATION

Site Name: Solvay Specialty Polymers, LLC

List All AKAs: Penwalt, Elf Atochem, Ausimont, and Solvay Solexis

Street Address: 10 Leonard Lane

Municipality: West Deptford (Township Borough or City)

County: Gloucester Zip Code: 08086

Program Interest (PI) Number(s): 01510 Case Tracking Number(s):

SECTION B. REPORT INFORMATION

Report Name: Remedial Investigation Work Plan - Soil

Report Date: 09/03/2021

Case Type:

☐ **RCRA GPRA 2020** ☐ **CERCLA/NPL** ☐ **USDOD** ☐ **USDOE** ☒ **Direct Oversight**

☐ **Other** (explain):

SECTION C. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: Solvay Specialty Polymers USA, LLC

Representative First Name: Terrance Representative Last Name Tham

Title: West Deptford Site Manager

Phone Number: (856) 251-3489 Ext: Fax:

Mailing Address: 10 Leonards Lane

City/Town: West Deptford State: NJ Zip Code: 08086

Email Address: Terence.Tham@Solvay.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: Date:

Name/Title: Terrance Tham/West Deptford SIte Manager

SECTION D. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: 576317

First Name: Scott Last Name: Drew

Phone Numbers: (609) 493-9007 Ext.: Fax:

Mailing Address: 1750 American Boulevard Suite 200

Municipality: Pennington State: NJ Zip Code: 08543

Email Address: sdrew@geosyntec.com

This statement shall be signed by the LSRP who is submitting this notification in accordance with N.J.S.A. 58:10C-14, and N.J.S.A. 58:10B-1.3b(1) and (2).

(1) I certify, as a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C-1 et seq. to conduct business in New Jersey, that for the remediation described in this submission, and all attachments included in this submission, I personally: Managed, supervised, or performed the remediation conducted at this site that is described in this submission, and all attachments included in this submission; and/or periodically reviewed and evaluated the work performed by other persons that forms the basis for the information in this submission; and/or completed the work of another site remediation professional, licensed or not, after having: (1) reviewed all available documentation on which I relied; (2) conducted a site visit and observed the then-current conditions and verified the status of as much of the work as was reasonably observable; and (3)concluded, in the exercise of my independent professional judgment, that there was sufficient information upon which to complete any additional phase of remediation and prepare workplans and reports related thereto.

(2) I certify:

- *That I have read this submission and all attachments to this submission;*
- *That in performing the professional services as the licensed site remediation professional for the entire site or each area of concern, I adhered to the professional conduct standards and requirements governing licensed site remediation professionals provided in N.J.S.A. 58:10C-16;*
- *That the remediation conducted at the entire site or each area of concern, that is described in this submission and all attachments to this submission, was conducted pursuant to and in compliance with the remediation requirements in N.J.S.A. 58:10C-14.c;*
- *That the remediation described in this submission, and all attachments to this submission, was conducted pursuant to and in compliance with the regulations of the Site Remediation Professional Licensing Board at N.J.A.C. 7:26I; and*
- *That the information contained in this submission and all attachments to this submission is true, accurate, and complete.*

(3) I certify, when this submission includes a response action outcome, that the entire site or each area of concern has been remediated in compliance with all applicable statutes, rules, and regulations and is protective of public health and safety and the environment.

(4) I certify that no other person is authorized or able to use any password, encryption method, or electronic signature that the Board or the Department have provided to me.

(5) I certify that I understand and acknowledge that:

- *If I knowingly make a false statement, representation, or certification in any document or information I submit to the Department I may be subject to civil and administrative enforcement pursuant to N.J.S.A. 58:10C-17.a.1(a)through (f) by the Board, including but not limited to license suspension, revocation, or denial of renewal; and*
- *If I purposely, knowingly, or recklessly make a false statement, representation, or certification in any application, form, record, document or other information submitted to the Department or required to be maintained pursuant to the Site Remediation Reform Act, I shall be guilty, upon conviction, of a crime of the third degree and shall, notwithstanding the provisions of subsection b. of N.J.S.2C:43-3, be subject to a fine of not less than $5,000 nor more than $75,000 per day of violations or by imprisonment, or both.*

(6) I certify that I have read this certification prior to signing, certifying, and making this submission.

LSRP Signature: Date: 09/03/21

LSRP Name: Scott R. Drew, L.S.R.P.

Company Name: Geosyntec Consultants, Inc.

Completed forms should be sent to:

Assigned Case Manager
Bureau of Case Management
Site Remediation Program
NJ Department of Environmental Protection
401-05F
PO Box 420
Trenton, NJ 08625-0420

Remedial Investigation Work Plan Soil

Solvay Specialty Polymers USA, LLC
10 Leonard Lane
West Deptford, NJ 08086
Program Interest No: 015010

Prepared by
Integral Consulting Inc.
110 Marter Avenue
Suite 304
Moorestown, NJ 08057

September 3, 2021

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ACRONYMS AND ABBREVIATIONS

ALS	ALS Environmental – Kelso Laboratory
ARS-MGW	alternative remediation standard-migration to groundwater
AXYS	AXYS Analytical Services Ltd
BFS	bifunctional surfactants
bgs	below ground surface
EVS	Earth Volumetric Studio
FSP	Field Sampling Plan
IGW SRS	Impact to Groundwater Soil Remediation Standard
MFS	monofunctional surfactants
NJDEP	New Jersey Department of Environmental Protection
OQA	Office of Quality Assurance
PFAS	per- and polyfluoroalkyl substances
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFUnDA	perfluoroundecanoic acid
PRM	Potomac-Raritan-Magothy
QA/QC	quality assurance and quality control
QAPP	quality assurance project plan
RIR	remedial investigation report
RIWP	remedial investigation work plan
Site	West Deptford, New Jersey, Facility
Solvay	Solvay Specialty Polymers USA, LLC
SPLP	synthetic precipitation leaching procedure
SRP	Site Remediation Program

EXECUTIVE SUMMARY

On behalf of Solvay Specialty Polymers USA, LLC (Solvay), this remedial investigation work plan (RIWP) includes:

1. A discussion and review of soil investigation activities previously completed on behalf of Solvay between 2014 and 2016
2. Proposed additional investigation activities related to the characterization of the potential presence of Site-related per- and polyfluoroalkyl substances (PFAS) in onsite soils, as requested in the New Jersey Department of Environmental Protection (NJDEP) letter dated December 20, 2019
3. Proposed additional investigation activities related to the soil migration to groundwater pathway, as described on pages 4 and 5 in the letter from Latham & Watkins on behalf of Solvay to the NJDEP dated May 6, 2021.

While recognizing that the NJDEP has not yet certified analytical methods or promulgated remediation standards for PFAS in soils, sediments, and surface water, NJDEP has directed Solvay to prepare a RIWP to complete the remaining elements required for submittal of a site-wide Remedial Investigation Report (RIR).

Data from this RIWP will inform development of later work plans to confirm and ultimately, upon NJDEP approval of certified analytical methods and clean-up standards for soils, to allow delineation and remediation of Site-related PFAS impacts that may be present in soils. Actual timing of work plan submittals will be dependent on NJDEP's review and approval of this RIWP, availability of the data gathered, and confirmation from NJDEP of the relevant analytical methods and remediation standards.

This RIWP has been prepared in accordance with applicable New Jersey environmental laws, applicable NJDEP regulations, and NJDEP's specific Direct Oversight demands. This document is submitted by the Licensed Site Remediation Professional for this investigation under the NJDEP Site Remediation Program (SRP), Program Interest No. 015010 (SRP PI No. 015010) and Activity Number RPC140002 – Solvay PFCs.

Investigation Background

Solvay has completed substantial remedial investigation work related to PFAS at the Site since 2014. A bulleted list of key work plans and reports which include information related to soil investigation is included below:

- September 22, 2015: Work Plan Perfluoroalkyl Compounds
- June 30, 2017: Perfluoroalkyl Compound Investigation Report

- May 18, 2018: Technical Memorandum
- June 29, 2018: NJDEP Comment Letter Response to Technical Memorandum
- August 27, 2018: Response to NJDEP Comments Dated June 29, 2018 on the Technical Memorandum dated May 18, 2018

Solvay has previously completed the following soil investigation activities, which include both onsite and offsite PFAS sampling:

- Collection of over 191 soil samples from 39 locations onsite
- Collection of over 43 soil samples from 10 locations offsite
- Development of a site-specific alternative remediation standard for the soil to groundwater migration pathway of 20 ng/g for perfluorononanoic acid (PFNA).

The existing data collected as part of these studies was used to create the proposed investigation described in this RIWP. As detailed below, further assessment is required as one next iterative step to evaluate the potential impacts to groundwater related to onsite soil. Sampling for monofunctional surfactants (MFS) and bifunctional surfactants (BFS) in soil will proceed pursuant to a separate work plan reviewed and approved by NJDEP.

Proposed investigation activities described in this RIWP include the following:

- Vertical assessment of PFNA and perfluorooctanoic acid (PFOA) at 18 prior locations where sampling results are above the reporting limit established (0.5 µg/kg) in the quality assurance project plan (QAPP).
- Horizontal assessment of PFNA and PFOA, through the addition of 29 sample locations.
- Evaluate in context with both the updated soil remediation standards[1] (May 2021) which include procedures for development of alternative remediation standards and recently issued NJDEP frequently asked questions (August 2021) the previously developed site-specific soil to groundwater remediation standard of 20 ng/g for PFNA proposed in the June 2017 Investigation Report.

[1] The Remediation Standards (N.J.A.C. 7:26 D), updated on May 17, 2021 did not include standards for any PFAS.

1 INTRODUCTION

On behalf of Solvay Specialty Polymers USA, LLC (Solvay), this Remedial Investigation Work Plan (RIWP) includes a review of completed data, a proposal for additional soil data gathering, and an evaluation to develop alternative soil remediation standards for per- and polyfluoroalkyl substances (PFAS) at the Solvay West Deptford facility located at 10 Leonard Lane, West Deptford, New Jersey (Site, Figure 1).

This RIWP is submitted by the Licensed Site Remediation Professional for this investigation under the New Jersey Department of Environmental Protection (NJDEP) Site Remediation Program (SRP), Program Interest No. 015010 (SRP PI No. 015010) and Activity Number RPC140002 – Solvay PFCs.

1.1 PURPOSE OF THIS DOCUMENT

NJDEP has requested that Solvay prepare a comprehensive RIWP to complete the remaining elements required for submittal of a Remedial Investigation Report (RIR), despite the lack of NJDEP-certified analytical methods for any PFAS in soils, sediments, and surface water, and the lack of NJDEP duly-promulgated remediation standards for any PFAS in soils, sediments, and surface water.

In an effort to expedite the process of providing information to NJDEP, portions of the comprehensive RIWP will be submitted as standalone documents, such as this RIWP. This work plan is intended to delineate perfluorononanoic acid (PFNA) and perfluorooctanoic acid (PFOA) in onsite soils[2] and evaluate the potential pathway between soil and groundwater. Completion of these iterative work plans, and NJDEP's review and approval, will inform the development and execution of successive work plans.

Additional focus areas and direction from NJDEP related to the remedial investigation (RI) will be addressed in later submittals.

1.2 PREVIOUS SUBMITTALS

While there have been multiple submittals by Solvay to the NJDEP concerning soil, the following reports and submittals are most applicable to this RIWP:

[2] The analytical method to be utilized for this RIWP is SGS of Orlando, FL (SGS) Laboratory SOP, EPA 537M, by LC-MS/MS Isotope Dilution (reporting PFAS carbon chain range from C4-C13, including branched and linear isomers of PFNA, PFOA, PFHxS, and PFOS) per the QAPP.

- September 22, 2015: Work Plan Perfluoroalkyl Compounds (Integral 2015)
- June 30, 2017: Perfluoroalkyl Compound Investigation Report (Integral 2017)
- May 18, 2018: Technical Memorandum
  - June 29, 2018: NJDEP Comment Letter Response to Technical Memorandum (Integral 2018)
  - August 27, 2018: Response to NJDEP Comments Dated June 29, 2018 on the Technical Memorandum Dated May 18, 2018.
- Field sampling plan (FSP) submitted to NJDEP on May 12, 2021 (Integral 2021a)
- Quality assurance project plan (QAPP) submitted to NJDEP on May 27, 2021 (Integral 2021b)

In addition, the NJDEP sent a letter to Solvay dated September 25, 2020, indicating NJDEP has determined that Solvay is subject to Direct Oversight under the Site Remediation Reform Act (SRRA) and Administrative Requirements for the Remediation of Contaminated Sites (ARRCS). Since this date, multiple correspondences have been exchanged between Solvay and NJDEP in reference to this determination. As described in these correspondences, there are several limitations to completing the remediation activities. One is the lack of NJDEP certification of laboratory methods for the analysis of any PFAS in soil, sediment, and surface water. Another limitation is that, for PFAS, including PFNA, NJDEP has not promulgated remediation standards for soil, or surface water quality or sediment screening criteria. The investigation and remediation required by NJDEP's Technical Requirements for Site Remediation (Tech Regs) cannot be completed without NJDEP duly-promulgated remediation standards for PFAS in soils, sediment, and surface water.

1.3 BACKGROUND

The Site encompasses 243 acres, with active plant operations occurring on 34 acres of the property and the remaining 209 acres remaining either in a natural state or developed as a solar farm. The far northern area of the Site contains dredge spoils placed there by the U.S. Army Corps of Engineers in the 1960s (ERM 2014). The Site is bounded to the north by the Delaware River, to the west by Little Mantua Creek, to the east by undeveloped property, and to south by a rail line.

Prior to 1970, the property was used for agricultural purposes. Fluorocarbon manufacturing began in 1970 when Pennwalt constructed a facility at the Site. Manufacturing ceased in 1977. Pennwalt constructed a new facility from 1983 to 1985, and started production of vinylidene fluoride monomers and polymers using fluorinated process aids in the manufacturing process in 1985 (ERM 2014). The facility was purchased by Elf Atochem in 1989 and operated until it was sold to Ausimont USA, Inc. in 1990. The Solvay Group acquired the holding of the parent

company of Ausimont USA, Inc. in May 2002 and changed the name to Solvay Solexis, Inc. on January 1, 2003. The company and facility name were then changed to Solvay Specialty Polymers USA, LLC on October 31, 2012 (ERM 2014).

The Site is located on an outcrop of the Magothy Formation. The formations that outcrop within the vicinity of the Site include the Potomac Group, Raritan Formation, Magothy Formation (PRM), and the Merchantville Formation. The PRM formations together form the PRM aquifer system, which is subdivided into upper, middle, and lower units with confining units separating the water-bearing zones. Shallow groundwater at the Site occurs in the Upper PRM. Groundwater flow from the Site is to the south-southeast based on historical and current groundwater gauging data from Upper PRM monitoring wells.

Since 2013, Solvay's remedial investigation activities to evaluate the presence of PFNA and other PFAS in media at or near the Site have included the following: monitoring well installation (53 monitoring wells), groundwater gauging and sampling (154 locations, 390 samples), public (7 systems, 280 samples) and private (101 locations, 130 samples) potable well sampling, soil sampling (49 locations, 234 samples), surface water sampling (44 locations, 77 samples), sediment sampling (32 locations, 79 samples) and porewater sampling (16 locations, 16 samples).

2 REVIEW OF HISTORICAL SAMPLING DATA

Investigation activities completed by Solvay between 2013 and 2021 have included soil sampling, in addition to groundwater, surface water, sediment and pore water sampling.

A summary of prior soil sampling activities and results are included in the sections below.

2.1 SOIL INVESTIGATION SUMMARY

Previous soil investigation activities were completed between 2014 and 2016. A description of soil investigation activities and the associated conclusions were reported in the 2017 Investigation Report and are described herein. Sampling locations and results are summarized in Table 1.

The focus of the soil sampling activities was to validate the air modeling results and to assess the soil-to-groundwater pathway. Sampling locations were also selected to target the main production area, materials storage areas, drainage swales, lawn/grass areas not used for materials storage or production, and monitoring well installation locations. Laboratory analysis for soil samples was completed by ALS Environmental – Kelso Laboratory of Kelso, Washington (ALS) and Test America of Denver, Colorado using the following methods:

- ALS: Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS (NJDEP Laboratory Certification No. WA005)
- Test America: DV-LC-002 Perfluorinated Hydrocarbons (LC/MS) by method PFC (NJDEP Laboratory Certification No. CO004)

Additional soil samples were also collected offsite as part of groundwater investigation activities. Offsite samples were analyzed by ALS or AXYS Analytical Services Ltd. (AXYS) using the following methods:

- ALS: Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS
- AXYS: MLA Rev.09 Vers. 3 Analytical Procedure for the Analysis of Perfluorinated Organic Compounds in Solid Samples by LC-MS/MS (NJDEP Laboratory Certification No. CANA005).

Historical onsite sampling locations are presented on Figure 2, and historical offsite sampling locations are presented on Figure 3. In addition to Site investigation activities, the results of the 2016 soil investigation were used to determine a PFNA partition coefficient for Site soils. The

results of the soil desorption equilibrium testing yielded site-specific partition coefficients for PFNA.

Results of this sampling and associated conclusions reported in the 2017 Investigation Report are as follows:

- The highest concentrations of PFNA in subsurface soil was generally between 2 and 5 ft below ground surface (bgs), and the maximum soil concentration of PFNA was 2,400 ng/g. These locations were within the main Polymer Building production area. Concentrations were lower by at least an order of magnitude in the areas away from and outside of the main Polymer Building production area.
- Perfluoroundecanoic acid (PFUnDA) (C11) appeared to be less mobile in soil than PFNA (C9) based on vertical profiling results. Concentrations of PFUnDA were present at higher concentrations at the surface than at the subsurface. This was also confirmed by the overall absence of PFUnDA in groundwater sampling conducted simultaneously.
- Lower levels of PFAS in soils outside of the Polymer Building and laydown/storage areas are likely the result of air deposition from identified emission sources located near the Polymer Building. This is consistent with the significant decrease in PFAS concentrations in soil on the Site with distance downwind from the identified emissions sources.
- PFAS concentrations (including PFNA) in all of the 2014 temporary well point borings offsite were non-detect. Concentrations in soil at the offsite monitoring well locations were non-detect at most locations with a maximum concentration of 2.6 ng/g at MW-103S. Based on the observed concentration gradient, PFNA in soil decreases with distance from the Site.
- Using NJDEP's spreadsheet tool (NJDEP, 2013) for calculating preliminary site-specific Impact to Groundwater Soil Remediation Standard (IGW SRS), a value of 20 ng/g or 0.020 mg/kg for PFNA in soil (IGW SRS) was developed. A copy of the spreadsheet is included as Appendix A.

Based on the results of the prior sampling, additional soil sampling activities were proposed in the Solvay technical memorandum submitted to NJDEP dated May 18, 2018 (Integral 2018; May 2018 Tech Memo), which incorporated comments on the memorandum received from NJDEP on June 29, 2018, and Solvay's response to NJDEP's comments on August 27, 2018 which proposed to delineate soil onsite to 20 ng/g of PFNA.

2.2 PFNA DISTRIBUTION IN ONSITE SOIL

Using the results of the soil sampling described above, isocontours for PFNA were developed using the Earth Volumetric Studio (EVS) modeling software and imported into ArcGIS software for graphical presentation. Isocontours were developed for the four soil intervals consistently sampled across the Site to provide the best resolution possible: 0–0.5 ft bgs (Figure 4), 1–1.5 ft bgs (Figure 5), 2–2.5 ft bgs (Figure 6), and 5–5.5 ft bgs (Figure 7). While this is a different representation of the data from the 2017 Investigation Report, the results of the isocontour data presentation are consistent with prior discussions of the results of the soil sampling and with the results of the air dispersion model. The highest concentrations of PFNA in soil are proximate to the Polymer Building and decrease with distance from the Polymer Building.

The isocontours maps were used to support the determination of additional characterization sample locations as described in Section 3.

3 PROPOSED SOIL INVESTIGATION

Soil samples are proposed to be collected from onsite locations as depicted on Figure 8. The analytical method currently proposed is EPA 537M, by LC-MS/MS Isotope Dilution with analysis completed by SGS (as presented in the QAPP). SGS is certified by the NJDEP to perform this method (certificate issued July 1, 2021); however, they are not eligible to report results and the timeframe for full credentials is not known. According to the NJDEP's "Contaminants of Emerging Concern Frequently Asked Questions (FAQ)" issued on Aug. 5, 2021 two options are available for the analysis of PFAS in soil. While Solvay has met the conditions outlined in Option 1 (preparation and submittal of the site-specific QAPP), the Direct Oversight determination requires that the NJDEP approve the QAPP, which has not yet occurred. To reduce the risk of data being rejected by the NJDEP, investigation activities related to soil will be conducted either (1) upon approval of the QAPP and NJDEP's concurrence that data collected pursuant to the QAPP will meet the requirements set forth in the Tech Regs and can be used to make final remedial decisions and/or issue a final remediation document, or (2) upon full certification of a laboratory by the Office of Quality Assurance (OQA), defined as Option 2 in the FAQ.

3.1 SOIL SAMPLING

Activities to be completed as part of this investigation include installation of soil borings and collection of soil samples as described below. Tables 1 and 2 describe proposed sample names, sample intervals, analysis consistent with that presented in the QAPP, and media.

Borings will be advanced by a New Jersey licensed driller using direct push (Geoprobe®) technology, or hand tools where appropriate, to the appropriate depth based on the sampling interval included in Table 1 or Table 2. All drilling work will be completed in accordance with the Field Sampling Plan (FSP) submitted to NJDEP on May 11, 2021 (Integral 2021a), and applicable NJDEP requirements. Boring logs, which include soil recovery, lithology, and color, will be recorded at each location.

Soil samples will be collected from discrete 6-in. intervals and analyzed by SGS - Laboratory SOP, using EPA 537M, by LC-MS/MS Isotope Dilution with isomer analysis as outlined on Table 1 and Table 2 upon NJDEP approval of (1) the QAPP and concurrence of Solvay's ability to use the data generated pursuant to the QAPP for compliance with the Tech Regs, or (2) a method fully certified by OQA. No samples will be collected from the saturated zone. Additional samples will be collected for grain size and total organic carbon analysis, consistent with prior sampling conducted at the Site. As the subsurface is generally consistent, grain size and total organic carbon will be collected from three onsite locations (southern property boundary, main plant area, and laydown area) and at intervals consistent with samples collected in those locations (approximately every 2 ft to the top of the water table).

Laboratory analysis and associated quality assurance and quality control (QA/QC) sample analysis will be completed in accordance with Solvay's May 27, 2021 QAPP, once approved by NJDEP. After soil samples are collected, borings will be backfilled consistent with NJAC 7:9D-3.4. The locations of soil borings will be measured using a handheld GPS unit in accordance with the FSP.

Soil sampling for monofunctional surfactants (MFS) and bifunctional surfactants (BFS) will proceed pursuant to a separate work plan reviewed and approved by NJDEP that works out from the areas of the plant where these materials were used at the Site. Sampling for MFS and BFS also will follow the QAPP Solvay submitted to NJDEP on May 27, 2021, once the QAPP is approved by NJDEP.

3.2 SITE SPECIFIC ALTERNATIVE REMEDIATION STANDARDS EVALUATION

Solvay requests NJDEP guidance on development of site-specific alternative remediation standards for the soil migration to groundwater pathway (ARS-MGW) for PFNA and PFOA. The additional activities requested by NJDEP in prior correspondence in 2017 and 2018 cannot be completed due to current limitations of analytical methods.

Specifically, NJDEP's communications dated November 15, 2017 (NJDEP internal memorandum from Paul Sanders to Dave Barskey), stated that the *"NJDEP prefers (for the present time) to utilize site- specific desorption data from site samples in order to determine site-specific standards for the perfluoro acids as was done by Integral Consulting in this submittal. However, the NJDEP has a standard procedure for generating site-specific standards from desorption data, namely the Synthetic Precipitation Leaching Procedure (SPLP)"*. In addition, during the February 21, 2018 conference call between NJDEP, Solvay, Integral, and Roux Associates, Inc., and in follow up correspondence (Integral 2018) to further discuss the development of site-specific standards, the NJDEP reiterated the use of SPLP to develop a site-specific standard. Solvay was prepared to evaluate this pathway using SPLP as requested by the NJDEP. However, in the recently NJDEP-issued "Contaminants of Emerging Concern Frequently Asked Questions (FAQ)" (Aug. 5, 2021), NJDEP states the following:

> The Synthetic Precipitation Leaching Procedure, SW-846 Method 1312 (SPLP) was not designed for use with PFAS and may not provide optimal results. Addressing the migration to ground water pathway presents difficulties due to the unique characteristics of PFAS… At this time, the Department recommends delineating to the Laboratory Reporting limits when investigating PFAS in soil.

Solvay is requesting a technical consultation with the appropriate persons in the NJDEP to further discuss the soil to groundwater migration pathway. This technical consultation is needed because two of four methods included in the Soil and Soil Leachate Remediation

Standards for the Migration to Groundwater Exposure Pathway Basis and Background Document (NJDEP 2021) applicable to the Site are not available for this Site. First, NJDEP, in its August 5, 2021 FAQ document, has now indicated that the SPLP method is not recommended for investigating PFAS in soil. Second, the 2021 Soil-water Partition Equation Calculator method requires default input parameters to be provided by the NJDEP (which NJDEP has not yet made available), or use of site-specific data developed by Solvay for the necessary equation inputs (which NJDEP has not approved). The remaining two methods, SESOIL and SESOIL AT123D Model, are not appropriate for use to develop a site-specific soil to groundwater migration pathway SRS based on the vertical distribution of PFNA in soil and that an impermeable cap is present at the Site (the SESOIL AT123D model relies on infiltration and groundwater recharge).

Given the current unavailability of a technical approach to evaluate the soil to groundwater migration pathway at the Site, Solvay requires a technical consultation with NJDEP to discuss and resolve this issue prior to implementing this RIWP.

3.3 DATA ANALYSIS

Until regulatory standards for PFNA and PFOA in soil are established, the extent of onsite impacts in soil will be assessed using the following benchmark for comparison:

- The previously submitted 20 ng/g IGW SRS calculated using the soil-to-groundwater partition equation

The results of the RIWP investigation will be submitted in the RIR, including figures and associated summary data tables. Electronic data deliverables will be emailed to srpedd@dep.nj.gov in conjunction with the RIR, per NJDEP guidelines.

The extent of remediation, if required, will be based on NJDEP duly promulgated soil remediation standards as they become available.

4 REFERENCES

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TABLES

Table 1. Historical Soil Sample and Proposed Vertical Assessment Locations

2021 Sample Location	2014 - 2016 Sampling Information					Reporting Limit (2021 QAPP)			2016 Depth to Groundwater	2016 Boring Depth	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
	Sample ID	Sample Depth	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)					
Onsite Soil Investigation													
SB15-01	SL0001-0	0-0.5'	14	0.27 J	0.35 J	0.5	0.5	0.5	15' bgs	16' bgs	None	N/A	No sample is proposed at this location due to 2016 observations. Groundwater was observed at approximately 15' bgs in 2016; the concentrations identified in the 14-14.5' bgs sample are believed to be due to either capillary fringe or seasonal variability in groundwater. The sample collected from 13-13.5' bgs had no detections of PFNA, PFOA, or PFOS so concentrations within the vadose zone are considered delineated.
	SL0001-2	2-2.5'	16	0.086 J	0.81 J								
	SL0001-3	3-3.5'	0.095 J	0.14 J	0.83 J								
	SL0001-4	4-4.5'	0.082 J	0.073 J	0.21 U								
	SL0001-6	6-6.5'	0.71 U	0.67 U	0.71 U								
	SL0001-7	7-7.5'	0.8 U	0.76 U	0.8 U								
	SL0001-8	8-8.5'	0.64 U	0.61 U	0.64 U								
	SL0001-9	9-9.5'	0.63 U	0.59 U	0.63 U								
	SL0001-10	10-10.5'	0.7 U	0.66 U	0.7 U								
	SL0001-11	11-11.5'	0.82 U	0.77 U	0.82 U								
	SL0001-12	12-12.5'	1 J	0.7 U	0.74 U								
	SL0001-13	13-13.5'	0.66 U	0.62 U	0.66 U								
	SL0001-14	14-14.5'	12	0.82 U	0.86 U								
SB15-02	SL0002-0	0-0.5'	8.9	0.093 J	1.2	0.5	0.5	0.5	N/A	8' bgs	2-2.5' 3-3.5' 5-5.5' 8-8.5' 11-11.5' 12-12.5'	PFAS by EPA Method 537M as defined in 2021 QAPP[1]	Sample depths chosen based on concentrations observed historically in surrounding borings SB15-09, SB15-21, SB15-23, and SB15-31.
	SL0002-1.5	1.5-2'	14	0.15 J	1.8								
SB15-03	SL0003-0	0-0.5'	27	0.06 U	0.43 J	0.5	0.5	0.5	10.5' bgs	16' bgs	None	N/A	No sample is proposed at this location due to 2016 observations. Groundwater was observed at approximate 10.5' bgs in 2016; the concentrations identified in the 9-9.5' and 10-10.5' bgs samples are believed to be due to either capillary fringe or seasonal variability in groundwater. In addition, this sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations. Additional investigation in this location is not warranted.
	SL0003-1	1-1.5'	74	0.062 J	0.57 J								
	SL0003-2	2-2.5'	240	0.1 J	0.41 J								
	SL0003-3	3-3.5'	290	0.07 J	0.33 J								
	SL0003-4	4-4.5'	440	0.073 J	0.37 J								
	SL0003-5	5-5.5'	570	0.74 U	0.79 U								
	SL0003-6	6-6.5'	270	0.66 U	4.3								
	SL0003-7	7-7.5'	0.71 UJ	0.67 UJ	11 J								
	SL0003-8	8-8.5'	0.84 U	0.79 U	5.7								
	SL0003-9	9-9.5'	28	0.78 U	13								
	SL0003-10	10-10.5'	26	0.75 U	0.92 J								
SB15-04	SL0004-0	0-0.5'	9.6	0.11 J	0.69 J	0.5	0.5	0.5	15.75' bgs	16' bgs	None	N/A	PFNA has been vertically delineated in this soil boring. Groundwater was observed at 15.75' bgs in 2016, so no further vertical delineation of PFOA can be completed.
	SL0004-1	1-1.5'	42	0.26 J	0.35 J								
	SL0004-2	2-2.5'	490	0.31 J	0.56 J								
	SL0004-3	3-3.5'	340	0.14 J	1								
	SL0004-4	4-4.5'	83 J	0.069 J	0.39 J								
	SL0004-5	5-5.5'	21	0.72 U	0.8 J								
	SL0004-7	7-7.5'	3.9 J	0.69 U	1.6 J								
	SL0004-8	8-8.5'	18	0.68 U	1.4 J								
	SL0004-9	9-9.5'	1.8 J	0.76 U	12								
	SL0004-10	10-10.5'	5.8	0.66 U	38								
	SL0004-11	11-11.5'	2.4 J	0.7 U	14								
	SL0004-12	12-12.5'	3.2 J	0.64 U	2.1 J								
	SL0004-14	14-14.5'	0.76 U	0.72 U	2 J								
	SL0004-15	15-15.5'	0.77 U	0.72 U	2.9 J								

Table 1. Historical Soil Sample and Proposed Vertical Assessment Locations

2021 Sample Location	2014 - 2016 Sampling Information					Reporting Limit (2021 QAPP)			2016 Depth to Groundwater	2016 Boring Depth	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
	Sample ID	Sample Depth	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)					
SB15-05	SL0005-1	1-1.5'	1100	0.078 J	39	0.5	0.5	0.5	10.5' bgs	12' bgs	None	N/A	No sample is proposed at this location due to 2016 observations. Groundwater was observed at approximately 10.5' bgs in 2016; no additional vertical delineation samples can be collected. In addition, this sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations.
	SL0005-2	2-2.5'	1300	0.088 J	21								
	SL0005-3	3-3.5'	920	0.06 U	9.6								
	SL0005-4	4-4.5'	1300	0.062 U	37								
	SL0005-5	5-5.5'	1900	0.06 U	80								
	SL0005-6	6-6.5'	460	0.68 U	32								
	SL0005-7	7-7.5'	770	0.7 U	190								
	SL0005-8	8-8.5'	1300	0.65 U	210								
	SL0005-9	9-9.5'	1300	0.7 U	260								
	SL0005-10	10-10.5'	1100	0.69 U	170								
SB15-06	SL0006-0	0-0.5'	0.73 J	0.06 U	0.21 U	0.5	0.5	0.5	11' bgs	12' bgs	None	N/A	No sample is proposed at this location due to 2016 observations. Groundwater was observed at approximately 11' bgs in 2016; no additional vertical delineation samples can be collected.
	SL0006-1	1-1.5'	0.32 J	0.06 U	0.2 U								
	SL0006-2	2-2.5'	0.12 J	0.06 U	0.2 U								
	SL0006-3	3-3.5'	0.084 U	0.063 U	0.2 U								
	SL0006-4	4-4.5'	0.29 J	0.06 U	0.2 U								
	SL0006-5	5-5.5'	0.75 U	0.71 U	0.75 U								
	SL0006-6	6-6.5'	0.75 J	0.68 U	0.72 U								
	SL0006-7	7-7.5'	0.84 J	0.6 U	0.64 U								
	SL0006-8	8-8.5'	0.8 J	0.69 U	0.73 U								
	SL0006-9	9-9.5'	4	0.6 U	0.63 U								
	SL0006-10	10-10.5'	1.9 J	0.67 U	0.71 U								
SB15-07	SL0007-0	0-0.5'	2.1	0.45 J	0.23 U	0.5	0.5	0.5	12' bgs	12' bgs	None	N/A	No sample is proposed at this location due to 2016 observations. Groundwater was observed at approximately 12' bgs in 2016; no additional vertical delineation samples can be collected. Elevated concentrations observed at 11-11.5' bgs are believed to be due to capillary fringe or seasonal groundwater changes based on the concentrations reported in the 9-9.5' bgs sample and the 10-10.5' bgs sample.
	SL0007-1	1-1.5'	8.2	0.29 J	0.2 U								
	SL0007-2	2-2.5'	84	1.2	0.2 U								
	SL0007-3	3-3.5'	53	0.43 J	0.2 U								
	SL0007-4	4-4.5'	69	0.71 J	0.2 U								
	SL0007-5	5-5.5'	32	0.7 U	0.74 U								
	SL0007-6	6-6.5'	11	0.61 U	0.65 U								
	SL0007-7	7-7.5'	26	0.67 U	0.71 U								
	SL0007-8	8-8.5'	27	0.67 U	0.71 U								
	SL0007-9	9-9.5'	0.72 U	0.68 U	0.72 U								
	SL0007-10	10-10.5'	1.9 J	0.65 U	0.69 U								
	SL0007-11	11-11.5'	35	0.63 U	0.67 U								
SB15-08	SL0008-0	0-0.5'	250	0.067 J	1.3	0.5	0.5	0.5	10.5' bgs	12' bgs	None	N/A	This sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations. Additional investigation in this location is not proposed.
	SL0008-2	2-2.5'	800	0.06 U	3.5								
	SL0008-5	5-5.5'	110	0.77 U	63								
	SL0008-8	8-8.5'	1700	0.62 U	140								
SB15-09	SL0009-0	0-0.5'	11	0.12 J	0.9 J	0.5	0.5	0.5	N/A	8' bgs	5-5.5' 8-8.5' 9-9.5' 10-10.5' 11-11.5' 12.12.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Sample depths chosen based on concentrations observed historically in surrounding borings and anticipated depth to groundwater. Samples will only be collected from the vadose zone and number of samples may be updated based on field observations.
	SL0009-2.5	2.5-3'	24	0.24 J	1.9								
	SL0009-DUP	2.5-3'	17	0.2 J	1.2								
SB15-10	SL0010-0	0-0.5'	14	0.12 J	0.79 J	0.5	0.5	0.5	12' bgs	12' bgs	None	N/A	This sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations. Additional investigation in this location is not proposed.
	SL0010-2	2-2.5'	140 J	0.063 U	4.8								
	SL0010-5	5-5.5'	0.65 U	0.61 U	16								
	SL0010-8	8-8.5'	51	0.66 U	3 J								

Table 1. Historical Soil Sample and Proposed Vertical Assessment Locations

2021 Sample Location	2014 - 2016 Sampling Information					Reporting Limit (2021 QAPP)			2016 Depth to Groundwater	2016 Boring Depth	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
	Sample ID	Sample Depth	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)					
SB15-11	SL0011-0	0-0.5'	5	0.15 J	0.37 J	0.5	0.5	0.5	12.5' bgs	16' bgs	9-9.5' bgs 10-10.5' bgs 11-11.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0011-2	2-2.5'	19	0.26 J	0.3 J								
	SL0011-5	5-5.5'	0.9 J	0.63 U	2 J								
	SL0011-8	8-8.5'	29	0.67 J	4								
SB15-12	SL00012-0	0-0.5'	4.6	0.06 U	0.22 U	0.5	0.5	0.5	10.5' bgs	12' bgs	9-9.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00012-2	2-2.5'	33	0.13 J	0.22 J								
	SL00012-5	5-5.5'	20 J	0.64 U	0.68 U								
	SL00012-8 @ 1143	8-8.5'	3.1 J	0.75 U	2 J								
SB15-13	SL00013-0	0-0.5'	180	0.06 U	0.91 J	0.5	0.5	0.5	11' bgs	12' bgs	None	N/A	This sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations. Additional investigation in this location is not proposed.
	SL00013-2	2-2.5'	1200	0.06 U	2.9								
	SL00013-5	5-5.5'	1900	0.65 U	27								
	SL00013-8	8-8.5'	2400	0.71 U	40								
SB15-14	SL00014-0	0-0.5'	1	0.06 U	0.2 U	0.5	0.5	0.5	10.5' bgs	12' bgs	None	N/A	This sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations. Additional investigation in this location is not proposed.
	SL00014-2	2-2.5'	0.75 J	0.06 U	0.22 U								
	SL00014-5	5-5.5'	0.73 U	0.69 U	4								
	SL00014-8	8-8.5'	0.78 UJ	0.74 U	6								
SB15-15	SL00015-0	0-0.5'	17	0.06 U	0.24 J	0.5	0.5	0.5	10' bgs	10' bgs	None	N/A	The deepest sample collected at this location, 8-8.5' bgs, is close to the water table and any samples collected below may be biased high due to seasonal groundwater changes. No additional samples proposed.
	SL00015-2	2-2.5'	39	0.06 U	1.7								
	SL00015-5	5-5.5'	23	0.06 U	0.51 J								
	SL00015DUP	5-5.5'	30	0.06 U	0.66 J								
	SL00015-8	8-8.5'	50	0.68 U	0.72 U								
SB15-16	SL00016-0	0-0.5'	16	0.19 J	0.56 J	0.5	0.5	0.5	N/A	16' bgs	None	N/A	Samples collected at 5-5.5' and 8-8.5' bgs both reported non-detections for PFNA, PFOA, and PFOS. Vertical delineation is complete for this location.
	SL00016-2	2-2.5'	1.2	0.094 J	3.4								
	SL00016-5	5-5.5'	0.71 U	0.67 U	0.71 U								
	SL00016-8	8-8.5'	0.74 U	0.7 U	0.74 U								
SB15-17	SL00017-0	0-0.5'	4.4 J	0.35 J	0.25 U	0.5	0.5	0.5	13' bgs	16' bgs	9-9.5' bgs 10-10.5' bgs 11-11.5' bgs 12-12.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00017-2	2-2.5'	43	0.061 J	0.2 U								
	SL00017-5	5-5.5'	36	0.73 U	0.77 U								
	SL00017-8	8-8.5'	3.4 J	0.69 U	0.73 U								
SB15-18	SL00018-0	0-0.5'	1.8	0.54 J	0.23 U	0.5	0.5	0.5	12' bgs	12' bgs	9-9.5' bgs 10-10.5' bgs 11-11.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00018-2	2-2.5'	65 J	1	0.21 U								
	SL00018DUP	2-2.5'	33	0.57 J	0.22 U								
	SL00018-5	5-5.5'	39	0.72 U	0.76 U								
	SL00018-8	8-8.5'	2.1 J	0.62 U	0.66 U								
SB15-19	SL00019-0	0-0.5'	2.4 J	0.25 J	0.24 U	0.5	0.5	0.5	11.75' bgs	16' bgs	9-9.5' bgs 10-10.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00019-2	2-2.5'	24	0.18 J	0.22 U								
	SL00019-5	5-5.5'	8.5	0.69 U	0.74 U								
	SL00019-8	8-8.5'	2 J	0.75 U	0.8 U								
SB15-20	SL00020-0	0-0.5'	0.56 J	0.06 U	0.2 U	0.5	0.5	0.5	4' bgs	12' bgs	None	N/A	The deepest sample collected at this location, 3.5-4' bgs, is close to the water table and any samples collected below may be biased high due to seasonal groundwater changes. No additional samples proposed.
	SL00020-3.5	3.5-4'	56 J	0.27 J	0.21 U								

Table 1. Historical Soil Sample and Proposed Vertical Assessment Locations

2021 Sample Location	2014 - 2016 Sampling Information					Reporting Limit (2021 QAPP)			2016 Depth to Groundwater	2016 Boring Depth	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
	Sample ID	Sample Depth	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)					
SB15-21	SL00021-0	0-0.5'	140	0.48 J	0.4 J	0.5	0.5	0.5	10.5' bgs	12' bgs	9-9.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depth will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00021-2	2-2.5'	420	0.48 J	1.7								
	SL00021-5	5-5.5'	0.65 U	0.62 U	0.78 J								
	SL00021-8	8-8.5'	15	0.66 U	3.9 J								
SB15-23	SL00023-0	0-0.5'	140	0.4 J	2.7	0.5	0.5	0.5	10.5' bgs	12' bgs	9-9.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depth will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00023-2	2-2.5'	600	0.19 J	6								
	SL00023-5	5-5.5'	17	0.099 J	200								
	SL00023-8	8-8.5'	4.5 J	0.077 J	72 J								
SB15-24	SL00024-0	0-0.5'	41	0.06 U	1.7 J	0.5	0.5	0.5	N/A	2' bgs	None	N/A	This sample location is present within the cap installed as an IRM and is surrounded by multiple other sample locations. Additional investigation in this location is not proposed.
	SL00024-1	1-1.5'	69	0.06 U	2.6								
SB15-25	SL00025-0	0-0.5'	71	0.064 J	0.26 J	0.5	0.5	0.5	10.5' bgs	12' bgs	None	N/A	Samples collected at 5-5.5' and 8-8.5' bgs both reported non-detections for PFNA, PFOA, and PFOS. Vertical delineation is complete for this location.
	SL00025-2	2-2.5'	2.2 J	0.06 U	13								
	SL00025-5	5-5.5'	0.68 U	0.64 U	0.68 U								
	SL00025-8	8-8.5'	0.63 U	0.6 U	0.63 U								
SB15-26	SL00026-0	0-0.5'	2.8	0.091 J	0.21 U	0.5	0.5	0.5	N/A	12' bgs	None	N/A	Sample collected at 8-8.5' bgs reported non-detections for PFNA, PFOA, and PFOS. Vertical delineation is complete for this location.
	SL00026-2	2-2.5'	8.7	0.06 U	2.6								
	SL00026-5	5-5.5'	0.75 U	0.7 U	1 J								
	SL00026-8	8-8.5'	0.73 U	0.69 U	0.73 U								
SB15-28	SL0028-0.5	0.5-1'	4.5	0.12 J	0.36	0.5	0.5	0.5	4' bgs	4' bgs	None	N/A	No additional samples are proposed at this location. Results for PFNA are at or below the reporting limits; vertical delineation is complete for this location.
	DUP	3.5-4'	0.52	0.06 U	0.2 U								
	SL0028-3.5	3.5-4'	0.42	0.06 U	0.2 U								
SB15-29	SL0029-2	2-2.5'	4.5	0.06 U	0.3	0.5	0.5	0.5	3' bgs	4' bgs	None	N/A	Sample collected at 2.5-3' bgs reported non-detections for PFNA, PFOA, and PFOS. Vertical delineation is complete for this location.
	SL0029-2.5	2.5-3'	0.21 J	0.06 U	0.2 U								
SB15-31	SL0031-0	0-0.5'	5	0.11 J	0.2 U	0.5	0.5	0.5	11.5' bgs	12' bgs	None	N/A	No sample is proposed at this location due to 2016 observations. Groundwater was observed at approximately 11.5' bgs in 2016; no additional vertical delineation samples can be collected.
	SL0031-6.5	6.5-7'	7.8	0.06 U	0.59								
	SL0031-11	11-11.5'	2.6	0.06 U	0.75								
SB15-32	SL0032-2.5	2.5-3'	22	0.06 U	0.82	0.5	0.5	0.5	3' bgs	4' bgs	None	N/A	Sample was collected from the base of the stormwater swale above the water table; no further sampling for vertical delineation is proposed.
SB15-33	SL00033-0.5	0.5-1'	170	0.29 J	4.9	0.5	0.5	0.5	5.5' bgs	6' bgs	None	N/A	Sample was collected from the base of the stormwater swale above the water table; no further sampling for vertical delineation is proposed.
	SL00033-2	2-2.5'	83	0.063 U	0.57 J								
	SL00033-5.5	5.5-6'	1000	0.06 U	35								
SB15-34	SL00034-0	0-0.5'	0.49 J	0.063 U	0.2 U	0.5	0.5	0.5	12' bgs	12' bgs	9-9.5' bgs 10-10.5' bgs 11-11.5' bgs	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL00034-2	2-2.5'	2.5	0.089 J	0.21 U								
	SL00034DUP	2-2.5'	2	0.06 U	0.2 U								
	SL00034-5	5-5.5'	1.7 J	0.65 U	0.69 U								
	SL00034-8	8-8.5'	5.5	0.71 U	0.75 U								
SB15-35	SL00035-1	1-1.5'	1.4	0.06 U	0.22 U	0.5	0.5	0.5	N/A	12' bgs	Every 1' interval from 11-11.5' until saturated soils	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the groundwater table.
	SL00035-2	2-2.5'	19	0.06 U	0.22 U								
	SL00035-3	3-3.5'	18 J	0.06 U	0.23 U								
	SL00035-4	4-4.5'	28	0.11 U	0.98 J								
	SL00035-5	5-5.5'	3.4	0.062 U	0.34 J								
	SL00035-6	6-6.5'	13	0.06 U	0.39 J								
	SL00035-7	7-7.5'	26	0.72 U	0.76 U								
	SL00035-8	8-8.5'	3.4 J	0.65 U	0.68 U								
	SL00035-9	9-9.5'	3.3 J	0.62 U	0.65 U								
	SL00035-10	10-10.5'	190	0.64 U	0.67 U								

Table 1. Historical Soil Sample and Proposed Vertical Assessment Locations

2021 Sample Location	2014 - 2016 Sampling Information					Reporting Limit (2021 QAPP)			2016 Depth to Groundwater	2016 Boring Depth	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
	Sample ID	Sample Depth	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)					
Offsite Monitoring Well Borehole Investigation													
MW-101D	MW101D_072016_0-0.5	0-0.5'	0.29 J	0.18 J	0.22 J	0.5	0.5	0.5	N/A	N/A	None proposed at this time, onsite delineation will be completed and results compared to reporting limits prior to any offsite sampling.		
	MW101D_72016_5.0-5.5	5-5.5'	0.24 J	0.093 J	0.23 J								
	MW101D_72016_15.5-16	15.5-16'	0.31 J	0.076 U	0.26 U								
MW-102S	MW102_080416_0.-0.5	0-0.5'	0.42 J	0.19 U	0.2 U	0.5	0.5	0.5	N/A	N/A	None proposed at this time, onsite delineation will be completed and results compared to reporting limits prior to any offsite sampling.		
	MW102_080416_2.0-2.5	2-2.5'	2.5	0.18 U	1.3								
MW-103S	MW103_080416_0.-0.5	0-0.5'	1.7	0.25 J	0.22 U	0.5	0.5	0.5	N/A	N/A	None proposed at this time, onsite delineation will be completed and results compared to reporting limits prior to any offsite sampling.		
	MW103_080416_2.0-2.5	2-2.5'	2.6	0.26 J	0.37 J								
MW-105D	MW105D_0-0.5	0-0.5'	0.76 J	0.23 J	0.41 J	0.5	0.5	0.5	N/A	N/A	None proposed at this time, onsite delineation will be completed and results compared to reporting limits prior to any offsite sampling.		
	MW105D_2-2.5	2-2.5'	0.48 J	0.18 U	0.19 U								
MW-106D	MW106D-081116-0-0.5	0-0.5'	1 J	0.18 U	1.9	0.5	0.5	0.5	N/A	N/A	None proposed at this time, onsite delineation will be completed and results compared to reporting limits prior to any offsite sampling.		
	MW106D-081116-2-2.5	2-2.5'	1.4	0.18 U	0.29 J								
2014 Soil Investigation													
SSI-S1	SL0001_20140409	0-2"	1.15	0.14 U	0.23 U	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0002_20140409	2-6"	0.49 J	0.14 U	0.23 U								
	SL0003_20140409	6-12"	1.01	0.14 U	0.23 U								
SSI-S2	SL0004_20140409	0-2"	0.64 J	0.15 U	0.24 U	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0004_20140409	0-2"	0.57 J	0.15 U	0.24 U								
SSI-S3	SL0008_20140409	0-2"	0.84 J	0.16 U	0.26 U	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0009_20140409	2-6"	1.56	0.15 U	0.24 U								
	SL0010_20140409	6-12"	2.69	0.16 J	0.22 U								
SSI-S4	SL0011_20140409	0-2"	3.14	0.43 J	0.25 U	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0012_20140409	2-6"	1.65	0.15 U	0.24 U								
	SL0013_20140409	6-12"	0.89	0.14 U	0.23 U								
SSI-S5	SL0014_20140409	0-2"	3.61	0.19 J	0.23 U	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0015_20140409	2-6"	1.45	0.15 U	0.24 U								
	SL0015_20140409	2-6"	1.74	0.14 U	0.22 U								
	SL0017_20140409	6-12"	0.76 J	0.14 U	0.23 U								
SSI-S6	SL0018_20140409	0-2"	24	3.99	0.54 J	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0019_20140409	2-6"	41.4	4.14	1.26								
	SL0020_20140409	6-12"	55.6	5.95	2.67								
SSI-S7	SL0021_20140409	0-2"	1.58	0.15 U	0.24 U	0.5	0.5	0.5	N/A	1' bgs	0-0.5' bgs and every 2 ' until the top of the water table	PFAS by EPA Method 537M as defined in 2021 QAPP	Recommended sample depths will vertically delineate soil to the anticipated groundwater table based on 2016 field observations.
	SL0022_20140409	2-6"	1	0.14 U	0.23 U								
	SL0023_20140409	6-12"	1	0.15 U	0.25 U								
	SL0023_20140409	6-12"	1.49	0.14 U	0.23 U								

Table 1. Historical Soil Sample and Proposed Vertical Assessment Locations

2021 Sample Location	2014 - 2016 Sampling Information					Reporting Limit (2021 QAPP)			2016 Depth to Groundwater	2016 Boring Depth	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
	Sample ID	Sample Depth	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)	PFNA (ng/g)	PFOS (ng/g)	PFOA (ng/g)					
TWP-1	SL0025_20140904	30-32'	0.101 U	0.203 UJ	0.101 U	0.5	0.5	0.5	N/A	N/A	None proposed, samples are from aquifer zones (saturated)		
	SL0026_20140904	55-57'	0.0966 U	0.193 UJ	0.0966 U								
	SL0026_20140904	55-57'	0.0973 U	0.195 UJ	0.0973 U								
	SL0028_20140904	75-77'	0.0984 U	0.197 UJ	0.0984 U								
	SL0029_20140905	120-122'	0.0961 U	0.192 UJ	0.0961 UJ								
	SL0029_20140905	120-122'	0.0961 U	0.192 UJ	0.0961 UJ								
	SL0030_20140905	148-150'	0.0942 U	0.188 UJ	0.0942 UJ								
TWP-2	SL0032_20140909	60-62'	0.0958 U	0.192 UJ	0.0958 UJ	0.5	0.5	0.5	N/A	N/A	None proposed, samples are from aquifer zones (saturated)		
	SL0033_20140910	85-87'	0.0926 U	0.185 UJ	0.0926 UJ								
	SL0034_20140911	105-107'	0.0909 U	0.182 UJ	0.0909 UJ								
	SL0035_20140911	125-127'	0.0927 U	0.185 UJ	0.126 UJ								
	SL0036_20140912	143-145'	0.0985 U	0.197 UJ	0.0985 UJ								
TWP-3	SL0038_20140916	82-84'	0.101 UJ	0.201 UJ	0.101 U	0.5	0.5	0.5	N/A	N/A	None proposed, samples are from aquifer zones (saturated)		
	SL0039_20140916	105-107'	0.0962 UJ	0.192 UJ	0.0962 U								
	SL0040_20140917	125-127'	0.102 UJ	0.203 UJ	0.102 U								
	SL0041_20140917	145-147'	0.0984 UJ	0.197 UJ	0.0984 U								
	SL0043_20140922	165-167'	0.094 U	0.188 U	0.094 U								
	SL0044_20140923	185-187'	0.0943 U	0.189 U	0.0943 U								
	SL0044_20140923	185-187'	0.0949 U	0.19 U	0.0949 U								
TWP-4	SL0045_20140925	85-87'	0.0936 U	0.187 U	0.0936 U	0.5	0.5	0.5	N/A	N/A	None proposed, samples are from aquifer zones (saturated)		
	SL0045_20140925	85-87'	0.0938 U	0.187 U	0.0938 U								
	SL0047_20140925	105-107'	0.0895 U	0.179 U	0.0895 U								
	SL0048_20140926	125-127'	0.0965 U	0.193 U	0.0965 U								
	SL0049_20140929	145-147'	0.0911 U	0.182 U	0.0911 U								
	SL0050_20140929	165-167'	0.0918 U	0.184 U	0.0918 U								
TWP-B	SL0067_20141002	55-55'	0.0988 UJ	0.198 U	0.0988 U	0.5	0.5	0.5	N/A	N/A	None proposed, samples are from aquifer zones (saturated)		
	SL0067_20141002	55-55'	0.0982 UJ	0.196 U	0.0982 U								
	SL0069_20141003	75-77'	0.0935 UJ	0.187 UJ	0.0935 U								
	SL0070_20141003	95-97'	0.0953 UJ	0.191 UJ	0.0953 U								
	SL0071_20141006	115-117'	0.0898 UJ	0.179 UJ	0.0898 U								
	SL0072_20141006	135-137'	0.0955 UJ	0.191 UJ	0.0955 U								
	SL0073_20141007	145-147'	0.0965 UJ	0.193 UJ	0.0965 U								

Notes:

Soil is being delineated to the reporting limit per the NJDEP's 4.22.2021 letter.

Highlight = exceedance of the reporting limit

[1] = Method presented in the May 27, 2021 QAPP. Method is subject to change pending NJDEP Office of Quality Assurance approval process and/or method revisions. QAPP will be updated as needed.

IRM = interim remedial measure
N/A = not applicable
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfanoic acid
QAPP = quality assurance project plan

Data qualifiers:
J = Estimated Value
U = Not Detected

Table 2. Horizontal Assessment Sample Summary

2021 Sample Location	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
SB21-01	0-0.5' 2-2.5' 5-5.5' 8-8.5' 9-9.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-21. Sample depths selected based on the results of the parent sample location.
SB21-02	1-1.5' 2-2.5' 4-4.5' 6-6.5' 7-7.5' 8-8.5' 10-10.5' All additional 2021 depths collected from SB15-35	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-35. Sample depths selected based on the results of the parent sample location.
SB21-03	0-0.5' 2-2.5 5-5.5' 8-8.5' 9-9.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-11. Sample depths selected based on the results of the parent sample location.
SB21-04	0-0.5' 2-2.5 5-5.5' 8-8.5' 9-9.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-05	0-0.5' 2.5-3' 5-5.5' 8-8.5' 9-9.5' 10-10.5' 11-11.5' 12.12.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-02 and SB15-09. Sample depths selected based on the results of the parent sample location.
SB21-06	0-0.5' 2.5-3' 5-5.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-32. Sample depths selected based on the results of the parent sample location.
SB21-07	0.5-1' 2-2.5' 5.5-6'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-33. Sample depths selected based on the results of the parent sample location.
SB21-08	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-14. Sample depths selected based on the results of the parent sample location.
SB21-09	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-08 and SB15-15. Sample depths selected based on the results of the parent sample location.
SB21-10	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-15. Sample depths selected based on the results of the parent sample location.

Table 2. Horizontal Assessment Sample Summary

2021 Sample Location	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
SB21-11	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-25. Sample depths selected based on the results of the parent sample location.
SB21-12	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-13	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-14	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-17. Sample depths selected based on the results of the parent sample location.
SB21-15	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-16	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-17	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-18. Sample depths selected based on the results of the parent sample location.
SB21-18	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-19	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-20	0-0.5' 2-2.5' 4-4.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-07. Sample depths selected based on the results of the parent sample location.

Table 2. Horizontal Assessment Sample Summary

2021 Sample Location	2021 Proposed Sample Depth	2021 Proposed Analysis [1]	2021 Sample Rationale
SB21-21	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-19. Sample depths selected based on the results of the parent sample location.
SB21-22	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-23	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-24	0-0.5' 2-2.5' 6-6.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-01. Sample depths selected based on the results of the parent sample location.
SB21-25	0-0.5' 2-2.5' 5-5.5' 8-8.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-16. Sample depths selected based on the results of the parent sample location.
SB21-26	0-0.5' 2-2.5' 5-5.5' 8-8.5' 9-9.5' 10-10.5' 11-11.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	Horizontal assessment - step out from SB15-34. Sample depths selected based on the results of the parent sample location.
SB21-27	0-0.5' 2-2.5' 5-5.5' 8-8.5' 9-9.5' 10-10.5' 11-11.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-28	0-0.5' 2-2.5' 5-5.5' 8-8.5' 9-9.5' 10-10.5' 11-11.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	
SB21-29	0-0.5' 2-2.5' 5-5.5' 8-8.5' 9-9.5' 10-10.5' 11-11.5'	PFAS by EPA Method 537M as defined in 2021 QAPP	

Notes:
PFAS = per- and polyfluoroalkyl substances

[1] = Method presented in the May 27, 2021 QAPP. Method is subject to change pending NJDEP Office of Quality Assurance approval process and/or method revisions. QAPP will be updated as needed.

FIGURES

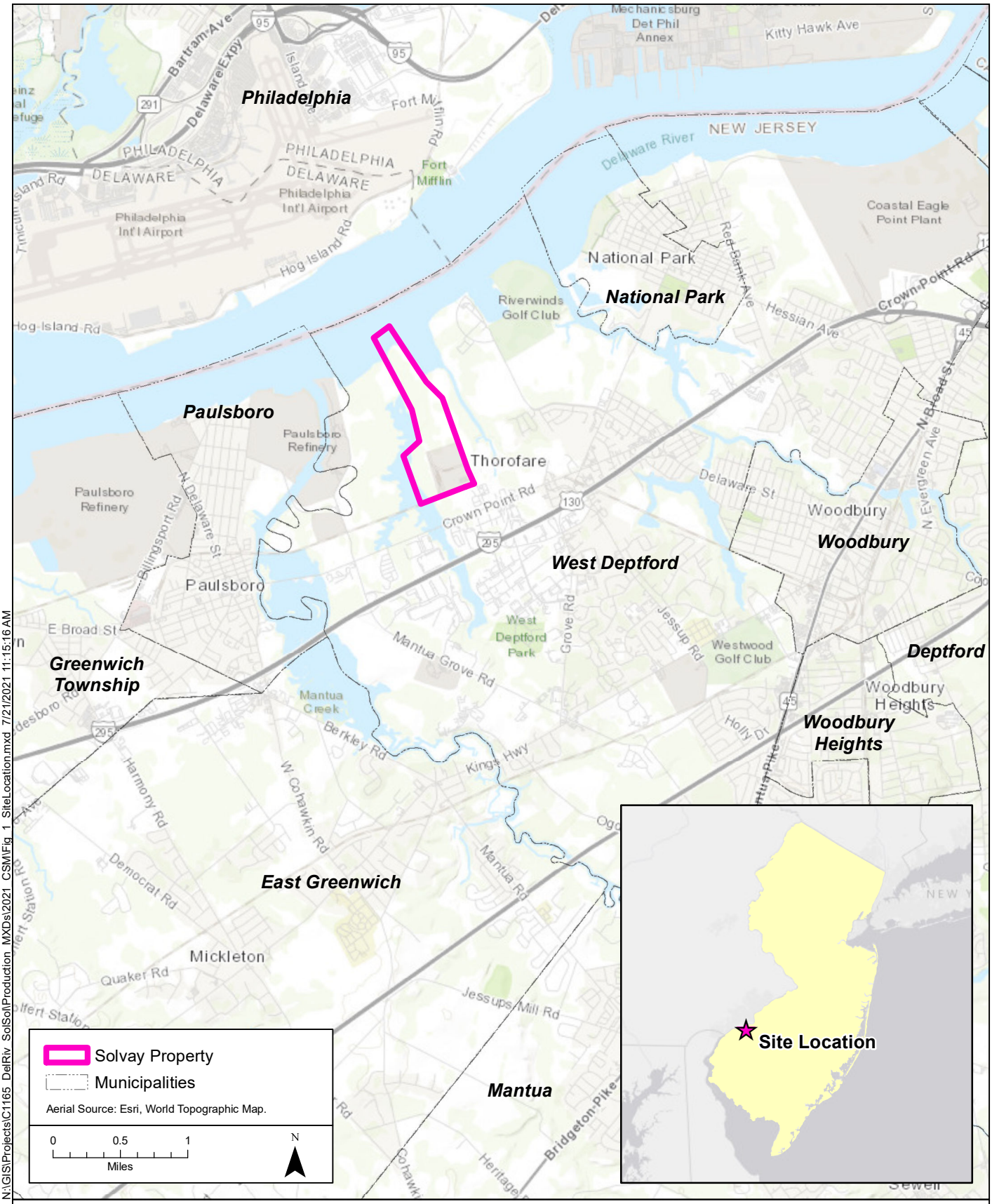

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Figure 1.
Site Location

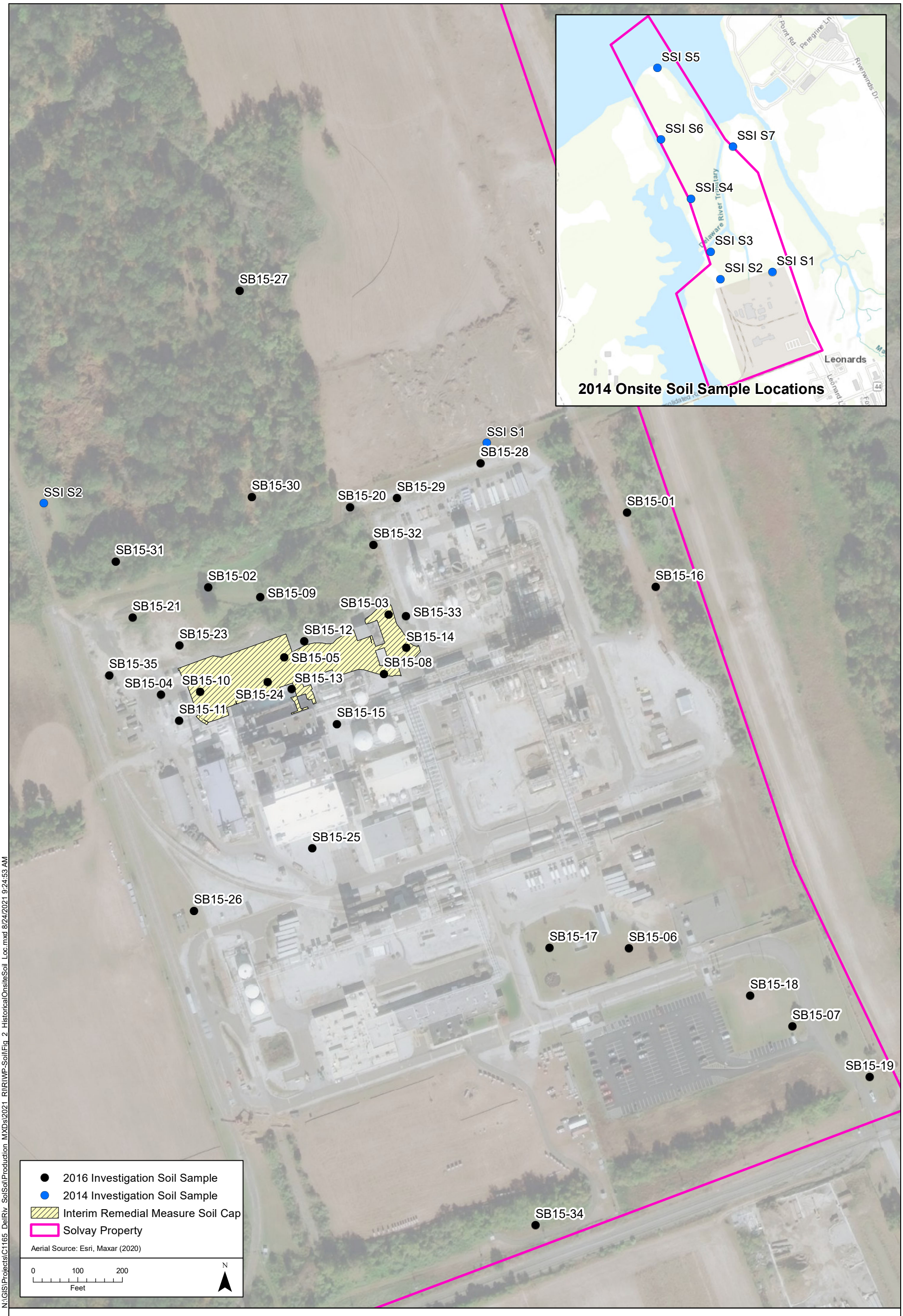

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Figure 2.
Historical Onsite Soil Investigation Locations

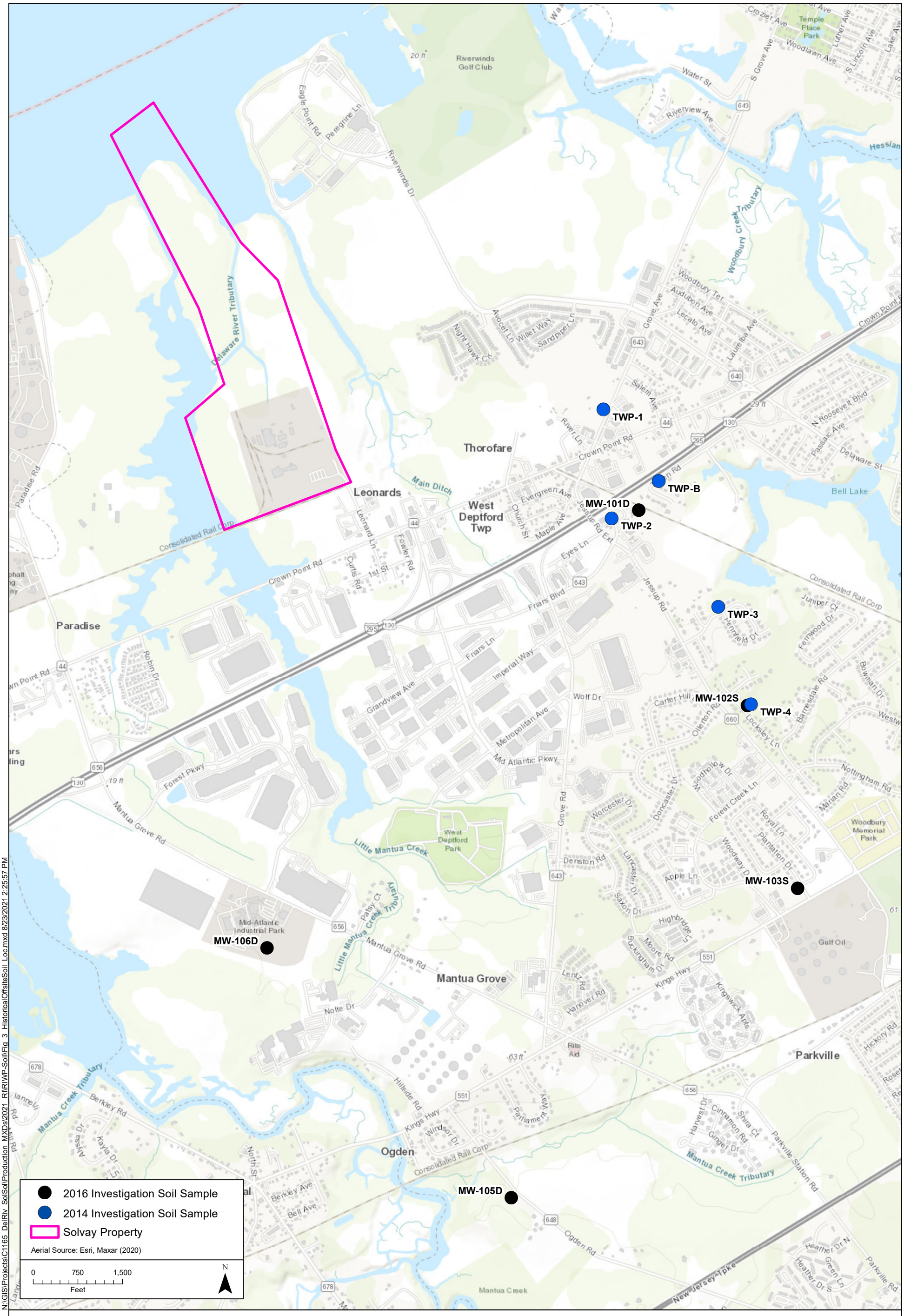

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Figure 3.
Historical Offsite Soil Investigation Locations

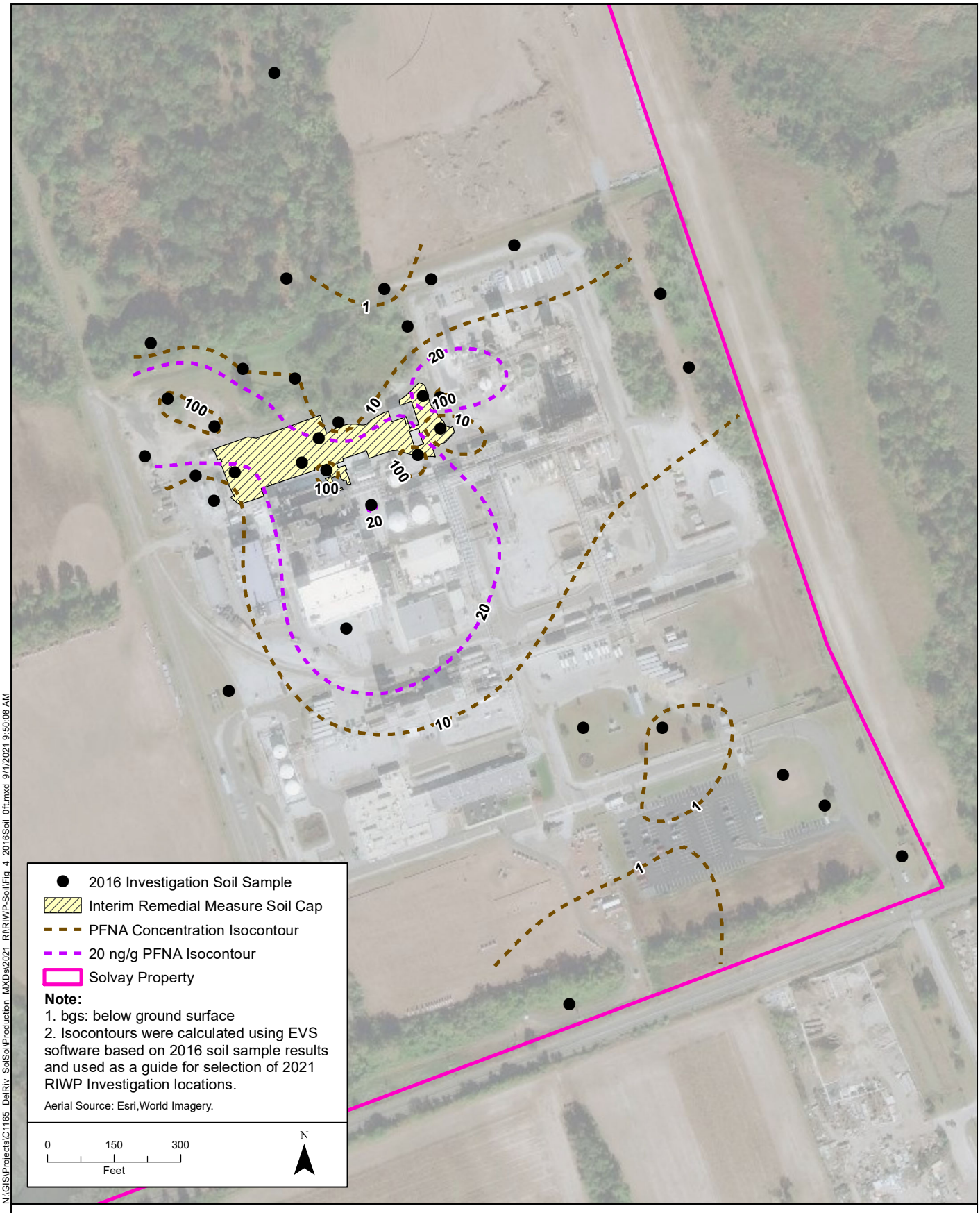

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Figure 4.
2016 Soil Investigation PFNA Isocontours
(0-0.5 ft bgs interval)

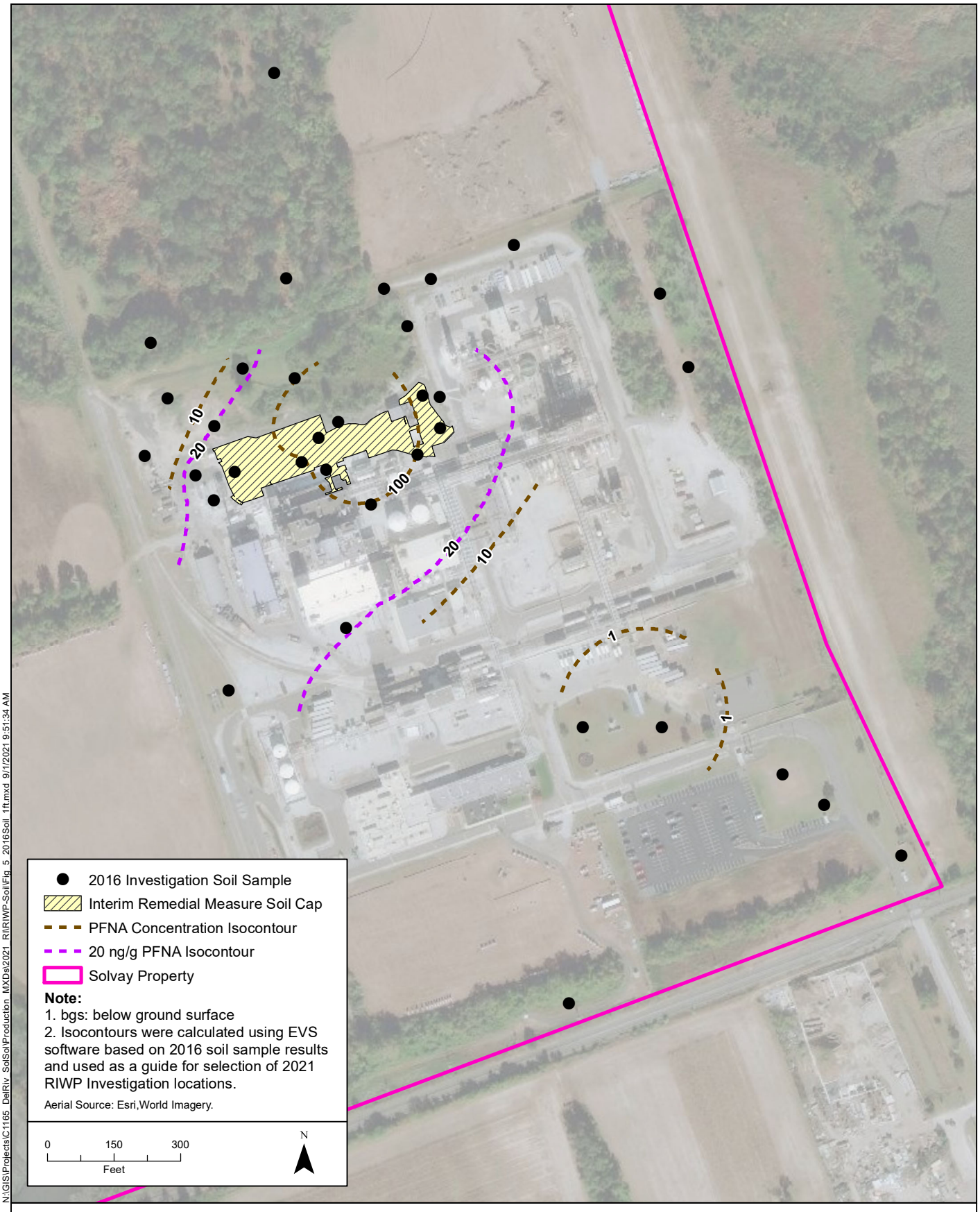

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Figure 5.
2016 Soil Investigation PFNA Isocontours
(1-1.5 ft bgs interval)

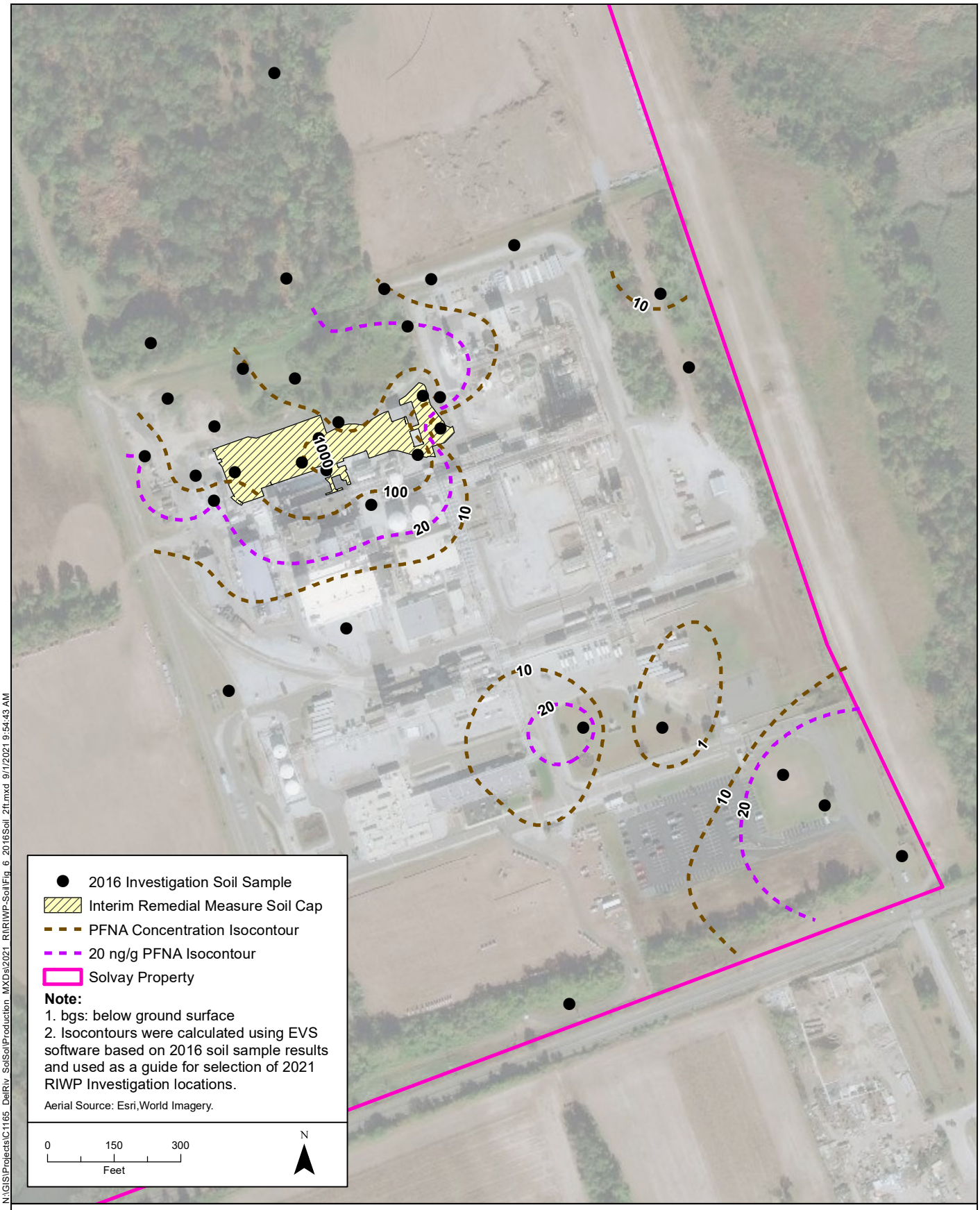

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Figure 6.
2016 Soil Investigation PFNA Isocontours
(2-2.5 ft bgs interval)

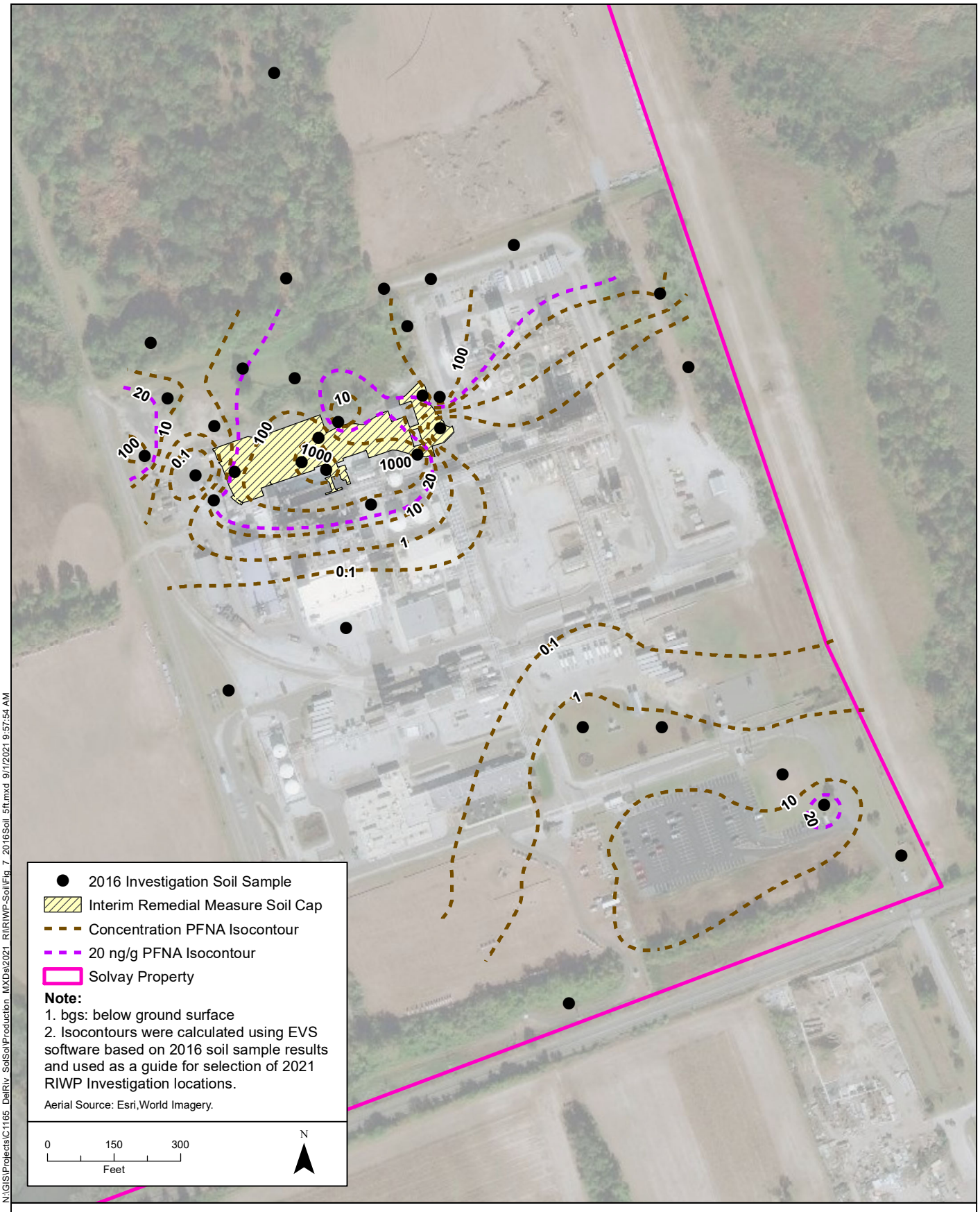

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Figure 7.
2016 Soil Investigation PFNA Isocontours
(5-5.5 ft bgs interval)

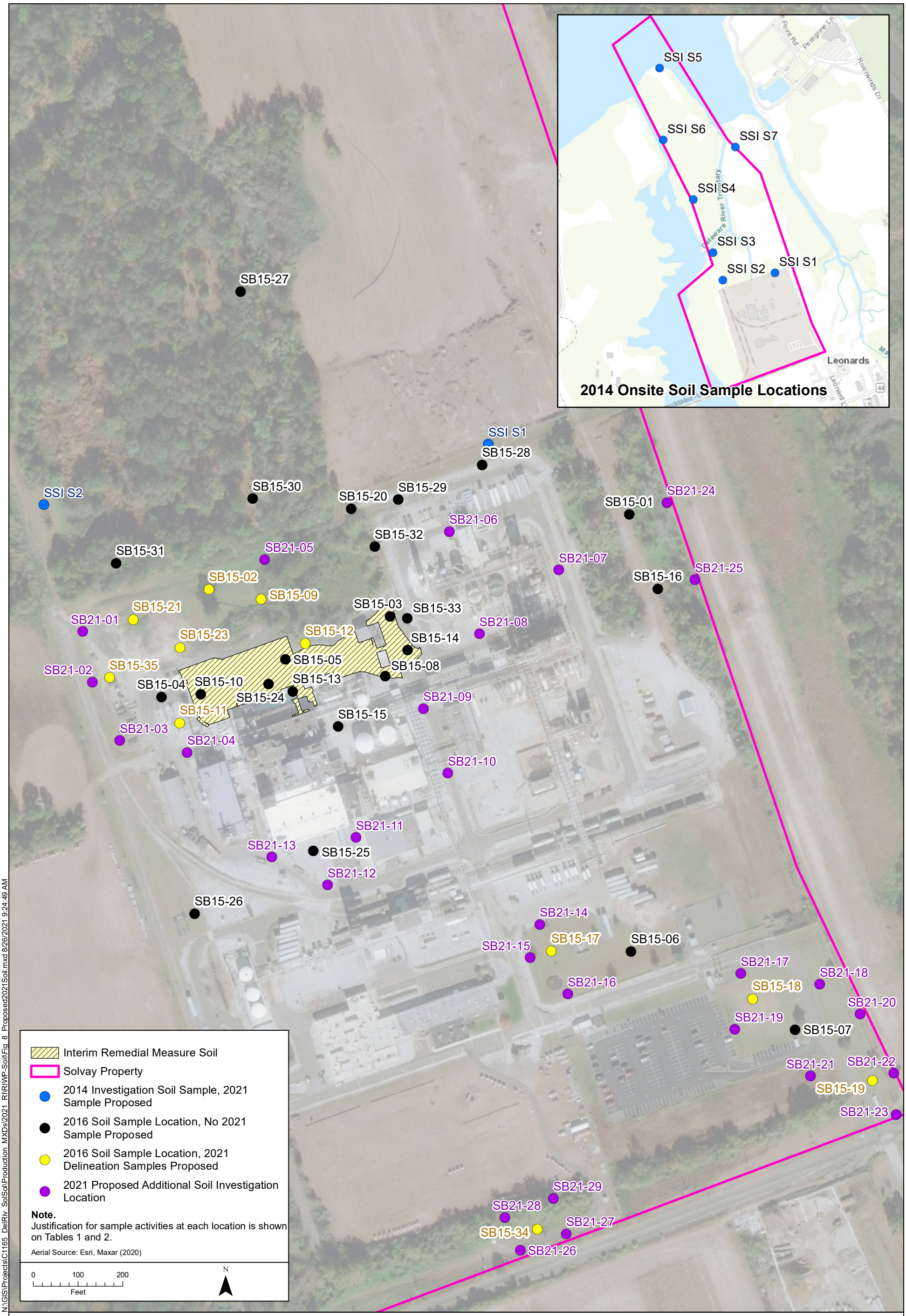

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Figure 8.
Proposed Soil Investigation Locations

APPENDIX A

IGW SRS NJDEP SPREADSHEET

NJDEP Soil-Water Partition Equation Calculator V2.1, November 2013

Site Name:	Solvay	Date:	30-Jun-17
Contaminant:	PFNA	CAS No.:	375-95-1
		Evaluated by:	Integral

$$IGWSRS = C_{gw}\frac{1mg}{1000\mu g}\{K_d + \frac{\theta_w + \theta_a H'}{\rho_b}\}DAF$$

$$K_d = K_{oc} f_{oc}$$

$$DAF = 1 + \frac{Kid}{IL}$$

$$d = (0.112L^2)^{0.5} + d_a\{1 - \exp[(-LI)/(Kid_a)]\}, d \le d_a$$

Contaminant Parameters:

Parameter	*Definition*	*Units*	*Value*	
C_{gw}	Health-based Ground Water Quality Criterion	µg/L	0.01	
K_{oc}	Soil Organic Carbon-Water Partition Coefficient	L/kg	1.61E+04	← ENTER ONE OF THESE
K_d	Soil-Water Partition Coefficient	L/kg		← ENTER ONE OF THESE
H'	Henry's Law Constant	dimensionless	0.00E+00	← enter zero if nonvolatile
S	Water Solubility	mg/L	9.50E+03	← enter NA if inorganic or a solid
C_{sat}	Soil Saturation Concentration	mg/kg	6.61E+05	

Soil Parameters:

Parameter	*Definition*	*Units*	*Value*
θ_w	Water-filled soil porosity	dimensionless (v/v)	0.23
θ_a	Air-filled Soil Porosity	dimensionless (v/v)	0.18
f_{oc}	Fraction Organic Carbon Content of Soil	dimensionless (w/w)	0.0043
ρ_b	Dry Soil Bulk Density	kg/L	1.5

NOTES: (click outside box when finished)

DAF Parameters:

Parameter	*Definition*	*Value*	*units*	Converted to metric: *Value*	*units*
L	Length of Area of Concern Parallel to Ground Water Flow	1200	ft	365.8	m
d_a	Aquifer Thickness	120	ft	36.6	m
I	Infiltration Rate	11	in/yr	0.28	m/yr
K	Aquifer Hydraulic Conductivity	80000	ft/yr	24384	m/yr
i	Gradient	0.0025	dimensionless	0.0025	dimensionless
d	Mixing Zone Depth			36.6	m
DAF	Dilution-Attenuation Factor			23	dimensionless

Rounded Health-based Impact to Ground Water Soil Remediation Criterion:

0.02 mg/kg